CORNELIUS GYSBERT DYKE: PIONEER NEURORADIOLOGIST*

Condensed from

THE FIRST CORNELIUS G. DYKE MEMORIAL LECTURE

LEO M. DAVIDOFF

Professor Emeritus, Department of Neurological Surgery
Albert Einstein College of Medicine
New York, N. Y

CORNELIUS GYSBERT DYKE—what a name for a scholar, painter, theologian, scientist, or physician! Cornelius might have been any of these, for he had great potentialities. There were famous painters in the family on his mother's side; theologians and scholars on his father's side; and physicians on both sides. Fortunately for neuroradiology, and especially for us, his old friends and colleagues, he and his older brother Lester so admired and respected two maternal uncles—one of whom, Will Maris, was a physician and the other, Gerrit Maris, a surgeon—that they both chose medicine as their careers.

Dyke's grandparents and their 10 children, of whom his father, Charles Dyke, was the youngest, came to the United States from their native Friesland, the Netherlands, in 1872, and settled on a large farm in northwestern Iowa. Unfortunately a fire in 1610 in the Gemeentehuis in the town of Wolvega in the Netherlands, where the family had lived for generations, destroyed all the records preceding that year. However, the official entries from that date onward, and the family traditions handed down by word of mouth, would indicate that the various members of the family in each generation were respectable burghers—for the most part merchants, and very successful businessmen of all sorts—in Wolvega and other small towns. A close relative in Dyke's father's generation, Jan Dyke, was, and may still be, rector of the Theological College at the University of Kampen.

The mother's family (Maris) was originally de Maree—French Huguenot. Three brothers of a branch of this family, Willem, Mathews, and Jacob Maris, were well-known artists who had lived in Holland,

*Presented during a Postgraduate Course in Neuroradiology at the Columbia University College of Physicians and Surgeons, April 12, 1967.

CORNELIUS GYSBERT DYKE, M.D.

France, and England at various times. Forty-eight of their paintings are on permanent exhibit in the Rijksmuseum in Amsterdam.

As for medicine, Lester Dyke estimates that there were about 16 doctors of medicine among the relatives by blood or marriage in the family.

There were two sons and two daughters in Dyke's immediate family: Lester, Cornelius, Grace, and Esther, in the order named. Cornelius was born on July 25, 1900, in Orange City, Iowa, about 1½ years after his older brother.

Although their father was a businessman, Lester Dyke recalls that "Our parents and grandparents, bilaterally, were extremely keen about learning." There was always an enormous amount of reading material available to the children, including newspapers and magazines. At one time 25 periodicals arrived regularly in the Dyke home. In addition to being a great reader, Charles Dyke was a writer of talent; a book of his, the *Story of Sioux County*, became a local best-seller, went through two editions and, now being out of print, is a valuable item on collectors' lists.

In spite of its serious attitudes toward life and its respect for learning, there was nothing straightlaced or Calvinistic about the Dyke family. Theirs was a very happy, free family life, with a stream of friends always about, especially on weekends. A boy with exceptional intellectual endowment, brought up in such an environment, it is no wonder that Cornelius was known at school for his original thought, especially when the answer to a question depended upon analytical thinking rather than pure memory.

Serious intellectual pursuits did not prevent Cornelius from enjoying games. In spite of an attack of anterior poliomyelitis at the age of 12, which left him with a slight limp, he was an excellent baseball and basketball player in high school, and a splendid pitcher at the University of Iowa, where he won games against top teams of the Big Ten and others. He was tall, straight, muscular, and slim, and throughout his life he never lost the eager stance of an athlete.

Of course, all the children went to college. Indeed, at one time all four of them were at the University of Iowa simultaneously, which strained the family's financial resources. But it was a burden of love which Charles Dyke assumed most willingly, since he asked for nothing in return except that they grow up to become worthy of his confidence in them. At college Cornelius was very popular. He loved to dance and

did so beautifully, but Cornelius was at all times a serious student.

After receiving the degree of doctor of medicine from the State University of Iowa College of Medicine, Dr. Dyke joined the United States Navy and took his internship as a lieutenant, J.G., at the United States Naval Hospital in Chelsea, Mass. Immediately after his internship he joined the resident staff at the Peter Bent Brigham Hospital in Boston, in the department of radiology.

Cornelius met his future wife, Doris, in the late fall of 1927, when she was the assistant administrative dietitian at the Peter Bent Brigham Hospital, but they did not really start dating until early in 1928. In June of that year Doris went abroad. Upon returning she was made the head of the Dietetics Department at the Waterbury Hospital in Connecticut. In September of 1930 they were married in Milwaukee at the home of her parents. Theirs was a happy, uncomplicated union, disrupted prematurely by the death of this kind, gentle, fine, and good man. Two sons, Cornelius E. Dyke and Gysbert C. Dyke, were still very young when they lost their father.

Outside his work, Dyke's interests were simple and few. He was devoted to his family and he loved music. Indeed, he had a beautiful tenor voice and he frequently sang for his own entertainment. While he did not regularly attend church, he was deeply and sincerely religious.

From the beginning his radiologic bent was in the direction of the diagnosis and treatment of diseases of the nervous system. This was in 1927, when Harvey Cushing was still active at the Brigham, and when Dyke's gifted teacher, Merrill C. Sosman, presided over the richest collection of neuroradiologic material in the world. While this opportunity colored Dyke's future career, he might have gone on as a general radiologist—with perhaps a special interest in neurological conditions—but for the fortuitous opening that occurred in 1929 in the staff of the Radiologic Department of the Neurological Institute of New York. This being a large hospital devoted entirely to patients with neurologic diseases, Dyke quickly recognized the analogy between his position and that of radiologists who devote their careers chiefly to diseases of the chest, gastrointestinal tract, or osseous system. He then and there became a student of neuroanatomy, neurophysiology, neuropathology, and clinical neurology. Combining his knowledge of these disciplines with a keen eye for details in the roentgenogram, he quickly became one of the leaders in the burgeoning field of neuroradiology.

Following in the footsteps of other great diagnosticians, he never failed to be present at the operating table or in the postmortem room, to verify his diagnosis or to benefit by his errors. As a consequence, his mistakes became fewer and his diagnostic acumen increased to the point where clinicians began to lean more and more heavily on his word. His reputation spread beyond the walls of the institute to neighboring hospitals, then to the rest of New York City and, eventually, to the country at large and to foreign countries. His mail was loaded daily with roentgenograms of the skull and spine from far and near, with letters requesting help in diagnosis. His devotion to his work was such that he never grumbled about these extra burdens. Indeed, he even welcomed them as a source of further experience. This frequently prolonged his working day beyond measure, yet he always sent a prompt report, often with some kind word to soften the blow to the self-esteem of a hardworking colleague in Mississippi, Oregon, or Staten Island, who had failed to see for himself some lesion obvious to Dyke.

He was imbued with the conviction that the master word in medicine is "work." As Osler said, "... a little [word]—but fraught with momentous consequences if you can but write it on the tablets of your heart, and bind it upon your forehead." Osler goes on to say that for most of us the work habit has to be cultivated, which "means a hard battle; the few take to it naturally." Cornelius Dyke was one of the chosen few.

Official recognition came rather quickly. At the Columbia University College of Physicians and Surgeons he was rapidly advanced from instructor to assistant professor, and then to associate professor. At the Neurological Institute he was made director of the Department of Radiology before he was 40. National societies, both radiologic and neurologic, honored him with membership. At the time of his death he was a founder member of the American Board of Radiology, a fellow of the American College of Radiology, a member of the New York and the American Roentgen Ray Societies, and first vice president of the latter. He was also an associate member of the American Neurological Association, a member of the Harvey Cushing Society—and indeed, past president (1940 to 1941) of this organization.

Dyke's death at the age of 43, long before his prime, from acute myelogenous leukemia, was in itself a symbol of his devotion to his work. Fortunately, Warren and Lombard[43] in their latest study show

that the real hazards of leukemia to the radiologist can now be avoided. How sad that Dyke lived during an era when this was not yet known!

As a teacher Dr. Dyke was singularly successful. His success rested on the simple theory, so well expressed by W. J. Tuddenham,[42] another great teacher of radiology, that "... diagnosis depends not on what they [the students] look *at*, but what they look *for*." As Tuddenham says further, "I often paraphrase that fine old 'radiologist,' [William] Shakespeare, who once observed that 'the fault is, not in our films, but in ourselves.' "

Solidity, perhaps derived from his Dutch ancestry, marked Dyke's approach to a diagnostic problem. Dyke never made "flash" diagnoses. He never tried to impress anyone with the idea that his (usually) correct interpretation of films was in any way dependent upon intuition. He invariably insisted upon scanning the *entire* film several times. On a number of occasions, for example, I have seen him point out minimal apical pulmonary tuberculosis on films made primarily for the examination of the cervical spine.

Dyke never treated casually any films submitted to him for examination. It is true that roentgenograms are often made for no particular reason other than routine screening. More frequently, the arousal of the clinician's suspicion leads to the request for an x-ray examination, and Dyke felt that the radiologist is in duty bound to cooperate and carry the investigation as much farther as the special penetrating quality of the roentgen ray provides. It was in this way that he became expert in the appearances and the variations of normal structures. He thus set a living example to his students. He never tried to tell them *what* they should learn, but rather *how* he himself went about acquiring knowledge. A gifted professor of chemistry at Harvard, Leonard K. Nash,[40] puts it most picturesquely when, in quoting Michael Polanyi, he says, "Thus, nobody at once learns to ride a bicycle when he has been instructed to steer in 'a curve with radius proportional to the square of his velocity divided by the angle of his imbalance,' though this is actually the way in which the competent cyclist, all unknowingly, maintains his balance." West,[44] in "The Case Against Teaching," states: "Most teachers understand the importance of developing the student's capacity for critical thinking and self-education, but most of us are too busy telling them what we know to get around to showing them how we learn." This was never a fault of Dyke's.

What directly concerns us on the present occasion is Dyke's contribution to radiology, which may be considered under four rubrics: general radiology; diagnostic radiology of the spine and its contents; radiation therapy of the central nervous system; and diagnostic radiology of the skull and its contents. Of these the second and fourth are the most important.

Dyke's contribution to general radiology was confined to the earliest period of his life as a radiologist. While still a radiologic resident in Boston he published, together with Merrill C. Sosman, mature observations on the mechanical cause and the postural treatment of postoperative massive atelectatic collapse of the lung.[29] I am aware of no other publication by him that was not concerned with the nervous system.

Dyke's original studies of the spine were relatively few, but included the classical study with Charles Elsberg[34] on "The Diagnosis and Localization of Tumors of the Spinal Cord by Means of Measurements Made on the X-ray Films of the Vertebrae, and the Correlation of Clinical and X-ray Findings." This paper includes a chart for interpediculate measurements which is still used by radiologists today; all of you are familiar with it.

In 1934 Dyke, in company with Elsberg and Earl D. Brewer,[36] published a very important paper on the symptoms and diagnosis of extradural cysts. The authors showed that this condition is one which affects chiefly adolescents who have painless, progressive paraplegia; a mid-thoracic sensory level; a complete manometric block; and a considerable widening of the interpediculate distance in a number of neighboring thoracic vertebrae, usually around thoracic six, seven, eight, and nine.

Finally, with Deery,[25] Dyke showed—I believe for the first time—that the perineural space around peripheral nerves may be continuous with the spinal subarachnoid space. Lipidol injected into the subarachnoid space for myelography appeared promptly, for a distance of 10 cm. along the lumbosacral nerves. In 1941 Dyke's accumulated experience on the diseases of the spine and spinal cord was condensed into a chapter included in one of Dr. Elsberg's books, *Surgical Diseases of the Spinal Cord*.[31]

It must be remembered that Dyke's primary interest was diagnostic radiology, but his responsibilities at the Neurological Institute included both therapeutic and diagnostic radiology. His contributions in radia-

tion therapy are less conspicuous but nevertheless substantial. Together with Gross,[27] and with Hare,[28, 37] he wrote some of the earliest favorable reports on the effect of radiation therapy on pituitary adenomas.

With Elsberg, Davidoff, and Tarlov,[10] Dyke participated, both experimentally and clinically, in a study on the effect of radiation on normal nervous tissue and on gliomatous tumors when the radiation was delivered directly through the open wound. While the results were disappointing in terms of treatment of malignant brain tumors, the work cast doubt on the opinion, then almost universally held, that damage from radiation to nervous tissue was secondary to damage to the intima of the precapillary and capillary blood vessels that supply nerve elements. Dyke's accumulated experience with radiation therapy of the diseases of the nervous system was summarized in a chapter published as a small book in 1942.[23]

The plain roentgenogram of the skull was already a field thoroughly harvested by the time Dyke started his education in neuroradiology, but he pored over the rich collection of skull x rays at the Peter Bent Brigham Hospital until he was nearly blind. There were literally thousands of films, and even some of the old glass plates, available for study. Dyke hoped he might glean some small undiscovered kernels of knowledge by so doing, but mostly it was his purpose to saturate his mind with the roentgen appearance of the skull in health and disease. No wonder he was eventually considered one of the best informed roentgenologists on the normal skull and its variations! As a result of this review, he was able to improve upon the width of the normal spectrum for the Vastine-Kinney measurements of the position of the calcified pineal in the lateral skull roentgenogram.[11] In 1932, together with Haig Kasabach,[38] Dyke showed what previously had only been suspected, namely, a transition from osteoporosis circumscripta to full-blown Paget's disease of the skull.

The year 1929 marked only about a decade since Dandy had described pneumoencephalography. This brilliant discovery was utilized mainly by neurosurgeons, in the form of ventriculography for the diagnosis of mass intracranial lesions. Since air injection as then practiced by the lumbar route usually made patients sick, was dangerous in the presence of increased intracranial pressure, and was of less definitive help in other than intracranial tumor cases, encephalography was not developing as rapidly as ventriculography. Both of us were aware that this method

of investigation could have great value not only in the diagnosis of obscure conditions (such as suspected brain tumors before increase of intracranial pressure), but in contributing to a greater understanding of the anatomy of the living brain and of the circulation of the cerebrospinal fluid.

The first task we set ourselves, therefore, was to reduce the morbidity accompanying this procedure. We investigated every facet of the problem connected with the performance of pneumoencephalography, and in 1932[1] we published a paper titled "An Improved Method of Encephalography."

In the course of three or four years many hundreds of pneumoencephalographic studies had accumulated in the files of the Neurological Institute. While many showed pathological distortion and displacement of the ventricles and other cerebral fluid spaces there was a great enough proportion of "negative" studies to furnish a whole spectrum of appearances and variations of normal brain anatomy *in vivo*.

Armed with the classical *Atlas of Brain Anatomy* by Key and Retzius[39] and other books, and with several formalin-fixed brain specimens, we systematically studied the intracranial contents as outlined by gas in the pneumoencephalogram. "Visualization of the Infundibulum and the Pituitary Gland," one of the first papers in a series on normal structures, was published by C. W. Schwartz and Dyke in 1930.[41] There followed five other reports on the "Demonstration of Normal Cerebral Structures by Means of Encephalography," including: "I. The Choroid Plexuses;"[14] "II. The Corpora Quadrigemina;"[2] "III. The Cerebral Convolutions and Sulci;"[3] "IV. The Subarachnoid Cisterns and Their Contents;"[15] and "V. The Ventricles, Interventricular Foramina, and Aqueduct of Sylvius."[5] All this, and much besides, eventually was gathered into a volume entitled *The Normal Encephalogram*,[7] which appeared originally in 1937. A second edition, and eventually a third, were published in 1946 and 1951 respectively.

Dyke's extensive familiarity with normal variations, his methodical scrutiny of every film that passed through his hands and his keen eye led him the more easily to recognize any deviation beyond the normal. One day a set of skull films intrigued him because it seemed to show marked asymmetry. On the smaller side (the right side) the calvarium was thicker, and the frontal, ethmoidal, and mastoidal cells were highly pneumatized and enlarged. The patient was a mentally

retarded boy of 16 with an infantile type of left hemiplegia dating back to a febrile convulsion at the age of six. Pneumoencephalography revealed a dilated lateral ventricle on the right and a displacement, literally a pull, of the ventricular system to the right. A search of our material yielded eight additional cases, all of which were reported by Dyke, Davidoff, and Masson[24] in 1933. This condition had not been recognized previously on roentgenograms.

In 1934 Elsberg and Dyke[35] clarified the syndrome connected with meningiomas attached to the mesial part of the sphenoid ridge. The year 1934 also brought to publication our paper on the pneumoencephalographic recognition of agenesis of the corpus callosum, based on three cases.[4] The first patient was a girl of six, who had been having left-sided seizures since the age of two, with a slowly progressive left hemiparesis. At four years of age she was studied by pneumoencephalography, which revealed a bizarre picture that we were unable to interpret exactly. The possibilities were those of an interhemispheral tumor, or a cyst of the cavum septi pellucidi. Following the gas studies she seemed to improve for two years, and then she had to be rehospitalized. A right transfrontal exploration was now made by Elsberg, and the frontal lobe retracted away from the midline. A large, thin-walled, clear, fluid-containing cavity was emptied, and the impression was that a cavum septi pellucidi had been entered. The child failed to survive.

Congenital absence of the corpus callosum was found postmortem. A restudy of the pneumoencephalograms in the light of this disclosure made everything clear, so that the diagnosis of absent corpus callosum now became quite easy, and was made from the pneumoencephalograms in two other cases reported.

Up to 1935 it had been the custom to perform ventriculography through posteriorly placed burr holes. At that time we had a case in which a shadow apparently representing a tumor in the region of the glomus of the choroid plexus was seen on the gas studies. Since this diagnosis did not seem to fit the clinical picture an encephalogram was made by the lumbar route. This showed a distinct reduction in the size of the "glomus" shadow and suggested that the original defect must have been due to a reversible condition, probably a trauma to the glomus caused by the ventricular needle that produced hemorrhage or edema in this structure. A search of our material revealed three similar cases, and a fifth case in which a postmortem examination had disclosed a

hemorrhage into the glomus of the choroid plexus that obviously had resulted from trauma produced by the needle. Finally, there was a case in which the enlarged glomus appeared to be on the side *opposite* to the puncture, but at postmortem this proved to be due to a bunch of small, grapelike cysts actually causing enlargement of the glomus. These findings were described in a paper[26] titled "Enlargement of the Defect in the Air Shadow Normally Produced by the Choroid Plexus: Its Occurrence After Ventricular Puncture."

Also in 1935, a paper[17] appeared on the "Significance of Abnormally Shaped Subarachnoid Cisterns As Seen in the Encephalogram." This was based on a wide variety of cases, including: deformation of the cisterna magna by projection into it of the cerebellar tonsils in a case of cerebellar tumor; obliteration of the cisterna pontis by a tumor of the pons; and enlargement of this cistern by pontine atrophy. The interpeduncular cistern was shown to be changed by a number of tumors situated in its proximity, such as suprasellar meningioma, pituitary adenoma, and chiasmal glioma.

A small but clear-cut isolated congenital variant was recognized in the paper[16] on the Congenital Absence of the Septum Pellucidum: Its Diagnosis by Encephalography." In 1936 Dyke collaborated with S. B. Wortis and Abner Wolf[45] in clarifying the clinical, pathological, and roentgenological pictures of xanthomatosis and the syndrome of diabetic exophthalmic dysostosis. This study was based on three well-documented cases of Hand-Schüller-Christian disease. A study of the definitive changes seen in the pneumoencephalogram in cases of tumor of the corpus callosum[18] also appeared in 1936.

A summary of our experiences with chronic subdural hematoma was published in 1938.[20] Two original observations on this subject had been reported earlier. Thus in 1936 Dyke[12] called attention to a fingerlike projection of gas appearing in the subdural space over a cerebral hemisphere, which is separated from the inner table of the skull by a dense mass representing an accumulation of solid hematoma or liquid blood. This apparently does not occur in a very high percentage of cases, but when it does it is pathognomonic of subdural hematoma, and has been referred to as the "Dyke sign."

Together we described an unusual form of chronic subdural hematoma in juveniles[9] which we called "Relapsing Juvenile Chronic Subdural Hematoma." We reported four such patients, aged 6, 14, 16, and

18 years. Each had had severe head trauma 5 to 11 years prior to hospital admission, and a second head trauma 2 to 12 months before admission, which evidently had precipitated the presenting symptoms. Plain roentgenograms of the skull all showed deformities—largely changes indicating localized enlargement of the cranial cavity at the site of the lesion, e.g., bulging of the anterior or lateral wall of the middle fossa. Pneumoencephalography revealed displacement of the ventricular system to the opposite side.

In each of the patients insufficient significance had been attributed to the history of the original trauma. Indeed, in two of the cases such a history was obtained only after the "relapsing" character of the hematoma had been recognized on the roentgen studies. In each case it was obvious that the second injury was too recent to have produced the cranial deformity which, we believed, resulted from the hematoma produced by the first trauma. The appearance of new cerebral symptoms after a recent trauma must then have resulted from new bleeding into the older lesion, with a relapse of the disease.

Dyke's constant vigilance in recognizing unusual and unexplained appearances in the roentgenograms was beautifully illustrated in 1937[19] in a case on intraventricular epidermoid. The patient was a 30-year-old woman with a long history of peculiar seizures that had led, clinically, to the assumption that she had a benign and very slowly growing tumor in the right hemisphere of the brain. The pneumoencephalogram showed the usual displacement of the ventricular system and the deformity of the frontal and temporal horns, seen with a deep fronto-temporal tumor. However, there were puzzling globular and linear collections of gas, which more or less outlined the surface of the tumor. At the operation, which Dyke, as was his habit, attended, we found an epidermoid cyst with the capsule showing irregular gyri and crevices in and around which the gas must have distributed itself. This unusual appearance has led later observers to diagnose, correctly, the histologic nature of such lesions from the gas roentgenograms.

In 1937 we studied cases of what most neurologists nowadays would call "pseudotumor cerebri."[8] Despite the widespread opinion that this syndrome is accompanied by dilatation of the ventricular system—the otitic hydrocephalus of Symonds—we were able to show that pneumoencephalograms in these cases reveal the ventricular system to be of normal or even subnormal size.

It is well known that in some cases of internal hydrocephalus the upper margins of the dilated ventricles as seen in the pneumoencephalograms are ribbed or scalloped instead of being smooth. One day we were present at a postmortem examination of such a case, and the explanation[21] of this phenomenon became apparent. We noted that at the inferior margin of each projection there was a blood vessel under the ependymal lining of the ventricle. It was then obvious that the parenchymal tissue between the vessels, which is softer and more yielding than the blood vessels, is pushed ahead by the excess of intraventricular pressure to a greater degree than the tougher vessels. At the same time the parenchymal tissue behind the blood vessels is protected from the pressure of the fluid.

In 1940 Dyke and I called attention[22] to the classical ventriculographic appearance of hemangioblastoma of the cerebellum. This consists of dilatation of the lateral and third ventricles, dilatation and rostral angulation of the posterior half of the aqueduct of Sylvius, marked narrowing of the cisterna pontis, and compression or nonvisualization of the fourth ventricle. This appearance was later shown to be characteristic not only of hemangioblastoma of the cerebellum but of most cerebellar tumors. However, such a ventriculogram in a young adult, with a relatively slowly developing history, is most likely to be associated with hemangioblastoma. In this paper we reported four of 13 cases in which the tumor was found to be located anteriorly and superiorly in the cerebellum, and hence not accessible at a primary operation whereas, at a second surgical procedure several years later, the tumor had seemingly "wandered" toward the decompression and was easily removed. This led to recommendation deliberately to delay the attack upon the hidden tumor until a secondary operation could be performed at some later date when the symptoms would have recurred.

Dyke was the first to describe the ventriculographic appearance of an "Acquired Subtentorial Pressure Diverticulum of a Cerebral Lateral Ventricle" in 1942.[13] What evidently happens in some cases of obstructive hydrocephalus is that a part of the medial portion of the atrium of a lateral ventricle, where it is normally thin in the region of the tela choroidea, extends medially and caudally through the tentorial incisura, thus becoming an accessory infratentorial sac filled with fluid. Dyke cautioned that this is not to be confused with an enlarged, rostrally displaced fourth ventricle. These observations were corroborated in three

cases, in one of which the presence of the diverticulum was verified at postmortem examination.

Dyke's last contribution to the literature was "Toxoplasmic Encephalomyelitis,"[30] an important study done with Wolf, Cowan, Paige, and Caffey. Characteristic of this disease are multiple small granulomas of the brain in varying stages of necrosis, and healing with calcification. Dyke reasoned that these lesions should appear as multiple spots of increased density on roentgenograms of the skull as, indeed, he was able to demonstrate; he thus established the characteristic roentgenographic appearance of this disease.

This ends my summary recitation of Dyke's major contributions to neuroradiology. Had Dyke lived into the period of angiography, isotope scanning, and other recent mechanical and electronic developments, neuroradiology would have been further enriched by his creativity and skill in their application. Certainly he invented the alphabet which later neuroradiologists have been using to spell out not only their own original observations, but even their routine daily reports. That Cornelius Gysbert Dyke was a pioneer in his field of endeavor and belongs among the elite in neuroradiology there can be do doubt.

REFERENCES

1. Davidoff, L. M. and Dyke, C. G. An improved method of encephalography. *Bull. Neurol. Inst. 2*:75-94, 1932.
2. Davidoff, L. M. and Dyke, C. G. The demonstration of normal cerebral structures by means of encephalography: II. The corpora quadrigemina. *Bull. Neurol. Inst. 3*:138-46, 1933.
3. Davidoff, L. M. and Dyke, C. G. The demonstration of normal cerebral structures by means of encephalography: III. The cerebral convolutions and sulci. *Bull. Neurol. Inst. 3*:147-89, 1933.
4. Davidoff, L. M. and Dyke, C. G. Agenesis of the corpus callosum: Its diagnosis by encephalography. Report of three cases. *Amer. J. Roentgen. 32*:1-10, 1934.
5. Davidoff, L. M. and Dyke, C. G. The demonstration of normal cerebral structures by means of encephalography: V. The ventricles, interventricular foramina, and aqueduct of Sylvius. *Bull. Neurol. Inst. 4*:91-132, 1935.
6. Davidoff, L. M. and Dyke, C. G. Congenital tumors in the rostral portion of the third ventricle: Their diagnosis by encephalography and ventriculography. *Bull. Neurol. Inst. 4*:221-63, 1935.
7. Davidoff, L. M. and Dyke, C. G. *The Normal Encephalogram.* Philadelphia, Lea and Febiger, 1937, pp. 224; 2d ed., 1946, pp. 232; 3d ed., 1951, pp. 240.
8. Davidoff, L. M. and Dyke, C. G. Hypertensive meningeal hydrops. *Amer. J. Ophthal. 20*:903-27, 1937.
9. Davidoff, L. M. and Dyke, C. G. Relapsing juvenile chronic subdural hematoma: A clinical and roentgenographic study. *Bull. Neurol. Inst. 7*: 95-111, 1938.
10. Davidoff, L. M., Dyke, C. G., Elsberg, C. A. and Tarlov, I. M. The effect of radiation applied directly to the brain and spinal cord: I. Experimental in-

vestigations on Macacus rhesus monkeys. *Radiology 31*:451-63, 1938.

11. Dyke, C. G. Indirect signs of brain tumor as noted in routine roentgen examinations: Displacement of the pineal shadow. *Amer. J. Roentgen. 23:* 598-606, 1930.
12. Dyke, C. G. A pathognomonic encephalographic sign of subdural hematoma. *Bull. Neurol. Inst. 5*:135-40, 1936.
13. Dyke, C. G. Acquired subtentorial pressure diverticulum of a cerebral lateral ventricle. *Radiology 39*:167-74, 1942.
14. Dyke, C. G. and Davidoff, L. M. The demonstration of normal cerebral structures by means of encephalography: I. The choroid plexuses. *Bull. Neurol. Inst. 2*:331-46, 1932.
15. Dyke, C. G. and Davidoff, L. M. The demonstration of normal cerebral structures by means of encephalography; IV. The subarachnoid cisterns and their contents. *Bull. Neurol. Inst. 3*:418-45, 1934.
16. Dyke, C. G. and Davidoff, L. M. Congenital absence of the septum pellucidum: Its diagnosis by encephalography. *Amer. J. Roentgen. 34*:573-78, 1935.
17. Dyke, C. G. and Davidoff, L. M. The significance of abnormally shaped subarachnoid cisterns as seen in the encephalogram: Correlation with clinical cases. *Amer. J. Roentgen. 32*:743-56, 1935.
18. Dyke, C. G. and Davidoff, L. M. The pneumoencephalographic diagnosis of tumors of the corpus callosum. *Bull. Neurol. Inst. 4*:602-23, 1936.
19. Dyke, C. G. and Davidoff, L. M. Encephalographic appearance of an intraventricular epidermoid. *Bull. Neurol. Inst. 6*:489-93, 1937.
20. Dyke, C. G. and Davidoff, L. M. Chronic subdural hematoma: A roentgenographic and pneumoencephalographic study. *Bull. Neurol. Inst. 7:* 112-47, 1938.
21. Dyke, C. G. and Davidoff, L. M. An explanation for the ribbing seen in the walls of dilated cerebral ventricles. *Yale J. Biol. Med. 11*:485-86, 1939.
22. Dyke, C. G. and Davidoff, L. M. The pneumo-encephalographic appearance of hemangioblastoma of the cerebellum. *Amer. J. Roentgen. 44*:1-8, 1940.
23. Dyke, C. G. and Davidoff, L. M. *Roentgen Treatment of Diseases of the Nervous System.* Philadelphia, Lea and Febiger, 1942, p. 198.
24. Dyke, C. G., Davidoff, L. M. and Masson, C. G. Cerebral hemiatrophy with homolateral hypertrophy of skull and sinuses. *Surg. Gynec. Obstet. 57*:588-600, 1933.
25. Dyke, C. G. and Deery, E. M. An observation on the relationship of the subarachnoid and perineural spaces. *Bull. Neurol. Inst. 1*:593-99, 1931.
26. Dyke, C. G., Elsberg, C. A. and Davidoff, L. M. Enlargement of the defect in the air shadow normally produced by the choroid plexus: Its occurrence after ventricular puncture. *Amer. J. Roentgen. 33*:736-43, 1935.
27. Dyke, C. G. and Gross, S. W. The roentgenotherapy of pituitary tumors. *Bull. Neurol. Inst. 1*:211-28, 1931.
28. Dyke, C. G. and Hare, C. G. Roentgen therapy of pituitary tumors: Report of sixty-three cases. *Proc. Ass. Res. Nerv. Ment. Dis. 17*:651-64, 1936.
29. Dyke, C. G. and Sosman, M. C. The postural treatment of postoperative massive atelectatic collapse. *Surg. Gynec. Obstet. 49*:752-63, 1929.
30. Dyke, C. G., Wolf, A., Cowan, D., Paige, B. H. and Caffey, J. Toxoplasmic encephalomyelitis: VII. Significance of roentgenographic findings in the diagnosis of infantile or congenital toxoplasmosis. *Amer. J. Roentgen. 47:* 830-41, 1942.
31. Elsberg, C. A. *Surgical Diseases of the Spinal Cord, Membranes and Nerve Roots: Symptoms, Diagnosis and Treatment.* With chapters by Cornelius G. Dyke and Abner Wolf. New York, Hoeber, 1941, p. 598.
32. Elsberg, C. A., Davidoff, L. M. and Dyke, C. G. The roentgen treatment of tumors of the brain or spinal cord in the operating room by direct radiation through the open wound. *Surg. Gynec. Obstet. 63*:794-96, 1936.
33. Elsberg, C. A., Davidoff, L. M. and

Dyke, C. G. The roentgen treatment of tumors of the brain in the operating room by direct radiation through the open wound. *Bull. Neurol. Inst. 6*:19-32, 1937.

34. Elsberg, C. A. and Dyke, C. G. The diagnosis and localization of tumors of the spinal cord by means of measurements made on the x-ray films of the vertebrae, and the correlation of clinical and x-ray findings. *Bull. Neurol. Inst. 3*:359-94, 1933.
35. Elsberg, C. A. and Dyke, C. G. Meningiomas attached to the mesial part of the sphenoid ridge, with syndrome of unilateral optic atrophy, defect in visual field of same eye and changes in sella turcica and in shape of interpeduncular cistern after encephalography. *Arch. Ophthal. 12*:644-75, 1934.
36. Elsberg, C. A., Dyke, C. G. and Brewer, E. D. The symptoms and diagnosis of extradural cyst. *Bull. Neurol. Inst. 3*:395-417, 1934.
37. Hare, C. C. and Dyke, C. G. Roentgen therapy of pituitary tumors: Report of twenty cases. *Arch. Ophthal. 10*:202-25, 1933.
38. Kasabach, H. H. and Dyke, C. G. Osteoporosis circumscripta of the skull as a form of osteitis deformans. *Amer. J. Roentgen. 28*:192-203, 1932.
39. Key, E. A. H. and Retzius, G. Studien in der Anatomie des Nervensystems und des Bindegewebes, vol. 1, 1st ed. Stockholm, Samson, Wallin, 1875-1876, p. 220.
40. Nash, L. K. Teachers don't teach. *Harvard Aumni Bull. 69*:22-23, 1966.
41. Schwartz, C. W. and Dyke, C. G. Visualization of the infundibulum and the pituitary gland. *Amer. J. Roentgen. 23*: 631-32, 1930.
42. Tuddenham, W. J. Diagnosis gets a logical assist. *Med. World News 7*:103, 1966.
43. Warren, S. and Lombard, O. M. New data on the effects of ionizing radiation on radiologists. *Arch. Environ. Health 13*:415-21, 1966.
44. West, K. M. The case against teaching. *J. Med. Educ. 41*:766-71, 1966.
45. Wortis, S. B., Wolf, A. and Dyke, C. G. Xanthomatosis and the syndrome of diabetic exophthalmic dysostosis. *Amer. J. Dis. Child. 51*:353-66, 1936.