food. Farms have become more specialized in the types of products that they produce and the sizes of areas devoted to single types of crops have consistently increased. This tends to reduce natural stability and man must become increasingly diligent to protect his crops from catastrophies such as infestations by plant pathogens or by population bursts of injurious insects. This necessity has supported rapid advancement in production and usage of various kinds of pesticides. These materials are used not only on most of our cultivated crops but also on large areas of forests and grazing lands. They are also used to control insects which spread human diseases and to control pests in our houses and yards and pests of our domestic animals.

In the early days of insect control, persistence of the insecticide was considered an important virtue because the residual activity provided control over an extended period of time. This characteristic is undesirable under many conditions because the persistent toxin can cause death or damage to desirable species even though they may be at great distances from where the pesticide was applied. The classical examples are so well known that I do not need to refer you to them. It is of great significance that during the past 3 or 4 years there has been a large shift toward pesticides that are more readily degradable and a market shift in emphasis by Federal agencies, particularly USDA, toward other methods of pest control. A considerable increase in effort, however, is desirable.

I have indicated a few of the pollution problems which need more research and some where we can apply what we know already. Actually, we do not have adequate understanding of many of the basic processes of the bioenvironment; we do not adequately understand the interrelationships between various species of plants and animals, and we have very little knowledge of the effects of environmental stresses upon natural populations and communities of organisms. We are particularly deficient in our knowledge of the chronic effects on man, plant and animal species, and ecological systems from long-term exposures to low levels of pollutants and other environmental stresses. This basic information is essential to enable us to assess the biological hazards of pollutants, to enable us to establish more meaningful tolerance levels of pollutants, and to assist in the improvement of methods of pollution control.

To achieve the needed advancements of scientific knowledge and technology, it will be necessary to attract many more highly qualified scientists and engineers to the many aspects of the broad problem. It is of particular importance to devote adequate attention to the advancement of basic knowledge.

These requirements indicate the need for increased Federal support of training and research through the various responsible agencies. Continued effort should be devoted to improve intramural research and development programs but at the same time more effort should be directed to utilizing the much greater pool of talent outside Government by increasing sound research, grant and contract programs with universities, non-profit research organizations and industry.

As a nation we have no really long-term plans to deal with either the problems associated with the carbon dioxide buildup in the atmosphere or the eventual exhaustion of our valuable fossil fuel supplies. Concerning the supplies of fossil fuel, there is no answer for the long term except for the development of new sources of energy such as nuclear power or solar or tidal energy. Nuclear power carries its burden of environmental hazards, but in the light of what we now know, the hazards from controlled nuclear energy may be less troublesome to manage than the use of fossil fuels with their attended buildup of atmospheric carbon dioxide.

It is time that our nation begins to work diligently toward the goal of efficiently recycling materials and utilizing natural energies for our power requirements. A concentrated effort devoted to developing methods and policies to effect the recycling of used materials back into the production of new products would result in both conserving our wealth of natural resources and materials which we must import, and it would contribute greatly to the alleviation of pollution. Our disappearing fossil fuels could perhaps serve their highest use as raw materials rather than being lost forever by burning them as sources of power. Our present usage of fossil fuels is much more serious than the exploitation of the forests by our ancestors because the supply that we are depleting does not represent the crop of one year or one century but the crop of many hundreds of thousands, indeed millions, of years. The loss cannot be redeemed by any of the powers of man.