

Mr. KITCHIN. Do they create a system upon which you can formulate a formula that you operate on these machines, or do they prepare the formula for you under certain given situations?

Dr. RIGBY. They do not prepare the formula for us under any kind of situations.

I can—I am capable of using their work in this way.

In practice, it is not my job. Other persons employed by the Navy, and also through contract, do this sort of thing—making the formulas and spelling out the procedures based on theoretical background such as this, including this and others.

Admiral BEARDSLEY. Mr. Kitchin, as I see it from a semitechnical point of view is that we have had a tremendous explosion in the techniques of computers during the last 10 years.

The computers will only work on something that is given to them that they can handle. They can't program themselves. They can't think what problems should be attacked. Human beings have to do that.

Now, mathematicians and other people of similar disciplines are also used in the programing aspects on particular problems.

But in between, or in front of those programers—and I have some in my own family who are working on this—you need people who are advancing the state of the art in the pure theoretical, analytical, mathematical, and economic sense, too. There are new fields and new ways of using these machines for man's assistance.

Now, they are out on these fringes. And studies like this are on these fringes. Exactly what they are doing.

Now, if we don't do this, we are falling behind. Somebody has to do it.

This is out on the fringe, where you come up with new methods of attacking new problems, because what we are doing with machines couldn't be done in a man's lifetime.

If we are going to get ahead in scientific development on all fronts—not just in logistics, but in the mathematical fields and in the scientific fields, we have to find some way of creating a greater know-how and a greater use of these we have today.

And we will have a continuing need for this type of research, no matter who does it, or who finances it. The country does need it.

Dr. SILVERMAN. I think a perfectly good analogue, Mr. Kitchin, might be the relationship that exists, for example, between the theoretical man who works on the electrical circuit theory and the electronic engineer who builds new tubes to take advantage of the theories which have indicated to him new devices that could be made if one had those tubes available. This sort of symbiotic relationship I think exists throughout all of our scientific disciplines. And I think it is a thing that one can expect, and these people I believe play the role essentially of the circuit theory people.

Now every so often, somehow development comes along and there is a whole burst of activity. You see the physicists were the people who, working 20 or 25 years ago on rather fancy problems which are of interest to very few people, came up with the fundamental facts which made the development of the transistor and other devices possible.