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Scientific Research and Philippine Progress

MIGUEL MA. VARELA

The last ten years have made it quite evident, even to the ordinary layman, that the Natural Sciences are a powerful weapon in the hands of men. But very few have come to appreciate, or even realize, the importance of scientific research, the instrument by which the Natural Sciences are focused to destroy a concentration of troops or an army of locusts. This want of proper evaluation of the potentialities of scientific research is noticeable not only among individuals, but even among some industrial organizations. As is to be expected those countries that have early enough sensed its hidden capacities and implications are today enjoying a rather comfortable level of material prosperity and expanding their world markets. Population density, geographic location, or territorial limitations are no impassable barriers. Japan and India have within the past few years made good progress in developing research centers where native raw materials are to be put to new uses, nutrition programs developed for a healthier citizenry, and agricultural projects undertaken towards national self-sufficiency. Dr. William L. Coolidge has pointed out that the Japan he visited in 1947 did not show a high degree of penetration of science into

industry.¹ Consequently, at that time Japanese industry suffered from inadequate control of its products at various stages of manufacture. But today he finds that country producing optical goods that compete with those of the U.S.A. Norway, with a population of about four million, is making use of scientific research to tap the resources of her long coast line. Her shores offer a plentiful supply of sublittoral and littoral seaweed. At present Norwegian enterprise is responsible for the flourishing industry created by the discovery of uses to which algae may be put. Her research workers have found fish waste a useful raw material in producing a thermosetting molding powder for her plastics industry, in the production of foam extinguishers, and as a source of protein materials.² Denmark, with one-seventh the area of the Philippines, possesses no coal, oil, or gas, and unlike other Scandinavian countries, has no hydroelectric power. Yet it counts 540 chemical establishments employing over 15,000 people. Danish researchers have aimed at forging a link between these chemical industries and agriculture, which is the predominant occupation of the population. These chemical industries produce the substances that supply Denmark's fermentation, pharmaceutical, and fertilizer demands. The past few years have seen Danish capital boost the industrialization program, rooted, so to speak, in its agriculture. Its animal husbandry work, for instance, is the source of insulin preparations extracted from animal pancreas.³ In the Netherlands the Central Institute for Agriculture Research has very recently reported a process which extracts proteins from grass. These extracted proteins are cellulose-free and said to be rich in carotene (a precursor of vitamin A) and chlorophyll. This discovery opens up a new method for improving protein deficiencies and livestock feeds.⁴

The accelerated tempo of scientific research on the European continent has become a source of admiration for American scientists. Dr. Joseph O. Hirschfelder, Director of the Naval Research Laboratory, has recently returned

from a two-month tour of European countries. He was impressed by the quality and volume of research now going on in their laboratories, as well as the large number of graduate students taking part in scientific research. He points out that the research centers in Europe receive a great measure of help from the national governments since "there is recognition that research in technology is one of the most hopeful means of solving economic problems." The University of Wisconsin professor commented further, "All of the European countries have the feeling that the international race for scientific supremacy is closely interlocked with economic survival, particularly for those countries lacking in raw materials."⁵ How true this statement is even for such an industrial Colossus as the U.S.A. is evident from the ever growing emphasis on scientific research undertaken by American establishments. Total research expenditures in the U.S.A. have gone up from 0.1 billion dollars in 1933 to 2.5 billion in 1953, and are expected to reach the 10 billion mark by 1973.⁶ A new profession created by the scientific research atmosphere is that of research manager. His work is principally to guide a profitable development from the time it is but "a preoccupied look on the face of a research chemist until it shows up as a profit in the annual report."⁷ How, then, we may ask, does American management look on research? "Research is our insurance on future profits." "If we discontinue our research activities today we would be out of business in five years."⁸ "Today it is research that gives the American economy its characteristic surge and its dynamic qualities," asserted the president of Du Pont enterprises.⁹ To put it summarily we agree with H.L. Fisher, president of the American Chemical Society, that "Research is the price of progress."

Granted the value and the need of scientific research, even for countries that do not rate with the Big Four in international politics, the question comes up of the type of research that best suits a given geographical and cultural group. Of primary concern for us is the limitation impos-

ed by our economic status. This rules out undertaking that type of pure fundamental research requiring budgets that run to six and seven figures. This, however, does not preclude undertaking a certain amount of fundamental work commensurate with our financial assets and utilized more as a means to an end, as a first step in obtaining an immediately practical result. *Practical* may not be the apt word to use, since any research of a purely fundamental character will sooner or later be concretized in terms of consumer's goods. Our cultural ties with the U.S.A. give us a rather advantageous position among the nations of South East Asia. Those links should help our research program. The pure research along fundamental lines undertaken by an American scientist could be the stepping stone for applied research by his Filipino colleague. It is for us to make the most of the opportunities and facilities offered by the research centers of the United States. What Dr. Coolidge said with reference to Russian scientific advances these recent years may also be used to honest advantage by the Philippines: "...The world has rapidly grown smaller, and this makes it easier for others to learn about and to adopt anything that is good in our methods. It is clear that the other fellow is learning very fast"10

Almost unconsciously and against our will we have been placed by history into situations thick with the challenge that creates and fosters the spirit of research. The blood-drenched years of Pearl Harbor, the Occupation, and the Liberation made us feel the discomforts and the embarrassments imposed by a national blockade. The post-war years with their tight economic controls challenged our ingenuity in an effort to satisfy the demand for imported products with locally produced materials. Today's tense and unstable international developments are disclosing to us the risks involved in a national economy that is predominantly parasitic. It is part of our contribution for the blessing we enjoy of Filipino citizenship to foster all opportunities that will place in the hands of our actual

and potential scientists the tool we call scientific research. The first steps towards that direction have been recently taken by both Government and private enterprise. Research projects are now in progress in government laboratories to control plant diseases in tobacco, abaca, and coconut. Filipino scientists are now busy implementing a research program aimed at finding a cure for the *kadang-kadang*. This coconut pest has already affected 5.5 million out of the 16 million coconut trees in the Bicol region and has meant a loss of P3,600,000 yearly from copra alone. There is no doubt that the six million Filipinos whose subsistence depends on healthy coconut harvests have their hopeful eyes fixed on the successful outcome of this research enterprise.¹¹

On the other hand, private industry has not gained sufficient momentum to launch a long-range plan of research studies. This situation is not to be wondered at since only in the past decade have the Islands witnessed a growing interest in the establishment of local industries that are controlled by technical know-how. It is significant and encouraging that the recent survey on the present status of scientific research in the Philippines shows a majority opinion in favor of a national policy for scientific research and development, and the creation by the Philippine Congress of a permanent committee to direct such a work.¹²

There is, however, much still to be accomplished to bring to maturity this scientific research-consciousness among our people. If we include the pre-war years, the roster of Filipino scientific research in terms of major publications shows 570 in Medicine and Public Health, 614 in the Biological Sciences, 41 in Engineering, and 80 in the Mathematical, Meteorological, Physical, and Chemical Sciences.¹³ If we measure research productivity in terms of scientific and technical journals, how do we compare with our Asian neighbors? The Unesco reports give the following figures:¹⁴

For 1951		For 1953	
Indochina	12	Indonesia	37
Indonesia	38	Japan	577
Malaya	27	Malaya	31
Philippines	38	Philippines	80
Thailand	16	Thailand	16
		Viet-Nam	38

We must learn early enough that a research program is not a magician's bag that works in the twinkling of an eye. The observation, study, correlation, and confirmation of data is a tedious and long process, even with the aid of mechanical and electrical instruments. Then, too, a national attitude towards research has to be developed among the intelligentsia as well as among the student and non-professional segments of the nation. Filipino scientists should take the lead in this movement. The same survey already mentioned shows that 227 out of the 273 replies sent advocate that scientists should keep the Government informed how best to bring to the people the benefits of scientific studies.¹⁵ Even in the U. S. A. itself Dr. D. W. Bronk, in his 1953 address to the American Association for the Advancement of Science insisted that scientists should have a more active and vigorous voice in the formulation of the scientific policies issued by the government and private organizations. "We need to revise and broaden our concept of a scientist's functions and his role in society. Unless we accept that broader role, our work and we will be controlled by those who do not understand the requirements for the furtherance of science."¹⁶ Filipino scientists, both individually and collectively, should strive for greater participation as consultants in the formulation and implementation of laws and measures aimed at the utilization of scientific manpower and natural resources. Students who give promise of scholarly capacities should be given greater encouragement through a planned program of scholarships, grants, exchanges with national and international centers of learning. Frequent visits and observations of various research centers

in Asia, Europe, and America can be an effective means of keeping alive the enthusiasm for investigation, of stimulating and ripening ideas, and of advertising Filipino scientific abilities. Scientists living in such a closely knit international community as ours is, need to be aware of advances in their field made in other parts of the world lest their work prove to be old-fashioned and their efforts ineffectual.

Scientific research, in the long run, does pay off in terms of pesos and centavos, in terms of higher efficiency and reduced man-hours of work, in terms of richer harvests and healthier citizens. We in the Philippines are in a more favorable position than the U. S. A. to reap higher profits from the results of scientific research. The Director of the Armour Research Foundation, after a study of southern Asia's potential in scientific research, commented that research is helping the growth of Asian industries by attacking basic problems of research. In the U. S. A., on the contrary, industry first grew to self-sufficiency before it turned its eyes to research for improvement.¹⁷ It is quite evident in our days that no nation can boast of absolute self-sufficiency and still keep up with the rapid march of Time. But it is equally true that the key to its material advancement and prosperity is largely in the hands of those responsible for drawing out of our God-given resources the treasures Nature reserves as a reward for patient, persistent scientific application.

¹ Coolidge, William D. "A plea for more fundamental research effort." *Science* 119 (Jan. 22, 1954), 110-11.

² *Chemical and Engineering News* 32 (Apr. 5, 1954), 1366.

³ Inskeep, G. "The Danish chemical industry." *Chemical and Engineering News* 32 (Jan. 11, 1954), 152-158.

⁴ *Chemical and Engineering News* 32 (Aug. 9, 1954), 3141.

⁵ *Industrial Laboratories* 5 (Mar., 1954), 5-6.

⁶ Kastens, M. L. "Dollars and science." *Chemical and Engineering News* 32 (Jan. 25, 1954), 303.

- ⁷ Kastens, M. L. Art. cit., p. 304.
- ⁸ Kastens, M. L. Art. cit., p. 302.
- ⁹ Greenewalt, C. "Let's take the long view." *Industrial Laboratories* 5 (Apr., 1954), 6.
- ¹⁰ *Op. cit.*
- ¹¹ Bigornia, A. E. "The coconut *kadang-kadang* disease and researches on its cause and control." *Plant Industry Digest*, B. P. I 17, (Mar., 1954), 29-38.
- ¹² Arguelles, M. V. et al. *Results of a questionnaire on the present status of scientific research and development in the Philippines*. Bureau of Printing, Manila (1954), pp. 15-16.
- ¹³ Arguelles, M. V. et al. *Op. cit.*, pp. 45-77.
- ¹⁴ UNESCO *Scientific and technical journals of East and South East Asia*. South East Asia Science Cooperation Office, Manila (1951, 1953 eds.)
- ¹⁵ Arguelles, M. V. et al. *Op. cit.*, p. 39.
- ¹⁶ Bronk D. W. "The role of scientists in the furtherance of science." *Science* 119 (Feb. 19, 1954), 110-111.
- ¹⁷ *Chemical and Engineering News* 32 (Jan. 4, 1954), 5.
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