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THE FUTURE OF SURGERY*

BY

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It is not given to mortals to see into the future. Those who claim to foretell coming events do so for their own profit. Racing tipsters, financial advisers, crystal gazers, palmists, politicians, all hedge their predictions with so many ambiguities that, whatever the result, they can never be proved to have been wrong. Wise men are more cautious.

It has often been stated in the past that surgery has no future, that it can make no further discoveries or spectacular advances, but that its role remains to polish and perfect what has already been done. Erichsen wrote in 1895: "There cannot always be fresh fields for conquest by the knife. There must be portions of the human frame that will ever remain sacred from its intrusion—at least in the surgeon's hand. The surgeon of the future can scarcely hope to invent new operations, he must be content to modify and perfect those that have been devised by the genius and skill of his predecessors."

These prophecies have been proved false—or have they? If surgery is the treatment of diseases and injuries by manual processes, it is probably true to say that the ultimate perfection of manual skill was reached some 50 or 60 years ago. Operative surgery dates from Lister. From the time when in 1867 he showed that human tissues could be divided and closed with safety, surgeons were quick to explore every region of the body, to study every disease in order to discover whether its progress could be arrested or ameliorated by operation. They planned and performed undertakings that have not since been exceeded in scope or severity. By 1910 they had laid down the main outlines of surgery as we know it to-day.

The majority of those pioneers were, as pioneers usually are, rough and rude. Good operators were as rare then as bad ones are to-day, but the best of them developed a skill and a dexterity that have never been, and probably never could be, exceeded. Men like MacEwen and Lane in 1890 and Moynihan in 1910 could have undertaken any modern operation on the brain, the heart, or the joints, had they had the tools and the assistants that we have to-day. Surgery has advanced. It has advanced out of all recognition within the last twenty years. Operative technique is gentler, operative mortality is less, operative results are better than they have ever been before. But the advance has been due, not to surgical skill or enterprise, but to advances in

parasurgical methods that have enabled the operator to do easily and safely things that his predecessors could not attempt. This is the day of the backroom boy.

Three Great Advances

The first world war marked a great advance in surgical thought, a return to the physiological outlook of Hunter, Astley Cooper, and Hilton. But the parasurgical advances I have in mind have all come about since that war; indeed, since I was appointed to the staff of Guy's Hospital. The continuous administration of fluids was introduced simultaneously by Hendon and Matas in 1926. I encountered it in Sweden in 1930, and was, I believe, the first to use it in England. Continuous gastric suction appeared a little earlier. John Ryle was working at gastric intubation in 1920, and my fellow registrar, Gaymer Jones, now at Windsor, was using continuous suction through an indwelling Ryle tube in the treatment of peritonitis and intestinal obstruction in 1922; but the credit for advocating the principle of intestinal decompression belongs to Wangensteen, who described it in 1932. These two advances enabled the surgeon to do something he had never been able to do before: to apply to the injured or infected alimentary canal the same principle as he used in the treatment of other injured or infected structures—rest. The mortality of intestinal obstruction and peritonitis dropped rapidly from one of 30 to 40% to one of 5 to 10%.

Intravenous medication brought also the new science of resuscitation. Blood transfusion began with Lewisohn, of New York, shortly before the first world war, but it is not unfair to say that in that war it never got beyond the stage of an interesting experiment. One or, at most, two pints of blood were given in cases of severe haemorrhage, and if the patient did not then recover he was said to be suffering from "irreversible shock." Continuous transfusion in amounts graded to the needs of the patient rather than the calculations of the theorist was introduced by Marriott and Kekwick in 1935 in the treatment of massive haemorrhage from peptic ulcer. The full use of blood in the quantities and at the rate necessary to restore rapidly that lost, and the standpoint that no traumatic shock is irreversible if it is reversed soon enough and energetically enough, we owe entirely to Lieutenant-Colonel G. A. Buttle, who directed the transfusion service of the 8th Army during the desert battles.

No more convincing demonstration of the value of these three advances—intravenous therapy, intestinal decompression, and resuscitation—could be produced

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than the difference between the recovery rate in the abdominal wounds in the first world war and that in the second. In the first war 40% recovered, in the second 70%, but this does not convey an adequate picture of the improvement. Of the deaths in the second world war, 60% took place in the first forty-eight hours. These early deaths were in men injured beyond recovery, men who in the first world war, without transfusion and motor transport, would never have survived to reach a surgical centre. If these deaths are excluded the recovery rate for comparable cases becomes 85%. The surgeons were no better, but the methods at their disposal were decisive.

With the increased use of intravenous replacement and medication has come the study of the needs of the body in water, electrolytes, proteins, and calories. A normal man, eating and drinking as he wishes, automatically adjusts his intake of water, salts, foodstuffs, and vitamins to the needs of his body. A sick man has different desires, but they are usually an accurate guide to his requirements, and he will make few mistakes. But a patient on intravenous medication gets what the doctor thinks he ought to have, and he may suffer gross excesses and dangerous deficiencies because of the well-meant miscalculations or the plain ignorance of his attendant. Within the last few years the study of fluid and electrolyte balance, which owes much to the work of Francis Moore at the Peter Bent Brigham Hospital in Boston, has enabled the surgeon to maintain a patient for weeks at a time, should this be necessary, in a state of metabolic health. The dangers of potassium deficiency and excess have only lately been appreciated.

The Effects of Chemotherapy

Chemotherapy dates from the introduction of "prontosil" in 1935. The era of antibiotics started with the production of penicillin in 1943. Within the last few years many new sulphonamides and many new antibiotics have been made available. In the constant succession the great value of the sulphonamides tends to be forgotten, and the dangers of indiscriminate use of the antibiotics are not considered. The chemotherapeutic agents, whether sulphonamides or antibiotics, are supremely effective in attacking bacteria without damaging the host, but each of them is effective against certain bacteria only, and none of them can attack bacteria that they cannot reach. By eliminating the sensitive organisms, they are gradually populating the world with a new race of bacteria, as virulent as those they have replaced, but infinitely more dangerous, because until some new antibiotic appears they are safe from attack. In one large hospital, 70% of the nursing staff are now carriers of penicillin-resistant staphylococci. By eliminating the sensitive organisms in the symbiotic colony that inhabits every epithelial surface of the body they leave the field open to the insensitive ones, which have hitherto been kept down by their more powerful neighbours. As pneumococcal pneumonia disappears, virus pneumonia takes its place. The streptococcal sore throat is often converted by penicillin lozenges into a sorer throat attacked by strange organisms hitherto latent. In the intestine sterilized by streptomycin and sulphaphthaldine the monilia is apt to become a pest. While compared with the antiseptics the antibiotics are innocuous, they are all to some extent dangerous—penicillin the least, chloramphenicol the most. In attacking the bacteria many of them may knock out the cellular resistance of the host—suddenly, without warning, and often irreparably. Their most harmful action is that they absolve the body from the need to bring its immune mechanism into play, and rob it of a defence mechanism that has been acquired and perfected through millions of years of evolution and that seldom fails.

Technical Methods

New technical methods have appeared. Electrocoagulation, as a method of cutting tissues and arresting haemorrhage, first came into use between 1920 and 1925. It has enabled great advance to be made in the surgery of regions that are inaccessible, or in which, owing to the vascularity and the absence of connective tissue, haemostasis is a major problem. These considerations apply particularly to the surgery of the brain, but to a less degree to that of the mouth, the lower urinary tract, and the solid vascular organs, such as the kidney and liver. On the other hand, it has enabled surgeons of little skill and ability to perform in comparative safety operations which they would otherwise have been unable to do. New surgical materials, stronger than those formerly in use and innocuous to the body, have helped haemostases and closure, and new metals and plastic materials have revolutionized the operative treatment of fractures, and made the use of prostheses to replace diseased or missing parts of the skeleton for the first time a practical proposition.

Anaesthesia

The most notable advance in the period I am reviewing, that of my own surgical career, has been in the field of anaesthesia. Anaesthesia has been advancing since its introduction in 1846, but the changes that have taken place in this field in the last twenty years exceed those of the previous ninety. In my first ten years as an assistant surgeon many of my difficulties during the operation, much of my post-operative morbidity, and perhaps a quarter of my post-operative deaths were due to the anaesthetic. As a junior surgeon I was unable to secure the services of a trained anaesthetist, and had to depend on the services of any recently qualified man whom my house-surgeon was able to bring in. Most of my patients were terrified when they entered the theatre, struggling during induction, deep purple when they reached the table, stertorous and bubbling throughout the operation, unconscious and motionless during the first six hours after they returned to the ward, vomiting for the next twelve, and chesty for the next week. So fearful was I of anaesthetics that for twelve years, from 1927 to 1939, I performed all my gastrectomies and much of my major surgery under local analgesia alone.

The modern anaesthetist gains the patient's confidence by a complete pre-operative overhaul, prepares him by a careful assessment and adjustment of his deficiencies, allays his fears by pre-operative medication, renders him unconscious by an intravenous barbiturate, maintains analgesia by one of the anaesthetic gases, ensures oxygenation and immobility of the diaphragm by controlled respiration, and by the use of relaxants provides the degree of muscular relaxation needed at any stage of the operation. He is no longer a mere "dope merchant." He takes over the whole responsibility for the patient's welfare and the surgeon's peace of mind. He presents the operator with tissues in a condition to suit him, relieves him of all anxiety except for the technical details of the operation itself, and hands him back a patient alive and well and about to come round.

Qualities of the Great Surgeon

Can one foresee what advances may come in the future? I have already expressed the view that manual skill has not appreciably improved in the last fifty years, and cannot improve much further. But manual skill is not the whole of surgery. The great surgeon must, at any rate, possess eight other qualities in high degree. He must have knowledge of the basic sciences, and particularly of pathology, of the theory and practice of clinical and operative surgery, and of the writings of other surgeons. He must have wisdom, the blending of knowledge and experience into a personal outlook that will guide him to the solution of fresh problems. He must have the power of communicating his views to others, of clear writing, and clear speaking,

which in turn arise from clear thinking. He must have originality, the ability to find in his experience the path that leads to fresh knowledge and enables him to leave surgery in some way better for his stewardship. He must have leadership, the power to convince contemporaries and to fire juniors with his own enthusiasm. He must have integrity, absolute standards of honesty, justice, and humanity. He must have courage to hold on in difficulty, to persevere in failure, to back what he believes to be right though all men attack him. He must also have humility, a consciousness of the great disparity between his achievements and his hopes. There are not many surgeons who are great by these standards, but of that small company three at any rate are in this country.

If perfect surgeons are so rare, might not the way to future improvement in surgery be in syndication, just as in evolution various creatures, by combining in packs, flocks, hives, or colonies, have been able to survive and flourish where as individuals they would have perished? Most surgeons believe in their inmost hearts that combined operations would lead to better work. When one of them is ill and in need of a severe and hazardous operation, he thinks along these lines, though he may not say it: "I should like old Smith to decide whether operation is necessary, and I should like Jones to confirm his opinion and tell us what operation should be done. I should like Brown to do the operation, but I should like Robinson to assist him and see that he doesn't have a brain-wave during the course of it. When it is over I should like Jenkins to take charge of the after-treatment." A great part of every operation consists in stitching, an art in which a surgeon has not been trained, that he attempts for the first time as an adult, and that he never learns to do really well. Yet by his side, veiled and voiceless, is a girl who has been stitching since she could toddle and who could do the job more neatly than he can, and in half the time. Operations would be done much better if the surgeon, having explored, decided, mobilized, and resected, were to hand over reconstruction and closure to a nurse working under his direction, leaving to her the fashioning of the anastomosis, the recovering of raw area, and the closure of the wound.

Problems for the Laboratory

It is difficult for one who is not a scientist to guess what advances may come from the laboratory or the factory. We shall certainly have a succession of new antibiotics, analgesics, sedatives, and ganglion blockers. I suppose we need them. At any rate, we shall get them. What do we need that we are unlikely to get? What should we beg the boffins to produce for us? I can think of two things. The first is a contrast medium excreted by the pancreas, that will give a reasonably accurate estimate of pancreatic function, and allow the demonstration of obstruction to the ducts and of tumours at an early stage. The second is some systemic haemostatic that will arrest bleeding from small vessels divided at operation. We have at present many effective means of preventing blood clotting, but no means of accelerating clotting that does not bring the risk of spontaneous thrombosis in the cardiac or cerebral vessels. Bleeding from large arteries in known situations is no problem. Bleeding from countless small vessels can be a very real nuisance in the operations of radical mastectomy, thyroidectomy, and many others. Can we not have some substance which when injected into the circulation acts like thrombokinase (if thrombologists still allow its existence) and seals cut vessels as soon as the blood spurts out? Can we not have a haemostatic liquid that is sprayed on to the flaps as they are turned back and on to the chest wall as the breast is removed? Can we not have a pistol-grip forceps with a reservoir in the handle with which we nip each little bleeding-point as we meet it, leaving it securely sealed with a drop of haemostatic glue?

Scientists have abolished the two chief causes of death in surgical patients—shock and sepsis—but bleeding remains a nuisance. The anaesthetists are attempting to diminish

blood loss by slowing down the circulation, but the basic danger remains that a retardation sufficient to help the surgeon at the site of operation may lead to thrombosis in central vessels, particularly in the elderly. Hypotension, however it is produced, brings grave risks of permanent damage to the central nervous system. In my view the tragedies following hypotensive anaesthesia are too numerous to justify its use except in the approach to intracranial and other aneurysms, in radical mastectomy in young women, and in thoracic operations, such as decortication and the resection of aortic coarctation, in which considerable blood loss is inevitable. It will certainly allow the general or plastic surgeon to do a difficult operation with supreme artistry and to take his bow; but that is little consolation to the relatives of the patient who may die within the next few hours or, worse still, linger for months as a decrebrate animal. Refrigeration appears preferable, for it not merely slows the circulation, but diminishes the need of the tissue for oxygen. It clearly has its place in cardiac surgery, but that place is at present strictly limited by the "fibrillation barrier" that seems to bar depression of the temperature below 25° C. without providing first ventricular fibrillation, then cardiac arrest. That barrier removed, the possible benefits of refrigeration, not merely surgical but social, would be almost unlimited. Surgeons could work slowly and methodically with a minimum of instruments. Parents could refrigerate their youngsters before going on holiday, merely asking the postman to keep an eye on the thermostat while they were away, and warm them up ready for an extra large meal on their return.

"Pneumatic Surgery"

Are there any further regions open to surgical enterprise? Every cavity has been explored. Every organ has been attacked. The body is worked at, and only the soul remains. I have been told that there was once a Scottish chair of pneumatic theology, concerned with the study of the pneuma or spirit. There is an equally important field of pneumatic surgery, whose boundaries only have been approached.

Personality, character, individuality, all that goes to make the pneuma, the motive force that animates the bodily frame from the cradle to the grave, seems to be compounded of instincts, impulses, and reflexes resident in the thalamus and basal ganglia. This "personality-motor" of any individual has been moulded and transmitted by heredity, modified to a slight extent during its period of development by education and environment, and throughout life is subject to chemical control—by the secretion of the ductless glands which it calls into action but which in reality control it, by the products of metabolism, by drugs and stimulants, and by the toxins of disease. The cerebrum is the sense organ, but not, as we fondly think, the director, of this personality-motor. It receives, sorts, and stores for future use the impressions received by the eyes, ears, and hands. It analyses the inarticulate demands received from the boss in the basement, and, using them as a guide, prepares a detailed plan of campaign, and working instructions to the effector organs. It has learned to ascribe the actions it initiates to voluntary decisions, made after careful consideration on the highest moral and intellectual grounds. But it does not really believe its own high-sounding protestations, and in sleep it laughs at itself.

Surgery has ventured to approach the fringe of pneumatic surgery from two points: the endocrine and the telencephalic. The effects of disordered endocrine function on personality are well known. The anxious restlessness of thyrotoxicosis, the lethargy of myxoedema, the aggressiveness of adolescence and the unambitious placidity of the eunuch, the sudden rages of the adrenal hypertensive, the bewildered loneliness of the hermaphrodite—all these are familiar clinical pictures. Surgery by correcting excess, and hormone therapy by supplying deficiency, can do much to restore these sufferers to normal. In mental disease the influence

of organic and removable neurological abnormalities in affecting character is being increasingly recognized. Hemispherectomy, while it cannot restore the paralysis of a spastic child, will make it no worse, and will put an end to the fits and the rages that made it ineducable. Identification and removal of a trigger focus in the temporal lobe may transform a handicapped epileptic into a useful citizen. Operations on the frontal lobes may enable a manic patient to leave hospital and fill a useful place in society.

These operations, apart from thyroidectomy for thyrotoxicosis, are recent developments, the first incursion of surgery into the field of pneumatic therapy. Much research is being undertaken into the function of the cortical areas and subcortical pathways of the frontal lobes in the endeavour to plan operations that can relieve tension without any associated deterioration in character. Further endocrine ablations, notably of the adrenals, have been undertaken for a variety of indications too recently for their value to be assessed. The surgery of endocrine replacement by transplantation must await the breaking of the barrier of the immune reaction that at present prevents the use of homogenous grafts, but it will come.

Surgery as a Profession

But let us leave Surgery as a science and an art, and attempt to see the future of Surgery as a profession. To one brought up in the traditions of British surgery the attempt is depressing.

British surgery has always stood high because it has always been progressive; indeed, it can be claimed, and not without reason, that every surgical advance of major importance has come from this country. The rescue of surgery from the traditionalism, empiricism, and charlatanism that marked its practice in the Middle Ages, and its establishment as a science based on observation and research, we owe to a Scotsman working in London, John Hunter. The transformation of the practice of surgery from a trade to an art was the work of a Londoner working in Scotland, Joseph Lister. Anaesthesia arose simultaneously in Britain and America, but modern anaesthesia that made modern surgery possible owes more to an Irishman in England, Ivan Magill, than to any other man. The final conquest of infection has come from another London Scot, Alexander Fleming.

British surgery has been progressive because it has developed by the method of natural selection that favours the good and discourages the bad with a certainty that planning can never accomplish. Every doctor has been legally entitled to practise medicine, surgery, and obstetrics, and till lately he has been able to do so within the limits imposed by the opinion of his fellows, the trust of his patients, and his own conscience. He might, if he was brilliant, skilful, or lucky, secure a post on the staff of a teaching hospital. He might be appointed surgeon to a general hospital in a large city or to a smaller country hospital. If he failed to get a recognized surgical post he could join a practice as surgical partner. Even without a higher surgical diploma he could still operate on those of his patients who demanded his services. In each case he was given an opportunity to make good, rather than a guaranteed position. If having started as a consultant he proved a failure, his colleagues ceased to call him in consultation, his patients went to others, and he yielded his place to a better man. If, on the other hand, having started as a general practitioner, he found that his real talents and interests lay in surgery, his success would bring him practice, and his reputation would eventually bring him a hospital appointment. Two of the most famous surgeons of all time, Mayo Robson and Rutherford Morison, began as general practitioners.

Under these conditions it was impossible to keep a good man down, and difficult to keep a bad man up for long. Each surgeon had the beds he could use, but no more. He might be attached to a chief for administrative purposes,

but he was never under his orders. He himself had juniors under his instruction, but he was never in the position to tell a colleague what operations to do and how to do them. Such conditions were in marked contrast to those prevailing in Germany, where in each centre a professor had control of some 300 beds, decided the work that his juniors should do and the research they should undertake, and expected that their papers should be published under his name. These juniors, often men of 50 or over, grew grey and subservient in his service, for their employment depended on his good will, and their promotion depended on his recommendation. The system led to the permanence of local tradition, to the production of gadgets and parlour tricks, but to the stifling of real advance. The contributions of Germany to surgical advance in the last 50 years have been pathetic.

Our British traditions have now been cast aside. In the place of surgery as a vocation, a dangerous adventure calling to the stout of heart, we have surgery as a guaranteed career, offering a fixed number of beds requiring a fixed number of sessions to look after them, a steady supply of patients, a scheduled income rising steadily with seniority rather than proficiency, little chance of promotion however good one's work may be, employment till a statutory age, however one may deteriorate, no opportunity of further employment after that age however good one may be at the time, and a pension on retirement. To this safe haven, offered by the Welfare State, many are called, but few are chosen.

A Heartbreaking Problem

The number of applicants for every consultant post in surgery is one of the most heartbreaking problems of to-day. It is easy to discuss the causes that have led to this situation, but very difficult to suggest a remedy. Once again posts that formerly presented an opportunity only have become forms of employment. A registrarship in pre-Beveridge days was an opportunity for learning and a possible stepping-stone for advancement, but always a temporary post. It did not provide a living wage or imply a promise of better things to come. If the holder was lucky he got on, if he was unlucky he got out, but without a sense of grievance, for there were other opportunities open to him. The registrar to-day is better paid than his counterpart in any other scientific profession, far better than his counterpart in America. He marries and settles down, though his status is by definition a transitory one. He may have no aptitude for surgery and have collected a Fellowship merely as a form of investment. In the old days he would have dropped out and sought other employment, but now there is no other employment open to him. He remains in the hope that he will move slowly to the head of the queue, and in remaining he keeps others from opportunities of which they might make better use. On the other hand, he may be a brilliant surgeon, fitted in every way for a consultant post, but he must compete for it against many whose seniority and long service will count perhaps unduly in their favour.

In the struggle, where 60 applicants competing for one consultant post are being judged by a selection committee who know none of them personally, the choice tends to be decided by labels rather than by ability, by degrees and testimonials rather than by evidence of clinical judgment, reliability, and operative skill. The tendency to collect and display multiple degrees and diplomas is an ominous one. It is difficult to reach the short list without a Mastership in Surgery. Some candidates possess the Fellowship of three, or even four, Royal Colleges.

While the number of applicants increases, the number of posts available is decreasing, for very often a group of beds that were shared a few years ago by five part-time surgeons are now allotted to two surgeons working whole-time or in that slightly phony category "maximum part-time." There is an increasing tendency on the part of those newly accepted as consultants to prefer regular hours and security to the certain anxieties and uncertain rewards of private practice.

Private Practice

I am one who holds that the maintenance of private practice in some form is essential not merely to the future advance of British surgery but to the integrity of the National Health Service. It is fundamental that every sick man should have a right to the treatment his disability requires, regardless of his ability to pay for it. It is equally fundamental that he should have the right, when in doubt, to consult an expert of undoubted standing and integrity selected and employed by himself. Without such a right, no State service can remain efficient or command respect. It is clearly in the interest of the State that those whose advice is sought in consultation and those who work in its service should be the same.

I will go further and express my conviction that the professors of all clinical subjects should not merely be allowed, but encouraged, to conduct private practice within the limits of their unit. I have urged this repeatedly at selection boards. I have outlined standing orders which would ensure that the whole work of the professor, including his private work, was available for the teaching of his subject. But my pleas fell on the deaf ears of the professors of theology, Arabic, and botany who made the appointment. The mere fact that they would not listen, that they would not try an experiment that is successful in every other country and observe its results, suggests that they were lacking in the scientific spirit.

I know admirable whole-time professors. I know none who would not be improved by private practice within the limits that I have suggested. Private practice would keep them human, for in it they would be dealing not with cases in a series but with human beings and their human families. It would keep them alert, for their supply of patients would depend on their success rather than on a professorial list. It would keep them humble, for their work would have to stand comparison with that of their colleagues.

The danger of the present position, as I see it, lies in the substitution of a label for reality, of an awarded position for an earned position. Formerly a surgeon was what he made himself in the eyes of his fellows. He started as one to be watched, became one to be employed, and finally one to be consulted. To-day he walks into a board-room a registrar and comes out a consultant. Formerly he climbed the ladder of professional standing carefully, under watchful and not always friendly eyes. He studied what had already been done and what results had already been obtained before he started to invent new methods, and he made very sure of the soundness of his innovations before he published them. To-day he is no sooner appointed than he designs a new operation, one that ignores past experience and physiological principles, and he blares it abroad with all the ballyhoo of an advertisement for a new detergent without waiting to observe its results. It is as wrong for a surgeon to undertake a difficult operation for which he has not been trained as it is for a man to run a sports car through a football crowd before he has passed his driving test. It is as criminal for a surgeon to practise and publish a new operation without complete study as it is for a manufacturer to put a dangerous drug on the market without previous laboratory tests.

Now that surgery has become a nationalized industry the nation must surely recognize that it is one in which skill and wisdom are acquired slowly, progressively, and by apprenticeship. The two grades at present recognized in surgery, registrar and consultant, do not recognize the progressive nature of surgical training and the gradual release of supervision and assumption of responsibility that is necessary in any surgical service. There is need for an intermediate grade, one comparable to that of a surgical specialist with the rank of major in the Army, an assistant surgeon of specialist rank, responsible for his own beds and his own out-patient sessions, but advised to some extent by

consultant colleagues and remunerated on a scale intermediate between that of registrar and consultant. Such a grade would absorb many of the senior registrars who are in fact doing the work, and give them the security of tenure that they now lack.

Conclusion

To conclude, I must disagree with Erichsen. The end is not yet. A multitude of problems remain to be solved. Though much is known about peptic ulceration and its treatment, the whole answer still eludes us. The discovery of the cause of cancer seems to be as far off as ever, but the cause of sarcoma, which is surely a different disease from carcinoma, may be found in our lifetime. If the pioneers of the past had failed to inspire others to build on the foundations which they had laid, the progress of surgery would have come to an end long ago.

Let me quote from the translation of a hymn from the Sanskrit:

Listen to the Salutation of the Dawn,
Look to this Day,
In its brief course lie all the verities and realities of
your existence.
For to-day well lived makes every yesterday a dream of
happiness, every to-morrow a vision of hope—
Look well therefore to this day.

CHEYNE-STOKES RESPIRATION AN OXIMETER STUDY

BY

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Cheyne-Stokes respiration is an easily recognized condition, the features of which are said to have been described by John Hunter (Gibson, 1892). Its presence during waking hours in patients suffering from cardiac or cerebral disease is thought to point to a serious prognosis and usually an early death. The nature of the mechanism which starts and perpetuates this disorder is still obscure, and it is therefore more than a passing physiological curiosity.

Traube (1871), who advanced the first noteworthy theory of the mechanism of Cheyne-Stokes respiration, described two groups of cases—those with intracranial lesions but without heart disease, and those with cardiac disease but no intracranial lesions. Common to both these groups, he thought, was cerebral anoxaemia, which diminished the normal response of the respiratory centre. This factor, however, cannot alone be the explanation of the phenomenon, for reasons discussed by several observers (Harrison 1939; Resnick and Lathrop, 1925), and by simple clinical experience with patients suffering from severe anoxaemia.

Much the same inadequacy is found with theories which seek an explanation on the basis of a deranged control of carbon dioxide tension in the blood. Fishberg (1937), in whose text is to be found a full description of these theories together with the clinical manifestations of Cheyne-Stokes respiration, says that this condition seems "especially common in those cases of hyperten-