TEMPLE FAY, 1895–1963
Temple Fay, M.D., Unconformable Crusader and Harbinger of Human Refrigeration

1895–1963

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In these days, a hospital would be considered inattentive to the modern climate of medical scientific splendor if it did not display at least one of the available variety of apparatus for "refrigerating" patients. The list of indications for the newly recognized art increases steadily. Surgical teams the world over reach profoundly low levels of hypothermia as routine workaday procedure for heart and brain operations, and the era of attaining core temperatures near freezing is close at hand. In some institutions there are well-organized hypothermia units, functioning as a specialty service.

Human refrigeration is carried into effect with a smug efficiency and sophistication that betrays its infancy as an accepted utility by the profession. The notion that clinical hypothermia is newly come to medicine and surgery is, indeed, far from the truth.14

Almost thirty years have passed since Temple Fay courageously, almost entirely alone in the midst of doubtful and untrusting colleagues, broke the temperature barrier. On March 7, 1963, in his home in the Philadelphia suburb of Germantown, Dr. Fay was lost in death to his family, his profession and to an uncountable number of patients who have reaped the benefits of a life devoted to unconformable crusading. It is fitting to briefly review the life and work of this dauntless medical frontiersman who was a living example of Harvey Cushing's dictum that a surgeon is nothing without a thorough knowledge of medicine, and a good physician is one who has a knowledge of surgical operations.4

It was only forty-seven years after the very first handful of settlers planted themselves on Alki's Point when Temple Fay's father, John Fay, traveled to what had become by then a booming town called Seattle, Washington. It was March, 1889, when this young, energetic lawyer, not long out of Harvard Law School, went west on a case which was not expected to occupy him in Seattle for very long.

The tranquil setting of the sierra of the Olympics across Puget Sound to the west, the serene Cascade range back-dropping Lake Washington to the east and snow-capped Mt. Ranier to the south must have enchanted him beyond cure, for John Fay never left the place. It was here, on January 9, 1895, that Temple was born.

The very ancient Fays are now a rather ill-defined, almost legendary set, sprinkled amongst the best breeding stocks of early seventeenth century England, and beyond. This tendency to maintain a sterling pedigree persisted long after the arrival of eight-year-old John Fay, aboard the "Speedwell" out of London in 1656. In the then rugged and sparsely settled colony of Massachusetts, he was deposited in a collection of crude houses in what became Watertown. From then until now the name of Fay became interwoven with other names important in early American history. Brigham, Ober, Winthrop and Priestley are amongst these names. Eli Whitney was a cousin of Temple's grandfather and Frederick Ober, world-renowned ornithologist, explorer, historian and associate of the Smithsonian Institution, was a brother-in-law of his father's. Alexander Agassiz, of the Harvard Museum, was a close friend of the family. This intimacy with naturalists may, in part, explain young Fay's proclivity for

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the wild life of his Seattle environment. His love of nature was nurtured by his parents and particularly his mother, who never found time to be idle. To these factors, we must add the close family life in the wilderness periphery of Puget Sound and camping trips to the family beach site, ‘Faybrook.’

When twelve years old, young Temple had already decided on his goal in life. His decision to become a physician and surgeon was unequivocally made during the illness of one of his three sisters in 1907. A young doctor had been summoned from Seattle across the Sound. The lad met him at the boat and toted his bag as he guided the doctor to the Fays’ country home. All along the way, throughout his stay and until he had embarked for the return trip, Temple had persisted at his side firing an endless barrage of questions from, what must have seemed, a bottomless source.

The details of this conversation and the almost overwhelming elation he experienced during this brief encounter with the kindly doctor were never forgotten throughout Fay’s lifetime. ‘If young professional men,’ said Fay lately, recounting the story, ‘would only realize and remember the potential efficacy of a few kind attentive moments and words to very young people, there would be so few of them growing up without ambition or direction . . . the inclination to imitate is so inherent in all of us.’

During this professional call, he had heard much concerning the doctor’s alma mater, the University of Pennsylvania, and the tale of a very great surgeon there who could operate on almost everything, including the brain. The hallowed name of Dr. Charles Frazier became sculptured so deeply in that young mind that it was to remain there as a monument and unaltered for his lifetime.

After graduation from the old Broadway High School in Seattle, Fay attended the University of Washington for his undergraduate studies. During these four years, much of his summer-vacation time was spent at the Marine Biological Laboratory at Fri
day Harbor, near Seattle. There, he collected a variety of marine specimens, studied and classified them and discovered a species of snail. During these undergraduate years, one unrelenting obsession possessed him and that was to study at the University of Pennsylvania and to meet the great Dr. Frazier.

During one of these summers at the Laboratory, Fay met a biologist who was investigating the oxygen-consumption of marine algae. This was the beginning of an interest in metabolism and gas-exchange which motivated a good deal of his thinking during his professional years. This particular summer brought a realization to him that all of life seemed to rotate around three main things, oxygen, carbon dioxide and water. To this he would later add salts and temperature.

While at the University of Washington he was frequently confronted by a persistent clergyman who did his utmost to persuade him to enter the ministry. Fay endured, however, and felt that he wanted to crusade in medicine much like the biologists were crusading in their fields over at the Marine Laboratory. Crusading in medicine meant a sort of mixture of clergyman and physician and he felt that his devotion to medicine would never have been matched in the clergy. Even as a young man he felt that serving in the humanities was not living in vain.

“My father always used to say,” once stated Dr. Fay, sitting himself alongside his pet Boston terrier in a large old chair once belonging to Mrs. Fay’s great, great, great, great-grandfather, Joseph Priestley, “. . . yes, my father used to say something from Hamlet, ‘There’s a divinity that shapes our ends, rough-hew them how we will,’ and this quotation has been a controlling factor all through my life.”

His father felt, of course, that if anyone were going to make anything at all of his life, he would of necessity have to go to Harvard to accomplish this. Fay’s dreams were in Philadelphia, however. Perhaps, as a sort of compromise, provisions were made for him to attend the Johns Hopkins Medical School. Fay did not make an issue out of going to Baltimore, since it was such a short distance

† Quotations throughout are from notes taken during numerous visits with Temple Fay from 1960–1963.
from Philadelphia that visiting Dr. Frazier would not be difficult.

The trip from Seattle to Baltimore necessitated a stop-over in Philadelphia for changing trains. With some time to spare, Fay decided to visit a friend from Seattle who just happened to be attending the Medical School of the University of Pennsylvania. He was given a grand tour through the School and also the wards of the Philadelphia General Hospital nearby. While walking through one of the “nervous wards” of the General they chanced to see one of the professors examining a patient. His friend whispered that this was one of the “greats” of the University and no less than Dr. Frazier’s right-hand man, Dr. William Spiller. To Fay, this was like suddenly meeting up with a king. Later that day he spotted Dr. Spiller talking with Dr. Frazier himself in a hallway and, impulsively, without hesitation, he decided then and there to attend the University of Pennsylvania.

Dean Pepper was probably just as startled to see this unscheduled young man before him as Fay was standing there. Immobile, fired with aspiration to attend his Medical School, was all Fay asked of him. Nevertheless, in spite of the fact that no vacancies were available for the coming term, the Dean took him in. Needless to say, Fay’s trunk had to be rerouted from Baltimore.

Throughout medical school, he became more and more convinced that he was destined to become a neurosurgeon. Every moment he could spare was spent with Dr. Spiller on the wards. Hospital appointments were awarded only to the upper eight members of the class, and Fay stood tenth. However, the “divinity that shapes our ends” shaped his and, at the last minute, he filled an unanticipated vacancy.

During his hospital term, 1921–1923, he attended Dr. Frazier’s service three times, taking the terms of others who preferred to pursue other fields of interest. On completion of his hospital appointment in 1923, Fay became Dr. Spiller’s assistant at the Philadelphia General. This was followed by an assistantship with Dr. Frazier, in those days entirely without pay. He then received a staff appointment as Assistant in Neurological Surgery and Instructor in Neurology at the University, which he remained active in until 1926.

Fay’s fortunate association with the foremost men in his chosen field early in his career, enlightened and disciplined him far more effectively than any of the formal, didactic training he received. William Spiller (1863–1940) was the most distinguished American neurologist of our time and many contemporaries attested to the fact that much of Frazier’s success in neurosurgery was attributable to the ideas and provocations of Spiller. Even if he was so wholly lacking in sartorial splendor, he was lacking nothing as a functional neuroanatomist and clinician.

Charles Frazier (1870–1936) was one of the leading neurosurgeons of his day and one of the small group of pioneers who created neurosurgery as a distinct specialized branch of surgery. He was a hard-bitten, “self-contained” individualist and disciplinarian whose operations were always begun with a large crew of assistants and interns, and often ended with the scrub nurse as sole assistant.

It was through Spiller that Fay developed such an intimate friendship with another leader in the field of neurology, Charles K. Mills (1845–1931). Upon opening his office, in 1923, Fay rented space from Mills who, at that time, was very little active in practice and blind. Having no patients to distract him, he would often read to Dr. Mills and listen and learn of the many things concerning medical practice not found in text books or in the prepared lectures of a professor.

Fay’s early interest in water balance and metabolism had remained uppermost in his mind. Weed and McKibben’s20 report in 1919, dealing with changes in spinal-fluid pressure in animals attending intravenous injections of various concentrations of salts, caught his immediate attention. This approach to the problem of reducing intracranial pressure had suggested itself to him previously during his observations of infants having been given large doses of magnesium
sulphate. He noticed the marked retraction of the fontanels which followed the administration of this salt and thought it was caused by the resultant dehydration of the brain. Hypertonic solutions of sodium chloride had already been used by Cushing and Foley, but left much to be desired for routine use as a dehydrating measure. Fay reasoned that a salt, such as magnesium sulphate, which could be tolerated better orally or rectally, possessed certain advantages over sodium chloride. Even when given intravenously, there was always the threat of vascular sclerosis. His paper on the reduction of intracranial pressure by hypertonic solutions, the first of his important publications, appeared in 1929. In addition to the salt, usually given rectally, he advised removal of as much spinal fluid as possible by lumbar puncture and the restriction of intake of fluid; a little opium added to the salt solution would retard peristalsis and promote absorption.

The succession of reports on the efficacy of spinal tap alone in reducing intracranial pressure, disfavored the general adoption of Fay’s rather drastic dehydrating measures, but the regimen was given an enthusiastic reception by his chief, Spiller, who also suggested that the routine be tried in cases of migraine.

Soon afterwards, Fay introduced, with Francis C. Grant, a ventriculoscope which could be adapted for intraventricular photography. This occurred only one year after Walter Dandy had presented the neurosurgical world with the first instrument of this kind.

Within a very few years after Weisenburg’s first description of neuralgia of the glossopharyngeal nerve, in 1910, the disease had become a fairly well known clinical entity. The first surgical attack upon this disturbing anomaly was made by Alfred Adson of the Mayo Clinic in 1924. He avulsed the nerve peripherally through an incision in the lower jaw. In 1926, Fay devised the first intracranial approach to the problem by sectioning the glossopharyngeal nerve within the vault, along with the upper cervical posterior roots and the trigeminal root.

Another early contribution to surgical technology appeared a year later, in 1927, when he devised the first lighted retractors, thus facilitating operative exposure beneath structural shelves and in deep recesses.

In 1929, Fay was appointed Professor of Neurosurgery and head of the Department at Temple University. In typical crusading fashion, he later, in 1935, brought about the combination of the chairs of neurosurgery and neurology. Within the next five years, seven other medical schools had followed suit.

A man whose very nature leads him besides the unstilled waters and over territory unmarked by trails of former venturers cannot live a settled and undisturbed life. The frustrations of pioneering, or as he preferred to call it, “crusading,” were early to be experienced by Fay. One group, in that magic land of medicine called “elsewhere,” contended that oxygen-lack was the most important physiological factor in epilepsy and that the administration of oxygen was definitely indicated. He thought that carbon dioxide was much more important than oxygen and the biggest argument in his favor was the fact that he demonstrated the effectiveness of carbon dioxide in bringing patients out of an attack. By 1930 he had satisfied himself of this conviction clinically. It was time to research properly on the subjects of cellular metabolism, gas-exchange, water balance and other physiological factors which had stirred his unresting mind all these years.

Fay considered the researches, initiated by him in the early 1930s, on the biochemical and biophysical balances at the cellular level of the central nervous system to be the most important contribution of his life.

He was instrumental, in this connection, in bringing to this country from Germany, Drs. E. A. Spiegel and M. Spiegel-Adolf. E. A. Spiegel was the most outstanding electrophysiologist in all of Europe and his wife was an authority on colloid physics and chemistry. At Temple University, in the newly established Department of Neurophysiology, Dr. Spiegel developed some of the earliest concepts of the factors of permeability in-
volved in the physiology of the central nervous system. He showed the reversibility of cerebrospinal-fluid flow by changes in cellular polarity brought about by alterations of pH caused by CO₂-carbonic-acid shifts. This work corroborated Fay’s notions concerning the importance of carbon dioxide to the nervous system.

The Society of Neurological Surgeons, founded in 1920, had become a close-knit social club with a restricted membership, in spite of the rapidly increasing number of neurosurgeons in the United States. The remaining specialists out on the fringe keenly felt the discrimination and the need for organization. On June 24, 1931, Dr. R. Glen Spurling wrote to Dr. W. P. Van Wagenen suggesting the formation of a society to fulfill this need, recommending, also, the names of others who might appropriately form the charter nucleus. Consequently, on October 10, 1931, Drs. R. Glen Spurling, W. P. Van Wagenen, Eustace Semmes and Temple Fay met at the Hotel Raleigh in Washington, D. C. to formulate the policies of the new society.

Thus, was founded the Harvey Cushing Society, its name having been suggested by Temple Fay. The first meeting of the Society, with twenty-three of the thirty of its selected founding membership present, was held on May 6 and 7, 1932, in Boston, appropriately for its honored patron, Harvey Cushing. Of some amusement, from the 1963 vantage point, is the fact that included on the program of this first meeting was Stafford Warren’s paper on, “Treatment of Diseases of the Nervous System by Hyperthermia.” It was about this time that Fay was organizing his thoughts and planning his era of experimental work concerned with the effects of low temperatures and would in short order be in the midst of his epoch-making investigations on human refrigeration.

In searching through the lives of many who have become historically great, it is almost astonishing how often seemingly small and trivial events have served to alter the entire course of their lives. Several episodes in the life of Fay, at the time of their occurrence seeming inconsequential to outward appearances, and which would have only momentarily registered on a less curious mind, made their unerasable mark upon his motivation. The meeting with the young physician from the University of Pennsylvania when he was twelve, and the hours spent observing and collecting at the Marine Biological Laboratory have served as samples. Another momentous event, practically unnoticed by anyone else, occurred during a pathology quiz in his sophomore year of medical school in 1919.

He was asked by his quizzer, Dr. J. Allen Smith, if he knew why it was that cancerous metastases seldom were to be found below the elbows and knees. Fay answered that he did not know. The professor admitted that he did not know either. This question left a profound impression upon Fay’s inquisitive mind and the pursuit of the answer to the quiz question led him directly into the work for which he is best known, the effects of low temperature on cellular growth and cancer in particular.

Fay began his investigations with a fundamental study of the temperatures at various sites of the body. He employed a very sensitive thermocouple device and galvanometer made by George Henny, of the Department of Biophysics at Temple University, which was sensitive enough to give readings to within 0.36°F. (0.2°C.). Temperatures were recorded in relationship to the segmental divisions of the body. A striking variation was found to exist on a segmental level, with diminished temperatures of 12° to 20°F. (6.7°–11.1°C.) below the elbows and knees. On the other hand, areas where cancerous growths and their metastases are to be commonly found presented the highest surface temperature (e.g. breasts). Although considerable work had been published on the effectiveness of cooling as a preservative of tissue, nothing had been reported on the effects of temperature on the growth of tissue-cultures. James Arnott had shown almost one hundred years before this that ice applied to cancerous breasts would diminish the tumor’s size, but no one had
followed this clue to the laboratory or even bothered to repeat the clinical experiment. Fay's next step was to study the direct effects of lowered temperature on living cells.

These experiments, for the most part, were carried out on the Fay farm located on the eastern shore of Maryland. Here, instead of finding solitude and relaxation and relief from the unpleasant climate of Philadelphia summers, he found an ideal place to investigate the unproved notions that would not let him rest. "We were in the chicken business for a while," stated Mrs. Fay recently as she reminisced about those uninterrupted days.

Marked retardation and inhibition of embryonic growth with the production of anomalous chicken foetuses attested to the effects of egg maturation under conditions of reduced temperatures. Cellular differentiation seemed to cease almost completely at 32.2° C. (90°F.).

Next, normal and cancer cells were grown by tissue-culture methods under varying temperatures. Again, the theory was borne out that a critical temperature existed for the maturation and growth of living cells. Most important of all was the discovery that normal cells would tolerate lowered temperatures much better than the immature malignant forms. Cancer cells, just as the embryonic chick cells, would cease growing and living at temperatures relatively far above those affecting normal cells. Drs. Machteld Sano and Lawrence Smith of the Department of Pathology at Temple University were instrumental in carrying out and reporting these experiments.

By logical sequence, the investigation of the effect of alteration in temperatures on the growth of immature, undifferentiated neoplastic cells in human beings was the next step. Carrying over his theories from the laboratory to the hospitalized patient was a giant step for Fay. In the first place, there were no clinical thermometers available for the recording of the low temperatures to which he intended to take his patients (23.9°C., 75°F. in one instance). Again, the ingenuity of medical physicist George Henny furnished the thermocouple-recording device he needed.

In November, 1938, Fay began the first scientifically controlled experiments on living human beings designed to reduce body temperature to deep hypothermic levels. Generalized body cooling was often supplemented with local cooling devices, employing small containers referred to as "bombs." These cold containers were placed in and about sites of tumor to effect extreme local cooling. For the following two years, a variety of clinical entities were subjected to the cooling program. One hundred and twenty-six patients were treated, the majority with inoperable cancer. Patients with severe head trauma, intracranial infections and one with incapacitating filariasis responded with sometimes astonishing results.

Prior to this work, the general impression was that survival below 34°C. (94°F.) was hardly possible. Indeed, the average hospitals were well-supplied with all sorts of re-warming apparatus, cabinets and special bedding to "protect" patients against sub-normal temperatures. In the face of an overwhelming existing prejudice against breaking this "thermal barrier" in humans, Fay, in typical, confident manner, protruded into the unknown. A very few dedicated residents and a handful of staff accompanied him along this unconventional clinical pathway. He thought himself fortunate to be accompanied by even these few stout hearts, "... I say fortunate, because... there is great comfort and encouragement in the assurance and confidence of the younger minds, to offset the disapproval and outright condemnation from the older and more conventional members of the profession."}

For two difficult years, Fay persisted with this task, enveloped by a company of disinterested to outright critical colleagues. The words of Mumford were never more applicable: "There is something in the nature of our race that prompts us passionately to oppose the man who comes to remedy great evils. History is full of such evidences. The case of Socrates is not unique; but, after all, the
truth at length prevails. In their blind anger men sacrifice their benefactors, and then deify them when convinced at last that no false prophet was there. It is the charlatan and impostor that we fear; so we kill the man of good works, and later tell how he was no knave."15

Fay left Temple University in 1943 and began working, in a progressive exclusiveness, among other little known aspects of his beloved neurology. He became intensely interested in rehabilitation, another much neglected field as regards the neurological patient. He applied his vast knowledge of comparative neurophysiology to the problems associated with primitive locomotion and movement in the obliterative disorders. He likened his "cripples" to amphibians, reptiles and other ontogenic relatives and began his rehabilitation efforts by attempting to progress the patient through successive phylogenetic stages of development. He has left us an ingeniously illustrated manuscript, not quite finished, documenting his thoughts along these lines.

Fay will be remembered for many things, but particularly by his contemporaries as an astute observer. One friend of long standing recently recalled an appropriate episode which occurred in 1938 during a meeting of the Harvey Cushing Society in Memphis.19 In keeping with the annual custom, a clinic was held during which a difficult problem was presented to the group. A final attempt to locate and alleviate the patient's problem had resulted in an exploratory operation upon his mid-spinal region, without success. Seated high up in the amphitheater, Fay whispered to his friend that the lesion was a high cervical one, obviously. He had simply observed a faint line of demarcation across the lower cheek, indicating a level below which there was no sweating. Without saying another word, the two later slipped into the ward where Fay proved his argument by further examination.

During the last few years of his life, when ill health more or less confined his body, but not his mind, to a relatively small radius of his home and friends, like his mother before him he never found time to be idle. He was unwilling to discuss the unhappy events of the past or old criticisms of his ideas and work. He would dismiss such conversation with simple utterances as "There are still those who think the sun rises and sets." His thoughts were not of the past but still looking ahead; few will ever know of the self-restraint which his own wisdom imposed upon him during these last years. Knowing far better than most men of the inevitable consequences of hypertensive encephalopathy, he spent his later time in quiet, sincere consonance, persisting in study, writing about new thoughts and solutions to old problems in an habitual way he could not alter. He appeared without any of the usual panic that comes with the abrupt awareness that time and life are running out. And this, alone, is the sign of a remarkable man who works on, completely trusting in whatever lies ahead and purposefully using well whatever time was left.

References

11. FAY, T. Early experiences with local and gen-