Great Britain

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NOTES from ABROAD

SCANDINAVIA

The isolation of the Scandinavian Countries during the war, and the difficulties for the different activities of society that arose from it, made clear to the authorities the essential role played in national management by scientific and technical research. To this growing understanding the splendid results of American and British science, and its decisive importance for the successful termination of the war, vastly contributed. In unoccupied Sweden a steady increase in government support of science already began in 1942, but the other countries had to wait until the war was over. Since 1945 much has been done in this field in all the Scandinavian Countries and therefore some leading scientific organizations now found the time ripe for a joint conference on scientific organization problems, where experiences could be exchanged. Such a conference was arranged in Copenhagen on February 5–7 of this year.

It turned out that the development had followed rather different paths in the different Scandinavian Countries. As indicated above, Sweden had had more time than the other countries to promote her scientific organization. Besides the Academy of Sciences and the Academy of Technical Sciences in Stockholm, both of which existed earlier, there were now special research councils for natural sciences, for medicine, for engineering, for agriculture, and for social sciences. All of these were founded by the state authorities and have comparatively big grants from the government at their disposal for the support of scientific research in their different domains.

In Norway there was set up after the war a combined research council for natural and engineering sciences, which has already done a good deal to encourage the efforts of the Norwegian scientists, although it has had to work under very unfavorable conditions, as little was done at the universities in Norway during the occupation.

In Finland a rather interesting type of organization, the Academy of Finland, was set up in the fall of 1947. It consists of twelve members with a salary which is intended to make it possible for the 'academicians' to devote their whole time to scientific work. At the same time the government established a considerable number of fellowships for younger and also for more experienced scientists. There has also been built up a big institute of engineering research.

Denmark has relied more upon private initiative than the other Scandinavian Countries. Of old this country has had very important private funds available for science, and also one rather big fund set up by the government. The Danes have not had time enough to settle their postwar problems yet, but a government committee is planning to strengthen the position of science, and it is hoped that something similar to what has happened in the other Scandinavian Countries will come out of this committee's work.

The conference in Copenhagen laid much stress on the cooperation among research institutions of Scandinavia in this field. It was generally understood that much can be done—the organization of inter-Scandinavian scientific papers, cooperation concerning the invitation of prominent foreign scientific guests, especially from the United States, and so on.

GÖSTA FUNKE

GREAT BRITAIN

The physics of metals is a wide subject, and in this article I would like only to deal with one part of it, the study, as a subject of pure physics, of the mechanical properties of metals and alloys. Research in this field stands in very striking contrast to nuclear physics. The natural phenomena which depend on the atomic nucleus were hardly known before the beginning of this century; but since then experiment and theory have both made the most rapid advances, so that nuclear physics has now become one of the most important branches of science. Our knowledge of the mechanical properties of metals, on the other hand, is almost as old as our civilization, and in the last 150 years the amount of practical information obtained about them has, of course, been very great indeed. But this information has nearly all been of a practical kind, and in contrast to the case of nuclear physics, very little theory has been built up with it. In fact, it is only in the last year or so that it has been possible to formulate a real theoretical basis for the subject, of the same kind that wave mechanics has provided for organic chemistry or for the explanation of electrical properties of solids. It is only very recently that it has been possible, for example, to give definite answers to any of the following questions: Would a mathematically perfect crystal be strong or weak? Why does cold-working harden a metal? Why does iron have a yield point? And why do minute traces of impurity have such an effect on the strength of a metal?

In many countries a feature of postwar physics has been a determined attempt to answer these questions and others like them. In America, besides the older schools at Pittsburgh and elsewhere, the Institute for the Study of Metals has been set up at Chicago and has already made striking advances. In Russia, Joffé's school existed before the war, and, though we know little of what is going on there now, some wartime papers of very great interest have appeared. On the continent of Europe groups at Paris (Ecole des Mines) Liége and Delft have formed together a little club to work together and exchange information, and are also in close touch with us. In England the work on this subject is mainly in four centers, the Universities of Birmingham, Bristol, Cambridge, and London (University College), though, in addition, there is of course much industrial work of fundamental significance.

Andrade's work on creep at University College goes back to 1911, and it was he who first made the clear distinction between transient and viscous creep. It is a tragedy that his laboratory was destroyed during an air raid, and that his work now is so limited by lack of space. In this country he is a pioneer in the study of the deformation of single crystals.

In Cambridge, since the war, a considerable section of the Cavendish Laboratory has been devoted to this subject, under the leadership of Dr. E. Orowan, with of course invaluable help from the director of the laboratory, Sir Lawrence Bragg. Orowan has extended Andrade's work on creep, and made some advances in the theory. Also fracture in metals has been investigated, including some work on notched bars. And under the leadership of R. Hill important advances in the mathematical theory of plasticity have been made, especially the investigation through a two-dimensional model of extrusion, punching, and wire-drawing.

In Birmingham, under Dr. Cottrell the center of interest has been the effect of carbon on the mechanical properties of iron. It now seems to be quite possible to explain in a quantitative way the phenomena of the yield point, strain ageing, blue brittleness, and so on, in terms of the effect of even minute traces of carbon on the 'dislocations'; this word denotes the particular kind of lattice irregularity which is responsible for mechanical properties.

At Bristol some work on creep of single crystals of alloys is in progress; in addition, there is a strong group working on the theory of metals under the leadership of Mr. F. R. N. Nabarro and Dr. F. C. Frank, which is attempting to deduce the mathematical consequences of various hypotheses about the phenomena on the atomic scale which accompany plastic deformation. The dynamics of the movement of the 'dislocations' turns out to be very interesting; it is a field where atomic theory, classical elasticity, and the theory of shock waves all impinge on metallurgy and engineering. In fact, it is our experience that for advance in this field one needs to bring into contact with each other research workers of quite different backgrounds, metallurgists, physicists, engineers, and mathematicians. This we attempt to do in England by holding frequent meetings of the specialists involved, which is not so difficult, as the main centers concerned are all within five hours' train journey of each other.

This research on metal physics is financed partly by the universities themselves, partly by the government's Department of Industrial and Scientific Research, and partly by the British Iron and Steel Research Association, which is supported by industry. Both through this Association and through the efforts of the universities themselves there is very close contact between this work and the scientists working in industrial laboratories. One of the ways in which this is maintained is through the 'Summer Schools' in metal physics which are held from time to time in Cambridge and in Bristol. These are quite short courses, lasting not more than a fortnight, and are intended primarily for scientists in government laboratories and industry. Their objective is to enable the university research workers most concerned with the recent advances to give an absolutely up-to-date account of their subjects to the men in industry, and to let both sides profit from a mutual exchange of ideas. N. F. MOTT