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NATIONAL EYE INSTITUTE

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON PUBLIC HEALTH AND WELFARE

OF THE

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

HOUSE OF REPRESENTATIVES

NINETIETH CONGRESS

FIRST SESSION

ON

H.R. 12843

A BILL TO AMEND THE PUBLIC HEALTH SERVICE ACT TO PROVIDE FOR THE ESTABLISHMENT OF A NATIONAL EYE INSTITUTE IN THE NATIONAL INSTITUTES OF HEALTH

(And Similar Bills)

OCTOBER 31; NOVEMBER 1, 1967

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NATIONAL EYE INSTITUTE

TUESDAY, OCTOBER 31, 1967

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON PUBLIC HEALTH AND WELFARE,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2322, Rayburn House Office Building, Hon. John Jarman (chairman of the subcommittee) presiding.

Mr. JARMAN. The subcommittee will be in order. The hearings today are on H.R. 12843, introduced by Chairman Staggers; H.R. 586, introduced by our colleague, Mr. Friedel; and other similar bills providing for the establishment of a National Eye Institute in the National Institutes of Health.

The first bill on the subject was introduced by our colleague on the committee, Hon. Fred Rooney, of Pennsylvania.

In 1937, the Congress created the National Cancer Institute, for the purpose of establishing in the Federal Government a central focus for research into problems involving cancer.

A few years later, legislation reported out of this committee provided an expanded role for the Public Health Service in medical research through the establishment of the National Institutes of Health, through which research and training would be conducted covering the general field of diseases.

From time to time, additional institutes have been created, some under general authority contained in law, such as the National Institute of Allergy and Infectious Disease, and some through specific statutory authority, such as the National Heart Institute.

There are today a number of separate Institutes in the National Institutes of Health, covering the full range of diseases and disorders affecting man. It is inevitable, therefore, that the creation of any new Institute, whether done administratively under the authority contained in existing law, or whether done by act of Congress, will involve some transfers of functions and responsibilities from an existing Institute within the National Institutes of Health.

Basically, we are faced in these bills with the problem of whether greater efficiency will be brought about in research and training in health problems relating to vision through the creation of a separate Institute, specifically oriented towards diseases and disorders of vision, than will continue under the existing organizational structure of the National Institutes of Health.

I think it is fairly obvious that greater efficiency would be brought about in research relating to vision through the creation of a separate National Eye Institute.

On the other hand, however, we also face the problem of whether the creation of a separate National Eye Institute might impair the efficiency of the existing National Institute of Neurological Diseases and Blindness, which today has most of the authorities that would be transferred to the separate Eye Institute proposed to be created by the bills before the subcommittee.

The purpose of these hearings is to explore the question of whether changes in the organizational structure of the National Institutes of Health through the creation of a separate National Eye Institute will lead ultimately to an overall increase in the efficiency and effectiveness of the National Institutes of Health in dealing with the problems of neurological diseases, blindness, disorders of the eye, and disorders of the central nervous system.

No particular organizational structure of Government departments is sacrosanct; nor, is any organizational structure necessarily the best that can be devised.

This committee is concerned with the overall problems of involving public health in general. It will be our purpose in these hearings to explore the question of whether the gains which we are certain will arise through the creation of a National Eye Institute will offset the losses which might arise, as a result of the transfer of responsibilities proposed.

(Bills similar to H.R. 12843, introduced by Mr. Staggers, are as follows: H.R. 586, Friedel, Maryland; H.R. 908, Moss, California; H.R. 1013, Murphy of New York; H.R. 1197, Rooney of Pennsylvania; H.R. 1470, Young, Texas; H.R. 2001, Kornegay, North Carolina; H.R. 2104, Helstoski, New Jersey; H.R. 2347, Multer, New York; H.R. 3364, Hathaway, Maine; H.R. 3985, O'Neill of Massachusetts; H.R. 4331, Gilbert, New York; H.R. 4866, Fulton of Tennessee; H.R. 5040, Clark, Pennsylvania; H.R. 5052, Fallon, Maryland; H.R. 5082, Nix, Pennsylvania; H.R. 5145, Hanley, New York; H.R. 5153, Patten, New Jersey; H.R. 5165, Wilson of California; H.R. 5252, Corman, California; H.R. 5260, Eilberg, Pennsylvania; H.R. 5264, Howard, New Jersey; H.R. 5322, Edmondson, Oklahoma; H.R. 5421, Fulton of Pennsylvania; H.R. 5464, Murphy of Illinois; H.R. 5501, Tenzer, New York; H.R. 5792, Ronan, Illinois; H.R. 5927, McDade, Pennsylvania; H.R. 6116, Farbstein, New York; H.R. 6407, Walker, New Mexico; H.R. 6601, Green of Oregon; H.R. 7526, Carter, Kentucky; H.R. 8049, Brasco, New York; H.R. 8080, Whalley, Pennsylvania; H.R. 8346, Price of Texas; H.R. 9712, Cleveland, New Hampshire; H.R. 10780, Rogers of Florida; and H.R. 13440, Horton, New York.)

(The text of H.R. 12843, and departmental reports thereon, follow:)

[H.R. 12843, 90th Cong., first sess.]

A BILL To amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That title IV of the Public Health Service Act (42 U.S.C., ch. 6A, subch. III) is amended by adding at the end thereof the following new part:

"PART F—NATIONAL EYE INSTITUTE

"ESTABLISHMENT OF NATIONAL EYE INSTITUTE

"SEC. 451. The Surgeon General is authorized, with the approval of the Secretary, to establish in the Public Health Service an institute for the conduct and

support of research for new treatment and cures and training relating to blinding eye diseases and visual disorders, including research and training in the special health problems and requirements of the blind and in the basic and clinical sciences relating to the mechanism of the visual function and preservation of sight. The Surgeon General is also authorized to plan for research and training, especially against the main causes of blindness and loss of visual function.

ESTABLISHMENT OF ADVISORY COUNCIL

"SEC. 452. (a) The Surgeon General is authorized, with the approval of the Secretary, to establish an advisory council to advise, consult with, and make recommendations to the Surgeon General on matters relating to the activities of the National Eye Institute.

"(b) The provisions relating to the compoistion, terms of office of members, and reappointment of members of advisory councils under section 432(a) shall be applicable to the council established under this section, except that the Surgeon General, with approval of the Secretary, may include on such council established under this section such additional ex officio members as he deems necessary.

"(c) Upon appointment of such council, it shall assume all or such part as the Surgeon General may, with the approval of the Secretary, specify of the duties, functions, and powers of the National Advisory Health Council relating to the research or training projects with which such council established under this part is concerned and such portion as the Surgeon General may specify (with such approval) of the duties, functions, and powers of any other advisory council established under this Act relating to such projects.

"FUNCTIONS

"SEC. 453. The Surgeon General shall, through the National Eye Institute established under this part, carry out the purposes of section 301 with respect to the conduct and support of research with respect to blinding eye diseases and visual disorders associated with general health and well-being, including the special health problems and requirements of the blind and the mechanism of sight and visual function, except that the Surgeon General shall, with the approval of the Secretary, determine the areas in which and the extent to which he will carry out such purposes of section 301 through such Institute or an institute established by or under other provisions of this Act, or both of them, when both such institutes have functions with respect to the same subject matter. The Surgeon General is also authorized to provide training and instruction and establish and maintain traineeships and fellowships, in the National Eye Institute and elsewhere in matters relating to diagnosis, prevention, and treatment of blinding eye diseases and visual disorders with such stipends and allowances (including travel and subsistence expenses) for trainees and fellows as he deems necessary, and, in addition, provide for such training, instruction, and traineeships and for such fellowships through grants to public or other nonprofit institutions."

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., November 2, 1967.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce, House of Representatives, Rayburn House Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in response to your request of March 10, 1967, for a report on H.R. 586, and your request of September 14, 1967, for a report on H.R. 12843, bills "To amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health."

The Department of Health, Education, and Welfare, in its report to your Committee on these bills, pointed to several reasons for recommending against enactment of this legislation. The Bureau of the Budget concurs in those views.

Sincerely yours,

WILFRED H. ROMMEL,
Assistant Director for Legislative Reference.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
Washington, D.C., October 31, 1967.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in response to your request of March 10, 1967, for a report on H.R. 586, and your request of September 14, 1967, for a report on H.R. 12843, bills "To amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health."

The bill H.R. 586 would authorize the establishment in the Public Health Service of an Institute for the conduct and support of research and training relating to blinding eye diseases and visual disorders, including research and training in the special health problems and requirements of the blind and in the basic sciences relating to the mechanism of sight and visual function.

The bill H.R. 12843 differs from H.R. 586 in that it would provide for the establishment in the PHS of an institute for the conduct and support of research "for new treatment and cures" and training relating to blinding eye diseases and visual disorders and includes authority for research and training in the "clinical sciences" as well as the basic sciences relating to the mechanism of the visual function and preservation of sight. In addition, H.R. 12843 would authorize the Surgeon General "to plan for research and training, especially against the main causes of blindness and loss of visual function."

It is proposed in the bills that this Institute have responsibility for programs directed toward the alleviation of blindness which are now encompassed within the activities of the National Institute of Neurological Diseases and Blindness (NINDB). The purposes of this transfer of programs and authorities would be to place greater emphasis on the problems of the blind by creating an advisory council concerned only with blindness; by making it possible for the Congress to allocate funds to an agency with this sole responsibility; and by organizing an institute staff within this more narrow orientation.

At the time of the creation of the NINDB, the question of establishing separate institutes for blindness, for deafness, for cerebral palsy, for multiple sclerosis, for muscle disorders, as well as for other neurological disorders, received serious consideration. Although each disease area has unique problems, it was recognized that each involves damage or dysfunction of a portion of the nervous system and that to create a separate institute for each would lead to a very unprofitable fractionation of effort. For this reason, the creation of a single institute for neurological diseases and blindness was decided on. Within this existing single organization, a highly significant unification of effort has been achieved. Thus, for example, within the Institute's large Collaborative Perinatal Project, a search for perinatal determinants of a number of neurological and sensory disorders is being carried forward. A major focus is the search for toxoplasmosis, now proving to be a significant cause of congenital as well as postnatal blindness. Such an integrated effort is essential to the advance of knowledge relative to the disorders of vision.

A considerable danger exists in the compartmentalization of research into specialized organizations. This is the isolation of scientists who may lose rapport with others working on closely related problems. Ocular disease due to infectious processes such as toxoplasmosis is only one manifestation of an infection which spreads, in its acute stage, throughout the body. Similarly, ocular disease due to rheumatoid arthritis or to diabetes represents only the damage in one organ. Damage to retinal cells, which are specialized nerve cells, can be representative of pathology in other parts of the nervous system. Therefore, the orientation of scientists toward one organ may represent an improper emphasis concerning a total disease process. The present structure of categorical disease Institutes within NIH already has many areas of overlap, as for instance the work on "slow" viruses, rubella, and the relationship of virus infection to cancer. From the standpoints of scientific endeavor and scientific surveillance and administrative management of research, further divisions of functions appear undesirable.

From the establishment of the NINDB in 1951, eye research has been an important part of its total program and the growth of eye research has roughly paralleled that of the total activity of the Institute.

The Ophthalmology Branch in the NINDB's Intramural Program is one of the world's finest eye research centers. The ophthalmology unit in the NINDB's Epidemiology Branch is almost the only ophthalmology epidemiology unit in existence. The Institute's Model Reporting Area for Blindness is a major seg-

ment of the activities of the Biometrics Branch. Within the Extramural Programs, the NINDB was influential in encouraging the establishment of a special vision research study section in order that proposals for blindness research would be assured of appropriate review by peer groups appreciative of the needs in this field.

At the present time in the Institute's overall training program, the highest percentage of graduate training grants (which are used to develop and strengthen capabilities in particular program areas) are in the field of opathalmology. As a result of these efforts and through the productivity of this training program, a greatly expanded research capability is now available, and the last few years have seen an almost exponential growth of eye research.

These activities to advance scientific effort in the area of blindness and vision have had a great impact. (Supported by additional funds allocated to the Institute by Congress in 1966, the program increased from $10.9 million in 1963 to $18.2 million in 1967).

In view of these evidences of strong representation of eye research within the present administrative structure, and in view of the potential for almost endless fragmentation of efforts which exists within the varied programs of the existing National Institutes of Health, the creation of a separate institute for eye research does not appear necessary or justifiable at this time.

It should be noted also that the bill is not consistent with Reorganization Plan No. 3 of 1967 which transferred the functions of the Public Health Service and its officers and agencies to the Secretary and gave him broad flexibility with respect to structural organization and assignment of functions within the Service. Such flexibility has advantages that would be lost by once again freezing in statutory law a functional assignment in a particular subject-matter area.

We therefore recommend against enactment of H.R. 586 and H.R. 12843.

We are advised by the Bureau of the Budget that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

JOHN W. GARDNER, *Secretary.*

DEPARTMENT OF THE NAVY,
OFFICE OF LEGISLATIVE AFFAIRS,
Washington, D.C., November 1, 1967.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Your request for comment on H.R. 586 and H.R. 12843, similar bills "To amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institute of Health," have been assigned to this Department by the Secretary of Defense for the preparation of a report thereon expressing the views of the Department of Defense.

These bills contemplate an amendment to the Public Health Service Act which would result in management of certain eye research, establishment of an appropriate Advisory Council and creation of the National Eye Institute. They would, if enacted, establish responsibilities for the Public Health Service with respect to the conduct and support of research concerning eye diseases and visual disorders and would be supported by Public Health Service appropriations.

The Department of the Navy, on behalf of the Department of Defense, has no objection to the enactment of H.R. 586 and H.R. 12843, however, since the Department of Health, Education, and Welfare has primary interest in the bills, we would defer to the views of that Agency.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Bureau of the Budget advises that, from the standpoint of the Administration's program, there is no objection to the presentation of this report for the consideration of the Committee.

Sincerely yours,

R. WRZESINSKI,
Captain, U.S. Navy, Director, Legislative Division
(For the Secretary of the Navy).

VETERANS' ADMINISTRATION,
OFFICE OF THE ADMINISTRATOR OF VETERANS AFFAIRS,
Washington, D.C., October 31, 1967.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: The following comments are furnished in response to your request for a report on H.R. 12843, 90th Congress.

The general purpose of the bill is to establish a National Eye Institute in the Public Health Service. This would be an institute for the conduct and support of research for new treatments and cures and training relating to blinding eye diseases and visual disorders. Research and training in the special health problems and requirements of the blind and in the basic and clinical sciences relating to the mechanism of the visual function and preservation of sight would be involved.

Provisions are made for an Advisory Council to advise and make recommendation to the Surgeon General in this area. The latter would be authorized to provide training and instruction and to establish and maintain traineeships and fellowships in the Institute in matters relating to blinding eye diseases and visual disorders with stipends, allowances, and travel expenses as necessary. This could also be accomplished through grants to public or other nonprofit institutions.

The bill would be administered under the Department of Health, Education, and Welfare. It does not appear to impose additional administrative responsibilities on the Veterans Administration, though its broad effects would be of interest to this agency in connection with its medical program for veterans.

For many years the Veterans Administration has recognized the importance of concentrated efforts toward preventing blindness and assisting the blind. We have included in our programs research activities in this field with particular reference to the problems and treatment of blinded veterans.

While we appreciate the general purpose of the bill, we defer to the views of the Department of Health, Education, and Welfare, which would have overall administrative responsibility, as to the need for this legislation in the light of other existing programs and whether the approach employed by this bill would be an effective method for achieving its aims.

We are advised by the Bureau of the Budget that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

W. J. DRIVER, *Administrator.*

Mr. JARMAN. Our first witness today will be our colleague on the committee, Sam Friedel, who is deeply interested in this problem, as we all are.

Sam, we are glad to have you with us today and you may proceed with your statement in your own fashion.

STATEMENT OF HON. SAMUEL N. FRIEDEL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MARYLAND

Mr. FRIEDEL. Mr. Chairman, I am very pleased to be given the opportunity to testify today before your Subcommittee on Public Health and Welfare in support of my proposal, H.R. 586, a bill to establish a separate National Eye Institute under the auspices of the National Institutes of Health.

Blindness and other visual disorders constitute one of the most severe health problems in America today. Statistics show that 1 million Americans are functionally blind, that is, unable to read a newspaper even with the aid of glasses.

Three and one-half million citizens of this country are afflicted with some sort of permanent visual defect that can't be corrected within the range of our scientific knowledge today.

Furthermore, 75 million Americans must wear glasses in order to achieve acceptable vision. To my way of thinking, these figures indi-

cate a widespread and serious health problem in our Nation—a problem which requires large-scale efforts in searching for a solution.

The urgency of this need and the indisputable public support for efforts to relieve this situation is reflected in the results of a late 1965 Gallup poll.

This report indicated that blindness is the second most-feared affliction of the American people, exceeded only by cancer. In other words, the loss of vision is more frightening to the citizens of this country than heart disease, paralysis, tuberculosis, and polio.

This, to me, constitutes a plea for action.

As an initial step to finding a solution, I have introduced H.R. 586 which provides for the separation of the National Institute for Neurological Diseases and Blindness into its two major component parts, with the name of the "National Eye Institute" given to the research institution involved in work on visual diseases and malfunctions.

The fact remains that the causes of 80 percent of all visual afflictions are unknown at this time because of lack of extensive research in this area.

Dr. Thomas D. Duane, Research Study Director of Research to Prevent Blindness testified before a congressional committee in 1965 that—

> No substantial reduction in incidence of eye disease and blindness can be anticipated in the absence of an adequately financed research program to find and eliminate the causes of disease.

Diseases which we do not now understand.

Although the agency report did not recommend the establishment of a National Eye Institute divorced from the National Institute for Neurological Diseases and Blindness, it did enthusiastically state that "there is an undeniable need for effective leadership for the national eye research effort. The existence of a position as Institute Director would be an important incentive to recruitment."

I believe that a concentrated eye research program is a vital necessity for the maintenance of the health and comfort of a very large proportion of the American population.

Visual problems cannot receive the attention they need if structurally maintained as a subsidiary part of a research institution with widespread interests, such as the National Institute of Neurological Diseases and Blindness.

Ophthalmic study, because of its increased importance to the health of our Nation, must be granted independent status, which is a prerequisite to further significant progress.

This view is supported by one of the most eminent scientists in the field of ophthalmology when he said:

"The creation of a separate Institute would be the most important thing that has ever happened to ophthalmology."

At present, we are linked to a predominantly neurological division of the National Institutes of Health which, however, gracious, can never understand fully the problems and requirements of ophthalmology.

Under the present system, we are committed to being a small appendage with minor ophthalmic representation in the administration—ophthalmic research is now sufficiently established that a separate Institute might well be justified.

We spend $1 billion annually for the care of the blind for vocational rehabilitation, special schools, and textbooks. However, the entire budget for eye research in fiscal 1967 was little more than $18 million and despite other Government funds and private sources, the total amount spent in the same fiscal year was still barely $24 million.

In other words, less than 2½ percent of all money spent in fiscal 1967 in relation to visual problems was used to discover the physiological causes of eye disease and disorders.

It is obvious to me that this percentage is nowhere near sufficient. I strongly believe that we must concentrate more on curing substantial numbers of eye diseases—something which cannot occur without intensive research into the causes of those diseases.

This, in turn, will effectively reduce our expenditures to help those we cannot cure to adjust to a "seeing" society.

The establishment of a National Eye Institute as an independent research department would be a very significant step to finding a cure for visual disease.

I, of course, am not alone in this judgment. Fifty-one of our distinguished colleagues in the Senate have cosponsored a similar bill bill, S. 325. Several of our friends in the House of Representatives have also submitted bills similar in language and provisions to mine for consideration by this subcommittee.

Furthermore, this measure is very strongly supported by the Association for Research in Ophthalmology, the Wilmer Institute of Johns Hopkins University, Research To Prevent Blindness, many ophthalmology professors around the Nation, and many, many more.

I feel that the formal establishment of a separate National Eye Institute under the National Institutes of Health would be a vital step toward more intensive research into this vast health problem and eventual progress toward cures for a substantial portion of the 90 million Americans with vision problems.

When I introduced this bill, I did not feel it would be necessary for us to specifically mention optometrists since I thought that it would be clear to everyone that optometrists are necessary in the treatment of eye diseases and disorders.

However, to insure that the talents of all specialists in visual disorders cooperate in this effort to find the cause of blindness, I would like to suggest that my bill be amended as follows:

On page 2, line 15, after the words "except that," I propose the following:

(1) the council established under this section shall include members who are optometrists or representatives of professional optometric organizations, and

(2) on page 3, line 25, delete the period and the close quotation marks and add: "(including training, instruction, traineeships, and fellowships in optometry)."

Mr. Chairman, and distinguished colleagues, I cannot stress too strongly the need for such legislation as promptly as possible, and I respectfully urge favorable consideration of H.R. 586.

Mr. JARMAN. Are there any questions?

Mr. NELSEN. I have no questions but I want to thank our colleague for his appearance.

We always appreciate Mr. Friedel's appearance before the committee, in the committee, and on the floor, the friendly gentleman that he is who is so concerned about the problems of the public.

Mr. ROGERS. I join in that statement. We are always delighted to have our colleague give us advice on legislation before the subcommittee. I might say in looking over the statement this certainly lets us see more clearly the explanation of this legislation.

Thank you.

Mr. JARMAN. Thank you very much for being with us.

Mr. FRIEDEL. Thank you, Mr. Chairman.

Mr. JARMAN. Our next witness this morning is our colleague on the committee, Congressman Fred B. Rooney, of Pennsylvania.

It is a pleasure to have you with us.

STATEMENT OF HON. FRED B. ROONEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. ROONEY. Mr. Chairman, members of this very distinguished subcommittee, I am delighted to be appearing before you today and I want to begin by thanking you for permitting me to take your valuable time to appear before the committee this morning to testify on behalf of my bill to create a separate institute.

It was nearly 2 years ago when I first introduced this legislation in the 89th Congress. And so it was with a great deal of satisfaction that I learned of these hearings and the opportunity for me to testify.

However, I would be remiss at this time, if I did not pay tribute to a colleague and close friend of mine, the late John Fogarty of Rhode Island, to whom I turned for guidance and support in those early days when I first introduced the bill.

The bill before this committee provides for creation within the National Institutes of Health of a separate and distinct institute to deal with what has aptly been called one of the most catastrophic, yet most neglected, of all human afflictions—the loss of sight.

This is a serious problem here in the United States where the blind population is 1 million, and it is a worldwide problem as well. There are more than 10 million totally blind throughout the world.

But the subject of eye diseases has far greater impact when we consider the fact that some 90 million Americans—nearly one-half of our entire population—suffer from some form of eye disorder or impaired vision.

Over 500,000 Americans will become blind in the next 10 years if the present trend continues. This year alone more than 30,000 men, women, and children may be expected to lose their sight.

Fear of blindness ranks second only to fear of cancer as "the worst thing that can happen," as indicated by a Gallup poll.

Contrary to popular opinion, accidents account for only 5 percent of vision loss. More than 80 percent of all blindness is the result of diseases whose causes are unknown to science.

While it is possible to rehabilitate a small percentage of those who are blind, this obviously is not the long-term solution.

Caring for the blind, while it is absolutely necessary, also is not the long-term solution.

I might point out that the cost of blindness, in addition to the human tragedy, runs to more than $1 billion per year. The only answer is a vastly expanded program of research.

And the means to achieve this is the creation of a separate eye institute within the National Institutes of Health.

We now have nine distinct national institutes for cancer, heart, allergy and infectious diseases, arthritis and metabolic diseases, dental research, mental health, neurological diseases and blindness, child health and human development, and general medical sciences.

And, I think the evidence proves that blindness ranks in equal importance to all of these.

The present administrative structure at the National Institutes of Health for blindness research is not as efficient as it could be. Blindness is only one of many other diseases given any attention within the Institute of Neurological Diseases and Blindness.

In 1967, only 15 percent of the total budget for the Institute of Neurological Diseases and Blindness was allocated for eye research—or only $18 million out of $116 million.

I submit that if a separate eye institute were created, it would reduce the total administrative cost for National Institute of Neurological Diseases and Blindness by more than 10 percent.

At the present time you find that many ophthalmologists at NIH are working under neurologists. And while I have high praise for the work these neurologists are doing in the fields of cerebral palsy, multiple sclerosis, epilepsy, and for other muscle disorders, I would question whether they should be responsible for administration of eye research.

Eye disease is unique and is not necessarily as closely related to the central nervous system as those I have just mentioned. It requires a program of research apart from the other diseases of the nervous system. It requires a staff of professionals trained specifically in this field.

You will hear testimony later from some of the leading ophthalmologists who will be explaining this. It is not my purpose to get into it now.

I submit that the increased efficiency in administration among both clerical, professional, and paraprofessional personnel within the National Institute of Neurological Diseases and Blindness, will provide enough savings to finance a separate eye institute.

If this bill were passed tomorrow, it would not cost the American taxpayer any more money. It would merely require the transferring of funds within the National Institute for Neurological Diseases and Blindness to a separate structure.

In other words, taking the fiscal year 1968 for example, the $20 million obligated for vision out of the total budget for NINDB would go for setting up the eye research institute.

In fact, through ophthalmological self-direction, which could be the result of a separate eye institute, it should be possible to secure greater private ophthalmic research productivity for every Federal dollar invested.

In most of our medical schools throughout the country, the departments of ophthalmology are unable to compete with larger departments and Government grants.

There can be no better way to alleviate this problem than to create a separate eye institute. It will provide the impetus needed, in both public and private programs.

Objections to the creation of a separate eye institute have been raised in the past on the grounds that it would be difficult to recruit and staff such a separate institute because of the salary differential between Government and private practice.

Perhaps in some individual cases, this may be a factor. I submit that the real reason is not salary, but rather that when a highly qualified ophthalmologist is approached, his primary concern will be the degree of authority and freedom he will have to conduct his research program.

I talked to many of the leading ophthalmologists in the country during their conference in Chicago last year and they all agree we could recruit many more ophthalmologists in Government service if we had this separate institute.

How large a staff will he have? Will their efforts be devoted solely to eye research?

Certainly under the present structure, it would be difficult to answer these questions in the affirmative. I am confident that if more support were given to eye research with the National Institutes of Health, there would be no problem in attracting highly qualified ophthalmologists.

Finally, it has been suggested by some that instead of creating a separate eye institute, there be developed a national eye research program to be planned and organized by a special subcommittee of the National Advisory Neurological Diseases and Blindness Council on Vision and Visual Disorders.

I would like to point out that such a program was only mentioned after I first introduced my bill nearly 2 years ago.

Incidentally, gentleman, in this Congress today there are 38 similar bills in the House and 52 bills in the Senate. To me setting up this special program is still in the talking stages and I doubt whether or not this would be accomplished in the next 5 or 10 years.

During the past several years, the charge has often been made that Congress merely reacts to the desires of the executive branch of Government.

In this respect, I would only say that in the creation of a National Eye Institute, Congress certainly has an opportunity to take the initiative in supporting what is clearly the well-known, well-publicized wish and need of the American people.

Thank you, Mr. Chairman.

Mr. JARMAN. We do certainly thank you for a strong, effective statement on this subject.

Are there comments by the committee?

Mr. ROGERS. I want to join the chairman in his statement. The statement is excellent and I think you have pointed up some of the problems this committee is very anxious to go into to see if we could bring about increased emphasis in research if it were set up separately.

Mr. NELSEN. I have no questions.

I merely want to thank my colleague for his appearance.

Mr. CARTER. Certainly I want to thank the gentleman for his appearance and his excellent presentation along this line. As a physician, I am aware of the fact that not enough research is being done in this field.

Also, it has been brought to my attention by many ophthalmologists throughout this counry that the formation and the development of this institute is necessary.

Just recently I have had communications from several ophthalmologists in medical schools throughout the country and other specialists—Dr. Arthur Keaney of the Wills Eye Clinic, I guess one of the most famous in our country, one of the oldest, to the effect that it is necessary.

I am happy to cosponsor the gentleman's bill and certainly I support it.

There is a great problem in obtaining men of the type who would be effective in this because their salaries are not on a level with what they make in private practice, but in some way or another this must be remedied.

Mr. ROONEY. Thank you, Dr. Carter. I am sure after you hear this testimony—several of the ophthalmologists will be appearing before this committee—you will find they are willing to devote time to Government service, and they have pride in their work and profession.

I thank you and the gentleman alongside you, Mr. Nelsen, who also sponsors this bill.

Mr. SKUBITZ. I have no questions. I do want to commend our colleague on the excellent statement he has made on behalf of this legislation.

Mr. SPRINGER. A very good statement, Mr. Chairman.

Mr. ROONEY. I am sure the Surgeon General will be able to answer any questions I cannot answer.

Mr. JARMAN. Our chairman, Mr. Staggers, is sitting in with us this morning.

Do you have any comments or questions?

Mr. STAGGERS. No thank you, Mr. Jarman.

Mr. JARMAN. At this time we will hear from our colleague on the full committee, the Honorable John Moss, who is the sponsor of similar legislation. Mr. Moss.

STATEMENT OF HON. JOHN E. MOSS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Moss. Mr. Chairman and my colleagues, I am pleased to have this opportunity to testify on behalf of my measure, H.R. 908, providing for the establishment of a National Eye Institute in the National Institutes of Health.

The most precious gift we possess other than life itself is our gift of sight. No other sensory mechanism provides as much information concerning our environment as do our eyes; This source of information provides an overwhelming base for the decisions which we make in our daily lives. Visually handicapped children are educationally handicapped in the 80 percent of the school tasks which are based on vision. One-sixth of our motorists have visual handicaps of which they are unaware—yet 90 percent of all the automobile driving decisions they make are based on sight.

Today heavy demands in education and scientific observation require long hours of looking at instruments, small print, symbols, and microscopic objects. Prolonged and critical seeing plays a vital role in all

professional activities. When 58 percent of our population has some visual deficiency—the productivity of our Nation must reflect the burden civilization has placed on our eyes.

We are looking at general visual problems which afflict most of our people and specific problems which seriously affect millions.

For reasons we have yet to comprehend there are more malfunctions of the eye than any other organ of our body. We have over 450,000 blind persons in the Nation, a figure which is increased by one every 15 minutes. Four thousand people go blind every year from one eye disease alone, glaucoma. An estimated 1 million Americans over 40 years of age have glaucoma and don't even know it. Early detection and treatment can control the progress of this disease for most of these 1 million people; we are discouraged, however, that a great many of them will not be treated until it is too late to prevent damage and ultimate total or partial blindness. Cataracts, degenerative changes in the eyes and brain, and a host of generally nonblinding infections and disorders complete the list of conditions which damage the intricate visual instruments which nature has so carefully constructed. It is our aim to learn how to prevent, alleviate, or cure these afflictions and to do so for as many of those affected as possible.

The prospects for giant strides in this critical area of our Nation's health have been significantly upgraded in recent advances in the field. It is interesting to note that the contribution to scientific understanding of the visual process by two American physiologists, Drs. George Wald and Haldan Keffer Hartline, was recognized recently by the Nobel Prize Committee. This recognition as well as the eminence of other eye researchers in our Nation, suggests that we possess a competence for understanding of which we should take full advantage.

It is the potential of this national leadership which the proposed legislation is all about. Section 453 of H.R. 908 specifically authorizes the Surgeon General to provide training and instruction and establish and maintain traineeships and fellowships, in the National Eye Institute and elsewhere, in matters relating to diagnosis, prevention, and treatment of blinding eye diseases and visual disorders with such stipends and allowances (including travel and subsistence expenses) for trainees and fellows as he deems necessary, and, in addition, provide for such training, instruction, and traineeships and for such fellowships through grants to public or other nonprofit institutions. This emphasis on training is not to the exclusion of the conduct and support of research on new treatment and cures for blinding eye diseases and visual disorders.

Mr. Chairman, I have purposely not provided elaborate statistics on the visual problems of our people in my remarks. These are pitiful and frightening. We know the dimensions of the problem—let us get on with the solution.

The public is growing impatient with our inertia on this matter. There is a growing interest, a stimulated scientific community, and a new sense of optimism stemming from research which has already yielded results with promise of new breakthroughs in the future.

It is time to identify and focus our fiscal and manpower resources which are consistent with the national need in this area. A new rallying point is required; the National Eye Institute will provide this and it will succeed just as similar organizations have succeeded in the solution of equally complex problems.

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I hope that the committee will take favorable action on this urgent measure.

Mr. JARMAN. Thank you Mr. Moss. Are there any questions? If not, we shall hear next from another colleague, the Honorable John Murphy, of New York. Please proceed, Mr. Murphy.

STATEMENT OF HON. JOHN M. MURPHY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. MURPHY. Thank you, Mr. Chairman, for the opportunity to appear before this subcommittee in support of H.R. 12843 and related bills to amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health. As a cosponsor of this legislation I welcome the opportunity to present my views on it today.

There is ample precedent for establishing a National Eye Institute; a number of times in the past National Institutes have been established to study health problems of national significance, including Institutes for Cancer Research, Health Research, Dental Research, and others in the National Institutes of Health. I think the statistics on blindness and visual defects qualify this as a health problem of national significance.

In the United States over 1 million people are functionally blind and are unable to read ordinary newspaper type, even with the aid of glasses; another 1½ million are blind in one eye, and more than 30,000 people may be expected to lose their sight this year. But blindness is only the tragic result of a much wider problem. Nearly 90 million Americans have some form of eye trouble, and about 75 million wear glasses.

These are compelling reasons for establishing a national program of eye research, and such a program would have the strong support of the American people; a recent Gallup poll found that fear of blindness ranks second only to fear of cancer as "the worst thing that can happen." My congressional mail in support of this legislation substantiates this finding.

There is a program of eye research today on the national level which is a part of the National Institute of Neurological Diseases and Blindness, but I feel, as do a number of my colleagues, that this is and will continue to be a totally inadequate response to the problem.

Statistical evidence alone would indicate that little progress has been made, and the reason can be found in the fact that a number of important projects in eye research have been and are being postponed or abandoned because approved applications for NIH grants have not been funded. The effect of this is to create uncertainty about the eye research program which inhibits the activities of established researchers and discourages others from entering the field of eye research.

The reason for this failure is not a lack of will or competence on the part of the Neurological Diseases and Blindness Institute, because I am convinced that they are working to the best of their ability. But the present structure of the Institute and its many diverse commitments have not permitted an adequate recognition of important needs or stimulated sufficient action to meet the requirements of vision research.

This is where a separate National Eye Institute would prove to be most valuable. It would focus national attention on eye research, it would attract qualified personnel to the field, and it would enable the establishment of an intensive, long-range plan for eye research. What we need today is leadership in the field of eye research, and such leadership can only come through the establishment of a National Institute created for the specific purpose of studying blindness and visual defects.

I urge this subcommittee to give favorable consideration to this legislation.

Mr. JARMAN. Thank you, Mr. Murphy.

Our next witness will be the Honorable John Young, who has been very active in consideration of this subject.

It is good to have you with us.

STATEMENT OF HON. JOHN YOUNG, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. YOUNG. Thank you, Mr. Chairman.

I have no written statement. I am leaving that to the people who are much more familiar with the technical aspects of this problem and much more familiar with the problems that have occurred heretofore in the establishment of this Institute.

Mr. Chairman, I want to commend you and the subcommittee on the fine interest that you have shown in this matter. I think your fine representation here today plus the distinguished senior members of the full committee present shows a very deep, earnest concern for this problem.

I have come here eagerly to offer my support to our friends and colleagues, Chairman Staggers, Mr. Rooney, Mr. Friedel, and others, in this very very worthy cause.

I was glad to come over here and I do thank you for the opportunity. I am anxious to lend whatever support I can in my own committee which, as you know, is the Committee on Rules, and I will be most eager to help in any way I can to help in the passage of this legislation.

Mr. JARMAN. Thank you very much.

Mr. CARTER. I want to compliment the gentleman on his statement. Of course, I think it is particularly meaningful since I understand the distinguished gentleman has had some troubles with his eyes and he knows the problems.

I notice other distinguished people here today, some of whom seem to be in a spirit of levity, which I can't understand, particularly considering the rank they hold in our country today.

It seems to me they are regarding the bill we are considering too lightly and I can't understand why, when we consider such a problem as blindness, how they could laugh at that and I have seen that among some of the highest ranking members of our Government.

Thank you, Mr. Young.

Mr. YOUNG. I might say in response to the distinguished gentleman, Dr. Carter, that I am happy I was spared noticing that levity. I can assure all that it is not a laughing matter.

Mr. STAGGERS. Mr. Jarman, I just want to compliment the gentleman from Texas for his interest in this very important legislation. I

might say for the record that he has been interested in it for a long time and has been after me as chairman of the full committee to have hearings on this bill. He has told me many times how important he thought it was to the Nation.

One of the reasons the bill is being heard today is because of the gentleman from Texas.

Mr. JARMAN. We appreciate your being here.

Mr. YOUNG. Thank you, Mr. Chairman.

Mr. JARMAN. At this point, the committee will hear a statement from the Honorable Richard Fulton, of Tennessee.

STATEMENT OF HON. RICHARD FULTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Mr. FULTON. Mr. Chairman, may I first thank you and the members of the Subcommittee on Public Health and Welfare, for extending to me this opportunity to speak in behalf of legislation which would provide for the establishment of a National Eye Institute under the National Institutes of Health.

More than 38 Members of the House of Representatives have submitted bills which would amend the Public Health Service Act to provide for the establishment of a National Eye Institute. It is my privilege to be among those Members who have submitted such legislation before the Congress.

Fear is one of the most powerful motivating forces known.

One of our national research organizations has reported that a survey of the public revealed that fear of blindness ranks second only to fear of cancer as what was termed "the worst thing that can happen to a person."

Fear of the unknown is truly a terrifying fear. There is really very little that we really know about eye disease and the extent to which millions of Americans suffer from some degree of eye disease.

For example, the causes of 80 percent of all loss of vision suffered by persons in this Nation results from diseases unknown to science.

In our Nation, there are more than 1 million persons who are classified as "functionally blind"; that is, they are unable to read ordinary newspaper type even with the aid of glasses.

Nearly 90 million Americans—almost half our total population—have some form of eye trouble.

About 75 million Americans must wear glasses full or part time.

Last year our Nation spent nearly $20 billion in scientific research and development. In that same year, both public and private spending for research in eye disease and disorders totaled no more than $10 million.

Within the Public Health Service, there are National Institutes of Health for research and treatment of cancer, heart, allergy and infectious diseases, arthritis and metabolic diseases, dental research, mental health, neurological diseases and blindness, child health and human development, and general medical sciences.

There is a need that a National Eye Institute, devoted solely to diseases of the visual system, be established. Such an Institute would be the most important step we have taken to seek ways to combat eye disease.

Through our science and advances in health knowledge and technology we have almost doubled life expectancy. Yet the incidence of cataract among people age 60 is nearly 60 percent, and at age 80, it is almost 100 percent.

Glaucoma is one of the leading causes of blindness in the United States, yet less than half the people in a national survey could identify glaucoma as a disease of the eye.

The causes of blindness largely remain a mystery, but that mystery can be solved.

I urge the members of this subcommittee to give favorable consideration to the establishment of a National Eye Institute.

Mr. JARMAN. Thank you, Mr. Fulton.

Our next witness is the Honorable Joshua Eilberg from Pennsylvania.

STATEMENT OF HON. JOSHUA EILBERG, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. EILBERG. Mr. Chairman, I wish to lend my support to the proposed legislation before your committee to establish a National Eye Institute.

I introduced a similar bill, H.R. 5260.

As a Philadelphian, I am particularly aware of work being done at the Wills Eye Hospital.

I lend my support with full knowledge of the present legal provisions for eye research as a part of the National Institute of Neurological Diseases and Blindness and of the very excellent development of eye research under that Institute—a job for which I believe it should be commended.

But as I see it, the need for a separate eye institute today is a practical measure, just as the combination of ophthalmology and neurology within NINDB seemed practical 17 years ago.

At that time, neither neurology nor ophthalmology had the necessary research manpower or other resources to meet the demands of their respective clinical questions. By virtue of vision being a sensory function, and by virtue of the infancy of its state of research development, therefore, it was probably the most practical move in 1950, for the Congress to combine the two within a single Institute.

The progress made thus far, thanks to the generous and consistent support of the Congress and the program developments by the National Institute of Neurological Diseases and Blindness, brings us to a new decision point demanding new legislation to correct this administrative anomaly.

By separating these ongoing programs, new focus will be placed upon eye research which will indeed be comparable to neurology, cancer, dental research, and heart disease.

The director of the new Institute will be able to devote his full energies to planning, administering, and evaluating a well-balanced program devoted exclusively to the visual mechanism and eye disorders.

No longer will research in this area have to be tucked in with the great range of neurological disorders, or with speech and hearing disorders, each of which is a full-time responsibility for any director.

The research manpower in each of these areas developed over the last 15 years brings us to a new staging point in each field. By correcting the administrative anomaly, the responsibility for priorities and appropriations of the still limited resources is placed more directly upon the shoulders of the Congress, where it rightfully should be, rather than upon the Director of National Institute of Neurological Diseases and Blindness and his advisory council which generally has only one or two members representing ophthalmology.

On March 8, 1966, Congressman Herbert Tenzer shared with us, through the Congressional Record, a great many letters he had received relating to a proposed eye institute.

Among them was a letter from Dr. Michael J. Hogan, chairman of ophthalmology at the University of California. As one who has worked closely with NINDB, at one time serving on the Vision Research Training Committee, Dr. Hogan's words are significant. He said:

> In spite of the efforts of the very capable people who have administered the NINDB, it has not been possible to maintain a proper balance in the administration of eye research and training.
>
> The problems involved with blindness are so distinct from neurological diseases that the two have no real connection.

Similarly, Dr. Goodwin M. Breinin, New York University School of Medicine, wrote as follows:

> For a good many years the problems of the eye have been submerged within the National Institute of Neurological Diseases and Blindness and very good work has most assuredly been carried out.
>
> It is presently clear, however, that we have evolved so far beyond the abilities of a joint institute to adequately serve the problems of blindness.
>
> Under the programs initiated by the NINDB great progress has been made in establishing first-rate departments of ophthalmology and affiliated research units around the country along with the development and training of personnel dedicated to research careers in vision.
>
> The time has now come to divorce the field of vision from its subsidiary role within an institute whose primary responsibilities and concerns have related to matters other than the eye and vision.
>
> To be sure, there are ties that bind ophthalmology and vision to the general field of neurological science and these ties must be maintained but the unique problems of the eye now require an administrative organization which can devote its efforts, undiluted, to the study and the implementation of programs of basic research and training centered on vision and blindness.
>
> The disadvantages of isolation from the Institute of Neurology will be more than made up in the enhanced stress which will rightfully be placed upon visual problems.

Dr. Goodwin Breinin has also been a member of the Vision Research Training Committee and an ad hoc Subcommittee on Vision and Its Disorders under the Institute's advisory council.

Mr. Chairman, I believe we should heed these signals from research ophthalmologists and provide new levels of growth for both eye research and neurological research.

It is time to cut the apron strings. To fail to do so when the energies of both medical fields have been primed to a healthy production rate could mean discouragement and a downward turn for each.

It has taken too long for our country to reach this level; we cannot afford to lose an inch.

I believe that by dividing the National Institute of Neurological Diseases and Blindness into two institutes, not only will eye research be enhanced, but the same may be true of neurology.

The more than 450,000 in our Nation, the additional 30,000 who are blinded every year, and the 3½ million Americans suffering from serious noncorrectable visual defects eagerly await our decision.

Mr. JARMAN. Thank you very much.

Are there any other questions or comments on Mr. Eilberg's statements?

Mr. ROGERS. I am certainly delighted to see our colleague here today. May I say to you, sir, that I, and I am certain the other members of the committee, too, appreciate your statement.

Mr. JARMAN. Thank you, Mr. Eilberg. We do appreciate very much the contribution you have made here today.

Our next witness will be the Honorable Frank Horton. Please proceed Mr. Horton.

STATEMENT OF HON. FRANK J. HORTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. HORTON. Mr. Chairman, I appreciate having this opportunity to appear before you and the other distinguished members of this committee to urge your favorable action on the proposal to establish a National Eye Institute within the National Institutes of Health.

I have sponsored legislation to establish such an Institute in both the 89th and 90th Congresses. If this Nation is to effectively combat blindness we must implement a vast and well coordinated research effort to determine the causes of blindness and to develop effective prevention and treatment techniques. This effort must be followed up with an educational program to better inform the American public about this dread condition. To achieve these goals I believe a separate administrative unit should be created within the National Institutes of Health which could devote its full efforts and resources to this campaign.

The administration continues to oppose such legislation arguing that the creation of an independent agency to lead the fight against diseases of the eye will fragment and isolate that activity from other related endeavors. I certainly do not believe that this is a necessary result of establishing a National Eye Institute. On the contrary, I believe that the establishment of such a centralized institute for eye research would attract the most talented and dedicated men and women of ophthalmic and related sciences because it would offer them the unique opportunity to participate meaningfully and effectively in the struggle to eliminate vision defects and blindness. Such an institute would also bring about a more realistic balance between financial support of the blind and research into the causes and treatment of blindness.

Despite the fact that this Nation possesses the financial resources and scientific capability to provide our citizens with the best protection in the world against disease, 80 percent of the cases of serious visual impairment are caused by disease rather than accidents. This fact indicates to me that there is a serious deficiency in our present programs to prevent and treat blindness, and blinding diseases.

The fact that most people regard accidents as the major cause of blindness indicates that there is also a serious deficiency in the public's understanding of blindness. This is further illustrated by the fact that fewer than one-half of our fellow Americans even identify glaucoma

as an eye disease. Yet this illness is responsible for a very substantial portion of all the cases of blindness in this country.

This ignorance of the facts concerning glaucoma is particularly tragic because more than 40 million persons in the United States are suffering from the disease without being aware of it. These people could be treated rather effectively for the disease were they to become aware of it early enough and undergo proper care.

An analysis of governmental expenditures for the aid of blind and partially blind persons reveals the cause of these two closely related deficiencies in our efforts to combat blindness.

Public assistance payments to the blind average approximately $100 million annually with the Federal Government providing about one-half of this sum. The Federal Government also contributes an additional $8 or $9 million per year to State rehabilitation programs. The Veterans' Administration provides another $26 million per annum to some 10,000 veterans who are totally blind.

That these are worthwhile expenditures cannot be disputed but when we compare these sums with the amount being spent by the National Institute of Neurological Diseases and Blindness on research into vision failures, a stark contrast appears. Last year the Institute spent somewhat more than $15 million for all of its activities related to blindness, slightly over two-thirds of which amount was devoted to research into the causes of vision failure. In fact the total expenditures of all agencies of the Federal Government will this year devote less than $25 million to learning the causes and cure of eye diseases.

At the present time the leaders in the field of visual research are private groups such as the Lions International who are the prime instigators of the notable eye bank movement in this country. Seventy-five percent of the 80 eye banks located throughout the country are sponsored financially by the Lions Clubs.

As a matter of fact, the Lions operate a vision care center in my home community of Rochester, N.Y. Through their activities there, the Lions provide needed services and health assistance to individuals throughout the central New York area. I know that all of us here in the Congress are well aware of the outstanding work being done by institutions such as the vision care center in Rochester. We all owe a great debt of gratitude to these operations and to the local Lions Clubs which support them.

Since this movement began in New York City in the late 1940's, there has been considerable progress made in the use of corneal tissue to restore sight to the blind. This organization is effectively seeking a means for the cure of visual defects, especially through research into the causes of glaucoma and retinal detachment. In many of the Lions-sponsored institutes affiliated with hospitals and universities research scientists are developing ways to make more effective use of eye tissue.

The Federal Government should give this worthy endeavor a needed boost by accepting a greater responsibility in the field of eye research. We can no longer afford to ignore this governmental responsibility or refuse to admit it exists. The sight of many thousands of people could be saved through more aggressive governmental action.

Mr. JARMAN. Thank you Mr. Horton. We appreciate hearing your views on this legislation. If there are no questions, we shall hear next from the Honorable Peter Rodino.

STATEMENT OF HON. PETER W. RODINO, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. RODINO. Mr. Chairman, I would like to add my support for the legislation before the subcommittee which would amend the Public Health Service Act to provide for the establishment of a National Eye Institute within the National Institutes of Health.

Since January of 1966, when our distinguished colleague Mr. Rooney of Pennsylvania introduced his bill, H.R. 12373, we can assume that an additional 48,000 men, women and children have lost their sight. We can make this assumption because it is derived from the known number of persons who are newly blinded every year. Today we have nearly 450,000 blind persons in the Nation. Over half of these are totally blind and the remainder severely handicapped by marked visual incapacities. If we add to this pitiful situation another 3½ million Americans who suffer from serious and noncorrectable visual defects, a million of whom cannot read ordinary type with the aid of glasses, we then have a population of 4 million who cannot see at all or cannot see very much.

This staggering figure is underscored by the fact that the number of legally blind persons is keeping pace with the growth of the population as a whole. Work-loss days in persons 45 years or older due to chronic visual impairment will probably be in the order of 2,000 this year. The work force of the Nation has always been affected by eye conditions. For example, a 1959–61 survey reported 124,000 persons as limited in their major activity due to chronic visual impairments. This group ranked 11th out of the 25 conditions which were studied. Finally, a recent study in Florida of suffered abnormalities of binocular eye control. Agreement has not been reached on the interpretation of this data as it relates to the ability to read, but whatever the cause or technicalities are, "seeing to read" is a very important problem in the education sector of our Nation.

We are not without progress in diagnosis and treatment of eye conditions, even in complicated disorders such as glaucoma and cataracts. There are new methods of unmasking low-pressure glaucoma, improvements in cataract surgery, drugs noted and removed from the market because of a cataract-producing side effect, new understanding of the role of heredity in certain eye conditions, and continuing success in corneal transplants.

It is encouraging that these and other developments have taken place, because they serve to prove the point. The point is that research pays off—it has already paid off, as I have just mentioned—and it will pay off more if it is stepped up and aimed directly at the problem. If private and community efforts, together with the excellent but inadequate program at the National Institutes of Health, can accomplish so much with so little, it seems a logical deduction that greater identification and effort are in order. The Institute in which vision research and training are now conducted and supported has done well, yet less than 20 percent of the Institute's appropriation is obligated to vision. I believe that a separate Eye Institute is needed as a strong central source of intensified research and training designed specifically to conquer blindness.

Mr. Chairman, there is a genuine need to focus more attention on eye care and eye problems, concerning which there is a surpprising degree of ignorance and fear among our people. There is no advertised commodity on the market through which public awareness is promoted and through which people are encouraged to care for their eyes and have regular examinations. Cosmetics have not been to the eyes what toothpaste has been to dental care. A program of public education would be an important part of the proposed Institute's activities.

I believe there is a critical shortage of ophthalmologists in our country. I have been told that this specialty has not developed and grown as well as some of the others. There are 8,272 ophthalmologists in the United States—about one for every 25,000 persons. About 50 of these eye specialists are in Government or military establishments, about 75 in full-time research, and about 300 in hospitals and medical schools. Of course, the pursuit of knowledge concerning abnormal functioning of the eyes is not left to physicians alone; there are many others in the basic scientific disciplines who are skilled investigators and who are searching for causes, cures, and treatments. It might even be said that eye doctors in the course of practice are contributing to research and understanding.

The fact remains, however, that more eye specialists are needed for treatment of patients and for research. A separate Eye Institute would encourage more young people to prepare as technicians in studies of the eye or take up the full course of study for ophthalmology. It would also provide the needed resources for an expanded training program.

In summary, Mr. Chairman, the establishment of a National Eye Institute is essential. A relatively small investment would enable our scientists to bring the scourge of blindness under control and eventually cure or prevent eye diseases. Public knowledge of such a center would create awareness of eyesight problems and promote proper care and examination. Federal action in this matter would stimulate support in other sectors: State, community, foundations, and other private organizations. A further and important outcome would be to encourage people to enter the field of ophthalmology where a critical shortage exists. Also, any major advance or discovery which would significantly reduce the growth rate of blindness would soon reduce public assistance payments to the blind. Such payments average close to $100 million annually. It is not unthinkable that an Eye Institute would eventually pay for itself.

Mr. Chairman, our international health organizations today are making plans for the total eradication of certain diseases, such as malaria and smallpox. They can do so realistically because they know the cause of these and similar diseases. Why do we not seek a like understanding of the causes of blindness with a greater dedication and determination? Perhaps 5 or 10 years from now we would be able to set a national goal for the eradication of blindness. A National Eye Institute is the next step in that direction. I hope the committee will approve this legislation.

Mr. JARMAN. Thank you for your testimony, Mr. Rodino.

Mr. RODINO. Thank you for the opportunity, Mr. Chairman.

Mr. JARMAN. We have several other Members to hear from before we hear the testimony of Dr. Stewart, Surgeon General. At this time we will hear from Mr. Gilbert, of New York.

STATEMENT OF HON. JACOB H. GILBERT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. GILBERT. Mr. Chairman, I want to commend this committee for its forward-looking stand in conducting hearings on the proposal to establish a National Eye Institute. I am one of the sponsors of this proposal, my bill being H.R. 4331, but Congressman Fred B. Rooney of Pennsylvania, author of the bill, deserves our particular thanks. This is a progressive measure, one that is worthy of Congress' tradition as a leader in the field of health care and research. All of us here in Congress, depending as heavily as we do on our eyes, understand its meaning. I urge favorable consideration of this bill and the establishment, without delay, of a National Eye Institute.

Mr. Chairman and members of the committee, we know that by 1975, unless there is a dramatic breakthrough in eye research and treatment, there will be some 16 million blind persons in the world. Even today, in the United States alone, there are three and a half million men, women, and children suffering from permanent and serious eye defects. It is estimated that nearly 90 million Americans suffer from some sort of eye trouble. At this moment, there are more than 10 million in the world who are blind.

It is difficult to believe that with all the effort and money that has been put into medical research, most diseases of the eye remain a mystery to doctors. Eighty percent of all loss of vision in the United States results from diseases of which the causes are unknown. Surely, that alone is testimony to the importance of this legislation.

In economic terms, the burden of eye diseases is staggering, Mr. Chairman. Public assistance is extended to more than 100,000 blind persons. Society pays for special facilities, books, teachers, and materials for no less than 20,000 blind children attending elementary and secondary schools. The upkeep is tremendous for vocational rehabilitation centers and other facilities to restore the productiveness of the blind. I have no figure of how much society pays for this grievous debility but it is enormous, and we, obviously, cannot measure blindness in monetary terms alone.

But, as an example, let me point out to you the story recently brought to my attention of one blinding disease. In 1953 doctors made the discovery that too much oxygen administered to premature infants resulted in retrolental fibroplasia, a cause of blindness. As a result of the discovery, the incidence of this disease fell from 1,900 cases in 1952 to only 28 in 1958. Happily, this terrible condition is today a rarity. But if this discovery had come only a year later, the lifetime cost of care for the additional blind persons would have amounted to more than $120 million. If the discovery had come 10 years later, the cost would have exceeded $1 billion.

So you see, Mr. Chairman, you are not being asked to undertake a project that is merely humane, as if humaneness alone were not sufficient reason for passage of the bill. This measure will pay for itself over and over again in the years to come. The National Eye Institute would conduct research on blinding eye diseases, blindness, and other visual defects. Its work will be of benefit not only to the thousands, perhaps millions, who will be saved from blindness. It will be of benefit to society, both at home and abroad.

Mr. Chairman and members of the subcommittee, the American people will be grateful to you for positive consideration of this bill. A recent Gallup poll disclosed that Americans fear blindness only second to cancer as a debilitating disease. I urge you to act quickly, for each day means more persons struck down, persons who could be leading happy and productive lives if only they had the use of their eyes. This bill will do so very much to keep these eyes functioning.

Mr. JARMAN. Thank you for your presentation, Mr. Gilbert.

If there are no questions we shall continue by hearing from another colleague from New York, the Honorable Frank Brasco.

STATEMENT OF HON. FRANK J. BRASCO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. BRASCO. Mr. Chairman, I come here today in support of the proposed legislation before your committee (H.R. 8049) which, in effect, would establish a National Eye Institute within the National Institutes of Health. This action would transfer to the new Eye Institute the responsibilities for research on vision and blindness currently invested in the National Institute of Neurological Diseases and Blindness. I believe this action is needed at this point inasmuch as the levels of research activity and research progress now warrant separate and fertile environments for the continued growth of each of the medical fields.

Although vision is a sensory function, the ophthalmologist's interests and language are so different from the neurologist's that as long as the two must share a common appropriation or a common administrative framework, one will very likely have to play second fiddle to the other. To date, this has been the plight of eye research which has always worked under an institute directed by a neurologist.

In such a setting, eye research has had to compete for funds, program emphasis, personnel, and space with other research efforts directed toward the epilepsies, multiple sclerosis, cerebral palsy, and other neurological disorders in childhood, muscular dystrophy and similar neuromuscular disorders, infectious diseases or metabolic abnormalities of the nervous system, as well as research in speech and hearing. It is only natural, then, that even a well-planned and rapidly developing program in vision would still be stifled by competing with each of these areas when the personal interests of the director or the majority of the advisory council members are inclined primarily toward fields other than ophthalmology. I dare say this would undoubtedly be the tendency regardless of how objective these individuals tried to be.

But there is another reason why the eye deserves individual focus within a research complex, and that is the growing recognition that it relates to a great many conditions throughout the body. It is not uncommon for many disorders to be reflected in the condition of the eye, even to the point where they might be detected and diagnosed first through an ophthalmic examination. Thus, to place eye research under any other research framework, such as neurology, constitutes an administrative anomaly which can only deter its full development. We would not dream of doing such a thing to dental research, yet the fear of losing one's teeth can in no way be compared to the horror of losing one's eyesight.

Mr. Chairman, a Gallup poll recently indicated that the American citizen fears the loss of his sight second among all other medical disasters. Yet in this 20th century, 30,000 of our citizens experience that tragedy every year, to say nothing of the 450,000 in our Nation who have already done so. Another three and a half million Americans also suffer from serious noncorrectable visual defects which are not entirely blinding. This, at a time in civilization when man is more and more dependent upon his sight for work, pleasure, and intellectual development.

We have made great strides in the rehabilitation of the blind and in providing talking books and many other marvelous aids. But nothing we can do after the fact can ever take the place of prevention. Prevention, however, can remain only a dream unless we untangle the mysteries of the diseases of the eye and apply our new knowledge effectively. This is possible only if the climate is right and the required resources are available to foster the highest quality of research. I believe that the proposed legislation is a new and timely step toward this end.

Thank you, Mr. Chairman.

Mr. JARMAN. Thank you, Mr. Brasco.

Our next witness will be the Honorable Leonard Farbstein, also of New York. Please proceed Mr. Farbstein.

STATEMENT OF HON. LEONARD FARBSTEIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. FARBSTEIN. Mr. Chairman, I welcome this opportunity to appear before you today in support of legislation creating a National Eye Institute in the National Institutes of Health. I support this legislation because, in my opinion, it will provide the organizational framework within which a major attack can be launched against visual disorders and blindness.

Legislation creating a National Eye Institute has been proposed by a number of Congressmen in both the House and the Senate. I, myself, introduced such a bill, H.R. 6116, on February 27, 1967. I believe it has become clear to many Members of the Congress that it is time to mobilize our efforts, to place top priority on combating the problems of eye diseases, the fear of which ranks second only to cancer among the American population.

To justify this legislation as critical to any overall public health program, one has only to examine the dimensions of the problem. Nearly 90 million Americans, or almost half of our Nation's population, have some form of eye trouble. In three out of every four American homes, one or more persons must wear glasses. More than 1 million persons are unable to read regular newspaper print even with the aid of glasses. These are startling statistics for they indicate that eye disorders are a nationwide health problem that demands our immediate attention.

To counter such tragic afflictions, the National Eye Institute will be responsible for coordinating preventive programs, conducting medical research and training personnel.

Prevention, of course, is basic to any responsible public program. This year alone more than 30,000 men, women, and children will lose their eyesight. It is important to note, though, that contrary to pop-

ular belief, only about 5 percent of visual defects will be due to accidents. Eighty percent of all blindness is the direct result of diseases whose causes are still unknown to science.

The need for eye-disease research is paramount. The importance assigned to research is indicated in the authorizing clause of this legislation. The clause establishes in the Public Health Service an Institute for the conduct and support of research for new treatment and cures and training relating to blinding eye disease and visual disorders. The bill would also authorize the Surgeon General to plan for research and training, especially against the main causes of blindness and loss of visual functions.

This year, in the United States, we will spend close to $20 billion in scientific research and development, yet only a tiny fraction of this amount, or about $10 million, will be spent for research in eye disease. Compare this with the scope of the problem and the inadequacy of the present research effort becomes painfully evident.

Compare it further with the economic consequences of caring for those citizens visually incapacitated. It has been estimated that we will spend $1 billion this year caring for the blind. Such services will include the cost of providing public assistance, of building and maintaining special educational facilities, of hiring and training teachers and constructing special teaching aids, and the cost of vocational rehabilitation programs.

It is clear to me that more can and must be done to mobilize public and private resources to seek out preventive measures, to research for cures, and to provide necessary treatment.

Since the founding of our Republic, medical advances have doubled the life expectancy of our citizens. It falls upon our generation to see to it that our citizens can use these years to the fullest in a life relatively free from limiting physical disorders.

As elected representatives of the people, we have a responsibility to provide the organization framework for action, to combat diseases which would take from our citizens one of their most precious senses, the ability to see.

In my judgment, this bill represents legislation which every Member of the Congress can in good conscience support, for eye disorders do not discriminate but afflict citizens from all races, religions, and economic classes.

I urge the members of this distinguished Committee on Interstate and Foreign Commerce to support this legislation. I commend Committee Chairman Staggers and the other committee members for conducting these timely hearings and for focusing public concern on this major health problem.

Mr. JARMAN. Thank you, Mr. Farbstein.

At this time we shall hear from the Honorable James Corman, of California. Mr. Corman.

STATEMENT OF HON. JAMES C. CORMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. CORMAN. Mr. Chairman, I speak today on H.R. 5252, which I introduced early this session.

A successful campaign of research and training to prevent and cure blinding eye diseases has yet to be waged in America, in spite of great

effort and diligent attempts on the part of some of our country's most respected ophthalmological and neurological associations. The present National Institute of Neurological Diseases and Blindness, an association which has unanimously voted to support the formation of a separate National Eye Institute within the National Institutes of Health, frankly points out that it is unable to give adequate attention to the requirements of vision research.

A National Eye Institute would permit us to give the kind of attention needed to alleviate the suffering of thousands of American blind. The programs of research and training provided by this measure would, hopefully, reduce the enormous cost to the country of blindness, as well.

I urge the committee to favorably report this measure.

Mr. JARMAN. Thank you for your concise statement, Mr. Corman.

Our last Member to be heard from this morning is the Honorable Herbert Tenzer, of New York. Please proceed as you see fit, Mr. Tenzer.

STATEMENT OF HON. HERBERT TENZER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. TENZER. Mr. Chairman and members of the Subcommittee on Public Health and Welfare, I appreciate the opportunity to appear before your subcommittee and to speak in support of the legislation now under consideration, to amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health.

In the 89th Congress, I introduced a bill calling for the establishment of a National Eye Institute in NIH and am delighted to again raise my voice in support of this forward-looking legislation which is so vitally needed.

For many years before I came to the Congress, I was identified with organizations engaged in research in the field of blinding eye diseases and visual disorders. During the past 20 years, it has been my privilege to have been a member and an officer, and for the past 11 years, president of the National Council to Combat Blindness, Inc. (Fight for Sight), a voluntary agency, which through its fight for sight makes awards annually, through grants-in-aid, student fellowships, postdoctoral research fellowships, and clinical service projects. Since 1946 the council has carried on extensive work in the field of basic and clinical eye research at hospitals, medical schools, and universities throughout the United States and elsewhere in the world.

Because of my experience through this affiliation and with other voluntary agencies which provide care for blind persons, I was motivated to introduce H.R. 5501 and to appear before your subcommittee in support of the legislation under consideration today.

Today in the United States alone there are 3½ million men, women, and children with chronic noncorrective visual defects and that number is increasing each year. It is estimated that by 1975, unless there are some dramatic major developments in the field of eye research and treatment, there will be 16 million totally blind persons in the world. This Nation cannot and must not accept defeat in this battle against eye disease.

Health is a basic human right. Its enemy—disease—respects no geographical boundaries. It discriminates against no one—irrespective of political belief, social or economic status, race or religion.

The establishment of a National Eye Institute would have a major effect upon our efforts to attack the causes of blinding eye diseases. Medical research, under the guidance of the Eye Institute, could be directed to the study of blinding eye diseases and visual disorders including research and training in the special health problems and requirements of the blind and in the basic sciences relating to the mechanism of sight and visual function.

In 1961 in the first of three annual health messages to Congress, President Kennedy stated:

> The health of the American people must ever be safeguarded; it must ever be improved. As long as people are stricken by a disease which we have the ability to prevent, as long as people are chained by a disability which can be reversed, . . . then American health will be unfinished business. It is to the unfinished business in health—which affects every person and home and community in this land—that we must now direct our best efforts.

We in the Congress must continue to recognize the urgency and seriousness of the problem of eye diseases and its effect on our economy, by reason of increased welfare costs to our cities, States and Nation for the care of the blind. It is hoped that with the establishment of the National Eye Institute, a more orderly and better coordinated war against blinding eye disease and blindness may be waged and that ultimately, the fight for sight will be won. At the very least the causes of blinding eye disease will be more expeditiously uncovered and cures found. Only then will it be feasible and practical to seek a merger of some of the numerous voluntary agencies in the eye research field. Such a move will better enable government and private voluntary agencies to coordinate their activities to the end that we may save many of our citizens from the scourge of blindness.

On March 7, 1966, I introduced H.R. 13358, a bill providing for a National Eye Institute devoted to research on blinding eye diseases, blindness and visual defects. But I do not want there to be any misunderstanding about my sponsorship of this bill. I want to state that the National Council to Combat Blindness, Inc., and its fight for sight will not be eligible to receive any funds directly or indirectly by the enactment of this legislation. The work of the National Eye Institute will be carried on under the direction of the Surgeon General, with the approval of the Secretary. The National Council to Combat Blindness, Inc., in cooperation with its fight for sight leagues, will continue to raise funds to supplement the work done by the National Eye Institute in such areas where the Institute may not be authorized to act. The fight for sight will also continue its work in the field of public information and education and guidance to individuals requesting information regarding available sources for assistance to blind persons.

Mr. Chairman, on February 10, 1966, I wrote to the members of the Scientific Advisory Committee of the Fight for Sight, requesting their comments on the proposed National Eye Institute. A copy of their replies appear with my Congressional Record statement of March 8, 1966, which is attached as exhibit A.

The legislation which this distinguished subcommittee is now considering provides for the establishment of a National Eye Institute—

to insure the most advanced medical research and development for the study of blindness. Only through the availability and accessibility of modern, well organized and supervised medical facilities and services can we hope to challenge the problem of eye blindness and visual defects. The need for a new program to assist the fight against blinding eye diseases is clear and I urge this committee to report favorably on the legislation to establish a National Eye Institute.

(Article from Congressional Record follows:)

EXHIBIT A

[From the Congressional Record, March 8, 1966]

NATIONAL EYE INSTITUTE GAINS DISTINGUISHED SUPPORT

(Extension of remarks of Hon. Herbert Tenzer of New York in the House of Representatives, Tuesday, March 1, 1966)

Mr. TENZER. Mr. Speaker, on yesterday, March 7, 1966, I introduced H.R. 13358, to amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health. In my statement supporting this legislation—Congressional Record A1232—I discussed the need for an institute devoted to research on blinding eye diseases, blindness and visual defects and I related to my colleagues my experience as President of the National Council To Combat Blindness, Inc.

As I stated in my previous remarks, I wrote to the members of the Scientific Advisory Committee of the Fight for Sight, requesting their comments on the proposed National Eye Institute.

I have received the following replies from members of the Scientific Advisory Committee as well as from others, including officers and directors of the Fight for Sight expressing their opinion on the proposed legislation:

THE WILMER INSTITUTE,
JOHNS HOPKINS HOSPITAL,
Baltimore, Md., February, 1966.

HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN TENZER: Thank you very much for your letter of February 10. I am delighted to know that you are interested in cosponsoring the bill introduced by Congressman Frederick B. Rooney of Pennsylvania for a National Eye Instiute. I sincerely believe that this would do more to promote research into the causes of blindness and the prevention of blindness than anything else that could possibly be done in this country.

Last year, when I testified before Senator Hill's committee with Mr. Jules Stein of Music Corp. of America, both of us strongly recommended that a separate institute for eyes be initiated in the NIH.

If I can send you further information about this, I would be most happy to do so, I am delighted to know that you are going to cosponsor this bill.

Very sincerely yours,

A. E. MAUMENEE, M.D.

NEW YORK, N.Y., *February 12, 1966.*

Re H.R. 12373.

Hon. HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR HERBERT: Thank you for acquainting me with the proposed bill to establish a National Eye Institute and for affording me an opportunity to offer my comments regarding it.

My first reaction is, of course, one of great pleasure and deep satisfaction. It is extremely gratifying to see that Congress will soon consider (and I do hope will approve and adopt) legislation providing for such an institute. Clearly a National Eye Institute could be effectively instrumental in furthering, improving, and increasing research in the field of blinding eye diseases—the very aim and

purpose that has inspired the efforts of the Fight for Sight for almost 20 years, I think the potential creation of the National Eye Institute is a wonderful project, and I think you and Congressman Rooney deserve widespread gratitude and support for your sponsorship of H.R. 12373.

The only thought that occurs to me, after a careful reading of the proposed act, is that (except by implication) it does not mention the prevention of blindness. I realize that more intensive research relating to blinding eye diseases and visual disorders will, as a consequence, lead to the prevention of blindness, but, nevertheless, it does seem to me that the bill might specifically include reference to the prevention of blindness among sighted people, as well as to treatment for those already afflicted. However, this is merely an incidental observation, and in no way lessens my profound regard for H.R. 12373 as it now stands, which I think is just great.

Thank you again for your very welcome communication.

With warm personal regards, and all good wishes.

Sincerely,

SYDNEY A. MAYERS.

THE UNIVERSITY OF IOWA,
Iowa City, Iowa, February 14, 1966.

Hon. HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR MR. TENZER: I am in possession of your letter of February 10, 1966, and wish to thank you most warmly for your interest in the proposal for a National Eye Institute as suggested by H.R. 12373 introduced by Congressman Fred B. Rooney. I believe that it would be a very fine thing, indeed, if you would cosponsor this bill. In view of your great concern with blindness and blindness research, you would be the obvious man to do so.

The establishment of the National Institute of Neurologic Diseases and Blindness has been a great boon to research on vision and eye diseases, especially in the early years of its existence when neurology was less prepared than it is now to avail itself of the facilities offered by the Institute. However, today, as I understand it, ophthalmology has materially been reduced in its share and the establishment of a separate National Eye Institute ahs become most desirable.

Again, thank you for your interest in this matter. With kindest personal regards.

Sincerely,

HERMANN M. BURIAN, M.D.,
Professor of Ophthalomology.

THE INSTITUTE OF OPHTHALMOLOGY,
THE PRESBYTERIAN HOSPITAL,
New York, N.Y., February 14, 1966.

MR. HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR MR. TENZER: Thank you for your note of February 10, 1966. I am wholeheartedly in favor of H.R. 12373.

The establishment of a National Eye Institute would have a major effect upon our efforts to attack the causes of blinding diseases.

I would be happy to write in support of this proposal to any of your colleagues you think desirable.

With best wishes.

Sincerely yours,

ARTHUR GERARD DEVOE, M.D.

HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA,
Philadelphia, Pa., February 15, 1966.

HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR MR. TENZER: In reply to your letter of February 10, I can only say that I strongly urge you to cosponsor, and guide through Congress, the proposal for a National Eye Institute as suggested by H.R. 12373.

The problem of eye disease and blindness is becoming increasingly important, particularly in its geriatric aspects. In my opinion, ophthalmologic research and teaching would be greatly stimulated by a separate institute. The Director, of course, would be responsible for eye alone. He would be able to devote his entire time to the program. I am somewhat concerned that blindness has not been given a position as prominent as cancer, heart disease, stroke and even other fields of medicine where greater knowledge is needed.

Sincerely yours,

HAROLD G. SCHEIE, M.D.

THE UNIVERSITY OF CHICAGO,
Chicago, Ill., February 15, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

MY DEAR MR. TENZER: Thank you for writing concerning H.R. 12373, introduced by Mr. ROONEY. I know what an active role you played in the establishment and subsequent development of the National Institute of Neurological Diseases and Blindness and of your desire to see ophthalmic research flourish. In the early years of the National Institute of Neurological Diseases and Blindness the major portion of their budget was diverted to neurology with the excuse that there were no adequate areas in which to spend research money wisely. With the expansion of ophthalmic research the complaint was that the research projects were not of comparable quality to those in neurology. This misinformation persisted although the research requests were judged by different committees, with the neurologists having one basic and one clinical committee while the eye programs were judged solely by a basic committee. Now with the tightened budget of the National Institute of Neurological Diseases and Blindness, worthwhile research programs in ophthalmology already approved are not being funded. Testimony before the House Subcommittee on Appropriations for the Department of Health, Education, and Welfare had led to specific recommendations for the allocation of funds for ophthalmic research. This has led to a sequestering of funds as required by the exact interpretation of the subcommittees' report, but not to an increased dollar amount for ophthalmic research.

It all points up, I believe, the need for an independent institute whose major attention is upon blinding disease and the mechanisms of vision. Such an institute would be able to attract an institute director and deputies of talents comparable to other institutes. This is not possible at the present time when a deputy directorship (one of several) is offered ophthalmology. I know very little about the mechanism of implementation of a bill such as that proposing a national eye institute. I should hope however that the activities, laboratories, funds, et cetera now encompassed in the blindness portion of the National Institute of Neurological Diseases and Blindness would be turned to the National Eye Institute. I believe that this constitutes my major concern in respect to this legislation.

Thank you for your letter.

Very truly yours,

FRANK W. NEWELL, M.D.,
Professor and Chairman, Division of Ophthalmology.

UNIVERSITY OF CALIFORNIA,
SAN FRANCISCO MEDICAL CENTER,
San Francisco, Calif., February 15, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR MR. TENZER: Thank you for your letter of February 10 asking for comments on the proposal for a National Eye Institute as suggested by Congressman FRED B. ROONEY, of Pennsylvania. I am very happy to learn that you are going to cosponsor H.R. 12373. In my opinion a National Eye Institute is long overdue and is greatly needed at the present time as a forward step in the prevention of blindness program that is of concern to all ophthalmologists, and indeed to all

Americans. Preventable blindness is a world problem, and the impact of a National Eye Institute would extend far beyond the confines of the United States.

It is true that much progress has already been made in the prevention of blindness through the efforts of such organizations as the National Institute of Neurological Diseases and Blindness and such private foundations as the National Council to Combat Blindness, Research to Prevent Blindness, and the National Society for the Prevention of Blindness. A very much greater effort is needed, however. The fact that 80 percent of all blindness is the result of diseases whose causes are either unknown or inadequately defined makes it imperative that present research efforts be multiplied many times. Fortunately, there is an increasing number of young investigators being trained by American universities who would be available for this greater effort if there were funds to support their work.

As the director of a small eye research foundation, I have been struck by the boundless possibilities for investigation into the causes of blindness and the means of preventing it. There is no question in my mind but that we greatly need the establishment of an Eye Institute that could assume leadership for eye research in this country and abroad. I do not wish to minimize in any way the good work accomplished by the Eye Section of the NINDB, but such effort could be expanded many times by an Institute devoted solely to eye diseases.

Please feel free to call on me for anything you think I might be able to do to promote the passage of H.R. 12373. You may be sure that I will work actively to that end.

Sincerely yours,

PHILLIPS THYGESON, M.D.,
Director, Francis I. Proctor Foundation for Research in Ophthalmology.

UNIVERSITY OF CALIFORNIA,
SAN FRANCISCO MEDICAL CENTER,
San Francisco, Calif., February 16, 1966.

MR. HERBERT TENZER,
Fifth District, New York, Congress of the United States, House of Representatives, House Office Building, Washington, D.C.

DEAR MR. TENZER: Thank you for your very nice letter and it is good to hear from you, especially from the exalted Halls of Congress. We have kept track of you through Mildred.

I had correspondence and personal communications from members of an organization which has just been formed in the country; namely, the Association of University Professors of Ophthalmology. This organization comprises the heads of ophthalmology of all the medical schools in the United States and it might be well to get an official statement from the organization. You could do this through Dr. A. E. Maumenee, John Hopkins Hospital, Baltimore, Md.

I am in favor of a separate National Eye Institute for the reasons that it is difficult for the purlic and Congress to be clearly oriented with regard to the exact position of eye disease and their connection in relation to neurological diseases. Since the eye field also is a surgical specialty there is very little connection between Eye and the Neurological Institute. In spite of the efforts of the very capable people who have administered the Institute of Neurological Diseases and Blindness, it has not been possible to maintain a proper balance in the administration of eye research and training. The problems involved with blindness are so distinct from neurological diseases that the two have no real connection. Very little work has been done on prevention of blindness or in research in this area and it has not been possible at the present time to properly handle this aspect of the problem. I think that it can only be done through separate departments.

With kindest personal regards.

Sincerely,

MICHAEL J. HOGAN, M.D.,
Professor and Chairman, Department of Opthalmology.

UNIVERSITY OF ILLINOIS AT THE MEDICAL CENTER,
Chicago, Ill., February 16, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN TENZER: I am glad for the opportunity to put myself on record as being strongly in favor of a National Eye Institute in the National Institude of Health.

An institute designed and operated primarily for research in the field of opthalmology could, in my opinion, most effectively demonstrate its potential as a major factor in the Nation's eye health. Such an institute would also, I believe, have an excellent chance of having its financial needs recognized and met.

I am pleased to learn that you are planning to cosponsor H.R. 12373, as introduced by Congressman Fred B. Rooney, of Pennsylvania.

If my memory serves me right, I had the pleasure of being introduced to you at one of the annual meetings of the Advisory Council of the National Council To Combat Blindness, the organization to which we in ophthalmology sort of lovingly refer to as Miss Weisenfeld's organization.

Thanking you in advance for all the support you are giving ophthalmology, I am.

Sincerely yours,

PETER C. KRONFELD, M.D.,
Professor and Head, Department of Ophthalmology.

NEW YORK, N.Y., *February 17, 1966.*

Representative HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN: I have your letter of February 10 concerning the proposal for a National Eye Institute.

At first glance, this would appear to be a good idea. However, before really giving you a considered answer, I should like to know how much money was appropriated for research in neurology and how much for research in ophthalmology during the past 5 years.

Upon receipt of your letter, I will give this matter further thought and communicate with you again.

With kindest personal regards.

Sincerely yours,

SAM SALTZMAN.

WASHINGTON UNIVERSITY,
SCHOOL OF MEDICINE,
St. Louis, Mo., February 18, 1966.

Mr. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR MR. TENZER: I am most enthusiastic about the proposal of Congressman Rooney for a National Eye Institute. Such an institute will afford those of us interested in eye research with the opportunity for investigating causes and means of prevention of blinding diseases.

I would like to encourage you in every way I can to cosponsor the proposal.

Best regards.

Sincerely,

BERNARD BECKER, M.D.,
Professor and Head of the Department of Ophthalmology.

UNIVERSITY OF CALIFORNIA,
SCHOOL OF MEDICINE,
Los Angeles, Calif., February 21, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C,

DEAR CONGRESSMAN TENZER: In reply to your request for comments concerning establishment of a National Eye Institute, may I state that I wholeheartedly endorse this proposed legislation and am pleased to know that you are planning to cosponsor this amendment to the Public Health Service Act.

Prior to receiving your communication, I wrote Congressman Alphonzo Bell, representative of the district in which I reside, indicating my support for this proposed legislation.

Sincerely yours,

BRADLEY R. STRAATSMA, M.D.,
Professor of Surgery and Chief, Division of Ophthalmology.

NEW YORK UNIVERSITY SCHOOL OF MEDICINE,
New York, N.Y., February 24, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR MR. TENZER: May I express my gratification at being asked to discuss the proposal for a National Eye Institute, introduced as H.R. 12373 by Congressman ROONEY. I am heartily in favor of this measure which will go a long way toward meeting one of the most critical needs in the health status of the Nation. For a good many years the problems of the eye have been subsumed within the National Institute of Neurological Diseases and Blindness and very good work has most assuredly been carried out. It is presently clear, however, that we have evolved far beyond the abilities of a joint institute to adequately serve the problems of blindness. Under the programs initiated by the NINDB great progress has been made in establishing first-rate departments of ophthalmology and affiliated research units around the country along with the development and training of personnel dedicated to research careers in vision. The time has now come to divorce the field of vision from its subsidiary role within an institute whose primary responsibilities and concerns have related to matters other than the eye and vision. To be sure, there are ties that bind opthalmology and vision to the general field of neurological science and these ties must be maintained but the unique problems of the eye now require an administrative organization which can devote its efforts, undiluted, to the study and the implementation of programs of basic research and training centered on vision and blindness.

I predict a great increase in productivity of programs in vision under the aegis of a National Eye Institute. The disadvantages of isolation from the Institute of Neurology will be more than made up in the enhanced stress which will rightfully be placed upon visual problems. The introduction of this bill by Congressman ROONEY, in my judgment, is a merited and necessary evolutionary step in the maturation of a discipline which is more than able to stand on its own feet and which must achieve independence if the problems of blindness are ultimately to be resolved.

I, therefore, enthusiastically endorse your cosponsorship of this most important and progressive bill.

With very best wishes,

Sincerely yours,

GOODWIN M. BREININ, M.D.,
Professor and Chairman.

PITTSBURGH, PA., *February 25, 1966.*

Mr. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR HERBERT: Sorry we did not have time to discuss proposal for National Eye Institute bill, H.R. 12373—as presented by FRED B. ROONEY, Democrat, of Pennsylvania, at our meeting of February 14. This proposal has been under consideration for about a year. At our SAC meeting last June, the members that I was able to speak to, were about equally divided on the subject.

Since receiving your letter, I have done some checking with the leaders of various private agencies who would be vitally interested—i.e., J. M. Ulmer, secretary, National Foundation for Eye Research—a paper organization but with political influence; Dr. John Ferree, National Society; Dr. Arthur Keeney, Secretary, National Commission for Research in Ophthalmology and Blindness, director of Wills Eye Hospital, Philadelphia, and a new member of our SAC. I also tried to get hold of David Weeks, executive director, Research To Prevent Blindness, but he was out of town until next week.

Dr. Keeney gave me the most important factual information. He personally is very much in favor of it. He advised that at a meeting in Chicago January 30, of one of the professional associations, attended by most of the leading ophthalmologists in the country, the news release of January 27, and Congressman ROONEY's bill was discussed fully and they were nearly 100 percent in favor of it.

I think this is very good because the ophthalmologists have been riding on the coattails of the National Committee for Research in Neurological Disorders, who have been very active through Col. Luke Quinn, Washington lobbyist, in getting appropriation increases for the National Institute for Neurological Diseases and Blindness (NINDB). Keeney said the ophthalmologists realize that if they don't get behind this bill and get off the seat of their pants, that the optometrists are going to take the play away from them, through the influence of the brother of Representative JOHN FOGARTY, who through some connection in Bethesda, is strong for the optometrists.

The ophthalmologists feel they have enough "get up and go" to do their own lobbying through their influential patients and contacts and they will be able gradually to obtain appropriation to fund the program that is now working out to some degree through the NINDB.

I also understand that Research for Prevention of Blindness—through a Gallup poll conducted last November—found that the loss of sight is the second illness feared by the public. This is mentioned in ROONEY's "fact sheet." Jules Stein, chairman, M.C.A., as well as chairman of Research for Prevention of Blindness, is sponsoring this through ROONEY, who was a patient of one of Mr. Stein's very close, friendly ophthalmologists. This is all background for your information.

Dr. John Ferree of the society told me this was going to be discussed Thursday afternoon by their executive committee and he could not give an official opinion until after the meeting but he personally was very much in favor of the bill. J. M. Ulmer, of Cleveland, has the same opinion.

I have not discussed this with Mildred yet but I personally think it would be a wonderful thing for the expansion of eye research. I am glad to know that you are planning to consponsor the bill. I would like to point out one thing that I don't think is included. If and when the bill passes, and I surely hope it will, it will probably take 3 to 5 years before appropriations are established, building complex secured or built; that is.

Haven't time to finish this today. In the meantime, I have talked to Fred Rooney and his executive secretary, Leonard Randolph. Will try and complete my report the first of the week. Keep well. Best wishes.

Sincerely yours,

S. ADELSHEIM.

FIGHT FOR SIGHT,
New York, N.Y., February 25, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR HERBERT: Only now I am able to respond to your letter of February 10, asking for my opinion with regard to a National Eye Institute.

Although I have a very definite opinion, based on my almost 20 years of service as executive director of the Fight for Sight, I wanted the views of leaders in the field of ophthalmology, many of whom serve on our scientific advisory committee and others with whom I am in contact.

I should like you to know that all are extremely enthusiastic and feel that the establishment of a National Eye Institute is past due and mandatory in order that the necessary progress be made in the fight against blinding eye diseases which, as you know, are on the increase.

This consensus from particularly qualified and conversant men in the field of sight, underlines my own conviction that a separate Institute concerned with visual impairments and blinding eye diseases is vital. I wish to go on record in urging the establishment of a National Eye Institute, and hope I may have the opportunity to testify on its behalf during the hearings.

I appreciate your own interest in this matter, but then again, in view of your association with the Fight for Sight over the years, first as a director, then vice president and then president, an office you still hold despite your many other commitments—I can only say that this is an extension of the leadership you have already given in the effort to conquer blinding eye diseases.

With continued appreciation for your devotion to the cause of preventing blindness, and kind personal regards.

Sincerely,

MILDRED WEISENFELD,
Founder and Executive Director.

BASCOM PALMER EYE INSTITUTE,
Miami, Fla., February 29, 1966.

Hon. HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR MR. TENZER: I have been impressed with the interests of ophthalmologists around the country in the bill introduced by Congressman Fred B. Rooney, of Pennsylvania, H.R. 12373.

Recently, at a meeting of university professors, the significance of this bill was discussed and there was unanimous opinion that everything should be done to establish a National Eye Institute. We are all convinced, as Mr. Rooney has so aptly put it, "that the enactment of this bill into law and the resulting establishment of a National Eye Institute will be the most important step ever taken to rid mankind of the scourge of blindness."

I hope that you will see your way clear to lend your support to this bill and that by next year we will be well on the way to establishing such an institute.

Sincerely,

EDWARD W. D. NORTON, M.D.,
Professor and Chairman, Department of Ophthalmology.

THE CITY OF NEW YORK, OFFICE OF HOUSING
AND DEVELOPMENT COORDINATOR,
New York, N.Y., March 2, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR HERB: I have read the bill proposing a National Eye Institute which you are planning to cosponsor with Representative Rooney, of Pennsylvania.

I think the bill is great. However, I have two comments:

1. Are the necessary funds appropriated to carry out the purposes of this bill, and

2. I believe that somebody from our organization should be included as a member of the Advisory Council, if consonant with section 452A, as set forth in the bill.

Sincerely yours,

DANIEL Z. NELSON,
Deputy Coordinator of Housing and Development.

THE MOUNT SINAI HOSPITAL,
New York, N.Y., March 2, 1966.

Hon. HERBERT TENZER,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN TENZER: There are many cogent reasons for the establishment of a National Eye Institute and I do feel that the Fight for Sight and National Council to Combat Blindness should support this vigorously.

Sincerely yours,

IRVING H. LEOPOLD, M.D.

WOODMERE, N.Y., *March 2, 1966.*

Congressman HERBERT TENZER,
Washington, D.C.

DEAR CONGRESSMAN TENZER: I am in full support to Congressman Fred B. Rooney's (Pennsylvania) proposal to establish a National Eye Institute.

Sincerely,

ARTHUR A. GOLD, M.D.

NEW YORK, N.Y., *March 2, 1966.*

Hon. HERBERT TENZER,
House of Congress,
Washington, D.C.

DEAR CONGRESSMAN HERB: Thanks for your enclosures on H.R. 12373. I can see the need for a separate institute; but I also see inherent dangers. The public wants eye diseases cured and prevented. The optometrists wants greater status—and this bill will offer them an opportunity to attain that by wasting millions on so-called vision research. I am for this bill if it is emphasized in the bill that the prevention and cure of blindness is the chief goal of the Institute.

Sincerely,

DAN M. GORDON, M.D.

HARRY MOSS JEWELER,
New York, N.Y., March 3, 1966.

Congressman HERBERT TENZER,
House Office Building,
Washington, D.C.

DEAR HERBERT: I have just returned from a lengthy trip, and I was pleasantly surprised to have received your letter advising me of the intention to open a National Eye Institute. Certainly, I am all for it.

In my position as national vice president of Fight for Sight, we have always urged what you have outlined in your proposed bill.

A National Eye Institute has long been needed and will help countless upon countless of thousands. Had there been a National Eye Institute my sight might have been saved.

You have my complete support, and if there is anything further I can do to help pass this measure; please do not hestiate to call on me.

I trust you are enjoying good health, and I am looking forward to seeing you in the very near future.

Kind regards,

HARRY MOSS.

Mr. Speaker, the support for the bill is to establish a National Eye Institute, illustrated by the correspondence which I have quoted above, is encouraging and should be considered by the Congress. The need for a new program to assist the fight against blinding eye diseases is clear and I urged my colleagues to join this effort to establish a National Eye Institute.

Mr. JARMAN. The subcommittee is pleased to welcome again an old friend of the committee, Dr. William Stewart, the Surgeon General, who is accompanied this morning by Dr. Richard L. Masland and Dr. Leon Jacobs.

STATEMENT OF DR. WILLIAM H. STEWART, SURGEON GENERAL, PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE; ACCOMPANIED BY DR. RICHARD L. MASLAND, DIRECTOR, NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS, NATIONAL INSTITUTES OF HEALTH; AND DR. LEON JACOBS, OFFICE OF THE ASSISTANT SECRETARY FOR HEALTH AND SCIENTIFIC AFFAIRS

Dr. STEWART. Thank you, Mr. Chairman.

The bills before us for discussion today propose the establishment of a new National Eye Institute within the National Institutes of

Health. A number of bills have been introduced in the House this session, and there are two bills in the Senate. The differences among these bills are relatively minor, and each seeks the same objective: the establishment of an Institute dealing with problems of visual disorders and blindness research.

Mr. Chairman, the Department of Health, Education, and Welfare is keenly aware of—and determined to solve—the national health problem these visual defects represent. Today, over 40,000 of our citizens are completely blind. Over 400,000 fall within the legal definition of blindness. Over 2 million are estimated to have some visual impairment. We all share an immense stake in the solutions of this problem. Accordingly, the Department has mounted an extraordinarily broad range of programs to do what can be done about each of the types of problems presented. These efforts include programs of education, of vocational rehabilitation, and of income maintenance, which directly assist the visually afflicted. Also included are programs to train the health professional and associated personnel who must provide the required care, and programs to improve the quality and delivery of eye care services to those who need them.

Among all of these departmental efforts, the ones that probe most deeply into the fundamental questions of causation and cure—and therefore are our main hope of ultimate prevention and control—are the research and research training programs of the National Institute of Neurological Diseases and Blindness.

Only as we come to understand, through research, the nature of the neurosensory process we call vision, and how defects in it may arise, can we move toward final elimination of these problems. Despite valuable gains in highly pertinent knowledge through eye research over the years, far more answers are still needed than are now in hand. We therefore strongly endorse the strengthened research objective sought through these bills before us today.

The issue for discussion, thus, is not one of objective—where we are in fact fully agreed, but one of means. The question becomes: would a new National Eye Institute strengthen our vision research?

There are many sincere individuals—including a number of distinguished Members of Congress and of the ophthalmology profession—who feel that a new institute is in fact the answer.

We in the department have assessed the pros and cons on this as carefully and as objectively as we can. Certainly the arguments don't go all one way. Nevertheless, on balance, we feel that a new institute is at best unlikely to have a significant strengthening effect on eye research.

We fear, in fact, that it might detract from overall effectiveness by removing eye research from its basic research continuum, and to some extent, by disrupting ongoing programs. Furthermore, a new institute will cost approximately $800,000 in additional administrative expenses, funds that would be better spent on research.

Let me explain, in some detail, the reasoning behind this position.

Accomplishments of the National Institute of Neurological Diseases and Blindness have already documented the very significant savings in money and in the reduction of human suffering which can be achieved through research in this field.

You may have recently read that two researchers supported by NINDB funds have shared the Nobel Prize for medicine. One is Dr. Haldar Keffer Hartline of Rockefeller University who has been a grant recipient for 13 years. The other, Dr. George Wald, of Harvard, received NINDB grants from 1954 through 1961. They were honored for their discoveries in the primary chemical and physiological visual processes in the eye.

During the 15 years since the establishment of NINDB, there have been other notable achievements, including solution of the problem of retrolental fibroplasia, the development of a specific antiviral agent for herpetic conjunctivitis, fundamental advances in the knowledge of structure and function of the eye, and important technical advances in the surgical treatment of retinal detachment. Equally important, a strong program has been created through the establishment of 11 clinical eye research centers and of 12 outpatient clinical research units. To provide research manpower, there are now 53 NINDB-supported training programs. An estimated 1,500 individuals have received training within such federally supported centers. A large proportion of these former trainees are continuing to retain their academic appointments on a part-time basis.

There are thus strong elements in existence for continuing and improving our eye research. We question the necessity, and in fact the desirability of creating a separate, new administrative structure for this purpose.

Several points have been advanced in favor of the establishment of a separate institute for eye research.

Unquestionably, the establishment of a separate institute would be satisfying and encouraging to those concerned with blindness research, and would provide a clear focus for their efforts to bring the story of eye research needs to Congress and to the public. Would this increase eye research funding significantly? It might, but this isn't clear. The record indicates that Congress has always been especially sensitive to the needs of vision research within the NINDB, and has appropriated additional money on several occasions specifically for this area. Moreover, the limiting factor for eye research is not primarily one of dollars. The main problems are in the area of trained manpower and good research ideas. It is difficult to see, therefore, how the capability of the Congress to provide effectively for expanded eye research would be increased by the establishment of a separate administrative structure for the program.

To date, the proportion of funds allocated by NINDB to blindness has reflected reasonably accurately the quality of the research proposals it has received. Thus the growth of eye research has depended upon the growth of the capability of the field. The proportion of NINDB's funds actually awarded for eye research has shown a slight, but progressive, increase. The proportion of applications paid is almost identical with that across NINDB programs and, significantly, above that across all NIH programs. For example, in 1966, of applications to NINDB relative to vision, 36 percent were paid; of all applications to NIH, 23 percent. There is, thus, no evidence that blindness research is being discriminated against within the present institute. Again, if a special effort is to be made for eye research, the administrative structure within which it is developed is not the primary issue.

Both scientific and practical administrative objections can be raised to the creation of a new National Eye Institute.

The problem of blindness and disorders of vision is broader than ophthalmology and the eye. The eye is a sense organ—an integral part of the nervous system. Its function can be studied and understood only in terms of nervous activity. The complex problems of the nature of the visual processes in the retina, dyslexia, and the control of the eye movement, myopia and the process of accommodation, and disorders of perception and cognition require a multidisciplinary approach. In the past, eye research, often carried on in separate eye and ear infirmaries, has suffered through isolation from the mainstream of medical science. Within the NINDB, there have been developed integrated, multidisciplinary programs to deal with the varied aspects of these problems. These programs are designed to draw into eye research scientists from diverse disciplines who have much to contribute. To make, at this time, an arbitrary separation of eye research from other aspects of vision and nervous function would be highly disrupting, both to neurology and to blindness programs.

The establishment of a separate National Eye Institute would require an unnecessary—and costly—duplication of the existing administrative structure. A considerable financial waste would be involved.

Equally important would be the need to duplicate the experienced administrative staff of the NINDB. Members of this group have had 5 to 10 years of experience in the field of neurology and blindness. Assuming that additional personnel can be recruited, there will be inevitable dilution of both programs during this period of transition and, at best, a continuing unnecessary expense in terms of both dollars and personnel.

The problem of recruitment and staffing would be a serious handicap to the effectiveness of a new Institute. The median annual salary for ophthalmologists in the United States is $37,720. The leaders earn more than $50,000. To accept the maximum allowable salary at NIH, $25,800 would be a serious and probably impossible sacrifice for most.

At the time of the creation of NINDB, the question of establishing separate Institutes for blindness, for deafness, for cerebral palsy, for multiple sclerosis, for epilepsy, and for muscle disorders received serious consideration. Although each disease area has unique problems, it was recognized that each involves damage or dysfunction of a portion of the nervous system, and that to create a separate Institute for each would lead to a damaging fractionation of effort. The points advanced now for the establishment of a separate National Eye Institute still relate almost equally well to these other forms of neurosensory disorders, and similar arguments can be made for individual program elements of a number of other Institutes of the National Institutes of Health.

For example, reference has been made to 40,000 blind individuals in this country. An equally cogent case could be made for an equal number of persons with congenital deafness, and almost a million whose lives are blighted by the social isolation resulting from inability to hear or understand the spoken word. Similarly, over 200,000 people die each year from stroke, and there are estimated to be over 2 million persons crippled by stroke in the population. Do their unique needs also require the establishment of a separate administrative struc-

ture within another Institute? A proliferation of new Institutes to satisfy the needs of each program element could have a devastatingly harmful effect on medical research in the United States.

A new National Eye Institute would not solve the scientific and technical problems which represent the real impediment to greater progress against blindness.

These are:

1. Significant expansion of vision research will require the training and recruitment for this field of scientists from a variety of related disciplines, such as biophysics, chemistry, physiology, and epidemiology. Such scientists are best recruited within the university environment through the development of strong multidisciplinary eye research centers.

2. Ophthalmology needs a stronger role within eye research and within the university environment. The recruitment of capable scientists in ophthalmology for full-time research has been difficult because of the salary differential and the relatively weak role of ophthalmology within the medical schools. A mechanism must be found to foster the role of full-time ophthalmic research within the university environment.

3. Further expansion of ophthalmic research is inhibited by lack of research space and facilities.

We believe that these problems can best be overcome by maintaining the multidisciplinary, coordinated programs now underway in the NINDB.

Mr. Chairman, at a time when the pace of many important programs of the National Institutes of Health must be throttled back because of tightness in funding and shortage of administrative personnel, we do not seek—in fact, we recommend against—the added burden of the establishment of a new Institute. Let me assure you that were we convinced that such a move would truly and significantly promote eye research now, it would have our fullest support. It is, on the contrary, our firm conviction that to establish a separate Institute would cause at least some disruption of a strong, ongoing program. Such action would also, in the long run, tend to isolate eye research from other related fields with which a close integration is desirable and, indeed, necessary. At this time, to select this one area for special immediate consideration, especially at the risk of long-term disadvantage to a total program, would not appear to be in the national interest. For these reasons, we cannot recommend enactment of the National Eye Institute bills.

Thank you, Mr. Chairman.

I and my colleagues will now be glad to answer any questions we can.

Mr. JARMAN. Thank you very much, Dr. Stewart.

The committee has received some testimony to the effect that only 15 percent of the total budget of NINDB is allocated for research, about $18 million out of $116 million. Is that in line with your figures?

Dr. STEWART. That is approximately correct. I can give you the exact figures. Dr. Masland can give you those figures.

Dr. MASLAND. It must be recognized that within our total budget of $116 million, there are included many costs which relate to each of the categorical areas for which the Institute has responsibility.

We have, for example, included in that $116 million the costs of the general research support grants which are supporting all types of research within universities. Included are our central administrative costs. Included are many other such items which relate to all of our areas of research. To credit to eye research only those specific projects which relate only to the eye gives a false impression of the total effort for eye research.

In addition, many of our projects are multidisciplinary. For example, one of the largest single projects in our program is our collaborative prenatal program whose purpose is to develop an understanding of prenatal causes of neurological sensory deficits.

That is categorized as research involving disorders in infancy and childhood. However, a very large segment of its concern has to do with causes of blindness which have prenatal etiology, such as German measles and toxoplasmosis which are significant causes of blindness. So this simple categorization of funds allocated to blindness gives a false impression.

I would like further to add that our Council has never attempted an arbitrary allocation of funds among program areas. They have taken the position that we will support the best research in the areas of our responsibility. The figure which then develops for a research area is a reflection of the strength and capability of that field.

Mr. JARMAN. I have one other question along that line. Are you adequately funded for the eye research program that you have or is additional money needed?

Dr. STEWART. Mr. Chairman, it is a little bit difficult to figure out what our 1968 budget is at the present moment. The President's budget contained an increase for the National Institute of Neurological Diseases and Blindness.

Mr. JARMAN. It does contain an increase?

Dr. STEWART. Yes.

Mr. ROGERS. What is the budget for 1968? What is the budget request?

Dr. STEWART. The estimate for 1968 is $128,633,000. We estimate $20,728,000 will be obligated in the vision area.

Mr. ROGERS. In your present budget $18 million was allocated for vision?

Dr. STEWART. That is right.

Mr. ROGERS. What in-house personnel do you have working on eye diseases.

Dr. STEWART. On the intramural program?

Mr. ROGERS. Yes.

Dr. STEWART. I will have to ask Dr. Masland about that.

Mr. ROGERS. Approximately?

Dr. MASLAND. We have approximately 55 people on our staff working on eye disease. Twenty-five are scientists.

Mr. ROGERS. How many are on contract doing contract research on the eye?

Dr. MASLAND. We have just developed a very large contract for the study of the feasibility of developing an artificial eye. This is a long-range program. There again I do not have the exact figures for the number of people who are working on that project.

Mr. ROGERS. That is an artificial eye. I was thinking about getting at the disease problem, of preventive rather than acting after the fact. What we are concerned with, and I think we are going to have

to start putting more emphasis on, is preventive medicine rather than curative steps.

Is the thrust of our program toward this?

Dr. STEWART. Yes, it is, Mr. Rogers. I am puzzled a little by your question. Do you mean our grant program when you say contract program?

Mr. ROGERS. Yes. Perhaps I misused the term. I thought of a contract with a university to carry out research in a grant program.

Dr. STEWART. In the grant program, the $20 million I gave you for 1968 and the $18 million for 1967 are for the research and research training grants in the vision area. That is only for the National Institute of Neurological Diseases and Blindness.

About 26 percent of the eye research that is supported by NIH is supported by other institutes. About 55 or 60 percent is in the National Institute of Neurological Diseases and Blindness.

Mr. ROGERS. How much of the $20 million would be going to grants?

Dr. STEWART. That is the total amount.

Mr. ROGERS. None of that is in-house.

Dr. STEWART. No, that figure includes the in-house research.

Mr. ROGERS. How much of the $20 million is in-house and how much is grants? Give us an approximate breakdown.

Dr. STEWART. The $20 million is the total obligation for vision. This includes in-house and grants.

Mr. ROGERS. Can you give us an approximate breakdown of that?

Dr. STEWART. Taking the $20 million total estimate for 1968, it is $14 million for grants in the research area; $2.4 million intramural; $3 million for the graduate training; half a million dollars for traineeships; and $700,000 for the fellowships.

Mr. ROGERS. Could you supply for the record just a list of those grants. I think that would be helpful to us, who gets them, the number of personnel involved. I think it would be helpful also to give us a rundown on your program say for the last 5 years, just for the record. It can be concise. It would be of the same thrust, as to the amount of programing into grants and what has been accomplished.

(The information requested follows:)

TABLE I.—NINDB OBLIGATIONS FOR VISION, 1951–68

Fiscal year	Extramural		Intramural		Graduate Training		Traineeships		Research Fellows		Total amount
	Number of grants	Amount	Number of grants	Amount	Number of grants	Amount	Number of trainees	Amount	Number of fellows	Amount	
1951	9	$81,026	0	0	0	0	0	0	0	0	$81,026
1952	30	255,354	0	0	0	0	0	0	2	$8,093	263,447
1953	32	267,840	0	0	0	0	0	0	2	8,150	275,990
1954	72	532,761	0	0	5	$118,559	2	$7,200	4	16,685	675,205
1955	84	823,407	16	$444,000	13	244,603	13	43,635	5	19,838	1,575,483
1956	96	1,002,831	22	575,400	22	436,536	23	89,723	3	10,939	2,115,429
1957	137	1,575,072	30	690,689	31	822,481	16	89,487	7	32,654	3,210,383
1958	146	1,769,949	24	1,067,673	39	895,879	22	165,390	9	41,093	3,939,984
1959	200	2,854,890	30	1,018,676	38	1,052,469	17	136,670	3	16,750	5,079,455
1960	236	4,015,000	32	872,380	41	1,953,474	30	248,424	5	30,315	7,119,593
1961	267	5,238,417	40	1,151,700	37	1,617,694	47	397,797	14	83,000	8,488,608
1962	288	6,229,571	43	1,445,994	34	1,709,000	47	420,186	13	120,003	9,924,754
1963	313	7,243,817	38	1,374,514	36	1,885,991	43	382,991	9	63,212	10,950,525
1964	315	8,337,633	48	1,745,000	37	2,189,755	39	363,445	15	185,034	12,820,867
1965	333	8,803,000	54	1,968,000	48	2,760,000	43	418,000	26	393,000	14,342,000
1966	317	10,637,000	53	1,817,000	52	3,072,000	36	362,000	40	561,000	16,449,000
1967	379	11,900,000	69	2,047,000	52	3,075,000	51	520,000	48	666,000	18,208,000
1968	425	14,039,000	70	2,375,000	49	3,105,000	50	520,000	49	689,000	20,728,000

TABLE II.—NINDB OBLIGATIONS FOR VISION, 1954–68

	Total appropriation	Obligations for vision	Noncategory obligations [1]	Vision percent of appropriation
1954	$4,500,000	$675,205	$9,700	15.0
1955	7,600,500	1,575,483	169,000	21.2
1956	9,861,000	2,115,429	293,000	22.1
1957	18,650,000	3,210,383	451,000	20.8
1958	21,387,000	3,939,984	1,079,000	22.6
1959	29,403,000	5,079,455	748,000	17.7
1960	41,487,000	7,119,593	1,669,000	20.7
1961	56,600,000	8,488,608	9,632,000	17.3
1962	70,812,000	9,924,754	6,683,000	14.4
1963	83,506,000	10,950,525	10,783,000	15.0
1964	87,675,000	12,820,867	10,631,000	16.6
1965	87,821,000	14,342,000	8,759,000	18.1
1966	101,153,000	16,449,000	8,090,000	17.6
1967 (estimated)	116,296,000	18,208,000	10,135,000	17.0
1968	128,633,000	20,728,000	11,773,000	17.0

[1] These funds are used to support total Institute efforts, and are not identifiable by disease category. Included are general research support grants, review and approval, program direction, transfers, scientific evaluation grants. In calculating percent effort, this figure is prorated to the various categories.

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	R01 NB07283-01	2A1-A4-V	Harding, Clifford V.; Oakland University, Rochester, Mich.; control of cell division in the ocular lens.	5-67— 8-68	1967	$39,620	$31,007	$32,667	$34,203	.....	.....	.....
5	R01 NB01544-10	2A1-A6-V	Reyer, Randall W.; West Virginia University, Morgantown, W. Va.; induction systems in lens development and regeneration.	1-67—12-67	1967	11,811	.....	.....	.....	.....	.....	.....
5	R01 NB01375-10	2A1-B4-V	Constant, Marguerite A.; Washington University, St. Louis, Mo.; lens in health and disease.	9-66— 8-67	1967	38,607	.....	.....	.....	.....	.....	.....
3	R01 NB01979-08S1	2A1-B4-V	Harris, John E.; University of Minnesota, Minneapolis, Minn.; movement of water and solutes across ocular barriers.	2-67— 3-67	1967	6,273	.....	.....	.....	.....	.....	.....
5	R01 NB01979-09	2A1-B4-V	....do....									
3	R01 NB06230-01S2	2A1-C1-N	Wood, Don C.; Providence Hospital, Portland, Oreg.; a study of eye lens proteins.	4-67— 3-68 5-67— 5-67	1967 1967	109,622 11,402	.....	.....	.....	.....	.....	.....
5	R01 NB06230-02	2A1-C1-N	....do....									
5	R01 NB01142-11	2A1-C1-V	Merriam, George R., Jr.; Columbia University, New York, N.Y.; changes in the lens proteins in radiation cataracts.	6-67— 5-68 9-66—11-67	1967 1967	52,233 9,368	30,986	.....	.....	.....	.....	.....
2	R01 NB01820-09	2A1-C1-V	Schwartz, Bernard; Research Foundation of State University of New York, New York, N.Y.; metabolism of lens cultured in a perfusion system.	12-66—11-67	1967	36,625	26,937	27,908	.....	.....	.....	.....
5	R01 NB04024-07	2A1-C1-V	Hanna, Calvin; University of Arkansas Medical Center, Little Rock, Ark.; biochemical studies in lens cataract formation.	2-67— 1-68	1967	14,608	12,174	.....	.....	.....	.....	.....
3	R01 NB04770-03S2	2A1-C1-V	Burns, Robert P., University of Oregon Medical School, Portland, Oreg.; basic mechanisms in cataract development.	12-66—12-66	1967	938	.....	.....	.....	.....	.....	.....
5	R01 NB05456-03	2A1-C1-V	Koenig, Virgil L., University of Texas Medical Branch, Galveston, Tex.; soluble proteins of the crystalline lens.	9-66— 8-67	1967	15,056	.....	.....	.....	.....	.....	.....
3	R01 NB06230-01S1	2A1-C1-V	Wood, Don C., Providence Hospital, Portland, Oreg.; a study of eye lens proteins.	3-67— 5-67	1967	2,755	.....	.....	.....	.....	.....	.....
2	R01 NB06515-03	2A1-C1-V	Spector, Abraham, Columbia University, New York City, N.Y.; lens proteins and glutathione.	12-66—11-67	1967	34,855	29,675	30,965	.....	.....	.....	.....
1	R01 NB06764-01	2A1-C1-V	Hines, Marvin C., University of Oregon Medical School, Portland, Oreg.; chemistry of the soluble lens proteins.	1-67—12-67	1967	25,062	14,809	15,317	.....	.....	.....	.....
1	R01 NB07033-01	2A1-C1-V	Dische, Zacharias, Columbia University, New York City, N.Y.; cell surface membranes and lens capsule.	1-67—12-67	1967	24,395	21,600	20,700	21,400	.....	.....	.....
1	R01 NB07091-01	2A1-C1-V	Wittgenstein, Eva, University of Cincinnati, Cincinnati, Ohio; biochemical protein studies of cataract.	2-67— 1-68	1967	28,694	20,800	17,800	.....	.....	.....	.....
2	R01 NB03711-05	2A1-C2-V	Sippel, Theodore O., University of Michigan, Ann Arbor, Mich.; respiratory metabolism of the lens.	5-67— 4-68	1967	26,997	18,286	19,896	19,037	$19,710	.....	.....

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	R01 NB06252–01A1	2A1–C2–V	Zeller, E. Albert, Northwestern University, Chicago, Ill.; chemistry and metabolic role of ocular enzymes.	2–67— 1–68	1967	$19,456	$13,846	$13,846	--------	--------	--------	--------
2	R01 NB03081–07	2A1–C3–V	Lerman, Sidney, the University of Rochester, Rochester, N.Y.; the metabolism of the normal and cataractous lens.	1–67—12–67	1967	61,802	44,481	47,582	$50,288	$53,170	--------	--------
2	R01 NB04277–06	2A1–C3–V	Feldman, Gerald L., Baylor University, Houston, Tex.; the lipids in experimentally induced cataracts.	6–67— 5–68	1967	45,306	35,571	36,709	--------	--------	--------	--------
2	R01 NB04866–04	2A1–C3–V	Kuck, John F., Jr., Emory University, Atlanta, Ga.; lens metabolism in normal and precataractous states.	9–66— 8–67	1967	33,359	24,750	25,350	24,950	25,550	--------	--------
2	R01 NB05075–04	2A1–C3–V	Keston, Albert S., Institute of Medical Research and Studies, New York, N.Y., enzyme inhibitors and cataractogenesis.	4–67— 3–68	1967	24,406	14,933	15,216	--------	--------	--------	--------
3	R01 NB06090–01S1	2A1–C3–V	Kinoshita, Jin H., Harvard University Boston, Mass.; cataracts.	8–65— 7–66	1967	1,365	--------	--------	--------	--------	--------	--------
5	R01 NB06090–02	2A1–C3–V	-----do-----	8–66— 7–67	1967	28,321	23,848	4,643	25,478	26,354	$27,274	--------
5	R01 NB06497–02	2A1–C3–V	Spector, Abraham, Columbia University, New York, N.Y.; metabolic studies of the ocular lens.	1–67—12–67	1967	23,837	20,838	21,685	22,674	--------	--------	--------
1	R01 NB06766–01	2A1–C3–V	Bito, Laszlo Z., Columbia University, New York, N.Y. ocular fluid composition and cell division in the lens.	9–66— 8–67	1967	15,355	11,608	11,772	11,932	--------	--------	--------
1	R01 NB07223–01	2A1–C3–V	Marcus, Leonard C., Albert Einstein College of Medicine, New York, N.Y.; congenital cataracts and associated anomalies.	5–67— 4–68	1967	8,395	8,643	10,143	--------	--------	--------	--------
1	R01–NB07250–01	2A–1C3–V	Brown, W. Jann, University of California, LosAngeles, Calif.; nutrition's long term role in cataract development.	5–67— 4–68	1967	39,196	29,997	27,407	26,472	--------	--------	--------
2	R01–NB01010–12	2A1–D3–V	Manski, Wladyslaw, Columbia University, New York, N.Y.; immunological observations on ocular lens in cataract.	6–67— 5–68	1967	84,762	58,991	61,524	64,088	67,335	--------	--------
1	R01 NB02861–07	2A1–E2–V	Troutman, Richard C., Research Foundation of State University of New York, the use of acrylics in eyes.	12–66—11–67	1967	32,797	30,750	--------	--------	--------	--------	--------
5	R01 NB04806–04	2A1–EX–V	Ludlam, William M., Optometric Center of New York, New York, N.Y.; photographic analysis of ocular dioptric components.	6–67— 5–68	1967	31,307	25,320	--------	--------	--------	--------	--------
1	R01 NB06773–01	2A1–E2–V	Roy, Frederick H., University of Tennessee Medical units, Memphis, Tenn.; improved microsurgery of congenital cataracts.	8–66— 7–67	1967	11,455	--------	--------	--------	--------	--------	--------
5	R01 NB00492–14	2A2–A5–V	Smelser, George K., Columbia University, New York, N.Y.; functional development of the eye.	1–67—12–67	1967	11,717	--------	--------	--------	--------	--------	--------
2	R01 NB01202–11	2A2–A9–V	Smelser, George K., Columbia University, New York, N.Y.; electron microscopy of the eye.	11–66—10–67	1967	29,340	25,685	26,530	27,375	28,220	--------	--------

3	R01 NB03448-05S1	2A2-A9-V	Pappas, George D., Columbia University, New York, N.Y.; E M study of eye and vascular fluid dynamics.	11-65—10-66	1967	1,695						
2	R01-NB03448-06	2A2-A9-V	----do----------	11-66— 6-67	1967	40,045						
5	R01 NB05550-03	2A2-A9-V	Kayes, Jack, Washington University, St. Louis, Mo.; trabecular meshwork of eye.	9-66— 8-67	1967	12,618	11,048	11,592				
5	P01 NB01689-10	2A2-B1-V	Armaly, Mansour F., University of Iowa, Iowa City, Iowa; neurogenic regulation of intraocular pressure.	4-67— 3-68	1967	63,118	54,018	51,437	49,437	49,437	49,437	
5	R01 NB00621-13	2A2-B4-V	Becker, Bernard, Washington University, St. Louis, Mo.; the aqueous humor.	9-66— -67	1967	85,442	77,027	83,434				
5	R01 NB01100-11	2A2-B4-V	Kinsey, V. Everett, Wayne State University, Detroit, Mich.; study of intraocular fluid dynamics.	4-67— 3-68	1967	27,490	41,739					
5	R01 NB02212-08	2A2-B4-V	Holland, Monte G., Tulane University, New Orleans, La.; physiology and pharmacology of aqueous humor flow.	9-66— 8-67	1967	24,835	21,400					
3	R01 NB02212-08S1	2A2-B4-V	----do----------	2-67— 8-67	1967	9,082	8,000					
2	R01 NB03452-05	2A2-B4-V	Kelly, Stephen J., University of Alabama Medical Center, Birmingham, Ala.; a miniature pressure telemeter.	6-67— 5-69	1967	29,235						
2	R01 NB03781-06	2A2-B4-V	Sears, Marvin L., Yale University, New Haven, Conn.; anatomic and physiologic studies of intraocular pressure.	1-67—12-67	1967	75,614	58,526	60,575	62,716	64,943		
3	R01 NB03781-06S1	2A2-B4-V	----do----------	4-67—12-67	1967	14,550	10,220	10,520	10,820	11,135		
5	R01 NB05451-03	2A2-B4-V	McEwen, William K., University of California, San Francisco, Calif.; rheology of the eye.	9-66—12-67	1967	28,994						
7	R01 NB07014-01	2A2-B4-V	Kupfer, Carl, University of Washington, Seattle, Wash.; control of intracoular pressure.	9-66— 2-67	1967	18,165						
2	R01 NB04319-06	2A2-C1-V	Waitzman, Morton B., Emory University, Atlanta, Ga.; parasympathomimetic properties of ocular extracts.	4-67— 3-68	1967	18,180	14,012	14,868				
5	R01 NB04243-05	2A2-C3-V	Waitzman, Morton B., Emory University, Atlanta, Ga.; metabolic systems in aqueous humor dynamics.	9-66— 8-67	1967	40,808						
5	R01 NB05226-03	2A2-C3-V	Thomas, Charles I.; Western Reserve University, Cleveland, Ohio; ciliary body metabolism.	9-66— 4-68	1967	40,744						
1	R01 NB07076-01	2A2-C3-V	Cole, David F.; Yale University, New Haven, Conn.; a study of the formation of aqueous humour.	5-67— 4-68	1967	50,072	36,960	38,560				
5	R01 NB06535-02	2A2-C4-V	Bill, Anders; University of Uppsala, Uppsala, Sweden; studies on intraocular fluid dynamics.	5-67— 4-68	1967	21,900	21,800					
5	R01 NB06561-02	2A2-C4-V	Langham, Maurice E.; Johns Hopkins University, Baltimore, Md.; the regulation of the intraocular pressure.	5-67— 4-68	1967	47,595	41,219					
2	R01 NB05098-04	2A2-D2-V	Lawrence, Carteret; Pacific Northwest Research Foundation, Seattle, Wash.; ocular pressure-volume relation.	4-67— 3-68	1967	79,401	55,963	60,881	62,070			
5	R01 NB05914-03	2A2-D2-V	Joyce, Eugene; University of Miami, Miami, Fla.; measurement of ophthalmic blood flow.	4-67— 3-68	1967	2,676						
5	R01 NB00213-15	2A2-E2-V	Roberts, R. Winston; Bowman Gray School of Medicine, Wake Forest, Winston-Salem, N.C.; glaucoma study, low tension and early glaucoma.	9-66— 8-67	1967	21,201	16,300	16,300				

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
5	RO1 NB00218–15	2A2–E2–V	Grant, W. Morton; Massachusetts Eye and Ear Infirmary, Boston, Mass.; pressure-regulating mechanisms in glaucoma.	9–66— 8–67	1967	$30,773	$26,915	$26,915	--------	--------	--------	--------
5	RO1 NB03636–05	2A2–E2–V	Armaly, Mansour F.; University of Iowa, Iowa City, Iowa; comparative study of glaucoma.	9–66— 8–67	1967	53,946	51,401	49,901	$49,901	--------	--------	--------
2	RO1 NB03637–04	2A2–E2–V	Barany, Ernst M.; University of Uppsala, Uppsala, Sweden; comparative study of glaucoma.	9–66— 8–67	1967	24,000	24,000	24,000	--------	--------	--------	--------
2	R01 NB05224–04	2A2–E2–V	Schwartz, Bernard, Research Foundation of State University of New York, New York, N.Y., the response of ocular pressure to corticosteroids.	4–67— 3–68	1967	28,336	20,211	20,918	--------	--------	--------	--------
5	R01 NB05696–02	2A2–E2–V	Richards, Richard D., University of Maryland, Baltimore, Md.; artificial devices for glaucoma surgery.	5–67—04–68	1967	19,222	14,900	--------	--------	--------	--------	--------
2	R01 NB05896–02A1	2A2–E2–V	Safir, Aran, Mount Sinai Hospital, New York, N.Y., intraocular pressure in young diabetics.	9–66— 8–67	1967	40,607	20,753	21,628	--------	--------	--------	--------
1	P02 NB06817–01	2A2–E2–V	Becker, Bernard, Washington University, St. Louis, Mo.; glaucoma clinical research center.	1–67—12–67	1967	249,946	192,772	209,082	215,656	$222,155	$228,708	$235,166
2	R01 NB07014–02	2A2–E2–V	Kupfer, Carl, University of Washington, Seattle. Wash.; control of intraocular pressure.	3–67— 2–68	1967	20,963	17,670	18,270	--------	--------	--------	--------
1	P02 NB07328–01	2A2–E2–V	Armaly, Mansour F., University of Iowa, Iowa City, Iowa; outpatient clinical research on glaucoma.	5–67— 4–69	1967	126,847	46,235	--------	--------	--------	--------	--------
2	R01 NB04774–04	2A2–G5–V	Moses, Robert A., Washington University, St. Louis, Mo.; factors affecting intraocular pressure.	9–66— 8–67	1967	37,722	31,012	33,419	36,145	39,050	--------	--------
3	R01 NB06077–02S2	2A2–G5–V	Stone, William, Jr., Cedars-Sinai Medical Center, Los Angeles, Calif.; anterior chamber drainage tubes.	10–66—12–66	1967	10,914	--------	--------	--------	--------	--------	--------
1	R01 NB06774–01	2A2–G5–V	Lynn, John R., University of Texas Southwestern Medical School, Dallas, Tex; a rapid, full field, computerdriven static perimeter.	1–67— 8–68	1967	30,892	--------	--------	--------	--------	--------	--------
1	R01–NB07089–01	2A2–G5–V	Kobayashi, Albert S., University of Washington, Seattle, Wash., analysis of the intraocular pressure-volume relation.	1–67—12–67	1967	12,821	11,040	11,040	--------	--------	--------	--------
2	R01 NB04446–04	2A3–C3–V	Patz, Arnall, Johns Hopkins University, Baltimore, Md.; diabetic retinopathy.	9–66— 8–67	1967	44,120	36,500	36,500	36,500	36,500	36,500	36,500
5	R01 NB06218–02	2A3–A2–V	Powell, Thomas P., University of Oxford, Oxford, United Kingdom; centrifugal fibers in the visual system.	10–66— 9–67	1967	1,850	1,850	--------	--------	--------	--------	--------
5	R01 NB06253–02	2A3–A2–V	Giolli, Roland A., California College of Medicine, Los Angeles, Calif.; study of subcortical projections of visual cortex.	1–67—12–67	1967	10,385	--------	--------	--------	--------	--------	--------
5	R01 NB06501–02	2A3–A2–V	Hamilton, Charles R., Stanford University, Stanford, Calif.; study of neural basis of visuomotor coordination.	1–67—12–67	1967	23,814	16,890	--------	--------	--------	--------	--------

2	R01 NB04228–05	2A3–A3–2	Foos, Robert Y., University of California, Los Angeles, Calif.; ultrastructure of retinal bipolar cells.	1–67—12–67	1967	53, 311	43, 499	-------	-------	-------	-------	-------
2	R01 NB03614–06	2A3–A3–N	Yamada, Eichi, Faculty of Medicine, Kyushu University, Fukuoka, Japan, morphogenesis of photoreceptive elements in the eye.	5–67— 4–68	1967	8, 911	8, 550	5, 200	-------	-------	-------	-------
5	R01 NB04816–04	2A3–A3–V	Cohen, Adolph I., Washington University, St. Louis, Mo.; cytology and physiology of the retina.	9–66— 8–67	1967	29, 742	-------	-------	-------	-------	-------	-------
5	R01 NB06580–02	2A3–A4–V	Meyer, David B., Wayne State University, Detroit, Mich.; visual cells origin, ultrastructure, chemistry.	5–67— 4–68	1967	14, 772	12, 048	-------	-------	-------	-------	-------
3	P01 NB06592–01S1	2A3–A4–V	Straatsma, Bradley R., University of California, Los Angeles, Calif; retinal morphology, function and clinical characteristic.	11–66— 8–67	1967	7, 686	-------	-------	-------	-------	-------	-------
2	R01 NB06952–02	2A3–A4–V	Kupfer, Carl, University of Washington, Seattle, Wash.; transneuronal changes in lateral geniculate nucleus.	1–67—12–67	1967	22, 385	19, 254	19, 736	-------	-------	-------	-------
1	R01 NB06761–01	2A3–A5–V	Cahn, Robert D.; University of Washington, Seattle, Wash.; eye development pigmented retina differentiation.	9–66— 8–67	1967	23, 562	1, 765	-------	-------	-------	-------	-------
3	R01 NB06761–01S1	2A3–A5–V	---do---	5–67— 8–67	1967	15, 000	-------	-------	-------	-------	-------	-------
2	R01 NB03951–06	2A3–A8–V	Hoyt, William F.; University of California, San Francisco, Calif.; study of nerve fibers in the anterior visual system.	4–67— 3–68	1967	27, 489	20, 447	20, 447	-------	-------	-------	-------
5	R01 NB06426–02	2A3–A8–V	Knapp, Harriet D.; Research Foundation of State University of New York, New York, N.Y.; evolution of visual system.	1–67—12–67	1967	13, 852	11, 820	-------	-------	-------	-------	-------
1	R01 NB06601–01	2A3–A8–V	Lessell, Simmons; Boston University, Boston, Mass.; Experimental optic neuropathies.	9–66— 8–67	1967	50, 870	28, 557	29, 530	-------	-------	-------	-------
3	R01 NB06601–01S1	2A3–A8–V	---do---	5–67— 8–67	1967	6, 805	-------	-------	-------	-------	-------	-------
5	R01 NB02698–07	2A3–A9–V	Cogan, David G.; Harvard University, Boston, Mass.; electron microscopy of retinal dehydrogenases.	8–66— 7–67	1967	29, 728	-------	-------	-------	-------	-------	-------
2	R01 NB02889–07	2A3–A9–V	Sjostrand, Fritiof S.; University of California, Los Angeles, Calif.; development and organization of visual pathways.	1–67—12–67	1967	147, 520	77, 515	77, 085	-------	-------	-------	-------
5	R01 NB03142–06	2A3–A9–V	Roberts, Seymour R., Stanford University, Stanford, Calif.; studies on idiopathic retinal detachment.	12–66—11–67	1967	22, 323	18, 603	-------	-------	-------	-------	-------
5	R01 NB03693–06	2A3–A9–V	Gay, Andrew J.; Washington University, St. Louis, Mo.; projection from retinal lesions to geniculate nucleus.	1–67—12–67	1967	21, 469	-------	-------	-------	-------	-------	-------
2	R01 NB04602–04	2A3–A9–V	Rubin, Lionel F.; University of Pennsylvania, Philadelphia, Pa.; studies on congenital day blindness.	9–66— 8–67	1967	33, 290	27, 794	-------	-------	-------	-------	-------
2	R01 NB05059–04	2A3–A9–V	Henkind, Paul; New York University Medical Center, New York, N.Y.; retinal pathology.	12–66—11–67	1967	52, 460	46, 058	50, 215	-------	-------	-------	-------
5	R01 NB06041–02	2A3–A9–V	Davis, Matthew D.; University of Wisconsin, Madison, Wis.; diabetic retinopathy.	9–66— 8–67	1967	43, 863	38, 436	39, 110	40, 808	41, 877	42, 978	-------
3	R01 NB06041–02S1	2A3–A9–V	---do---	9–66— 8–67	1967	10, 437	9, 293	-------	-------	-------	-------	-------
5	R01 NB06083–02	2A3–A9–V	Watzke, Robert C.; University of Iowa, Iowa City, Iowa; retinal dtachment by sulfated polysaccharides.	9–66— 8–67	1967	3, 835	6, 631	-------	-------	-------	-------	-------

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	R01 NB06558–01	2A3–A9–V	Rubin, Lionel F.; University of Pennsylvania, Philadelphia, Pa.; retinal dysplasia.	9–66— 8–67	1967	$34,069	$27,241	$28,103	--------	--------	--------	--------
5	R01 NB03337–06	2A3–B1–V	Arvanitaki-Chalazonitis, A.; Centre Nat de la Recherche Scien, Marseilles, France; photo-activation of excitable systems.	11–66—10–67	1967	7,000	7,000	--------	--------	--------	--------	--------
5	R01 NB05404–03	2A3–B1–V	Witkovsky, Paul; Columbia University, New York, N.Y.; factors affecting the excitability of retinal neurons.	10–66—11–67	1967	7,019	--------	--------	--------	--------	--------	--------
5	R01 NB05506–03	2A3–B1–V	Sprague, James M.; University of Pennsylvania, Philadelphia, Pa.; neural mechanisms of vision.	9–66— 8–67	1967	19,741	26,207	26,207	--------	--------	--------	--------
5	R01 NB05556–03	2A3–B1–V	Burke, William; University of Sydney, Sydney, Australia; effect of disuse in the visual system.	9–66— 1–68	1967	2,000	--------	--------	--------	--------	--------	--------
5	R01 NB06251–02	2A3–B1–V	Brown, Joel E.; Massachusetts Institute of Technology, Cambridge, Mass.; anatomy and physiology of vision.	1–67—12–67	1967	21,600	17,300	--------	--------	--------	--------	--------
5	R01 NB01903–08	2A3–B3–V	Brown, Kenneth T.; University of California, San Francisco, Calif.; intraretinal recording in unopened eyes.	1–67—12–67	1967	56,463	57,949	57,949	--------	--------	--------	--------
5	R01 NB02010–09	2A3–B3–V	Bernstein, Maurice H.; Wayne State University, Detroit, Mich ; electron microscopy of retina and supporting tissues.	6–67— 5–68	1967	27,054	22,868	21,592	--------	------	--------	--------
5	R01 NB02165–08	2A3–B3–V	Jones, Richard W.; Northwestern University, Evanston, Ill.; dynamics of the visual system.	12–66—11–66	1967	34,093	--------	--------	--------	--------	--------	--------
2	R01 NB02208–07	2A3–B3–V	Enroth-Cugell, Christina A.; Northwestern University, Evanston, Ill.; retinal ganglion cell responses to time varying stim.	2–67— 1–68	1967	26,124	9,550	9,750	$10,150	$10,350	--------	--------
5	R01 NB02340–08	2A3–B3–V	Abrahamson, Edwin W.; Case Institute of Technology, Cleveland, Ohio; photochemistry of photoreceptors.	9–66— 8–67	1967	27,240	--------	--------	--------	--------	--------	--------
5	R01 NB02522–08	2A3–B3–V	Potts, Albert M., University of Chicago, Chicago, Ill.; experimental and clinical study of electroretinography.	10–66— 9–67	1967	41,136	--------	--------	--------	--------	--------	--------
2	R01 NB03412–05	2A3–B3–V	Cornsweet, Tom N., University of California, Berkeley, Calif.; spatial interaction in the stabilized retinal image.	8–66— 6–67	1967	16,320	--------	--------	--------	--------	--------	--------
5	R01 NB03582–05	2A3–B3–V	MacNichol, Edward F., Jr.; Johns Hopkins University, Balitmore, Md.; mechanism of vision.	10–66— 9–67	1967	37,500	37,500	37,500	--------	--------	--------	--------
5	R01 NB03721–06	2A3–B3–V	Wulff, Verner J.; Masonic Foundation for Medical Research and Health Welfare, Utica N.Y.; a study of visual coupling reactions.	1–67—12–67	1967	23,509	--------	--------	--------	--------	--------	--------
5	R01 NB03750–06	2A3–B3–V	De Voe, Robert D., Johns Hopkins University, Baltimore, Md.; analysis of flicker retinal action potentials.	1–67—12–67	1967	14,632	11,670	11,670	--------	--------	--------	--------

2	R01 NB05001-04	2A3-B3-V	Hayes, William N., Research Foundation of State University of New York, Buffalo, N.Y.; studies of the visual system.	1-67—12-67	1967	25,483	16,132	16,283	----------	----------	----------	----------
5	R01 NB05416-03	2A3-B3-V	Hill, Richard M., Ohio State University Research Foundation, Columbus, Ohio; receptive fields of the mesencephalon.	9-66— 8-67	1967	9,232	----------	----------	----------	----------	----------	----------
5	R01 NB05756-03	2A3-B3-V	Purple, Richard L., University of Minnesota, Minneapolis, Minn.; studies on integrative mechanisms of single neurons.	1-67—12-67	1967	11,898	----------	----------	----------	----------	----------	----------
5	R01 NB06400-02	2A3-B3-V	Swartz, Jean G., Washington University, St. Louis, Mo.; studies on the properties of the retinal rod sac.	7-66—11-66	1967	4,432	----------	----------	----------	----------	----------	----------
5	R01 NB06421-02	2A3-B3-V	Tomita, Tsuned, Keio University, Tokyo, Japan; electric sign of single photoreceptors.	3-67— 5-68	1967	10,123	8,200	----------	----------	----------	----------	----------
5	R01 NB06618-02	2A3-B3-V	Sturr, Joseph F., Syracuse University, Syracuse, N.Y.; spatio-temporal factors in vision.	6-67— 5-68	1967	25,831	19,506	----------	----------	----------	----------	----------
1	R01 NB06978-01	2A3-B3-V	Strother, Greenville K., Pennsylvania State University, University Park, Pa.; microspectrophotometry of visual systems.	3-67— 2-68	1967	14,729	12,630	9,430	----------	----------	----------	----------
1	R01 NB07248-01	2A3-B3-V	Wilson, Paul D., University of California, Riverside, Calif.; visual development.	6 67— 5-68	1967	36,897	24,590	29,043	----------	----------	----------	----------
7	R01 NB07412-01	2A3-B3-V	Swartz, Jean G., Mount Sinai Hospital, New York, N.Y.; properties of the retinal rod sac.	12-66— 4-68	1967	6,445	----------	----------	----------	----------	----------	----------
8	R01 NB07617-05	2A3-B3-V	Lit, Alfred, Southern Illinois University, Carbondale, Ill.; effects of illumination on binocular space perception.	10-66— 9-67	1967	37,632	19,380	19,305	19,430	----------	----------	----------
2	R01 NB00253-15	2A3-B6-6	Lowenfeld, Irene E., Columbia University, New York, N.Y.; Pupillography, physiological and, clinical research.	1-67—12-67	1967	20,290	18,155	19,115	----------	----------	----------	----------
5	R01 NB00434-14	2A3-B4-V	Lowry, Oliver H., Washington University, St. Louis, Mo.; quantitative histochemistry of the retina.	9-66— 8-67	1967	10,326	8,605	8,605	----------	----------	----------	----------
3	R01 NB00434-14S1	2A3-B4-V	----do----------	1-67— 8-67	1967	4,336	5,856	6,056	----------	----------	----------	----------
5	R01 NB00568-13	2A3-B4-V	Hubbard, Ruth, Harvard University, Cambridge, Mass.; chemistry of vision.	1-67—12-67	1967	13,512	----------	----------	----------	----------	----------	----------
3	R01 NB00568-13S1	2A3-B4-V	----do----------	6-67—12-67	1967	4,854	----------	----------	----------	----------	----------	----------
5	R01 NB00864-12	2A3-B4-V	Hartline, Haldan K., Rockefeller University, New York, N.Y.; electrical activity, single receptors, neurons of eye.	9-66— 8-67	1967	53,346	41,607	----------	----------	----------	----------	----------
3	R01 NB00864-12S1	2A3-B4-V	----do----------	9-66— 8-67	1967	21,746	----------	----------	----------	----------	----------	----------
5	R01 NB01453-10	2A3-B4-V	Riggs, Lorrin A., Brown University, Providence, R.I.; the human erg in response to monochromatic light.	10-66— 9-67	1967	20,625	17,934	18,350	18,767	19,571	----------	----------
5	R01 NB01482-10	2A3-B4-V	Wolf, Ernst, Retina Foundation, Boston, Mass.; visual sensitivity in normal and abnormal retina.	9-66— 8-67	1967	40,802	----------	----------	----------	----------	----------	----------
5	R01 NB01509-09	2A3-B4-V	Crescitelli, Frederick; University of California, Los Angeles, Calif.; electrophysiological analysis of the visual system.	1-67—12-67	1967	35,227	31,700	32,100	----------	----------	----------	----------
5	R01 NB02260-08	2A3-B4-V	Hubel, David H.; Harvard University, Boston, Mass.; organization of visual system.	12-66—11-67	1967	58,470	57,000	60,500	62,075	64,000	$65,750	----------
2	R01 NB02274-08	2A3-B4-V	De Valois, Russell L.; Indiana University Foundation, Bloomington, Ind.; electrophysiology of color vision.	9-66— 8-67	1967	50,449	39,100	40,650	41,850	43,150	----------	----------

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
5	R01 NB02660-08	2A3-B4-V	Benolken, Robert M.; University of Minnesota, Minneapolis, Minn.; visual mechanisms.	5-67— 4-68	1967	$12,534	$10,190	$10,190	$10,190	$10,190	$10,190	--------
5	R01 NB03154-06	2A3-B4-V	Westheimer, Gerald; University of California, Berkeley, Calif., fundamental problems of retinal function.	10-66— 9-67	1967	30,956	--------	--------	--------	--------	--------	--------
5	R01 NB03333-07	2A3-B4-V	Goldsmith, Timothy H.; Yale University, New Haven, Conn.; visual mechanisms.	4-67— 3-68	1967	35,150	20,212	--------	--------	--------	--------	--------
2	R01 NB03590-06	2A3-B4-V	Chapman, Robert M.; Institute for Behavioral Research, Inc., Silver Spring, Md.; visual mechanisms for wavelength discrimination.	12-66—11-67	1967	50,242	46,501	48,727	--------	--------	--------	--------
5	R01 NB04630-05	2A3-B4-V	Hamasaka, Duco I.; University of Miami, Miami, Fla.; effect of ions and drugs on the electroretinogram.	4-67— 3-68	1967	13,392	--------	--------	--------	--------	--------	--------
2	R01 NB04717-05	2A3-B4-V	Riesen, Austin H.; University of California, Riverside, Calif.; vision in special environments developmental effects.	1-67—12-67	1967	67,701	41,150	36,350	34,150	--------	--------	--------
2	R01 NB04888-04	2A3-B4-V	Holland, Monte G.; Tulane University, New Orleans, La.; electroretinographic potential field analysis.	12-66—11-67	1967	41,129	34,196	35,217	--------	--------	--------	--------
2	R01 NB04935-04	2A3-B4-V	Liebman, Paul A.; University of Pennsylvania, Philadelphia, Pa.; microphotometric studies on retinal rods and cones.	9-66— 8-67	1967	45,634	36,800	38,817	--------	--------	--------	--------
2	R01 NB05215-06	2A3-B4-V	Barlow, Horace B.; University of California, Berkeley, Calif.; problems in visual physiology.	4-67— 3-68	1967	79,612	62,676	64,184	65,740	67,346	--------	--------
3	R01 NB05260-03S1	2A3-B4-V	Bartley, S. Howard; Michigan State University, East Lansign, Mich.; effects of stimulus intermittency on color perception.	2-67— 3-67	1967	1,744	--------	--------	--------	--------	--------	--------
2	R01 NB05260-04	2A3-B4-V	----do----------	4-67— 3-68	1967	30,261	21,633	22,139	--------	--------	--------	--------
3	R01 NB05336-03S1	2A3-B4-V	Dowling, John E.; Johns Hopkins University, Baltimore, Md.; structure and function of vertebrate visual systems.	8-66— 5-67	1967	21,785	12,763	13,173	--------	--------	--------	--------
5	R01 NB05536-04	2A3-B4-V	Dowling, John E., Johns Hopkins University; Baltimore, Md.; structure and function of visual systems.	6-67— 5-68	1967	40,665	34,728	--------	--------	--------	--------	--------
5	R01 NB05487-03	2A3-B4-V	Ripps, Harris; New York University Medical Center, New York, N.Y.; the study of visual pigments in situ.	9-66— 8-67	1967	21,107	--------	--------	--------	--------	--------	--------
5	R01 NB05730-05	2A3-B4-V	Miller, William H., Yale University, New Haven; Conn.; structure and function of eyes.	1-67—12-67	1967	19,460	17,003	17,870	--------	--------	--------	--------
5	R01 NB06027-03	2A3-B4-V	Noell, Werner K.; Research Foundation of State University of New York, Buffalo, N.Y.; vulnerability of the retina to light and other agents.	6-67— 5-68	1967	74,168	--------	--------	--------	--------	--------	--------
3	R01 NB06046-01S1	2A3-B4-V	Krauskopf, John; Institute for Behavioral Research, Inc., Silver Spring, Md.; research on spectral sensitivity.	8-65— 7-66	1967	4,996	--------	--------	--------	--------	--------	--------

5	R01 NB06046-02	2A3-B4-V	Srebro, Richard, Institute for Behavioral Research, Inc., Silver Spring, Md.; research on spectral sensitivity.	8-66— 7-67	1967	34,537	32,329					
5	R01 NB06108-02	2A3-B4-V	Cone, Richard A., Harvard University, Cambridge, Mass.; visual excitation role of early receptor potential.	9-66— 8-67	1967	11,872	8,197					
5	R01 NB06111-02	2A3-B4-V	Adolph, Alan R., Retina Foundation, Boston, Mass.; neuropharmacology of the eye.	1-67—12-67	1967	32,996	34,306					
5	R01 NB06124-02	2A3-B4-V	Clynes, Manfred, Rockland State Hospital, Orangeburg, N.Y., evoked brain potentials to color vision.	2-67— 1-68	1967	29,224	24,834	25,645	26,456			
1	R01 NB06151-01A1	2A3-B4-V	Keesey, Ulker T., University of Wisconsin, Madison, Wis.; visual processes with a motionless retinal image.	9-66— 8-67	1967	38,567	23,836	25,255	26,345			
5	R01 NB06204-02	2A3-B4-V	Yoshizawa, Toru, Osaka University, Osaka, Japan, photochemical study of visual pigment.	9-66— 8-67	1967	2,000	2,000					
5	R01 NB06354-02	2A3-B4-V	Sekuler, Robert W., Northwestern University, Evanston, Ill.; movement and contour processes in human vision.	2-67— 1-68	1967	12,724	10,604					
1	R01 NB06635-01	2A3-B4-V	Dawson, William W., University of Florida, Gainesville, Fla.; ontogenesis of human visual discrimination.	9-66— 8-67	1967	39,814	22,365	17,850				
1	R01 NB 6681-01	2A3-B4-V	Porter, Vonne F., Southern College of Optometry, Memphis, Tenn.; basic parameters of the Troxler effect.	10-66— 9-67	1967	23,700	20,900	17,300				
5	R01 NB01923-07	2A3-C1-V	Kropf, Allen, Amherst College, Amherst, Mass.; photochemistry of the visual pigments.	9-66— 8-67	1967	7,680						
5	R01 NB05687-03	2A3-C1-V	Abrahamson, Edwin W.; Case Institute of Technology, Cleveland, Ohio; structure of rhodopsin.	6-67— 5-68	1967	20,132						
1	R01 NB06746-01	2A3-C1-V	Buckser, Stanley; Carnegie Institute of Technology, Pittsburgh, Pa.; retinal sodium fluxes after light stimulation.	2-67— 1-68	1967	33,166	19,871	19,709				
7	R01 NB07140-01	2A3-C1-V	Williams, Theodore P.; Florida State University, Tallahassee, Fla.; photochemical aspects of visual processes.	9-66— 4-67	1967	16,773						
2	R01 NB07140-02	2A3-C1-V	----do----									
5	R01 NB02198-08	2A3-C3-V	Patz, Arnall; Johns Hopkins University, Baltimore, Md.; metabolic studies on the retina and retinal vessels.	5-67— 4-69 9-66— 8-67	1967 1967	91,295 22,414						
3	R01 NB04452-04S2	2A3-C3-V	McConnell, David G.; Ohio State University Research Foundation, Columbus, Ohio; chemical studies of stimulated retina.	10-66—12-66	1967	5,076						
5	R01 NB04452-05	2A3-C3-V	----do----									
3	R01 NB04452-05S1	2A3-C3-V	----do----	1-67—12-67	1967	23,168						
3	R01 NB04695-04S1	2A3-C3-V	Howard, Rufus O.; Yale University, New Haven, Conn.; retinal vascular metabolism.	1-67—12-67 5-67—12-67	1967 1967	23,092 6,000						
5	R01 NB05214-03	2A3-C3-V	Straatsma, Bradley R.; University of California, Los Angeles, Calif.; mucopolysaccharides related to retinal detachment.	9-66— 8-67	1967	24,607						
3	R01 NB02769-06S1	2A3-C4-V	Futterman, Sidney, Massachusetts Eye and Ear Infirmary, Boston, Mass.; retinal metabolism.	9-66—12-66	1967	17,730						
2	R01 NB05010-04	2A3-C4-V	Muirhead, J. Fraser, University of California, San Francisco, Calif.; mechanisms of phenothiazine retinal toxicity.	4-67— 3-68	1967	26,577	18,369	19,137				

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
2	R01 NB06950-02	2A3-C4-V	Futterman, Sidney, University of Washington, Seattle, Wash.; retinal metabolism.	1-67—12-67	1967	$33,161	$27,605	$28,655	$29,758	$30,916	--------	--------
1	R01 NB06813-01	2A3-D1-N	Hermann, Howard T., McLean Hospital, Belmont, Mass.; photic regulation of pineal hormones.	9-66—12-67	1967	33,520	23,000	23,000	--------	--------	--------	--------
2	R01 NB04285-06	2A3-D2-V	Frayser, Regina, Indiana University Foundation, Indianapolis, Ind.; study of the retinal circulation.	9-66— 8-67	1967	18,738	10,180	10,280	10,400	--------	--------	--------
2	R01 NB05051-04	2A3-D2-V	Norton, Edward W., University of Miami, Miami, Fla.; retinal angiography.	1-67—12-67	1967	25,630	18,500	18,500	--------	--------	--------	--------
2	R01 NB06303-02	2A3-D2-V	Friedman, Ephraim, Boston University, Boston, Mass.; ocular blood flow.	9-66— 8-67	1967	56,891	44,175	43,160	47,420	51,733	--------	--------
3	R01 NB06303-02S1	2A3-D2-V	---do----------	6-67— 8-67	1967	7,514	--------	--------	--------	--------	--------	--------
2	R01 NB04590-04	2A3-D8-V	Klein, David, University of Geneva, Geneva, Switzerland; genetic studies of tapeto-retinal degenerations.	11-66—10-67	1967	7,250	7,250	7,250	--------	--------	--------	--------
5	R01 NB06358-02	2A3-D8-V	Munz, Frederick W., University of Oregon, Eugene, Oreg.; genetics of visual pigments.	5-67— 4-68	1967	33,815	33,960	--------	--------	--------	--------	--------
5	R01 NB02866-07	2A3-E1-V	Foos, Robert Y.; University of California, Los Angles, Calif.; the eye growth plus aging changes in systemic disease.	9-66— 8-67	1967	41,251	35,146	--------	--------	--------	--------	--------
5	R01 NB00810-12	2A3-E2-V	Sloan, Louise L.; Johns Hopkins University, Baltimore, Md.; use of optical aids, studies in physiological optics.	9-66— 8-67	1967	23,442	20,926	21,938	--------	--------	--------	--------
5	R01 NB02003-09	2A3-E2-V	Ogle, Kenneth N.; Mayo Association, Rochester, Minn.; pupillography.	4-67— 3-68	1967	13,358	--------	--------	--------	--------	--------	--------
2	R01 NB02589-08	2A3-E2-V	Goodman, George; New York University Medical Center, New York, N.Y.; erg and psychophysical studies in retinal disorders.	4-67— 3-68	1967	34,034	20,524	22,036	23,554	25,097	--------	--------
3	P01 NB03489-05S1	2A3-E2-V	Schepens, Charles L.; Retina Foundation, Boston, Mass.; connective tissue diseases in the eye.	9-66—10-66	1967	52,766	50,123	52,138	--------	--------	--------	--------
5	P01 NB03489-06	2A3-E2-V	---do----------	11-66—10-67	1967	212,976	127,357	--------	--------	--------	--------	--------
5	R01 NB04987-04	2A3-E2-V	Jacobson, Jerry H.; Cornell University Medical College, New York, N.Y.; clinical electroretinography.	9-66— 8-67	1967	38,934	34,672	--------	--------	--------	--------	--------
5	R01 NB05342-03	2A3-E2-V	Krill, Alex E.; the University of Chicago, Chicago, Ill.; studies of carriers of inherited retinal disorders.	9-66—12-67	1967	18,558	--------	--------	--------	--------	--------	--------
5	R01 NB05895-03	2A3-E2-V	Safir, Aran; Mount Sinai Hospital, New York, N.Y.; spectral variation of retinal directional sensitivity.	12-66—11-67	1967	25,068	21,215	--------	--------	--------	--------	--------
3	R01 NB06328-01S1	2A3-E2-V	Hayashi, Donald T.; Stanford University, Stanford, Calif.; the response of ocular tissues to various dynamic forces.	11-66— 5-67	1967	2,543	--------	--------	--------	--------	--------	--------
5	R01 NB06328-02	2A3-E2-V	Hayashi, Donald T.; Stanford University, Stanford, Calif.; the response of ocular tissues to various dynamic forces.	6-67— 5-68	1967	38,015	28,963	29,405	29,870	--------	--------	--------

5	R01 NB06343-02	2A3-E2-V	Shipley, Thorne; University of Miami, Miami, Fla.; visual direction and anomalous correspondence.	6-67— 5-68	1967	24,576	18,056	19,926	21,131				
1	R01 NB06368-01	2A3-E2-V	Forsius, Henrik R.; University of Oulu, Oulu, Finland; studies on X-chromosomal retinoschisis in Finland.	3-67— 2-68	1967	22,700	13,200	10,100					
1	R01 NB06717-01	2A3-E2-V	Kornzweig, Abraham L.; Jewish Home & Hospital for aged, New York, N.Y.; studies of the macula lutea in the aged eye.	2-67— 1-68	1967	8,878	8,700	8,980					
3	P02 NB06841-01S1	2A3-E2-V	Norton, Edward W.; University of Miami, Miami, Fla.; a study of macular disease.	5-67— 5-67	1967	51,034	49,000	51,000					
5	P02 NB06841-02	2A3-E2-V	----do----										
1	R01 NB06843-01	2A3-E2-V	Friedman, Ephriam,; University Hospital, Inc., Boston, Mass.; ophthalmic OPD clinical research proj8ct.	6-67— 5-68 9-66— 8-67	1967 1967	115,126 70,170	29,180 58,410	60,293					
1	R01 NB06847-01	2A3-E2-V	Duane, Thomas D.; Jefferson Medical College, Philadelphia, Pa.; retinal clinical research unit.	9-66— 8-67	1967	30,235	22,354	21,754					
3	R01 NB06921-01S1	2A3-E2-V	Davis, Matthew D.; University of Wisconsin, Madison, Wis.; diabetic retinopathy—vision outpatient center.	11-66— 5-67	1967	572							
5	R01 NB06921-02	2A3-E2-V	----do----										
1	P02 NB07130-01	2A3-E2-V	Campbell, Charles J.; Columbia University, New York, N.Y.; coagulation therapy in human retinal disease.	6-67— 5-68 5-67— 4-69	1967 1967	31,610 238,771	25,063 70,000						
1	R01 NB07302-01	2A3-E2-V	David, Noble J.; University of Miami, Miami, Fla.; experimental fluorescein angiography.	5-67— 4-68	1967	33,779	23,670	24,515					
2	R01 NB02681-07	2A3-F1-V	Symmes, David; Yale University, New Haven, Conn.; neural basis of visual and auditory fusion.	9-66— 8-67	1967	17,090							
5	R01 NB04886-05	2A3-F1-V	Onley, Judith W.; University of Rochester, Rochester, N.Y.; psychophysical studies of visual sensitivity.	6-67— 5-68	1967	33,412	27,400						
2	R01 NB04951-04	2A3-F1-V	Pinnelo, Lawrence R.; Tulane University, New Orleans, La.; neurophysiology of brightness perception.	6-67— 5-68	1967	30,664	30,158	30,513	30,879				
2	R01 NB04974-04	2A3-F1-V	Meikle, Thomas H., Jr.; Cornell University Medical College, New York, N.Y.; effects of brain lesions on brightness discrimination.	4-67— 3-68	1967	31,324	21,162	22,390					
5	R01 NB05395-03	2A3-F1-V	Battersby, William S.; Queens College, New York, N.Y.; retrochiasmal limitations of visual excitability.	9-66— 8-67	1967	32,593	27,566	28,000					
5	R01 NB05528-03	2A3-F1-V	Wist, Eugene R.; Franklin & Marshall College, Lancaster, Pa.; temporal factors in depth perception.	9-66—12-67	1967	11,438							
5	R01 NB05569-03	2A3-F1-V	Horel, James A.; University of Florida, Gainesville, Fla.; experiments on the visual system.	9-66— 8-67	1967	9,147							
5	R01 NB06050-02	2A3-F1-V	Nachmias, Jacob; University of Pennsylvania, Philadelphia, Pa.; mechanisms of luminance detection and discrimination.	9-66— 8-67	1967	23,281	24,980	25,987					
1	R01 NB07075-01	2A3-F1-V	Hailman, Jack P., University of Maryland, College Park, Md.; behavioral and physiological aspects of color vision.	1-67—12-67	1967	27,843	16,699	17,575					
1	R01 NB07078-01	2A3-F1-V	Matteson, Halsey H., Tulane University, New Orleans, La.; metacontrast and visual perceptual latency.	1-67—12-67	1967	21,451	21,633	14,488					

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	R01 NB07152–01	2A3–F1–V	Rinalducci, Edward J., University of Virginia, Charlottesville, Va.; photopic mechanisms of dark adaptation.	5–67— 4–68	1967	$10,610	$7,288	$7,625	--------	--------	--------	--------
1	R01 NB07228–01	2A3–F1–V	Baker, Howard D., the Florida State University, Tallahassee, Fla.; dichromatic neutral loci in peripheral normal retinas.	6–67— 5–68	1967	15,889	12,076	12,076	--------	--------	--------	--------
1	R01 NB07249–01	2A3–F1–V	Thomas, James P., University of California, Los Angeles, Calif.; spatial integration and perceived brightness.	6–67— 5–68	1967	13,862	9,744	9,744	--------	--------	--------	--------
1	R01 NB07301–01	2A3–F1–V	Lawson, Robert B., University of Vermont, Burlington, Vt.; stereopsis and anomalous contour.	6–67— 5–68	1967	16,770	10,567	11,020	--------	--------	--------	--------
1	R01 NB07340–01	2A3–F1–V	Stecher, Sidney I., Brandeis University, Waltham, Mass.; luminance discrimination and apparent brightness.	5–67— 4–69	1967	31,487	--------	--------	--------	--------	--------	--------
9	R01 NB07455–02	2A3–F1–V	Sheridan, Charles L., University of Missouri at Kansas City, Kansas City, Mo.; neural mechanisms of interocular transfer.	2–67— 1–68	1967	18,114	--------	--------	--------	--------	--------	--------
1	R01 NB07456–01	2A3–F1–V	Schiller, Peter H., Massachusetts Institute of Technology, Cambridge, Mass.; spatial and temporal interaction in visual perception.	3–67— 2–68	1967	35,325	18,462	19,222	--------	--------	--------	--------
1	R01 NB07461–01	2A3–F1–V	Weisstein, Naomi, Loyola University, Chicago, Ill.; the organization of complex visual perception.	3–67— 2–68	1967	19,125	12,650	--------	--------	--------	--------	--------
8	R013 NB07618–04	2A3–F1–V	Kaplan, Ira T.; New York University Medical Center, New York City, N.Y.; ocular movement during visual form perception.	12–66—11–67	1967	11,790	11,224	--------	--------	--------	--------	--------
5	R01 NB07619–04	2A3–F1–V	Fox, Robert; Vanderbilt University, Nashville, Tenn.; the suppression mechanism in binocular rivalry.	6–67— 5–68	1967	13,659	--------	--------	--------	--------	--------	--------
5	R01 NB07622–02	2A3–F1–V	Dember, William N.; University of Cincinnati, Cincinnati, Ohio; experiments in visual backward masking.	6–67— 5–68	1967	20,213	15,945	--------	--------	--------	--------	--------
3	R01 NB06069–01S1	2A3–G1–V	Cooper, William C.; Columbia University, New York City, N.Y.; natural history of retrolental fibroplasia.	9–66— 4–67	1967	6,380	--------	--------	--------	--------	--------	--------
1	R13 NB06602–01	2A3–G2–V	Straatsma, Bradley R.; University of California, Los Angeles, Calif.; symposium on the retina.	8–66— 7–67	1967	21,783	--------	--------	--------	--------	--------	--------
	R13 NB07564–01	2A3–G2–V	Ferree, John W.; National Society for the Prevention of Blindness, Inc., New York City, N.Y.; oxygen therapy and retrolental fibroplasia.	1–67— 3–68	1967	11,200	--------	--------	--------	--------	--------	--------
5	R01 NB02863–07	2A3–G3–V	Walsh, Frank B.; John Hopkins University, Baltimore, Md.; neuropathology and clinical ophthalmological diagnosis.	9–66— 8–67	1967	40,171	34,223	--------	--------	--------	--------	--------
5	R01 NB05090–04	2A3–G5–V	Sias, Fred R., Jr.; University of Mississippi, Jackson, Miss.; retinal coding of visual stimuli.	5–67— 4–68	1967	13,130	10,813	--------	--------	--------	--------	--------
2	R01 NB05135–04	2A3–G5–V	Behrendt, Thomas; Jefferson Medical College, Philadelphia, Pa.; detailed photography of the vitally stained retina.	1–67—12–67	1967	26,691	22,306	--------	--------	--------	--------	--------

1	R01 NB07460-01	2A3-G5-V	Evans, Selby H.; Texas Christian University, Fort Worth, Tex.; spatial operations for a perceptual model.	3-67— 2-68	1967	13,241	10,650					
1	R01 NB07082-01	2A4-D3-V	Barron, Almen L; Research Foundation of State University of New York, Buffalo, N.Y.; biologic and serologic properties of trachoma agent.	2-67— 1-68	1967	35,928	34,501	35,898				
1	R01 NB06748-01	2A4-A4-V	Baum, Jules L.; New York University Medical Center, New York, N.Y.; origin of the fibroblast in corneal wound healing.	9-66— 8-67	1967	22,230	18,817					
3	R01 NB02546-07S1	2A4-A9-V	Sery, Theodore W.; Wills Eye Hospital, Philadelphia, Pa.; uveal reactions induced by extraocular methods.	6-66— 5-67	1967	4,950						
5	R01 NB02546-08	2A4-A9-V	---do---	6-67— 5-68	1967	29,506	25,639					
2	R01 NB04125-04A1	2A4-A9-V	Fromm, Paul O.; Michigan State University, East Lansing, Mich.; comparative physiological studies of vertebrate eyes.	9-66— 8-67	1967	37,376	25,858	26,333				
5	R01 NB04333-05	2A4-A9-V	O'Rourke, J.; Georgetown University, Washington, D.C.; uveal bloodflow and metabolism studies in vivo.	4-67— 3-68	1967	24,472	21,500					
5	R01 NB05575-03	2A4-A9-V	McTigue, John W.; George Washington University, Washington, D.C.; study of the cornea by light and electron microscopy.	9-66— 8-67	1967	31,906						
5	R01 NB06199-02	2A4-A9-V	Davis, Robert W.; Colorado State University, Fort Collins, Colo.; parasites as causes of blindness.	6-67— 5-68	1967	64,652	48,588					
1	R01 NB06422-01A1	2A4-A9-V	Settler, Sheridan H., Jr.; Tuskegee Institute, Tuskegee Institute, Ala.; photocoagulation of the ciliary body.	1-67—12-67	1967	26,402	7,370	7,430				
5	R01 NB04334-05	2A4-B3-V	Zadunaisky, Jose A.; University of Louisville, Louisville, Ky.; corneal electrophysiology.	1-67— 6-67	1967	726						
1	R01 NB07392-01	2A4-B3-V	Brown, Stuart I.; Cornell University Medical College, New York, N.Y.; precorneal tear film.	6-67— 8-68	1967	31,783	20,000	18,800				
2	R01 NB04854-04	2A4-B4-V	Langham, Maurice E.; Johns Hopkins University, Baltimore, Md.; the physiology of the cornea.	9-66— 8-67	1967	58,482	48,219	50,165	$52,208	$54,353		
5	R01 NB05641-03	2Z4-B4-V	Ruedemann, Albert D.; Wayne State University, Detroit, Mich.; photoelastic corneal investigation.	6-67— 5-68	1967	42,838						
2	R01 NB04693-04	2A4-C1-V	Robert, Leslie; Institut National de La Sante, Paris, France; biosynthesis of glycoproteins of corneal stroma.	9-66— 8-67	1967	40,700	11,800	11,800				
5	R01 NB06325-02	2A4-C1-V	Zadunaisky, Jose A.; University of Louisville, Louisville, Ky.; biochemical aspects of corneal transport.	1-67— 6-67	1967							
5	R01 NB06456-02	2A4-C1-V	Refojo, Miguel F.; Retina Foundation, Boston, Mass.; synthetic hydrophilic polymers for eye surgery.	1-67—12-67	1967	33,362	29,200					
7	R01 NB07610-01	2A4-C1-V	Zadunaisky, Jose A.; Yale University, New Haven, Conn.; biochemical aspects of corneal transport.	6-67—12-67	1967	10,144						
1	R01 NB06760-01	2A4-C2-V	Schoellmann, Guenther; Tulane University, New Orleans, La.; the active site of collagnese and related enzymes.	9-66— 8-67	1967	47,617	26,113	27,079				
3	R01 NB05426-02S1	2A4-C3-V	Andrews, John Stevens; Massachusetts Eye and Ear Infirmary, Boston, Mass.; corneal lipids.	9-66—12-66	1967	22,819						

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Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
5	R01 NB06309–02	2A4–C3–V	Mishima, Saiichi S.; Columbia University, New York, N.Y.; studies on the physiology of the cornea and tears.	2–67— 1–68	1967	$19,210	$16,227	--------	--------	--------	--------	--------
7	R01 NB07037–01	2A4–C3–V	Andrews, John S., Vanderbilt University, Nashville, Tenn.; Corneal Lipids.	9–66—12–66	1967	8,749	--------	--------	--------	--------	--------	--------
2	R01 NB07037–02	2A4–C3–V	----do----------	1–67—12–67	1967	31,145	25,332	$27,425	--------	--------	--------	--------
1	R01 NB07227–01	2A4–C3–V	Burns, Robert P., University of Oregon Medical School, Portland, Oreg.; carbohydrate metabolism of corneal epithelium.	5–67— 4–68	1967	18,314	9,900	10,300	--------	--------	--------	--------
5	R01 NB03457–06	2A4–C4–V	Riegelman, Sidney, University of California, San Francisco, Calif.; corneal permeability to corticosteroids and other drugs.	1–67—12–67	1967	19,009	--------	--------	--------	--------	--------	--------
5	R01 NB05076–04	2A4–C4–V	Hanna, Calvin, University of Arkansas Medical Center, Little Rock, Ark.; cell migration in the eye.	2–67—01–68	1967	33,751	29,063	--------	--------	--------	--------	--------
2	R01 NB04310–04A1	2A4–D3–2	Aronson, Samuel B., University of California, San Francisco, Calif.; a study of ocular inflammatory diseases.	1–67—12–67	1967	43,946	40,997	42,282	$43,631	$45,048	--------	--------
3	R01 NB01516–09S1	2A4–D3–V	Sery, Theodore W., Wills Eye Hospital, Philadelphia, Pa.; response of corneal stroma to injection of proteins.	4–66— 3–67	1967	3,869	--------	--------	--------	--------	--------	--------
5	R01 NP01516–10	2A4–D3–V	----do----------	4–67— 3–68	1967	33,948	29,790	30,790	31,790	--------	--------	--------
5	R01 NB01646–09	2A4–D3–V	Ehrlich, Gabriele F., Columbia University, New York, N.Y.; effects of anti-ocular antibodies on ocular tissues.	9–66— 8–67	1967	29,656	25,714	--------	--------	--------	--------	--------
5	R01 NB03040–07	2A4–D3–V	Silverstein, Arthur M., Johns Hopkins University, Baltimore, Md.; studies in ocular hypersensitivity.	1–67—12–67	1967	17,345	21,265	--------	--------	--------	--------	--------
5	R01 NB04140–05	2A4–D3–V	Spalter, Harold F.; Columbia University, New York, N.Y.; autoimmunity in experimental and human uveitis.	9–66— 8–67	1967	22,967	--------	--------	--------	--------	--------	--------
3	R01 NB04310–03S3	2A4–D3–V	Aronson, Samuel B.; University of California, San Francisco, Calif.; a study of ocular immune reactions.	9–66—12–66	1967	7,425	--------	--------	--------	--------	--------	--------
2	R01 NB04747–04	2A4–D3–V	Wacker, Waldon B.; University of Louisville, Louisville, Ky.; autoimmune and isoimmune response to ocular tissues.	9–66— 8–67	1967	28,429	22,605	23,224	23,843	--------	--------	--------
5	R01 NB04855–04	2A4–D3–V	Straatsma Bradley R.; University of California, Los Angeles, Calif.; virus and nematode infections of the eye.	9–66— 8–67	1967	19,429	17,441	--------	--------	--------	--------	--------
3	R01 NB05366–03S1	2A4–D3–V	Silverstein, Arthur M.; Johns Hopkins University, Baltimore, Md.; pathogenesis of uveities.	12–66— 5–67	1967	3,796	--------	--------	--------	--------	--------	--------
2	R01 NB05366–04	2A4–D3–V	----do----------	6–67— 5–68	1967	35,290	30,350	31,150	--------	--------	--------	--------
5	R01 NB05531–03	2A4–D3–V	Castroviejo, Ramon; New York University Medical Center, New York, N.Y.; suppression of the immune response in keratoplasty.	9–66—12–67	1967	21,301	--------	--------	--------	--------	--------	--------

5	P01 NB06207–02	2A4–D3–V	Thygeson, Phillips; University of California, San Francisco, Calif.; studies on immunologic diseases of the eye.	9–66— 8–67	1967	360,000	300,000	300,000	300,000	300,000	$300,000	----
5	R01 NB06619–02	2A4–D3–V	Sapse, Alfred T.; Cedars-Sinai Medical Center, Los Angeles, Calif.; immunological pattern of tears in ocular diseases.	6–67— 5–68	1967	13,136	10,670	----	----	----	----	----
2	R01 NB06959–02	2A4–D3–V	Elliott, James H.; Vanderbilt University, Nashville, Tenn.; studies of ocular hypersensitivity.	1–67—12–67	1967	51,343	48,061	48,436	48,840	49,264	----	----
1	R01 NB06977–01	2A4–D3–V	Flax, Martin H., Massachusetts General Hospital, Boston, Mass.; studies of ocular hypersensitivity reactions.	1–67—12–67	1967	13,960	13,000	13,950	14,300	14,550	----	----
1	R01 NB07013–01	2A4–D3–V	Pollikoff, Ralph, Wills Eye Hospital, Philadelphia, Pa.; studies on primary herpetic keratitis.	2–67— 1–68	1967	42,995	32,375	32,375	----	----	----	----
5	R01 NB06308–02	2A4–D4–V	Smith, J. Lawton, University of Miami, Miami, Fla.; experimental ocular histoplasmosis.	6–67— 5–68	1967	39,552	31,126	----	----	----	----	----
5	R01 NB06355–02	2A4–D4–V	Laibson, Peter R., Wills Eye Hopsital, Philadelphia, Pa.; studies on recurrent herpetic keratitis.	1–67—12–67	1967	17,432	15,370	----	----	----	----	----
5	R01 NB00604–13	2A4–E2–V	Jawetz, Ernest, University of California, San Francisco, Calif.; viral keratoconjunctivitis and related disorders.	9–66— 8–67	1967	91,106	76,917	79,316	78,391	----	----	----
5	R01 NB03538–06	2A4–E2–V	Kaufman, Herbert E., University of Florida, Gainesville, Fla.; ocular herpes simplex.	2–67— 1–68	1967	77,932	65,800	65,800	----	----	----	----
5	R01 NB04968–04	2A4–E2–V	De Voe, Arthur G., Columbia University, New York, N.Y.; a corneal center.	1–67—12–68	1967	287,713	285,827	293,119	301,036	----	----	----
2	R01 NB05037–04	2A4–E2–V	Kaufman, Herbert E., University of Florida, Gainesville, Fla.; corneal preservation and keratoplasty.	6–67— 5–68	1967	54,777	46,401	44,621	44,700	44,700	----	----
3	R01 NB06035–02S1	2A4–E2–V	Baldwin, William R., Pacific University, Forest Grove, Oreg.; the effect of full-time contact lens wear.	2–67— 5–67	1967	3,104	----	----	----	----	----	----
3	R01 NB06281–02S1	2A4–E2–V	Stone, William, Jr., Cedars-Sinai Medical Center, Los Angeles, Claif.; alloplastic substitution for opacification of cornea.	10–66— 8–67	1967	3,624	----	----	----	----	----	----
1	R01 NB06307–01A1	2A4–E2–V	Straatsma, Bradley R.; University of California, Los Angeles, Calif.; accomodative astigmatism—pattern acuity relations.	1–67—12–67	1967	29,421	23,241	----	----	----	----	----
1	R01 NB06345–01	2A4–E2–V	Ledley, Robert S.; National Biomedical Research Foundation, Inc., Silver Spring, Md.; automatic ray tracing of the optical system of the eye.	9–66— 8–67	1967	28,176	26,101	26,994	----	----	----	----
5	R01 NB06394–02	2A4–E2–V	Poster, Maurice G.; Optometric Center of New York, New York City, N.Y.; optical investigation/classification of keratoconus.	5–67— 4–68	1967	20,645	----	----	----	----	----	----
5	R01 NB06840–02	2A4–E2–V	Baum, Jules L.; New York University Medical Center, New York City, N.Y.; corneal research clinic.	6–67— 5–68	1967	9,504	8,702	----	----	----	----	----
3	R01 NB06842–01S1	2A4–E2–V	Laibson, Peter, Wills Eye Hospital, Phildelphia, Pa.; investigation of recurrent herpetic keratitis.	6–66— 5–67	1967	1,666	----	----	----	----	----	----
5	R01 NB06842–02	2A4–E2–V	Laibson, Peter R.; Wills Eye Hospital, Philadelphia, Pa.; investigation of human recurrent herpetic keratitis.	6–67— 5–68	1967	11,521	8,960	----	----	----	----	----
1	R01 NB07077–01	2A4–E2–V	Mandell, Robert B.; University of California, Berkeley, Calif.; morphometry of the infant cornea.	2–67— 1–68	1967	20,986	11,921	11,921	12,427	----	----	----
5	R01 NB03144–07	2A4–G1–V	Grayston, J. Thomas; University of Washington, Seattle, Wash.; prevention of trachoma.	12–66—11–67	1967	125,823	111,543	115,621	119,944	----	----	----

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	RO1 NB06743–01	2A5–A4–V	Shapiro, Arnold L.; New York Univeristy Medical Center, New York City, N.Y.; growth and synthesis in cultured lens cells.	9–66— 8–67	1967	$31,223	$20,670	$20,770	--------	--------	--------	--------
3	RO1 NB04501–0451	2A5–A6–N	Irvine, A. Ray, Jr.; Estelle Doheny Eye Foundation, Los Angeles, Calif.; effect of blood and pressure on cultured ocular tissues.	11–66— 4–67	1967	973	--------	--------	--------	--------	--------	--------
5	RO1 NB04501–05	2A5–A6–V	----do----------	5–67— 4–68	1967	54,488	47,560	--------	--------	--------	--------	--------
3	RO1 NB03015–06S1	2A5–A8–N	Cogan, David C., Harvard University, Boston, Mass.; metabolic histochemistry of the retina.	1–66—12–66	1967	4,592	--------	--------	--------	--------	--------	--------
5	RO1 NB03015–07	2A5–A8–V	----do----------	1–67—12–67	1967	56,420	50,313	--------	--------	--------	--------	--------
5	RO1 NB01789–09	2A5–A9–V	Okun, Edward; Washington University, St. Louis, Mo.; experimental retinal pathology.	9–66— 8–67	1967	44,040	39,670	--------	--------	--------	--------	--------
5	RO1 NB02885–07	2A5–C1–V	Reddy, D. V.; Wayne State University, Detroit, Mich.; intraocular transport.	6–67— 5–68	1967	27,529	25,200	25,700	$25,700	$25,700	$25,700	--------
2	RO1 NB03370–06	2A5–C1–V	Balazs, Endre A.; Retina Foundation, Boston, Mass.; studies on the connective tissues of the eye.	9–66— 8–67	1967	168,052	122,593	125,451	128,366	131,436	--------	--------
1	RO1 NB06712–01	2A5–C1–V	Blatz, Paul E., University of Wyoming, Laramie, Wyo.; interactions and properties of retinal-opsin complex.	9–66— 8–67	1967	44,160	22,900	22,900	--------	--------	--------	--------
7	RO1 NB07365–01	2A5–C2–V	Fisher, Earl, Jr.; Portland State College, Portland, Oreg.; action of proteolytic enzymes on corneal tissue.	12–66—11–67	1967	24,585	--------	--------	--------	--------	--------	--------
5	RO1 NB02343–08	2A5–C3–V	Donn, Anthony; Columbia University, New York City, N.Y.; physiologic studies of the living cornea in vitro.	12–66—11–67	1967	17,637	--------	--------	--------	--------	--------	--------
3	RO1 NB03446–05S1	2A5–C3–V	Barder, George W.; Wills Eye Hospital, Philadelphia, Pa.; studies on lens metabolism.	12–65—11–66	1967	3,620	--------	--------	--------	--------	--------	--------
2	RO1 NB03446–06	2A5–C3–V	----do----------	12–66—11–67	1967	59,752	45,000	46,671	46,671	48,342	48,342	$50,013
2	RO1 NB05253–04	2A5–C3–V	Koenic, Edward, Research Foundation of State University of New York, Buffalo, N.Y.; visual cell RNA during normal and abnormal differentiation.	4–67— 3–68	1967	20,548	16,111	16,541	--------	--------	--------	--------
5	RO1 NB02168–08	2A5–E2–V	Enoch, Jay M., Washington University, St. Louis, Mo., the etiology of reduced visual function.	9–66— 8–67	1967	34,851	--------	--------	--------	--------	--------	--------
5	RO1 NB06710–2	2A5–E2–V	Wadsworth, Joseph A., Duke University, Durham, N.C.; human macular disease, a clinical outpatient study.	6–67— 5–68	1967	24,402	17,449	--------	--------	--------	--------	--------
3	RO1 NB05794–02S1	2A6–A8–V	Miller, James E., Albany Medical College, Albany, N.Y.; a study of normal and diseased extraocular muscle.	8–66— 5–67	1967	39,375	1,320	--------	--------	--------	--------	--------
5	RO1 NB05794–03	2A6–A8–V	----do----------	6–67— 5–68	1967	36,984	--------	--------	--------	--------	--------	--------
5	RO1 NB06152–02	2A6–A9–V	Breinin, Goodwin M., New York University Medical Center, New York, N.Y.; Electron microscopy of ocular muscle.	1–67—12–67	1967	26,242	26,512	--------	--------	--------	--------	--------
5	RO1 NB03934–06	2A6–B2–V	Ludvigh, Elek J. II, Wayne State University, Detroit, Mich.; dynamics of binocular ductions.	4–67— 3–68	1967	21,417	21,674	22,590	--------	--------	--------	--------

5	R01 NB05338-03	2A6-B2-V	Gonzalez, Caleb, University of Puerto Rico, San Juan, P.R.; ocular electromyography and inhibitory mechanisms.	6-67— 5-68	1967	12,240						
1	R01 NB06715-01	2A6-B2-V	McLaughlin, Samuel C., Tufts University, Medford, Mass.; visual and auditory feedback in amblyopia ex anopsia.	2-67— 1-68	1967	14,732	9,947					
5	R01 NB00294-14	2A6-B3-V	Bender, Morris B., Mount Sinai Hospital, New York, N.Y.; oculomotor system and body postural mechanisms.	9-66— 8-67	1967	85,257						
2	R01 NB00911-12	2A6-B3-V	Breinin, Goodwin M., New York University Medical Center, New York, N.Y.; electrophysiology of the oculomotor system.	9-66— 8-67	1967	64,312	54,695	54,695				
5	R01 NB04547-05	2A6-B3-V	Jampel, Robert S., Columbia University, New York, N.Y.; eye movements from brain stimulation.	9-66— 8-67	1967	16,212	13,680	13,680				
5	R01 NB01325-10	2A6-B4-V	Chin, Newton B., New York University Medical Center, New York, N.Y.; studies in accommodation and convergence.	4-67— 3-68	1967	43,308	38,429	40,561	42,850			
5	R01 NB04936-04	2A6-B4-V	Miller, James E., Albany Medical College, Albany, N.Y.; electromyographic study of oculomotor function.	9-66— 8-67	1967	35,608	31,985	33,279	34,612			
1	R01 NB07079-01	2A6-C4-V	Eakins, Kenneth E., Columbia University, New York, N.Y.; neuromuscular effects of anesthetic agents.	1-67—12-67	1967	17,966	15,390	16,702				
1	P02 NB07187-01	2A6-D8-V	Burian, Hermann M., University of Iowa, Iowa City, Iowa; congenital strabismus functional and genetic studies.	5-67— 4-69	1967	197,206	75,245					
5	R01 NB01637-10	2A6-E2-V	Ogle, Kenneth N., Mayo Association, Rochester, Minn.; foveal vision by resolution and contrast thresholds.	11-66—10-67	1967	8,931						
3	R01 NB01711-09S1	2A6-E2-V	Torok, Nicholas, University of Illinois, Chicago, Ill.; clinical nystagmography.	12-66— 3-67	1967	3,241						
5	R01 NB01711-10	2A6-E2-V	---do---	4-67— 3-68	1967	19,772						
5	R01 NB04242-05	2A6-E2-V	Flom, Merton C., University of California, Berkeley, Calif., contour interaction and fixation tremor in amblyopia.	9-66— 8-68	1967	25,125						
3	R01 NB04576-04S1	2A6-E2-V	Bender, Morris B., Mount Sinai Hospital, New York City, N.Y.; effects of arousal on human oculomotor function.	11-66— 3-67—1967		2,270						
5	R01 NB04576-05	2A6-E2-V	---do---	4-67— 3-68	1967	23,986	15,333					
5	R01 NB05147-05	2A6-E2-V	Von Noorden, Gunter K., Johns Hopkins University, Baltimore, Md.; strabismic amblyopia.	5-67— 4-68	1967	15,382						
5	R01 NB05945-02	2A6-E2-V	Brock, Frederick W., Optometric Center of New York, New York City, N.Y.; adaptability to amblyopia and/or Strabismus.	5-67— 4-68	1967	21,337	17,093					
5	P01 NB06038-02	2A6-E2-V	Jampolsky, Arthur; Institute of Medical Sciences, San Francisco, Calif.; neurophysiology of the visual apparatus.	10-66— 9-67	1967	229,842	175,427	177,126	174,892			
5	R01 NB06526-02	2A6-E2-V	Windsor, Charles E., Washington University, St. Louis, Mo.; retinal illumination, imagery, and nystagmus.	5-67— 4-68	1967	19,221	15,522					
1	R01 NB06654-01	2A6-E2-V	Perry, Nathan W., Jr.; University of Florida, Gainesville, Fla.; monocular and binocular evoked potentials.	9-66— 8-67	1967	41,016	27,407	28,370				

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
1	R01 NB06787-01	2A6-E2-V	Flynn, John T.; University of Miami, Miami, Fla.; change of fixation in amblyopia.	9-66— 8-67	1967	$25,659	$16,475	--------	--------	--------	--------	--------
2	R01 NB01852-09	2A6-F1-V	Ogle, Kenneth N.; Mayo Foundation, Rochester, Minn.; critical factors in stereoscopic depth perception.	9-67—12-67	1967	11,593	--------	--------	--------	--------	--------	--------
1	R01 NB06861-01	2A6-F1-V	Cheifetz, David I., Presbyterian-Saint Lukes Hospital, Chicago, Ill.; visual scanning patterns in copying disability.	2-67— 1-68	1967	12,468	8,170	--------	--------	--------	--------	--------
5	R01 NB03770-04	2A7-A6-V	Harrison, Paul C., Washington State University, Pullman, Wash.; eye and brain damage induced by continuous light.	4-67— 3-68	1967	19,159	--------	--------	--------	--------	--------	--------
5	R01 NB05425-03	2A7-A6-V	Rothstein, Howard, University of Vermont, Burlington, Vt.; wound healing in lens epithelium.	12-66—11-67	1967	24,055	--------	--------	--------	--------	--------	--------
3	R01 NB05425-03S1	2A7AA6-V	----do----------	12-66—11-67	1967	12,255	--------	--------	--------	--------	--------	--------
5	R01 NB02521-08	2A7-B4-V	Potts, Albert M., University of Chicago, Chicago, Ill.; nutrition and metabolism of eye avascular structures.	10-66— 9-67	1967	21,069	--------	--------	--------	--------	--------	--------
5	R01 NB03788-06	2A7-C2-V	Weimer, Virginia L., University of Oregon Medical School, Portland, Oreg.; reaction of connective tissue cells to injury.	9-66— 8-67	1967	37,135	--------	--------	--------	--------	--------	--------
5	R01 NB01161-11	2A7-E2-V	Georgiade, Nicholas G., Duke University, Durham, N.C.; preservation of corneal grafts.	1-67—12-67	1967	10,604	--------	--------	--------	--------	--------	--------
5	R01 NB02220-08	2A7-E2-V	Dohlman, Claes H., Retina Foundation, Boston, Mass.; Studies on corneal dehydration, wound healing, and grafting.	9-66—12-67	1967	86,661	--------	--------	--------	--------	--------	--------
1	R01 NB06679-01	2A7-G1-V	Luntz, Maurice H., University of the Witwatersrand, Johannesburg, Republic of South Africa; interracial study on ocular neoplasms.	4-67— 3-68	1967	10,000	10,540	--------	--------	--------	--------	--------
5	R01 NB04633-05	2A7-G5-V	Lovell, William V., Lovell, William Vail, Sanford, Fla.; modified Lovell eye magnet for nonmagnetic metals.	1-67—12-67	1967	1,600	--------	--------	--------	--------	--------	--------
3	R01 NB04633-05S1	2A7-G5-V	----do----------	4-67—12-67	1967	8,800	--------	--------	--------	--------	--------	--------
1	R01 NB06045-01A1	2A7-G5-V	Beckman, Hugh; Sinai Hospital of Detroit, Detroit, Mich.; effects of laser energy.	2-67— 1-68	1967	49,160	17,195	$17,655	--------	--------	--------	--------
5	R01 NB06092-02	2A8-A3-V	Laties, Alan M.; University of Pennsylvania, Philadelphia, Pa.; a histochemical study of autonomic innervation of eye.	10-66— 9-67	1967	20,295	17,182	--------	--------	--------	--------	--------
5	R01 NB06353-02	2A8-A3-V	Thornton, John W.; Oklahoma State University of Agriculture/Applied Science, Stillwater, Okla.; morphology of intraocular muscles.	2-67— 1-68	1967	7,297	--------	--------	--------	--------	--------	--------
2	R01 NB06241-03	2A8-A6-V	Harrison, John R.; Washington & Jefferson College, Washington, Pa.; growth and differentiation of embryonic eye.	6-67— 5-68	1967	21,899	15,559	16,985	$18,525	--------	--------	--------
3	R01 NB02698-06S1	2A8-A9-V	Cogan, David G.; Harvard University, Boston, Mass.; electron microscopy of retinal dehydrogenases.	8-65— 7-66	1967	2,056	--------	--------	--------	--------	--------	--------

5	R01 NB03807-06	2A8-A9-V	Young, Richard W.; University of California, Los Angeles, Calif.; histophysical and histochemical studies on the eye.	5-67— 4-68	1967	27,369	22,808	22,880	-------	-------	-------	-------
5	R01 NE05918-02	2A8-A9-V	Kroll, Arnold J.; University of Miami, Miami, Fla.; electron microscopy of retinal changes.	1-67—12-67	1967	34,260	30,950	32,150	33,350	-------	-------	-------
2	R01 NB03413-06	2A8-B3-V	Sokollu, Adnan; Western Reserve University, Cleveland, Ohio; study of eye physiology and disease by ultrasound.	4-67— 3-68	1967	96,438	70,116	70,900	72,150	-------	-------	-------
5	R01 NB04145-05	2A8-B3-4	Rosenberg, Barnett; Michigan State University, East Lansing, Mich.; electronic charge transport in visual systems.	9-66— 8-67	1967	21,804	-------	-------	-------	-------	-------	-------
7	R01 NB07611-01	2A8-B3-V	Zadunaisky, Jose A.; Yale University, New Haven, Conn.; corneal electrophysiology.	6-67—12-67	1967	10,082	-------	-------	-------	-------	-------	-------
5	R01 NB00624-14	2A8-B4-V	Boynton, Robert M.; University of Rochester, Rochester, N.Y.; psychophysiological and optical studies of vision.	6-67— 5-68	1967	56,940	50,063	52,732	55,546	-------	-------	-------
5	R01 NB01413-10	2A8-B4-V	Malis, Leonard I.; Mount Sinai Hospital, New York, N.Y.; interaction in the visual pathways.	12-66—11-67	1967	67,275	57,401	57,401	60,557	-------	-------	-------
5	PO1 NB03627-06	2A8-B4-V	McCann, Gilbert D.; California Institute of Technology, Pasadena, Calif.; study of cerebral and related systems.	5-67— 4-68	1967	278,710	240,968	-------	-------	-------	-------	-------
5	R01 NB05628-03	2A8-B4-V	Kampa, Elizabeth M.; University of California at San Diego, San Diego, Calif.; the structure and function of eyes.	12-66—11-67	1967	30,251	-------	-------	-------	-------	-------	-------
5	R01 NB06361-02	2A8-B4-V	Steinman, Robert M., University of Maryland; College Park, Md.; stimulus variables in monocular fixation.	2-67— 1-68	1967	18,390	15,950	-------	-------	-------	-------	-------
7	R01 NB07387-01	2A8-B4-V	Sechzer, Jeri A.; New York University Medical Center, New York, N.Y.; visual learning and memory.	9-66— 8-67	1967	8,976	-------	-------	-------	-------	-------	-------
7	R01 NB07608-01	2A8-B4-V	Sperling, Harry G.; University of Texas, Houston, Tex.; excitability of visual pathways.	3-67—12-67	1967	29,797	-------	-------	-------	-------	-------	-------
2	R01 NB05053-04	2A8-C1-V	Kern, Harold L.; Albert Einstein College of Medicine, New York, N.Y.; transport processes in ocular tissues.	1-67—12-67	1967	30,724	23,445	24,100	24,700	$25,070	-------	-------
3	R01 NB05887-02S1	2A8-C1-V	Berman, Elaine R.; Hebrew University, Jerusalem, Israel; mucopolysaccharides in ocular tissues.	2-67— 5-67	1967	7,140	6,495	-------	-------	-------	-------	-------
5	R01 NB05887-03	2A8-C1-V	---do	6-67— 5-68	1967	17,875	-------	-------	-------	-------	-------	-------
5	R01 NB06357-02	2A8-C1-V	McFarland, William N., Cornell University, endowed colleges, Ithaca, N.Y.; environmental control and biochemistry of opsins.	5-67— 4-68	1967	34,847	26,180	-------	-------	-------	-------	-------
5	R01 NB4765-04	2A8-C2-V	Maisel, Harry, Wayne State University, Detroit, Mich.; the ontogeny of ocular enzymes.	9-66— 8-67	1967	20,737	15,310	15,270	-------	-------	-------	-------
5	R01 NB03689-06	2A8-C4-V	Freeman, Robert G., Baylor University, Houston, Tex.; photosensitization of the eye.	1-67—12-67	1967	20,296	-------	-------	-------	-------	-------	-------
5	R01 NE05505-03	2A8-C4-V	Potts, Albert M., University of Chicago, Chicago, Ill.; the action of drugs and poisons on the eye.	10-66— 9-57	1967	46,609	42,805	45,420	-------	-------	-------	-------
1	R01 NB06579-01	2A6-C4-V	Leopold, Irving H., Mount Sinai Hospital, New Yrok, N.Y.; studies on ocular pharmacology.	9-66— 8-67	1967	107,622	64,200	66,700	69,200	69,200	$69,200	$69,200
3	R01 NB06846-0151	2A8-C4-V	---do	11-66— 5-67	1967	945	-------	-------	-------	-------	-------	-------
5	R01 N806846-02	2A8-C4-V	---do	6-67— 5-68	1967	41,468	29,489	-------	-------	-------	-------	-------

NINDB RESEARCH GRANTS IN THE FIELD OF VISION, FISCAL YEAR 1967—Continued

Type	Grant No.	Program class	Investigator, institution, city, State, and project title	Start and end date	Year	Current funds	1st year	2d year	3d year	4th year	5th year	6th year
5	R01 NB01578–09	2A8–E2–V	Alpern, Mathew, University of Michigan, Ann Arbor, Mich.; psychophysiological studies of ocular abnormalities.	9–66— 8–67	1967	$38,788	$33,750	--------	--------	--------	--------	--------
5	R01 NB03284–07	2A8–E2–V	O'Rouke, J., Georgetown University, Washington, D.C.; cannulation infusion of ocular arteries.	6–67— 5–68	1967	927,369	23,540	--------	--------	--------	--------	--------
5	R01 NB03638–03	2A8–E2–V	Goldmann, Hans, Universitat Bern, Bern, Switzerland; studies on visual functions.	1–67—12–67	1967	33,950	--------	--------	--------	--------	--------	--------
2	R01 NB03639–05	2A8–E2–V	Becker, Bernard, Washington University, St. Louis, Mo.; studies on visual function.	9–66— 8–67	1967	95,940	56,584	$61,262	$66,582	$72,220	--------	--------
5	R01 NB05360–04	2A8–E2–V	Horenstein, Stimon, Highland View Hospital, Cleveland, Ohio; sensori motor concomitants of homonymous hemianopia.	4–67— 3–68	1967	12,103	--------	--------	--------	--------	--------	--------
5	P01 NB05691–02	2A8–E2–V	Cogan, David G., Massachusetts Eye & Ear Infirmary, Boston, Mass.; intrinsic and extrinsic ocular disease investigations.	9–66— 8–67	1967	367,484	414,580	431,376	438,689	444,839	$450,105	--------
1	P02 NB06839–01A1	2A8–E2–V	Kaufman, Herbert E., University of Florida, Gainesville, Fla.; outpatient clinical research project external ocular Di.	1–67—12–67	1967	87,777	67,086	68,993	--------	--------	--------	--------
1	P01 NB07226–01	2A8–E2–V	Johns, Richard J., Johns Hopkins University, Baltimore, Md.; interdisciplinary research in ophthalmology.	5–67— 4–69	1967	549,437	215,000	210,000	220,000	--------	--------	--------
5	R01 NB04870–04	2A8–F1–V	Nolan, Carson Y., American Printing House for the Blind, Louisville, Ky.; reading and listening in learning by the blind.	9–66—12–67	1967	19,009	--------	--------	--------	--------	--------	--------
5	R01 NB05459–03	2A8–F1–V	Young, Francis A., Washington State University, Pullman, Wash.; growth environmental refractive changes.	9–66— 8–67	1967	32,380	--------	--------	--------	--------	--------	--------
5	R01 NB05554–03	2A8–F1–V	Wiesel, Torsten N., Harvard University, Boston, Mass.: studies of the visual system.	9–66— 8–67	1967	53,578	46,584	49,167	51,917	54,834	--------	--------

1	R01 NB07222-01	2A8-F1-V	Graf, Virgil A., Dartmouth College, Hanover, N.H.; behavioral visual function.	6-67— 5-68	1967	9,750	8,176	4,153	-------	-------	-------	-------
3	R09 NB06536-01S2	2A8-G2-V	Becker, Bernard; Council Program Planning Committee, NINDB, Bethesda, Md.; program planning committee.	3-67— 9-67	1967	15,000	-------	-------	-------	-------	-------	-------
1	R01 NB07633-01	2A8-G4-N	Carroll, Thomas J.; Advisory Ad Hoc Subcommittee on Rehabilitation, Newton, Mass.; Behavioral sciences and blindness.	4-67— 3-69	1967	150,000	-------	-------	-------	-------	-------	-------
3	R01 NB06243-02S1	2A8-G4-V	Becker, Bernard; Washington University, St. Louis, Mo.; viscual disorders program development.	1-67— 3-68	1977	10,000	-------	-------	-------	-------	-------	-------
2	R01 NB04233-05A1	2A8-G5-V	Duane, Thomas D.; Jefferson Medical College, Philadelphia, Pa.; pletyhsmographic occlusion of the ophthalmic artery.	1-67—12-67	1967	19,662	12,859	12,859	-------	-------	-------	-------
5	R01 NB05547-03	2A8-G5-V	Lincoff, Harvey A.; Cornell University Medical College, New York, N.Y.; the cryosurgical treatment of ocular disease.	9-66— 8-67	1967	30,073	-------	-------	-------	-------	-------	-------
3	R01 NB06078-02S2	2A8-G5-V	Stone, William, Jr.; Cedars-Sinai Medical Center, Los Angles, Calif.; surgical polymers—standardization and synthesis.	9-66—12-66	1967	25,473	-------	-------	-------	-------	-------	-------
2	R01 NB06078-03	2A8-G5-V	----do----------	1-67—12-67	1967	169,674	124,490	109,238	-------	-------	-------	-------
1	R01 NB07364-01	2A8-G5-V	Cohen, Gerald H., the University of Rochester, Rochester, N.Y.; pupil reflex control system study.	5-67— 4-69	1967	45,739	-------	-------	-------	-------	-------	-------
1	R01 NB06634-01	2A8-G6-V	Sheehe, Paul R.; National Society for the Prevention of Blindness, Inc., New York, N.Y.; classification of vision impairment and blindness.	9-66— 3-68	1967	9,644	12,300	-------	-------	-------	-------	-------
1	R01 NB07414-01	2A8-G4-V	Becker, Bernard; Washington University, St. Louis, Mo.; program development on vision and its disorders.	1-67—12-68	1967	40,000	-------	-------	-------	-------	-------	-------
5	R01 NB04342-06	2A8-B4-V	Hurvich, Leo M.; University of Pennsylvania, Philadephia, Pa.; visual mechanisms temporal and inductive aspects.	4-67— 3-68	1967	35,275	-------	-------	-------	-------	-------	-------
3	R01 NB05398-02S1	2A8-G2-V	Riviere, Maya; Rehabilitation Codes, Inc., New York, N.Y.; classification of impairment of visual function.	6-67— 3-68	1967	14,674	-------	-------	-------	-------	-------	-------

Mr. ROGERS. We would like to see some accomplishments. Are we making any progress or are we just spinning around without getting too many results.

(The following information was subsequently submitted:)

PROGRESS IN EYE RESEARCH IN THE NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS

Because of impressive advances in the conquest of visual disorders made by Institute-supported studies in recent years, many thousands of men, women, and children have useful sight who might otherwise have faced their days in darkness.

At least 5,000 infants have been saved from blindness since Institute grantees a few short years ago discovered that too much oxygen was the cause of retrolental fibroplasia, a disease that strikes prematurely born infants in their first few months of life. Thousands of senior citizens have had their sight restored following cataract surgery that would have been impossible a decade ago. Recent techniques for transplanting corneas have restored sight to many blinded persons. Detection of glaucoma in its early stages, now possible due to Institute-supported discoveries, and new means of keeping the disease under control, assure many thousands of people that they will not lose their sight due to this insidious disease. There are many other accomplishments to which the NINDB can point with pride.

One of the most significant advances in therapeutics was the discovery by an NINDB grantee that herpes simplex, the most common cause of corneal ulcers and blindness, could be cured by the drug IDU. This was the first drug ever to be proved effective against any virus and has opened up new approaches into the broader study of antiviral drugs.

Continued advances in our understanding of the management of glaucoma and a more sophisticated use of drugs reduce the need for surgical intervention. New knowledge of the hereditary patterns of the disease now makes it possible to predict which individuals are prone to develop glaucoma and to treat persons at an early stage of the disease before any vision is lost.

Chemical research has provided valuable data on the physical and chemical properties of lens proteins, thus adding to our understanding of cataracts. Laboratory studies recently revealed the presence of the German measles virus within the cataractous lens of infants whose mothers had the disease early in pregnancy, a very important discovery in terms of our understanding of the mode of action of this virus in producing cataracts. The discovery of the safety and usefulness of alpha chymotrypsin to loosen the lens in cataract operations has aided in making cataract surgery one of the most successful operations in medicine.

Institute scientists were among the first to discover that the infection, toxoplasmosis, is a prominent cause of uveitis. Additional understanding of eye destruction as a reflection of a hypersensitivity of the body tissues of the eye represents another advance in the final conquest of this disease. The inflammation from both causes can now be modified by use of drugs.

Clinical studies in ophthalmology demonstrated that blindness could result from large doses of chloroquine, sometimes used to treat rheumatoid arthritis and related disorders.

Institute studies of corneas for transplantation have resulted in improved methods of freezing and dehydrating donor material for long-range shipment and storage. Discovery of the use of transparent silicone in implants offers new hope for some patients for whom corneal transplants are unsuccessful or cannot be used. Some plastic corneal implants have been used with success in experiments which also offer hope for the future. The effective use of suppressive drugs has been assured through studies connected with corneal transplant surgery.

Accurate understanding of the retina has been increased through NINDB studies. More is known about the causes of retinal detachment and improvements have been made in surgical techniques. Grantees now report successful laser reattachments in many patients.

Greater understanding and better management of many other visual disorders have been accomplished over the past few years, particularly as related to diabetic retinopathy, retinitis pigmentosa, exophthalmos, and color blindness. We have learned more about the processing of visual information, including the initiation

of nerve impulses and the analysis carried on within the brain. A gigantic study of trachoma has been supported in Egypt.

We now have more precise knowledge of visual pigments which are light sensitive. Disorders of these chemicals relate to various types of severe blindness. Electrophysiological techniques have been developed whereby disease in these pigments can be recognized in the early stages. We now know that this is not a single disease but several which can be distinguished by these techniques. While not a cure, it is a significant step forward.

The NINDB points with pride to a current grantee and a former grantee who this year were awarded the Nobel Prize in Physiology of Medicine for their accomplishments in eye research, Dr. Halden K. Hartline of Rockefeller University, and Dr. George Wald of Harvard. Dr. Hartline demonstrated the reaction pattern of individual visual cells in relation to quantity and quality of light. He also made primary contributions to the study of the generating of impulses in visual cells. Dr. Wald made a number of basic discoveries about photo-chemical reaction of sensory cells in the retina and discovered the molecular buildup of substances sensitive to light of the sensory cells common to animals.

The Institute has had a very active training program in the vision field for the past decade. The growth in ophthalmological manpower, spurred by NINDB training support, has been twice that of medicine, in general. The total number of ophthalmologists has increased from 7,279 to 9,131, an increase of 25 percent, while those engaged in full-time research and teaching has increased from 105 to 224, an increase of 114 percent. During the same period, the number of all physicians engaged in full-time teaching and research activities has increased by only 42 percent.

The Institute's vision program has been directed toward the development of (1) trained personnel in the field to conduct research, and (2) expansion of the general academic field. This program is providing highly trained men to lead the national research effort.

Mr. ROGERS. How long have these 11 clinical eye research centers been established, where are they, and the out-patient clinical research units. If you could supply that for the record, it would be helpful.

(The information requested follows:)

NINDB VISION RESEARCH CENTERS

Investigator and institution	1967 costs	Title of project	Primary goals
B. Becker, M.D., Washington University School of Medicine, St. Louis, Mo.	$249,946	Clinical glaucoma research---	The natural history of the glaucomas. Training personnel in glaucoma research and management.
M. W. Van Allen, M.D., University of Iowa, Iowa City, Iowa.	212,672	Neurological clinical research center.	Supports laboratories of neuropsychology, electroretinography, and retinal physiology, pupillography, electromyography, histology, electron microscopy, and biochemistry.
M. B. Bender, M.D., the Mount Sinai Hospital, New York City.	85,257	The oculometer system and body postural mechanisms.	Oculomotor function. Pathways in the brainstem cerebellum and cerebrum mediating eye movements.
Frank W. Newell, M.D., Sensory Diseases Clinical Research Center, University of Chicago, Chicago, Ill.	179,096 90,184	Sensory disease clinical research center.	(1) Immune mechanism in ocular disease. (2) Retinal profiles of children with unexplained decreased visual acuity and inpatients with progressive retinal disease and intermediate sex-linked carriers of retinal disease. (3) Etiology of presenile cataracts. (4) Ocular tumors—management and diagnosis. (5) Diabetic retinopathy. (6) Otology studies.
Richard J. Johns, Jr., M.D., Johns Hopkins University, Baltimore, Md.	549,437	Interdisciplinary research in ophthalmology.	Improved instrumentation for ophthalmology.
C. L. Schepens, M.D., Retina Foundation, Boston, Mass.	212,979 52,766	Connective tissue diseases of the eye.	(1) Optimize methods of using light and other radiations in ocular diagnosis and therapy. (2) Direct clinical research in diagnosing, managing, and preventing retinal detachment and allied conditions. (3) Experimental pathology of retina with emphasis on wound healing.
A. G. DeVoe, M.D., College of Physicians and Surgeons of Columbia University, New York City.	287,713	A corneal center----------	Basic studies on the cornea as well as on specific clinical problems. Immunology (corneal transplants), biochemistry, electron microscopy, physiology, pathology, pharmacology, and histology of the cornea.

NINDB VISION RESEARCH CENTERS—Continued

Investigator and institution	1967 costs	Title of project	Primary goals
D. C. Cogan, M.D., Massachusetts, Eye and Ear Infirmary, Boston, Mass.	$367,484	Intrinsic and extrinsic ocular disease investigations.	Clinical research in glaucoma, uveitis, neuro-ophthalmology, retinal anomalies, strabismus, and corneal problems.
A. Jampolsky, M.D., Institute of Visual Sciences, Institute of Medical Sciences, San Francisco, Calif.	229,842	Neurophysiology of the visual apparatus.	(1) Electrophysiology of the eye. (2) Oculomotor neurophysiology. (3) Endoradiosonde study of intraocular pressure changes. (4) Eye movement measurement and training. (5) Visual psychophysics.
P. Thygeson, M.D., San Francisco Medical Center, University of California.	360,000	Studies on immunologic diseases of the eye.	Immunological mechanisms as they apply to ocular disease.
B. R. Straatman, M.D., University of California, Los Angeles, Calif.	7,686	Retinal morphology, function and clinical characteristics.	Normal and abnormal retinal morphology function, and clinical characteristics.
Total, research centers.	2,885,062		

NINDB VISION OUTPATIENT RESEARCH CENTERS

T. D. Duane, M.D., Jefferson Medical College, Philadelphia, Pa.	$30,235	Retinal clinical research unit.	Evaluation of choroido-retinal disturbances by a number of techniques, especially spectral reflectance photography and fundus cinematography with fluorescein angiography.
M. D. Davis, M.D., University of Wisconsin, Madison, Wis.	31,610	Diabetic retinopathy vision outpatient center.	Study of the natural cause of diabetic retinopathy. Fundus stereophotography, indirect ophthalmoscopy, biomicroscopy, perimetry, critical flicker fusion, and electroretinography are some of the techniques employed.
Armaly, M. F., University of Iowa, Iowa City, Iowa.	126,847	Outpatient clinical research on glaucoma.	An outpatient clinical research laboratory devoted to glaucoma.
Burian, H. M., University of Iowa, Iowa City, Iowa.	197,206	Congenital strabismus, functional and genetic studies.	An outpatient clinical research center to study the functional and genetic aspects of strabismus.
Campbell, C. J., Columbia University, New York, N.Y.	238,771	Coagulation therapy in human retinal disease.	An outpatient department clinical research center to evaluate various methods of coagulation in selected retinal disease and choroid. Different types of diathermy, cryosurgery, and photocoagulation techniques will be studied.
Kaufman, H. E., University of Florida, Gainesville, Fla.	87,777	Outpatient clinical research project (external ocular).	An outpatient clinical research facility to integrate laboratory and clinical research.
J. A. Wadsworth, M.D., Duke University, Durham, N.C.	24,402	Human macular disease, a clinical outpatient study.	Classification of macular disease. Genetics, prophylaxis, and therapeutics of same.
J. L. Baum, M.D., New York York University Medical Center.	----------	Corneal research clinic------	(1) Determination of tear flow and tear volume in patients with Sjogren's syndrom.
	9,504		(2) Relationship of chronic alcoholism and Moraxella keratitis.
			(3) Optimal time for beta-irradiation after a pterygium operation.
E. W. Norton, M.D., University of Miami, Coral Gables, Fla.	51,034	Study of macular disease----	Macular disease in a selected group of patients—diagnosis, classification, natural history, hereditary and familial aspects, therapy and pathological correlation.
P. R. Laibson, M.D., Wills Eye Hospital, Philadelphia, Pa.	1,666	Investigation of human recurrent herpetic keratitis.	Investigation of the possible inciting mechinisms in recurrent human cases of herpetic keratitis.
E. Friedman, M.D., Boston University, Boston, Mass.	70,170	Ophthalmic OPD clinical research project.	Long-term clinical and epidemiologic studies of (a) macular pigmentary degenerations; (b) optic neuropathies; (c) industrial trauma; (d) angle closure glaucoma.
I. Leopold, M.D., Mount Siani Hospital, New York City.	41,468	Clinical OPD center for ocular pharmacology.	(1) Pharmacogenetics. (2) Evaluation of new therapies. (3) Drug influences on anterior segment structures. (4) Toxicology and side effects. (5) Drugs in diagnosis. (6) Drugs and disease mechanisms. (7) Serum factors and diseases. (8) Drug effects on microcirculation.
	945		
Total, outpatient research centers.	911,635		

Mr. ROGERS. Could you briefly tell us about these eye research centers?

Dr. STEWART. The first of the 11 eye research centers were established about 6 years ago and the 12 outpatient clinics, a little over a year.

Mr. ROGERS. Are these funded through the $20 million?

Dr. STEWART. Yes; they are by grants.

Mr. ROGERS. Actually part of this is clinical——

Dr. STEWART. These were an attempt to augment and put more emphasis on the clinical research area. We do have a list of all of the places that we could supply, Mr. Rogers.

Mr. ROGERS. And the amount of money and people involved and what seems to have been accomplished.

(The following information was subsequently submitted:)

SPECIAL REPORT: DISORDERS OF VISION [1]

Of all the disorders which afflict man, probably none causes greater problems than blindness. A recent survey shows that, next to cancer, people in the United States fear blindness more than any other handicap.

It is estimated that there are in the United States today 411,000 legally blind and 3,500,000 who have only partial vision. About half of the totally blind are not employed, and approximately 75 percent are 40 years of age and over. The National Health Survey estimates that one million people in the United States have visual impairment so severe that they cannot read a newspaper. Based on available figures, it is possible that the annual bill for aid to the blind approaches $1 billion.

Major causes of blindness and visual impairment include cataract, glaucoma, diabetic retinopathy, corneal scarring, uveitis, retinal detachment, tumors, amblyopia, and refractive anomalies.

Visual disability and blindness already can be reduced significantly by early detection and treatment. However, fundamental knowledge is still lacking in the understanding of causes and mechanisms of blinding diseases. The acquisition of this fundamental knowledge is essential to any major reduction in blindness and visual impairment. Too, since not only the eye but also the nerve pathways and the brain are necessary for vision, basic neurological research is involved. Sight depends upon the transmission of signals along nerve pathways to the brain and upon cognitive processes. This visual process profoundly affects learning, thinking motivation, and human communication.

Any concerted attack on eye disorders necessarily includes study of the systemic disorders which may involve the eye, such as diabetes, diseases of the blood vessels, and diseases of the nerve and brain.

Federal payments to the blind amount to more than $95 million annually. Based on limited figures from New York State and Massachusetts, it is estimated that payments for aid to the blind within the States total from $600 million to $900 million annually. It is thus quite probable that the annual bill for aid to the blind approaches $1 billion, a figure frequently used though not authenticated.

The incurably blind cannot benefit from either prosthetic devices, such as subnormal vision aids or drug therapy. The only recourse is to provide the people, if possible, with an electronic artificial eye. The Institute is interested in the research being conducted to further this goal and intends to support such activity.

Each step in understanding eye disorders, their nature and treatment represents solid progress toward an ultimate goal of good sight for all. As each discovery is made, however small it may seem in relation to the total problem, the goal is nearer.

During 1966, a number of significant steps were made in this direction.

[1] Prepared January 1967 as background information for the Director of the National Institute of Neurological Diseases and Blindness, Public Health Service, U.S. Department of Health, Education, and Welfare, in connection with fiscal year 1968 appropriations hearings.

THE INSTITUTE PROGRAM

The eye research and training programs at the National Institute of Neurological Diseases and Blindness include research at the Bethesda laboratories, research grants to individual scientists in academic institutions throughout the country, and training grants to aid universities and other centers in educating more ophthalmologists and research scientists. In addition to individual research projects, the Institute is supporting eight multidisciplinary research programs in vision. Model Reporting Areas in 14 States provide epidemiological data. Information about the eye and its disorders is also being obtained from the Institute's collaborative and field projects, especially the Laboratory of Perinatal Physiology in Puerto Rico. These vision programs are currently operating at a level of $15 million.

Program Planning

To assist the Institute in review and planning, and Advisory Council Subcommittee on Vision and Its Disorders was organized a little over a year ago under the chairmanship of a member of the Institute's National Advisory Council. This Council Subcommittee is engaged in a general assessment of the present status of knowledge in vision and visual disorders, a review of current research and training, and identification of problem areas and special needs.

The Subcommittee is providing information gathered from the scientific community upon which the Institute can base long-term planning of its research and training program in the fields of visual science, visual disorders, and blindness. During the past year, the Council consulted with over 250 of the Nation's leading scientists to advise the Institute regarding those areas of investigation now must appropriate for intensive study.

National Information Center

To hasten dissemination of scientific information and to aid in program analysis, the Institute established this year a National Information Center on Vision Research at the Harvard University Library. Objectives of the Center are to define, identify, store, retrieve, and disseminate the literature of vision, so that the information may be communicated more quickly and completely.

This university-based unit combines the resources of a research center and one of the largest medical libraries. Within the Center, some of the Nation's outstanding scientists review and critically analyze the worldwide literature and research reports, in order to increase current awareness of research among scientists, teachers, and clinicians in ophthalmology and related fields; supervise the preparation of abstracts, summaries, reviews, and analyses of these data; and make this information available, both to the Institute for program planning and to the scientific community at large. Integration of the activities of the Center with the national network of specialized information centers, now being developed with the support of NIND, is under way.

Conferences

The NINDB in cooperation with the American Academy of Neurology and the American Neurological Association jointly sponsored a Conference on Education in the Neurological Sciences which featured a symposium on research horizons in several areas of neuroscience, including vision, as well as round-table discussions of aspects in neuroscience education. During the year, the Institute also sponsored a symposium on the retina and a workshop on refractive anomalies of the eye.

Program-Projects

In addition to supporting research projects related to specific problems of the blinding diseases, the Institute is now developing a group of eye research centers in which strong multidisciplinary teams are being mobilized to carry out the broad-scale attack on these disorders. Excellent studies have been reported from four of these vision program-projects now in full operation: The Retina Foundation of Boston, The Neurosensory Center at the State University of Iowa, the University of Chicago Program-Project for studies on glaucoma and disorders of the retina, and the Research Center for Corneal Disorders at Columbia University in New York. This year, with funds appropriated specifically for this purpose, three new centers have been established at the Massachusetts Eye and Ear Infirmary in Boston, the Institute of Medical Services in San Francisco, and at the University of California in San Francisco.

Outpatient Clinical Research Units

This year, the Institute has established a new program of outpatient vision research units. Persons whose eye disorders do not require hospitalization are being studied in a more organized fashion by physician-scientists seeking clues to many eye problems. The new units offer opportunities for studying ocular diseases which affect only humans and cannot be duplicated in animals, and for continuing research which has reached its limits in the laboratory or in animal trials. Specific research areas include human macular diseases, diseases of the retina, diabetic retinopathy, corneal research, herpetic keratitis, and ocular pharmacology. The first outpatient units are located at Jefferson Medical College of Philadelphia, the University of Wisconsin, Duke University, New York University, the University of Miami, the Wills Eye Hospital and Research Institute of Philadelphia, Boston University, and Mount Sinai Hospital of New York City.

Blindness Statistics

Adequate statistics on blindness are essential to any program of prevention and control. These must be well defined and carefully assembled. At both State and national levels, this need for information includes not only total blindness but also the related degrees of severely handicapping visual impairment, both in relationship to the socioeconomic setting of each case.

The Institute has organized Model Reporting Areas for blindness in 14 States to provide urgently needed information. These areas use a common method of classification and record keeping intended to produce comparable records from each of the cooperating States. With the addition of four States this year, the project represents approximately one-third of the States and also one-third of the population of the United States. Even so, an extension of the project will be necessary before figures of national significance can be produced.

Training

The research community working in the field of vision and its disorders is proud of its record of accomplishment. However, the responsibility and challenge are enormous when compared with the small number of clinical and basic science investigators in the field. The task ahead must be contrasted with the small size of the research establishment.

NINDB-supported training programs are providing a focal point in 34 university centers for teaching and research in vision and visual disorders. However, in many of the 50 remaining schools there is no focus. To fill some of the manpower needs, the Institute proposes to establish a program of teacher-investigator awards in ophthalmology and the visual sciences. These awards will be for the support of full-time academicians in selected medical centers to promote leadership in the development of programs of undergraduate and graduate training and in the establishment of eye research programs in areas where these are lacking.

In fiscal year 1966, 379 trainees benefited from the Institute's grants in the fields of ophthalmology, ophthalmic basic science, and vision psychophysiology. Eighteen special fellowships were awarded in the areas of neuro-ophthalmology, ophthalmology, ophthalmic pathology, and sensory physiology to prepare basic and clinical scientists for careers in research and academic medicine and related fields. The Institute has given one Research Career Award on sensory physiology (vision). There were 13 Research Career Development Awards and 7 post-doctoral fellowships awarded in ophthalmology and ophthalmological sciences.

RESEARCH

Glaucoma

Glaucoma is an eye disease due to increased pressure of the aqueous fluid within the eyeball which tends to destroy the nerve cells within the retina. If untreated, it leads to impairment of vision and eventual blindness. The major emphasis of NINDB glaucoma research is toward a better understanding of the processes for maintaining proper pressure within the eye, including the early use of medications which save vision by correcting the pressure. Therefore, NINDB researchers are studying the effects of drugs on eye pressure to facilitate early diagnosis. Epidemiologists are defining the characteristics of individuals for whom special vigilance is required because they are especally prone to develop glaucoma.

It is now believed that it will be possible to predict which individuals are prone to develop glaucoma because of the knowledge gained about the genetic and

hereditary patterns of this disease. This represents an important advance in the field of preventive medicine. It means that we may now be able to treat patients at an early stage, thereby greatly reducing the number of people blinded by glaucoma.

This great move forward has been made possible through highly significant studies such as the Collaborative Glaucoma Study and the recently discovered steroid provocative test.

The administration of anti-inflammatory steroids was found to coincide in its effect with that of the standard water-drinking provocative glaucoma test. Minimal, moderate, and maximum responses were obtained, indicating absence or presence of glaucoma. This steroid-induced glaucoma may be the result, according to one hypothesis, of increased rate of production of aqueous humor.

In addition, much progress has been made in our understanding of the basic dynamics of intraocular pressure, and in applicable diagnostic techniques.

Community-wide screening with the aid of tonometry is making it possible to find many victims of glaucoma before the disease has advanced to a stage where vision is affected—often among people who have had no suspicion that they were affected. Continued and expanded epidemiological, genetic, laboratory, and diagnostic studies are needed, however.

In addition to patient and laboratory studies, the Institute is conducting epidemiology studies of chronic simple glaucoma in selected population groups in Pennsylvania and Arizona. Variations in tonometry techniques for measuring eye pressure have been subjected to searching evaluation. Another study of 200 pairs of twins has been established to determine genetic influences in the development of glaucoma.

Cataracts

A cataract is a clouding of the lens of the eye which interferes with normal passage of light rays to the retina.

At the present time, the only known treatment is the surgical removal of the lens. This is a relatively simple operation which has been facilitated in recent years through the use of the enzyme alpha chymotrypsin to loosen the lens. At the present time it is possible for even very elderly patients to undergo cataract surgery if their general health is good.

Less well known is the fact that many children are born with cataracts. They will have the best chance to see normally if surgery is performed between the ages of 6 and 18 months, according to recent research findings of NINDB grantees. If congenital cataracts are removed in late childhood, functional results are likely to be poor, these investigators found. On the other hand, the sooner the surgery, the less likely the development of irreversible changes in the eyes.

Over a period of 5 years the case for early surgery was demonstrated in studies of the visual pathways of developing kittens with cataract or artificially induced blindness. These studies demonstrated that if vision is not permitted during the early months of life, the visual pathways do not develop fully. Even though vision is later restored, the essential functional connections may never be established, and there is permanent visual impairment. A similar situation exists if a muscle imbalance occurs which prevents the two eyes from focusing on the same object. If such a squint is permitted to persist too long, the mechanism for the coordination of eye movements is severely retarded, and there is deep-rooted impairment of the ability to develop binocular vision. Accumulated evidence suggested that children whose eyes have been similarly incoordinated since birth will have difficulty with effective binocular vision and the fusion it requires even after the incoordination is corrected.

If few binocular synapses remain in the cortex, even the most skillful balancing of extraocular muscle tensions would cause little more than cosmetic benefits. The earlier the surgery, the less likely the development or irreversible changes in the eyes. Investigators conclude that in such cases, operations between the ages of 6 and 16 months seem advisable.

Research by Institute grantees has provided valuable data on the physical and chemical properties of lens proteins. Since the formation of cataracts is associated with accumulation of insoluble proteins, these data are valuable in understanding cataracts.

Laboratory studies recently revealed the presence of the German measles virus within the cataractous lens of infants whose mothers had the disease early in pregnancy. This finding is extremely important in terms of our understanding the mode of action of this virus in producing cataracts.

Studies indicate that cystoid macular edema, or papilledema, may be present in patients whose vision fails to improve or suddenly decreases after cataract surgery. This is another problem to meet, if sight is to be saved.

Disorders of the Cornea

The cornea is a transparent membrane covering the iris or colored portion of the eye. Similar in size and structure to the crystal of a wristwatch, it acts as a protective window through which light rays pass on their way to the retina. The cornea also helps to bend and focus light rays.

Scarring produced by injury and disease causes 10 percent of the blindness in the United States and much more of the blindness in the Near and Far East. However, new drugs and improved treatments are helping to reduce the amount of this type of blindness.

Viruses.—In this country the most common cause of corneal ulcers and blindness is infection with a virus called herpes simplex, which also causes the common cold sore. One of the most significant advances in therapeutics was the discovery several years ago that herpes simplex could be cured by the drug 5-iodo-2-deoxyuridine (IDU). This was the first drug to be proved effective against any virus, and has opened up new approaches into the broader study of antiviral drugs.

Corneal Transplants.—When corneal diseases are not treated promptly, they may destroy the cornea's transparency, and cause poor vision or blindness. Fortunately it has been found possible to substitute a healthy cornea for a diseased one.

Some successful corneal transplants have been made for almost 20 years. They are usually performed with corneas taken posthumously from persons who have previously signed statements donating their eyes to eye banks. Recent Institute studies have led to improvement in transplants and in freezing and dehydrating corneas for long-range storage and shipment. This year an improved technique was developed for transplanting which may mean that some cases previously considered hopeless will regain vision.

One of the big problems with conventional transplants is that the cellular layer on the back side of the cornea—the endothelium—easily becomes damaged by a transplantation immune reaction. This results in the accumulation of fluid (edema) in the endothelium of the cornea. Such edema is rarely reversible and usually results in a cloudy graft so that the eye remains blind.

With the new procedure, a thin transparent membrane, made of silicone rubber, is sutured in back of the corneal graft. This serves as a barrier to the influx of fluid from the anterior chamber of the eye. With the insertion of the "fluid barrier," the corneal edema is reduced or eliminated and the graft has a much better chance of surviving.

The silicone rubber membrane adds support and distributes pressure from the sutures evenly over the graft, ensuring smoothness. The transparency of the silicone membrane permits inspection of the wound to observe progress of healing and formation of the anterior chamber. Local medication can be given with normal effectiveness.

While still in the experimental stage, plastic corneal implants have proved their value for a number of persons for periods of time up to 5 years.

Recent improvements in surgical techniques have greatly enhanced the prospects of success in corneal transplant operations, but graft rejection due to auto-antibodies has remained a serious problem. Certain drugs inhibit the induction and production of antibodies, but to determine which are the best drugs and what are the most desirable dosages, it is necessary to have a baseline in relation to which their powers may be tested. Until the mechanism of rejection is known, the choice of drugs must be empirical.

In a series of animal experiments, NINDB scientists augmented the intensity of the corneal graft rejections with simultaneous skin implantations from donor animals to recipients. Such recipient animals uniformly showed graft reactions with complete and sudden clouding of the grafted corneas on an average of 12 days postoperatively. This represented an earlier and more uniform reaction than had been achieved in previous efforts to establish a baseline.

Now it was possible, through a series of controlled experiments, for the investigators to demonstrate that three immuno-suppressive chemicals, namely 6-mercaptopurine—examined in a previous study—azathioprine, and corticosteroids, could delay or even suppress graft rejection in animals. The latter appeared to be the safest and most effective.

The establishment of a baseline for measuring effectiveness of suppressive drugs represents an important step in the development of agents to assure successful corneal transplant surgery.

Retinal Disorders

Although the cornea, lens, and other issues help convey light through the eye, the actual visual process does not begin until light strikes the retina. This light-sensitive tissue at the back of the globe of the eye is the site of many disturbances which lead to visual impairment. Disorders of the retina include circulatory disturbances, injuries, inflammations, degenerations, detachments, tumors, and congenital anomalies.

Many of these disorders, especially degenerations and anomalies existing at birth, are untreatable by present-day medicine. Therefore, investigators are seeking to understand the basic anatomy and function of the retina, which they feel is necessary before treatment or prevention is possible.

Accurate understanding of retinal topography was increased this year through NINDB studies which systematically evaluated the nature of the retina in a series of eyes obtained through surgical removal and autopsy. This analysis revealed the general size and shape of the retina, the dimensions of the optic disk, and the relationship between the disk and the foveola. Through such topographical studies we shall have a better understanding of the physical and physiological characteristics of the eye.

Retinal Detachment.—Retinal detachment is a separation of the innermost layer of the eye, the retina, from the choroid, the layer just behind it. These two layers are usually in close contact; but if the retina should peel away or be pushed up from the choroid, all or part of the vision is blocked out.

Retinal detachment may be due to injury or disease. Changes that occur with age increase the chances for detachment. Persons who are nearsighted or who have had cataract operations may also be predisposed to detachment. Most detachments, however, occur for reasons unknown to medical science.

If treated early, retinal detachment may be arrested by procedures which produce an adherent scar at the point of separation. There have been important advances in the way in which this is accomplished. The retina may be burned by a sharply focused laser beam. More recently, freezing techniques (cryosurgery) are proving highly effective.

Recent advances reported in the use of retinal light coagulation indicate that certain lesions, particularly in cases of diabetic retinopathy, small fundus tumors, and lesions that lead to retinal detachment, may respond in selected cases to light coagulation. In this method, light makes a "spot weld" which, when properly directed, can be used to close off blood vessels, seal a retinal hole, anchor the retina to underlying tissue by scar formation, or necrotize ("kill") small tumors. Certain medical lesions of the fundus may be treated by light coagulation alone; in others, it is necessary to supplement the coagulation effect with heat applied to the posterior scleral surface after surgical exposure. Success with this method depends upon careful selection of patients; all cannot profit from it.

Understanding of retinal detachments was advanced by the evidence that there may be hereditary causes. There is indication of a relationship between myopia and retinal detachment. This was substantiated by a statistical analysis of 1,000 cases.

Diabetic Retinopathy.—Diabetic retinopathy is a vascular disorder of the eye which occurs in conjunction with diabetes. The condition is caused by baloon-like enlargements (aneurysms) of the capillaries supplying blood to the retina. No effective treatment is currently available. The incidence of this disorder increases with the length of time an individual has had diabetes. For example, in a series of patients who had diabetes for 15 years, 70 percent showed retinopathy, and of those who had diabetes for 25 years, 90 to 95 percent had diabetic retinopathy.

Morbidity statistics indicate that in 1934 the incidence of diabetic retinopathy among diabetics was 17.7 percent; in 1945 it was 29.6 percent; and in 1955 it was 47 percent! Diabetic eye complications are among the leading causes of blindness in the United States.

A few short years ago there was no specific treatment for diabetic retinopathy, but recently a few physicians have had success with removal of the pituitary gland in patients threatened with blindness. Preliminary results have shown improvement in visual acuity with no known harmful effects from the surgery. Nevertheless, further observations are needed before the procedure can be widely recommended.

Future studies are needed to further elucidate the mechanism of diabetic retinopathy and to develop a natural history which will make possible a more precise evaluation of present treatment methods.

A grantee study of the condition of retinal capillaries after the death of diabetic and nondiabetic patients may provide a better understanding of the disorder. Investigators found that in addition to retinal microaneurysms, dibetes is characterized by capillary sheathing and a decrease in the ratio of pericyte to endothelial cells. This blood-vessel damage is not evident in clinical examination, for by the time that capillary lesions become so gross as to be recognized clinically in the form of incipient diabetic retinopathy, the patient already has generalized diabetic microangiography (disease of the capillaries).

Retinitis Pigmentosa.—Retinitis pigmentosa is an inherited disease that usually produces its first symptom—night blindness—in childhood. Over the years peripheral vision is lost through changes which take place in the retina.

The electroretinogram and a related test, the electroculogam, have provided very sensitive and accurate measurements of retinal damage to patients. These tests have been helpful to Institute scientists in localizing early retinal damage in the rod photoreceptors rather than in the cones.

A recent study suggests that while the light to which human beings are customarily exposed rarely produces permanent damage to normal eyes, people with inherited night blindness may benefit from wearing dark glasses when exposed to bright light. This may be particularly helpful in cases of a chronic progressive degeneration: subjective symptoms are night blindness, contraction of the field of vision, and diminution of sight.

In this study scientists found that albino rats with normal vision when kept around the clock in light of ordinary brightness developed severe night blindness after only 3 to 5 days of exposure. Given longer periods, up to 3 months, of dark adaption afterward, these animals recovered very little of their normal sensitivity to light. The visual cells in their retinas were almost completely destroyed by several days of constant exposure to light.

Retrolental Fibroplasia.—Retrolental fibroplasia (RLF) was once common in premature infants, until it was discovered through an Institute-supported study that the ocular abnormality was related to excess oxygen consumption.

A recent study of experimental retrolental fibroplasia threw new light on the underlying mechanism of this disease which may also aid in understanding other vascular disorders of the retina. It appears that this blinding disorder may be caused by the same mechanism that produces retinitis proliferans (the late stage of diabetic retinopathy) and blindness following retinal vein occlusion.

Investigators used light and electron microscopy and histochemical techniques to study changes (hyperoxia) produced in retinas of premature kittens and other animals by excessive oxygen. Findings suggest that blood vessel proliferation (reproduction of cells and morbid cysts) following hyperoxia might be due to the liberation of some toxic substance by degenerating endothelial vessels.

Recent studies have demonstrated that full-term infants exposed to oxygen therapy are sometimes affected, too. Investigators found that the retina is not fully vascularized until shortly after birth of the full-term infant. Animal experiments have shown that the incompletely vascularized retina is susceptible to oxygen damage.

An Institute workshop planned for 1967 will discuss oxygen use in hyaline membrane disease and its potential for causing RLF.

Diseases of the Conjunctiva

The conjunctiva forms the inner lining of the lids and is contiguous with the lining of the lacrimal apparatus.

Conjunctivitis is a general term covering a number of symptomatic complaints including itching, tearing, and foreign body sensations which are not necessarily due to local conjunctival disease. Conjunctival disorders may be allergic, bacterial, or traumatic. All are inflammatory.

In a 10-year study of kerato-conjunctivitis, a research team recognized 12 distinct clinical and etiologic types of the disease. They learned that adenoviruses are the principal cause of acute follicular conjunctivitis, and herpes simplex virus the principal cause of keratitis. Keratitis and conjunctivitis caused by other viruses were also studied.

Trachoma

Trachoma, a viral disease which produces scarring of the eyelids and opacification of the cornea, is a prolonged progressive disease which spreads through

families and institutions, especially in depressed areas where hygiene is poor. Current World Health Organization estimates indicate that more than 400 million people throughout the world suffer from this disease. The disorder can be cured by drugs, but there is a lack of natural immunity and frequent reinfection is common.

Much more research is needed to find an effective vaccine for prevention, and therapy for permanent cure, before trachoma can be eradicated. Diagnosis of early trachoma has always been a problem. The development of an immunofluorescent technique, however, has been a major diagnostic advance.

This is an area where the ophthalmologic community can make substantial contributions toward the eradication of disease not only in a portion of our own population, but in the undeveloped areas of the world which are looking toward our technology for help.

Under the leadership of the Neurology Institute, the first broad-scale scientific survey on the prevalence, causes, and possible means of prevention of trachoma is under way in Egypt. This study of the world's most prevalent blinding disease is expected to yield a store of knowledge. A random sampling of 10,000 of 250,000 inhabitants in two large areas has now been tested for visual acuity and subjected to study, in the survey which will continue for several years.

Although trachoma blinds many people in most parts of the world (the U.S.A. is relatively free of it save among the Indians of the Southwest), Egypt was chosen for the study because trachoma occurs there in epidemic proportions.

Attempts to eradicate trachoma through mass public health programs have been successful only in the more highly developed nations. In other countries such campaigns have either failed to cure or there has been a high percentage of relapsed cases and reinfection. This is true even among Indians in southwestern U.S.

Uveitis

The underlying causes of some types of uveitis (inflammation of the iris), which strikes people in their most productive years, has been found in some cases to be toxoplasmosis, syphilis, or tuberculosis, but the cause of the majority of cases is still unknown.

Several hundred uveitis patients have been admitted to the Clinical Center for close observation and treatment with drugs. Institute scientists were among the first to discover that the infection, toxoplasmosis, is a major cause of uveitis. They concentrated their studies this year on a concerted attack on the disease with use and evaluation of a group of drugs. A new antibiotic was found to be effective when used in combination with the usual treatment for uveitis. The effects of chemotherapy on presumably toxoplasmotic uveitis and the usefulness of antimetabolite treatment on specific types of uveitis appear to hold great promise.

The role of hypersensitivity to disease-producing microorganisms or to altered tissues needs much more intensive study. Animals have been inoculated to produce similar lesions, and such studies should be continued. Extensive epidemiological studies are needed and uveitis clinics are necessary for research.

The Institute's Collaborative Perinatal Project, which studies 60,000 pregnant women and their offspring, has revealed evidence of toxoplasmosis in 1 out of every 2,000 babies. A series of controlled epidemiological studies, to demonstrate more precisely how this infection is transmitted, may do much toward eliminating it.

Exophthalmos

New information on the nature and treatment of dysthyroid (endocrine) exophthalmos and recent advances in surgical treatment for the condition will bring new hope to victims of this disease, which is characterized by abnormally prominent eyeballs with lid retraction and an excessive accumulation of fluid in tissue spaces.

In two related research projects, Institute grantees succeeded in (1) establishing the site and nature of the changes which take place in ocular muscles in cases of dysthyroid exophthalmos, and (2) tested the chances of success to be expected in this disease. The investigators concluded that surgery is indicated only in the acute phase of the disease, where the cornea and optic nerve are threatened and where other measures appear inadequate.

Antithyroid drugs proved effective in one study of 129 patients whose cases were controlled over a period of years with the drugs. In none of these cases was ocular surgery required nor did the ophthalmology significantly worsen.

In cases where the medical treatment alone does not stop the progress or fails to improve the condition, X-ray therapy to the orbit has been found beneficial.

Angiographic examination (the study of blood vessels of the eye) has proved to be a safe and valuable method for establishing the nature of unilateral exophthalmos.

Various studies have demonstrated the promise in potential application of ultrasound when combined with other aphthalmologic techniques in dealing with the disease.

In one study, a basic problem in surgical correction of the severe limitation of elevation so frequently seen in the end stages of this disease was found to be the fibro-adhesive connections between the interior rectus and inferior oblique muscles and to the orbital floor. In a new method of surgery, these adhesions are separated with recession of the inferior rectus, and in some patients, recession of the medial rectus. Improvement was obtained in all cases.

Tumors

The more enlightened management of ocular neoplasms, based on better knowledge of their biological behavior, constitutes one of the major advances that have been made in clinical ophthalmology. Refinements in diagnosis of intra-ocular tumors, which too often lead to serious visual loss and may also create life-endangering situations, have been achieved through long-term studies by Institute scientists and grantees. The relatively benign character of certain tumors of the uvea, conjunctiva, eyelid, orbit, and lacrimal gland has become widely appreciated, and efforts are being made to develop more conservative techniques in their treatment. Other tumors are being recognized as highly malignant cancers requiring early radical surgery if the patient's life is to be saved.

As examples, characteristers of malignant tumors of the choroid may now be identified preoperatively by the use of new techniques and instrumentation. In a system developed in the ultrasonic laboratory an ultrasonic record is produced which has the appearance of an active photograph of the diseased tissue or tumor of the eye. This facilitates recognition of characteristics of different tissues.

Radiation therapy has been reported 84 percent successful in one experimental project in initial and secondary treatment of patients with retinoblastoma (tumor of the retina). This was the first time that supervoltage irradiation had been used exclusively in a uniform manner. The project was reported after patients had been observed for a period of 6 years with no deaths and with generally useful vision.

Far more sophisticated methods of diagnosis and detection of malignant tumors of the eye are urgently needed. While the new methods, using fluorescent dyes and radioactive tracers, appear to hold great promise, more specialized tumor diagnostic centers are needed. The lack of experimental models has hindered investigation of the basic dynamics of tumor growth and development.

Refractive Anomalies

This year, as part of its program to promote exchange of information and generate new research approaches, the Institute has supported a workshop on refractive anomalies of the eye. Considered by approximately 30 specialists from various parts of the world were such eye disorders as hyperopia, myopia, presbyopia, astigmatism, and anomalies of the accommodative and convergence mechanisms. Recommendations for further research into these eye conditions, which affect more than 90 percent of the Nation's population, were made regarding the mechanisms giving rise to the dysfunctions and diseases, diagnostic and therapeutic techniques available, and promising areas for future investigation.

In recent years, important advances have been made in the ability to correct errors of refraction, such as myopia (near-sightedness), which range from minor problems to serious involvements, some of which lead to severe visual impairment. So, too, has there been advancement in the design of instrumentation needed to exploit these new developments. Lasers, X-rays, and ultrasound have all been used successfully.

Several grantees are studying how the retina codes light impulses into electrical messages as well as how the brain decodes the message and produces the image we call vision.

Studies of the relation of the vision mechanism to perception of time, space, color, brightness, and form continue to receive support.

Institute grantees are investigating optics and refractive disorders. The use of high speed computers and ultrasound to measure different parts of the eye may lead to greater understanding of these areas. Other investigators are studying the muscles which move the eye.

Much of the work of Institute grantees has been directed to mapping the visual impulse through the retina and various nerve pathways in the brain. The knowledge that has been gained from these studies has contributed greatly to understanding of the nervous system as well as the visual function. It has been shown, for instance, that there is an independent nerve pathway for the eye to pick up and follow roving objects.

Color Vision

Investigations have added to the information on the chemistry and other properties of the pigments in the human eye on which color vision depends. The spectra of these pigments have been determined by direct microspectrophotometry and their composition determined in part by direct regeneration experiments. Also a simple psychophysical procedure has been designed that isolates the action spectra of these pigments in living subjects. This makes it possible to measure the color vision pigments and their properties in the eyes of normal, color-blind, and color deviating subjects. The information so obtained has implications for the genetics of inherited types of color defective vision.

Microspectrophotometric measurements upon the outer segments of the cones of primates and of fish which appear to be able to distinguish colors in the same manner as humans have explained color vision at the receptor level; these animals possess three classes of cones, each of which absorbs light maximally in a different part of the spectrum.

However, electrophysiological studies in both fish and primates have shown that the different classes of receptors are not connected by separate pathways to the brain. Instead, opponent pairs of receptor types exert the antagonistic effects of excitation and inhibition upon the retinal ganglion cells.

It has been incontestably demonstrated that topical administration of certain adrenocorticosteroids produces in some individuals an increase in intraocular pressure. Were it possible to find a drug with antiinflammatory activity, yet free from intraocular pressure-increasing effect, the result would be both a beneficial therapeutic agent and a valuable investigative tool. Some success with such a medication, a synthetic steroid called medrysone, has been reported. Administration of this drug was not associated with rise in intraocular pressure in either glaucoma patients or normal volunteers.

A new synthetic steroid called medrysone was successfully used with glaucoma patients and normal controls. This drug has antiinflammatory activity yet is free from the intraocular pressure-increasing affects which characterize certain other drugs used to control glaucoma. It should be a valuable investigative tool as well as a beneficial therapeutic agent.

Because a number of drugs being used in the treatment of systemic disease may have dangerous side effects on the eye, it is important that these side effects be recognized at the earliest moment in order that blindness may be prevented. For example, chloroquine, used to treat arthritis and lupus erythematosus, produces eye damage if given in large doses over prolonged periods of time. The most serious, and irreparable damage is that which occurs to the sensitive neural film—the retina of the eye. A simple test has now been devised to recognize this dangerous reaction in its earliest stages.

To be treated are a continual stream of individuals from all walks of life who have been exposed to an unbelievable array of toxic agents, the actions of which are only partially understood and for which we have few antidotes.

Expanded research dedicated toward the development of new and effective pharmaceuticals for the treatment of many eye disorders is of at least equal importance. It is to the national interest to develop more active programs dealing with these critical problems.

Instruments and Techniques

Increasingly, psychology and engineering are joining forces with medicine and surgery to find the answers to problems of vision. While scientists keep their sights on prevention and treatment of eye disorders, they also look forward to the day when an artificial eye may be developed, perhaps with the characteristics of a miniature TV camera, which can replace a faulty human eye. So positive are scientists that this may become a reality that definite planning is under way to lay the groundwork for this accomplishment. Meanwhile, many new instruments and

techniques have been developed which are helping physicians in their treatment of patients with visual disorders.

Just recently a grantee designed and built a retinal densitometer with which he can measure in 10 seconds the amount of visual pigment upon any selected region of the human retina. With this he is measuring visual pigments, and is studying bleaching and visual function and the electrophysiology of the retina.

An instrument for measuring corneal thickness by optical means has been developed. This type of apparatus can be used on any modern slit lamp. It increases the accuracy of this type of measurement in normal corneas and those which are opaque. It practically eliminates distortions present in older instruments. It assures that the measurement is being made while observing the cornea at exactly the right angles.

A model of the retina has been developed. Electro-oculography has been developed as a technique for clinical usefulness in understanding rod and cone anatomy and connections.

SUMMARY

As can be seen from this brief review of the field of vision, the research is extremely complex and the causes of blindness many. Unsolved problems in the field are legion, but there are many hopeful elements: great strides in research have been made in the last few years; there are now more well-trained investigators available than at any previous time; more research projects are under way than ever before; and there are more well-equipped eye research centers. This does not mean that the needs for manpower, money, and facilities have been met, but rather that research is moving in the right direction.

Mr. ROGERS. Do you give them any guidance in your research with your clinical research projects? Are they given particular projects to work on or are particular goals set? Is any of those done?

Dr. MASLAND. I can give you some examples. Let me mention for example Dr. Cogan at the Massachusetts Eye and Ear Infirmary. The title of his project is "Intrinsic and Extrinsic Ocular Disease Investigations." It is a very broad clinical program concerned with glaucoma, uveitis, the control of ocular movements by the nervous system and abnormalities of the retina.

Another one is Dr. De Voe at a corneal center at Columbia in New York City. He is concerned particularly with problems of the surface membranes of the eye.

We have one on the west coast, Dr. Thygeson, immunologic diseases of the eye. He is particularly interested in inflammation and infections. Thus each of these centers has a major focal point.

Mr. ROGERS. A particular area of the eye?

Dr. MASLAND. Yes. Basically, our philosophy has been to select people whose area of interest relates to a major concern of the Institute and then to let them carry out their research. We provide them with support, but the development——

Mr. ROGERS. But you are guiding your programs into these areas where you think work should be done.

Dr. MASLAND. Yes. This is accomplished through a special subcommittee of the Council which was mentioned briefly.

Mr. ROGERS. In these clinical research centers, do you establish the clinic itself? Do you fund the establishment? Do you go into construction at all, or is it entirely a staff function, or what?

Dr. MASLAND. The responsibility of the National Institutes of Health is limited to the support of research and research training.

Frankly, I think this is a cause of uncertainty within the country as a whole. There is a lack of understanding that we do not have the responsibility or the authority to support clinical services.

Mr. ROGERS. That is what I was wondering about when you say you established 11 clinical eye research centers.

Dr. STEWART. It has come about by concentrating research programs in a clinical area.

Mr. ROGERS. It is in an already established center and you are picking out people to do the work.

Dr. STEWART. This is bringing in scientists and ophthalmologists to work in this area.

Mr. ROGERS. It is more just simply a grant program, funding staff work in a center; is it not?

Dr. STEWART. If you are visualizing a new building in a center, this is not true. It is a concentration of people, within a clinical setting, working on the clinical problem.

Mr. ROGERS. I presume you don't fund all of the people in it.

Dr. STEWART. No; some of the funding comes from elsewhere.

Mr. ROGERS. You pick out the outstanding people in certain fields.

Dr. MASLAND. Although the Institute does not have funds for the construction of buildings, within the Division of Research Facilities and Resources at the National Institutes of Health, research construction money is available. We collaborate closely with that group and where there is a strong group of people prepared to develop a research unit, then in collaboration with the other Division we can assist in the construction.

Mr. ROGERS. Was this done in these 11 clinical centers?

Dr. MASLAND. In three, NIH has supported construction.

Mr. ROGERS. Would you let us know how much money was put in from the other Division of NIH and so forth?

(The following information was subsequently submitted:)

The Division of Research Facilities and Resources provided some funds to the following NINDB Vision Centers:

Investigator and institute	1967 costs
A. Jampolsky, M.D., Institute for Visual Sciences, Institute of Medical Sciences,[1] San Francisco, Calif.	$9,654
M. D. Davis, M.D., University of Wisconsin,[2] Madison, Wis.	7,395
E. Friedman, M.D., Boston University,[2] Boston, Mass.	11,151
Total	28,200

[1] Clinical research center.
[2] Outpatient research center.

Dr. MASLAND. The outpatient units are a rather unique undertaking. We have been concerned because we felt there was a need for stronger clinical research on the eye. The question was how to get stronger programs or to start stronger programs in areas and institutions which at the moment did not have the full potential for an inpatient center.

We recognize that a good deal of research work can be done with outpatient resources. You don't require hospitalization for certain types of studies. Therefore, in order to advance this special field, we have launched a new program; we now provide resources for outpatient research units.

We think this will greatly strengthen the vision research program.

Mr. ROGERS. How many ophthalmologists have you working in the Institute?

Dr. MASLAND. In the direct research program itself, we have 25 scientists working on eye disease; three of whom are board-qualified ophthalmologists.

There are also three professionals working in administration in vision activities, one of whom is an ophthalmologist and one is an optometrist.

Mr. ROGERS. How many would you suggest in your grant program?

Dr. MASLAND. I have those figures here. More than one-third of our vision research grantees are physicians. You must recognize that a good portion of our research in the eye is not carried out by ophthalmologists.

Mr. ROGERS. I understand that. You can furnish that figure for the record.

(The information requested follows:)

QUALIFICATIONS OF PRINCIPAL INVESTIGATORS[1] OF NINDB-VISION RESEARCH GRANTS

	Degrees				
	M.D.'s	Ph. D.'s	Other higher degrees[2]	Other degrees	Total
United States:					
States	302	232	40	91	665
District of Columbia	11	1	----	----	12
Puerto Rico	2	----	----	----	2
Foreign countries	21	2	3	4	30
Total	336	235	43	95	709

[1] There is an approximate ratio of 2 supporting personnel to each principal investigator, indicating approximately 2,100 personnel supported by these grants.
[2] Other higher degrees: O.D., D.O.S., Ed. D., D.Sc., D.D.S., D.V.M., Doctor of engineering, D.S. (Japan).

Mr. ROGERS. How many ophthalmologists do you use in your program for delivery of services or preventive care? Are you doing any research in this area?

Dr. MASLAND. No, sir.

Mr. ROGERS. Should you?

Dr. MASLAND. It needs to be done, but it is done in other areas of the government. The mission of NIH is in research, not in health services research or in the provision of services.

Mr. ROGERS. Let us know where that is done.

(The information follows:)

PUBLIC HEALTH SERVICE PROGRAMS IN THE AREA OF EYE CARE AND PREVENTIVE SERVICES

Efforts by the PHS toward primary prevention of vision loss include control of communicable diseases such as gonorrhea, syphilis, and trachoma, promotion of the use of safety glasses, prevention of eye injuries, and the elimination of retrolental fibroplasia through standards for oxygen concentration in the care of premature infants.

Secondary prevention efforts include the earliest possible detection of visual defects in preschool children and their correction to prevent amblyopia ex anopsia (one-eyed blindness), where delay of care results in a lifetime of irreversible unilateral blindness. Also included in secondary prevention is the earliest possible detection of glaucoma so that treatment can be instituted which ideally can prevent 4,000 cases of needless blindness annually. Early detection for visual disorders of children and adults is promoted in public clinics, doctor's offices, and hospitals.

Diabetic retinopathy, the Nation's third leading cause of blindness, holds promise for secondary prevention in new therapies and control measures that Public Health Service is helping to explore and develop.

Total eye care projects that bring the expertise of academic centers of excellence to the urban poor and the isolated rural population are being promoted as

satellite operations in order to provide the full spectrum of eye care services to these groups.

The development of new instruments and techniques such as automatic electronic screening devices is also an important function of Public Health Service Programs.

Training of both medical and allied medical personnel to provide eye care services is also being supported.

Dr. STEWART. We are using optometrists in the Public Health Service. I don't know the number. It is not very many.

Mr. ROGERS. Do you have any on your staff, Doctor?

Dr. STEWART. No, sir; not that I am aware of.

Mr. ROGERS. Would it be a good idea?

Dr. MASLAND. I have an optometrist on my staff.

Mr. ROGERS. I was thinking of delivery. As I understand it, what they do is try to help people with certain problems and then they are referred to the ophthalmologists.

Dr. STEWART. We are using them in clinical centers wherever the workload is sufficient to warrant them. Usually we use the military for certain services.

Mr. ROGERS. I am concerned about the problem of recruitment and staffing, would be a serious handicap to the staffing of a new institute. Why wouldn't that be true in the present Institute where the median salary for ophthalmologists is $37,700.

Dr. STEWART. The recruitment of the high-level research scientist and the physician, particularly in certain specialities of the medical profession, is very difficult because we are not competitive enough in salaries. It is one of our most serious problems.

Mr. ROGERS. Do you bring them in as consultants at $100 a day?

Dr. STEWART. There are time limits as to how long a person can be a consultant. They are paid $70 or $50 a day, depending on their qualifications. We do use people such as this, and we have also been able to get some particular university people who are taking their year's sabbatical and who come in with us temporarily in the management area usually. We do have a visiting scientist program from across the seas but this also is not the permanent, ongoing group that you are talking about. These are people who come in for a few months to a year. The recruiting of the caliber of people that we think are necessary to run a high-level scientific program is very difficult.

Mr. ROGERS. Of the five or 10 ophthalmologists you have in your intramural program, would you say they were used more in research or more in administration?

Dr. MASLAND. They are used primarily in research.

Mr. ROGERS. Would you give us a breakdown on that?

Dr. MASLAND. Three board-certified ophthalmologists work in direct research in the NINDB intramural program. One ophthalmologist works in administration in the extramural area.

In response to this question of how you develop a program, I believe in our administrative setup, I am the only neurologist. We rely on people with basic science competencies or people with administrative skills, and very little of the professional decisionmaking is made by Institute staff.

The professional decisionmaking is made upon the recommendation of advisory committees. We then have at our fingertips the top scientific competence of the country to advise us regarding the proper

allocation of funds and the decision as to which type of project should or should not be supported.

Mr. ROGERS. I am fairly familiar with your procedure and I think it is generally pretty good. Although I think we need very high competency in the staff because it is the staff these groups must rely on in giving them advice as to which ones they think should be done.

Dr. MASLAND. Certainly, I would not question that.

Mr. ROGERS. Finally, are there any breakthroughs that you see in the immediate future that need special funding or need special effort? Are we making some progress in any particular areas?

Dr. MASLAND. We have made considerable progress in eye research. In fact, I think the advances in this field are as great as in any area that we have. I share the concern also that we are not doing everything that could or should be done. It is a tremendously challenging field and the opportunities are there. I don't question this for one moment. We need more cooperative studies than we now have. We need additional centers. There are definitely ways that this program can be strengthened.

Mr. ROGERS. Would you let the committee have your suggestions on this, please, and where you think most effective work can be done and possible suggested funding.

Are there any particular exciting breakthroughs in view right now?

Dr. MASLAND. That is always a dangerous prediction to make.

Dr. STEWART. We are counting on a rubella vaccine which will have an effect on the blindness in babies that occurs when pregnant women contract rubella. That is the German measles vaccine.

While the children born of these women have multiple congenital defects, ophthalmological problems are high on the list. We are very hopeful of getting this vaccine.

(The following information was subsequently submitted:)

PROMISING RESEARCH OPPORTUNITIES IN VISION

Research accomplishments of the last decade have opened up a number of new research opportunities in vision research. Every detail in the knowledge gained regarding the processes of sight and eye disease has introduced fundamental questions which yet must be answered.

In broad over-view, it is clear that epidemiology in the ophthalmological field offers significant rewards in our understanding of the occurrence and distribution of various diseases affecting the eye and may illuminate many etiological factors. While epidemiology in ophthalmology is relatively new, it beckons with the rewards of necessary research in a wide number of areas, such as diabetic retinopathy, glaucoma and uveitis. Such epidemiological work requires, by its very nature, the employment of biostatisticians and epidemiologists, in addition to the interested ophthalmological personnel.

Genetic studies in diabetes and microangiopathy are greatly needed. We need to know more about the possible changes, the response to normal and abnormal insulin, the sulfonylureas, autonomic agents, and hormones, as well as the role of genetics in prognosis.

In addition, exploration is indicated in the influence of pituitary extirpation and photocoagulation on diabetic retinopathy. Since these are only ameliorative, it is essential that understanding be attained in the basic biochemistry and physiology of this disease. Diabetes mellitus has been singled out here only as an example. Many other areas of research in eye disease are equally demanding.

Pediatric opthalmology and optometry are relatively new as comprehensive entities, although clinical practices have usually included children. These subspecialties emphasize the need for further research in experimental embryology projects; the effect of hyperbaric oxygen on the immature and mature retina; brain and ocular pathologic studies; the evolution of perception; the etiology of amblyopia; dyslexia; cerebral dominance, handedness and eye dominance;

the causation of myopia and other refractive errors; the effect of environment on visual behavior; and the objective evaluation of vision training and orthoptics.

The development of eye pathology banks is the first order of business in terms of research. Such eye banks would provide further insight into the factors of eye disease.

Other areas for advances in our understanding of visual physiology and pathology are the exploration of ultrasound in the diagnosis of eye pathology, photocoagulation and other therapy for histoplasmic choroiditis, and intensive emphasis on drug investigations. The latter would include pediatric effect of ocular drug therapy, steroids and glaucoma, systemic drugs and occular pressure, problems in drug penetration, antibiotic problems in opthalmology and developments in opthalmic anesthesia.

FUNDING

It is estimated that approximately $1,400,000 above the NINDB Appropriation for FY 1968 would be needed to expand into the new areas discussed.

Mr. ROGERS. Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Nelsen.

Mr. NELSEN. Referring to another subject which might have some application, when we were considering the establishment of a liberal arts college and vocational educational facilities in the District of Columbia, the feeling was that they had to be separated. Otherwise the competition within a unit might damage one to the advantage of another. Is it possible that in the area of eye research and attention to eye problems that the competition within the total package might detract from the needed attention in one area or another?

Dr. STEWART. Mr. Nelsen, first we think there is no evidence that the competition is resulting in an adverse funding of the good research in the eye field at the present time.

Our major concern is that if we develop too narrow a categorization within the several Institutes, we will establish artificial barriers between scientists from various disciplines who need to be collaborating on research. The approach needs to be from a broad front rather than from a narrow front. We are afraid of this isolation and that categorization is too tight.

Mr. NELSEN. Referring to the competition for able people, in your grant program you reach out into all areas of the country. You might find it more difficult to bring those people into a single center than to leave them in a locale where they are perhaps at a little lower salary but perhaps where they want to be.

Wouldn't you find a greater problem in bringing them into a center and drafting them into a new activity?

Dr. STEWART. That is quite correct, Mr. Nelsen. Where we need to build eye research is in the university itself where we can draw upon all of the scientific disciplines within a particular setting.

That is why we put emphasis on our extramural program. We have an intramural program of our own which we think is excellent but we could not use that to expand the research in all the fields where we think it is necessary.

Dr. MASLAND. In that regard, we feel one of the most crucial things is to have a focal point for eye research in every university. There are good people in small universities just as there are good people in big ones. We think that our key problem for vision research is the recruitment of good people. This recruiting takes place in the early years of

medical school, and our best recruitment device is to have within every medical school a focal point to attract those people who have the natural bent, the interest, and capability to engage in vision research. If we don't have such a focal point we won't attract them.

We now have 53 research training centers in the universities and as our program expands, when a university gains the requisite capability, we establish a new training center there.

Mr. NELSEN. Without question, this legislation has a good deal of appeal—even the name of it—which would indicate stimulated activity in the field of eye research and attention to the problem.

However, I think this committee is interested in the type of a plan that will do the most effective job. I was interested, Dr. Stewart, in your statement that there are areas where you feel more could be done. I am very much interested in your suggestions as to where we should direct more of our attention in order to do a better job with the facilities we have.

I think that is what we are interested in, in this committee and sometimes it becomes attractive to move for labels. There is a lot of that in the Congress at times, but we want results and I am sure you will find this committee interested in your suggestions. Thank you, Mr. Chairman.

Mr. KYROS. First, I would like to say that I am remarkably impressed that you come here today and you really oppose this bill in the face of the fact that 51 Members of the Senate have sponsored a bill for an Eye Institute and many Members of the House.

I think this indicates the depth of your commitment to the fact that the program should remain within this neurological concept that you have.

I am not clear precisely what adverse effects would occur if you did remove the eye research from the National Institutes of Neurological Disease.

Dr. STEWART. Let me first say our opposition is not based on the objective of getting important research in the eye field or doing something about all of the visual problems in the country. The feeling is the administrative mechanism proposed would not per se increase this research that everybody wants.

At the present time, we are very interested in developing multidisciplinary approaches to eye research in the universities and that is what Dr. Masland pointed out.

The etiology of eye diseases relates to a multiplicity of systemic diseases. For example, we could do a lot for the eye if we could find a cure for hypertension, if we could prevent diabetes, and so on. We have already made material advances in preventing blindness due to the use of oxygen in newborns and through the study of toxoplasmosis to which Dr. Jacobs has contributed.

You have infectious, metabolic, congenital defects, neurological disease, and eye disease all being manifested as disorders of this one end organ of a sensory nerve, the eye. It seems to us if you really want to tackle the visual problems you must bring in a variety of skills including those of ophthalmologists. Our objective is to encourage collaboration between the ophthalmologists and these other clinical and laboratory specialists.

We fear the isolation of eye research in one clinical specialty rather than the broad multidisciplinary approach which is required. Narrow

specialization would hinder the eye research development rather than promote it, and I think this is the principal objection we have.

Mr. KYROS. You have undoubtedly studied the bill that has been proposed.

Dr. STEWART. Yes, I have.

Mr. KYROS. As I read this bill, beginning with section 452, actually enormous control is vested in you as Surgeon General, starting with section 452, on page 2 of the bill. You are authorized to establish an advisory council which consults with you. After you do that in subsection c of 452 you specify the duties and functions of this so-called council.

You specify any duties and functions and powers of any other advisory council that it may adopt. It goes on further and says that you decide in what areas and to what extent it will carry out the purposes.

So, what comes to my mind is accommodation.

Naturally, emotionally and rationally and from the interest indicated by all of our colleagues and from the statements we have heard this morning, there is enormous interest in eye research.

Isn't it possible that you could have some kind of a program within this neurological and blindness board that you have?

Dr. STEWART. Let me say first that the powers granted in this bill are the powers that are the same or very similar to those relating to the existing institutes.

We do have and are moving to an eye program which has a great deal of emphasis. The problem of implementing more eye research is really the shortage of able, good people, to move into research in the eye area. There is also some limitation on research space.

In regard to the administrative decision to establish a new eye institute, such a decision would create serious problems relative to the allocation of various special research programs. Would I transfer the toxoplasmosis program from the NINDB or the aging process from the National Child Health Institute? We can go on down the line like this forever. We would have to have some arbitrary decision.

I think we could make the arbitrary decisions and I think we could administer it afterwards but I don't think it would have the effect of augmenting the eye research program of the country. In fact, I think it would be more likely to set it back.

Mr. KYROS. If I understand your testimony this morning, it is not a national institute, no new administrative body or council is needed. No new money just to be pumped into the Institute is needed. What is needed is to be training people to go into ophthalmology and the related fields of the eye?

Dr. STEWART. We don't think the Eye Institute as outlined in the bill is the administrative mechanism to increase eye research in this country.

Certainly, more research is going to have to be done and supported and we are going to have to expand the Neurological Disease and Blindness Institute to do this but I don't think this will be augmented by creating a new Institute. In fact I think it would cause some troubles and in the transition stage of x number of years, even interfere with the ongoing programs and the developments we have underway.

Mr. JARMAN. Dr. Carter.

Mr. CARTER. You have a very interesting statement, Doctor. I notice in your statement you state that an additional $800,000 will be required

perhaps for administration. Do you consider that a great sum in this day of great spending in the United States?

Dr. STEWART. Any unnecessary expenditure is excessive.

Mr. CARTER. Compared to what more might be accomplished in the establishment of a National Institute of Eye Diseases and so on, I think it very little.

I notice that many of our teaching institutions throughout the country have difficulty in getting trained ophthalmologists. Are you doing much to help them along this line at the present time?

Dr. STEWART. You are quite right, they do have difficulty, Dr. Carter, in getting trained ophthalmologists. I will ask Dr. Masland what we are doing in the training program for ophthalmologists.

Dr. MASLAND. As I mentioned a little earlier we are supporting 53 research training programs. Again, I must point out that the responsibility and the authority of the Institute do not include the training of individuals to provide patient services. This, by law is not included in our responsibilities.

Mr. CARTER. Of course, we know that, but know that is gotten around. We know the way to help medical schools is through research grants but I am quite sure much of this money is used for promotion of medical school programs. I think we realize that 50 percent I believe of the cost of most medical schools are paid through HEW; is that not true?

Dr. STEWART. It is quite true the research fund from NIH are a major source of funds for all of the medical schools in the country; that is correct.

Mr. CARTER. It is my feeling we could better integrate the services in this particular field and treat them with a national institute since it is a division of medicine, and from what I hear from deans of medical schools, particularly, there is a sad lack, an inability to get trained men in these fields to establish good departments of ophthalmology.

I think we need an Institute or group that will press this more aggressively.

Dr. MASLAND. I would like to emphasize the fact that we have been pressing for the training of research ophthalmologists and academicians.

Mr. CARTER. I regret it is without avail. We recognize the eye is the mirror of many diseases, and the skilled ophthalmologist can tell right off what is involved, from the eye.

Hypertension, nephritis, all these various things can be seen in the eye by the ophthalmologist. We realize the study of the eye must be integrated with the study of the body as a whole. But still there is no reason why this can't be integrated, can't be set up as a separate agency or Institute and still be integrated with other fields of study which it of necessity must be, just one part of a general program.

I believe you mentioned heart, cancer, and stroke. It seems to me in comparison with this, we appropriated some $340 million for this a year or so ago and of course that should be very helpful along that line. We have just $15 million to $18 million I believe for diseases of the eye.

There are in truth many stumbling blocks which have been thrown out today but I feel we should certainly turn them into stepping stones

toward accomplishing something in this field toward further study of blindness and doing something about it. It is a serious proposition particularly to those many, many people who have these diseases.

How many ophthalmologists did you say you have in the present National Institute of Neurological Diseases?

Dr. MASLAND. Within our own staff we have four.

Mr. CARTER. That seems an unreasonably small number to do research for a country of 200 million people having 40,000 blind and 400,000 practically blind people.

Dr. MASLAND. Dr. Carter, the direct research program of the Institute represents a very small portion of the total Institute's program. This is true in each of our areas. We have a very strong ophthalic research program within our intramural program, but the other 22 scientists represent other specialities than ophthalmology.

At a recent international congress, people came from all over the world, because of their accomplishments in research, and one-half of these outstanding investigators were supported by the NINDB. And out of some 50 who were there, three of them were members of our own staff, so we have a very significant eye research program. Naturally, it could always be better.

Mr. CARTER. That is what we are looking to. We want to do our best to get rid of blindness and we feel that our efforts should be concentrated on this.

How many people outside your NINDB are receiving NINDB grants for eye research?

Dr. MASLAND. We have approximately 700 principal investigators receiving vision research grants.

Mr. CARTER. What does your advisory committee recommend as to the establishment of a National Institute? What is the recommendation of that committee?

Dr. MASLAND. The Council of the Institute has not made a recommendation.

Mr. CARTER. It would be interesting to find out what that might be.

Certainly I appreciate the testimony you gentlemen have given.

Mr. JARMAN. Dr. Stewart, since a major emphasis on everything these days here on Capitol Hill and elsewhere in the Government is on cost and what we can afford to do, considering other financial obligations which the Government has, I think it would be helpful for the committee if you could submit to us for the record a breakdown on this conclusion you have reached that a new Institute would cost approximately $800,000 more in administrative costs.

Dr. STEWART. I would be very happy to, Mr. Chairman.

(The information requested follows:)

PUBLIC HEALTH SERVICE STATEMENT ON FUNDING AND POSITIONS REQUIRED FOR NEW INSTITUTE, INCLUDING TRANSFERS FROM NINDB

It is estimated that a new Institute would require an *administrative* structure of approximately 54 positions and $1,095,000. Approximately 17 existing positions and $295,000 could be transferred from the NINDB. The net additional cost of the new Institute thus would be 37 new positions and approximately $800,000.

The following is a functional and cost breakdown:

Organization	Positions	Funding requirements (personnel and other costs)
Program direction	13	$220,000
Program analysis	5	75,000
Public information	5	70,000
Extramural operations	20	400,000
Office of Associate Director, collaborative and field research	5	100,000
Office of Associate Director, intramural research	6	155,000
Planning activities		75,000
Total	54	1,095,000

Mr. JARMAN. Are there further questions?

Mr. CARTER. $800,000 is a lot of money to one man or two, but certainly in the face of what we are spending is just such a small, insignificant fund.

In thinking about what might be accomplished by this, the cost would be minimal when compared to the cost of the bombs we drop every day.

Dr. STEWART. $800,000 is new money for administrative costs; $300,000 additional funds would have to come out of the existing NINDB by transfers.

Mr. JARMAN. This would be administrative expense?

Dr. STEWART. Yes.

Dr. JACOBS. With that money we could support approximately 30 to 40 research projects, or 10 to 20 clinical outpatient research centers, three or four major eye research centers, or perhaps 10 major training programs.

Mr. JARMAN. That is very helpful to the committee in its overall consideration of the problem. Thank you very much.

Our final witness this morning is Dr. V. Eugene McCrary, Department of National Affairs, American Optometric Association, accompanied by Mr. William P. MacCracken, Jr.

STATEMENT OF DR. V. EUGENE McCRARY, DIRECTOR, DEPARTMENT OF NATIONAL AFFAIRS, AMERICAN OPTOMETRIC ASSOCIATION; ACCOMPANIED BY WILLIAM P. MacCRACKEN, JR.

Dr. McCRARY. Thank you, Mr. Chairman.

Before I present my own testimony on this bill, I would like to submit for inclusion in the record of these hearings, three brief statements by some of my colleagues who are vitally concerned with this legislation. The first of these is from Dr. Spurgeon Eure, president of Southern College of Optometry at Memphis, Tenn., who is also chairman of the Advisory Research Council of the American Optometric Foundation. The second statement has been prepared for submission by Dr. Gordon G. Heath, professor of optometry at the Indiana University Division of Optometry and who is now on loan to the University of California, at Berkeley. The last of the three statements is by Dr. William Baldwin, dean of the College of Optomerty, Pacific University, Forest Grove, Oreg., and chairman of the American Optometric Association's Committee on Research.

(The statements referred to follow:)

STATEMENT OF SPURGEON B. EURE, O.D., PRESIDENT, SOUTHERN COLLEGE OF OPTOMETRY, MEMPHIS, TENN., AND CHAIRMAN, ADVISORY RESEARCH COUNCIL, AMERICAN OPTOMETRIC FOUNDATION

I am Spurgeon B. Eure, President of Southern College of Optometry located in Memphis, Tennessee, and, more pertinent to this committee, Chairman of the Advisory Research Council of the American Optometric Foundation, to which post I was appointed in the fall of 1966 by Dr. Emmons L. Eichhorn, President of the AOF. I am the holder of a Bachelor of Science degree from the University of Southern Mississippi in Hattiesburg, Mississippi, Master of Arts degree from Memphis State University in Memphis, Tennessee, and a Doctor of Optometry degree from Southern College of Optometry.

The Advisory Research Council consists of sixteen prominent men in the field of visual science. They are charged with the responsibility of screening and recommending as to acceptance or rejection of all American Optometric Foundation Grants and Fellowships.

Attached to my statement is a list of the visual scientists who are Council members, and who have authored over five hundred manuals and articles. Quoting the titles of each publication would be most time consuming, however, a mention of a few which are most pertinent seems in order: "Optometry and Blindness", "What Price Research", "The Effect of Toxic Involvements on Vision", "Examining the Partially Blind Patient", "Prin. and Exam. Techniques for the Care of the Partially Seeing Child", "Social and Vocational Rehabilitation of the Blind and Partially Sighted Older Patient", "Subnormal Vision Aids." These gentlemen have organized and disseminated additional information to the eye professions through the publication of fourteen books.

I am before this committee today with a report on the activities of the American Optometric Foundation, to give a review of the objectives, efforts and results the Foundation has effected in its short history. I feel this end can best be conducted with a chronological history of the AOF and its accomplishments in vision care research, and training of future vision scientists. The importance of education pertaining more specifically to optometric education will likewise be brought out.

On July 11, 1947, just 20 years ago, an announcement was made public from the Golden Jubilee Congress of the American Optometric Association meeting in Atlantic City that the American Optometric Foundation had been founded under the patronage of the American Optometric Association and by authority of New York Supreme Court Justice Samuel Dickstein. Dr. William C. Ezell, then past president of the AOA, buttressed the infant organization by consenting to be the first president of the Foundation. With the help of other leading optometrists, he structured the Foundation with a design which would move optometry into the ranks of other professions that were willing to underwrite their own research organization. Said Dr. Ezell, "The AOF will seek and administer funds for the broadening, upholding, improving and aiding in all respects optometric education, the profession of optometry, and its practitioners. The organization will also foster research projects in optometry." All of this philosophy was incorporated in the objectives of the AOF with the credo of Research, Education, Literature, and Professional Advancement. The AOF is basically an altruistic, non-profit corporation that depends mainly on its 2,739 members for its sustenance.

From its meager beginning 20 years ago to its present position in health circles, the AOF has continually made its presence felt. Limited initial funds forced the Foundation to concentrate in the early days on just two of its announced four objectives: training teachers and visual research. So far, Foundation funds have aided fifteen optometrists in obtaining the Ph. D. degree. Currently, funds are being provided for eight additional doctoral candidates (two are expected to receive the Ph. D. degree this year).

In the research department, 20 special grants have been provided for far ranging visual research projects. These grants have resulted in the publication of manuals and texts; translations of foreign texts; publication of the first optometric reference dictionary; television film series designed to increase the public understanding of vision; development of a tonometer modification; and a camera which is capable of recording eye movements. At the present, two research grants are in progress at Indiana University's Division of Optometry

and Gesell Institute of Child Development in Connecticut. At Indiana an investigation, under supervision of Dr. Merrill J. Allen, into night vision driving problems is being conducted and at Gesell Institute they are studying the behavioral changes in children resulting from visual training therapy.

Dr. Merrill J. Allen's Night Vision Study is reported to have fomented a considerable amount of the current national attention focused on vision problems of night time automobile driving. Due to his study of this problem, Dr. Allen has received national recognition as an authority on the subject of driving vision problems, and was recently appointed to the newly established Public Advisory Panel on Automotive Safety of the United States General Services Administration. As a panelist he will help screen the approximately 60,000 vehicles purchased each year by the Federal Government.

Over the years, as optometry has reached out to form its own boundaries in our society, it has become more and more concerned with the age-old problem of blindness, its causes, prevention and the special care needed by the blind. The early attempts made by the profession and the AOF to tackle this problem brought a frustrating realization that the United States was handicapped with a shortage of qualified vision scientists. The deficit was one of the factors that forged the directions of early AOF endeavors. Before the problem of blindness could be researched, the professions would need researchers. This need brought about the inception of the AOF's fellowship grant program, which has since continued to seek promising young doctors with the hope of providing the means for their emergence as leaders in the science of vision. Some of these grants have led to basic investigation in visual problems and disorders, and all have produced scientists of the order of those which are capable of carrying out original eye research. An early AOF supported effort to investigate one of the diseases of the eye was a grant awarded to Dr. D. B. Ganse of Philadelphia to study a method of early glaucoma detection. Subsequent to this project the AOF awarded the School of Optometry at the University of California a $1,000 grant to further knowledge of possible methods of early glaucoma detection.

Further, in 1960, the Foundation supported a compilation of optometric articles by Drs. Monroe J. Hirsch and Ralph E. Wick, which included a thorough study of blind and partially-sighted children by Alfred A. Rosenbloom, M.A. and O.D. In his article Dr. Rosenbloom discusses past and present educational methods of teaching the blind and partially-sighted with recommendations for improvements and he also discusses procedures of vision care for those declared legally blind but are partially-sighted. The value of such articles as this is not always entirely intrinsic for oftentimes they lead to further studies by the eye-care professions, but the first step in some cases is the most important one. Another bane of vision which has recently come under the scrutiny of the AOF is diabetes, and its effects on vision. The Foundation has awarded a grant for a pilot study to Massachusetts School of Optometry to determine if there is a more desirable time of day which to refract diabetic patients.

Although not initially supported by AOF funds, but in part by Federal funds, a most incisive and rigorous search into the causes of blindness and partial-sightedness was recently completed by Robert H. Peckham, Ph. D., now a resident Professor at the Southern College of Optometry. Based on over thirty years of research experience, Dr. Peckham's report, published in October, 1966, revealed some important concepts in eye research, vision rehabilitation, and blindness prevention, such as development of peripheral vision in lieu of central fixation when macular vision has been impaired or destroyed; detection with an improved electroretinography of the early symptoms of visual disability before any failure is detectable with routine tests; a study of the effects of drug intoxication on vision; a correlated study of electroretinogram and cortical responses and the measurement of retinal responses to lowered contrast instead of black and white test targets. This report is leading to important new fields of visual research and rehabilitation.

In addition to the Special Grants, the American Optometric Foundation has provided twenty-five Fellowship Grants out of which has come many research projects concerned with early recognition of blinding eye diseases and the causative agents of visual disorders. A few titles of these projects are as follows:

"Does the anomalous projector have a single point of view of the world?"

"Eccentric fixation and its relationship to anomalous correspondence."

"Investigating the critical determination of the areas of correspondence throughout retinae."

"Eye movements during fixation and fusion."
"Relation between border gradients and contrast thresholds."
"Development of equipment for determining axial length of the eye by means of X-rays and for measuring the horizontal limit of the fixation field using Maxwell spot technique."
"Tracing the development of form discrimination in children."
"The utilization of ultra-sonics in mapping the structures of the eyeball."
"The nature of amblyopia: psychometric, motor, and statistical."

All of this progress is of little value unless it is disseminated to the public and put into practice by the optometrist. The AOF sponsored five 30 minute television films on increasing the public's understanding of vision, and through their central office in St. Louis the Foundation is continually publishing information to the practicing optometrists.

The results of graduate fellowships must eventually overflow into the schools which are charged with the responsibility of educating the practitioners who will serve the visual needs of the American citizen. In a time of severe shortage of teaching personnel, such as now and in the past decade, the American Optometric Foundation has attempted to develop a pool from which the various universities and colleges of optometry could draw needed personnel, both in teaching and research areas. Unfortunately, however, sufficient funds have not been available to produce the number of fellowships and, in turn, graduates to meet the rising need in optometric education. All schools of optometry today are experiencing this dilemma.

Optometric education is found in ten universities and colleges across this nation. It is commonly known as a six-year program. This, of course, refers to the minimal requirements and by no means represents the average academic years of education found among the various student bodies. As an example, the Southern College of Optometry entered 107 first year optometric students in September of 1966. The average pre-optometric academic training for this class was 3.5 years beyond high school, with one-third of the class possessing a Bachelor of Science or a Master's degree. The class which graduated in June of 1966 showed a minimal pre-professional and professional education of 7.1 years with a maximum of 9.5 years. However, a small number of these years were devoted to research training. This simply means that the young graduating Doctor of Optometry must pursue graduate education prior to becoming a high caliber researcher.

Upgrading of an instructional staff while there is such a shortage of personnel that they can be released for only a short period of time (one to two years) is a most difficult matter. The schools of optometry are constantly releasing professors for further education, as well as inter-changing professors so that new and different ideas may be brought onto each of the campuses. The establishment of training centers for postgraduate education is most laudable. One must remember, however, all of the finest discoveries through research become of no value if they are not taught in present institutions, learned by the student and put into practice by the doctor.

In the optometric curriculum, the student spends the better part of two years in clinical routines in which he will come face to face with a substantial number of patients exemplifying symptoms of diseases which may cause blindness. The highest quality of training and experience is necessary if we are going to successfully attack the agents of blindness, but one should not exclude the optical corrections and orthoptic procedures which could be applied, once a disease has left a person with subnormal vision.

Again, if I may use an example of the Southern College of Optometry, we find that last year in the outpatient clinic, 141 subnormal vision patients were examined, of which twelve had been previously pronounced legally blind and had remained that way for some period of time. Senior students working under the direct supervision of Dr. Frank Maier were able to provide the majority of these patients with a visual aid which provided the resumption of usable vision. Of the twelve patients who came into our clinic classified as legally blind, eight were provided with visual aids which would allow them to read a newspaper. All of these patients had previously been seen by medical practitioners and many by Doctors of Optometry. I personally have a saying which expresses my feelings pertaining to this type of patient, "Most blind people, unfortunately, are doctors."

Referrals of an active or preventive nature were made in 97 cases to ophthalmology, 21 to dentistry, any number to general practitioners of medicine,

neurologists, general surgeons and internal medicine specialists. As the referring agency, the Southern College of Optometry received reports from these various health practitioners to the point that the far majority did possess and were treated for pathology of some nature.

Visual disorders other than those that are normally thought of as pathologically induced are far more common than one might imagine. Whereas patients with a functional visual disorder may be able to respond to the sensation of light and thereby not be classified as blind, in many instances are severely crippled in their visual environment. In 1966, 571 patients were seen for visual and developmental training at the College. Two hundred forty-eight patients were accepted for reading development and there were 300 developmental vision analyses made. Over 85% of this portion of the clinic patient load is made up of children.

Science courses taught in the optometric curriculum at Southern College which specifically form a base for the proper handling of the above mentioned patients consist of over 17 quarter hours of physiological optics including electro-physiology, 17 quarter hours of pathology, consisting of general and ocular pathology. All of the basic science courses form a foundation for the clinical instruction. In all, over 4,000 instructional clock hours are consumed in the optometric curriculum.

In an article in "The Optometric Weekly," Henry Hofstetter, Ph. D., measured the AOF's role in the advancement of optometric research when he wrote, and I quote, "The AOF has not been able to compete in size with other rapidly expanding sources of support for research and development; but this circumstance has given rise to an even more important opportunity, that of providing 'seed' or 'starter' grants for projects and persons not yet well enough established to command major support. Such grants, though small, are the hardest to obtain from outside sources. Further, outside agencies are less able to judge the potential and merits of embryonic ideas and budding vision scientists. The AOF with the help of its talented Research Advisory Council, can effectively, do just that, providing however, that the funds are available."

It is my opinion as Chairman of the Advisory Research Council to the American Optometric Foundation that we would not like to see this legislation considered in a positive manner unless the inclusion of optometry were so considered.

ATTACHMENT No. 1

MEMBERS OF THE ADVISORY RESEARCH COUNCIL OF THE AMERICAN OPTOMETRIC FOUNDATION

Charles A. Abel, B.S., O.D., Dean of Los Angeles College of Optometry: Memberships: Past President of Association of Schools and Colleges of Optometry; Past Board of Directors of Garrick Welfare Clinic; Co-Chairman Assistant to Graduate Committee, California Optometric Association.

William R. Baldwin, B.S., M.S., O.D., Ph.D., Dean of Pacific University College of Optometry: Memberships: Chairman of the American Optometric Association's Committee of Research; Past Chairman of American Optometric Association's Academic Facilities Committee; Chairman of the Association of Schools and Colleges of Optometry's Educational Policy Committee.

Lawrence Fitch, A.B., O.D., President of Pennsylvania College of Optometry: Memberships: Executive Council and Past President of American Academy of Optometry; Director of Pennsylvania Optometric Association; Council on Optometric Education of the American Optometric Association, past member; Fellow of the American Association for the Advancement of Science; Eastern Association of Deans; American Higher Education Association.

William Greenspon, O.D., Civilian Optometry Consultant to the Surgeon General, U.S. Navy: Memberships: Optometric Extension Program; American Optometric Association; West Virginia Optometric Association; Past Director, AOA Department of National Affairs; Past Chairman, AOA Committee on Legislation; Past President, West Virginia Optometric Association; Past President, Southeastern Congress of Optometry; Past President, International Association of Boards of Examiners in Optometry; Member, National Commission on Accrediting.

Frederick W. Hebbard, B.S., M.S., Ph.D., Director of the School of Optometry,

Ohio State University: Memberships: Ohio State Optometric Association; Central Ohio Optometric Society; University of California Optometry Alumni Association; Optical Society of America; American Association for the Advancement of Science; American Academy of Optometry; Ohio State University Optometry Alumni Association; Chairman, AOA Committee on Visual Problems in Aeronautics and Space.

Henry W. Hofstetter, B.S., M.S., and Ph.D., Director of the Division of Optometry, Indiana University: Memberships: Past President of the Association of Schools and Colleges of Optometry; Vice-President of American Optometric Association; President-elect of State Optometric Journal Editors; President of American Optometric Institute.

Hyman R. Kamens, A.B., B.S., O.D., Dean of Massachusetts College of Optometry: Memberships: American Optometric Association Committee on New Academic Facilities.

Irving B. Lueck, B.S.E.E., O.D., Head of Ophthalmic Lens and Machinery Research and Development at Bausch & Lomb, Inc.: Memberships: American Institute of Physics; Optical Society of America; Reading (Pennsylvania) Eye, Ear, Nose and Throat Society.

Meredith W. Morgan, B.A., M.A., Ph.D., Dean of the School of Optometry at University of California: Memberships: Council on Education, American Optometric Association; Vision Screening of School Children Advisory Committee, California State Department of Public Health; American Optometric Association Commission on Education and Research; National Advisory Council on Medical, Dental, Optometric and Podiatric Education, U.S. Public Health Service.

Chester H. Pheiffer, A.B., M.A., O.D., Ph.D., Dean of the College of Optometry at University of Houston: Memberships: Fellow of American Academy of Optometry; American Psychological Association, American Association for the Advancement of Science.

Alfred A. Rosenbloom, B.A., M.A., O.D., Dean of Illinois College of Optometry: Memberships: Fellow of American Academy of Optometry; Contact Lens Society of England; International Reading Association; National Educational Association; National Society for the Study of Education; American Association for the Advancement of Science; American Optometric Association Council on Optometric Education (Professional Accrediting Agency); Section Binocular Vision and Perception, and Section on Contact Lenses and Subnormal Vision Aids of American Academy of Optometry.

A. M. Skeffington, O.D., Director of Education, Optometric Extension Program, Director, Graduate Clinic Foundation, St. Louis, Missouri: Memberships: Fellow, American Academy of Optometry; Recipient, American Optometric Association Apollo Award for Distinguished Service, 1961.

Charles R. Stewart, B.S., M.S., Ph.D., Past Dean of the College of Optometry at University of Houston: Memberships: Southwest Contact Lens Society; Inter-Society Color Council; Texas Society on Aging; Diplomate of the American Academy of Optometry; Director of Education and Research for Contour Comfort Contact Lens Company.

Ralph Leonard Vasa, B.S., M.S., Captain, USN, Head of Optometry Section of Navy Department Bureau of Medicine and Surgery since 1941: Memberships: Chairman of the Military Commission of the American Optometric Association; American Optometric Association Commission on Military Affairs.

Ralph E. Wick, O.D.: Memberships: American Optometric Association Committees—Practice Management, Vision Care of the Aging, Long Term Planning and Commission on Education; Fellow of American Association for the Advancement of Science; American Public Health Association; Gerontological Society, Inc.; President's Advisory Committee for the White House Conference on Aging; Advisory Committee on Health Care of the Aging for the State of South Dakota Department of Public Health; Advisory Committee of Vision and Aging for the National Research Council, National Academy of Science.

STATEMENT OF GORDON G. HEATH, O.D., PH.D., PROFESSOR OF OPTOMETRY, INDIANA UNIVERSITY, DIVISION OF OPTOMETRY, BLOOMINGTON, IND.

In July, 1963, the House of Delegates of the American Optometric Association adopted a list of six major objectives toward which the Association would direct its efforts. The second of those six objectives was "graduate a sufficient number of optometry students to keep pace with the population growth, retirement and death

of practicing optometrists." In part the adoption of this objective reflected not only the need resulting from attrition and population growth but also the need created by increasing numbers of optometrically trained individuals electing to pursue careers in vision research in industrial, in military and governmental research laboratories, in teaching, primarily in optometry schools, in administrative activities, and as optometric technologists.

Programs for recruitment of qualified students were instituted which soon resulted in full enrollments in all of the schools of optometry, but it was evident from the beginning that this alone would not be sufficient to carry out the objective. The existing schools, even by increasing their enrollments to maximum capacity, would not be able to provide the number of graduates that every analysis indicated would be needed in the near future. Therefore, it was necessary to work toward the establishment of additional schools to meet these needs.

In 1964, a committee to investigate locations for new schools of optometry was appointed, and in 1965 the Committee on New Academic Facilities was established as a standing committe of AOA. I am chairman of the committee whose function is to aid and encourage the establishment of new optometry schools.

Analysis of the projected needs for additional graduates in relation to realistic institutional enrollments has indicated thaat approximately ten new schools of optometry will be required within the next decade. Because the high cost of professional education and training would be even higher if new schools of optometry had to include the facilities and faculty necessary to provide instruction in the basic sciences that are a part of optometric education, and for many other reasons related to quality and diversity of the educational program, the committe has adopted the position that all new schools should be within state supported universities. An important consideration is that of providing the environment and facilities for the research activities important to a strong academic program, and for the development of graduate programs for the training of optometric educators and vision researchers.

The creation of a new professional school is a lengthy and often uncertain process. In spite of the excellent Federal support offered by the Health Professions Educational Assistance Act which provides up to two thirds of the construction costs for new schools plus annual basic improvement grants, scholarships, loans, and other benefits, and which therefore makes a new school of optometry at least economically feasible for any university, no new schools have yet come into being. Our committee is presently working with optometric representatives, university officials, and legislators in more than 10 states where interest and support for a new school has been shown. We are confident that the much needed new institutions will be developed in the near future.

At present six colleges and universities in the United States offer advanced study programs designed to accommodate graduates of regular optometry curricula who wish to pursue specialized study leading to graduate degrees. These programs serve not only to meet the further academic interests of individual students but also to qualify graduates for college teaching, research careers, and specialized clinical and administrative assignments. At Indiana University, I am chairman of the graduate school Committee for Physiological Optics. To quote from the Indiana University Bulletin describing this program:

"The graduate program in physiological optics is intended to advance the knowledge in sciences that relate to vision and seeing, collectively referred to as physiological optics, and is designed primarily for graduates of optometry curricula wishing to prepare themselves for teaching and research in the field of vision. The principal career opportunities for recipients of graduate degrees in physiological optics are in optometry schools, visual research centers, the ophthalmic industry, and specialized optometric practice. Administered entirely by the Graduate School, the graduate program in physiological optics is offered in cooperation with the faculty of the Division of Optometry."

This program leads to the M.S. and Ph.D. degrees in Physiological Optics. Since 1962 our program has produced twenty M.S.'s and six Ph.D.'s, nearly all of whom are now pursuing careers in optometric education or in vision research.

Although the program is designed primarily for graduates of optometry curricula, it is not limited to such graduates, and indeed the Administrative Committee itself is interdisciplinary in makeup, including representatives from optometry, psychology, and anatomy and physiology. Ph.D. candidates are required to complete two nondepartmental minors and in recent years those offered have included mathematics, astronomy, biochemistry, physiology and psychology. The range of research topics carried out by graduate students and by faculties is large and covers virtually every facet of vision research. Faculty research has

been supported by the U.S. Army, the U.S. Air Force, the National Science Foundation, NIH, the American Optometric Foundation, and a host of other agencies, including private foundations.

In 1959 a conference on training in physiological optics was held at Indiana University supported by a grant from the National Science Foundation. The conference was attended by representatives from all of the optometry schools in the United States and Canada. During the course of the conference consideration was given to the definition and scope of physiological optics as a discipline. Some twenty-nine separate definitions were considered. These are listed in the "Transactions and Reports of the Conference on Training in Physiological Optics," which was a report of that meeting. I would like to quote here just three of the twenty-nine separate definitions in order to provide some idea of the scope and the diversity of physiological optics:

(1) "The science of vision encompassing the physical events which influence visual stimuli from the moment they enter the eye; the physiological functions of seeing from stimulus reception to perception; and the related psychological factors of individual response which in any way could affect the study and understanding of the physiological processes themselves."

(2) "Broadly, the scientific study of vision and the eye. Specifically, the branch of science concerned with the physiological and psychological phenomena of vision, the biological processes underlying such phenomena, and the physical characteristics of visual stimuli."

(3) "Physiological optics is the science of the visual perception by the sense of sight . . . accordingly the theory of the visual perceptions may be divided into three parts: 1) the theory of the path of light in the eye . . . may be entitled the dioptrica of the eye; 2) the theory of the nervous mechanism of vision; 3) the theory of the interpretation of the visual sensations. Thus the difference between physiological optics and physical optics is that, whereas the former is concerned with the properties and behavior of light only as they pertain to visual perception, the latter investigates optical phenomena and laws independently of the human eye."

The latter definition is one provdied by Hermann von Helmholtz some hundred years ago. Helmholtz is generally recognized as the father physiological optics.

In addition to its concern with the scope and definition of physiological optics, the conference considered specifically the objectives of training in physiological optics, the course content necessary and desirable in a physiological optics curriculum, the content and character of laboratory exercises in physiological optics laboratory courses, the availability and nature of laboratory equipment specifically required in physiological optics laboratories, the textbooks and journals pertinent to the field and the library classifications of materials suitable to and pertinent to the study of physiological optics. A particularly valuable outgrowth of the conference was the formation of a committee to prepare a directory of personnel involved in vision research. Such a directory was compiled within the year following the conference and consisted of those vision researchers throughout the world who were specifically involved in physiological optics research. This directory has been revised from time to time since then.

This background concerning the education and research in physiological optics has been intended to give this committee a broad overview of the contributions that optometry and its graduate programs can offer in vision research. We recognize the intended function of a National Eye Institute as the conduct and supervision of research to prevent blindness and visual disorders. We cannot, however, support this bill in its present form. Such research must include broad studies of the normal individual and the normal processes of vision as well as those of disease and abnormalities. Optometry's training and research programs in physiological optics which have been developed for so long and cover such a broad range of vision research must be included in the activities of the National Eye Institute. If we can be assured of integral participation in the activities of the Institute we could then endorse this legislation.

STATEMENT OF WILLIAM R. BALDWIN, O.D., PH. D., DEAN, COLLEGE OF OPTOMETRY, PACIFIC UNIVERSITY, FOREST GROVE, OREG.

My name is William R. Baldwin. I am Dean of the College of Optometry, Pacific University, Forest Grove, Oregon. I received my Bachelor of Science

degree (Major: Biology) and O.D. degree at Pacific University. Following five years in private practice I attended Indiana University where I received a Master of Science and Ph. D. degrees in Physiological Optics. I taught in the Division of Optometry at Indiana University for six years prior to assuming my present position three and one half years ago. I have been Chairman of the American Optometric Association Committee on Research for four years.

The Committee on Research of the AOA was created by the House of Delegates in 1945. It was charged at that time with—

1. Reviewing current research in the field of vision.
2. Determining needed areas of emphasis in vision research.
3. Seeking sources of financial support for research.
4. Developing programs to encourage research in the field of vision both within and without the profession of optometry.
5. Encouraging the dissemination of research information to the profession.

From its inception the Committee on Research has been actively concerned with expanding the quantity and improving the quality of vision research. For a number of years the Committee has maintained a directory of researchers in nonpathological aspects of vision. In 1963 a National Conference on Vision Research was held in Washington, D.C. under the sponsorship of the Committee on Research. The broad purposes of this meeting were to familiarize optometric educators and researchers with research programs and research administration in vision research disciplines outside optometry and to meet with representatives of government agencies concerned with vision research. Since that time the Committee has thoroughly re-evaluated its role and has established action programs to help achieve each of the following goals:

1. The development of more centers of excellence for vision research.
2. A marked increase in the supply of capable researchers.
3. Attention to unanswered questions that affect the competent rendering of visual care.
4. Improved methods of disseminating primary information in the visual sciences.

The Committee recognizes that there are severe shortages of manpower and funds for vision research. A program has been insituted for encouraging capable students in schools of optometry to continue their education in graduate programs in physiological optics, psychology, optics, neurophysiology, and public health. The number of students who have entered graduate work after receiving degrees in optometry and increased six-fold in the last ten years. Four institutions offer graduate degree programs in physiological optics. Currently there are forty-two students enrolled in these programs. All of these students have previously received degrees in optometry. Currently thirty-two individuals have earned Ph.D. degrees in physiological optics. Thirty-one of these have published results of original research within the last eighteen months. It is estimated that the number of graduate degree holders in physiological optics will more than double within the next five years.

Two additional trends are developing which will almost certainly improve the quality and expand the quantity of vision research. A growing number of individuals holding degrees in optometry are earning graduate degrees in basic science graduate departments which have a history of important research in vision. Colleges of optometry are also bringing to their faculties individuals who have strong academic and research backgrounds in the biological, physical, and behavioral sciences and whose primary research interests involve vision.

The above developments are offered as examples which indicate that the capability of inter-disciplinary and broad spectrum vision research is growing. The Committee strongly feels that the best interests of visual science and of the public will best be served by the establishment of the National Eye Institute only if all the academic and professional disciplines which have developed competence and interest in vision research are permitted and encouraged to work within the framework of one organization. We can think of no rationale which would justify limiting research administered or sponsored by the National Eye Institute to studies of disease processes; nor can we think of any reasonable justification for excluding optometric participation, particularly since the research capability that is developing under the aegis of optometry is expanding dramatically.

Mr. JARMAN. They will be received for the record. I might point out to you that naturally when the bells ring and we have to go to the

floor of the House that that will be the end of the time that we can allot to this, so in representing this organization and these professional people, I think you had best do so by highlighting the particular pertinent points that you think the committee should hear because we will miss it if you read page after page and don't get through much of your statement before the bells ring.

Dr. McCRARY. Mr. Chairman and members of the committee, I am V. Eugene McCrary, an optometrist in private practice in College Park, Md. I am a past president of the American Optometric Association and currently serve as director, department of national affairs of the association. I served as a member of the Maryland Board of Examiners in Optometry—appointed twice to 4-year terms by Governor Tawes. I served 10 years as a vision consultant to the industrial vision program at the U.S. Naval Research Laboratory in Washington. Additionally, I hold membership on the President's Committee on the Employment of Physically Handicapped and am also a national consultant to OEO's Project Headstart, a vital part of the President's program of the war on poverty.

My appearance before you today is to express the interest in this bill of the profession of optometry which renders a majority of vision care in the United States. The American Optometric Association is the national body representing our profession in the United States and our membership numbers over 14,000. We have certain misgivings about this proposal to establish a National Eye Institute and feel the need to express our views from our particular vantage point.

We do not feel strongly "for" or "against" the establishment of a National Eye Institute within the NIH complex. We do oppose enactment of this legislation in its present form because it does not specifically state that optometrists and their services must be an integral part of the Institute, if such an Institute is needed to be established.

We have documented a long series of discriminatory practices against optometry by various Government agencies. It is against this background of discrimination and in this context that we feel optometry and optometric services should be specified in the statutory language of the bill. I call your attention now to attachment No. 1 titled "Discrimination Against Optometrists in the Federal Service."

(The attachment referred to follows:)

ATTACHMENT No. 1

DISCRIMINATION AGAINST OPTOMETRISTS IN THE FEDERAL SERVICE

In World War I there were only a few optometrists who were called upon to practice their profession in the Military Service. Most of these were enlisted men and none of them, as far as the records show, were commissioned as optometrists. However, when this country became involved in World War II there was a great need for optometric services, both in the Army and the Navy. The then Surgeon General of the Navy, Admiral MacIntyre, an ophthalmologist, recognized the capabilities and the need for the professionally trained optometrists over the poorly trained corpsman. He caused to be established by Executive Order the Hospital Specialist Corps of the Navy and began commissioning optometrists as Reserve Officers in that Corps. By V. J. Day there were between 130 and 140 optometrists holding Reserve Commissions with ranks ranging from Ensign to Lieutenant Commander. The Army, on the other hand, refused to let any commissioned optometrist practice his profession as such in the service. The result was that the Army trained to perform optometric duties so-called "90-day wonders" who had no optometric education and who were uniformly incompetent to perform the duties assigned them. Approximately half of the optometrists in the Army were commissioned officers all performing non-optometric duties ranging from

artillery, to G–2, to pilots. Some of them were commissioned in what was then known as the Medical Administrative Corps, but even though their duties brought them in contact with the Army Medical Corps, they were not allowed to function in their professional capacity. When it became apparent that in spite of the harmful effects of this policy the Army would do nothing to correct it, the American Optometric Association undertook to secure legislation to create an Optometry Corps in the Army.

The War Department and the American Medical Association strongly opposed the Bill, but the Committee, by unanimous vote, recommended its passage. While the same opposition was encountered in the Senate, the Bill was reported favorably and passed by unanimous consent.

Reaching the White House after Victory in Europe Day, it was vetoed by President Harry S. Truman, who said he had the assurance of the War Department that provision would be made for the commissioning of optometrists in one of the consolidated Corps to be created following cessation of hostilities. In 1947, Congress passed the Medical Service Corps legislation which provided for commissioning of optometrists in the Army, the Navy, and what subsequently became the Air Force. The Surgeons General of the Army, Navy, and Air Force, and the Medical Director of the Veterans Administration have appointed civilian optometric consultants who have performed valuable services to those whom they serve as advisors.

Another problem which we encountered during the war was the matter of deferment of optometry students from the draft. This was resolved only recently with passage of the Military Selective Service Act of 1967 and subsequent Executive Order Number 11360 dated July 4, 1967. In the 1950 extension of the draft law, optometry students were deferred and optometrists were included in the Draft-Doctors Law, but were not included in the special pay provisions of that Law. Bills are now pending in the House to partially correct this inequity by providing incentive pay of $100.00 per month for optometry officers.

A fringe problem of World War II involved the Office of Price Administration (OPA). Optometrists were arbitrarily classed and treated as merchants and were required to comply with OPA price regulations. AOA rightfully contended that optometrists were professional people and should be exempt from the price regulations in the same manner as physicians, dentists, lawyers and other professional groups. From time to time we made some progress, but before a clear-cut decision was reached OPA was abolished and the question became moot.

Following the Japanese surrender, General Omar Bradley was named head of the Veterans Administration and undertook to reorganize the Department of Medicine in the Veterans Administration after securing the services of General Hawley as Medical Director. Legislation to carry out the plan was introduced in the House and passed. The language of the Bill was broad enough to permit the utilization of optometrists in the Veterans Administration even though optometrists were not named specifically. As a result of the battles we had previously had with the Army, the AOA felt that the Bill should be amended in the Senate to make certain that optometrists' services were utilized in the new set up.

At the request of General Bradley and General Hawley, the amendment was not offered, since sponsors wanted the Bill to be passed prior to adjournment, and further amendments may have delayed adjournment.

After General Hawley (himself an optometric patient) was sworn in, it was first brought to our attention that under what was known as the Civil Service Classification optometrists were classified as semi-professional—not professional —and in the list they came next to chorus girls. We petitioned the Civil Service Commission to change the classification of optometrists to professional. The classification was ultimately changed to professional but before an optometrist was appointed, the professional classification was abolished and all federal employees were in a new classification, GS 1 to GS 18. Optometrists were employed in veterans facilities in grades GS 7 to GS 9. We tried to secure a contract with the Veterans Administration whereby veterans entitled to out-patient care could go to an optometrist for those services which could be rendered by an optometrist. We learned that the ophthalmologist consultants to the Veterans Administration threatened to resign en masse if any such contract were concluded.

For several years we continued negotiations with Dr. Hawley's successors, with the same results. There were few veterans qualified for out-patient optometric services. We appealed to Congress for corrective legislation. Several bills were inroduced. All were opposed by the American Medical Association. Finally, Congressman Teague of Texas offered one which passed both the House and Sen-

ate and was signed into law. Now veterans entitled to out-patient vision care may seek the services of an optometrist if they so desire.

Because of the comparatively small number of optometrists in the Federal Government, it was very difficult to get a general reclassification to improve grades for optometrists under Civil Service. In 1966, the Chairman of the Civil Service Commission authorized a revision of the optometry standards. The lowest grade is still listed as GS 7, but any optometrist who has graduated from a 6-year school will enter Civil Service at Grade 9. While the top grades are not as high as we would like to see them, namely, Grades 11 for clinical and 12 for industrial, optometrists who are performing services above and beyond those described in these grades are eligible for a higher grade.

In the 1940's it was brought to our attention that North Carolina and Oklahoma optometrists were were being barred from all Aid to the Blind Vision Programs of the Social Security Administration. Regulations required that in order to qualify for Federal Aid to the Blind Program the person had to be examined by a "physician skilled in diseases of the eye." Optometrists were barred from participating in all State Vision Programs on the theory that one with a vision problem might some day apply for Aid to the Blind under Title X of the Social Security Law. This was disasterous for the optometrists in those States where the regulation was being misconstrued.

In 1950, the Social Security Law was being amended and the American Optometric Association endeavored to secure some language in the Bill which would make it clear that the utilization of optometrists in State Programs would not impair a State's right to Federal funds for its Aid to the Blind Programs.

Led by Chairman Doughton of the House Ways and Means Committee, the Committee reported out the amendment which required that to be approved for Federal Aid to the Blind a state plan must make available to the beneficiaries either the services of an optometrist or a physician skilled in diseases of the eye, whichever he might elect. Both the American Medical Association and the Social Security Administration fought the amendment but it was passed in the House and the Senate. This is still part of the law in spite of numerous antioptometric efforts to amend it by deleting the word "optometrist."

The Interstate Commerce Commission required that motor vehicle drivers engaged in Interstate Commerce must have their vision certified to by a physician. The American Optometric Association was able to prevail upon the Commission to amend their regulation so as to accept vision certification by an optometrist although the rest of the physical examination must be made by a physician.

When the Administration and the Federal Government embarked on an expanded program for health care and education, the legislation as drafted contained language which was broad enough to include optometry, but did not specifically mention it. Based on prior experience, the American Optometric Association recognized that unless optometry was specifically mentioned there was very little likelihood that optometry students, schools or colleges, could benefit. When the administration sponsored legislation to provide financial assistance for health education, the American Optometric Association offered amendments to specifically include optometry schools, colleges and optometry students. All of our amendments were incorporated in the bills as passed. Optometrists are now accorded forgiveness provisions relating to student loans owed by those who serve in the Armed Forces or who practice in approved rural and shortage areas.

The Bureau of the Census for years required reports from optometrists classed along with retail merchants. The forms used were inappropriate for those practicing as professionals. After considerable effort on our part, the Bureau of the Budget reclassified optometrists along with physicians, dentists and other professional practitioners, thereby relieving optometrists who exclusively engage in optometric practice from reporting as merchants.

The most recent glaring example of discrimination has resulted from the administration of Title XVIII commonly referred to as Medicare. When the Bill was pending before the Senate Finance Committee, Senaor Carlson of Kansas offered an amendment which became known as the "Freedom of Choice" amendment in that it accorded the beneficiaries of the Social Security Law the freedom to choose either an optometrists or a physician skilled in diseases of the eye. The amendment was accepted in the Senate but the House conferees removed it. This was the last concession the Senate made as the bill moved out of conference and to the White House. The Secretary of Health, Education, and Welfare had given assurance that Title XVIII would be administered in accordance with the spirit of the Senate amendment. This has not proven to be the case.

Under Title XVIII routine eye examinations and glasses are expressly excluded from the benefits provided by the law. Senator Ribicoff has introduced a Bill this session which would eliminate this discrimination without expanding the benefits.

The Military Services require a cyclopegic eye examination for applicants for Cadet Flight Training. This requires patients of optometrists to go to an M.D. for the eye examination or the optometrist must arrange for an M.D. to administer the cyclopegic and allow the optometrist to complete the examination. This requirement is unscientific, unrealistic, unnecessary and discriminatory.

The Federal Aeronautics Administration regulations have been the source of considerable negotiations both in person and by correspondence covering certification by optometrists of the pilots' visual capabilities. FAA in Washington accepts reports from optometrists, but medical examiners in the field frequently interpose difficulties which result in the applicant being required to have his eyes examined by a physician to secure license renewal.

Within the last 18 months the Public Health Service appointed the first commissioned optometrist. There is a great need for many more optometrists in that service.

There is a marked tendency on the part of those in the Federal Government when they prepare copy for publications dealing with the eye or with vision, to do one of two things: either, to ignore optometry completely, or, to compare the services of optometrists to those of ophthalmologists ridiculing optometry in the process. We must be constantly on the lookout to try to forestall the issuance of such discriminatory and unfair publications.

There can be no question that there has been an awful lot of discrimination against optometry at the national level. Part of it is due to lack of information and part is due to prejudice stemming from professional jealousy. It will apparently continue until better interprofessional relations are achieved and Government officials are better informed.

Dr. McCRARY. We are not convinced of the necessity for establishing an Eye Institute. We find that some of the primary arguments put forth by proponents of the legislation rest, to say the least, on a very shaky foundation of information and statistics which could well be misleading.

Proponents of this legislation state that there is an alarming increase of blindness in the United States and that there exists a dearth of research effort directed toward the prevention of blindness, disease detection, and control. I should like to deal with these two points separately.

First, as to the supposed "alarming increase in blindness," I call your attention to attachment 2, a table showing the combined payments of Federal and State funds to persons qualifying for aid to the blind.

(The table referred to follows:)

ATTACHMENT NO. 2—TOTAL STATE AND FEDERAL PAYMENTS MADE UNDER AID TO THE BLIND PROGRAM, 1955–65

Fiscal year	Total paid	Total recipients	Total population	Percent of total population
1964–65	$98,898,000	94,576	192,119,000	0.049
1963–64	96,665,000	96,438	189,417,000	.050
1962–63	95,001,000	97,793	186,656,000	.052
1961–62	92,819,000	99,580	183,756,000	.054
1960–61	93,991,000	103,422	180,684,000	.057
1959–60	92,309,000	107,556	177,830,000	.060
1958–59	89,066,000	109,062	174,882,000	.062
1957–58	85,397,000	109,844	171,984,000	.063
1956–57	80,610,000	108,431	168,903,000	.064
1955–56	73,064,000	107,483	165,931,000	.064

Source: Public Information Office, Bureau of Family Services, Welfare Administration, HEW, July 13, 1967.

Dr. McCrary. You will note that ever since 1958, the total number of recipients of these funds has decreased every year, while the population has increased every year.

At the same time, the total disbursements to these individuals has increased. In 1958, there were 109,062 recipients, and by 1964, the last full year for which figures are available, the number of recipients had dropped by 14,486. In terms of the percentage of total population qualifying for aid to the blind funds, the 1958 figure was 0.062 percent, as compared with 0.049 percent in 1964. These figures do not indicate an "alarming increase" in the incidence of blindness.

Considered in another light, these figures suggest that proponents of this legislation are basing their promotion on gross assumptions and statistical guesswork, much of which seems to have been drawn from the 1965 annual report of RPB (Research to Prevent Blindness, Inc.) and a more recent publication of NSPB (National Society for the Prevention of Blindness, Inc.). The NSPB "Fact Book 1966" titled, "Estimated Statistics on Blindness and Vision Problems" points up the fact that the increasing number of cases of blindness in the United States can be attributed in some measure to the increased longevity of the population.

On Page 26, the "Fact Book" states:

> The estimated number of cases of blindness in the U.S. has shown a steady upward trend since 1940. Between 1940 and 1960 this increase amounted to 154,700 persons or 67.2 percent. This increase is probably due primarily to the sheer increase in the population. When the estimated rates are compared, it is found that the difference is not too great.

In this 20-year period, the age-65-and-over population increased by 83.3 percent, the population as a whole increased by 35.7 percent, and estimated rate of blindness increased 22.3 percent. The difference between the overall increase in population and increase in blindness seems to indicate a 13.4-percent reduction in cases of blindness—35.7 percent minus 22.3 percent equals 13.4 percent. Yet we are told of an "alarming increase" in blindness.

A proponent of establishing an Eye Institute has stated: "More than 80 percent of all loss of vision in this country results from diseases whose causes are unknown to science." This statement fails to correlate with figures given within the chart on page 46 of the NSPB "Fact Book" which, incidentally, is probably the most comprehensive statistical study I have seen attempted on the subject of blindness.

The estimated total cases attributable to causes "unknown to science," according to the chart, comprise 38 percent of the total. This leads us to concur completely with the statement contained in the introduction on page 6 of the "Fact Book," which reads:

> These estimates are admittedly crude but they have proved useful even though their reliability cannot be measured, and they may be subject to gross and unrecognizable errors.

It would appear that the extensive public information programs by both Government and private sectors of the economy have materially increased the American public's awareness of the need for regular vision examinations. The resulting earlier detection of pathological conditions is beyond doubt a major factor in the decreasing incidence rate of blindness. Gentlemen, we simply are not convinced that "an alarming increase" exists. We are quite certain that proponents of this

legislation have accepted the "scare technique" as the most likely method by which they might sell this bill to Congress.

Let's examine for a moment the statement made by proponents of this legislation claiming a dearth of research effort being brought to bear on the cause of blindness.

NINDB, the National Institute of Neurological Disease and Blindness, has for many years exerted a profound influence on research into blindness and sensory diseases involving human vision. NINDB's focus of more attention on vision problems has consistently resulted in necessary annual appropriation increases to continue its fine work. In some respects, the expenditures for research into blindness may be a bit out of proportion, especially in view of the decreasing incidence rate I cited earlier. While we must comment that the NINDB staff has involved the profession of optometry very minimally in the intramural and extramural programs it controls, we must in all fairness add that the situation is gradually improving.

We are looking forward to the day when a better balance will exist between the support for ophthalmological disease-oriented research and optometric research oriented toward functional vision problems. A great deal more effort—and probably a great deal more money—must be forthcoming to strengthen the scientific foundation of the rapidly expanding optometric sciences. We feel that NINDB has done, and is now doing, good work in research into blindness. We are not sure it would be wise to water down NINDB's efforts by diverting Federal funds to a whole new series of disease-oriented programs under a National Eye Institute.

In a new NINDB booklet published this year, titled "Neurological and Sensory Impairments," we see that the largest single category of research, listed by disease or disorder, is disorders of vision, with 396 individual research efforts underway within the intramural and extramural programs at a total expenditure of $12,403,000. We regret that such a small percentage of this sum is being expended in optometric institutions and in the area of optometric sciences.

The October 1966 issue of HEW's Health, Education, and Welfare Indicators describes NINDB appropriations and funds obligated for vision. In 1965, expenditures totaled $14,343,000. This indicates considerable growth when compared with the 1954 figure of less than $700,000. The same table shows estimated 1967 appropriations and funds obligated for vision as $17,410,000.

These figures represent Federal funding of NINDB vision and blindness research work only. With the millions of dollars expended annually from other Federal Government projects and privately funded research in the field of vision, eye care, and blindness, it is difficult to accept a statement, from whatever source, that there is a dearth of research effort in this field.

The profession of optometry relates in a very meaningful way to current efforts designed to strengthen our national health and productivity. Our primary domain is provision of professional care to maintain and enhance functional vision. The accompanying article and tables (attachment 3) may help clarify the extensive responsibility optometry accepts in this important endeavor.

(The attachment referred to follows:)

ATTACHMENT No. 3

[From the December 1966 issue of the Journal of the American Optometric Association]

THE ROLE OF THE PROFESSIONS AND GOVERNMENT—VISION CARE OF CHILDREN IN A COMPREHENSIVE HEALTH PROGRAM

(Henry B. Peters, O.D., M.A.[1])

A comprehensive program for the health of children must include vision care. In today's visually oriented world, it hardly seems necessary to point out the intimate relationships that exist between vision and school achievement, vision and social development, vision and safety, vision and adjustment, vision and recreation, vision and health. Many activities of the child, his opportunities as well as his achievement, his health as well as his welfare, are related to the widening circles of influence generated by an uncorrected vision problem. A refractive error impedes development of the visual skills needed for reading while the impairment in reading skills leads to educational and social problems that restrict opportunity. Of course, vision neither operates by itself nor accounts for all the characteristics of the child, but it does play a definite and important role in the performance and health of the child.

The importance of vision care for children is attested to by the many state laws that require vision testing in the schools; the public and private programs for the detection of certain vision problems (e.g., amblyopia); the large body of research on the relation between vision problems and school achievement (e.g., reading); the major efforts for the rehabilitation of the visually handicapped, the partially seeing, and the brain injured child; the studies of epidemiological and sociological factors related to vision problems; and research on the relation between chronic disease, acute disease, physical development, sensory performance (including vision), and scholastic achievement. The evidence is overwhelming that a significant proportion of children have vision problems, many undetected, that interfere with their health and performance; and that almost all of these vision problems can be corrected or compensated for using available techniques and knowledge.

As the child grows and develops, vision problems change and new problems appear, thus requiring a continuing program of surveillance and care until the visual system attains a stable maturity in the third decade.

Eye disease occurs only rarely in children, but requires close supervision. Organic problems, including congenital, chronic and episodic disease, general health and nutrition problems, as well as emotional problems and stress, all influence the vision performance of children and require a coordinated, comprehensive and continuing program of care.

Vision care is an important part of any health program for children. Vision problems occur in a significant proportion of children, many undetected, and can be corrected with established techniques and knowledge. Vision care should be part of a coordinated, comprehensive, and continuing program of health care for children.

NATURE OF THE PROBLEM

Vision problems occur with statistically predictable frequency in children. These problems, when present, influence the development, adjustment, and achievement of the child. Vision problems change and new problems appear as the child grows and develops through the adolescent years. The pressure of vision-centered activities of school, recreation, and, later, driving and employment make it imperative to discover vision problems as expeditiously as possible. Not until the end of the teens, when the visual system attains a relatively stable maturity, can we relax this constant vigilance.

Most measurements of vision are continuous variables (with the obvious exception of organic problems). Visual acuity measurements, for example, vary continuously from total blindness to 20/10 with the peak of the acuity distribution dependent on the age and level of eye care of the population group. Significant vision problems represent departures from the mean or normal value. To determine whether a departure from normality is significant is not a simple technical process, but requires professional judgment and a careful evaluation, in each individual case, of the importance of the deviation and its interrelation to the other measurements of vision performance in that child.

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[1] Assistant Dean and Director of Clinics, Associate Professor of Optometry, School of Optometry, University of California, Berkeley.

Table I shows the population under consideration and the distribution of vision problems in numbers and percent for the most prevalent vision problems. In this table, the vision problems are defined as significant deviations from normal, as agreed to by a broad sample of optometric and ophthalmological opinion. It is obvious that some children would have a constellation of problems; for example, a child might have reduced acuity in the left eye, amblyopia, hyperopia, astigmatism, anisometropia, and squint. He would then appear in several rows in the table and each of his vision problems would contribute to the "Total Conditions" but he would be counted only once in the "Total Children."

[Number columns in thousands

TABLE I.—CLINICALLY SIGNIFICANT VISION PROBLEMS OF CHILDREN BY AGE GROUP

[Number columns in thousands]

Age group	0–4		5–9		10–14		15–19		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Population, 1965	21,242	100	20,420	100	18,888	100	16,977	100	77,527	100
Vision problems:										
Visual acuity	850	4	1,225	6	1,700	9	3,059	18	6,834	9
Amblyopia	425	2	408	2	378	2	340	2	1,551	2
Refractive error:										
Myopia	212	1	613	3	2,267	12	2,886	17	5,978	8
Hyperopia	1,487	7	1,225	6	1,133	6	1,019	6	4,864	6
Astigmatism	425	2	613	3	567	3	509	3	2,114	3
Anisometropia	425	2	613	3	756	4	849	5	2,643	3
Coordination problems:										
Squint	850	4	817	4	756	4	679	4	3,102	4
Esophoria	212	1	408	2	378	2	340	2	1,338	2
Exophoria	425	2	613	3	567	3	509	3	2,114	3
Hyperphoria	------	(1)	------	(1)	------	(1)	------	(1)	------	(1)
Organic problems:										
Congential	212	1	204	1	189	1	170	1	775	1
Traumatic	------	(1)	------	(1)	------	(1)	------	(1)	------	(1)
Disease	212	1	204	1	189	1	170	1	775	1
Performance problems:										
Vision performance	1,062	5	2,859	14	3,966	21	4,244	25	12,131	16
Vision development	?	?	2,042	10	2,267	12	1,358	8	5,667	7
Vision perception	?	?	817	4	944	5	679	4	2,440	3
Total conditions	6,797	------	12,661	------	16,057	------	16,811	------	52,326	------
Total children	2,549	12	4,084	20	4,722	25	5,263	31	16,618	21

[1] Less than 0.5 percent.

The existing level of care and its adequacy have a major influence in determining the unmet need. *Table II* presents information on the percent of children in each age group who have had previous professional care (examination, glasses, surgery, etc.) by either an optometrist or ophthalmologist. Effectivity of care is indicated as the percent of those children with vision problems, receiving care, who passed established levels of performance. Two communities of differing socioeconomic levels are compared.

TABLE II.—PREVIOUS VISION CARE BY OPTOMETRISTS OR OPHTHALMOLOGISTS, EFFECTIVITY OF CARE, AND EFFECT OF SOCIOECONOMIC FACTORS

[In percent]

	Age group			
	0–4	5–9	10–14	15–19
Vision problems	12	20	25	31
High income community previous care	3	9	24	39
Effectivity	21	30	41	52
Time since last visit (months)	11	17	18	19
Low income community previous care	?	4	14	18
Effectivity	?	25	30	42
Time since last visit (months)	?	19	26	29

VISION CARE RESPONSIBILITIES AND MANPOWER

The responsibility for the visual welfare of a child must be shared by many individuals and groups. These change with the age of the child. First, observations are made by the obstetrician, later by the pediatrician. Parent observation begins at birth and continues until maturity. In the preschool years, special vision-screening activities are provided by voluntary agencies in cooperation with the vision care professions, local health agencies, service clubs and community welfare groups. At school entering time, the emphasis shifts and educators and school health personnel assume a responsible role. That this organization of vision care is inadequate is shown by the results of every professionally performed vision screening program and clinical study, where 8 to 12% of elementary school children are found to have previously undetected vision problems.

The following *Table III* shows the relationship between the various professional groups and their responsibilities, in terms of usual actions, for the detection of vision problems of children.

TABLE III.—RESPONSIBILITIES FOR DETECTING VISION PROBLEMS BY PROFESSION

Vision problems	Pediatrician	Ophthalmologist	Optometrist	Educators, school nurse	Psychologist
Disease	+	+	+		
Acuity	+	+	+	+	
Squint	+	+	+		
Refractive error		+	+		
Coordination			+		
Visual performances			+	+	
Developmental			+	+	+
Perception			+	+	+

The treatment of vision problems involves complex and overlapping relationships involving a variety of professions. The nature of these relationships are illustrated in the following *Table IV*.

TABLE IV.—INTERPROFESSIONAL RELATIONS IN TREATMENT OF CHILDREN WITH VISION PROBLEMS

Children:			
4 percent	Organic problems: Congenital, Traumatic, Disease	Uniquely	Ophthalmology (100 percent).
20 percent	Refractive error, Visual acuity, Squint	Shared	Optometry (75 percent). Ophthalmology (25 percent).
10 percent	Visual performance, Coordination problems, Vision training, Developmental vision	Uniquely	Optometry (100 percent).
6 percent	Vision perception as it affects reading.	Jointly	Optometry. Educational psychology.
1 percent	Visual rehabilitation, Visual handicapped, Brain injured, Mentally retarded	Jointly	Optometry. Ophthalmology. Psychologist. Rehabilitation personnel. Special teachers.
100 percent	Visual environment: Lighting, Safety	Jointly	Lighting engineer. Architect. Optometrist.
100 percent	Vision health education	Jointly	Optometrist, ophthalmologist, health education, nurse/teacher.

The distribution of optometrists and ophthalmologists is also of concern, particularly with respect to the distribution of the population of children. The distribution by states is shown in Appendix A. Optometrists are more widely disbursed into small cities and towns. Ophthalmologists tend to congregate in the large cities.

A PROPOSED PROGRAM

The clinical requirements of assessing the vision problems of a child and planning an individual program of vision care require a high order of profes-

sional training and professional judgment. Optometrists and ophthalmologists constitute the health manpower trained for these tasks. Because their competencies overlap, but they each have unique skills, a close interprofessional relationship is required in the interests of the children. The training of technicians, varying between 6 month to 2 years, does not prepare them for this kind of service nor does it compare to the training of optometrists, 6 years of college, nor to that of ophthalmologists 8 to 10 years of college. If proper relationships are developed between optometry and ophthalmology, there will be a lessening of the manpower shortage and an improvement in the quality of service to children. There really is little overlap in their interests as shown by the research publications in 1964 of the Department of Ophthalmology and the School of Optometry of the University of California as shown in *Table V*.

TABLE V

[In percent]

Classification	Ophthalmology	Optometry
Anatomy	7	
Disease	12	
Experimental pathology	77	
Neurosensory physiology	2	12
Optics and refraction		45
Visual physiology	2	41
General		2
Total	100	100

It should be the goal of the vision services portion of the comprehensive health program for children that every child, at planned intervals, have: 1) an evaluation of his eye health; 2) an analysis of visual acuity, refractive error, and coordination; and 3) an assessment of his vision performance. These should be explored in as broad a form as possible. The crucial needs are to bring disease under treatment to protect the child's health, to identify the children with problems of vision and remove or compensate for the handicap, to locate the children with vision performance problems so that treatment procedures may be implemented, and to provide these services in an environment of comprehensive health care. Clearly, to do less would be to deny some children the best care we know how to provide.

SUMMARY

If vision care is to be part of a coordinated, comprehensive, and continuing program, it must be provided in the social setting devised for all other health care of children. Optometric, and to some extent ophthalmologic, services have been fractionated, separate from the general health care of children. It is time these professions and their services be brought together for their complementary, rather than competitive, benefit to children and both be made an integral part of the comprehensive program.

The recommendation then is for the Federal Government to enact such legislation as is appropriate to: 1) stimulate the development of a comprehensive approach to the health care of children, including vision care, in: (a) children's health centers where a comprehensive scope of services can be made available, and/or (b) group practice or individual practice arrangements designed to provide the necessary scope of services; 2) provide funds to plan and implement experimental or demonstration programs for children's health care. It is suggested that the units, in (a) and (b) above, be as small as possible and still provide comprehensive care and be as widely distributed in the community as possible to provide easy access. It is recommended that a pediatrician be the person in charge of the professional services of each of the centers or coordinated units, that optometrists and ophthalmologists be active participants in implementing the vision care services, and that these recommendations be written into the legislation. It is highly desirable that optometry's position in these centers or units be established by law, since the history of many private and public clinic programs show discrimination that has excluded optometry to the detriment of the public. The professional skills, knowledge, and judgment of optometrists represent a major health resource that should be utilized.

It is further recommended that universities having Schools of Optometry and Departments of Pediatrics and Ophthalmology be encouraged to explore the development of the vision care units in the comprehensive health program for children.

Finally, it is recommended that the services of these children's health centers or units be available to all children, but primarily to those who would not otherwise receive adequate care.

APPENDIX A.—LICENSED OPTOMETRISTS AND CERTIFIED OPHTHALMOLOGISTS RELATED TO THE POPULATION OF THE UNITED STATES OF AMERICA

State	Population	Certified ophthalmologists	Population per certified ophthalmologists	Licensed optometrists	Population per licensed optometrists
Alabama	3,407,000	42	111,905	184	18,510
Alaska	250,000	3	83,333	16	15,625
Arizona	1,581,000	44	35,932	128	12,351
Arkansas	1,933,000	20	96,650	143	13,517
California	18,084,000	669	27,031	2,461	7,348
Colorado	1,966,000	72	27,305	201	9,781
Connecticut	2,715,000	99	27,424	279	9,731
Delaware	491,000	11	46,364	33	14,879
District of Columbia	808,000	64	12,625	182	4,439
Florida	5,705,000	155	36,806	514	11,099
Georgia	4,294,000	57	75,333	287	14,962
Hawaii	701,000	18	38,944	65	10,785
Idaho	692,000	13	53,231	96	7,208
Illinois	10,489,000	269	38,992	1,992	5,265
Indiana	4,825,000	88	54,829	547	8,821
Iowa	2,756,000	38	72,526	359	7,677
Kansas	2,225,000	34	65,441	245	9,082
Kentucky	3,159,000	48	65,812	246	12,841
Louisiana	3,468,000	61	56,852	248	13,984
Maine	989,000	22	44,954	123	8,041
Maryland	3,432,000	73	47,013	195	17,600
Massachusetts	5,338,000	182	29,329	852	6,265
Michigan	8,098,000	179	45,240	786	10,303
Minnesota	3,521,000	88	40,011	425	8,285
Mississippi	2,314,000	21	110,190	130	17,800
Missouri	4,409,000	94	46,904	483	9,128
Montana	705,000	13	54,230	91	7,747
Nebraska	1,480,000	30	49,333	184	8,043
Nevada	408,000	10	40,800	37	11,027
New Hampshire	654,000	12	54,500	78	8,385
New Jersey	6,682,000	175	38,183	732	9,128
New Mexico	1,008,000	19	53,053	74	13,622
New York	17,915,000	735	24,374	1,838	9,747
North Carolina	4,852,000	55	88,218	338	14,355
North Dakota	645,000	13	49,615	82	7,866
Ohio	10,100,000	208	48,558	1,056	9,564
Oklahoma	2,465,000	35	70,429	262	9,408
Oregon	1,871,000	65	28,785	324	5,775
Pennsylvania	11,459,000	301	38,069	1,373	8,346
Rhode Island	914,000	16	57,125	141	6,482
South Carolina	2,555,000	26	98,269	166	15,391
South Dakota	715,000	10	71,500	193	7,688
Tennessee	3,798,000	60	63,300	320	11,869
Texas	10,397,000	220	47,259	844	12,319
Utah	992,000	34	29,176	86	11,539
Vermont	409,000	9	45,444	35	11,686
Virginia	4,378,000	71	61,661	265	16,521
Washington	2,984,000	88	33,909	400	7,460
West Virginia	1,797,000	39	46,077	159	11,302
Wisconsin	4,107,000	89	46,146	454	9,046
Wyoming	343,000	10	34,300	38	9,026
Total	191,334,000	4,798	39,877	20,610	9,283

Sources: Blue Book of Optometrists, 1965–66; Directory of Medical Specialists, 1965; Bureau of the Census, Statistical Abstracts, 1965.

Dr. McCrary. Optometry has a duty and a responsibility to participate with both government and private sectors of the economy in the formulation of vision research efforts and better methods of delivering this essential health service to the American people.

Optometry has assumed this rightful role under many Federal programs. To mention just a few, there are titles V and XIX of the Social

Security Act; programs of the Office of Economic Opportunity—specifically Project Headstart and the neighborhood health centers; and our rapidly expanding participation in establishment of comprehensive health centers under the Elementary and Secondary Education Act. Optometrists, members of the U.S. Public Health Service Commissioned Corps, work to combat trachoma in areas where American Indians show a high rate of incidence.

We firmly believe that the U.S. Public Health Service should rapidly expand the number of optometrists in the Commissioned Corps and should more fully utilize the unique expertise of our profession.

The American Optometric Association has affirmed by resolution its recommendation that each and every member cooperate and participate in every possible way to strengthen existing vision care programs at the State level in low vision clinics for the partially sighted in providing functional vision care services to State welfare recipients, in formation of driver licensing standards, in the spectrum of optometric services offered at comprehensive health centers, and a number of other vital activities of similar nature.

Today our profession stands on the threshold of a renaissance in the understanding of the functions of human vision. We have the capacity and the duty to clinically apply this new knowledge to the maximum benefit of mankind. But a tremendous amount of research remains to be done in all areas of clinically applied knowledge. Referring again to the recent NINDB booklet "Neurological and Sensory Impairments," we note that none of the research funds has been directed toward the problem of children's reading disability.

The booklet states that some form of reading disability affects an estimated 150 children per 1,000, or some 15 percent of the entire school-age (5 to 17 years) population. An estimated 10 percent suffer from so-called specific dyslexia, a disorder which is the current subject of a number of optometric and nonoptometric studies. We would like to see the role vision plays in reading disabilities given more attention within the framework of NINDB. Optometrists would like to have the opportunity to lend their knowledge of functional vision to such a program, working toward solutions of difficult problems such as dyslexia and other vision-related reading disabilities.

Optometry has been defined as "the art and science of vision care." In this definition we urgently need to strengthen the "scientific" half.

The Nation needs answers to a number of pressing questions, such as: (1) What is the role of vision in relation to the safe functioning of our astronauts in space?; (2) What role does vision play in relation to learning problems, school dropouts and juvenile delinquency?; (3) How and to what degree can America improve her industrial capacity through better utilization of visual science in a visual environment which becomes increasingly complex each day?; (4) What emphasis is to be placed on the value of adding vision standards to job training and retraining programs?; (5) What toll will the computer age take on human vision and how can we best adapt to the new computer-oriented environment?; (6) How can mankind make maximum use of its visual capacity in order to keep abreast of the technological and information explosion we presently face?; (7) How important is vision to our national defense posture?; and (8) How do we effectively organize all available manpower in the vision field to search out the answers to these and hundreds of related questions?

The American people stand to reap great rewards as optometry and coordinate disciplines join together to address these research questions, seek workable solutions, and implement the answers with appropriate action programs for the application of the new found knowledge.

I would like to inject here, before I conclude my statement, that optometrists of this Nation in no way wish to minimize the fact that blindness is a horrible affliction. It is. I hope to also leave with you a clear understanding that serious impairment of functional vision is likewise a difficult condition for those who suffer it, exacting a terrible toll in lost capacity, productivity and in human suffering. We optometrists would like to see full utilization of every available resource and every shred of scientific knowledge to prevent blindness and reduce or combat functional vision impairments.

Optometry is America's first line of defense against blindness. Over 70 percent of Americans who have or suspect that they have a vision problem rely upon optometrists for their visual examinations and care. It stands to reason that a profession which renders the majority of vision care in the United States has a vital stake in the establishment of any new Institute which has as its purpose—

. . . the conduct and support of research for new treatment and cures and training relating to blinding eye diseases and visual disorders, including research and training in the special health problems and requirements of the blind and in the basic and clinical sciences relating to the mechanism of the visual function and preservation of sight. . .

To provide the comprehensive vision research proposed by this legislation, optometric participation is required in all aspects of program planning and execution. We feel strongly that specific statutory provisions must be made for the inclusion of optometry in the National Eye Institute by Congress if Congress in its wisdom decides to enact this legislation. We herewith submit our proposed amendments.

AMENDMENTS TO H.R. 12843, PROPOSED BY THE AMERICAN OPTOMETRIC ASSOCIATION

Page 2, line 11, before the word "and" insert "including optometric procedures for the improvement".

Page 2, line 24, after the word "that" insert "(1) and the Council established under this section shall include one or more members who have a Ph. D. degree in Physiological Optics; also one or more members who are licensed optometrists, and (2)".

Page 4, line 6, before the word "with" insert "including those which may be corrected by optometric procedures".

Page 4, line 10, after the word "institutions" insert "(including training, instruction, traineeships, and fellowships in optometry)".

Dr. MCCRARY. Thank you for your attention and for the opportunity to appear before you today. I will be happy to try to answer any questions you may have.

Mr. ROGERS. Thank you very much, Dr. McCrary. Your statement is most helpful and we are delighted to see our friend Bill MacCracken here. It is always good to have him up here before the committee.

Mr. KYROS. It is nice to see you again, Dr. McCrary. I enjoyed your statement very much. I think it is an outstanding statement and I know your organization and association does an outstanding service to the United States.

If I understand your statement, you are not fully in favor of the bill as it stands. You have read the bill, Dr. McCrary?

Dr. McCrary. Yes, sir. I have read the bill and in its present form, Mr. Kyros, we are afraid that optometrists will not be integrated into the programs of the institute unless specific statutory language is provided in the bill.

Mr. Kyros. In an appendix to your remarks you have included amendments. For example on page 2, line 11 you propose that before the word "and" insert "including optometric procedures for the improvement . . ."

Also on page 2 line 24 you also want an insertion that the council shall include one or more members who have a Ph. D. in physiologic optics and one or more members who are licensed optometrists.

Can you explain again so we can have it clearly why you feel these inclusions should be made to include optometrists in this kind of institute or a council working toward a national institute.

Dr. McCrary. The council which would be established in this piece of legislation performs a very important function. They would exert a great deal of influence with regard to determining the course which research activity will take. Optometry is a separate and distinct profession. It is not a part of medicine, dentistry or any other profession. It has an area of knowledge which is unique and an area of expertise which is unique, and we feel that optometry must be involved at every strata, including the council which will be involved in setting policy and perhaps in determining research directions and trends, that an optometrist—at least his knowledge—should be available and on tap as a member of that council in order to get a fair hearing for this profession in terms of strengthening the research program within our profession.

Mr. Kyros. On page 4 of this bill under section 453, the last page of the bill, it talks about the eye institute maintaining trainingships and fellowships in relation to diagnosis, prevention and treatment of blinding eye diseases. Now, in the area of prevention, do you think that is where optometry could serve a greater role than anywhere else—prevention?

Dr. McCrary. In terms of the total concept of the institute our profession can play a role in all aspects of the operation of the institute in both the intramural and extramural research programs.

Certainly in prevention we play a primary role throughout the United States since we see the majority of the patients who originally seek eye care, so prevention, yes, in terms of early detection of various types of eye diseases and disorders or occular signs and referral to the proper person whether it be to an ophthalmologist or neurologist or whoever the proper person may be.

(The following table was subsequently submitted by Dr. McCrary:)

Optometry's role in functional vision care

Total population	200, 000, 000
Persons with some form of eye trouble	100, 000, 000
Persons with functional vision problems (other than those involving disease or serious pathological conditions) whose needs can be met entirely by optometrists	46, 500, 000
Persons with disease or serious pathological conditions requiring medical or surgical treatment	3, 500, 000
Persons with functional vision problems involving disease or serious pathological conditions whose needs can be met by optometrists following medical treatment or surgery	1, 750, 000

RESPONSIBILITIES FOR DETECTING VISION PROBLEMS BY PROFESSION

Vision problems	Pediatrician	Ophthalmologist	Optometrist	Educator, school nurse	Psychologist
Disease	X	X	X	----	----
Acuity	X	X	X	X	----
Squint	X	X	X	----	----
Refractive error	----	----	X	----	----
Coordination	----	----	X	X	X
Visual performance	----	----	X	X	X
Developmental	----	----	X	X	X
Perception	----	----			

Dr. McCRARY. There is a role in prevention, but there is a large role in the area of subnormal vision clinics, where people are not legally blind but are between good sight and legal blindness. There have been some outstanding programs throughout the United States. In this area, I would cite the Industrial Home for the Blind in New York City as an example, in the various programs of the proposed Institute optometry would play a larger role—a larger role, I would hope, in implementing program activity.

Mr. KYROS. I want to thank you for coming here today. I think your testimony has been most valuable to the committee.

Mr. ROGERS. Thank you very much.

This concludes today's hearing and the committee is adjourned subject to the call of the Chair.

(At 12:15 p.m. the committee adjourned, subject to the call of the Chair.)

NATIONAL EYE INSTITUTE

WEDNESDAY, NOVEMBER 1, 1967

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON PUBLIC HEALTH AND WELFARE,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2322, Rayburn House Office Building, Hon. David Satterfield presiding (Hon. John Jarman, chairman of the subcommittee).

Mr. SATTERFIELD. The subcommittee will come to order to continue considering H.R. 12843 and companion bills to establish an eye institute at the National Institutes of Health.

We are glad to have the chairman of our full committee, Mr. Staggers, present today and I will call on him at this time to introduce our first witness for this morning.

Mr. STAGGERS. Mr. Chairman, thank you for giving me the privilege of introducing one of my colleagues from the State of West Virginia.

We have as our first witness this morning Dr. Ralph W. Ryan, treasurer of the American Association of Ophthalmology.

I have known Dr. Ryan for some 15 years since he was connected with the Institutes of Health. Since he has come back to West Virginia he has been my personal eye doctor and is the eye doctor for my entire family. I think he is one of the greatest eye doctors in the country. We travel some distance to visit him.

Dr. Ryan travels not only all over this land but some other nations of the world in his profession. We are very happy to have him with us today.

I feel this is a very important bill and I am sure that the committee wants to hear from you. We have different colleagues who have introduced bills along the same line and I think it is important to our land.

So we are very happy to have you.

STATEMENT OF DR. RALPH W. RYAN, TREASURER, AMERICAN ASSOCIATION OF OPHTHALMOLOGY

Dr. RYAN. Mr. Chairman and Congressman Staggers, I feel honored at this introduction.

I am a private practicing physician in the field of ophthalomology in a small town; namely, Morgantown, W. Va.

I would like to make a statement today and I have divided this statement into two or three categories which I will read to you.

I have made it rather general. I have drawn some statistics that come largely from research done by Dr. Duane and Mr. Stein's Research to Prevent Blindness, Inc. Perhaps when it comes to statistics

for blindness, more effective questioning can be directed to them regarding this.

On the importance of sight, I would like to state that sight provides the average individual with at least 80 to 90 percent of the knowledge of his environment. Sound waves can be heard at best only a few miles, but light waves travel the seemingly limitless expanses of the universe to show us the distant stars.

Loss of this precious window to the world about us dooms most of the blind to a life of dependency and frustration in a surrounding of perpetual darkness. Even with all of our rehabilitation measures, the income of the blind is usually at the subsistence level.

The families of the blind also are often subjected to great hardship because of lost family income or the task of caring for the blind person's physical needs.

The effect of blindness on the public is less devastating but is terribly expensive. Our estimated 1 million blind, augmented by some 30,000 newly blinded each year, costs us an estimated billion dollars annually.

Cost of rehabilitation, cost of subsistence of the blinded individual and his family, loss of productivity, and loss of taxes, all increase the annual tax burden on the public.

Disorders of the eyes constitute the Nation's leading cause of disability. Some 90 million Americans are estimated to require correction or treatment of some eye difficulty. Some 3.5 million of these have permanent noncorrectable defects.

A million persons are estimated to have undiagnosed glaucoma, one of our leading causes of blindness. Glaucoma is one of our most damaging eye diseases and the cause of a great deal of our blindness.

The United States is estimated to have 1.5 million persons blind in one eye.

Most of us accept good vision as a matter of course. But the fear of blindness among our people is second only to the fear of cancer as the worst thing that can happen to us.

In spite of our fear, in spite of scientific advancement, blindness has increased in incidence some 340 percent since the 1940's.

The increased lifespan of adults and the decreased mortality of premature babies have both worked to increase the incidence of blindness.

MAGNITUDE OF OUR EYE RESEARCH NEEDS

Eighty percent of all our blindness is estimated to be the result of diseases whose cause or basic mechanism of action is not adequately understood. This lack of knowledge is apparent throughout both basic and clinical research.

This, again, is from statistics furnished by Dr. Duane, which he can probably explain better than I.

To give nonmedical people an idea of the tremendous variety of things which must be explored in eye research, the following outline is presented:

A. Anatomical factors, covering embryological development, gross anatomy, microscopic anatomy, and neuroanatomy of the eye and also the pathways in the brain and the visual cortex.

B. Biochemical, biophysical, pathologic, pharmacologic, physiologic, and psychologic factors in the eye in health.

C. Changes in the biochemical, biophysical, pathologic, pharmacologic, physiologic, and psychologic factors in the eye in aging and in all the various diseases of the eye or of the body as a whole.

D. Relationships of eye diseases to systemic diseases such as diabetes, hypertension, and arteriosclerosis.

E. Hereditary and congenital eye diseases such as retinitis pigmentosa.

F. Eye diseases typical of infancy and childhood such as retrolental fibroplasia which was so much in the news a few years ago and which caused so much blindness in premature infants.

G. Refractive errors and their correction by spectacles, contact lenses, drugs, surgery, et cetera.

H. Ocular motility problems and their correction.

I. Infectious agents such as bacteria, fungi, viruses, in causation of eye disease.

J. "Degenerative" eye diseases such as macular degeneration which we are so powerless to do anything about at the present time.

K. Eye injury from trauma, radiation, chemicals and drugs, which again is becoming more prevalent in our highly industrialized environment.

L. Neoplastic eye diseases such as retinoblastoma and malignant melanoma.

M. Corrective or palliative therapy of eye diseases or conditions by (*a*) medical measures, (*b*) surgical measures (*c*) physical measures, (*d*) refractive measures, (*e*) prosthetic measures.

N. Instrumentation used in ophthalmology and ophthalmological research.

O. Statistics gathering, processing, and interpretation regarding eye disorders, which is one of the weakest links. The statistics gathering in regard to blindness has been very poor in the past.

P. Sociologic and economic research in sight conservation in the community, in industry, and in military service.

Q. Rehabilitation of the blind: (*a*) Braille and other aids to communication; (*b*) reading machines; (*c*) aids to locomotion; and (*d*) low-vision aids.

PRESENT STATE OF EYE RESEARCH

The inadequacy of present eye research becomes evident when we contrast the less than $10 million spent annually for research with the $1,000 million dollars spent on the blind. We are investing in the pound of treatment—not cure— rather than the ounce of prevention.

In that regard I would like to read a statement which I noticed in one of the NINDB publications for 1967. The NINDB "Profile No. 3, Eye Disorders 1967."

I notice this statement on page 4 under "Training":

> The research community working in the field of vision and its disorders is proud of its record of accomplishment. However, the responsibility and challenge are enormous when compared with the small number of clinical and basic science investigators in the field.
>
> The task ahead must be contrasted with the small size of the research establishment.

This is from the National Institute of Neurological Diseases and Blindness in the current year.

Like most other types of research, the significant findings are being made largely by highly trained and experienced workers and often by coordinated efforts of groups working on a common project.

Expensive laboratories with such costly equipment as computers, radiation counters, electron microscopes, and highly sophisticated electronic, chemical, and physical measuring devices are now routine.

The so-called basic research is best corrdinated with clinical research in most types of projects. Thus, the medical school or teaching hospital provides the usual environment where the laboratory and equipment for basic research can be combined with clinical facilities and clinical subjects for research.

The trained manpower is usually more easily available in the medical school or teaching hospital.

However, the laboratory, the equipment, the trained manpower, and the clinical cases for eye research do not automatically occur in any institution. They are provided only by advance planning by some group of dedicated people able to obtain large sums of money and convert it into the ingredients of research.

Only about one-fourth of our medical schools have outstanding eye research facilities at the present time. Most of these have been provided largely by grants from the Federal Government, and most of these, incidentally, are found in the schools where the department is a separate, independent department and not a branch of some other specialty of medicine such as general surgery.

The grant system has helped to provide coordination of what research is now being conducted. Federal funds have also aided in training scientists to carry out research activities.

Results of research endeavor are now made available to the rest of the scientific community by papers presented at numerous professional meetings, and published in a great variety of technical journals.

ROLE OF NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS

The National Institute of Neurological Diseases and Blindness was established in 1951 with the thought of providing for research needs in both the neurological and ophthalmological fields.

Unfortunately, the name "blindness" connotes a negative approach of research in sight conservation.

Dr. William Hart was chief of the eye branch of the Institute when I joined it in June 1953. Our staff then consisted of two doctors, Dr. Hart and I, and a secretary. We set up an eye clinic for examination of patients and organized a research project in uveitis.

We later set up projects in glaucoma and strabismus in cooperation with the Eye Department of Howard University. A biochemist was later secured and began a study of the proteins making up the lens of the eye.

Dr. Hart resigned during the autumn and I became Acting Chief of the ophthalmology branch. No beds were available for inpatients, hence our first project on uveitis was largely carried out on ambulant patients and in collaboration with the Laboratory of Tropical Diseases of the Institute of Allergy and Infectious Diseases which did serological tests on our patients for toxoplasma gondi.

It was just a happenstance that with most of the research projects we had, what collaboration we had was with other institutes rather than with our own.

The results of this first research project of the ophthalmological branch of NINDB were reported to the American Academy of Ophthalmology annual meeting in 1954, the title being "Diagnosis and Treatment of Toxoplasmic Uveitis."

This first research project was significant in that the methods of diagnosis and treatment delineated in the report still have worldwide acceptance. It was representative of the stated purposes of the clinical center to provide a place where basic and clinical research could be combined.

The results of this project were important enough to lead Congressman Fogarty to tell his colleagues that this one research project repaid to the American people all the costs of the National Institutes of Health up to that time.

During the ensuing months, I proposed a modest increase in budget, facilities, staff, and new projects for the Ophthalmology Branch. It was refused by the Director of the Institute with the explanation that when the Neurological Diseases Branch was built up sufficiently he would see what he could do for us.

As I recall, when I left the NINDB in 1955, the entire staff of our Branch consisted of about 12 people—a very small group of people to tackle the problems of blindness in the United States.

Since 1955 the Ophthalmology Branch has carried out very valuable research under the capable supervision of Ludwig von Sallman.

However, I feel sure it has been limited by budget, space, facilities, and manpower. This statement I read to you from the research profile, I think, substantiates that. From a study of the budgets of NINDB from 1954 to 1963 it can be seen that only some 16 or 17 percent of each annual budget was obligated for eye research.

One need not be critical of the NINDB administrative staff for not providing more generously for eye research. It is only natural to consider one's own specialty as having more urgent problems and greater importance than another with which one is not so familiar.

The Ophthalmology Branch has always been in the role of an appendage to the Institute and could hardly expect to be considered otherwise.

Instead of criticism, ophthalmologists are thankful that we have had the Ophthalmology Branch of NINDB to give the leadership it has rendered.

It can now serve as the nucleus about which to establish a National Eye Institute. The lesson for us is that we must have an independent institute if eye research is to grow and develop as its tremendous importance to the people justifies.

The National Eye Institute will become a symbol and focus about which the people and organizations interested in eye research and sight conservation can group.

Hardly any of them now realize we have an eye institute under this camouflage name of "blindness." It will become the fountainhead and coordinator of eye research and the repository of scientific advances in the field of eye research.

It is our hope that this Congress will realize the vast need for more medical knowledge to enable us to prevent or more successfully treat the various diseases causing loss of sight.

It must not fail the people of the United States in protecting them against the most disabling of all physical handicaps, blindness.

Let us have a National Eye Institute where doctors of medicine can bring together scientists of many disciplines to aid them in discovering the scientific truths that will prevent an ever increasing number of our people from living in perpetual darkness.

Mr. Chairman, this is all I have to say.

Do you have questions you would like to ask?

Mr. SATTERFIELD. Thank you, Dr. Ryan. I have one or two brief questions.

I understand from your statement then that you feel it would be impossible to achieve the objectives you think should be achieved within the present framework of the National Institute of Neurological Diseases and Blindness?

Dr. RYAN. When one uses the word "impossible"——

Mr. SATTERFIELD. Improbable.

Dr. RYAN. Improbable or unlikely would be better. I think it is extremely unlikely that it will be achieved. The present setup is illogical.

Mr. SATTERFIELD. Is it possible there could be a reorganization that would produce what you desire?

Dr. RYAN. I think the only thing that will give eye the status it needs and appeal to the public and the country will be an independent eye institute to serve as a symbol not a portion of another institute.

Mr. SATTERFIELD. I don't want to put you on the spot but based on your experience and expertise, do you have some idea as to the amount of money you feel should be budgeted for research in the area of the eye?

Dr. RYAN. I could only give a vague estimate. I would say that we need about four times what we have now and that would probably run about $40 million a year.

Mr. SATTERFIELD. For eye alone?

Dr. RYAN. For the eye alone.

Mr. SATTERFIELD. Dr. Carter?

Mr. CARTER. Thank you, Mr. Chairman.

There have been many new developments concerning the eye, particularly concerning eye surgery. Can you tell us about some of this research?

Dr. RYAN. I think all phases of eye surgery needs research. We are doing research in removal of cataract lenses and retinal detachments.

There have been many developments in that. We need research in practically every field of surgery. There may be new things entering the field of surgery such as refractive error. We know the largest number of retinal detachments occur in myopic people.

It has been noticed when you treat the high myopia with retinal detachment surgically in one of the common operations where we treat this by removing a strip of sclera it reduces the amount of myopia.

In the country of Japan this has been very successful. There have been cases of removal of sclera around the eye merely for cutting down the degree of myopia.

Mr. CARTER. Have we done much of this in the United States?

Dr. RYAN. Not too much has been done on people in this country. I cite this as one indication of the extent to which medical research and surgery needs to go. We have many new approaches that could be followed if we had the funds, the facilities and the manpower to carry these out.

Almost every field of surgery could be exploited further, and has to be in the future.

Mr. CARTER. For more direction you need more funds?

Dr. RYAN. Yes, I think the beginning point is getting a setup which is logical and then having the funds provided and the rest of these things will gradually fall into place.

Mr. CARTER. Do you feel the present National Institute of Neurological Diseases is proceeding along these lines as it should?

Is it giving enough emphasis toward research and development of new techniques in eye surgery?

Dr. RYAN. I think the Eye Branch has probably used the funds it has available to the best advantage possible to do research in both the basic field and the clinical field. I think the bottleneck has been the lack of funds, the lack of prestige in having a separate institute, the lack of having a symbol about which the organizations of the country who are interested in sight conservation can focus themselves and attach themselves as to a figurehead.

The way it is up now it is very awkward for them to say they adhere to this institute of "blindness."

Blindness is a negative approach to this whole problem.

It is part of another Institute. So it is just illogical.

I think as long as we have this setup, we will never have the proper focus on eye research that the importance of this type of research justifies.

Mr. CARTER. I certainly agree with you, Doctor. I do think certainly we need to have a separate Eye Institute. Of course, I introduced a companion bill to Mr. Rooney's to this effect.

Mr. JARMAN (presiding). Mr. Kyros?

Mr. KYROS. Doctor, have you had an opportunity to read the testimony of our Surgeon General, Dr. William Stewart?

Dr. RYAN. No, sir; I have not. I was not able to get a copy of his testimony.

Mr. KYROS. I will not try to summarize it but one of his major points in opposing the bill was the National Institute of Neurological Diseases and Blindness already included within it, as you discussed somewhat the kind of research and study that could be done on eyes without having a separate institute or council.

I just want you to be aware that that is one of the things he said.

What do you feel, becoming very concrete and specific, are the weaknesses that now exist in this ophthalmological branch with the NINDB.

Give us some concrete instances of weaknesses that you feel exist.

Dr. RYAN. The first weakness is there is not one at the head of the Institute who is ophthalmologically oriented. We can't expect a pediatrician to direct an orthopedic clinic. I am just citing this to give you an idea of what I mean.

I think that the overall program planning and the direction of the program should be in the hands of someone who is oriented in the field

of ophthalmology so he will have the interest and the zeal to go ahead in this.

Mr. KYROS. If I remember Dr. Stewart's testimony, his argument to that point is you can't separate the eye from the rest of the nervous system, that it is an integral part of it and having it in the family of allied neurological problems was the best place to have it and if you remove just the Ophthalmologic Branch from the whole field of neurological diseases and blindness, you would dilute the efforts that would be available.

How do you answer that argument?

Dr. RYAN. I will agree there are certain phases of research in which there is need for collaboration between the ophthalmologist and the neurologist and the neurosurgeon but I think in present-day ophthalmology there is probably even greater need for collaboration between the ophthalmologist and the man in internal medicine and in the other fields of medicine.

When I was there I can't recall a single bit of research that we did—of course, this was early in the Institute—in which we collaborated with the other branch of our Institute.

Instead, nearly all of our collaboration was with other Institutes.

Actually, the eye is a tract of the brain and while the visual tracts are a portion of the brain and the visual cortex, the function and the nature of the situation is such that it becomes a whole field in itself.

It is entirely different from all of the other sensory parts of the body as I tried to bring out in my first paragraph here and it is of such importance that I think it warrants complete consideration by itself.

Regardless of the fact that it happens to be related to the nervous system, it is related just as much to the general systemic body by such diseases as hypertension, diabetes, and many others as it is to the brain.

For research purposes, I think a separate institute is extremely important.

Mr. CARTER. Would the gentleman yield?

Mr. KYROS. I would be very pleased to.

Mr. CARTER. The eye is a mirror of many, many diseases; is it not?

Dr. RYAN. That is true.

Mr. CARTER. By looking at the retina we can tell if a person has diabetes or hypertension and we can see arteriosclerotic changes and, also, we can tell about brain tumors if there is increased pressure, and so on.

So, in establishing this separate institute, of course, you would want to work with various other groups, such as internal medicine people as you have indicated.

Of course, it is just as important to communicate with them, perhaps even more so, than it is with neurologists.

Dr. RYAN. We found it is so in the 2 years I was at the Institute. We had much more in common with other Institutes than we had with other branches of our own Institute.

The purpose of the National Institutes of Health was to bring together all those Institutes, and collaboration was the rule when I was there, so that merely being a separate institute would not remove the possibility of full collaboration whenever there was opportunity for research to become more advantageous by such means.

Mr. CARTER. I believe the Surgeon General said it would only cost an additional $800,000 to establish this Eye Institute which in this day and age of huge spending is merely a drop in the bucket.

Mr. KYROS. I have to disagree that $800,000 is a drop in a bucket. Just the other day we cut out a project in Maine that would cost $800,000.

Mr. CARTER. If I remember correctly, that project in Maine would be something over a billion dollars once you get your foot in the door with $800,000.

Am I not correct in saying the final cost of that would be $1,500 million?

Mr. KYROS. No, sir.

Mr. CARTER. Since you brought up this subject, please state what the final cost of the Dickey-Lincoln project would be.

Mr. KYROS. The fact is $800,000——

Mr. CARTER. Quiet please. I didn't get your reply.

Mr. JARMAN. I think it might be more appropriate to get this information apart from this testimony.

Mr. KYROS. The fact is that $800,000 additional would have to be spent to set up an additional Eye Institute.

Dr. RYAN. I have no figures to support that.

Mr. KYROS. These are the figures presented by the Surgeon General.

Dr. RYAN. I am sure the present Institute could be used as the nucleus to establish a separate Eye Institute.

Mr. KYROS. The Surgeon General said yesterday the problem was not just obtaining money but it was obtaining the personnel for the Institute.

He suggested they were simply not available and by taking them out of the current program they now have at the National Institute you would just dilute that program.

How do you answer that argument?

Dr. RYAN. I fail to see in what way it would dilute it. I think one would still have the same number of research workers available as before.

With a separate Eye Institute there would be a chance of interesting more people in going into research, I believe. I believe that that one factor would be instrumental in increasing the interest in eye research, and the interest in eye research and the funds precede the availability of trained personnel.

I would say it would enhance that effort instead of discouraging it.

Mr. KYROS. If you have an opportunity, I would like to get a copy of the Surgeon General's statement for you because he said the main problems are in the area of trained manpower and good research ideas.

I thought he suggested that was the main problem rather than the problem of setting up a new council or adding new money.

Dr. RYAN. I fail to see at all how making a separate institute could make less people available or make it more difficult to get trained personnel and also the same goes for ideas and research.

I would think a separate institute would create more interest and enhance the likelihood of getting ideas for research because the people of the country would have something to look toward as an entity.

I feel at the present time that a good portion of the people of the United States do not realize that we even have any research institute

set up for eye research because it is camouflaged under this name of "blindness."

Mr. KYROS. Do you know what the median annual salary is of ophthalmologists in the United States?

Dr. RYAN. When you say "salary," do you mean those working in governmental positions?

Mr. KYROS. No; private ophthalmologists.

Dr. RYAN. I am unable to state that.

Mr. KYROS. Does a figure of $37,000 sound about right?

It is a statement that was made in some of the testimony yesterday.

Dr. RYAN. I don't make that much; I doubt that it is that high.

Mr. KYROS. To get people to work at the National Institute at the salary level would perhaps be a sacrifice to some of these people.

Dr. RYAN. I don't know why it would be any more difficult than getting heads for other Institutes.

I don't know how much money could be offered the head of an Institute, but regardless, I think having a separate institute will enable Congress, or will justify to Congress the appropriation of more funds, and will make it more likely that such a person could be secured to direct the Institute.

Mr. KYROS. According to the Surgeon General, the maximum allowable salary at the Institute would be about $25,800. If the median is indeed around $37,000, it would be a sacrifice to a lot of people and would deter them.

Dr. RYAN. I feel people would more likely make the sacrifice to be the head of an independent Eye Institute than to be head of a portion of an institute that is named "blindness."

Mr. KYROS. Do I understand it then, sir, in reviewing this proposed bill, H.R. 12843, that you are in complete support of every bill and you are not proposing any amendment to it as it exists?

Dr. RYAN. I am not proposing any amendments.

Mr. KYROS. You see, the function the Surgeon General plays throughout the bill. It seems to me he has pretty much control of the entire program.

Dr. RYAN. I think this is true of all the Institutes. This is probably a type of organizational structure that all of them have and I assume there would be little possibility of setting this up in a different way from the other Institutes of Health.

Mr. KYROS. Do you believe that optometrists should serve on the advisory council established under this bill?

Dr. RYAN. I would rather leave the administrative aspects of it alone to be worked out later after such an Eye Institute was established.

Mr. KYROS. I appreciate that, but do you have a judgment yourself? You have relationships with optometrists in your own experience as an ophthalmologist. What is your own opinion as to whether they should be included in the advisory council?

Dr. RYAN. These are a group of people who have training in certain aspects of eye care. I would be inclined to think that if we include them we probably would feel like including the biophysicists, the biochemists, various other people of Ph. D. status.

I know some of the optometrists have Ph. D. status in such fields as physical optics and such a person might be useful, particularly in an advisory capacity.

But, I think the administrative aspects might best be worked out later on. I think we are more interested in getting the factual setting up on an Eye Institute and let all of the details be worked out as best decided.

Mr. KYROS. Your testimony then, as I understand it is, notwithstanding these criticisms which appeared in the Surgeon General's report, you think it would be a highly beneficial thing to have the National Eye Institute?

Dr. RYAN. Yes; I do, unqualifiedly.

Mr. CARTER. I believe the Surgeon General stated at the present time there are six ophthalmologists in the National Institutes of Health and according to the information brought out this morning, each probably receive a salary of $25,000.

Now, it is true we might have to pay $37,000 for a higher caliber ophthalmologist, but don't you think that certainly we should do this in order to assist our blind?

Dr. RYAN. I think the cost of the salary here would be just a very small consideration when it is contrasted with the importance of this Institute to the American people—the prevention of blindness, the reduction of eye disease, the more effective treatment of eye disease.

Mr. CARTER. Actually, don't you think we should turn these stumbling blocks thrown into the picture by the Surgeon General into stepping stones toward helping alleviate blindness?

Dr. RYAN. Yes; I do.

Mr. JARMAN. Dr. Ryan, we appreciate very much your taking the time to be here this morning and contributing to our hearings.

Dr. RYAN. I am grateful for the opportunity to give this testimony. The organizations I am testifying for are the American Association of Ophthalmology which has something over 3,000 members and my State Academy which has about 50 regular members and 100 associate members.

Mr. JARMAN. Our next witness will be introduced by our colleague from Texas, Mr. Young. The witness in turn will introduce the distinguished panel which will be sitting with him.

Congressman Young?

STATEMENT OF HON. JOHN YOUNG, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. YOUNG. Mr. Chairman, it is a great honor and privilege for me to be here and especially so for you to extend to me the privilege of introducing one of the truly outstanding professionals of the world in the field of ophthalmology.

It is seldom that we see on the Hill here at the Capitol such a distinguished group of outstanding men in any profession as we see here in this room today.

I count myself singularly honored that I have had the good advantage and the good fortune to have had a relationship with the gentleman whom I am introducing, both as a physician and patient, but as important to me too as friend to friend.

So, I think typical of the group he joins here today in this most worthy of causes, it is my honor and privilege to present to you Dr. Edward Maumenee of Johns Hopkins Hospital.

Mr. JARMAN. Dr. Maumenee, we do appreciate your being with us and if you would introduce the other members of your panel, the committee will hear all of you with great interest.

STATEMENT OF DR. A. EDWARD MAUMENEE, DIRECTOR, WILMER EYE INSTITUTE, JOHNS HOPKINS HOSPITAL, BALTIMORE, MD.

Dr. MAUMENEE. I think you have the introduction of these men in some detail so I will take the time to introduce them by name only at this time.

On my right are Doctors Stein, Straatsma, Cogan, and Kaufman.

On my left are Doctors Duane, Hogan and Newell.

Mr. Chairman and members of the committee, it is a great privilege to be allowed to testify before your subcommittee on health.

I am Dr. A. Edward Maumenee, professor of ophthalmology of the Johns Hopkins University School of Medicine, and director of the Wilmer Eye Institute of the Johns Hopkins Hospital.

I am immediate past president of the section of ophthalmology of the American Medical Association; past chairman of the Association of University Professors of Ophthalmology; and first vice president of the International Society for the Prevention of Blindness; and chairman of the American Board of Ophthalmology.

I am a member of the Council of the Pan American Association of Ophthalmology; a member of the Council of the American Academy of Ophthalmology and Otolaryngology; and a trustee of the Association for Research in Ophthalmology.

I am a special consultant at the Walter Reed Army Hospital, the U.S. Naval Hospital in Bethesda, and the Clinical Center of the National Institutes of Health.

One of the most vital considerations in the establishment of a separate National Eye Institute is the need for a Director of the Institute whose whole orientation is directed to the problems of visual disorders.

Indeed, one of the great needs of the eye program in the present Institute of Neurological Diseases and Blindness has been to have an associate director or a deputy director whose training and thinking are focused on eye care.

But in spite of the exhaustive efforts of Dr. Richard Masland, the neurologist who is the Director of the National Institute of Neurological Diseases and Blindness, it has not been possible to find a suitable eye specialist to head the research and training programs in ophthalmology.

This was made clear in the hearings of the Labor/HEW Subcommittee on Appropriaions in 1966.

In the course of those hearings, there was an interesting colloquy between the late Congressman John E. Fogarty and Dr. Masland, who were engaged in a discusion on the establishment of a National Eye Institute. The dialogue was thus:

> Mr. FOGARTY. What do you think about establishing an eye institute on blindness?
>
> Dr. MASLAND. The Department has taken the position that the question of blindness research can be dealt with within the Institute of Neurological Diseases and Blindness.
>
> Mr. FOGARTY. I am not asking the Department. I am asking you.
>
> Dr. MASLAND. From the personal point of view, we in the Institute have put a great deal of effort into the development of a research program for blindness.

Mr. FOGARTY. I know you have, but it took you years to get off the ground. You looked for 3 years to get a qualified ophthalmologist.

Dr. MASLAND. We still do not have an ophthalmologist in the office of the director to provide total central leadership.

I might add that even today such a person is still lacking at the National Institute of Neurological Diseases and Blindness.

One might ask, "Why do you need a specialist in eye disease to direct a program of eye research in a combined institute; and indeed, why must one be an ophthalmologist to head a separate eye institute?"

The reasons are quite clear. Would you have a specialist in obstetrics and gynecology direct programs on arthritis and broken bones?

Would you have a specialist in kidney disorders supervise heart surgery?

Would you have a pediatrician look out for the problems of the aged?

Would you have a cancer specialist organize research in diabetes?

Would you have an ophthalmologist administer brain surgery or take care of such diseases as multiple sclerosis, Parkinsonism and stroke?

Although all the specialists who have been mentioned are of course physicians, and at one time during their study and training knew something of the diseases mentioned, each field is now so highly technical that physicians have found it necessary to specialize in these areas in order to give patients the best possible care.

Therefore, in order to assure the most efficient and effective use of public funds that are appropriated for research into the causes and prevention of blindness, it is vital to have an ophthalmologist who thoroughly understands these problems to guide and administer the Government program.

Not to do so would be much like holding this present hearing before a subcommittee on rivers and harbors.

It has been said that the eye is an extension of the brain and that therefore research on blinding eye disease is closely related to neurology. There are connections, of course, although only the retinal tract itself is an extension of the brain.

The point regarding neurology is quite misleading here, however, for even a cursory review of the causes of blindness shows the following:

Corneal disease involves microbiology, virology, immunology, and the physiology of corneal transparency;

Glaucoma involves membrane transport systems, biophysics, physiology, and genetics;

Cataracts and macular disease involve a specialized study of the relation of the vitreous and its physical and chemical structure to the aging process and degeneration of the retina;

Uveitis involves virology, bacteriology, parasitology, and immunology;

Strabismus and other eye muscle problems involve refraction, orthoptics, and ophthalmic surgery;

Refraction, low vision aids and contact lenses involve the varied aspects of physiological optics and visual aids.

A detailed discussion of these and many other ocular lesions is contained in the report of the Subcommittee on Vision and Its Disorders

of the Neurological Diseases and Blindness Council, which was made in November 1966.

This report clearly shows that most of the blinding eye diseases are not problems of neurology.

There are two other reasons—of almost equal importance to those just cited—why an ophthalmologist is needed to direct ophthalmic research in the National Institutes of Health.

First, the eye, because of its unique physical properties, lends itself to the study of basic physiological problems in a manner that cannot be accomplished in other areas of the body.

Thus, the cornea, because of its avascularity and particular cellular structure, offers unique opportunities for studying the homograft rejection problems; that is, how to keep a newly grafted, clear cornea from going bad.

Information gained from this type of research will be of great value in the successful transplantation of other vital organs such as the kidney, lung, liver, and heart.

Conjunctival and corneal infections caused by viral agents offer an unusual opportunity to study the effect of chemicals and antibiotics on virus disease in man.

Many agents can be used topically on the eye which are too toxic to be used in the systemic treatment of such viral infections as colds, pneumonia, measles, smallpox, et cetera, and once effective agents have been found, they can be modified so that their toxicity can be reduced.

The lens of the eye is suspended in the ocular fluids or aqueous, free of blood vessels. It becomes opaque or cataractous because of aging and other metabolic processes.

Thus, the lens is like an in vivo tissue culture and offers unusual opportunities for studying these processes and defects.

Knowledge obtained from a study of the secretion of the aqueous will shed much light on the problems of secretion of the cerebral spinal fluid by the chorodial plexus, and urine by the kidney.

Another important reason why an ophthalmologist is needed to direct the ophthalmic activities of the National Institutes of Health is that the eye is "the window of the body."

It is affected, at least in some respects, by almost all systemic diseases. One professor of ophthalmology likes to tell his class each year that if a student can name five systemic diseases in which the eye is not involved, the student will automatically pass ophthalmology.

It is not possible in this testimony to name all the systemic diseases that effect the eye; but a few are: diabetes, hypertension, thyroid disease, leukemia, anemia, bacterial and viral infections, and many neurological problems.

To summarize, an ophthalmologist is needed to direct a separate eye institute because:

(1) Most blinding eye diseases are not directly problems of neurology;

(2) The eye offers a unique anatomical area to study basic metabolic and physiological processes;

(3) The eye is affected by most systemic diseases, and knowledge gained from the study of these ophthalmic complications will be helpful in understanding disease processes in other areas of the body.

This understanding, and the basic eye knowledge from which it flows, can be developed only by an institute director highly skilled and specifically trained in ophthalmology.

One of the aspects of the Eye Institute to which an ophthalmic director would devote himself would be the training of a much larger number of eye specialists than we have today.

Eye specialists are needed in the academic fields of teaching and research, as well as in the practice of clinical ophthalmology.

There is no lack of interest in ophthalmology among medical students who must make a decision on the field of medicine to which they are to devote their lives.

For the past 5 years, between 95 and 98 percent of the approved residencies in ophthalmology in this country have been filled. This is in contrast to other medical specialties in which only about 60 percent of the residencies have been staffed.

It is clear from these figures that we need to have more residencies available, and we need to have more qualified young men coming out of the medical schools to fill them.

Not only is there the shortage in the academic areas of ophthalmology, there is an even greater shortage of eye specialists in practice to take care of the patients who need their ministrations.

Right now, there are so many more patients in need of specialized eye treatment than there are ophthalmologists to give it that there is often a waiting period of from 2 to 4 months between the time a patient feels the need for seeing an eye specialist and the time he can get an appointment with one.

Such a person's well-being—and in the case of ocular malignancies, even his life—may be involved.

Moreover, this shortage of practitioners compounds the research and teaching problem in ophthalmology because men in clinical practice are able to earn large sums of money.

There is such a great need for their services that many men are drawn toward ophthalmological practice and away from teaching and research largely because of financial considerations.

This imbalance between practitioners and academicians, and the overall shortage of both, will require the full resources of a highly qualified doctor with ophthalmological orientation as director of a separate eye institute.

Only if we place these problems in the proper setting of ophthalmologic medicine can we hope for a reasonable solution.

Even then the solution will not come easily; but the first necessary steps will have been taken, without which we can hardly expect a solution.

In addition to addressing himself to insuring a larger flow of qualified ophthalmologists, a specialist director of a national eye institute would be able to devote himself to an intensive drive on the various ophthalmological disease problems which need concentrated and continuing attention.

These areas can be recognized by other medical men, but they can be appreciated in their true context and in their full significance only by an ophthalmologist who has had full exposure and training in them.

These are such areas as corneal opacification, glaucoma, cataract, retinal detachment, uveitis, strabismus, myopia, et cetera.

These eye problems, by their very nature, cannot be properly initiated and cannot be expected to flourish unless they are under the direction of a man who has devoted his entire professional life to ophthalmologic medicine.

There is no doubt that although Dr. Masland has not been able to find an eye man of sufficient stature to take over the position of Deputy Director of the National Institute of Neurological Diseases and Blindness for Ophthalmology, we shall have no such difficult in finding an outstanding ophthalmologist to take on the duties of director of a separate eye institute.

The reason is that the outstanding men in the field of ophthalmology are strongly and rightly dedicated to their specialty; they believe in its vital importance and in its proper existence as an entity in itself.

Many brilliant men I know would not hesitate to accept such a position because it would enable them to contribute so much; but they would do this only if they could be the final administrative judge of what is to be done regarding eye care without their decisions being subject to the veto of another man, whose professional specialty is in another field of medicine.

Thank you very much, Mr. Chairman and gentlemen, for the opportunity of appearing before you today to urge your approval of the legislation for a new and separate eye institute in the National Institutes of Health.

Mr. JARMAN. Thank you for your statement.

Our colleague, Congressman Fred Rooney, will introduce the next witness.

It would be well if the committee could hear from the panel first and then have questions and answers.

STATEMENT OF HON. FRED B. ROONEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. ROONEY. Thank you, Mr. Chairman, for giving me the opportunity to introduce the next witness.

Dr. Thomas D. Duane formerly practiced ophthalmology in the city of Bethlehem, Pa., part of my congressional district, and much has been said about the manner in which we can obtain qualified ophthalmologists to work for the Government at a salary of $25,800, which is allowed under the law.

Out of the dedication to his profession, Dr. Duane left a very lucrative practice in the city of Bethlehem. He is now professor of ophthalmology at Jefferson Hospital in Philadelphia and I am sure his compensation today is far less than it would be had he still been practicing in the city of Bethlehem.

I also want to take this opportunity to congratulate all of the doctors who appear on this panel today who traveled to Washington to testify before this distinguished committee from as far east as Rome and as far west as Los Angeles. I know they have gone to considerable personal time and expense to appear here today.

STATEMENT OF DR. THOMAS D. DUANE, PROFESSOR OF OPHTHALMOLOGY, JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, PA.

Dr. DUANE. Thank you, Mr. Chairman, and Congressman Rooney, for that introduction.

My name is Dr. Thomas D. Duane. I am professor and head of ophthalmology at Jefferson Medical College Hospital, in Philadelphia.

I am here today, also as an investigator who is intimately involved in efforts to discern the mysteries of the visual system and one who has had the unique opportunity to survey in depth the present state of ocular research in the United States.

During 1962 and 1963 I spent 14 months in the conduct of a nationwide survey in which I examined at firsthand the conditions under which eye research was being carried on throughout the entire country.

I traveled more than 50,000 miles making personal site visits to over 100 institutions and research laboratories in every part of the Nation.

I had an opportunity to observe what they were doing, what they were capable of doing, what resources currently were available to them, and what their potential for accomplishment would be if more and better resources were made available to them.

I interviewed more than 600 medical school deans, administrators, department heads, and researchers, among them the most eminent leaders in the field of ophthalmology and ophthalmic research, men whose knowledge, experience, and productivity are respected throughout the profession.

These discussions covered all aspects of ocular research quality, quantity, shortcomings, and potential. In addition, I received quantitative data from questionnaires sent to all the eye research laboratories as well as information stemming from science information exchange.

This material was compiled in a publication of Research To Prevent Blindness, the voluntary medical research foundation which commissioned the survey and obtained my services with the consent and cooperation of the trustees and dean of the Jefferson Medical College.

The publication was entitled "Ophthalmic Research U.S.A." A copy was sent to each Member of Congress.

The evolution of the need for the survey has bearing on my testimony today. Research To Prevent Blindness, Inc. was organized in 1960 and was operating with the expert scientific advice of a small group of ophthalmic research leaders.

It became apparent to them that in order to plan for effective programs of research sponsorship, it was necessary to have in hand a total picture of the current status of eye research.

This would disclose the nature and substance of ongoing research efforts and would evaluate unmet needs and neglected opportunities which merited increased attention and responsible action.

This voluntary organization therfore committed $130,000 of private funds to conduct the nationwide survey and to publish its findings. Before this time a similar survey had been planned and underwritten by NINDB in the field of neurological sciences.

Dr. Aura Sevringhaus, an eminent scientist and former associate dean at Columbia, was retained for this purpose. I believe it is significant to point out that though the economic costs of blindness equal or exceed those of neurological diseases and though the manpower shortage in ophthalmology equals or exceeds those in neurology, no similar

survey was planned by NINDB in the field of visual research. This pinpoints the orientation of those who have been making policy program decisions at NINDB.

I will not attempt to even list all the recommendations and conclusions based on the eye survey. I believe it is worthy of note, however, that though this was the product of the best thinking at that time, few of the recommendations calling for Federal sponsorship have been undertaken.

There is one statement in the publication that I would like to call to your attention, namely:

> The following recommendations are made with the emphatic statement that ophthalmic research support must be a joint effort involving all segments of our society both public and private. . . . A separate National Institute for Ophthalmology within the National Institutes of Health is a need which must now be anticipated and ultimately acted upon.

In my talk to over 600 individuals concerned one way or another with ophthalmic research, I did not find anybody truly opposed to this concept for the future, although a handful had minimal reservations about its immediate necessity.

That was in 1962–63.

I think you should know that today it is the conviction of the overwhelming number of investigators in eye research that the time has since come to seek establishment of such an institute, and among many of them is the opinion that it is now overdue.

One of the most eminent of these men has spoken for the rest of us in the following words:

> The creation of a separate institute would be the most important thing that has ever happened to ophthalmology. At present, we are limited to a predominantly neurological division of the National Institutes of Health, which however gracious, can never understand fully the problems and requirements of ophthalmology.
>
> Under the present system, we are committed to being a small appendage with minor opthalmic representation in the administration. One should not forget, of course, our debt to neurology for permitting us to be allied to their Institute during our formative years.
>
> But opthalmic research is now sufficiently established that a separate institute might well be justified.

Ironically, there is a parallel today between our relation to NINDB and the relation some 15 years ago of NINDB to the National Institutes of Health.

The NINDB was established by law in 1950 but for the first couple of years the funds for the then new Institute were included in an item called Operating expenses, NIH.

The Chief of the Neurological Institute, who was then Dr. Pearce Bailey, was not able to testify to the Appropriations Committees of Congress on the detailed needs and programs of NINDB as the chiefs of the other institutes were.

He was on hand at the hearings to provide information and material as his superiors called on him to do.

But it was the Director of NIH who gave the testimony for the "Operating expenses" item in which the NINDB's funds were contained.

In March 1952, the late Congressman John Fogarty, who was the chairman of the House Health Subcommittee on Appropriations brought this to the attention of the House of Representatives in the course of debate on the health appropriations bill.

Mr. Fogarty stated on the floor of the House:

In spite of a long history of proposals and the introduction of bills by Members of Congress, the National Institute of Neurological Diseases and Blindness was not established by law until August 1950, and even then we did not see fit to activate this Institute by appropriation until the current year.

When finally we did make funds available, the budget of $1,137,400 was less than was recommended by the most conservative medical authorities for research alone into just one of the major neurological diseases.

Let us no longer procrastinate in giving this Institute a working program in fact as well as in name. Let me remind you that our procrastination has not gone unobserved, and there is already evidence of doubt concerning the Government's willingness to serve the just needs of those for whom this Institute was established.

Mr. Fogarty then discussed the matter with his opposite number in the Senate, the Honorable Dennis Chavez of New Mexico.

They agreed that the Institute would never be able to flourish under this arrangement.

They said it would have to be liberated from the NIH operating expenses and put in the budget as a line item in its own right.

They told the Bureau of the Budget that if this were not done voluntarily they would break the item out themselves beginning with Mr. Fogarty when he brought the bill up in committee the following year.

Senator Chavez said he would do the same thing. The Bureau of the Budget, responding to the pressure of the two chairmen, gave the Institute an identity of its own.

The following year, 1953, when the appropriations bill for fiscal year 1954 was on the floor, Congressman Olin Teague of Texas brought the situation up to date when he said in debate:

Unfortunately, in past years, the funds for the Institute of Neurology and Blindness were covered in with other funds of the Public Health Service and perhaps inadvertently were not given the attention that funds for the other institutes were given.

This year for the first time, the Institute of Neurology and Blindness is a line item in the budget and is being treated on the basis it deserves as a budget item.

The funds being appropriated in this bill for the institute will enable it to do more than it did last year.

But when we consider that the concept of such an institute goes back to the days of Dr. Harvey Cushing, who more than 30 years ago recommended such a setup, we can readily see that for many years nothing was done in a medical area which affects millions of our people.

We must make up for the deficiencies of these intervening years. Starting with the additional progress represented in this bill for fiscal year 1954, we must give our most serious attention to the development of the program throughout the rest of 1953 and the first part of 1954, so that a year hence we can reevaluate the need and at that time provide more adequate funds in this field.

It was only from this point forward that Dr. Bailey was able to do justice to the needs of the NINDB, no longer covered by the umbrella of "Operating expenses, NIH."

And only in this way was the NINDB able to experience the growth and development it has enjoyed in the ensuing 15 years.

We in ophthalmology find ourselves today in the same relationship to NINDB as NINDB did to NIH in 1952. We are able to supply a few words here or there on one or another of our needs.

Unfortunately, we are always overshadowed and inhibited by alining these to neurological disorders.

Our funds are not separately estimated, our programs do not have their own exclusive identity and our presentations have to be subordinate to the presentations of an alien and remotely related discipline. We deplore being rated as poor cousins. We ask you gentlemen for the same relief from the structure of NINDB that NINDB asked from NIH. We ask you for a separate eye institute and we contend now that our need is at least as urgent and our case is just as valid as that of the NINDB in 1952.

Thank you very much.

Mr. JARMAN. Thank you very much, Doctor, for your fine statement.

Will you introduce your next panel member?

Dr. MAUMENEE. Michael Hogan is our next witness from the panel.

STATEMENT OF MICHAEL J. HOGAN, M.D., CHAIRMAN, DEPARTMENT OF OPHTHALMOLOGY, UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL, SAN FRANCISCO, CALIF.

Dr. HOGAN. Mr. Chairman and gentlemen, I am Michael Hogan, professor of ophthalmology and chairman of the Eye Department of the University of California in San Francisco.

I am pleased to be here today to offer to this committee and to the Congress my views on the need for a separate and independent Eye Institute in the framework of the National Institutes of Health.

I would like to discuss in particular the way in which ophthalmic research and training are carried on in the medical schools in this country and especially in my own institution and to show how the medical school experience applies to the National Institutes of Health.

To begin, I would like to indulge in a brief historical review of the administrative development of ophthalmology in the older institutions in Europe and then bring us up to date through its development in the American system.

European universities recognized in the last century that ophthalmology should have an important place in the teaching, administration, and research performed in the medical schools.

The ophthalmology departments of such universities as Vienna, Paris, Heidelberg, Prague, Rome, Berlin, London, and Edinburgh, became world famous for their research and the care of eye diseases, and for their teaching.

The recognition of ophthalmology by these universities came about because of the need of the population for eye care. For this reason many famous physicians found it important to specialize in eye diseases.

The demand for eye care was due to the prevalence of trachoma, cataract, glaucoma, retinal detachment, cancer, and inflammations of the eye.

Up to World War I, European ophthalmology dominated world thought and research in eye diseases. American physicians before this time almost had to visit famous European clinics in order to acquire the knowledge to treat eye diseases.

Early in this century, the specialty of ophthalmology was hardly recognized by most American medical schools, even though the needs of the public were great.

Finally, in order to raise the standards of practice, American ophthalmology organized the American Board of Ophthalmic Examinations in 1918—the first medical specialty to establish scientific qualifying examinations for eye practitioners.

Medical schools soon became very much aware of the importance of this specialty, and a number of outstanding schools, therefore, established separate departments of ophthalmology by detaching them from the department of surgery.

There still existed a large group of individuals in medical schools who were opposed to the idea of splitting the various specialties in medicine from the main departments of medicine and surgery, principally because of supposed administrative efficiency.

These individuals did not wish to have too many competing departments in the medical school. It was established, however, that this attitude was not the best for teaching, research, and patient care, and in recent years more and more schools have created separate departments of ophthalmology, dermatology, otolaryngology, orthopedics, urology, neurology, and neurological surgery.

Along with the establishment for many separate eye departments in medical schools during this century, there has been a unique development of eye training and research in institutes of ophthalmology, especially in the United States.

These include the Howe Laboratory at Harvard, Wilmer at Johns Hopkins; Institute of Ophthalmology of Columbia in New York City; Proctor Foundation at the University of California in San Francisco; Jules Stein Institute at the University of California at Los Angeles; Doheny at the University of Southern California, Weeks at the University of Oregon; Oscar Johnson at Washington University; Institute of Ophthalmology at the University of London; Bishop at the University of Washington; and the Institute for Vision Research at Ohio State.

These eye institutes have been created mostly within the administrative area of the eye department. Their existence makes it possible to provide proper guidance and support for the solution of the problems of blindness.

The fact that these institutes and laboratories were formed testifies to the importance of eye diseases in the minds of private individuals who support them.

The idea for the creation of a separate National Eye Institute, therefore, has strong scientific precedents. Separate departments of ophthalmology can plan teaching facilities, budgets for teaching and research, and patient care, unhampered by a department of surgery and its tendency to lump all personnel, funds, and teaching activities as well as to curtail special programs.

My knowledge of departments of ophthalmology in this and other countries is based on 30 years of administration, teaching, and research, on 4 years of observation as a member of the NINDB Training Grant Committee; on 10 years as an examiner for the American Board of Ophthalmologic Examinations; and on 20 years of lecturing and study of schools of medicine and departments of ophthalmology.

I am convinced that ophthalmology is more effective in those schools where it is separated from surgery. I am also convinced that this would be true if a separate National Eye Institute were established in the National Institutes of Health, separate from neurology.

The most outstanding eye departments in the United States, to mention a few, are Harvard, Columbia, Johns Hopkins, University of California at San Francisco, Washington University of St. Louis, Western Reserve, Ohio State, and the Universities of Oregon, Miami, Emory, and Duke.

They are all separate departments in their respective medical schools. Since the separation of ophthalmology is recognized nationally by the most important medical schools, and because eye is not associated with neurological diseases in any medical school, there is every reason for the Congress to recognize this difference in the National Institutes of Health, to provide better direction to the research and training in the field of eye diseases.

I had my eye training in a division under the Department of Surgery at the University of California Medical Center in San Francisco.

This division was severely handicapped because the professor of surgery was not interested in its welfare, or in developing a strong teaching department.

Finally, because of the low national status of the eye division, the dean decided to grant separate status to the ophthalmology department.

Since 1952, when autonomy was granted, this eye department has developed into one of the most outstanding in the school, as well as in the world.

It receives substantial support from our Government and private organizations. In contrast, those departments still under surgery at the same school—neurological surgery, urology, and ear, nose, and throat, have not developed into strong departments compared to eye and orthopedics, which have separate status.

It is evident that eye diseases constitute a separate entity and the needs of the school and public are best served by a separate department.

With very few exceptions, or under very special circumstances such as endowments and the like, those departments not separated from surgery have not thrived.

Since there is no example of a medical school in the world in which the eye department is integrated with neurological diseases, there seems to be no question that the eye portion should be separated from the National Institute of Neurological Diseases and Blindness.

Those new medical schools in which ophthalmology has become outstanding as a separate department from surgery include the University of Miami, University of Florida, and University of Washington.

The reason they have thrived is because they have been able to attract strong young departmental leaders with foresight, who can develop good research and training programs.

This same relation seems to exist, in my mind, in the NINDB, where, because of the failure to separate eye from neurological diseases, an ophthalmologist director has not been obtained.

I certainly would not accept the position of director of the eye program in the NINDB, if it were offered, for the reason that I do not think that eye research and training can develop under the present organizational arrangement, even if the National Advisory Council of the NINDB is changed to include more proper representation of ophthalmology.

I also do not think that the newly formed Advisory Subcommittee on Eye to the National Advisory Council of the NINDB will solve the problems of eye training and research because there still will be a lack of strong central direction by an ophthalmologist and a failure to provide the internal organization for a free director to implement the needed programs.

The administration of the NIH is opposed to a separate Eye Institute because it supposedly will contribute to the fragmentation of the Institutes.

The Director of the NIH, however, proposes to separate the National Institutes of Health from the Public Health Service and he makes out a good case for such a separation.

It does not seem logical, therefore, for him to object to a separate Eye Institute on the basis of fragmentation.

Until a separate Eye Institute is created, ophthalmologic training and research will continue to be inadequate, mainly because of a lack of adequate ophthalmic direction within the NIH.

Under the present organization program projects may be reviewed by committees which have inadequate ophthalmologic representation, in comparison with committees in other components of the NINDB and HEW.

Of the 12 members of the Advisory Council of the NINDB, only three are from the field of blindness, and until recently, one of these was a layman, one biochemist working with the eye, and the other an ophthalmologist.

A member of the present Council states that ophthalmology is not properly represented and the recently established Ophthalmic Advisory Committee to the Council is not likely to overcome the deficiencies of the NINDB in research, training, and teaching in ophthalmology.

With 30 years of experience in education, training, and research in the field of ophthalmology, I can look back and obtain a good perspective of the contributions of various organizations to this field.

I have always been hopeful that the NINDB would develop a well-directed program and provide direction toward the needs of ophthalmology.

The overburdened administration and lack of ophthalmic direction has seriously interferred with the development of strong programs in the treatment and prevention of serious blinding eye diseases.

As with those medical schools which refused to establish strong eye departments years ago, the NIH will never develop a strong program for the study of eye diseases until there is a separate Eye Institute.

I trust you gentlemen will approve the legislation before you.

Thank you very much.

Dr. MAUMENEE. Mr. Chairman, our next witness from the panel is Dr. Frank Newell.

STATEMENT OF DR. FRANK W. NEWELL, PROFESSOR AND CHAIRMAN, DIVISION OF OPHTHALMOLOGY, UNIVERSITY OF CHICAGO, CHICAGO, ILL.

Dr. NEWELL. Mr. Chairman and members of the committee, I am Frank W. Newell, professor of ophthalmology and chairman of the Division of Ophthalmology at the University of Chicago.

I am editor in chief of the American Journal of Ophthalmology, an independent scientific journal with a circulation of 10,500 in the United States and abroad.

Currently, I am president of the Association of University Professors of Ophthalmology and chairman-elect of the Association for Research in Ophthalmology. Both of these organizations have unanimously endorsed legislation to provide a National Eye Institute within the National Institutes of Health.

I appear before you today to tell you why we believe the legislation authorizing a National Eye Institute should be approved.

In the past few years ophthalmologists and laboratory scientists concerned with the causes and cures of blinding disease had discussed what could be done to bring to bear the benefits of modern scientific technology on the prevention of blindness and on restoring vision in those who have already lost their sight.

We have considered the leadership, the creative concepts, and the methods which must be used to meet the expanding health requirements of our country. It is our belief that these problems are so great that they can be coped with only by an institute fully and exclusively devoted to vision research.

The development of a science proceeds through several stages, each dependent on what has gone before. Modern surgery was not possible until the development of anesthesia, followed shortly by the knowledge of antisepsis and the prevention of infection.

Modern atomic science depended significantly upon the demonstration of radioactive particles by the Curies and the demonstration of X-rays by Roentgen.

The study of visual disorders phase of research has reached a sophistication and maturity so that blindness is prevented and vision is salvaged for more individuals than every before.

A variety of studies now underway promise even greater rewards in the future.

In the past few years ophthalmologists have pioneered in the initial demonstration of the first effective treatment for virus diseases.

Through a miracle of ingenuity, technical and surgical skill, individuals blinded with dense scars at the front of the eye have been restored to nearly normal vision by means of ingenious plastic lenses substituted for the hopelessly scarred cornea.

Modern techniques of cataract surgery, or glaucoma operations, and retinal detachment surgery have preserved vision in individuals who would otherwise have been hopelessly blinded.

The study of the eye and its diseases has thus reached that auspicious moment when giant advances are possible both in treatment and the discovery of the causes of blinding eye disease provided there is adequate leadership and properly oriented research.

I have prefaced my remarks to emphasize that we are seeking approval of legislation establishing a National Eye Institute not because of a problem which is ill-defined and unstudied, with the steps necessary to solution unclear, but because ophthalmic scientists at this moment have the tools and the knowledge necessary to make a concerted effort upon the causes of blinding disease that will be of immediate benefit to the people of this country and all the world.

Since the establishment of the National Institute of Neurological Diseases and Blindness, research in blinding eye disease has been managed administratively by this group.

The association of blinding eye disease with neurologic disorders is at best an artificial one.

The amount of blindness and visual disability that is caused by neurologic disease is minute. Additionally, many research techniques in neurological disorders, particularly those involving the central nervous system, are at the very earliest stages of development.

In contrast to this, the blinding diseases caused by inflammations of the eye, are in an organ easily accessible to observation, study, and treatment.

When one considers the number of individuals blinded by diabetes, by diseases of the blood vessels, by inflammatory disease, and by nutritional disease, it would be just as logical to include research in blindness in the National Heart Institute or the National Institute of Allergy and Infectious Diseases.

I emphasize this point principally to impress on you that the study of blinding eye disease constitutes an independent field and there is little likelihood that research can be expanded and applied unless eye diseases are managed in an independent institute.

My colleagues and I believed that a National Eye Institute would prove to be a vital instrument in the prevention of blinding disease.

With an institute focused solely on blinding disease, national leadership would be provided to expand the present research base and apply the findings of investigation to the conquest of blindness. It would provide administrative leadership by the Director of the Institute and a properly oriented approach by his staff and the advisory council for the Institute.

Such a national advisory council would encompass not only talented scientists for scientific consultations, but leaders of philanthropy in blindness and rehabilitation familiar with the needs and problems of the blind and the requirements or returning the blinded citizen to his proper place in society.

The influence of such a national advisory council dedicated to the prevention and cure of blinding eye disease cannot be underestimated.

Ad hoc committees, special advisory committees, and subsidiary groups reporting to the Director of an Institute and his staff cannot provide the leadership and advice that a National Eye Advisory Council could provide.

The establishment of an Eye Institute would call for an Institute Director skilled in the field and a staff dedicated to the problems of blinding disease and capable of bringing together the best medical minds to develop the creative concepts and the methods necessary to meet the challenge of blindness.

Such a group would provide an impetus for the solution of the problems of blinding eye disease which has not been possible with the present administrative arrangement.

As you gentlemen know, the National Institutes of Health have a research team at Bethesda unmatched by any in the world. The program at Bethesda centers about two principal areas: the first at the clinical center where the problems of disease are studies, and the second in the intramural laboratories which are devoted in the main to basic research.

The establishment of an Eye Institute would provide the administrative mechanism for establishing research laboratories in blinding disease at Bethesda which could provide the model for research development as has been done in heart disease, cancer, neurologic disease, and arthritis and metabolism.

At present there is not a single intramural laboratory at Bethesda devoted to the problems of blinding eye disease. The sole ophthalmic research at Bethesda is carried on within the clinical center.

It is first class in every respect but it does not provide the facilities for basic research that are available in other Institutes.

We envisage the Eye Institute as developing intramural laboratories devoted to hereditary disease of the eye, tumors of the eye, the nervous and muscle control of the eyes, and the relationship to vision.

We believe that the areas of physiologic optics must be adequately supported. A major research program devoted to the causes of refractive errors and blindness due to nearsightedness is long overdue.

We see intramural laboratories as complementing research studies supported at a National Eye Institute as occurs in other National Institutes.

Additionally the establishment of the National Eye Institute would provide a means of communication between scientists in the other Institutes which we do not now enjoy.

Neglect in the study of blinding disease has not arisen because of inability to seek solutions or inability to secure skilled and competent investigators. Rather the toll of blindness continues because of lack of a sense of urgency and the absence of programs to solve the problems.

We need a program in the investigation of blindness from variations in the shape of the eye such as occurs in nearsightedness. We lack adequate programs in the best methods of rehabilitating those already hopelessly blind and in programs dealing with engineering methods to provide the development of other senses in those who cannot use their sight.

This neglect is not due to lack of compassion or counsel or interest in these fields on the part of the National Institutes of Health.

It is due to the fact that blindness and blinding eye disease cannot have the priority required in an institute with major interest and priorities in an unrelated field.

In the field of ocular surgery there have been unusual developments in the provision of operating microscopes with zoom lenses and attached cameras permitting the most exquisite surgery that has ever been carried out.

There is tremendous need, however, for a marked expansion in the instrumentation used not only in ocular surgery but in ocular diagnosis.

Combined with this is the need for automation of much equipment so that valuable personnel might be freed for other important tasks.

Mr. Chairman, members of the committee, our group does not believe that the present structure of the National Institutes of Health is so administratively constituted that it can carry out his broad purpose.

We do believe that it is solely by means of a National Eye Institute that it will be possible to meet the problems of blinding eye disease now with us and to be encountered in the future.

Thank you.

Mr. JARMAN. Thank you very much, Dr. Newell, for your presentation.

Dr. Maumenee, will you introduce your next panel member?

Dr. MAUMENEE. Dr. Kaufman.

STATEMENT OF DR. HERBERT E. KAUFMAN, PROFESSOR AND CHAIRMAN, DEPARTMENT OF OPHTHALMOLOGY, UNIVERSITY OF FLORIDA, GAINESVILLE, FLA.

Dr. KAUFMAN. Mr. Chairman and members of the committee: I am Dr. Herbert Kaufman, professor and chairman of the department of ophthalmology at the University of Florida College of Medicine.

I was trained in part in the intramural branch of the National Institute of Neurological Diseases and Blindness, and continued my training under sponsorship from the Institute.

My life in academic medicine is, therefore, a direct function of support by the National Institute of Neurological Diseases and Blindness.

For many years my department and I have worked closely with NINDB, and we have been fortunate in making significant contributions to the understanding of some blinding diseases.

This considerable experience with NINDB, and my appreciation for the enormous good that has already been accomplished under the present direction of the Institute makes me realize, however, that much remains to be done and many needs remain unfulfilled.

I believe that these unfulfilled goals can be reached if there is a separate eye institute. It is for this reason that I am here to urge you to establish a new and separate eye institute in the National Institutes of Health.

You have heard about the tremendous amount of blindness occurring in this country and the enormous economic cost both in terms of support for these disabled people and in terms of the loss to the country of their potential earnings. Even a tiny advance in the war against blindness would more than offset a considerable outlay, but this advance must depend upon people.

Laboratories, equipment, and facilities are all important but only in that they facilitate the recruitment and productivity of the essential personnel.

It is the problem of personnel which I would like to discuss with you this afternoon. In research, I believe that anyone will admit that there is a marked shortage of trained personnel in the laboratory searching cures against blindness.

In addition, there is a shortage of practicing ophthalmologists, but despite the shortage, virtually all of the available training places are filled.

The lack of adequate specialists is due to a shortage of teachers and training programs. How, then, can we increase the number of teachers and the number of researchers?

Eye research is a new, young, underdeveloped field; and research projects, in spite of their merit, must come in large part from the

younger investigator, many of whom do not have established national reputations.

Fields such as neurophysiology, neuroanatomy, neuropathology, neurology, and others are more established fields with many investigators in physiology departments as well as departments of neurology with established reputations and records of productivity. Even younger investigators often have the advantage coming from well established laboratories and working with well-known investigators.

As you know, it is inevitable that when priorities are assigned to grants, the established individuals with a proven record of productivity, and the individuals in an environment known to be productive will be assigned higher priority for projects of similar value.

When eye research projects compete with projects in more established areas for research funds, the greater previous development of the neurological fields discriminates against eye research and the developing eye researchers, and by preventing newer investigators and centers from developing tends to suppress vision research and keep it in the same underdeveloped state as in the past.

There is also less opportunity for the young investigator to work "on someone else's grant" in an established laboratory until he becomes sufficiently sophisticated to compete well.

By denying funds to the investigators, the difficulty of attracting younger men into their field which so badly needs new talent and expanded research activity becomes intense.

This is especially severe as the young clinician-investigator is faced on the one hand with considerable financial remuneration from practice alone and on the other hand with great uncertainty over whether, if he pursues an academic career, the funds his research needs may be abruptly terminated, and the many years of preliminary research effort may be wasted.

This competition is much more serious in our specialty in which relatively high incomes are compatible with a reasonable amount of leisure and makes the present great uncertainty over an academic career more than many dedicated investigators can bear.

There is a need, therefore, to provide opportunities for security in ophthalmic research so that an adequate body of researchers can be recruited and that work in the less established ophthalmic field cannot be discriminated against by the priority system.

The formation of a few large research centers helps this condition, but does not aid in the development of the many smaller, but excellent research departments which, in many instances, can make outstanding contributions.

These problems are not abstract problems, and the development of younger individuals, though important, is no more of a problem than that of maintaining the competent and established personnel in a situation of productivity in this field.

In my own laboratory, for example, an outstanding scientist and microbiologist was working with me and doing excellent research in the diagnosis and treatment of infectious eye diseases.

This man, a Ph.D. in microbiology, depended for his productive life on research funds. A senior scientist, approaching the age of 50 years, was faced with a situation in which it was difficult for a new, young department to guarantee his salary if some difficulty developed in the funding of a research grant.

In addition, even though his salary could be guaranteed, his whole productive life depended on research and the necessity and insecurity involved in applying for a research grant every few years was enormous.

During this time, a new program appeared to emerge—a program of career awards which could recognize outstanding achievement and reward it by a pledge of long-term support. It was indicated that this outstanding scientist would receive such an award, but at the last minute, policies were changed and the "career" award was no longer granted.

This established scientist was then requested to have himself considered for a "career development award" in spite of his many years of established and outstanding productivity.

Again, at my request, he permitted such consideration, only to learn that this award was approved, apparently with high priority, but that no funds were available for paying such an award.

Imagine yourself in the position of a man such as this, forced to depend for his academic life on an agency which could, in the middle of things, disband programs and then give awards and not fund them.

Under these circumstances, if you had ability adequate for you to work in other fields, would you remain in ophthalmic research?

The particular scientist of whom I speak left the field of ophthalmic research, not because he wished to, and in spite of the fact that he was greatly productive and extremely happy in his surroundings.

He left the field of ophthalmic research in order to acquire the academic and financial security which he so desperately needed and which was otherwise unavailable.

You may think that this is an isolated, unfortunate example, but it was only 2 or 3 years ago that less than 50 percent of new research grants were approved, and of those approved, approximately one-third in vision were not funded.

If we consider that ophthalmic research is a new field desperately in need of productive talent and desperately in need of stabliity and encouragement, this type of activity must not be permitted.

No matter how hard the members of our present institute have tried and continue to try to promote vision research, the fact that such things occur points out the need for an institute independent of the more established disciplines of neurology and neurophysiology which can set priorities and provide such encouragement and stability.

The present National Institute of Neurological Diseases and Blindness has made a considerable investment not only in ophthalmic research in general, but even in my own department.

It would be a terrible mistake to imply that this has not been beneficial to the health of our country and nothing could be further from the truth.

The present director of NINDB has sought guidance from a special committee on ophthalmic goals and priorities.

He has selected an excellent training committee with which I now have the pleasure to be associated, and he has made every effort to to provide leadership and to stimulate the furtherance of eye research and the improvement of the general health of our people.

I have no criticism of the Institute in terms of its efforts and in terms of its desire to help in the fight against blindness.

When an institute encompasses many broad fields, however, it is extremely difficult to make special policy for one area with special needs and to provide programs which apply to this area to the exclusion of others.

This is especially true when one considers the real need for researchers and academic personnel in the area of ophthalmology—a problem which seems to me the most serious one we face.

The need for encouraging physicians to develop academic skills and research interests, the desperate need for teachers who can train more ophthalmologists, the very real requirement for more basic scientists to be interested in problems of blindness and to remain in this area of research—these are our greatest problems, and are needs which have not been adequately met.

I would be the last to suggest that there is a panacea for these problems, but we must recognize that the problems in this area are quite different from those in an area such as neurophysiology or neuroanatomy.

The enormous shortage of capable people demands that we conserve the brains and ability that are available to us and encourage them to remain in this area of desperate need.

To do this, we must supply some basic security to the researchers of proven ability and must assure them that they can continue on in these areas of research without the vagaries of periodic grant reviews and the possibility of salary cancellations within a few years.

Provisions for long-term security of outstanding researchers and teachers must be made to apply not only to large institutions with major projects, but to the smaller institutions with outstanding personnel who can make tremendous contributions to our fight against blindness.

Both in terms of salary and in terms of assurance that research activity can continue, some type of long-term assurances and commitments should be possible.

In many other areas in which a shortage of research personnel and teachers is not so critical, this type of commitment might not be necessary, and a periodic review might well be desirable to assure the highest level of productivity.

But in an area such as ophthalmic research, where the temptations of private practice in terms of financial reward and leisure time are so great, and the insecurity involved in an academic career is now so enormous that some provision for encouraging people to remain in this field is necessary.

Remember that only a few years ago an enormous proportion of approved vision research projects were not funded.

This may be a situation which is quite different for other areas of neurology and basic neurological research, and the difficulty of finding a program which applies equally to all areas of neurological investigation and to the area of vision research may be formidable.

In fact, regardless of the enormous amount which the present NINDB has accomplished, and regardless of the good faith and tremendous effort on the part of the administration of NINDB, the need for adequate research personnel and teachers has not been met and I doubt that anyone could deny this.

It is difficult to guarantee that the flexibility and ability to focus on these problems which would result from a separate Eye Institute could guarantee that such a need would be met, but I feel certain in my own mind that our ability to meet the need for personnel would be far greater in a separate Institute which could focus on problems of vision and could promulgate regulations and programs which would need to apply only to vision and not necessarily to other areas of neurological research.

Gentlemen, I appreciate your time and consideration in hearing this testimony.

I hope that early and favorable action on the formation of a separate Eye Institute may soon be forthcoming.

Again, my thanks, gentlemen.

Mr. JARMAN. Thank you, Dr. Kaufman, for your presentation.

Dr. Maumenee, who is our next witness from the panel?

Dr. MAUMENEE. Dr. David Cogan, Mr. Chairman.

STATEMENT OF DAVID G. COGAN, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF OPHTHALMOLOGY, HARVARD MEDICAL SCHOOL

Dr. COGAN. Mr. Chairman and members of the committee, I am Dr. David G. Cogan, professor and chairman of the Department of Ophthalmology at Harvard Medical School.

It has been my privilege to serve NINDB in several capacities including membership on the first Training Grant Committee and Council member for the years 1955 to 1959. I would like to begin this testimony by reiterating deep admiration for the patience and wisdom with which the administration of NIH handles the complexities in this important and sometimes conflicting area of medicine. The predominately Neurologic Institute, which became known as NINDB, was given the responsibility of ophthalmology when this specialty lacked the spokesmen and organization for its own presentation. But ophthalmology has now matured to the state where the natural process of growth requires separation of the two specialties in order that each may make its fullest contribution to the common good.

It is true that ophthalmology and neurology have many interests in common. The eye is often considered an anterior projection of the brain. It is said that 30 percent of all stimuli incident on the central nervous system come through the eyes. Many diseases of the nervous system manifest themselves first in the eye. Thus multiple sclerosis, brain tumors, infantile dementing diseases, and other conditions may be present initially with visual defects or eye movement disorders.

A few physicians specialize in this overlapping field of neuro-ophthalmology. I am one of these few and feel, therefore, in a uniquely favorable position to appreciate the give-and-take between ophthalmologists and neurologists. Yet I must in all honesty acknowledge that neuro-ophthalmology constitutes a very small part of the totality of either eye care or blindness. I suppose the percentage of neuro-ophthalmic patients in an ophthalmologist's practice is less than 1 percent and the percentage of blindness caused by neuro-ophthalmic disease is less than 10 percent.

The bulk of disabling eye disease with which ophthalmology must contend comprises uveitis, glaucoma, cataracts, detachment of the retina, and tumors. These have only tenuous connections with neurology. Uveitis is an inflammatory disease often linked to rheumatoid arthritis or other systemic diseases properly pertaining to the domain of medicine.

Diabetes, which has loomed recently as such a prolific cause of blindness, is similarly of primarily medical and biochemical concern. Glaucoma and cataracts, on the other hand, are, from the treatment point of view, chiefly surgical problems. So are detachment of the retina and tumors of the eye. With rare exception, these have little or no neurologic connection.

Ophthalomolgy is generally included in medical school as one of the surgical specialties. This was more justified in the past then in the present. Surgery and surgical training are still the prime preoccupation of ophthalmologists, but it is probably fair to say that the major advances of the specialty in the past 50 years have been in medical ophthalmology and in the diagnosis and recognition of disease.

In glaucoma, for instance, although significant improvements have been made in the technique of surgery, the greatest advances have been made in the diagnostic selection of cases for surgery and in the medical management of glaucoma. Similarly, with detachment, the increasing use of photocoagulation and laser radiation has progressively advanced the noncutting aspects of detachment treatment.

Ophthalmology is in the ambiguous position of being neither clearly a surgical nor medical specialty. It has equal contacts with both major disciplines, to say nothing of its commitment to optics which sets it outside the realm of either. Its linkage to ear, nose, and throat was a marriage of economic convenience and is even more ambivalent. It is now an anachronism.

All of this points up the uniqueness of ophthalmology. While some of us have a prime interest in neuro-ophthalmology, we must acknowledge that this is a small facet of ophthalmology. To expect an Institute which is primarily concerned with neurology to oversee the needs of ophthalmology is as illogical as it would be to subordinate ophthalmology in the neurologic sciences or other major disciplines in medical school curriculums. NINDB has wisely urged that ophthalmology have separate departmental status for its grantee institutions in medical schools, and this has been accomplished as the schools have sufficiently matured.

We now feel that NIH has developed to a comparable stage of maturity when it is appropriate to establish a separate and peer status for ophthalmology among the Institutes.

Had the institute concept been born full grown from the head of NIH, an Eye Institute would logically have been one of the first categorical units to be established. Ophthalmology is the oldest of the clinical specialties with practical aspects that set it apart from the mainstream of medicine.

One of its major preoccupations, for instance, is optics, which has no parallel in general medicine; ophthalmic surgery is so minute and delicate as to have little in common with general surgery; and its methods of examination are a specialty unto themselves.

Except possibly for dentistry, ophthalmology is the specialty most requiring an Institute administered and advised by persons who have had intimate experience with its problems and possibilities.

No more than one or two ophthalmologists have been on the Council at any one time. The sheer bulk of applications to be processed and policies to be discussed have precluded adequate consideration of the pressing ophthalmic needs. But more importantly, the Council and administration already taxed to their capacity with predominantly neurologic affairs cannot be expected to take the initiative in developing new and imaginative approaches to the problems of eye disease and blindness.

We have major problems in ophthalmology which must have a vigorous and undivided leadership at the national level. In the first place there are so few ophthalmologists across the country that patients commonly cannot get an appointment for weeks and sometimes months in advance. To say that emergency care is always available is meaningless for the patient is put in the anomalous position of having to decide whether or not he is an emergency.

We have all seen the disastrous consequences of this impossible situation. In the second place we have a problem in training since medicare and medicaid are directing the patients to the private physicians. We are, therefore, faced with an acute shortage of patients at the training centers. We may subscribe to the general principle that each institution must solve its own problems but we are now faced with a nationwide emergency in surgical training which affects ophthalmology more than any other specialty because of the nature of its surgery.

We need strong support from leadership which only those can give who have intimate knowledge of ophthalmology. And then there is the problem of ophthalmic assistanceship, how best to integrate optometry into opthalmology, for the overall good of the patient. These are some of ophthalmology's prime problems, the answers for which cannot be expected to come from an Institute dedicated primarily to neurology.

Size is also a not inconsiderable factor in recommending separate institutional status for ophthalmology. In my hospital, for instances, 25 percent of the total outpatient visits are eye patients, whereas no more than 3 percent are neurologic patients.

Or, across the country the number of broad-certified ophthalmologists in 1966 is listed as 6,397, whereas the number of board-certified neurologists is only 753. At NINDB the representation is reversed. Is it fair to expect the present Institute to care for the problems of such an oversize division or fair to that division to depend on a predominantly nonophthalmic Institute?

The wonder is that it has worked as well as it has but the chance of it continuing to do so lessens with our increasing need for national leadership. We should make long-range plans before the crises get out of hand.

In an Eye Institute we would envisage an entire Council drawn from persons concerned with vision and an administration dedicated exclusively to this field. When the Council met we would expect them to address themselves entirely to problems of eye diseases, training of medical and paramedical personnel for visual care in this country,

identification of the most urgent areas for ophthalmic research, and application of these researches to the care of the patient. A separate supervision in the form of an Eye Institute is the most effective way of accomplishing the ideals which we aim for. Such an Institute will almost certainly be established eventually and the most appropriate time is now.

I thank you.

Mr. JARMAN. Thank you, Dr. Cogan.

Dr. Maumenee, who is our next witness?

Dr. MAUMENEE. Dr. Bradley R. Straatsma.

STATEMENT OF DR. BRADLEY R. STRAATSMA, M.D., DIRECTOR, JULES STEIN EYE INSTITUTE, PROFESSOR AND CHIEF, DIVISION OF OPHTHALMOLOGY, UCLA SCHOOL OF MEDICINE, LOS ANGELES, CALIF.

Dr. STRAATSMA. Mr. Chairman and members of the committee, I am Dr. Bradley R. Straatsma, director of the Jules Stein Eye Institute and professor and chief of the Division of Ophthalmology at the UCLA School of Medicine, Los Angeles, Calif.

In addition to fulfilling these positions, I have, during the past year, served as chairman of the American Medical Association Section on Ophthalmology and chairman of the Western Section of the Association for Research in Ophthalmology.

I am here before your committee to urge you to act favorably on the legislation to establish a separate Eye Institute in the National Institutes of Health.

There are a number of overwhelming reasons for the establishment of a National Eye Institute, not the least of which is the enormous dimension of the problem related to vision disorders and blindness. Too often, in my judgment, we consider this problem without fully reflecting on the figures that define its magnitude.

The fact is that 90 million Americans have some form of ocular misfunction. More than 12 million schoolchildren require eye care; 3,500,000 people in this country have a permanent, noncorrectable, visual defect; 1,500,000 are blind in one eye according to the legal definition of this condition, and 416,000 are blind in both eyes. More than 32,000 Americans lose their vision each year so that in the 20-year period from 1940 to 1960 the blind population in the United States increased by 67 percent while the general population increased by only 36 percent.

In my own State of California, nearly half the population is considered to have some type of ocular disturbance. There are 1,200,000 schoolchildren in need of eye care; 34,500 people are legally blind, and in the 5 years from 1960 to 1965 the blind population increased by more than 17 percent.

These figures are appalling, but even these statistics do not adequately express the cost of blindness in economic or human terms. For this it is essential to consider the loss of social and economic productivity associated with sight deprivation, the nearly $1 billion that is spent annually to aid the blind or the human unhappiness caused by the inability to see. More than any other facet, it is this loss of human

values that makes blindness, next to cancer, the disorder most feared by the people of the United States.

With this enormous incidence and resulting disability, vision disorders and blindness merit more attention than they have received in the past and, without question, deserve a scientific attack specifically designed to be as effective as possible. Unfortunately, mounting of this attack in the present National Institute of Neurological Diseases and Blindness is handicapped by an organizational structure that clusters vision disorders and blindness with the diffuse field of neurology, neurosurgery, and otolaryngology. During the early years of the Institute of Neurological Diseases and Blindness, this grouping of medical sciences served a useful purpose and enabled programs to get started in each of these fields. At this time, however, this organization should, in my judgment, be changed because (1) it is based on the incorrect belief that there is a special, overriding relationship among these disciplines; (2) it forces the leaders of the Institute of Neurological Diseases and Blindness to divide their attention among disparate fields of medicine; and (3) it does not provide an optimum framework for a scientific attack on vision disorders and blindness.

The statutory grouping of ophthalmology and the entire field of vision science with neurology, neurosurgery, and otolaryngology presumes that these fields belong together because they have a special and essential relationship to each other. A review of the facts, however, indicates that these fields are not closely related to each other but, on the contrary, are associated in only a general and rather limited way.

In research, for example, only a modicum of ophthalmic investigations relate to neurology, neurosurgery, or otolaryngology. In the education and training of ophthalmologists, there is no special rotation of these future specialists through the neurological or otolaryngological services and, in actuality, contacts with these disciplines are made through lectures, conferences and consultations just as with other fields of medicine.

Finally, in the care of patients with visual disorders, only a very small number of the people who require eye care have conditions related to neurological or otolaryngological disorders. Thus, in research, in training, and in patient care, vision science has no special or overriding relationship with neurology, neurosurgery, or otolaryngology.

Indicative of this, no university or group of medical practitioners is organized so that it lumps these separate and distinct medical specialties into a single administrative whole.

The effect of this unnatural grouping of vision science with neurology and other disciplines in the Institute of Neurological Diseases and Blindness is to force the Director of the Institute, the National Advisory Council, and the Institute staff to divide their attention among disparate fields of medicine.

Moreover, as a reflection of the Institute's organization, the National Advisory Council is virtually forced to give primary consideration to neurological activity and secondary consideration to ophthalmological endeavor. In fact, the makeup of the Council shows that it would be almost impossible, on the basis of the training and professional responsibilities of the individuals involved to do otherwise.

There are 12 members of the National Advisory Council. Two of these are neurologists, one is a neurosurgeon, one a neuropathologist, one of the head of a Department of Physiology and Biophysics, one an audiologist, one an otolaryngologist, three are laymen, and only two are ophthalmologists.

Thus, of the 12 people called on to make decisions concerning research and training in the field of ophthalmology to the extent of some $20 million a year, only two are trained in ophthalmology and, I might add, the two alternate members of the Council are a neurologist and a layman in the Office of the Army Surgeon General. You can readily see that this Council represents all the disciplines included in the Institute of Neurological Diseases and Blindness but cannot, therefore, incorporate adequate representation of vision science.

This organizational structure is particularly unsatisfactory when it is recognized that ophthalmology and the sciences related to vision encompass a broad field of medicine in which many aspects are unique and have no counterpart in neurology, neurosurgery, or otolaryngology.

The utilization of physiological optics, the essential appraisal of intraocular pressure dynamics and the specialized methods of ophthalmic examination are vital to ophthalmology and without parallel in other neurosensory disciplines. Optical abnormalities and most of the disorders that affect the visual system are not comparable to abnormalities affecting other neurosensory structures. Even the retina, a part of the eye that is derived embryologically from the central nervous system, is so highly specialized that it has many diseases, such as retinal detachment and senile macular degeneration, that are unrelated in terms of diagnosis and management to the central nervous system or the disciplines of neurology, neurosurgery or otolaryngology.

In essence, vision science is of itself a major branch of medicine with areas that are exclusively in its realm and relationships to a broad spectrum of basic and clinical science. The full development of vision science and the necessary growth of its important relationships to other areas of science cannot be expected in the present statutory structure of the Institute of Neurological Diseases and Blindness.

To establish an optimum framework for an attack on vision disorders and blindness, a National Eye Institute is needed. This would provide for an Institute Director, a National Advisory Council, and an Institute staff totally committed to the preservation of vision.

Able to concentrate exclusively on ocular disorders, the Director and staff of the Institute would be selected primarily on the basis of their qualifications to promote, coordniate, and administer eye research, training, and patient care. The National Advisory Council, composed of similarily qualified scientists and lay representatives, would be able to include representatives of the clinical and basic sciences related to vision.

With this structure, a fully knowledgeable Council would oversee the Institute's activities, would be capable of analyzing every aspect of the vision problem and would be able to establish subcommittees, supported by consultants, to evaluate progress in critical areas and propose programs conducive to the advancement of vision science.

In research, for example, committees of experts could concentrate on the major causes of blindness such as cataract, glaucoma, and

diabetic retinopathy, in an effort to detect unmet needs and recommend programs to seek solutions. In training, the overall requirements of the American people could be regularly compared to on-going training activities, the training of an adequate number of ophthalmologists and others in the vision sciences could be encouraged, and new methods of computer-oriented and machine-monitored programed instruction could be developed.

The latter are particularly applicable to instruction in optics and other fields of precise biophysical science. Other expert committees could appraise patient care for the purpose of stimulating clinical investigation and assuring that basic science advances are promptly applied to the care of patients with eye disease.

In toto, a National Eye Institute would provide the administrative structure and the assembly of knowledgeable scientists ideally suited to plan and implement a comprehensive program of research in the sciences related to vision, the care of patients with eye disease and education in the broad field of ophthalmology.

Moreover, this Institute would give appropriate emphasis to an area of importance to more than half of the people in the United States and of vital concern to the millions of infants, children, and adults afflicted with serious ocular disorders. I urge this committee to report this legislation for creation of a National Eye Institute to the full House of Representatives with a recommendation for its early enactment.

Thank you very much.

Mr. JARMAN. Thank you, Dr. Straatsma.

Dr. Maumenee, will you introduce our next witness?

Dr. MAUMENEE. Mr. Jules Stein.

STATEMENT OF JULES C. STEIN, CHAIRMAN, BOARD OF TRUSTEES, RESEARCH TO PREVENT BLINDNESS, INC.

Mr. STEIN. Mr. Chairman and members of the committee: My name is Jules Stein, and I am chairman of the board of Research to Prevent Blindness, Inc., a national voluntary foundation which has been created to take realistic action toward the solution of this terrible problem of visual loss.

As a former board-certified, practicing ophthalmologist, I am familiar with the tragic results of blinding diseases. And I am appalled that our Nation has done comparatively little to halt the increasing incidence of blindness among our people.

The lack of a far-reaching, concerted attack on the causes of blinding diseases amounts to a national disgrace. While research in other health areas is progressing by leaps and bounds with full Government interest and support, there has been no similar encouragement of those engaged in eye research.

On the one hand we see our magnificent Institutes of Health leading the research attack against a host of killing and disabling diseases, exploring new ideas, training new scientists, and physicians, providing broad financial support for investigations in every aspect of medical science at our institutions of learning. Lives are being saved. The sick are being cured. We are learning more than man has ever known about disease and how to prevent it. New concepts, new techniques are evolv-

ing, and that which was medically impossible yesterday has become commonplace today.

On the other hand, we find ophthalmic investigators working under deplorable conditions which make it difficult, if not impossible, for them to move ahead effectively toward the conquest of blinding diseases. There is not enough laboratory space for eye research, there is not enough modern equipment, and there is not enough manpower to do what must be done.

We are not training enough researchers to meet the enormous needs in this field, and we are not providing sufficient incentive to keep those we train. Money alone will not provide the answer. Our essential need if for a concerted research attack against blinding diseases, planned, directed, and executed by those whose lives are dedicated to the study of the eye and its problems.

Until we put leadership and direction of eye research in the hands of those who best understand ophthalmic problems, we will witness the continuous, steady rise in the incidence of blindness in this Nation and throughout the world. The cost of this neglect is more than $1 billion each year in this country alone in terms of care, treatment, and services for our rapidly-increasing blind population.

The Surgeon General of the U.S. Public Health Service, Dr. William H. Stewart, made some very astute observations on health needs in a speech a few months ago. He said that great segments of our population are totally separated from vital health services and that changes will not come about until the public demands them.

I quote Dr. Stewart's words: "We need a renewal of public indignation and initiative." Public health officials, he said, "need to be held to the fire to hammer out (their) words into sharp, pointed action."

I appear before this committee today as an intensely interested layman to register a "public demand," as the Surgeon General has put it. I am here to express indignation that millions of our people are compelled to face the threat of visual loss without the benefit of sharp, pointed action.

And I am ready to demonstrate public initiative in pleading with our Representatives to act positively upon our urgent request that the Congress create a National Eye Institute separate and complete within the National Institutes of Health.

Since we established Research to Prevent Blindness, Inc., in 1960, it has been necessary for us to amass all sorts of information relating to vision. We have explored the dimensions of the problem in terms of people—how many suffer from eye problems, what are the major causes of their disability and whether the best interests of people are being served in our traditional approach to loss of sight. We have inquired into public attitudes toward blindness. We have informed ourselves as to what is being done by the multitude of organizations and agencies created by the American people to meet the vast and complex needs of the blind and the near-blind.

Most important in the planning and development of our programs, we have had to find out just what the status of eye research is in the United States—what potential exists for a concerted research attack, what are the strengths and weaknesses of American opthalmology, what are the scientific needs and opportunities in terms of laboratory space equipment, trained manpower, and financial support.

Our organization sponsored a 14-month exhaustive nationwide survey of ongoing eye research in the United States, conducted at a cost of more than $100,000. Our study director personally visited over 100 medical institutions, conducted discussions in depth with some 600 scientists, department heads and medical administrators, and completely documented the activities of nearly 300 opthalmic investigators. The findings of that survey were published by our organization, Research to Prevent Blindness, Inc., in 1965 under the title "Ophthalmic Research: U.S.A."

We have also asked the Gallup organization to conduct a national opinion survey on many questions relating to vision, and this has provided insight into public attitudes and concepts which are important to legislators in acting to meet the needs of our people.

Moreover, through the years we have maintained continuous contact with the heads of eye research departments and opthalmic investigators. Reports of their work are provided us annually by some 33 medical institutions which receive grants from our organization.

It is apparent to us now that serious visual disability is far more widespread than is generally recognized. The blind population of this country today has been estimated at anywhere from almost half a million people to more than a million, depending upon which of the many definitions of blindness is used.

The lack of accurate, authoritative statistics on visual disability is characteristic of the Nation's failure to come to grips realistically with the most fundamental aspects of this major health problem. In addition to our huge blind population, it is estimated that another 1½ million Americans are blind in one eye.

Ironically, such persons would not be considered blind at all by our present definitions. Most important to consideration of the legislation before this committee today is this fact: In the 20 years between 1940 and 1960, while the general population was increasing by 36 percent, our blind population increased by 67 percent. In terms of blindness alone, such statistics constitute a warning that we cannot ignore.

But blindness is only part of the problem—the ultimate condition of visual deprivation. On just the other side of the thin line that separates the legally blind from those with severe visual loss we find millions more living with minimal vision and in constant fear of losing the little sight they have.

It is estimated that 3½ million Americans suffer from serious, permanent, noncorrectable visual defects—one out of every seven families has at least one person so afflicted. More than 10 percent of all patients treated at general hospitals are eye patients, and this does not take into account the millions who are treated for eye conditions in the offices of physicians.

Just 45 of the Nation's medical schools recently reported to us that they alone performed more than 127,000 major eye operative procedures in the past year. We cannot even guess at how many operations would be performed had we the knowledge, the facilities, the financial resources, and the trained manpower to serve all for whom such surgery is indicated.

Let us step a little further back from these most acute cases of visual disability and observe that the general conditions that exist because

we lack much scientific knowledge of the visual processes. More than 90 million Americans—about half our population—have some ocular malfunction.

The New York Times, in publishing a new large-type weekly newspaper, estimated its potential market at 6 million people whose vision is so poor that they cannot read standard-size news type or can do so only with the greatest difficulty. These are not numbered among the blind. But they live in a far different world than that of the fully sighted, accepting the fact of fading vision—because as a nation we seem to accept it as an unalterable act of fate.

Just think what the result would be in terms of human life, health, and happiness if our scientific genius were put to work in a full-scale effort to find and eradicate the causes of cataract and glaucoma and diabetic retinopathy and those other diseases of the eye which are the primary causative factors in more than 80 percent of all blindness in America today.

For instance, cataract is the leading cause of blindness in the United States. At age 60, cataract is present in 60 percent of our people. By age 80, the incidence is almost 100 percent. If we could discover what causes cataracts and eliminate that cause, we could reduce blindness in this country by 25 percent. But we do not know the cause of cataract.

Another example—glaucoma. This is the second leading cause of blindness in this country, an insidious disease that often is not diagnosed until irreparable damage to vision has been done. Some 2 million Americans over 40 years of age have glaucoma, and more than half are not yet aware of it. By age 65, about 10 percent of our population is so afflicated. If we eradicate the cause of glaucoma, up to 15 percent of all blindness can be eliminated. But the cause is not known, and we will find it only through a much more imaginative and extensive eye research effort than we are now supporting.

The advance of medical science is creating a desperate need for greater knowledge of the eye. People are living longer, but unless we halt deterioration of the eyes due to progressive diseases, millions of Americans will live out these extra years in darkness. We are saving the lives of infants who once would have died as a result of prenatal and perinatal conditions which also affect the eyes. Much of our research must be aimed at the visual problems of these youngsters, otherwise we have saved lives only to number them among the visually disabled.

It is time we recognized that visual problems are not confined primarily to our aging population. It is estimated that 12 million American schoolchildren—one out of every four—need some form of eye care. And nearly 2 percent of all children in the country have crossed eyes.

Another example—blindness due to diabetes. Through the use of insulin, the the lifespan of diabetics is being vastly extended. But we have learned that insulin does not always halt the progress of one major vascular complication of diabetes—diabetic retinopathy. This disease is the most rapidly growing cause of blindness in the United States today.

In 1930, it was the causative factor in less than 1 percent of all new cases of blindness. Today, it is responsible for almost 15 percent of newly reported cases. In this one area of vision alone, the prospects for the future are frightening, unless we begin to do something about

it. Our scientists have demonstrated that among persons with diabetes for 11 years or more, diabetic retinopathy is present in 64 percent.

Among those with diabetes for 15 to 20 years, diabetic retinopathy is present in as high as 93 percent. When we consider that there are at least 4 million diabetics in this country today, it is obvious that we must have vastly more knowledge of retinopathy than we have now, and we must learn quickly or suffer the terrible consequences.

Your constituents are not totally unaware of the situation, and many of them are frightened by it. Our Gallup survey revealed that the American people fear blindness more than any other physical affliction with the single exception of cancer. More than twice as many feared blindness as feared heart disease. And we will learn to fear it even more as the population of the blind and the near blind continues to increase.

That our Congress recognizes the catastrophic nature of blindness is evident in our income tax laws, which permit a special $600 tax deduction for blind taxpayers, more than 106,000 exemptions were taken for blindness by blind persons with reportable income during the tax year 1964—resulting in deductions of nearly $64 million. No other physical ailment receives such consideration.

If it were not for our antiquated concepts of blindness, an Eye Institute would have been among the first and most important of those established when the National Institutes of Health were inaugurated. Yet even today, when eye patients constitute 10 percent of all patients seen at your hospitals, the argument is offered that the creation of a separate Eye Institute would be a "fragmentation" of effort.

Gentlemen, we have been minimizing the needs of a major health problem for the purpose of administrative expediency. When I last visited Bethesda, it was interesting to see the 60 beds of the National Institute of Neurological Diseases and Blindness divided equally: 30 for ophthalmology; 30 for neurological diseases. But the equality cannot be sustained in practice, because the dominating interest of the Institute lies in the field of neurology. And it is impossible to achieve balance, because the two disciplines were never meant to live together.

There is no more reason for eye research to be joined with neurology in the National Institutes of Health than there has been in our outdated concept of the eye, ear, nose and throat hospital, a relationship based only upon the medically irrelevant fact that these organs are all located in the head.

We have moved out of the horse-and-buggy era and the potential of our ophthalmic researchers today far exceeds the resources available to them. But there will be no substantial progress while ophthalmology is forced to tag along as a medical subspecialty, without self-direction and subject to the narrower leadership of those whose major interests lie in other fields.

Only through the establishment of a separate National Eye Institute can we place this critical health problem in its proper perspective. It is in the hands of this Congress to open a whole new era in the preservation of sight by recognizing and giving priority to diseases of the eye. Science and technology have created the means of accomplishing what could not be accomplished a few short decades ago. It is time to put this enormous potential to work. It is time to "zero in" on specific problems of vision, bringing the Nation's nearly 8,000 practicing ophthalmologists into direct and continuing contact with the accomplish-

ments and services of an Eye Institute, so that the products of a vastly intensified eye research program may be translated into preservation of sight for millions of Americans.

I would like to lay to rest a ghost which could haunt these hearings and have a substantial bearing on the outcome of this legislation; namely, the cost of administering a separate eye institute as compared with the cost of administering the eye programs now going on in NINDB.

As you may know, I was originally a practicing ophthalmologist and, therefore, had a thorough understanding of the medical and professional aspect of this matter. I am a businessman and I am cost conscious. I believe I have been reasonably successful in developing MCA-Universal-Decca which I founded as one of the world's largest entertainment industries. I am presently chairman of the board.

I do not think the Federal Government should do anything in a given way if there is a more efficient or less costly way of doing it. I know this is the attitude of our Congressmen and this is being reflected by recent actions on appropriation bills. I agree with this congressional attitude, and I assure you I would not be here today if I did not have the complete conviction that a separate National Eye Institute would cost less to run than the present eye programs within the NINDB.

On this basis alone, even if there were no other compelling considerations, this Congress should be moved to act favorably on the bill which is before you today.

It is my humble opinion that if you reduce—yes, I mean reduce—the administrative budget of eye programs within the NINDB by 10 percent and put the remaining 90 percent into a separate National Eye Institute, you would get better administration of the programs in vision and improved research and training through elimination of the time and effort wasted in the neurological supervision of ophthalmology.

In the words of the Surgeon General, I ask those responsible for public health services to "hammer out their words into sharp, pointed action." I urge this committee, with all the sincerity and conviction of which I am capable, to endorse and support before the Congress this proposal for the establishment of a National Eye Institute.

Thank you.

Dr. MAUMENEE. Mr. Chairman, this concludes our prepared testimony.

Mr. JARMAN. Gentlemen, on behalf of the subcommittee I certainly want to commend you for the brevity of your presentation, and for your consciousness of the time limitations under which the committee has to operate in hearings.

I also commend you upon very effective panel presentation and I assure you that we will thoroughly study your statements.

We appreciate your emphasis on the particular things you think we should keep in mind.

I was very interested, Mr. Stein, in that final part of your statement with reference to cost. With any bill that we take to the floor of the House and Senate these days, the spotlight is on costs and what additional costs may be involved. The presentation of this bill to either body and both bodies certainly will involve question of what the cost

factor is, what additional personnel, if any, would be involved, what in dollars and cents would follow from the creation of a separate institute. Any information that you could give us on that would have a serious bearing on the ability that we might have to present successfully a bill of this sort to the House and Senate.

Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I have no questions, but I would just like to second what you have said and to express my own appreciation to you gentlemen for the time and effort you have taken to come to us today and give us your views.

I appreciate it very much.

Mr. JARMAN. Mr. Nelsen?

Mr. NELSEN. I have no questions, thank you, Mr. Chairman.

Mr. JARMAN. Mr. Kyros?

Mr. KYROS. I appreciate hearing from so many experts in this field. I think it is a wonderful thing that all of you took your time to come here today.

If I understand it, presently what exists under the National Institute of Neurological Diseases and Blindness is unsatisfactory for eye research.

Is that correct?

Mr. STEIN. That is correct.

Mr. KYROS. This program has existed for 15 years.

Mr. STEIN. That is correct.

Mr. KYROS. So far as we are concerned, even though the Government was spending $20 million, very little has actually been accomplished for blindness research and rehabilitation.

Mr. STEIN. If you will check the progressive increase in the last 5 years, you will see how little was applied even 5 years ago.

I think it was less than half a million dollars. The amount of money is not what we are talking about. We are talking specifically about administration.

Mr. KYROS. With $20 million in the NIH, someone said in their statement, they have done relatively little for blindness.

Mr. STEIN. No; I don't think we should say that. There have been more advances in the field of ophthalmology in the last 35 years than in the past 2,000 years.

There has been some very good work done in the past few years.

Mr. KYROS. I quote from your own statement:

> I am appalled that our Nation has done comparatively little to halt the increasing incidence of blindness among our people.

I think we spent $20 million through the NIH. So, now why try to get another Federal Eye Institute?

Why don't you try to do it through a public corporation and keep the Government out of it?

Mr. STEIN. I think private institutions are active in this field. The one of which I have been fortunate to be chairman of the board has been instrumental in stimulating ophthalmic interest throughout the country. This has happened in the last 6 or 7 years.

Mr. KYROS. This is my point and I wish you would direct your attention to it. If our Surgeon General and the people who worked at NIH for the past 15 years have failed to realize this difference, why should we leave this program in the hands of the Federal Government?

Mr. STEIN. I think this can be left in their hands, but it should be in the structure of a separate institute. Ophthalmology has been at the bottom of the totem pole of our universities and of the National Institutes of Health.

I would like to ask Dr. Maumenee to reply to that or perhaps one of the other distinguished ophthalmologists here today.

Mr. KYROS. Why should it remain as a function of the Federal Government? Why can't you have a private group and possibly apply for grants from the Federal Government to do your research work, getting the same amount of money but not having the Federal Government in charge of the program?

After all, one of the daily complaints we hear whether it is in cities, in air, water, automobiles, safety, is that the Federal Government is undertaking too many obligations that local governments and the public should meet by themselves.

Frankly, with all your expertise which I admire so much, I am somewhat surprised that you all come here and say wholeheartedly that you want to have an Eye Institute headed up by the Surgeon General which might engender the same types of administrative problems you are complaining about.

Mr. STEIN. Would you be asking us to argue against the whole National Institutes of Health?

Mr. KYROS. No; I am not.

First, we would have an Eye Institute and something for kidneys and legs and toes and we could simply go on forever. I am just asking you to tell me because I just want to be convinced.

My mind is open on this. I am merely inquiring why it should be another Federal program.

Mr. STEIN. There are more eye cases than any other disease of the human body. It should be top priority, not bottom.

Mr. KYROS. My point is: Why should it not be administered by some group such as you are in, the National Research to Prevent Blindness?

Why not some group like that to administer it rather than the Federal Government?

Dr. MAUMENEE. Congressman Kyros, you have posed a very interesting question and you are certainly much more knowledgeable about the structure of government than I am, but I don't know under what structure we could have a contract of this magniture on health, administered by private industry and funded by the Federal Government.

This may be a method to be considered in the future for handling such problems. I think it would be asking even more of you gentlemen to establish such a totally different structure than we are asking for within the National Institutes of Health.

Our primary plea to you is that although the National Institute of Neurological Diseases and Blindness has done a good job considering everything, we know that with an ophthalmologist heading a separate Eye Institute we can take these same dollars and put them to more effective use for research in the prevention of blindness than has been done in the NINDB.

Mr. KYROS. No one quarrels with that and I respect your point.

If the Government through its efforts has not been successful because of administrative problems and other problems pointed out

here, and you are in such sharp difference with the men who run the NIH and the Surgeon General and you still feel it should be done through the NINDB, then why would you not think you would get the same grants from the Government but you would be in control?

I am perplexed to see doctors coming to the Government and saying you want another Government program.

Dr. COGAN. Mr. Kyros, I think maybe we have failed to get across our respect for what NINDB has actually done.

These are not sugared statements when we say we appreciate what they have done. We think in the natural course of growth for NINDB and NIH this is a natural splintering off.

I served on the original training grant committee. When I sat with neurologists I had to decide on scholarships in the neurological field and the neurologists had to decide them in the ophthalmic field.

We had such small projects that we had to pass on one another's projects.

It soon became apparent that this was undesirable to exert authorities in fields with which we were not really acquainted so there were formed separate divisions.

There was formed a separate ophthalmic training committee and a separate neurological training committee. Then in the original setup of the scientific advisory committees they were simply conjoined but they developed separately.

They developed separate vision sections and neurologic sections and they now operate separately.

Recommending an Eye Institute is an extrapolation of this sort of trend which has been continuously developing since the two were formed.

It is not that we are decrying what NINDB has been doing. We earnestly think they have done an excellent job but now in order to get the supervision that is necessary at this stage, it would be better for the country and for the ideas for which we strive to have this separate Eye Institute.

It is the same thing that medical schools have gone through. Departments of ophthalmology all began as part of a department of surgery.

As one of my colleagues pointed out, the process of growth, the evolution of separate eye departments have resulted in better direction and better results on their own responsibility.

I don't know if this answers your question but it expresses what we think is one of the main reasons for having a separate institute at this time.

Mr. KYROS. Speaking to what you explained, sir, why was it not possible then for you gentlemen with your credentials and your backgrounds in the light of this very excellent and exacting analysis you have made here of the problem, to go to the Surgeon General and simply have him set up a separate department of ophthalmology which would have been separated from the neurological sciences.

Why could you not have approached it in that manner for the last 15 years?

You say the colleges have made these separations. I remember when I was a youngster it was always eye, ear, nose, and throat departments.

Why couldn't you approach the Surgeon General seeking a separate department so there would have been greater efficiency in the past few years rather than having Mr. Stein's statement in the record that we have not done enough for blindness?

Dr. COGAN. This is now actually what we are asking. We are asking for separate representation now. Had we originally started with a separate eye institute, it would have been a most logical thing to do.

Historically, this is the way the institutes developed and we were tagged on by a very gracious group of neurologists when we had no other spokesman.

Mr. KYROS. It is the consensus of this outstanding group of doctors here that indeed the Federal Government should play a leading role in this Eye Institute and the Surgeon General, as set forth in H.R. 12843, should head this up.

Dr. KAUFMAN. I think there is one little point of misunderstanding. What you seem to have proposed is the Government take a lump of money and give it to us and in essence say, "Do whatever you want with it."

Mr. KYROS. This would be if you had a public corporation.

Dr. KAUFMAN. We all feel the present structure of the National Institutes of Health is really second to none. The amount the NIH has contributed in terms of basic research in the health of our country is enormous. The system of checks and balances where Congress can review what is going on and where divisions within the NIH can review their own programs has been so eminently satisfactory it seems ridiculous to me to set up a totally different administrative structure and perhaps a structure that would not have the checks and balances in the best interests of the country.

This is why we feel no special group with special bias or interests should be supported in this way. We would like to continue the benefits which have been enormous of the general National Institutes of Health structure.

Mr. KYROS. You mentioned optometrists. Do you believe optometrists sould serve on the Advisory Council under this bill as proposed?

Dr. KAUFMAN. Perhaps Dr. Maumenee can speak to that.

Dr. MAUMENEE. We do not think that any specialty, including ophthalmology, should be specifically represented in the bill to be represented on the council. We think it should be left to the Surgeon General.

However, we would welcome an optometrist on the Council if the Surgeon General wanted one. There are other specialties such as biochemistry, which might be represented on the Council; therefore, we think they should not be mentioned.

Mr. KYROS. Optics was also mentioned and the fact that in this area it is so specialized, the physics science of optics, do you think physiological research in optics should be supported by the eye institute?

Dr. MAUMENEE. Absolutely.

Mr. KYROS. I don't want you to think I am opposed to this, but I am down here in my first term in Congress and I need to learn and quite often I hear that the Federal Government should not get in so many problems.

Here I see an eminent group of ophthalmologists who wholeheartedly propose a Federal program.

Thank you very much.

Mr. CARTER. Mr. Chairman, certainly I want to compliment this distinguished group for their excellent presentation.

A comment about Federal involvement, we have already been involved since the establishment of NINDB for many years. What you gentlemen want is an improvement. A neurologist is head of NINDB. It is your feeling that it could be better run with an ophthalmologist to develop these programs; is that not true? Certainly I am in agreement with that. Of course this is a national problem that involves all of the States and all of the people.

The States, of course, are not able to solve all of this problem and therefore the Federal Government must come in to help them do it. That is why NINDB was established in the first place; was it not?

Dr. MAUMENEE. Yes, sir.

Mr. CARTER. Of course, I realize that you want all the discipline included in this and that would be helpful. Perhaps, since the gentleman has asked about inclusion of certain disciplines, would you explain the difference in training of an ophthalmologist and the discipline which he mentioned, sir?

Dr. MAUMENEE. Dr. Hogan, do you want to do that?

Dr. HOGAN. Yes; the ophthalmologist is a physician trained in the regular way, who, after completion of medical school takes a year of internship and then spends from 3 to 5 years after internship specializing in the field of eye diseases.

At the completion of this specialization almost all these individuals take what is called a national examination, called the American Board of Ophthalmology examination to prove that they are qualified to take care of eye patients and do surgery and test eyes for glasses and this sort of thing.

The optometrist is trained in college in biology and during the latter part of his college career, commences instruction in physiologic optics, physical optics, and eventually learns in the 5 years of his education to examine eyes and do refractions and certain other special eye procedures but most optometrists are not trained to handle disease.

In fact, most of them want to not be involved with diseases. They want to be able to recognize disease and refer the diseased patient to an ophthalmologist. So the two are not competitive. They collaborate in most States and most areas there is close collaboration between optometrists who are in practice and ophthalmologists who are in practice.

The optometrist does carry out a small part of the work that an ophthalmologist is trained to do.

Mr. KYROS. Would the gentleman yield for a question?

Mr. CARTER. I will be glad to yield.

Mr. KYROS. My impression has been, and you can correct me if I am wrong, in fact in the first instance where sometimes some disease of the eye is discovered like cataract or glaucoma, seen, not diagnosed medically is when a person visits an optometrist.

I thought perhaps that profession could play some role here, not that they should go into your field. In many instances the optometrist is the first person to see a glaucoma and the cataract and should be referred to an ophthalmologist.

Dr. HOGAN. They are instructed in their schooling that if they can improve an eye condition, by all means they are expected to do so, or if

a condition is such that the patient be referred to an ophthalmologist, then the optometrist refers the patient to an ophthalmologist.

Mr. CARTER. I want to compliment this group for their excellent testimony.

Mr. ROGERS. I apologize for being late. I had to testify before a committee myself. I will certainly go over the testimony of this most distinguished panel.

Yesterday Dr. Stewart, the Surgeon General, testified that to create an eye institute would be disruptive both to work on the eye and to other functions of the NINDB.

As I understand from the testimony, you feel this is advisable to have a separate institute. It would not be harmful to eye research, but what about on the functions of the rest of the division? What effect would it have by taking the eye research out of the present administrative setup?

Dr. STRAATSMA. Congressman Rogers, we have no desire whatsoever to harm any portion of the Institute of Neurological Diseases and Blindness. In fact, we feel the arrangement recommended by this panel would be very important to all of the components of this National Institute.

There is no evidence that separating an eye institute in the present NINDB would disrupt the relationship of eye research to other disciplines. These relationships in fact would be freer to develop as the scientific context dictated rather than being joined in any legislative or preconceived fashion with the neurological diseases.

By the same token, I believe neurology and neurosurgery and otolaryngotomy would be completely free to develop their relationships in what we would hope would be a most productive institute of neurological diseases.

Mr. ROGERS. Then you don't feel a multiple discipline approach is advisable?

Dr. STRAATSMA. We strongly recommend a multidiscipline approach just as we have in our own university institutes. The multidisciplinary approach in ophthalmology can be improved on in the structure we propose and the separate institute would not in any way be disruptive of the relationships that now exist.

Mr. ROGERS. I think this was the point the Surgeon General tried to stress as I understood his testimony. He felt it was a breakup of the multidiscipline approach and more to the single where you are zeroing specifically on an eye without giving much consideration to the other disciplines.

Dr. MAUMENEE. I think in the formal testimony you will see numerous examples of multidiscipline attack on eye problems, but many of them have nothing to do with neurology. For instance cataract, retinal detachments, uveitis, glaucoma, are all out of the field of neurologists.

The whole point of our program is we need specialists in the basic sciences who are interested in ophthalmic problems, to work on the problems of blindness.

Mr. ROGERS. What about measles? Is that multidiscipline?

Dr. MAUMENEE. Yes; there will always be many, many overlapping areas with medicine. As was testified before, we have the problem of hypertensive retinopathy.

Congressman Carter brought out there are tremendous overlapping disciplines. We certainly would not want to have an isolated eye institute. This would negate our whole project entirely.

We think the problems of ophthalmology are great enough that with specific direction we can accomplish more with the money you appropriate us.

Mr. ROGERS. With specific interest directed to the eye itself?

Dr. MAUMENEE. Yes, sir.

Mr. ROGERS. I am glad to see you, a University of Florida man here, Dr. Kaufman. I notice in your statement you are concerned with getting qualified people and holding them in research and teaching and I think this was brought out by the Surgeon General's testimony as I recall, that it is difficult to get people in the area.

I notice you think perhaps a reestablishment of the career research grant would be a good thing?

Dr. KAUFMAN. Let me not be quite so specific and say rather that we end up in a situation where the dog is chasing his tail.

One argument advanced by the Surgeon General against the separate eye institute is that perhaps there are not enough qualified people. In fact with our present priority system, when there are not sufficient funds, the older established investigator who is more likely to be present in a department of neurophysiology is much more likely to get priority. So the younger ophthalmic investigator is systematically handicapped. In the framework of the present institute it is impossible to encourage the young people to develop and to assure them any security.

So one says you have difficulties because there are not enough personnel. I would say you have not enough personnel because the present administrative structure has automatically discriminated against these people and this has to be changed.

Mr. ROGERS. Do you think five to 10 ophthalmologists is sufficient in the work of the National Institute for Eye Research?

Dr. KAUFMAN. May I answer that this way. We feel, first of all, that the intramural program although excellent in miniature is nowhere near adequate to stand as an example of an approach to the problems of ophthalmology. Almost all of these ophthalmologists are in the intramural programs. There is no ophthalmologist in the director's office or in a position of policymaking.

Mr. ROGERS. On Council advising?

Dr. KAUFMAN. There are two ophthalmologists on the Council out of a total of 12. I think that a Council coming to the National Institutes of Health two or three days every few months cannot give the direction, by itself that is necessary. Only an institute chief really devoted to eye care and vision would provide the leadership necessary.

Mr. ROGERS. I would agree.

You say they are not in the director's office. Do you mean Dr. Shannon?

Dr. KAUFMAN. No; in NINDB. There is no ophthalmologist in a senior position in the NINDB.

Mr. ROGERS. Thank you very much for this testimony. It has been most helpful and I will read these.

Mr. JARMAN. Are there further questions by the committee? Gentlemen, the panel has made a real contribution to our hearing and we

are grateful to you for taking the time to be with us. Our final witness this morning is John F. Nagle, chief of the Washington Office of the National Federation of the Blind. We are pleased to have you with us today.

STATEMENT OF JOHN F. NAGLE, CHIEF, WASHINGTON OFFICE, NATIONAL FEDERATION OF THE BLIND

Mr. NAGLE. Mr. Chairman and members of the committee, my name is John F. Nagle. I am chief of the Washington Office of the National Federation of the Blind. My address is 1908 Q Street NW., Washington, D.C.

Mr. Chairman, the National Federation of the Blind is a nationwide organization with a membership primarily of blind men and women.

Representative of every background, activity, and area in the Nation, the members of the National Federation of the Blind are rank and file Americans.

By our organized efforts, we seek to translate shared hopes and objectives into improved conditons and equalized opportunities for all blind persons.

When the National Federation of the Blind met for its 26th annual national convention in Louisville, Ky., last year, with more than 700 blind persons in attendance from all parts of the Nation, a resolution was considered and unanimously approved by the resolutions committee, it was unanimously approved, after floor consideration, by the convention meeting in business session.

The resolution reads:

Whereas, Senator Lister Hill, Alabama, has introduced in the United States Senate S. 3514, a bill to establish a National Eye Institute in the National Eye Institute in the National Institutes of Health; and

Whereas, the National Eye Institute would conduct research and explore and determine the causes of blindness, and would also authorize and finance the research of others for the same purpose; and

Whereas, although we as blind people know that, today, blindness does not have to be a disaster in a person's life, we also know that, too often, it is a disaster because of inadequate help and training needed for successfully adjusting to the changed circumstances resulting from loss of sight; and

Whereas, we as blind people believe that the economic and social consequences of blindness upon the individual, his family and society, generally, are so great and grave as to justify and demand a major governmental-financed effort to ascertain the causes of blindness in order that it may be eradicated from the lives and experience of the men, women, and children of this nation and throughout the world;

Now, therefore, be it resolved by the National Federation of the Blind in convention assembled this 7th day of July, 1966, in the city of Louisville, Kentucky, that this organization commends and congratulates Senator Hill for his sponsorship of the bill to create a National Eye Institute;

And be it further resolved that this organization orders and directs its officers and staff to take all actions necessary to support the National Eye Institute bill toward Congressional enactment in the 89th Congress.

Mr. Chairman and members of the committee, it is in furtherance of the spirit of this resolution and the expressed policy of the National Federation of the Blind that we are appearing here today.

And we are appearing here to give our full support to the bills H.R. 12843 and H.R. 10780, introduced in the House of Representatives by the Honorable Harley Staggers and Hon. Paul G. Rogers, both able and distinguished members of this committee.

Identical to the measure described in the above resolution, identical, too, to S. 325, introduced in the Senate in the 90th Congress by Senator Hill, joined by 50 of his colleagues—and I have attached a copy of S. 325 to my printed testimony that you might see the broad cross-section support for it in the other Chamber—H.R. 10780 would not only authorize the establishment of a National Eye Institute to issue grants for research into the causes of blindness as would the other numerous similarly named bills now pending before this committee, but H.R. 10780 would also empower the agency to conduct research in this field itself.

Mr. Chairman, statistics may be cited to show the seriousness of the visual defect problem in this Nation, the great need to determine the basic causes of defective vision, and the pressing need for the establishment of a Federal institute whose sole function it is to coordinate, finance, and conduct research into the causes of blindness, that the nature of sight-imparing and sight-destroying diseases may be discovered and eliminated from the experience of all mankind.

About 420,000 Americans have 10 percent or less vision, and about 55,000 of this number are totally blind.

More than 1 million Americans are unable to read regular newsprint, even with the aid of glasses.

Nearly 90 million have, to some degree, impaired vision.

About 30,000 Americans, adults and children, become blind each year.

But the most startling and disturbing statistic on visual impairment in America is that 80 percent of all blindness is the result of diseases whose causes are unknown to sicence.

Then, Mr. Chairman, there are the dollars and cents statistics:

The cost of providing public assistance to nearly 100,000 needy blind American adults.

The cost of providing special facilities, teachers, textbooks, and materials required in the education of more than 20,000 elementary and secondary school-attending blind American children.

The cost of providing training centers and facilities, of providing adjustment to blindness help and other specially needed services to newly blind Americans, and to Americans who have been without sight for years and undiscovered or neglected.

The cost of providing vocational rehabilitation programs and training facilities to offer occupational retraining and job placement help to employable blind Americans.

The cost of providing braille and recorded books for the blind, the structures to house them, the personnel to circulate them.

But, Mr. Chairman, although we of the National Federation of the Blind cite frequency of blindness and visual impairment figures, we do so that you may understand the extent of this problem in our Nation.

Although we cite a variety of tax-provided special services to blind people, we do so that you may better understand the dollars and cents cost of blindness and severe visual impairment in our society.

But we would urge your approval of H.R. 10780, not for the statistical reasons given, but because we know that, too often, a disease which destroys a man's sight, also destroys his dreams and possibilities.

Too often, diminished vision means diminished earning power, diminished employment opportunities or even no employment opportunities at all.

Too often, loss of sight means loss of livelihood.

Far too often, blindness means a lifetime of struggle against misconceptions and obstructively adverse attitudes.

Too often, the occurrence of blindness means the hurts and humiliations of dependency, the indignity of sight-superiority, the despair of inactivity and unproductivity.

We, as blind people, know that blindness need not mean any of these things—for today, it is possible for a blind person to live fully and successfully in normal society, to work constructively, productively, and proficiently in the regular occupations of the community—and we know this is true, for many of us, members of the National Federation of the Blind, are doing it.

For such people, blindness is a nuisance, an inconvenience, a fact of life to be dealt with competently, sensibly, and successfully.

But we of the National Federation of the Blind also know that there are many others for whom blindness is a grievious burden and a major disaster—poorly trained in the techniques of functioning without sight—or not trained at all—never receiving a sound and sensible philosophic orientation to blindness—uninformed or misinformed on the actual limitations imposed upon him by his disability, or the nearly limitless possibilities of worthwhile life and living still available to him, still attainable by him, in spite of his disability.

Under such circumstances, Mr. Chairman, blindness is a disaster, and a lifetime of helplessness and hopelessness is the unhappy lot of such a person.

But whether blindness is a nuisance or a disaster, it should not be needlessly perpetuated in our society.

Mr. Chairman, experience has shown that when a concentrated scientific attack is made upon a particular disease, often and eventually, secret and corrosive causes become curable conditions, and mysteries become medical commonplaces.

We urge this committee and the Congress to approve the creation of a National Eye Institute, that a concentrated scientific attack may be launched against sigh-destroying diseases—against glaucoma, diabetes, cataract, and the others whose names are all so well known—so well known to the medical profession who must deal with them, so well known, too, to persons who are blind because of them.

I thank you, Mr. Chairman, for this opportunity to appear here.

Mr. JARMAN. Mr. Nagle, you have made a very effective and dramatic presentation in your testimony to the committee this morning and we are very grateful to you. Are there questions or comments?

Mr. ROGERS. I want to welcome Mr. Nagle to our committee. We are delighted to have him here. He does an outstanding job for the Federation of the Blind here in Washington.

Your statement is excellent and most persuasive. Thank you.

Mr. JARMAN. Mr. Nelsen?

Mr. NELSEN. I have no questions, but to Mr. Nagle I want to express my appreciation for his testimony.

Certainly we all admire the courage with which he faces his problem and also the enthusiasm with which he represents the people whom he seeks to serve, so I want to thank him for his statement.

Mr. JARMAN. Mr. Kyros?

Mr. KYROS. I just want to join in your remarks, Mr. Chairman, and those of my colleagues and say to Mr. Nagle that I feel very deeply from his own personal experience, which he shared with us today and from the testimony we have heard before, I think this is most convincing evidence in regard to this bill.

Thank you very much, sir.

Mr. JARMAN. This concludes our committee hearing on this bill. The committee will stand adjourned.

(The following material was submitted for the record:)

STATEMENT OF IRVIN P. SCHLOSS, LEGISLATIVE ANALYST, AMERICAN FOUNDATION FOR THE BLIND, INC.

Mr. Chairman and members of the Subcommittee, I am pleased to have this opportunity to present the views of the American Foundation for the Blind in support of H.R. 12843, a bill which would establish a National Eye Institute as part of the National Institutes of Health.

In addition to representing the Foundation, which is the National research and consultant agency in the field of services to blind persons, I am also indicating the support for this legislation of the American Association of Instructors of the Blind, American Association of Workers for the Blind, and Blinded Veterans Association. All four of these national organizations know the cost in dollars, dedication, and painstaking professional effort to assist blind persons to achieve self-care and self-support in spite of a severe handicap and lead productive, useful, and satisfying lives. They also know the cost in human misery of the failures—the blind persons who became of age or other factors are not employable or who cannot find jobs and must subsist on welfare payments.

Blindness and serious visual impairment are severely handicapping conditions which require highly skilled special education, mobility training, vocational rehabilitation, special reading material, and a number of ancillary services. The cost of providing these services by public and voluntary organizations is quite substantial. The cost of income maintenance and welfare programs alone for these individuals approaches $150,000,000 annually.

According to the estimate of the National Society for the Prevention of Blindness based on the Hurlin projection, there are approximately 450,000 persons within legal definition of blindness; i.e. visual acuity of 20/200 or less in the better eye with correcting glasses, or contraction of the visual field to 20 degrees or less. The National Society estimates that approximately 30,000 persons become legally blind each year. According to the National Center for Health Statistics of the U.S. Public Health Service, approximately 1,000,000 Americans cannot see enough to read ordinary newspaper print even with correcting glasses. It is also estimated that 90,000,000 persons have some degree of visual impairment.

Needless to say, prevention of blindness through effective research to determine the cause and cure of visual disorders and the application of the knowledge gained is essential to reduce the increasing number of blind persons in this country. The four national organizations I am representing firmly believe that the establishment of a National Eye Institute at the National Institutes of Health will be the most effective way of focusing public interest and support for a concerted professional attack on the cause, cure, and prevention of blinding eye diseases and severe visual disorders. Such a concerted research effort is bound to have beneficial results as have similar intensive efforts in other areas of health concern. And we can confidently predict that the cost of such an effort will be more than offset by savings which result from a diminished need for specialized services.

Thanks to medical research, we are steadily prolonging the life span of the average American. However, we do not seem to be making progress in determining the cause, cure and prevention of glaucoma, cataracts, and diabetic retinopathy—the three leading causes of blindness in older persons. It is worth noting more than half of the blind population in this country is over 60 years of age. Let us continue to strive for our national goal of a long, full, and happy life for every American; but let us take steps to make sure that the retirement years of older Americans are not marred by the devastating effects of blindness.

We respectfully urge the Committee to take favorable action on H.R. 12843 as a means of establishing an effective mechanism which will ultimately make blindness a rare condition.

[Telegram]

NEW YORK, N.Y., *October 31, 1967.*

Hon. JOHN JARMAN, M.C.,
Chairman, Subcommittee on Public Health and Welfare,
House of Representatives, Washington, D.C.:

As Founder and Executive Director of the Fight for Sight, National Council to Combat Blindness, Inc., founded in 1946 to stimulate and support ophthalmic research and as one of the original participants in the June, 1949 Congressional hearings which resulted in the establishment of the National Institute of Neurological Diseases and Blindness, I urge the Committee's most sympathetic and positive action on the proposed new National Eye Institute.

My recommendation is based on a keen awareness of the pressing need for accelerated and increased support to research into the causes, treatments and cures of disabling eye diseases which take such enormous toll in human suffering and economic cost to our nation. As one who has lived without sight as a result of a blinding eye disease and through my professional experience in directing the distribution, since 1950, of more than Three Million Dollars for Eye Research I am convinced of the urgency for a National Eye Institute.

While the present Institute has contributed significantly to advancing eye research, the enormity of the problem demands a separate institute with primary concern and concentration on the problems which cause defective sight and blindness. I believe it is important to point out that when we deal with sight we are involved with multiple disorders, each of which requires specialized research investigation. A National Eye Institute would encompass a broad scope of diseases and disorders which affect and afflict millions in our nation.

We have every reason to feel encouraged by the progress that has been made despite limited facilities, manpower and funds and to be obtimistic about the results that could be achieved through a National Eye Institute within the National Institutes of Health.

I would appreciate your making this message a part of the Official Record and, if possible, read before your Committee during the hearings.

MILDRED WEISENFELD,
Founder and Executive Director, Fight for Sight, Inc., National Council to Combat Blindness, Inc.

U.S. SENATE,
COMMITTEE ON COMMERCE,
Washington, D.C., October 31, 1967.

Hon. JOHN JARMAN,
Chairman, Subcommittee on Public Health and Welfare, House Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR CHAIRMAN JARMAN: I am writing to commend you for scheduling hearings on H.R. 12843, and related bills, to amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health.

I am the sponsor of a bill in the Senate, (S. 392) to accomplish the same purpose. I have been trying to get hearings on my bill, and I am delighted to see the House begin consideration of this important subject.

I realize that one of the institutes already established at the National Institutes of Health—the Institute of Neurological Diseases and Blindness—is devoting part of its time and resources to research on diseases of the eye. However, blindness is such a scourge that it deserves an institute entierly devoted to searching out its causes and their cure. We need one great center in this country whose emphasis and scientific personnel are directed in only one channel—to the control of eye defects, eye diseases, and blindness.

I ask that this letter be made a part of the record of the hearings.

Sincerely,

FRANK E. MOSS,
U.S. Senator.

AMERICAN OPTOMETRIC ASSOCIATION,
St. Louis, Mo., December 28, 1967.

Hon. HARLEY O. STAGGERS,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN STAGGERS: I wish to express to you grateful appreciation for your sympathetic interest in my profession's position on the bill to create a National Eye Institute (H.R. 12843).

As documented in my testimony, we feel that many of the arguments put forth by the proponents of this legislation are weak and misleading. If this bill is just to serve the specific interests and needs of the blind, and the prevention of blindness, then we feel that this is too narrow and restrictive a purpose in terms of the projected cost and the size of the national problem. If it has a broader purpose—to cover all areas of vision—then we feel it has more merit and are certain that it will intimately affect optometry. If this institute is to be established, we feel that it should stand as a monument to the government's continuing interest in the visual welfare of *all* her citizens, and not as a monument to ophthalmology.

If the bill is to be enacted, we urge you to fight for inclusion of optometry's amendments within its provisions. Since optometrists render the major portion of eye care in America today, adequate provision must be made for the free and unfettered utilization of optometric services and optometrists in all programs administered by the institute.

I look forward to seeing you again and extend to you and yours the very best wishes for a Happy Holiday Season.

Sincerely,

V. EUGENE MCCRARY, O.D.,
Director, Department of National Affairs.

AMERICAN MEDICAL ASSOCIATION,
Chicago, Ill., October 31, 1967.

Hon. JOHN JARMAN,
Chairman, Subcommittee on Public Health and Welfare, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR CONGRESSMAN JARMAN: On behalf of the American Medical Association, I would like to take this opportunity to submit Medicine's support of H.R. 12843 and similar bills. It is our understanding that these bills would amend the Public Health Service Act to provide for the establishment of a National Eye Institute in the National Institutes of Health.

Although the duties of the proposed National Eye Institute are for the most part presently the responsibility of the National Institute of Neurological Diseases and Blindness, it now seems appropriate to give special emphasis to the study and research into the causes and prevention of blindness through the creation of a separate institute.

The bills before you also provide authorization to the Surgeon General to establish and maintain traineeships and fellowships in the National Eye Institute, in matters relating to the diagnosis, prevention, and treatment of blinding eye diseases and visual disorders. He also would be authorized to make grants to public or other nonprofit institutions for the purpose of providing such traineeships and fellowships. We believe that this is an appropriate means of advancing our knowledge concerning the prevention and treatment of diseases of the eye.

We appreciate the opportunity of submitting our views on this legislation and request that our letter be included in the record of your hearings.

Sincerely,

F. J. L. BLASINGAME, M.D.,
Executive Vice President.

WESTERN MICHIGAN UNIVERSARY,
Kalamazoo, Mich., December 5, 1967.

Hon. HARLEY O. STAGGERS,
Interstate and Foreign Commerce Committee,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN STAGGERS: I am writing you because of your appointment to the Interstate and Foreign Commerce Committee whose subcommittee on Public Health and Welfare is now involved in hearings related to the establish-

ment of a National Eye Institute. This letter constitutes my firm endorsement for establishment such an Institute. I realize that certain highly qualified persons in Washington have expressed some objection concerning the establishment of such an institution because of the increased administrative costs and possible overlapping functions with other Institutes. I am aware that the National Institute of Neurological Diseases and Blindness now has within its province some of the missions which would be included in the mission of the National Eye Institute which has been proposed.

I am not derogatory of the accomplishments of the National Institute for Neurological Diseases and Diseases and Blindness. However, the rather extensive mission of that Institute has made it impossible for the staff to exert efforts directly toward attacking the many aspects of blindness, which I am sure you will recognize as being one of the most undesirable afflictions that can befall a man. Meanwhile, it is well known that blindness is on the increase in the United States. This is pointed out in a recent article that appeared on page 1 of the *National Observer* for Monday, November 20, 1967. In that article, it is indicated that although the population of the United States increased 36% from 1940 to 1960, blindness increased more than 67%.

In my work as a scientist, I am well aware that many of the efforts now undertaken for developing phosthetic devices for the blind do not take advantage of the capabilities of modern science and technology. Many of the devices that have been developed use obsolete components and technologies. This seems doubly tragic when blindness is such a serious affliction, and there are ways in which problems may be successfully attacked—problems which seemed insuperable only a few years ago.

I am enclosing an article that appeared a short time ago in *Blindness 1966* and which will apprise you on my views on the matter. I certainly trust that your deliberations will result in favorable consideration for the establishment of a National Eye Institute and a concerted effort to make use of the storehouse of capabilities and technologies which are most promising.

Very truly yours,

GEORGE G. MALLINSON,
Dean, School of Graduate Studies.

[From "Blindness 1966," AAWB Annual]

PROSTHESIS FOR THE BLIND—ONE BILLION DOLLARS IN TEN YEARS?

(By Dr. George G. Mallinson, Dean, School of Graduate Studies,
Western Michigan University, Kalamazoo, Mich.)

October 4, 1957, the date on which the Russians launched Sputnik I, may be viewed in many different perspectives. It was a day of humiliation, real or imaginary, when "those people" suddenly orbited the first satellite, thus placing the United States in an allegedly unenviable position of being second. It was a day on which much witch-hunting began. Instead of crediting the Russians with much scientific and technological skill, we sought to find the perpetrators of the indigence and delay that resulted in our failure to orbit some hardware earlier. American education, declining juvenile morality, and the degradation of Appalachia were among the phenomena castigated. It may be viewed, also, as the real beginning of the Space Age when man first began to send and control vehicles outside the earth's atmosphere. Many dour scientists, including colleagues of the writer, proclaimed that the United States would need at least 25 years of intensive research before a satellite equivalent to Sputnik I could be orbited. Without question, the day set off the "Space Race" with one major objective the landing of a manned vehicle on the moon presumably with the subsequent return of the occupants. This noble venture is referred to as Project Apollo.

There is little doubt that a manned vehicle on the moon will elicit vast amounts of scientific information, much of great importance, and much also of questionable importance. The exact cost of Project Apollo will probably never be known, although it is estimated that direct and indirect expenditures aimed at landing and hopefully returning the vehicle and its occupants will be at least 50 billion dollars.

NOTE.—The nature of this publication has suggested that technical and scientific details be kept to a minimum. The references cited will provide many pertinent details, assuming the reader is desirous of exploring them further. Italic numerals in parentheses refer to bibliography at end of article.

What may be expected on the lunar surface? The best thinking indicates that the vehicle will have a somewhat uncertain landing on a surface of dubious characteristics. It is generally agreed, however, that the surface will be hotter than boiling water during the day and colder than dry ice during the night, both of these periods lasting about 14 days. There is little doubt that the environment will be airless, waterless, and, except possibly for some organic compounds similar to those in living things, lifeless. The elements necessary to provide an environment capable of life support will need to accompany the vehicle and occupants, thus limiting the tenure of the spacemen on the lunar surface.

Because the moon is a smaller sphere than the earth, its curvature is such that the horizon is approximately one mile distant, thus limiting visual communication to about one mile. Direct auditory communication will be impossible since there is no air to carry soundwaves. Whether the legendary Indian ear-to-ground technique for listening for hoofbeats may be adapted for communication is a matter of conjecture, but probably unlikely. Since radio waves travel in straight lines and there is no Kennelly-Heaviside layer in the atmosphere to reflect waves back to the lunar surface, ordinary radio communication beyond the distance of a mile will not be feasible. Thus, 50 billion dollars is indeed a handsome sum to place spacemen in such an unfriendly environment with such restricted orientation and mobility. Nevertheless, it is being expended with little complaint.

Some persons believe that October 4, 1957, may best be viewed as a day of irony. Less than 10 years after the ignominious collapse of Vanguard I, science and technology, marshalled in a vast crash effort, have produced feats of "orbitsmanship" for the United States not even imagined at that earlier date. More than one hundred different space vehicles have been placed in orbit. Spacemen have cavorted at the end of synthetic umbilical cords outside space vehicles to the delight of television viewers and their compatriots inside.

Yet with at least 90 million Americans having some kind of eye trouble, in 3.5 million of whom the trouble is serious, and with more than 300 thousand persons totally blind, less than 10 million dollars per year are being spent in the attempt to find causes, preventives and control for diseases that destroy sight. Probably considerably less is spent for research designed to provide some type of replacement for that loss of sight. The greatest irony is that there are at least 50,000 times as many persons with relatively inadequate means for mobility living in a modestly satisfactory environment, as there will be spacemen struggling to survive in a hostile environment. A comparison of the fiscal support given the two programs is ample evidence of cultural blindness.

This cultural blindness is evident in the problems related to real blindness, particularly concerning the development of prosthetic devices for blindness as compared with those for other sensory handicaps. Research on prosthetic devices to aid the auditory handicapped has been directed toward helping the deaf to hear better, and from this research, the modern hearing aid has emerged. Likewise, research on devices to aid the orthopedically handicapped has been directed toward helping the individual walk about better or to grasp objects more effectively, to wit, the development of artificial limbs. However, with blindness, most of the effort has been directed toward helping the individual *feel* his way about better.

It is noteworthy that a special Gallup poll conducted for Research to Prevent Blindness, Inc. revealed that next to cancer, the affliction most feared by American people is blindness.

Yet, in spite of the inexorable conclusions that must be drawn, a scientific attack on the problems of blindness using the total available resources of science and technology is yet to be marshalled. The approaches being taken and the activities underway epitomize the philosophy of "little think."

Despite these anomalies, October 4, 1967, may be viewed with optimism from several aspects. The crash effort in science and technology for competing in the Space Age has produced many significant developments that indicate cautious optimism for "substitute sight." *It should be noted here that the writer uses the term "substitute sight," not substitute for sight.* Specifically it is hypothesized that the artificial eye with accompanying sight may be less "blue sky" than may have been previously surmised by rational persons. Such possibilities are based on changing "little think" to "Big Think." This suggests the application of the imagination and scientific knowhow used in photographing Mars on the problem dealt with here. In brief, the dissipation of cultural blindness could lead to the alleviation of real blindness, at least to some degree.

Obviously, postulates for systems of substitute sight are not inventions of this writer. Many individuals have had ideas antecedent to those expressed here. But, within the past few years, speculations on such possibilities have been based on some optimistic developments in the fields of electronics, space technology and neurophysiology.

One such investigator, Shaw (*1*) patented a device employing photoelectric circuits which generate and send signals to the brain of a blind person producing the sensation of light. Another investigator, the neurologist Button, (*2*) has conducted experiments that enable blind persons to see light. This is accomplished by stimulating certain brain cells with voltages generated by photocells and conducted through wires to the brain. The reports suggest that the investigator planned additional experiments involving many wires to be connected permanently to the brain carrying visual currents produced by miniaturized electronic devices. The investigator predicted that in the "not too distant future" visual impressions obtained by the blind will approximate true vision with an apparatus as simple as the hearing aid.

It seems to the writer that the efforts of Shaw and the conclusions of Button were quite premature and possibly unrealistic on the basis of knowledge then current in the relevant fields of neurophysiology and the relatively macro-level of electronics technology when these statements were first made. This is directed particularly at Button's, (*3*) optimism and some of his later reports about implantation as an appropriate technique. The writers' views about such optimism are supported by Shipley, (*4*) who states that "the intimate neurodelicacies of sensory mechanisms seem honor bound to resist our mechanical intrusions." Cautious but more optimistic positions have been taken by Shrager and Susskind, (*5*) in their review in which the two following statements appeared:

"* * * recent progress in neurophysiology makes it at least conceivable that artificial stimulation of the brain itself to provide a visual sensation might be achieved some day. Here, as in the case of devices [for guidance and reading], success will depend on the close cooperation of workers in psychology, engineering and physiology. This collaboration has been increasing in recent years, and interdisciplinary groups are growing rapidly." Page 262.

They further indicate:

"It should be stated at the outset that artificially stimulating "vision" in a blind person is not likely to become a reality in the immediate future."

A number of psycho-physiological problems, some directly, and some indirectly, related to stimulation of the brain to produce vision are discussed in the *Annual Review of Psychology* by Onley. (*6*) Obviously, these problems are not part of an organized presentation related to the possibilities of substitute sight, but they do imply some of the investigations that need to be undertaken next, if substitute sight is to be developed.

Problems Formidable, Perhaps Insuperable

The writer was apprised recently of some "off-the-record statements" made by extremely competent individuals who have been concerned with the application of science and technology to problems of artificial sight. Because of their "off-the-record" nature, the comments will be only paraphrased here.

One of the less optimistic individuals indicated that the consensus of his neurophysiological colleagues is that the neuroanatomical problems on connecting any conceivable "artificial eye" hardware in the visual nervous system are formidable, if not insuperable. Estimates of the time required to achieve the minimal useful knowledge for such purposes are thought to range from five to fifty years. His colleagues believe it will be harder to make the appropriate "connections" than to produce the necessary inputs.

Another scientist indicated that the knowledge of peripheral (primary sensory neuron) auditory physiology is nearing the level of sophistication necessary for developing artificial end organs. The major problems that do remain and which are claimed to be purely technical, included among others mode of connection, tissue tolerance without degeneration and numbers of channels needed. He indicated there was some question as to whether blind persons could learn to use effectively an input which, under the best of conditions, would not be identical to those from the "original model" even if the model was not technically superior to the substitute.

Still another scientist indicated there is no serious unsolved methodological difficulty at the apparatus and hardware end of the man-made interface but that

the major unsolved problem lies entirely within the domain of physiology. A similar comment from another engineer indicates that the engineering knowledge is much farther ahead than the physiological knowledge. However, he believes that we should immediately get to work on the application of the latest engineering techniques to develop visual replacements while waiting for the physiologists to learn more about the operation of the human brain.

One scientist indicates that research has been conducted for several years in his laboratory on the conditioning of animals to electrical stimulation introduced directly into various brain regions. In addition to the theoretical interest of these studies with respect to information processing methods of the brain, they are concerned with the practical possibilities for sensory prosthetic devices. In his judgment there is already physical evidence that information can be directly introduced into the brain, but currently there is inadequate evidence to evaluate the information handling capacity of such as input channel. However, he believes that such stimulation, under specific conditions, could replace some of the qualities of normal sensation, but he hesitates to speculate how good this reproduction might be.

One of the more optimistic indicates that he is convinced, from a technical point of view, that the creation of an "artificial eye" is sufficiently feasible at this time to warrant serious research efforts for its development. The image pickup, signal conditioning and filtering aspects of the problem are well within the current state of the engineering art. He believes that the application of microelectronics and solar power supplies to current technology could result in a substitute eye that would produce a signal similar to that which enters the optic nerve.

From these comments plus the information provided in many other sources, one may evidence cautious optimism about the likelihood of developing an artificial eye. Optimistic statements have been made by some scientists, although the pessimistic comments of others cannot be disregarded. Yet the expressed pessimism has emerged in the light of minimal level funding with little or no organized systems analysis of the types of information needed and the research that should be undertaken.

Thus there is reason to believe that an organized major effort, adequately funded, involving both systems analysis and systems engineering, *might* result in the development of artificial sight within the lifetimes of many who are now blind. It is, of course, impossible to compare the magnitude of such an effort with that of the present space program. Such a comparison cannot be made until a sustained effort analogous to that of the space program has been undertaken.

Prospects for Hardware and Technology

Obviously, any group of devices which together provide artificial sight must meet certain practical limitations. Among these are portability, comfort and economy. Fortunately, electronic circuitry that contains a full complement of transistors, resistors, capacitors and other essential components and, yet occupies less space than a pinhead, is now regularly produced on the assembly lines of electronic manufacturers. In a recent article by Hittinger and Sparks (7) this information appeared:

"Between 1955 and 1965 the electronics industry developed and reduced to practice a remarkable microelectronic technology that has shrunk transistors and other circuit elements to dimensions almost invisible to the human eye. A complete circuit consisting of 10 to 20 transistors and 40 to 60 resistors can be built into a bit of silicon measuring only about a twentieth of an inch on a side. Between 100 and 500 such 'integrated' circuits can be manufactured simultaneously on a silicon wafer that is about an inch in diameter and less than a hundredth of an inch thick . . . With the new microelectronic technology it is hardly more costly to put 100 circuit elements on a single chip of silicon than it is to put one, 10 or 50. Moreover, the 100 elements can then be handled as a unit when the final system is being assembled. Whereas a good transistor cost about $1 as an individual unit in 1960, an integrated circuit containing several dozen transistors and other elements can now be bought for about the same price."

Thus, the routine requirements of portability and economy, and in all likelihood comfort, have been met.

In a system for substitute sight three major components must be included:

1. A scanning "device" that will convert light into electric current.
2. An "organizing device" that may temporarily store the electrical energy and serve as a transducer to produce electrical impulses.

3. A mechanism that will use the pulses from the transducer for stimulating the "visual areas" of the brain.

The first component can be accomplished by applying routine technologies and hardware already developed by NASA. Obviously, devices capable of scanning the Martian surface from several thousands miles and producing adequate signals for later transmission to the earth over a distance of many million miles are readily adaptable for such a component. The Technology Utilization Program of NASA is available as a resource. (8)

Formidable Neuro-physical Difficulty

Specifications for the hardware for the second component are still a matter of some conjecture. However, technologies are nearly refined for producing information storage devices with capacities for staggering amounts of information and which seem to have the capabilities desired. Among these devices are the ferrite memories such as the IBM Flute for which fabrication methods are in final stages of dovelopment. (9) It has been estimated that in some of these systems it will be possible to store 250 billion digits of information in a volume of seven cubic inches with mocrosecond retrieval. The adaptability of such ferrite memories in a transducer component seems eminently practical.

The problem with the third component is, of course, one of the more formidable as has been indicated in many references already cited. The problem, essentially neuro-physiological rather than technical, involves the connection of artificial organs to body parts. Some efforts in which attempts have been made to implant materials in the brain have been far from successful. Thus, this approach does not seem currently to be the most practical solution.

Some research efforts about which there is little publicity involve the stimulation of the nervous system by means of electronmagnetic induction. The application of such principles might eliminate the need for implantation and connecting artificial and regular body parts. However, in order to apply such a principle for stimulating vision, much needs to be learned about the mechanisms by which visual imagery is produced in the brain. There is no reason, however, to assume that such information is illusive and its acquisition insuperable. Neither is there evidence that its acquisition will require vastly different avenues of neurophysiological research than are now being employed.

Need for Great Caution

Before making any recommendations for proceeding with "Project Big Think" in a major research effort to develop substitute sight, *the writer wants to emphasize the need for the greatest amount of caution.* Under no circumstances should any statements in this article be used as support for diminishing efforts in improving current techniques of orientation and mobility, whether such efforts involve dogs, the long cane, or ultrasonics.

If the efforts in developing some system of substitute sight are successful, it is likely that the pioneer devices will be crude and at best will serve only a few of the blind population. It is also reasonable to expect that the entire blind population may not be served, even if more sophisticated systems emerge.

It is likely also that medical services necessary for compromising the device-man interface will be relatively sparse, and that for some time only a few of the blind who are anticipating prosthesis can be accommodated. Thus, efforts in improving and disseminating present techniques for orientation and mobility, however mundane they may seem, also must be accelerated.

$100 Million Per Year Is Trivial

Obviously, several steps are needed if efforts for marshaling talent and technology are to be successful. One of the most important involves appropriate publicity, which will lead to adequate funding.

The funding must obviously be at the Federal level and should constitute a commitment of at least $1 billion over ten years. A commitment of $100 million per year, however, is trivial. When one considers the U.S. population of nearly two hundred million persons, any one of whom has a chance to be blind, a gamble of fifty cents per year per head for a system of "substitute sight" is "small potatoes" indeed. This point must be brought to the attention of those at the "decision-making" level both from a mundane pecuniary viewpoint, as well as from one of social conscience. This matter, however, can be debated later.

Most important, the very best brains in the fields relevant to such a system must be recruited without regard for cost. Their talents must be directed toward the various unsolved aspects of the problem, which are identified by a thorough systems analysis and attacked through systems engineering.

Need for Someone to Light Fuse

Unfortunately, many admirable proposals traverse the systems analysis stage and falter at systems engineering. Thus the various associations concerned with blindness, including the American Association of Workers for the Blind, the American Foundation for the Blind, and the American Association of Instructors for the Blind, and all the agencies in the Federal government concerned with blindness might well marshal their forces toward such a goal, since the stakes are far higher than those in any of their previous activities.

The talent and much of the technology are available. Perhaps one may well consider the words of "Boss" Kettering, who commented shortly after Sputnik I, "We have all the talent and technology we need in the United States to compete successfully in the space race or in any other race. All we need is someone to light the fuse."

Why doesn't the AAWB light the fuse?

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(Whereupon, at 12:30 p.m., the committee adjourned.)

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