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SCIENTIFIC RESEARCH, THE HOPE OF THE SOUTH[1]

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I WISH, first, to discuss the importance of scientific research to the nation as a whole; second, to contrast the scientific research done in the North and the Far West with that done in the South; and third, to suggest ways of building up scientific research organizations in the South or in any other region.

We all know about the "Report on Economic Conditions of the South" prepared by the National Emergency Council for President Roosevelt, and his statement that "The South presents right now the Nation's number one economic problem." This report emphasizes our poor ranking in education, housing facilities, etc., but barely mentions our low ranking in the field of scientific research. This is all the more remarkable since we now know that the present status of the United States as the leading nation is due primarily to the *unbeatable combination of business and scientific research,* backed by our great resources.

Big business to-day is exploiting the fruits of our scientific research laboratories—our last remaining frontiers, our so-called "inner frontiers"—as during the past century it exploited our exterior—or geographical—frontiers. There is one big difference now—we shall never run out of "inner frontiers." Success in one field of scientific research immediately presents many new and worth-while fields.

It is this scientific research, chiefly in the fields of applied chemistry and physics, backed by excellent industrial organizations, which has enabled us gradually to forge ahead of all other countries. Our nation

[1] Address of the retiring president of the Alabama Academy of Science, Birmingham, Alabama, March 29, 1940.

has at last become intensely interested in scientific research, chiefly because there is "money in it" and also security against war. Dr. C. M. A. Stine, of the du Pont Company, vice-president in charge of research, has said that scientific research is a "definite contribution toward the maintenance of peace." It is the most useful tool of the democracies. If, as Walter Lippmann writes, "The democracies have become softened by a false sense of security," all the more do we need scientific research organizations to keep ahead of the dictatorships.

Our nation has now become the center of scientific research primarily through the large amount of work done during the past ten years by our industrial, educational and governmental scientific research organizations. Approximately $500,000,000 is invested each year in scientific research in the United States. Half of this, or $250,000,000, is invested by industrial concerns practically all in the North and Far West; the other half is invested by governmental and educational institutions, primarily in the North and Far West.

Three examples will indicate the extent to which industry invests in scientific research. Note that I use the word "invest" and not "spend." The research budget of the du Pont Company for the year 1939, was $7,000,000; that of the Dow Chemical Company, $1,400,000. The California Fruit Growers Exchange reports that their research for the past twenty-five years has "so far paid more than $8,000,000 in direct profits to growers and has led to two by-product plants." Twenty years ago there were about 100 companies investing money in scientific research. To-day, there are over 2,000 companies, practically all in the North and Far West, investing large sums of money in scientific research. Now double the amount of work done by these 2,000 companies, and you will have the total of all research done, including that done by about 200 universities, colleges and various research institutions, again, located primarily in the North and Far West—the richest sections of our country—thus making these rich sections richer.

There is never any doubt about the profits of organized scientific research, and these profits are progressively increasing in these modern times. In fact, the depression years have been the most outstanding years for industrial scientific research. This industrial scientific research is leading us into prosperity and will continue to lead us through prosperous times. We are in a "new era," a more realistic world, whether we like it or not, based more and more upon scientific research. This condition exists primarily because we now have in the United States more cooperation between the men of business and the men of science. James Truslow Adams, the historian, states in "Democracy at Work" that, as a nation, "We depend more and more on brains and less on brawn. We create our new horizons in the laboratory."

Because of the commercial importance of scientific research, many new concerns are establishing, and many older concerns are expanding their research laboratories. For example, the American Cyanamid and Chemical Corporation has just completed its magnificent new scientific research laboratory in Stamford, Connecticut. The American Telephone and Telegraph Company recently announced that it will build a new $3,000,000 research laboratory at Murray Hill to be completed in 1941. Many more laboratories have been completed and others announced for completion in the near future.

The importance of scientific research is well illustrated by recent developments in the airplane industry. According to a recent announcement, most of the research has been completed for building bombers capable of flying across the ocean and back on one fueling. More research will be done, and we will make this transatlantic round trip bomber, and so it goes. This probably means that transatlantic round trip bombers will eventually end the United States' isolation policy.

To realize the importance of scientific research, one only has to think of some of the things that we did not have ten years ago, such as transoceanic passenger air service, streamlined trains, new nylon synthetic silk for hosiery, glass-building blocks, glass textiles and insulation materials, new synthetic rubbers, television, new and very strong plywoods, synthetic vitamins and hormones, sulfanilamide and sulfapyridine drugs, etc. This in itself shows that business has invested heavily in its research laboratories during the past ten years of depression. Certainly, a great future awaits us in the United States. This is impressed upon one when he remembers that the bulk of scientific industrial research in the United States only began with World War number one.

We are remaking the world through our "inner frontiers"—our organized research laboratories. The whole of our future mechanical civilization depends upon them. At the present moment, a large number of new products of the research laboratories are almost ready to be put on the market. Some are being tried now on a small scale in certain sections of the country. All these and many more will be commonplace in a few years. Thus we may easily visualize the tremendous effect of scientific research upon our nation as a whole.

Now, I should like to emphasize the effect of scientific research on a given geographical section of the country. It is now well known that our "inner frontiers" are in the scientific research laboratories. We can no longer go West! We are now developing a new civilization based upon the products of the scientific research laboratories. As a result of this tremendous amount

of research activity in the United States (about $500,000,000 expended annually) the following rule stands out in bold relief: *The prosperity of a region is roughly proportional to the number of patents taken out in that region.* Consequently, you can readily understand that it is highly important that the South take steps so that Southerners intensely interested in the South will take out patents and develop fields which will utilize the resources of the South rather than those of some other section. This will create new industries and additional jobs in the South.

I realize the tremendous importance of the social, economic and educational forces that have such powerful influences upon our lives, yet as I see it, at the present stage, *the South's number one problem is the utilization of its natural resources through scientific research.* Our scientific research is lagging when compared with our social, economic and educational progress. The question immediately arises, what steps should be taken to enable the South to utilize its own natural resources? The general answer is—simply build up scientific research organizations similar to those in the North and Far West. Everything in science, as in other fields, is becoming highly organized. A lone scientist or inventor is able to do little. At the present time, we, in the South, need organization and help, but we should help ourselves. *We should develop our own scientific research organizations for work on Southern resources.* This may be done in many ways.

In the past, it has taken a man with determination, fighting ability, salesmanship and imagination to build up single-handed an industrial research laboratory in the South. We have had few such men. The only ones, so far as I know, are Theodore Swann, who lives in Birmingham, the late Charles H. Herty, who pioneered our new newsprint paper mill and laboratory at Savannah, and William H. Mason, of Laurel, Mississippi, who started the Masonite Corporation. If it had not been for Theodore Swann, the Monsanto Chemical Company would not now be in Anniston, nor the Swann Chemical Company in Birmingham, nor several other plants in other places. Swann has been the pioneer and one of the greatest exponents of Southern industrial research. The South needs more Theodore Swanns! In this connection, mention should certainly be made of the large part that patents played in the success of Erskine Ramsey, who likewise lives in Birmingham. Despite our lack of large industrial scientific research organizations, some outstanding scientific research has been done in the South. I should like to mention especially the making of cast-iron pipe by centrifugal force as developed in the Birmingham district.

The other day in his column in the Birmingham *Age-Herald,* John Temple Graves II described the following statement: "A revival of the pioneer spirit, a venturesome and creative outlook on the problems of our day," as the "eternal song" of Vanderbilt's Chancellor O. C. Carmichael. This is his "remedy for the sickness that has come over democracies." We need a revival of the pioneer spirit in scientific research in the South to-day.

Of course we are gradually developing some small research laboratories in the South, but this increase has taken place primarily during the past ten years, and is not at all in proportion to the amount of industry in the South. In fact, the scientific research laboratories pioneered by Swann and Mason are still the largest industrial research organizations existing in the South. Some of our paper mills are true Southern concerns and as such are helping to build up Southern scientific research. Apparently where the new research idea is born is where the research organization is built up, which in turn produces other new products and establishes more new industries with their resultant new research laboratories—the usual snowball effect. Ideas count tremendously in industry and most of them are born in the scientific research laboratories.

Heretofore, research activity has been in the interest of the North and Far West with the profits from new industries, monopolies of patents, etc., likewise going there. Although this scientific research has already greatly affected the South (and other regions) it will affect the South to a much greater extent in the very near future, and much more adversely unless we have our own scientific research organizations working in the interest of the South. The concentration of research in the North and Far West amounts to a scientific research differential, which is much more important than our freight differential, important as that is, because the research differential is more fundamental. We often hear of the absentee ownership of industries of the South, but we never hear about the absentee research done for these same industries.

A further step in the development of our Southern resources is being made at the present time, but it is the Federal Government who is doing it for us. I refer to the new $1,000,000 regional research laboratory recently established at New Orleans to obtain new products and uses of cotton, peanuts and sweet potatoes. This will help just as a government sweet potato research laboratory at Laurel, Mississippi, has already helped. More scientific research supported by the Federal Government is badly needed in the South. Although we recently obtained one of the four Federal regional laboratories—which in itself is geographically fair—in general, I can say that here again we have a governmental research differential. The rule of rewarding the institutions that have already established large research organizations is applied even by the Federal Government. Since the Federal Government

invested $60,000,000 last year in research, this is a considerable advantage. It is only fair to say, however, that such a project as TVA with its many research activities tends to eliminate this governmental research differential, for those living in that region.

This generally accepted custom of rewarding those institutions that have already established large research organizations destroys enthusiasm for research in the South. This in turn, has its effect upon industrial scientific research, and thus is another and very considerable factor in making the South poorer.

While there has been some decentralization of plants, there has been much more centralization of research and management. Research and management which usually go together, determine where the excess money of a region ultimately goes. This centralization of research and management in the North and Far West has drawn most of our competent Southern scientists away from the South. Many Southern scientists in charge of very important research work in the North and Far West would like to work in the South but are offered little inducement. Many scientists in Southern colleges and universities desire to work on Southern resources but have few facilities.

If you list the most important raw materials, such as coal, iron, petroleum, cellulose, salt, sulfur, phosphates, etc., and include power, you will find that the South has a near monopoly, or, as a minimum, has its share, in proportion to the rest of the United States. Since scientific research is necessary in the development of these vast resources, the South has done little toward the utilization of these raw materials. What has been done has been brought about almost entirely by outside capital.

According to Georgia's geologist Garland Peyton: "The Southeast is the only sector of the United States whose agricultural diversities, climate and mineral resources are sufficient to make it wholly self-supporting from the raw material standpoint." The Southeast is destined to become the greatest chemical manufacturing region in the nation because of these natural resources. The flow of chemical industries, paper mills, etc., to the South during the past ten years is excellent evidence that we are on our way. Dr. E. Emmet Reid, chemical consultant to many industries and Southern colleges and universities, informs me that for the past three years there has been more actual construction of chemical plants, or total expenditure for chemical plants, in the Southeast than in all the rest of the United States combined. However, research and management have seldom followed the flow of chemical plants into the South. The time required for the South to take the number one position in the chemical manufacturing field may be definitely speeded up by organizing our own research laboratories—not waiting for the other fellow. Then, too, by planning our own research, we can gradually build up our own industrialization. If we do not organize our own companies, and plan our own research, we still shall have absentee ownership and absentee research, and the South will continue to send most of its excess money up North.

I believe that, as Stewart J. Lloyd, dean of the school of chemistry, metallurgy and ceramics at the University of Alabama, has said, "A group of business men in the Birmingham district should get together and build up an industrial scientific research organization—not with the idea of subsidizing research, but to make money." This would help the Birmingham district and the South. The Mellon Institute at Pittsburgh has evolved many new industries for that and other regions. This type of organization is everyhere in the North and Far West. We need more Southern business men interested in science.

There is another type of scientific organization that the South needs. The February 1 issue of *Forbes* (business magazine) contained the announcement of the next logical step in New England's systematic method of increasing its scientific research. The larger companies of New England already have their research organizations. Now New England is starting to make scientific research organizations available to all their smaller industries.

Many leading industrial executives and scientists, under the leadership of Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, have organized New England's various research agencies into a unit, which gives technical assistance to small as well as large business establishments having research problems. This large-scale cooperative research project is the first of its kind in the United States.

Economic difficulties forced New England to originate cooperative science. This is the answer to those who may say that the South—or any other region—can not afford to do much research.

I do not wish you to think that I blame the Northern and Far Western interests for what they are doing. I am sure that we would do exactly the same thing under the same conditions. They are simply using good business methods. The South should form similar organizations. What New England is doing, other regions can do, thereby benefiting science and industry in the entire nation.

We need not fear that we shall over-expand in scientific research. Chaplin Tyler, of the du Pont Company, believes that at the present time it would be profitable for industry in the United States to do five times the amount of research it is now doing. Thus, should the South expand its research, it would be building up industry in the nation as a whole.

Southern industry and, in turn, Southern agriculture would be benefited enormously. Dr. C. M. A. Stine states the following:

> Chemical industry spends 2 per cent. to 4 per cent. (as high as 7 per cent. in some cases) of its gross sales revenue on research; agriculture, in contrast, spends only about one seventh of 1 per cent. of the value of its products on research. As much as $240,000,000 might be expended annually in the United States on agricultural research and the expenditure would not be at all fantastic nor out of line with need.

Money for scientific research is the greatest need of Southern colleges and universities at the present time. The legislatures of the Southern states should appropriate additional money to the universities and other state colleges for scientific research. This is undoubtedly the most important means of building up scientific research within the Southern states. In addition to state aid, many gifts for scientific research from business men and endowed foundations have helped Northern and Far Western educational institutions. Few such gifts have been made to Southern educational institutions. Of course, Federal aid for scientific research in Southern educational institutions would help solve the problem. We can not build up Southern industrial scientific research laboratories without the cooperation of Southern universities and colleges.

A large number of individual companies and many trade associations make research grants to educational institutions. Need I say that very few of these are given to Southern colleges and universities? We need to increase our industrial scientific research organizations, along with our university and college research organizations, so that our Southern-trained young men will remain in the South and build up the South. These will be the men who will have new ideas and create many new Southern industries. If we train Southern men in scientific research, a certain proportion of them will remain in the South. Hence, the universities and colleges should take the lead in building up scientific research in the South. We should strive to have at least one institution in each of the Southern states granting the Ph.D. and M.D. degrees.

We should also build up natural science education in the secondary schools. At present there is a strong trend away from natural science in these schools.

We should establish our own nationally great colleges and universities, our own grants-in-aid for research, our own journals for the publication of research, etc.

A direct way to encourage scientific research in the South would be for the Southern states to forego taxes on industrial, as well as on college and university research laboratories.

Now I should like to mention just a few ways in which I believe the Alabama Academy of Science can help in this program. The more interest in science on the part of the people of the state, the better off science will be in the state. We are certainly furthering this interest through our Junior and Senior Academies of Science. For the first time we have several important all-year-round committees to carry on the work of the Academy. We are progressing in our finances, our membership, and in our journal activities. We should further expand our journal so as to be able to publish valuable research pertaining to the state of Alabama that would not otherwise be published and thus kept for posterity. Many colleges, universities and other institutions, primarily in the North and Far West, are beginning to publish their own scientific manuscripts. This is a necessary trend in view of the large amount of scientific research now being done. We should work for the establishment of similar publications in the South. We should also increase our grants-in-aid for research. These are all valuable and sure ways of building up science in the state. We need state aid to adequately finance the academy. I believe our next step should be the formation of a Southeastern Scientific Society (S.S.S.), perhaps later to become the Southeastern Division of the A.A.A.S., similar to the Southwestern Division, and meeting with our various state academies. This should stimulate further interest in science in the Southeast.

Finally, I should like to say that I sincerely hope that by the end of the South's "ten year program of economic and cultural enrichment" sponsored by the Southern Governors' Conference and to be climaxed by a great world's fair of the South in 1950, we shall be able to report much progress in scientific research. Therein lies the hope of the South for the utilization of its own natural resources.

SCIENTIFIC EVENTS

FIELD PROGRAM OF THE CANADIAN BUREAU OF GEOLOGY AND TOPOGRAPHY

THIRTY-SEVEN geological and topographical survey and exploratory parties, comprising a force of about a hundred and seventy men, have been assigned to field work this year by the Mines and Geology Branch, Department of Mines and Resources, Ottawa. These parties, most of which will be leaving Ottawa in the immediate future, will map and investigate areas in every mineral-producing province in the Dominion and in Yukon and the Northwest Territories.