adhesive meningitis, leads to distension of the third ventricle. The distended cyst-like third ventricle may act as a tumour in exercising injurious pressure upon the surrounding hypothalamic centres, the optic chiasma, the bony structure of the sella turcica, and the pituitary gland itself. Thus hydrocephalus secondary to disease elsewhere may give rise to Fröhlich's syndrome, to bi-temporal hemianopia, to stunting of growth, and to erosion of the sella turcica recognizable in x-ray studies.

(To be continued)

POST-GRADUATE TRAINING IN THE PRACTICE OF PREVENTIVE MEDICINE IN INDUSTRY*

BY

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The words "post-graduate" and "preventive" have been deliberately included in the title of this paper for the following reasons. "Post-graduate" is used because it is essential that a sound basic training in medicine, surgery, and the medical sciences should precede concentrated study of the conditions and special human problems of health and disease which arise in industry. In industrial practice the medical man or woman will need to give detailed consideration to many matters which of necessity receive little, if any, attention in the already overloaded medical curriculum for qualification. Unless the would-be industrial medical officer takes advantage of the knowledge which is now available as a result of the experience and studies of others, he or she will have to acquire such knowledge and technique by experience at the expense of employees and of industry. This is the justification for proposing some form of post-graduate instruction.

"Preventive" is included because the efficiency and success of the industrial medical officer is directly proportional to the degree of fitness and standard of health he succeeds in maintaining in the population he serves, and inversely proportional to the size of his curative medical practice in industry. The industrial medical officer will best serve employees and employers by keeping men and women in an optimum state of fitness and freedom from disease and accident by taking endless pains to ensure that factors predisposing to unfitness or disease or accident are noticed, assessed, and promptly dealt with. The basic training for qualification enables the doctor to recognize disease, but the industrial medical officer must also be able to assess the degree of physical fitness of applicants and employees and their fitness for the particular work applied for, or on which they may be already engaged.

From our experience at the London School of Hygiene and Tropical Medicine and the contacts we have had with our past students, who, having taken the course for the Diploma in Public Health of London University, have proceeded to appointments wholly or partly connected with industry at home or abroad, I feel that the general teaching and practical instruction in the laboratory and the field now given by this School for the D.P.H. London and the Diploma in Tropical Medicine and Hygiene would, with some readjustment in respect of the allocation of time to certain subjects, admirably fit a medical man or woman for the industrial medical service.

Industrial Medicine in the D.P.H. London

I should like briefly to outline the course for the D.P.H., and to draw attention to the subjects which are of particular interest to industrial medical officers. To begin with, the course for the D.P.H. London is whole-time for one academic year, from October to July, or approximately nine months. It comprises teaching in the following subjects:

Bacteriology Applied to Public Health.—This course includes immunology, uses of antitoxins and sera; serological tests; the bacteriological examination of foodstuffs, air, dust, soil, and sewage; the bacteriology of animal diseases communicable to man; and the study of diseases due to moulds and yeasts, etc.

Chemistry and Physics in Relation to Public Health.—Under this heading such matters are dealt with as water supply and its purity; analysis of air and its impurities; analysis of foods and beverages, adulterants, preservatives, and chemical poisons; disinfectants, disinfestants; poisonous substances occurring in trade processes, etc.

Parasitology as Applied to Public Health.—Including entomology, helminthology, and protozoology.

The Theory and Practice of Public Health Administration and the Principles of Sanitary Law.—Comprising administration; social insurance; control of food; legal procedure concerning offensive trades; infectious diseases, factories, and workshops; public education in health, etc.

Sanitary Engineering.—Including building sites and site planning; building construction; reading of plans; drainage, sewage, and refuse disposal; sanitation of houses, factories, workshops, and dairies; sanitary administration; sanitation of ships, etc.

Epidemiology and Vital Statistics.—Compilation and analysis of medical statistical data; reports and forecasts and methods of conducting special investigations, etc.

Medical Industrial Psychology.—Labour wastage; sickness absenteeism and methods of investigation of such problems in industry, etc.

Physiology Applied to Hygiene and Industry.—Physiological requirements in relation to age, sex, occupation, and environment; family hygiene, budgets, food; physical education and tests for fitness in children and adults; physiological principles of heating and ventilation; recent advances in first-aid measures; factors influencing human efficiency and fatigue in industry; the physiological rationalization of industrial work, etc.

Throughout the course for the D.P.H. the attention of students is drawn to current literature—the publications of the Medical Research Council, the Industrial Health Research Board, and the various official reports of the Ministry of Health and the Home Office Factory Department. In addition to the subjects mentioned above, the course includes some forty visits to institutions, works and factories, dairies, food factories, offensive trades, special industrial processes, the Port of London, and numerous clinics. Special lectures are given on industrial hygiene and medicine by industrial medical officers and medical officers from the Home Office Factory Department, and several visits are paid to the Home Office Industrial Museum. During the session the students are also required to attend a course in district work involving a large number of attendances of not less than three hours each, and also a course on infectious diseases and hospital management provided by the London County Council.

This is only a brief outline, but I think it is clear that a very large part of the course for the D.P.H. London concerns matters of immediate interest and practical importance to industrial medical officers. No doubt some modification in the form of expansion in certain directions and cutting down in others would be necessary in order to provide more instruction in subjects of special significance to the industrial medical service, as, for example, the attendance at factory and works clinics for clinical and administrative instruction under experienced industrial medical officers in place of district work and possibly the course on infectious diseases. I think, however, that this post-graduate course, which has already proved its value to those entering the public health service, may usefully form a basis for discussion when considering the type and scope of training best calculated to fit medical men and women for the work and responsibilities which face the medical officer in industry.

Industrial Physiology

I have been asked to deal more especially with our work at the London School of Hygiene and Tropical Medicine in the field of industrial physiology, and as time does not permit me to go into details I propose to outline very briefly our approach to the subject and its scope. In doing so I wish it to be clearly understood that I do not consider the training we could give in the

* Paper read at the meeting of the Association of Industrial Medical Officers on October 30th, 1936.

Department of Industrial Physiology alone would be comprehensive enough for the medical man or woman preparing to enter the industrial medical service. In addition, it would obviously be necessary to include, for example, occupational diseases and disabilities, medical industrial psychology, medical statistics, health administration, and sanitary law.

In industrial physiology we try to direct and co-ordinate the thoughts of students in regard to the factors which influence the health, physical fitness, comfort, and efficiency of individuals and groups of individuals engaged in industrial work. You must forgive me if I state the case in a very elementary way, but I feel convinced that we must have in our minds some simple but fundamentally true physiological conception as a basis on which to build the superstructure of procedure, method, administration, and other measures concerned with the preservation of health and fitness.

At the outset we remind ourselves of that most interesting, and, I think, fundamentally true conception of life in the physiological sense which was put forward by Claude Bernard in 1878 in his book *Les Phénomènes de la Vie*, in which he wrote: "It is the constancy of the internal environment which is the condition of free and independent life. . . . All the vital mechanisms, however varied they may be, have only one object, that of preserving constant conditions of life in the internal environment." Physiological knowledge, which has accumulated as a result of research since Claude Bernard's time, serves to substantiate the truth of that conception. The importance and significance to physiological function of relative constancy inside the body in respect of temperature, osmotic pressure, hydrogen-ion concentration, blood sugar, calcium, chlorides, oxygen tension, and other physical and chemical characteristics of the blood and tissues is established, and we have to study the varied influences which tend to disturb that optimum internal state on which depends the individual's sense of well-being, health, comfort, physical fitness, efficiency, and working capacity.

It is clear that any material disturbance in one or more of these characteristics of the internal environment may find expression in the form of that intangible but none the less real phenomenon of life—"fatigue." Moreover, it is also apparent that attempts to find a universally applicable method of assessing fatigue by estimating the change in any single physiological characteristic are doomed to failure.

In seeking to make use of these fundamental conceptions in problems of health and comfort in everyday life and work it is useful to express the daily cycle of life in very simple terms—namely, activity, fatigue, recovery—and then proceed to analyse the physiological factors which determine equilibrium or balance in this cycle from day to day and working week to working week. Equilibrium in this cycle means that the optimum state of relative constancy in the internal environment is being maintained. The maintenance of equilibrium in this cycle, so that the recovery phase completely compensates for the state of fatigue occasioned by the activity phase, is the physiological problem before us. We must not, therefore, overlook any internal or external factor or group of factors influencing that equilibrium in any part of the body or in the body as a whole.

We can group the factors which are of physiological significance under the four headings, activity, environment, time, and individual, and draw up a plan or schedule into which may be fitted the various subjects which fall within the scope of industrial physiology. In the following schedule many subjects are listed, but all have some bearing on the equilibrium of the daily cycle of life—activity, fatigue, and recovery.

Schedule of Factors Influencing Daily Cycle

II. ENVIRONMENT FACTOR.—Temperature. Humidity. Atmospheric Pressure. Air Movement. Air Change. Radiation. Noise. Vibration. Illumination. Atmospheric Pollution. Dust.

III. TIME FACTOR.—Duration of work per work spell; per day; per week; rate and rhythm of doing work.

IV. INDIVIDUAL FACTOR.—Individual make-up, physique, and state of fitness. Nutrition. Personal Hygiene. Economic Circumstances. Responsibilities. Family. Clothing. Home Environment.

All these subjects involve problems which need study, research, and application, some more some less according to the industry concerned and according to the individual or types of individual employed. If we have in our minds Claude Bernard's conception of the significance of constancy in the internal environment and have before us some such schedule as that outlined above, we are able to understand better the real nature of the problem of the preservation of the health and working capacity of industrial workers and the abolition of industrial fatigue, which I conceive to be the true objective of the Association of Industrial Medical Officers. To achieve that end most expeditiously and efficiently it is necessary that the medical men and women seeking whole-time or part-time service in industry should at least be armed with already available knowledge, and be trained in its application to special problems which arise in the practice of preventive medicine in industry. The provision of a course of post-graduate training on the lines indicated above would afford the necessary opportunity to those who feel attracted towards the promising field of medical service in industry.

In conclusion, I should like to add that I hope the day is not far distant when a comprehensive post-graduate course in preventive medicine in industry will be provided not only in London but elsewhere, and that those who take it and obtain a diploma or degree will thereby be fitted to become medical officers in a national industrial medical service or industrial health service on a par with the public health service, but with this difference, that both the State and industry collectively bear the burden. Such a service would include whole-time medical officers in particular industries and whole-time officers serving groups of works or industries which, in themselves, may be too small or too local for the whole-time employment of individual medical officers in each. In addition to medically qualified personnel it is not at all outside the bounds of practicability or common sense to suggest that physiologically minded engineers and physiologists, with interests in the application of medical science to the human problems of health in industry, might with advantage co-operate with or form part of such a service. The problems to be faced are many and varied and change with industrial progress and invention, and if man is to maintain his mastery over the machines the application of medical science in industry on a national scale should no longer be delayed.

The seventh annual meeting of the Federation of the Medical Scientific Societies of North Africa will be held in Algiers on March 22nd, 23rd, and 24th, 1937, the subject for study being "Typhus and Typhus-like Diseases." Reports will be made by Professor Burnet, director of the Pasteur Institute of Tunis, Dr. Blanc, director of the Pasteur Institute of Casablanca, Drs. Donatien and Lestoquard of the Pasteur Institute of Algiers, Dr. Gaud, director of the Public Health Service of the Morocco, Dr. Lemaire, director of the Public Health Board of Algiers, and Dr. Costantini of the Faculty of Medicine of Algiers. Additional notes and communications will be freely admitted. Special cheap tickets have been granted by French and North African railways, by the French lines between France and Algiers, and by Air France on seaplane trips between Marseilles and Algiers. Trips in Algeria will be arranged. Any medical men interested in this congress should apply to one or other of the general secretaries: Professor Seïevet, Faculté de Médecine d'Alger, and Dr. Sarrouy, 47 bis, Rue d'Isly, Alger.