

for research work. This amounts annually to between \$250 and \$300. In addition to this the State Historical Society has a fund of \$12,000 from Mr. and Mrs. Hollister for a pharmaceutical library. The income of this fund is not being used for the purchase of books, but for historical research in pharmacy and publication of the results. Temporary grants, such as the sum of \$500 for a research fellowship by the Association of Flavoring Mfg. of the United States, I suppose fall outside the field covered by the report of the committee.

EDWARD KREMERS

QUOTATIONS

SCIENCE AND INDUSTRY

THE privy council report on scientific and industrial research, of which we publish a summary this morning, is a very able document. It reveals a firm and comprehensive grasp of the subject. To begin with, it gives an account of the existing institution for promoting industry by science. In the National Physical Laboratory, the Engineering Standards Committee, the Imperial Institute, the Imperial College of Science and Technology, the engineering schools of Cambridge and Oxford, the technological departments of the other universities and the larger technical colleges, we possessed before the war an apparatus which would excite the enthusiastic admiration of native critics if they came across it in some other country where the arts of advertisement are better understood and more efficiently practised. It is true that the apparatus was comparatively young, and the use made of it miserably inadequate to its potentialities and to the need; but that was due to a general failure to appreciate either. It is a mistake to infer that we possessed no means for developing industrial science because a poor use was made of them through conservatism, lack of insight, and the obsession of cheap imports deceptively labelled "free trade." The war has changed all that. It has made manifest the need of applying far more energetically the means we have and of supplementing them, as the present report points

out. The outbreak of war found us unable to produce at home many essential materials and articles for carrying it on; and since then it has become clear that the future maintenance of our industries in peace demands a new attitude and new efforts in this field on the part of all concerned. This is the sufficient reason for undertaking the reorganization and development of industrial science now, while we are still at war.

The two main things required are financial support and the cooperation of manufacturers. Of the two the latter is, in our opinion, both the more important and the more difficult to secure. If it is effectively secured, the rest will follow; if it is not, nothing else will be of much use. Our manufacturers have not been wholly indifferent to science. The steel industry of Sheffield leads the world in the application of scientific metallurgy to commercial production. Nowhere do the laboratory and the workshop cooperate more closely or with better results. And in recent years other branches of industry have been making a gradual advance in the same direction. But the great bulk of our manufacturing interests have stood aloof and clung to the old. So have the labor interests, which are still more obstructive to change. The British workman's dislike of novelty and his power of resistance are an insufficiently recognized element in the British manufacturer's conservatism. It is obviously useless to spend money on discoveries and new processes if the attempt to apply them leads to strife. This prospect is enough to deter men who might otherwise be inclined to take up research and experiment in their works, and it must be taken into account. But it is not the chief cause of manufacturing inertia. Nor is the small size of many business concerns, to which the report refers. Small concerns can not undertake large, far-reaching researches of a fundamental order; but that is no reason for general indifference or hostility to research. They can carry on scientific work of a different kind with a direct practical bearing on their own business. Some do, but they are few. In Germany they are many. The notion that works there which

employ a large proportion of scientific experts are all on a gigantic scale is quite mistaken. Even those which are on a gigantic scale were small once; they have become large through applying science. Some small works in this country are highly scientific; some very large ones are exactly the opposite. The chief cause of manufacturing inertia is the mentality of British business men, which is essentially practical and distrustful of ideas. But the shock of war has undoubtedly disturbed them, and there is some prospect of a change. It is essential to success, as the committee admit. "We recognize that unless the generality of British firms can be induced to alter their present attitude we shall have failed profoundly in one of our appointed tasks." Research has hitherto offered no career for able and enterprising young men in this country. So they have not gone in for it, and when a manufacturer did want a man he had to go abroad for him. It was a vicious circle. But we believe that in the new prospect now opening up the committee are right in advocating the policy of increasing the supply of men. The demand will follow.—*London Times*.

SCIENTIFIC BOOKS

The Mechanism of Mendelian Heredity. By T. H. MORGAN, A. H. STURTEVANT, H. J. MULLER and C. B. BRIDGES. Henry Holt and Company, New York. 1915.

Students of genetics some six years ago learned with lively interest that Professor Morgan had discovered in the fly *Drosophila ampelophila* an example of inheritance parallel to that seen in the well-known descent of color-blindness in man. Substituting red eye and white eye in the fly for normal color vision and color-blindness respectively in man the phenomena were exactly similar. Hitherto no such case in an animal available for experiment had been known. We were aware of several instances, notably that of the moth, *Abraxas grossulariata*, the pigmentation of the silky fowl, and certain others in poultry, canaries and pigeons, in which analogous descents had been traced; but in all these the

parts played by the sexes were reversed. From this evidence indeed it had been proved that in the moth and the birds the unfertilized eggs are differentiated into two classes, those destined to become females and those destined to become males. Obviously enough it would be inferred from the descent of color-blindness that in man the sperm was similarly thus differentiated into two such classes, destined to form females and males respectively, a phenomenon which Wilson and others had cytologically demonstrated in various insects. At this point the matter rested.

With the discovery of the peculiarities of *Drosophila* genetic research has passed into a new phase. The animal breeds rapidly, going through many generations in a year. It is inexpensive to breed, and the families consist of numbers which, relatively to those attainable in most subjects, are enormous. Since it first attracted Professor Morgan's attention it has been found to produce a long and intricate series of factorial varieties, or "mutations" as the authors prefer to call them, differing in the color of eyes and body, the sizes and shapes of the wings, and other respects, the number of these differences being now computed at more than a hundred. Professor Morgan and a band of enthusiastic colleagues set themselves with the utmost zeal to analyze the inter-relations of this mass of factors. Half a million flies have been bred, with the result that the data respecting the genetics of *Drosophila* in quantity now surpass those obtained from any other animal or plant. The advances made are on any estimate many and of quite exceptional significance. That much is certain. If we go further, and accept the whole scheme of interpretation without reserve we are provided with a complete theory of heredity, so far as proximate phenomena are concerned.

We may perhaps best approach the subject by reference to a class of facts with which all investigators are now familiar. Of the factorial differences detected in *Drosophila*, many of the more important were soon shown to be sex-limited, as we used to call it, the "limitation" being to males, just as in color-