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President's Address

ON

ONE HUNDRED YEARS AND AFTER

BY

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The Historic Background

Our art has a background of history rich beyond compare. There appears, through the twilight of history in Egypt fifty centuries ago, an art of healing mature in form and with it a leader of men. Imhōtep was born about 3000 B.C. and belonged to the time of King Zoser of the Third Dynasty. Great in learning and achievement, he was statesman, sage, priest, physician, architect, and astronomer. As priest and physician he founded an art of medicine which occupied a prominent place in the polity of Egypt through the succeeding centuries, and became merged with the medicine of Greece, and influenced the thought and practice of medicine during the early centuries of the Christian era.

The custom of mummification encouraged the study of natural and morbid anatomy. There existed a knowledge of the bones and the splinting of fractures. There was knowledge of the digestive organs, of the heart and blood vessels connected with it, though they did not realize the heart was a pump, and the vessels were thought to convey air as well as blood—a mistake rather of method than of fact. They developed a classification of diseases which proved their acceptance of the value of observation. They possessed formidable materia medica, many items of which have descended to our day, notably the use of enemata and castor oil, and they even prescribed the latter to be taken with beer. The tree of knowledge was obscured by the magic which entwined it. The conviction that disease was caused by a living spirit entering the body and sapping the vital substance, and that salvation was to be found by appeal to the deities who could bring aid and the appeasement of evil spirits, had such a stranglehold of the Egyptian mind as to blunt

its perception of the natural history of disease, and so it was that the application of physical remedies went hand in hand with rites such as incantation and incubation, the dominance of science or sorcery depending on the bent of mind of the physician.

This cult of Imhōtep was beneficent in intention and brought to the people healing, support, and solace; but with the lapse of time the ivy outgrew and obscured the tree, and the ritual of shrines and temples eclipsed medical knowledge, and the latter from 1000 B.C. onwards lapsed into stillness. Thus the art of medicine which ushered in the dawn of Egyptian greatness preceded it into the shadows, and in result but little ascertained truth floated down the stream of time during those many centuries. None the less Imhōtep the Physician gave inspiration and direction to the march of a people and was elevated to demigod in 2850 B.C. and to a full deity in 525 B.C., by which time the Greek learning was gathering influence and the cults of Imhōtep and Asclepius became henceforth blended.

I pass to a nearer though greater background—the wonderful age of Pericles which gave the world Hippocrates. In the teaching of Hippocrates mythology was

put aside, the supernatural in medicine was rejected, and the observation of disease, objective examination, and the importance of prognosis were the outstanding features. To this day we not only follow his methods but treasure his wisdom.

In the Christian era, alas! there was retrogression; and the growing power of Christianity, although fostering a spirit of service, delayed rather than promoted medical progress. The natural origin of disease did not find acceptance, and the devitalizing magic of the Egyptians

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returned in no less force because of its altered guise. And the opposition of Christianity to scientific progress for the most part continued, though with diminishing repression, till later days. At the same time it is only fair to say that the Church took a prominent interest in the cure of the sick, and that some of its priests, with the hesitating consent of their Superiors, practised the art of medicine.

Having then done obeisance to Imhôtep and Hippocrates and other early masters in our art let me pass to the consideration of the hundred years it is our purpose to celebrate.

This address does not envisage a recital, still less a description of discovery. It rather seeks to consider the directions along which knowledge has grown during the century under review and the trends of thought and action which have thereby resulted. How are the problems of the practice of medicine being modified on the one hand by this advance of knowledge and on the other by the rapid changes in material civilization? What is the role of medicine in that statesmanship which aims at the health and welfare of the people? I have tried to keep in mind that I have the honour of addressing not only doctors but the public. I need the indulgence of both.

Medical Problems of the Early Years

The opening of the period found medicine without as yet the guidance of either physical or biological science and at the same time faced with problems resulting from profound political and social changes. Sir Charles Hastings founded this Association in the year of the great Reform Bill at a time when the demands of the industrial age were forcing masses of the populations into towns unready to receive them. The result was misery, ill-health, and discontent. To consider the then conditions of life will make clear the disability and disease with which the medical profession had to strive. Houses already overcrowded were deprived of light by the operation of the Window Tax imposed on every extra window in a house which indulged in "one over the eight" permitted. The smaller dwellings were commonly without a supply of water, which was distributed by means of standpipes (one to some fifteen or more houses), out of which water ran for an hour or less three or more times in a week. The inhabitants carried the water or bought it from carts and stored it in vessels. Small wonder that they washed neither their houses nor their persons. There was a saying that only on entering the world and again on leaving it was a citizen well washed.

Till those days houses were either undrained or connected with cesspools; and sewers were built only to carry off water from the land and empty it into rivers. As the population rapidly increased the honeycombs of cesspools became inadequate and overflowed into and saturated the soil. House drainage was then for the first time connected to the sewers, with the result that the rivers became large open cesspools, and if these rivers ran through towns the effects were disastrous. In London, for instance, the Serpentine became an open sewer which drained Kilburn, Paddington, and Bayswater. Infective diseases ravaged the land. One is reminded of Aristotle's dictum:

"The greatest influence upon health is exerted by those things which we most freely and frequently require for our existence, and this is especially true of water and air."

During the year of this Association's birth the country was in the throes of a cholera epidemic from which the number of deaths in England and Wales exceeded 50,000. In 1848 cholera was responsible for 5,275 deaths in London—a mortality of nearly 48 per cent. of the cases. Typhoid

and typhus and diphtheria were ever-present perils. The infection of wounds, erysipelas, and gangrene made the surgical wards of hospitals sources of danger.

There was still planted in men's minds the idea that epidemic diseases were visitations beyond our ken and control and having origin in disturbances of earth or sky or in the minds of gods—habits of thought little different from those belonging to the age of Egyptian medicine. A break from this tradition of helplessness came with growing confidence in vaccination. In the first two years of Queen Victoria's reign there were 30,000 deaths from small-pox in England and Wales, apart from numberless people disabled or disfigured. In 1840 optional vaccination was provided by law, and by 1853 the mortality had been reduced 50 per cent. In 1853 vaccination of infants was made compulsory, and by 1863 the mortality had been reduced a further 30 per cent.

The attitude of authority towards epidemics is shown by the following minute:

"November 11th, 1831.—The Board agreed to take precautions against Cholera, along with the Town Trustees, Church Burgesses, Magistrates, Surveyors of Highways, Church Wardens and Overseers."

Another minute throws light on the standard of nursing:

"January 5th, 1849.—Resolved that an advertisement be inserted in each of the papers to-morrow for a nurse who can read and write, or at least read writing, and must produce good recommendations as to character and ability."

The Ferment of New Knowledge

Altogether for the sick and disabled and for those who tended them it was a struggle in the darkness with little to lighten the pathway till the eighties of last century. But during the waiting years great minds were working—that of Virchow, for example, in cellular pathology, of Claude Bernard in physiology, of Bright in medicine, Chadwick in sanitation—and in 1859 the world of thought became aglow with the publication of the *Origin of Species*, the first edition of which was sold out on the day of publication.

In 1857, Pasteur presented to the Academy of Sciences his paper on "Alcoholic Fermentation," in which he showed that the process was a vital one and due to invasion by living organisms. Little can he have thought that this discovery was the dawn of an era. During the early 'sixties he demonstrated the presence of bacteria in air, dust, and water, the power of heat to destroy them, and the sterility of media protected from their contamination.

At this time there went to Glasgow Joseph Lister. Seized with the meaning of Pasteur's experiments there came to him the idea that germs from outside caused the decomposition of wounds. After five years Lister had solved the problem of wound infection and modern surgery was born. Pasteur and Lister were the world's deliverers. They had followed the injunction of Harvey to search out and study the secrets of Nature by experiment.

From 1865, onwards for six years, Pasteur turned his attention to silkworm disease, and this like other of his researches had the stimulus of direct public purpose, for the preventive measures he devised saved that industry. There were two diseases each of which was due to a specific infection. When experimentally transmitted from worm to worm in series the period of incubation of an infection was shortened and the virulence increased and the worms showed variations in susceptibility and resistance. Here light was thrown on the problem of infection. Further landmarks on the road of knowledge were afforded by Pasteur's researches into epidemic chicken cholera. He found that cultures of the organism lost their strength

with age, and that by inoculating fowls with these attenuated cultures he conferred on them immunity against chicken cholera—in short, he had laid the foundation of preventive vaccination. He further discovered that this micro-organism which was virulent in its effect on fowls was mild in guinea-pigs—that whereas fowls were very ill and died, the disease produced local abscesses but not illness in guinea-pigs. Thus the conception of the carrier.

Next anthrax; and now on the stage beside Pasteur comes Koch—the one a chemist and the other a country doctor. Koch first and Pasteur later demonstrated the constant presence of germs in the blood of animals suffering from anthrax: they grew those germs on suitable media outside the body through several generations and reproduced the disease in animals from the last sub-culture. There followed the demonstration of preventive inoculation against anthrax in dramatic manner. Twenty-five sheep were vaccinated by attenuated cultures of anthrax and twenty-five controls were left unvaccinated. Subsequently the whole of the fifty sheep were inoculated with a virulent culture of anthrax. The vaccinated sheep all recovered and the non-vaccinated all died.

The climax of Pasteur's discoveries was the cause and prevention of rabies. Here was a dread disease, comparatively rare, affecting the nervous system, and with a long incubation of weeks or even months. By changing the seat of inoculation from the skin to the surface of the brain he shortened the period of incubation from months to weeks. By passing the disease from rabbit to rabbit in series he raised the virulence of the infection and shortened the inoculation period to one week. By keeping the spinal cords of mortally infected rabbits in dry air he found the virus in them became attenuated proportionately to the length of such preservation. By inoculating dogs from these rabbit cords, in doses of increasing specific strength, these dogs were found to be protected. Then came a dramatic happening—a boy from Lorraine bitten badly by a mad dog—he was given injections of increasing strength for nine days. The protective virus with its short period of incubation got ahead of the mad dog virus with its longer incubation period. The boy was saved and thus was established the preventive treatment of hydrophobia for the benefit of the world.

This culminating achievement brings us into the eighties of last century. Pasteur and Lister had given men's minds a new impulse—their thought a new direction—the world a new learning—the beginning of it all had been Pasteur's study of the law of fermentation. It is interesting to recall that this new learning had been rendered possible by the completion of the compound microscope by Lister's father in 1830. Yet another association: this year is the tercentenary of the birth of Leeuwenhoek, creator of the first microscope, and the first learned body to recognize this important advance was the Royal Society of this country.

Then the harvest—in 1882 Koch demonstrated the tubercle bacillus—an event great in itself and in consequence. There followed the discovery in rapid succession of the causal germs of typhoid, diphtheria, cholera, tetanus,* plague, pneumonia, gonorrhoea. Nor must we forget the discovery of the causal germ of Mediterranean fever by Bruce. The position of bacteriology had become commanding and caused the dry bones of pathology to live.

Beside Pasteur stands the figure of Manson, the Father of Tropical Medicine. Alone and unaided at Amoy in 1877 he demonstrated the periodicity of filariae in the

blood (first discovered by Timothy Rees)—their numbers increasing till midnight and disappearing by noon. He was the first in 1879 to perceive the role of the blood-sucking insect. With only meagre apparatus and after months of work he ultimately succeeded in tracing the filaria through the stomach wall of the mosquito, and thence into its thoracic muscles, and he observed that during its passage the little parasite increased enormously in size; it developed a mouth, an alimentary canal, and other organs, and he says, "manifestly it was on the road to a new human host." Listen next to his prophetic words in a letter to Cobbold in June, 1879—and please note these dates:

"This is a striking and most suggestive fact, and in connexion with it one might be tempted to speculate on the causes of the periodicity of malarial fevers. It is marvellous how nature has adapted the habits of the filariae to those of the mosquito. The embryos are in the blood just at the time the mosquito selects for feeding."

The malarial parasite was in fact demonstrated a year later (1880) by Laveran—a young Frenchman—but this discovery fell upon stony ground. Even in 1893 Ross writing in the *Indian Medical Gazette* speaks of "the supposed haematozoon." Then in 1897 Manson demonstrated to Ross in London the malarial parasite and its crescents. As a result "Ross not only went in with the few who received Manson's theory with joy," but became the convinced adherent who voluntarily undertook the labours of demonstrating its fundamental truth and in the event gave it the perfect precision it had hitherto lacked. Years later, in 1909, when vacating the presidential chair of the Society of Tropical Medicine, Manson with characteristic largeness of heart claimed credit for himself "not so much for having formulated the mosquito-malaria theory as for having discovered Ronald Ross."

Following Manson's vision of insect-borne diseases the road of discovery opened out. Bruce was the first to demonstrate the transmission by an insect of a protozoal disease—namely, the tsetse fly as the conveyor of nagana disease in cattle; Ross demonstrated the transmission of malaria by the mosquito; and by 1900 yellow fever, one of the world's worst scourges, had been shown beyond peradventure, by a commission in Cuba, to be similarly conveyed. David Bruce correlated the tsetse fly with sleeping sickness: the cause and transmission of amoebic dysentery became known, and in 1905 came the discovery of the spirochaete of syphilis by Schaudinn.

The knowledge of bacterial and protozoal diseases achieved in the closing years of the nineteenth century was soon to be put to valuable test. Pestilence had played a large part in defeating past attempts to build the Panama Canal, so when the United States undertook that project in 1904 it first established a health administration under General Gorgas. In two years the mortality amongst the workers was reduced by two-thirds. Yellow fever had been banished and dysentery was under control—altogether an example of statesmanship directed by medical knowledge.

The Acceptance of New Truths

It is interesting to reflect on the varying degrees of difficulty which new truths have to encounter. In retrospect one wonders at the want of receptiveness in men's minds. That the discovery of the anthrax bacillus in the blood of patients roused men's minds while the previous discoveries in the blood of the malarial parasite (1880) and of the spirillum in relapsing fever (1873) were but little noticed, is an instance of how the implantation of truth depends not only on its discovery but on the readiness of men's minds to receive it.

* To Kitasato in 1889 we are indebted for obtaining the tetanus bacillus in pure culture, and with Behring for antitetanic serum.

The history of anaesthesia affords a striking example of how long truth may remain unheeded. The anaesthetic properties of nitrous oxide were described by Humphry Davy in 1800 and those of ether by Faraday in 1818. Hickman tried in both England and France in the years 1824 to 1828 to secure consideration for anaesthesia as a practice. Yet despite repeated stimuli the imagination of the medical world remained untouched. To the year 1844 does not belong the discovery of anaesthesia but its acceptance—nearly half a century after the birth of the idea.

On the other hand, it cannot be said that the acceptance of the infective theory of disease and its meanings lingered unduly, and this was no doubt due in large measure to the qualities of character of its apostles. Pasteur had to dissolve long-established belief and he did it by a notable quality of appeal. From his genius came a revelation which time is still unfolding. Lister had not only to win men's minds but conquer the fixed habits of a craft and he did it with a patience only equalled by his persistence. Nevertheless a generation of disciples bred in its methods was needed to bring his teaching to fruition. Even he from the heights of Pisgah saw but dimly the promised land—neither encompassing the surgery nor performing the operations which his own discoveries had rendered possible. The beauty of Lister's character is illustrated in a letter he wrote to Pasteur in 1874:

"Allow me to take this opportunity to tender you my most cordial thanks for having by your brilliant researches demonstrated to me the truth of the germ theory of putrefaction, and thus furnished me with the principle upon which alone the antiseptic system can be carried out. Should you at any time visit Edinburgh, it would, I believe, give you sincere gratification to see at our hospital how largely mankind is being benefited by your labours."

Thus with the early years of this century the craft of surgery, never lacking in technical skill, was set free and with results fruitful of great benefit to mankind. It has lately been stated with authority* that the craft of surgery had "almost reached the end of its progress along the lines which so far it has followed," that "the full fruits of Lister's work have now been garnered," and that with operations now carried out upon every organ in the body little further success can be expected. This gives me to wonder and to think. Surely surgery has not reached so gloomy a finality. "Life is short but Art is long." Listerism which freed surgery of its chains is surely a great permanent possession which conditions all progress but without determining the nature or limit of that progress.

On the other hand, has not the extension of the field of surgery been determined by the growth of knowledge derived from physiology and pathology and by improvements in technique? The researches of Pavlov gave inspiration to the surgery of the alimentary tract, and radiology and chemistry have been increasingly reliable guides. The change is not in facts but in habits of thought. At the beginning of this century when surgery took possession of the freedom Lister bestowed upon it, there was a bound ahead and with it an exuberance of craft, which was sometimes forgetful of physiology and wider clinical considerations. That detachment has passed and surgery has come back into the fold of medical knowledge. And has not the craft of surgery large fields yet to conquer? There come to my mind the thorax, the arteries, the nervous system, and the ductless glands, as examples which are on the threshold of their possibilities whether of purpose or technique.

* Romanes Lecture (1932) by Lord Moynihan. A similar view was expressed by Professor Erichsen in his introductory address at University College, London, in 1873.

Chemistry and Physics in the Service of Medicine

In the present century physics and chemistry in linkage with physiology have taken pride of place in their services to medical knowledge. The growth of the science and craft of radiology following Roentgen's discovery in 1895 and the development of radium therapy have been features of the present century.

Biochemistry gives us the means of quantitative assessment. It enables us to measure the normal processes of metabolism and learn full early of their departure from the standard of health. The estimation of the nitrogenous bodies in the blood has proved of great help in prognosis and treatment of kidney disease, while detection of a fall in the protein content of the plasma bespeaks the imminence of dropsy. The power to estimate sugar has rendered rational and exact the treatment of diabetes; and the chemistry of calcium has opened up a new field in clinical medicine. Indeed biochemistry, of which England is so proud, will be more and more a guiding star of progress.

A word on the aid which chemistry has afforded to therapeutics. It is giving us the active principles of long and well established remedies and so helping us to precision. It has provided us with invaluable synthetic anodynes, hypnotics, and sedatives—much needed in this hustling, nerve-racking world. Not least of its gifts are the means of inducing sleep and content as a prelude to anaesthesia—though we still await with hope an anodyne, local or general, which will ensure enduring freedom from pain, for there is no more powerful means of healing than the assuagement of pain and the lure of forgetfulness. Chemistry is further giving us specific remedies, the chief of which belong to the dyes and compounds of arsenic. Trypan blue, the substance known as 205 and its derivative 307, cure or control trypanosomiasis—thus conferring benefits on those who have to inhabit the vast districts ravaged by the tsetse fly. The cure of syphilis by arsenic and the discovery of its causal spirochaete are alike achievements of the present century. Pernicious anaemia, until recently a fatal malady, has, by the discovery of the anti-anaemic factor in liver and stomach by Minot and his colleagues, been converted into a simple deficiency disease.

Ultra-violet Rays: Vitamins

Though sunlight therapy dates back to Hippocrates its scientific application and that of artificially produced ultra-violet rays belong to the last twenty-four years. The treatment of tuberculous bones and joints by sunlight and immobilization has wrought wonders, and as in the case of phthisis has achieved an even greater good by the habits it has engendered among the healthy, for every patient cured becomes an apostle of light and air, often to the distress of his or her family.

One great interest attaching to these rays belongs to rickets. Here is a disease (a vital change) associated with deficiency of calcium. The ultra-violet rays produce, by their effects on the ergosterol in the skin, the vitamin D, which restores that deficiency. Here then are physical, chemical, and physiological events in causal sequence. The unfolding of the story of the antirachitic vitamin is a romance and a triumph of the experimental method for which this country deserves the chief credit. The isolation of this vitamin in crystalline form has been accomplished and the crystalline calciferol is so potent that it has 400,000 times the value of an equal weight of cod-liver oil,* and one ounce of it could produce the necessary daily ration for a million children—truly the "little leaven." A practical application of vitamin D to the formation and the growth of healthy teeth in children and prevention of their decay initiated by Mrs. Mellanby

* Report of the Medical Research Council, 1930-1, p. 10.

gives promise of far-reaching results in the promotion of the health of the coming generation.

There are now seven vitamins known, each of which is related to some indispensable function. They activate chemical changes within the tissues that underlie nutrition, on the study of which hang national issues. As regards the body, vitamins are imports, whereas hormones are home-grown products manufactured by the glands and disbursed by them into the blood stream.

Hormones

These bodies have a definite chemical composition, and like vitamins are potent in minute doses and are selective in their actions. They are produced as required by ductless glands, are carried by the blood, do their work and disappear. Some of them are relatively simple in their action. Thus secretin (described by Starling, to whom we owe the first description and conception of these bodies) has the relatively simple role of a chemical reflex. Its formation having been provoked by the appearance of acid chyme in the duodenum, secretin is absorbed into the blood, travels to the pancreas and liver and evokes the secretion of their digestive juices, and disappears. Again, the minute parathyroid glands, each measuring no more than 6 by 4 millimetres, have a relatively limited function in maintaining the level of lime salts in the blood. Let them be removed, the calcium content falls and tetany appears. Administration of parathyroid extract restores the calcium level and cures the tetany. Let these glands become overactive and the bones of the skeleton lose their calcium support and fractures ensue.

The suprarenal glands, regarded by the ancients as having miraculous powers, described by Eustachius in 1543 and by Addison from the clinical standpoint in 1835, are now known to produce two hormones—adrenaline from the medulla and eucortone from the cortex. It is of interest to note that an adrenaline-like substance is produced at the peripheral sympathetic nerve endings either by direct stimulation or by emotion.¹ The remarkable results which follow the administration of eucortone in Addison's disease more than suggest that yet another fatal disease has been mastered and a substitution therapy realized.²

Some of the internal glands have a wider range of activity and extend their influence over the mind and character. Have too much thyroid gland: the fires of life burn too fast and easily, the mind is too impressionable and meets life's troubles more than half-way as shown by the staring eyes, the trembling hands, and the palpitating heart. Remove a portion of this thyroid gland and the wheels of life move with more smoothness and content. Possess too little thyroid gland: the fires of life become a smoulder, you are cold in body and mind, you are a dullard in feeling and appearance, slow in thought, word, and deed, you may hardly have a soul. Then take thyroid extract and once more you feel—and look—human. The active principle of the thyroid extract—namely, thyroxine—thus determines our weal or woe by its quantitative gradation and those mental and emotional qualities which make or mar us. We are here also brought in contact with problems of conduct and self-determination.

But surely the pituitary is the wonder world of the ductless glands. This structure, consisting of two lobes and set in the base of the skull, though weighing not more than three-quarters of a gram, in a special sense presides over our destiny. The anterior lobe is the source of no fewer than four hormones which are concerned with growth, metabolism, and sex activity. The posterior lobe

is the source of two hormones which are concerned with vaso-constriction and (in the pregnant woman) with parturition. I will restrict my attention to the sex hormones of the pituitary gland, and consider with them the hormones of the ovary and testicle, because the harvest of new knowledge gathered in increasing measure with the succeeding years is giving indications not only of clinical usefulness but of influence on scientific thought and sociological reactions.

The ovary produces two hormones, one from the ovarian follicle (oestrin) concerned with ovulation and oestrus and the other from the corpus luteum (progestin) which prepares the uterine mucosa for the reception and retention of the fertilized ovum. With failure of this secretion, progestin, the embryo does not become fixed in the uterus and dies. But both these ovarian hormones are mobilized by the overriding influence of the anterior pituitary hormone, prolactin. Transplantation of a piece of the anterior pituitary body will by stimulating the oestrin hormone render, after the lapse of three or four days, an infantile female rodent sex-active and sex-attractive, thus pushing forward its sex maturity. From the posterior lobe of the pituitary gland comes, besides the vasopressor extract, a hormone (oxytocin) which by stimulating the pregnant uterus initiates parturition. In this the originating influence is thought to be the ovarian hormone (oestrin), which sensitizes the uterus to the action of the posterior pituitary.

Here then is a wonderful kingdom over which the minute pituitary gland rules enthroned in the middle of the skull. This gland presides over the destinies of ourselves and our descendants. The anterior lobe influences our growth and our sex—its dominance and degree. Without it—no sex desire—no conception; without the posterior lobe—no parturition. Perhaps Descartes was not far afield when he placed the soul in the pineal gland.

Further, the female sex hormone has been obtained in crystalline form from the urine of pregnant women and has a chemical structure represented by $C_{18}H_{22}O_2$, and one forty-millionth part of a gram of this pure substance produces oestrus in the mouse; and last year we learned that the male hormone had also been crystallized and has a probable formula of $C_{16}H_{26}O_2$, and one ten-millionth of a gram of this substance is active and provokes marked comb growth in capons.* It is truly wonderful that so apparently slight a difference in the chemical structure of the male and female hormones should carry with it so vast a physiological distinction.

“Oh the little more and how much it is!

And the little less, and what worlds away!”

This expanding volume of knowledge must in time make clearer certain problems of sex in health and disease. Further, it perhaps foreshadows the time when sex perversion will belong more to pathology than to crime and require medical as well as legal handling.

There is evidence that even in the individual cell the action of oxygen is regulated by an activating factor or catalyst. In therapeutics too we think of a remedy as being provocative of change without sharing in it and perhaps breaking up after its provocative message has been delivered. That a vitamin or hormone can in minute quantity produce so extensive a physiological change suggests that it is determinant of, rather than a partner in, that change. The material units in germ or sperm—the chromosomes, which are concerned with inherited characters—are determinants which influence, rather than particles which participate. This dynamic conception suggests means of accord between processes of body and mind with both of which doctors are concerned.

* Tribute is due to biochemists for these advances in knowledge, and especially to the young German chemist Butenandt.

¹ Dale.

² Swingle and Pfiffner, 1930; Theodore Thompson, *Lancet*, July, 1932.

Maybe, the hormone is a go-between—a physical embodiment of influence.

To revert to bacteriology—the knowledge of immunity foreshadowed by Edward Jenner, established by Pasteur—rationalized by Ehrlich and others has grown and extended. In this country the mantle rests on the shoulders of Almroth Wright, who has enriched medicine not only by his discoveries but by provocative thought. The study of immunity brings us to realize how remedy lies within man himself—a potential energy which becomes kinetic in the face of the foe. Such remedy is aroused by external stimuli; true it may be temporarily replaced by serum, but its origin and its power must come from within the tissues of the body. So it is with the hormone or the vitamin which is a determinant of rather than a partner in bodily reaction. If I may be tempted to make a parallel not complete, but adequate, a study of the body politic suggests that there is within it a power of recuperation which is called forth by morbid social processes. Of this it would be easy to produce examples from the life of to-day. The reaction of immunity may be provoked and encouraged from without by a process of progressive stimulation, but salvation lies within the organism itself—"Behold, the Kingdom of God is within you." How great a confidence does such an ordering of things inspire!

The Virus Diseases

Certain diseases of man, animals, and plants are caused by particulate organisms so minute as to be (most of them) invisible under the microscope and passable through filters which catch bacteria. I may give as examples: in man, measles, small-pox, infantile paralysis; in animals, foot-and-mouth disease and dog distemper; in plants, tobacco and banana diseases. These viruses are specific and multiply in the bodies of their hosts; some are highly contagious; some are transferable from the sick to the healthy by insects.

In size the "virus" organisms would appear to begin where the hitherto known bacteria end, their varieties tapering away into intangibility. It is their smallness which taxes not only our resources but our comprehension. We might even think of their size in terms of molecules. But history is repeating itself, and as histology and bacteriology needed for their being the completion of the compound microscope in 1830, so developments in the science of optics are aiding the study of the viruses to-day. By the use of the short ultra-violet rays and quartz instead of glass virus organisms have been photographed and measured.

Do not viruses in essentials "live and move and have their being" much as do visible pathogenic microbes?

The Art of Healing

The art of medicine embraces the understanding of illness no less than the morbid process, and if the physical and biological sciences are given a too exclusive attention they are apt to give to medical thought a too pronounced objectivity. We welcome their guidance and even their chastening but we have to be naturalists as well: we need to take count of the whole man.

What of personality and its infinite variety? What of environment? In these days when diseases of invasion are receding and diseases of stress loom larger both these factors receive accentuated importance. A man's physical and mental make-up—his inborn trends—play no small part in the clinical picture he presents. To take simple examples—in similar circumstances of stress one type of man will get hyperchlorhydria, hypertonic stomach, and it may be duodenal ulcer, while another man gets hypo-

chlorhydria and an atonic stomach. Some people are born with achlorhydria and its attendant disadvantages. Again one type of man develops high blood pressure, while another type in like conditions develops low blood pressure. And so with the mind—its make-up both inherited and acquired may colour or even confuse the picture presented by a physical illness. The latter may release some buried or suppressed emotional experience which in its turn will produce further physical reactions. To effect a cure both aspects of the illness must be studied. This wider comprehension demanded of medicine may be set forth by an illustration:

Given a business man—efficient, impressionable, courageous: his parents brought him up in the cold shades of virtue and not in the sunshine of the understanding heart, so he had learnt repression, not self-expression. He gets overworked, loses confidence in himself, doubts the rightness of his calculations and decisions, suffers self-depreciation, anxiety, insomnia; and all this hidden behind an outward appearance of carrying on cheerfully. At this point the stress may take effect in one of several directions. For instance, it may knock out the nervous system regulating the intestine: the diagnosis is "colitis"; he is satisfied—"Here is the cause of my troubles—a microbe in my intestine." If the microbe is not crushed very soon and the illness lingers, he is told he is "nervy"; this causes a pang of self-reproach; he retires into his shell, his colitis gets worse, and he drags on until we hope he meets a doctor with a more comprehensive outlook.

Pervading these problems there is a fundamental error of thought—namely, that disturbances of your mind are under your control and are therefore your fault, whereas disturbances of your body are not under your control and are therefore your misfortune. This false doctrine of control, and all the perversions of the doctrine of free will with which it has long been entangled, are responsible for much faulty thinking and human suffering. Self-control can be bought too dearly or sought where it ill belongs.

And next as to treatment of these complex cases. Apart from remedies which are specific and those which assuage pain and assist relaxation and sleep, efficient treatment lies in comprehensive diagnosis. It is sometimes only necessary to explain an illness for the patient to cure himself. Let the doctor understand the component parts of the picture and explain faulty trends of thought and feeling and their relation to bodily function. Thus restoration of perspective and reassurance will follow and the patient will be put on the road towards health. True, the faults and errors may be too ingrained for remedy by a single readjustment; then the treatment becomes educative, and needs the discerning mind, reasoning which is persuasive, and those further gifts of the teacher—the power to give from himself understanding and confidence, and this the more effectively because unwittingly. It is far easier to prescribe medicine than to give the patient healing.

Kinship between Medicine and Education

This increasing kinship between medicine and education leads to further reflections. Our public medical services and the various voluntary agencies which have the same objective should be judged even more by what they teach than by what they provide. The infant and child welfare clinics and the school medical services respond to this test. They have given parents not only help but vision of better things and have stimulated individual effort. And does not medicine teach this to be the touchstone of sound statecraft? Health like healing comes in last resort from

within. Stimulation and assistance from without—yes; but such must not replace or outpace the integrating process within. If they do, there follows a negative phase of inertia and a paralysis of that individual endeavour on which depends the onward march of the organism. Has not latter-day statesmanship fallen into this error?

Ways and Means

There is now alike ability and desire to investigate illness in its early or potential stage, and this aim of constructive health has increasing support from the public. We see it on the preventive side in the work of the Industrial Health Board by means of which the misfitting of the worker to his task with its tale of ill-health and unhappiness is avoided or ameliorated; stress of body and mind and the balance between effort and relaxation are studied, to the advantage of the work and the contentment of the worker. Many large firms have welfare organizations on similar lines.

Persisting deviations from fitness require investigation. Hospitals and clinics will be needed for every class of citizen. There investigations can be made and results marshalled and at less cost. Care will need to be taken that general practitioners do not become separated from their patients when the latter enter hospitals, for such would damage professional efficiency, to the disadvantage of the public.

When the nature of the defects is disclosed the mere giving of medicines will often accomplish but little. What the patient wants is regimen and re-education in methods of living; treatment, it may be by diet, physiotherapy, and relaxation, under controlled observation. Such treatment or education of the man and his tissues might take several weeks, and in most instances it would be advantageous for such patients to continue their ordinary avocations. We need a new type of institution—distinct from hospital provision—namely, a Health Hostel. Examples flow from any physician's experience. Overweight—the man of 40 getting a fat body and a fat head, who avows himself a small eater yet is clogged with his own metabolic products; the man becoming set about the neck and waist, who turns his body slowly rather than his head and eyes quickly, or who is bluish and breathless, losing his rib movements and wants to "stay put." Then the various gastro-intestinal victims who need to be taught how to eat, how to digest, and to regulate their bowels, and perhaps to be cured of their "conscious abdomens." Then again the patient in the early diabetic stage where not only himself but his wife needs instruction in food calories and cooking, and it may be in the administration of insulin. All such and many more need for a space a designed environment; they require education but under the conditions of their working life. Such institutions must have a kitchen under a trained dietitian, and a physiotherapeutic department; skilled control, but no cults or fads. It would prevent disease in untold measure and would be self-supporting and even profitable. The cost to the individual might where necessary be defrayed out of that comprehensive sickness insurance scheme which we wait long and wearily for the vision and constructive ability of the insurance companies to provide.

Education in Health

The good of the people demands education in matters of health. Would it not be possible for the medical faculty of a university to include among its functions the provision of approved health lectures when such are demanded by the districts within the area of its influence? In this way sound educational standards would be maintained—fads and fancies avoided. The objective of such

teaching should be a knowledge of health with only incidental or illustrative reference to disease. The result would be great saving of illness and therefore in a few years of expense. Medical insurance costs employers, employed, and the State 36 millions of pounds a year. Not the least advantage of education would be to dissipate belief in the magical with its false gods, and to inculcate belief in the reign of law and its close pursuance as the only way:

"Spells? Mistrust them.

Mind is the spell which governs earth and heaven."

Research

Nature will not yield her secrets on demand, nor can discovery be bought. You can decide a path of inquiry but neither its end nor its exact direction. Our aim should be to secure the men—to enable those possessing the ability and while still young to live free of anxiety so as to seek out the secrets of Nature. The medical sciences are so embracing that their pursuit yields results beyond those of direct human application. I need only instance the study of genetics or that of virus disease. Take foot-and-mouth disease and diseases of potatoes and bananas. These concern not only our food but by their ravages involve the loss of vast sums of money.

In this country the quest for new knowledge is to be found in all and varied quarters, and a rich harvest is being gathered. The Medical Research Council is doing a great service in supporting and directing efforts wheresoever they come, and it maintains contacts between workers and between the institutions to which they belong. There is however need for further co-ordination among bodies which represent varied aspects of medical knowledge such as the basic sciences, medicine, surgery, obstetrics, education, and administration. It is a reproach against our profession that we do not establish means of giving collective advice when the art of government depends increasingly on our knowledge. Gods on Olympus, however wise, cannot in detachment represent collective authority. Corporate advice could be forthcoming only if there existed the means for its expression. To the hackneyed saying that "doctors always differ" let me reply that the vain repetition of error does not convert it into truth. In fact there is no sphere of learning in which consensus of opinion on matters of importance is so forthcoming as in that of medicine. Contrast with it for example economics or politics, and recall the confusion of tongues over the cure of our post-war afflictions—and it is an intellectual exercise and even a treat to hear one court of law upset the decision of another.

Conclusion

If we look back, what a panorama presents itself during the life of this Association; and never was there greater promise that the advancing front of knowledge will "make one music as before, but vaster."

Pursuit of knowledge in the medical sciences not only brings results prolific of benefit to mankind, maybe by adding to life's quality or lightening the burden of suffering, but its very pursuit makes doctors of every nationality and clime into comrades who, animated by the same ideals, think and work together—the gold of endeavour without the alloy of conflict. Does not this distinguished gathering of guests, whom I am so proud and happy in your name to welcome, bear witness? Be it remembered, there burns in our temple not only the lamp of reason but the lamp of service. These together betoken the qualities of wisdom and the understanding heart, and that desire to know "who is my neighbour" which gives to life its savour and to humanity its hope and purpose.