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THE RESPONSIBILITIES OF MEDICINE IN WARTIME[1]

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MEDICAL EDUCATION

THE needs of both the military and the civilian population for adequate medical care emphasize the danger of reduction of either the present-day standards of medical practice or the number of physicians. At present approximately five thousand physicians are graduating yearly from the seventy-six accredited medical schools of the country. When one considers, however, that the loss due to death, retirement and other causes is approximately three thousand a year, it becomes apparent that it is impossible to build a reserve pool of any size in a short period.

The standards of medical education in this country to-day undoubtedly are superior to those found in any other country in the world. Our public has available to it a quality of medical service elsewhere unsurpassed. One of the main problems in medical care is and has been for many years a distribution of talent, for admittedly the concentration of physicians in urban areas has been too great, whereas the dilution among rural populations has been a major and perplexing affair. However, this question of distribution of more physicians and of maintaining present medical standards is one which we can hardly expect to be satisfactorily solved during the present period. The method of production of more physicians and of maintaining present medical standards is one which

[1] Concluding portion of the president's address before the American Medical Association at the ninety-third annual session, Atlantic City, N. J., June 9, 1942.

demands untiring scrutiny and should not be decided in a hurried manner under pressure of emergency.

Postgraduate Education

Postgraduate education, as it is carried out at present, must inevitably suffer from wartime circumstances. Continuing education as it is applied to general practitioners and specialists differs materially because of the very nature of the essential instruction. The education of a specialist has been largely influenced by the wide-spread adoption of the residency system of training. Within the past three decades this system of apprentice teaching in the wards, plus a long term service in hospital after graduation, has spread to most parts of the country. It is definitely recognized, although somewhat belatedly in hospitals in many larger cities, that residencies are the most useful method of teaching young men surgical diagnosis, surgical judgment and handicraftsmanship under controlled conditions. The length of time devoted to specialized training in the various fields naturally differs but, measured by whatever yardstick one may use, ranges from three years upward, following a year's rotating internship.

That this type of training successfully answers the professional requirements of all specialized groups is beyond cavil; that it is practicable in wartime and under the stress of emergency is distinctly debatable. Younger physicians who have just completed or are in the process of completing a relatively long term of specialized instructions obviously comprise the group which can furnish most useful professional services in specialized fields to the armed forces, for the tempo of modern warfare is so exhausting to even those of superb physical stamina that it is the policy of the War Department to utilize younger officers with troops if they can be found available. Because of these circumstances in which men in residencies and entering the age group for residencies find themselves, it is distinctly probable that much dislocation will be inevitable in postgraduate instruction in specialized fields. Nevertheless, the principles of continuing education along specialized lines must be recognized and adhered to with whatever flexibility allows its most advantageous adjustment in the mosaic of wartime medical education.

It is worth while to note here that an opportunity to continue their professional apprenticeship will be given, wherever possible, to those men who are in the midst of their specialty training and have been called into service. Some of the specialty boards have already agreed to apply the time spent in acceptable army hospitals on the training time required by that board. Only a small number of men can enjoy this privilege because of the exigencies of the times, but the principle of postgraduate education is so fundamental that it must be maintained in wartime in every available institution.

Basic principles in medical education must not be jettisoned; they may be held in abeyance, but the enormous damage which becomes unavoidable in the wake of war may be mitigated by every endeavor to maintain as high a level of both practice and education as is humanly possible.

Research

Research is a part of a planned postgraduate medical education, which languishes under the exigencies of catastrophe. To date the effect of the present-day war on research has been to direct its attention mostly in channels of military medicine, and from these efforts unquestionably many advantageous developments in special research regarding useful drugs and other substances in the treatment of wounds, shock, infections and burns have resulted. The inevitable letdown in experimental investigation in postgraduate medical education may properly be bridged over but feebly during this period, yet a comprehensive view of the situation suggests that all efforts at maintenance of as many opportunities for scientific research as possible, within the emergency program, are necessary.

It happens that not infrequently science is exposed to programs and tendencies which, because of political considerations, may justifiably be viewed with little enthusiasm and often with forebodings. Obviously, scientific bodies must remain independent; their work should never be influenced by either political expediency or legislation. While it is easy to argue the thesis that such organizations remain within the framework of government, of necessity the hazards of governmental subsidization must ever be kept in mind because of "the danger that he who pays the piper may call the tune and that research may be required to be devoted primarily to objects which the politician, or the civil servant, regard for the moment as of national importance."

Research is a part of scientific development which no longer need be carried on in the sabbatical solitude of a laboratory but may be indulged in by all who wish. Every clinician, every practicing physician, is a research worker in a true and practical sense. Observation of symptoms, observation and recording of the action of therapeutic agents as applied to disease and the correlation of clinical data are obviously of comparable importance in the general scheme of application of medical knowledge. We clinical men of medicine must recognize the necessity of a proper balance between scientific research and clinical investigation and remember the urgent necessity of this dual approach to all problems of healing the sick. Tolerance should temper the interchange of views between the group of academic teachers habituated to

investigation and that part of our profession inclined solely to clinical practice.

TRENDS IN MEDICAL PRACTICE

Among the interesting developments of the first questionnaire which was sent out to the medical profession was the surprising fact that only 41 per cent. of the physicians classified themselves as general practitioners. Of the remainder, 25 per cent. were classified as full-time specialists and 34 per cent. as part-time specialists, the latter group indicating that they paid particular attention to some special line of work while at the same time carrying on a general practice. Thus it becomes apparent that approximately one medical man in three is devoting his entire time to a specialty. That these specialists are of varying degrees of proficiency and training is beside the point, for their numbers indicate definitely a trend in the practice of medicine which is apparently most satisfactory to both the public and the profession, and therefore the number of specialists is likely to increase rather than otherwise. Such a trend has been quite apparent to the most casual observer over the last two decades, and the profession itself, as is its wont, has taken steps to evaluate the capabilities of specialists through the establishment of authoritative examining bodies in fifteen special fields.

This development of specialty boards is a milestone on the road of medical progress which represents self-imposed restrictions and standards of training on physicians who elect to practice in limited fields. It is a part of the scientific discipline of medical men which began in the nineteenth century and has been maintained until to-day. These boards are like licensing boards, which were established primarily for the protection of the public except that they interest themselves only in standards of training, ethics and proficiency. They do not seek to interfere with any freedom of action of medical schools or licensing bodies or hospitals, and certainly their usefulness would be decidedly impaired should they undertake to arrogate to themselves such prerogatives. It should be emphasized here and now that these boards were formed by groups of specialists with the approval and consent of the Council on Medical Education and Hospitals of the American Medical Association and the Advisory Board of Medical Specialists. In no sense was pressure applied in their birth, and operation under the auspices of national authoritative bodies has been one of their basic principles. That they were formed in the spirit of idealism and that the members of the boards have performed a monumental service which has demanded sacrifice of huge amounts of effort and time from their various other duties is, I think, worth pointing out. As a member of one of these original boards, I can testify to the conscientious fairness and undeviating sense of duty with which each candidate, not only for certification by examination, but in the Founders' Group, has been scrutinized. It is with considerable pride that I assure you that in no instance as far as the Board of Surgery, with which I am most familiar, is concerned, has any decision been arrived at save on merit.

That there are two dangers from which specialty boards are not entirely free must be admitted: first, that there be too many specialty boards and, second, that the boards, because of their very independence, make certain decisions affecting medical education or hospital staffs, which could be adjudged either as arrogant or dogmatic and therefore harmful.

Relative to the number of boards, it may be pointed out that the Board of Internal Medicine, for example, has appointed a Committee on Medical Specialties in the fields of allergy, cardiovascular disease, gastroenterology and tuberculosis. Each candidate in these specialties must first pass the general examination of the parent board, and members of the board of examiners will sit in with the subspecialties in evaluating all candidates. This seems a wise provision if subspecialties are to be recognized by special certification, since it presupposes that the candidate is adjudged a competent physician in general internal medicine before he undertakes a more confined field of specialization. Too many boards for minor specialties can add confusion and destroy much of the usefulness of the general plan, but, as long as parent boards supervise examinations and give certificates only after the basic requirements of a major specialty have been satisfied, there is small likelihood of this development occurring.

Enthusiasm for service should continue to be one of the outstanding characteristics of specialty boards, but this enthusiasm should be tempered with common sense, practicality and freedom from any savor of applying pressure. That their programs must be flexible enough to meet changing demands is a truism, and that their decisions must be of an elastic form albeit tempered with resolution and foresight is essential to their continued usefulness. These boards have performed a service to the profession and the public by identifying the well-trained and competent specialists, and for this accomplishment they deserve tolerant cooperation, thoughtful scrutiny and helpful constructive criticism.

OUR OBJECTIVES AND OBLIGATIONS

Our nation has now passed from a stage of prebelligerency into a phase of mobilization and active participation in warfare. We have emerged from a stage of preliminary training to take station in battle lines. Our forces are already fighting on many battle fronts

and in foreign seas. War is now our principal business; all national efforts are ancillary to its successful termination in a permanent peace by decisive victory. In this struggle the entire nation is mobilized and, as an integral part of its citizenry, the medical profession cheerfully and enthusiastically offers its all. Our profession is the trustee of the nation's health, and as such its obligations are to furnish adequate medical care to the armed forces while at the same time maintaining faithful service to the civilian population and productive war industry installations. It further demands that public health programs be cheerfully guarded, maintained or even increased as the need grows larger and larger. We are committed to the decision that provision for graduate education and for special education to develop specialists be continued at their present high level of efficiency. These and other essential duties which unfold continually in our daily duties must, and will be, accepted and accomplished to the extent of our capacity. In the inescapably somber times ahead, often our fortitude will be challenged, often our ideals will appear frustrated by circumstance; but the true mettle of a profession emerges only when tried in the fires of adversity.

Changes, unavoidable and unpleasant, face us in our daily and professional lives; we do not speak of the inevitable essential sacrifices; we speak rather of the glories of service. To serve is our destiny, to serve freely, faithfully and effectively is our wish and ambition.

Our duty is plain to see: we shall go forward to our task, and we shall not fail.

INFRARED RADIATION

By Dr. N. C. BEESE

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ALL bodies, whether they feel hot or cold, emit infrared radiation, or what is usually classed as heat. Hot and cold are relative terms. A so-called hot body radiates energy faster than the human body, while a cold body radiates energy at a slower rate than human bodies do.

Infrared radiations are electromagnetic vibrations, similar to visible light but of longer wave-lengths. They extend from the visible red radiations of about 7,000 angstrom units to some arbitrarily selected limit such as 5,000,000 or 10,000,000 angstrom units. At this point the radiations approach the region of the shortest radiations produced by ultra-high-frequency radio tubes.

Several physical laws that can be defined with mathematical formulas describe the principal phenomena of radiant energy from a black body, which is defined as a perfect non-selective absorber and emitter of radiations. The amount of energy radiated per unit area at any temperature is given by the Stefan-Boltzmann Law $E = \sigma T^4$. In this formula E = energy; $\sigma = 5.73 \times 10^{-5}$ ergs per cm^2 per sec; T = absolute temperature in Kelvin degrees (centigrade degrees plus 273). The relationship $\lambda_{max} \times T = 0.2886$ centimeter degrees is derived from Wien's displacement law; λ_{max} is the wave-length at which the radiated energy is a maximum. For every given temperature there is a wave-length at which the radiated energy is a maximum.

Another useful relationship is known as Planck's radiation law. It gives the intensity I of radiated energy for every wave-length and every temperature T. Expressed mathematically,

$$I_\lambda = \frac{A\, c_1}{\lambda^5 \left(e^{\frac{c_2}{\lambda T}} - 1 \right)}$$

in which A is the surface area and c_1 and c_2 are constants. This is a complex but highly accurate formula.

By applying these formulas one can learn several interesting things about radiation in general and about infrared radiation in particular. Table I shows a comparison of relative energy and wave-length of maximum radiated energy of a black body at several selected temperatures.

TABLE I

TEMPERATURE-ENERGY-WAVE-LENGTH CHARACTERISTICS OF A BLACK BODY

Selected Temperatures	max (microns)	Relative Energy
90°K (Boiling point of liquid oxygen)	32.1	0.000064
273°K (Melting point of ice)	10.55	0.0055
373°K (Boiling point of water)	7.75	0.019
1000°K (Approx. temp. of radiant electric heater)	2.89	1.00
2500°K (Approx. temp. of filament in drying lamp)	1.15	39.0
5300°K (Approx. temp. of surface of sun)	0.55	800.

The second column shows that the wave-length of maximum energy shifts toward shorter wave-lengths, as the surface temperature of a body is increased. This shows numerically that as a body is heated it goes through the color changes of dull red, bright red, yellow, white and at extreme temperatures it appears bluish white. In addition to color change the total radiated energy increases rapidly, the third column of the table shows.