A man who would make an after-dinner speech may be forgiven if he selects a title that promises great and unexpected things. It is like a dinner menu, printed in a strange language. The appetite of the unsuspecting guest is whetted in anticipation when he discovers that he is about to be served something described, for example, as pièce de résistance even if, in retrospect, he should come to realize that it was only hash.

Yesterday, Today and Tomorrow is therefore an excellent title for my address. It could mean that you were to hear the polished prose of Sir William Osler. He was a Montrealer, physician and pathologist at the Montreal General Hospital and Professor at McGill before he started on his academic Odyssey. During his last years at Oxford I was fortunate enough to move in his orbit.

Listen to him as he gave to the students of medicine at Toronto the master-word in Medicine:

It is the open sesame to every portal, the great equalizer in the world, the true philosopher’s stone, which transmutes all the base metal of humanity into gold. The stupid man among you it will make bright, the bright man brilliant, and the brilliant student steady.

... And the master-word is Work, a little one, as I have said, but fraught with momentous sequences if you can but write it on the tablets of your hearts, and bind it upon your foreheads.\(^5\)

As you see, work sounds inviting when you call it the master-word, the open sesame to every portal!

My title for tonight’s address could mean that you were to hear tragic poetry like that of John McCrae:

We are the Dead... Short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved, but now we lie,
In Flanders fields.\(^4\)

McCrae was a Montrealer, a physician and pathologist at the Royal Victoria Hospital. He was a common man like you and me, until he stood in a trench in Flanders and heard above him the rushing sound of the wings of death.

Permit me one more quotation from a man who was dear to us here in
Montreal, Dr. Edward Archibald, member of the Society of Neurological Surgeons and the first to practise that specialty in Canada. Twenty years ago he brought William Cone and me to Montreal and then abandoned the field to us to do what we could with it, while he pursued his own brilliant career in thoracic surgery. He could really have done justice to the title I have chosen. But now, alas, I can only recall his words at the time of the opening of the Montreal Neurological Institute:

The nervous system is one of the most difficult parts of a man's frame to understand. Few subjects in Medicine have demanded of investigators as great an intellectual capacity or as arduous a labour. And in that very fact lies the reason and the justification for neurological specialism. The earnest man knows that neurology demands his whole life. But his guerdon is great.

To gather knowledge, and to find out new knowledge, is the noblest occupation of the physician. To apply that knowledge with understanding, and with sympathy born of understanding, to the relief of human suffering is his loveliest occupation; and to do both with an unassuming faithfulness sets the seal on the whole.¹

So, I have given you the menu of this address. You might say I have proposed the toast, and three Montrealers more eloquent than I have responded to it. We Montreal neurologists and neurosurgeons welcome you, our guests from far and near.

Now I must draw forth from my own literary oven the pièce de résistance. I do so with a sinking heart, for I know quite well that when you, honest men and women, have sampled it you can only pronounce it hash. Nevertheless, here it is—Neurological Surgery, Yesterday, Today and Tomorrow.

Yesterday, between 1870 and 1900, neurosurgery was born in England. Principles such as localization of function within the nervous system, asepsis, anaesthesia, were combined so as to make possible a new therapy. This was the period of advance in the basic science of our specialty.

Today, from 1900 to now, we see the evolution of the technique of the surgery of the nervous system, chiefly in the United States. It is a familiar pattern: basic science in Europe, applied science here; basic atomic research in Europe, the "atom bomb" here. I hope to indicate that the time has come for us to turn our attention to basic research as well as to its application.

Cobb Pilcher took as the title of his excellent presidential address to the Harvey Cushing Society less than a month ago: "Neurosurgery Comes of Age." So it has, physically, if not intellectually!

Young surgeons who have learned to use the scalpel so expertly that they can take anything out of anywhere without a fatality, to cut the pathways of the currents of the intellect and leave a man who is still capable of walking, may be tempted to look upon the performance of the pioneers in the earlier period with unjustified contempt.

Elaboration of surgical technique is an important mechanical achievement. But beware of vainglory; for it may be that our intellectual maturity is yet far off, and to be acquired only after years of further pioneering.

While Edward Jenner, a country practitioner, was elaborating the hy-
pothesis that he hoped would control the world’s worst plague, namely vaccination for smallpox, John Hunter wrote to him, “Don’t think, try; be patient, be accurate.” Twenty years later Jenner tried, with the result that a million lives were saved.

Today we seem to be in so great a hurry! Too often we listen only to the first part of Hunter’s injunction: “Don’t think, try.”

Tomorrow? What of Tomorrow? I believe that a new day will dawn tomorrow and that in its light will be found an understanding of the nervous system. Mental as well as physical activity will then be recognized as a function of the brain, and neurosurgery and psychiatry will gradually lose the separate authority conferred upon them by ignorance until there remains only neurology. Neurology will then stand forth as a single discipline to which internist, psychologist, surgeon, chemist and physiologist will contribute.

But before the dawn of that new day applied science must wait for the development of basic science. The neurosurgeon stands now in a strategic position. He alone can solve certain problems in human physiology, but he must stop to heed John Hunter’s words, “be patient, be accurate.” He must perceive the basic problems which block our advance, must think physiologically, chemically, anatomically or pathologically. The type of early training he has received will probably determine the manner of his thinking, if he thinks at all. Each can approach some problem according to his own ability, his own training, and according to the cry that reaches his ears from suffering humanity.

Perhaps, after all, we need a longer perspective before considering neurological surgery. More than 2000 years before Christ the Egyptians had innumerable specialists. As Herodotus, the historian, expressed it, some undertook “to cure diseases of the eye, others of the head, others again of the teeth, others of the intestines, and some those which are not local.”

For two millenniums these specialists continued to practise and to collect fees without making the slightest advance. Indeed, they steadily degenerated. The trouble was that the Egyptians made a fatal mistake. They wrote text books, the hermetic books. They made another and more serious mistake, and that was to believe that the text books were correct. So they forbade physicians, at peril of their lives, to depart in any way from the treatment prescribed in the hermetic books. It was a remarkable experiment. Science (and art, religion and education as well) were all frozen by rules which, when originally written, may well have been the best that could be drawn up. The experiment demonstrated that standardization can halt advance but that it does not in any way hinder retrogression.

The only worthwhile heritage that came to us from the Egyptians was through the writings of Hippocrates, who obviously borrowed from their learning. There was, however, another thing we inherited directly from them and that was the charm, the incantation, which every physician invokes today to banish evil from the drugs he uses. I refer to the R with crossed tail
which mysteriously heads all of our prescriptions. This is the utchat, the eye of Horus, who was the Egyptian god of health.

Few physicians, and reputedly no surgeons, know what they are doing when they write a prescription today! Perhaps the knowledge that they have called upon such an ancient and honourable deity to free their formulas of any curse should be a consolation to them. In any case, I like to think that somewhere, in a forgotten Egyptian heaven, Horus is chuckling about it. On the other hand, it may well be that he looks down upon this new generation of specialists with alarm, lest they too should come to worship the perfection of their own achievement and so standardize treatment and training that basic science would again be frozen.

You who sit here tonight know exactly when and how the Academy of Neurosurgery was founded. But what about your mistress—how much do you know about her derivation? I refer, of course, to Neurosurgery. I propose to enquire for you into her past.

The date of her birth is uncertain, and also the place of her origin. Neurology obviously gave birth to her sometime after the conception of localization of function in the central nervous system. But she is not to be recognized as an individual until there was developed for her new techniques and a new set of principles. Some of you may be thinking that mistresses are usually distinguished for their lack of principles. Not so neurosurgery.

The great Joseph Lister once operated upon a patient for a brain tumour which had been localized for him by David Ferrier. When the dura was opened the pressure was so alarming that the operator plunged his thumb into the protruding cortex. Clear fluid gushed forth, as though he had used the rod of Aaron. Autopsy, which was not long delayed, showed that he had missed the tumour by a fraction of an inch. That, however, was not the beginning of neurosurgery. Nor would it have been if the luckless patient had happened to be relieved of his trouble, for many of the basic principles on which the specialty had to be built were still unrecognized.

In 1884 Rickman Godlee, a nephew of Lister, removed a brain tumour in the operating room of the Hospital for Paralyzed and Epileptic in Queen Square. The localization had been made for him by Hughes Bennett, according to the theory of cerebral localization lately enunciated by Broca, Fritsch, Hitzig, Ferrier and Jackson.

But, again, this performance was not the beginning of neurosurgery either. The localization was accurate, the surgery faulty. The brave young Scot who laid himself upon the operating table that day died weeks later of an operative infection. But the event may be looked upon as the prologue to neurosurgery, the curtain-raiser.

Wilfred Trotter, referring to this operation 50 years later, said,

We shall not get a proportioned view of our event unless we pause a moment to call up the world in which it took place. In 1884 we find ourselves in the richest depths of the Victorian era, and the warm tranquil air of its impenetrable security closes round us. . . . The land belonged to its monarchs, the seas belonged to Eng-
land, and the firmament was unconquered though perhaps still a little vaguely claimed by the Church. In science the air was as yet unadulterated with inert gases, and matter still sat contentedly in its little hard globular and indestructible atoms.

There was a neurosurgeon who could write as well as operate!

Those who were to play the leading role in the birth of our specialty followed every detail of this operation. Sir David Ferrier and Hughlings Jackson stood anxiously in mask and white coat to see the tumour come out, and two young surgeons, Victor Horsley and William Macewen, were in the audience when the case was reported.

I suspect that the first formulation of essential principles of neurological surgery took place in the minds of these two young men during the extended discussion of Godlee’s case. I can imagine them listening to the enthusiastic talk of Ferrier, for only the year before, in his Marshall Hall oration, he had concluded his discussion of experimental brain operations in mammals with the argument that the time had come for the beginning of neurological surgery. I am sure the young men would have sought out Hughlings Jackson, then 50 years of age. Jackson had delivered a series of lectures eleven years before on “The Diagnosis of Tumours of the Brain” and two years before on “Localised Convulsions from Tumour of the Brain.” No doubt, also, there was much conversation with the indefatigable clinician, William Gowers, then 39 years of age.

At all events, Horsley, who had just begun a brilliant series of physiological experiments of his own, found time to report a series of ten human craniotomies in 1886, and two years later he reported with William Gowers the first successful removal of an accurately localised tumour from the spinal canal. In the same year Macewen reported twenty-one craniotomies for brain abscess with eighteen astonishing recoveries. Perhaps the secret of this success lies in his first case which was not included in the twenty-one. I fancy that it was on his return to Glasgow from the discussion of Godlee’s operation in London that he diagnosed an abscess in the frontal lobe of a boy. The parents refused permission for operation, but he secured the autopsy, tapped the abscess and inserted the drain, thus rehearsing step by step the procedure which was to save many lives. From basic science he had advanced to applied science.

Neurosurgery had had its birth, but not yet its baptism. It was not named a specialty and the technique those surgeons used was so crude as to bring a blush of shame today to the cheek of any member of this Academy.

I have begun with discussion of neurology and neurological surgery in London and have referred to the evolution of certain basic principles which were indispensable to the beginning of our specialty. For the next stage in its development we must turn to the United States, where a group of surgeons elaborated the technique, thereby reducing mortality to a reasonable level.

Harvey Cushing, surgical resident at Johns Hopkins, went abroad in 1900. He found Horsley too busy with practice and politics to be interested in his training. In Berne he worked on a neurophysiological problem sug-
suggested to him by Kocher, drifted back to Liverpool to watch Sherrington experimenting with anthropoids, and on returning to Baltimore asked Professor Halsted if he might specialize in the surgery of the nervous system. Halsted suggested that he might better take up something useful, like orthopaedies!

However, in 1913, when he left Baltimore for Boston, he had become a specialist, a neurosurgeon, and in 1920 the Society of Neurological Surgeons was founded. In the next quarter of a century the specialty came of age under the leadership of Cushing, Dandy, Frazier, Sachs, Mixter and others.

This was the period of technical evolution.

Not all leaders in neurosurgery were primarily surgeons. Otfrid Foerster, of Breslau, was a neurologist who assisted Kutner, the Professor of Surgery, for a time until abruptly, in an upsurge of impatience, he seized the scalpel himself. As might be expected, his contributions lay in the field of neurological mechanisms, not surgical technique. Neurosurgery for him was an opportunity to study pathological physiology and anatomy. Clovis Vincent, likewise, was a neurologist who slipped directly into neurosurgery after assisting Dr. de Martel.

It is splendid for men to be trained in surgery and apprenticed to neurosurgeons until they can carry out every standard procedure. That may be the "strait gate" and the "narrow way" of the orthodox. But there are other ways of entering the "kingdom of Heaven." I am sure that the great god Horus would join me in a plea that certificating boards should not close the gate to those who choose another approach. Not everyone can have a perfectly balanced training. Leave a crack in the gate wide enough to admit those of us who have had only surgical experience without approved neurosurgical apprenticeship, and for those with apprenticeship but with little general surgery.

The fields in which advance will be made "are white already to harvest." Those capable of taking in that harvest are few indeed. If there must be standardizing tests, and I suppose there must be, let them be intellectual ones and leave loopholes in the rules of time of service. Remember that the Egyptians achieved remarkable things in medicine and then retrogressed through two millennia of standardized specialization.

My advice to men entering the field is to learn to speculate reasonably regarding its mechanisms. When it is that you learn this, what time you spend at it, and how you achieve it matters very little. It is never too late. Close up the flower of your busy practice for a few months. It may be then that your surgical tree will bear good fruit, whatever its past history.

Some men think in anatomical terms, others neurologically, psychologically, pathologically, physiologically, even chemically. There should be no room in our cult for those who think only financially, socially or not at all. Let certification boards aim to keep these men out, if indeed there are any such seeking admission.

It is enough for us to learn to think about our problems in terms of some basic science and learn to operate with adequate safety. This brings great
spiritual reward (to which, fortunately, financial reward is usually added!).
To use the quaint phraseology of Archibald, the "guerdon is great," and again: "To gather knowledge and to find out new knowledge is the noblest occupation of the physician. To apply that knowledge . . . with sympathy born of understanding, to the relief of human suffering, is his loveliest occupation."

It is a source of satisfaction, no doubt, to devise technical procedures and to invent new gadgets. But this, it seems to me, is nothing compared with the reward that comes to a man when he at length evolves a general principle from many isolated observations.

Such a deduction may come to him suddenly, like a flash, while he is talking. It may come late at night when he is alone, writing out his analysis of observations. It may come when he has turned his mind quite away from the problem. But when it comes it is the result of his own intellectual effort.

Osler was right, I suppose. The master-word, the "open sesame," is work, for work must precede and work must follow a generalization, but the work which follows is different.

Whenever scientific creation comes to a man, and however unimportant it may seem to others, it is for him an exciting experience that he will not forget in his lifetime. The task of testing and retesting his principle is not a task at all for him, for each time he finds verification of his thesis there will return to him something of the exaltation of that first excitement.

Finally, what constitutes the specialty of neurosurgery? A body of accepted basic principles, yes, and a group of technical and operative procedures which conform to these principles. But something more—the alluring promise of new discovery. I have already pointed out that this is what makes her a formidable mistress. It is the call which explorers feel I suppose; difficult to explain but powerful. Kipling called it an "everlasting whisper."

"Something hidden. Go and find it. Go and look behind the ranges—something lost behind the ranges. Lost and waiting for you. Go!"

The promise of discovery may be found in other special fields as well as in the nervous system, but nowhere is the future so full of promise, the possibility of advance so unlimited, and the results of research so important to mankind.

REFERENCES