Royal Sanitary Institute: Folkestone Congress, June 20–25.

THE Royal Sanitary Institute was founded in 1876. For more than forty years it has been, as it were, a chorus to interpret to the official and general public the methods of applying scientific ideas to the improvement of the environment and to the promotion of individual health. Among its earliest congress presidents it included Edwin Chadwick, Ward Richardson, Douglas Galton, and others well known in the history of the modern public health movement. The annual congress has always been a convenient occasion either for the announcement of some fresh application of hygienic ideas or for the discussion of administrative difficulties in their realisation. This year the congress was held at Folkestone. The Earl of Radnor was president. In his address he pleaded for the retention of the voluntary hospital system, arguing that unpaid medical service is somehow superior to paid service. There is, perhaps, a sense in which the consultants of the great and small hospitals are unpaid, but it is an abuse of words to suggest that they are philanthropists. The hospital problem, however, is rapidly coming to a point when discussion will yield to action, and with their usual elastic adaptivity our institutions will emerge into something better. The "science" of the transition will not be traceable until after the event. His lordship's plea was put with lucidity and dignity—a typically good illustration of a voluntary administrator's attitude. The later discussion on hospital service and medical service generally took a much wider sweep, and made manifest how far we have already travelled along the lines of official medical organisation. But this is a practical rather than a scientific question, and may safely be left to the administrators.

Not so the question of smoke prevention. Doubtless it is a practical question, and is probably as old as the oldest British health congress. It is one of the by-products of the industrial revolution. From the merely commercial point of view the waste has been incredible, whether we think of the factories or of the home fires; but not until the last twenty or thirty years have the evil effects of smoke-spoiled light and air begun to be understood or studied scientifically. More than twenty years ago, at Glasgow, Sir William Ramsay in a popular lecture put forward the suggestion that the fog-clouds due to smoke absorbed the sun's violet and ultra-violet rays, and, therefore, prevented those rays from having their proper germicidal effect on the bacterial life of the streets; hence the increase of microbic epidemics. The remedy, he said, was to use gas-fires. Sir William Ramsay at a later stage bettered this when he suggested the production of energy from coal without bringing it to the surface. These suggestions deserve exploiting. But Prof. Leonard Hill, of the Medical Research Council's Department, put the whole problem in a new setting. This is what we should expect from a man whose experimental work has given a richer meaning to the term "ventilation," and shown that our cardinal practical concern should be with the cooling-rate of the body in relation to the air. On the present occasion he explained the peculiar effects of light, particularly the visible rays. "Men live long who work in the clean moving air and sunshine of the fields. While the expectation of life for females (1911–12) in Westmorland was 66·6 and in the rural districts of Norfolk and Suffolk 61·03, it was in the county boroughs of the North 49·93, in Middlesbrough 46·65." It need not be assumed that the whole responsibility for this rests on smoke, but the cumulative case against it is very strong. On the other hand, the positive value of light in its effects on metabolism is extraordinarily high. This is accepted in therapeutics. "The visible (luminous) rays of sunlight are of immense importance, because they penetrate the skin and locally warm up the blood, which absorbs them in the subcutaneous vessels, while the body as a whole is kept cool by the cool moving air." (This refers to the sun-treatment of tubercular bones and joints in Alpine sanatoria.) "On the other hand, the dark heat rays are absorbed by the surface of the skin and make this warm. The ultra-violet rays have also no power to penetrate. They are absorbed by as little as one-tenth of a millimetre of the outer horny layer of the skin." It is, then, the luminous, not the ultra-violet, rays that have "so powerful an effect on health." The inference from this double fact is obvious. "Sunlight warming the blood locally, cold moving air keeping the body cool and stimulating metabolism, open-air exercise—these are the great factors for health next to good food and sufficient sleep, and of these the people of the cities are largely deprived." There are many practical deductions, but it will take the medical schools and the administrative authorities a long time to exhaust the value of this piece of science revealed by research.

In supplement to Prof. Hill's paper, Dr. Owens, of the Committee on Atmospheric Pollution, gave actual figures as to the tons of matter per square mile deposited from the air. The broad facts are (*a*) that industrial smoke is a small fraction of the whole and can be completely controlled by existing methods, and (*b*) that domestic smoke accounts for a vastly greater quantity, and at present cannot be controlled. That is the smoke problem.

There were many other practical discussions, each involving a good deal of nascent science. For example, the discussion of infant feeding is, in spite of the innumerable army of skilled observers, still losing itself among unresolved factors. Dr. Vynne Borland showed that in certain cases the overfeeding of infants results in wasting. This conclusion was based on carefully analysed cases. Dr. Jervis gave other cases to show that in certain forms of malnutrition no variation of food has any effect, and that here we are face to face with unknown factors, such as deficiency or excess of secretion in the endocrinal glands. It seems clear that until the relatively rough work of clinical treatment can be better illuminated by the work of the laboratories we shall have to continue our practice empirically.

Science is taking a steady grip of industrial fatigue. Mr. Wilson, of the Industrial Fatigue Research Board, gave a summary of results under the title "Some Effects of Environment on Efficiency and Safety." Temperature, humidity, ventilation, and lighting, all have definite relations to output, but the precise effects are not easy to estimate. Heavy work in high temperatures produces more in winter than in summer. Good ventilation is found to neutralise the reducing effects of humidity. In silk weaving artificial light reduces production by 10 per cent. compared with daylight. There is an obvious case for continuing research into these "raw materials" of industry, if only to secure some scientific basis for a system of "welfare work."

The science of rat destruction was represented at the congress. Research has not got much beyond the "aniseed" of the older rat-catchers and certain familiar poisons. Mr. Claremont, of the Ministry of Agriculture, gave a careful summary of facts. The rat, it appears, is "peculiarly susceptible [to

poisons], for it has a very delicate stomach, and, I believe, cannot vomit; at any rate, does not readily do so." There is room for an extended biological and psychological study of the rat, for it does seriously affect the commerce of the world both directly as a consumer and indirectly as the international carrier of plague.

Perhaps the most fascinating item of the congress programme was the popular lecture by Prof. Mellanby, of Sheffield, on "Vitamins." A health congress without a discussion on diet would be a solecism, and to-day the whole theory of diet has been transfigured by the "vitamin" hypothesis. It is well to regard the word as provisional, for in this way the methods of research are likely to remain more fluid. No one has established a better right than Prof. Mellanby to be heard on the recent developments. He set forth the data with persuasive lucidity. He showed that experiment discredited the old view that diet could be exhaustively expressed in terms of proteins, carbohydrates, fats, salts, and water. There is a *sextum quid*. From Eyckman's discovery that beri-beri was due to rice robbed of certain portions by "polishing" to the latest experiments with puppies to show the production and arrest of rickets, Prof. Mellanby made clear the reasons for assuming the existence of the three factors: Fat-soluble A, water-soluble B, and the anti-scorbutic factor. The work of Prof. Mellanby and his wife in this field is well known to the technical and official public, but there is much need to spread the ascertained facts among the wider public, for this is the only way to generate sufficient pressure to secure that the consumer shall have the benefit of the latest discoveries. The fact that hypotheses are disputed is no reason for not making them known. In this matter the facts even as now ascertained are of high practical value. The physiological and biochemical departments of the various schools ought to work in more intimate touch with the administrative public, especially with the clinical investigators.

Of the congress as a whole it can be said truly that the mayor and councillors did everything to show that they understood the importance of the institute's educational work, and as we parted in the clean air and light of a perfect summer day we assured each other that on the scientific, as well as on the social, side it had been "a very nice congress."

The Importance of Research in the Development of the Mineral Industries.[1]

By SIR RICHARD REDMAYNE, K.C.B.

THE present state of the civilised world is, economically, paradoxical. The need for commodities is very great, yet the production of them is so costly that industry is languishing for lack of orders. On the termination of the war, after four years of excessive waste and destruction, the world is found short of houses, food, and other commodities; railways and rolling stock are in sad need of repair, restoration, and expansion; the output of fuel, the life-blood of our economic existence, is greatly decreased, and the mines from which it is produced are in a backward state of development.

The cessation of hostilities was succeeded almost at once by a period of feverish industrial activity—it would be erroneous to apply the words "general prosperity"—followed by a cycle of great depression. The demand for goods is great, but production is falling. What is the explanation? It lies, I think, in a combination of circumstances:—

(1) A feeling of insecurity due to unsettled political and financial conditions. Hence a disposition to conserve rather than to utilise in commercial ventures such capital as is available.

(2) The incidence of rate of exchange.

(3) The high cost of production consequent on the high cost of living and the higher standard of comfort demanded (and rightly demanded) by the labouring classes than formerly obtained.

(4) The lower, and still apparently decreasing, productive power of labour.

The first two conditions will in part right themselves in process of time as the various political problems are solved, or partly solved, and rates of exchange will then tend towards the normal; but a very great deal depends upon the last two conditions, as the future position of production is not easy to forecast. Higher and cheaper production is a difficult desideratum to obtain in view of the high rate of wages now ruling and the diminishment in working time either achieved or claimed by the manual workers of the day, and these are demands which are not likely to show much abatement in the future. What is the solution? The answer I venture to give, the solution which I presume to propound, to this problem, is "research." To discover by research cheaper means of production, and by research to create new outlets.

The object, then, of my address to-day is to direct attention to the necessity for research work in the mineral industries. Let me make more clear what I have in mind by taking one special case in point, a most important case—that of coal. It is an axiom that a cheap and plentiful supply of suitable fuel is necessary for our prosperity as a manufacturing country. This situation will remain, and is bound to remain, until some other means of producing power cheaply is discovered.

I think it may be taken that, roughly speaking, the rate per cent. of return on the capital invested in coal-mining in Great Britain over the last hundred and fifty years has, on the average, not varied much—reckoning in, say, periods of ten years—yet the progress made during the last two or three generations in every respect, except in the rate of return on capital, has been enormous.

Thus such everyday features of a colliery working at the present time as shaft cages and guides, the safety lamp, the steam locomotive, the trade in coke and by-products, ventilating fans, wire ropes, mechanical haulage, mechanical screening, the use of compressed air, the application of electricity to signalling, lighting, and motive power, and the mechanical cutting of coal have all been introduced in the course of the last hundred and twenty years. There is scarcely an appliance (save the simplest tools) or a machine in use at a modern colliery which could have been made at the beginning of the nineteenth century; and during this period the wages of the workmen—I omit the war period and the present abnormal time from consideration—have been increased certainly between 200 and 300 per cent., and this though the price of coal did not greatly increase; as a matter of fact, between the years 1828–1900 the variation was small and the price was lower in the latter year than in the former.

It was *because* of the improvements introduced into coal-mining that it was possible to keep down the

[1] Address delivered at the annual meeting of the British Science Guild held at the Goldsmiths' Hall on June 8.