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KIRTLEY FLETCHER MATHER'S LIFE IN SCIENCE AND SOCIETY[1]

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ABSTRACT. Kirtley Fletcher Mather (1888-1978) was a renowned geologist whose contributions range well beyond the geosciences. He was a scientist with a religious spirit and a social conscience. He graduated from Denison University in 1909, received the Ph. D. in Geology from the University of Chicago in 1915, and was awarded 6 honorary doctorates. Mather taught at the University of Arkansas (1911-1914), Queens University (1915-1918), and Denison University (1918-1924). For 30 years (1924-1954) he was a Professor of Geology at Harvard University, serving terms as Chairman of the Department of Geology and Director of the Harvard Summer School. In 1951, Mather was elected President of the American Association for the Advancement of Science and from 1957 to 1961 he was President of the American Academy of Arts and Sciences. After retiring from the Harvard faculty, Mather continued to be very active as a lecturer, reviewer, and social activist.

A superb teacher and productive scholar—as evidenced by his dozen books, 250 professional articles, and 1,200 book reviews—Kirtley Mather was an exemplar of the interdisciplinary approach to understanding the world. His geologic writings concerned geomorphology, petroleum geology, paleontology, and popularizations of all phases of modern geology. His belief in the mutual merits of religion and science received wide attention in 1925 when he participated in the highly publicized Scopes Trial, on the side of Scopes, Darrow, and the evolutionists. A political liberal, Mather frequently opposed movements which he considered to be threats to human freedom and dignity. The rebellion against the Massachusetts Teacher's Oath of 1935 was led by Mather and he was an outspoken critic of the McCarren Act and "McCarthyism" in the 1950s. The volume and diversity of Mather's achievements are impressive, but equally noteworthy is the integrated wholeness of his view of the world.

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INTRODUCTION

In an era when specialization is increasing and attention is turning to the 21st century, it may seem anomalous to focus upon the life and times of a liberally educated geologist who was born in the 1880s. But the past has the power to inform the present. A biographical sketch of Kirtley Fletcher Mather (1888-1978) may help us comprehend an earlier period in American science and society while at the same time explaining why 2 institutions are currently celebrating his life and accomplishments. Mather was honored as an exemplar of the liberal arts tradition during the 1981 Sesquicentennial of Denison University, his undergraduate alma mater. The Ohio Academy of Science is also honoring its Past-President of 1923-24 by establishing the Kirtley F. Mather Memorial program to further the work of the Academy. The essay which follows is meant to illuminate Mather the man and indicate why his life is worthy of contemporary consideration.

ORIGINS—THE MATHER CLAN

For many Americans the name Mather probably conjures up the image of a Puritanical Cotton Mather (1663-1728) denouncing witches who "met in Hellish Rendezvous" (Summers 1956). Those familiar with Harvard University may well

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think of Mather House and the legacy of Increase Mather (1639-1723), the first President of Harvard to come from the ranks of Harvard College graduates. Anyone old enough to remember the newspaper headlines of the 1950s may in fact recall Kirtley Mather's frequent adventures with the advocates of McCarthyism. But the name Mather predates any of the American namebearers by centuries. An inscription in the Ancient Chapel of Toxteth, in the Liverpool area, speaks of the Mathers as a family of "worthy non-conforming yeomen" (Mather 1977). Kirtley was greatly pleased with that description because he felt it summed up his concept of productive members of a free society.

In 1635 the American branch of the Mather family tree was founded. Richard Mather (1596-1669), with his wife and 4 sons, emigrated from Toxteth, England, to the Massachusetts Bay Colony. One of those sons, Timothy (1628-1684), became a farmer in the Lexington area. By not entering the ministry, Timothy was something of an anomaly in the family. The direct line to Kirtley originates with Timothy and his wife. Increase, so named because he was the first Mather child born in the New World, was Timothy's younger brother. When Increase and his wife, a daughter of the Reverend John Cotton, had a son, they named him Cotton Mather. The practice of using an ancestral surname as a first name explains Kirtley's distinctive moniker: the Reverend Lycurgus Kirtley had officiated at the 1884 marriage of Kirtley's mother and father.

Kirtley F. Mather (1888-1978).
Bachrach photograph of 1929.

From Massachusetts the descendants of Timothy Mather slowly migrated westward. Kirtley's father, William Green Mather (1855-1937), was born in Romeo, Michigan, and his mother, Julia Sabrina King (1860-1938), was from Jackson, Michigan. William was the son of a Baptist minister but did not pursue such a calling. As a ticket agent for the Michigan Central Railroad he helped people reach such worldly destinations as Chicago and Michigan City. Although he lived to be 82, William's health was greatly impaired by constant breathing of dense smoke from the locomotives which surrounded his ticket booth in the Chicago railroad yard. Early retirement on disability pension and resettlement in Arkansas, in addition to a strong Mather constitution, contributed to his longevity. Six children were born to Julia and William Mather: Asher (1886-1928); Kirtley (1888-1978); Ruth (1890-); Juliette (1896-); Harriet (1898-); and William (1901-).

Kirtley Fletcher Mather was born in Chicago on 13 February 1888. He bestowed the Mather name on 2 exceptional women: Marie Porter Mather, his wife from 1912 until her death in 1971; and Muriel S. Williams Mather, his bride of 31 May 1977. Marie and Kirtley had 3 daughters: Florence (Mrs. Sherman A. Wengerd of Albuquerque, New Mexico); Julia ("Judy"; Mrs. LeRoy G. Seils of Granville, Ohio); and Jean (Mrs. Jean M. Seibel of New Hope, Pennsylvania). In April 1978 Kirtley suffered a massive stroke and he died on 7 May 1978 in Albuquerque. He was survived by Muriel Mather, 3 younger sisters and a brother, 10 grandchildren, and 6 great-grandchildren.

THE EDUCATION OF A POLYMATH

The maxim that education begins at home was certainly correct in the case of young Kirtley Mather. Neither of his parents had been able to pursue formal education beyond high school, but both were concerned and involved with all facets of his intellectual and spiritual growth. By word and deed they taught their children the moral, social, and religious messages built into the Protestant ethic of the era. Their Baptist beliefs were actively practiced, but they seem to have avoided narrow dogmatism and intolerance of the many other religious persuasions to be found in the complex ethnic mix of South Chicago. For the rest of his long life, Kirtley was deeply committed to demonstrating that religion had a place in the increasingly secular and scientific world of the 20th century. William and Julia Mather were also very supportive of their son's interest in science and natural history. When Kirtley became interested in butterfly collecting, his mother made a net from mosquito netting and his father fabricated the frame from a long wooden handle and a wire loop. There was no question in the household about the merit of college education, even though definite financial strains were involved. William did not take disability leave from the railroad until Kirtley and his older brother were out of college. Three of the 4 younger children subsequently finished college, aided by contributions from Kirtley.

At each stage of his formal education Mather had a gifted and inspiring teacher who taught him specific information but, more importantly,served as a model of how to learn and how to enjoy the quest for knowledge. Mrs. Jane Perry Cook, of South Chicago High School,taught a course in "Physiography" which was unusual in its day for its field trip component. Not only did her students profit from her insights in the classroom, they also saw that the real world could be a textbook on a grand scale. Kirtley found the course to be one of the pivotal educational experiences in his career. But he was not alone. Frank W. DeWolf, a director of the Illinois Geological Survey, and William Embry Wrather, a director of the U. S. Geological Survey (USGS), were also products of Mrs. Cook's tutelage.

After high school graduation in 1904 Kirtley attended the University of Chicago for 2 years and then transferred to Denison University in Granville, Ohio, to complete his undergraduate education. Wallace W. Atwood and Rollin D. Salisbury were among the Chicago faculty who had contact with young Mather but it was not until his graduate career that the full impact of their pedagogy would be felt. Atwood's 1906 summer field program in geology, conducted in the Baraboo, Wisconsin, area, was an important educational event for Kirtley. Not only was a city boy introduced to field geology, his final report, replete with photographs he had taken and developed himself, made a very favorable impression on Atwood. The Fall Term of 1907 found Kirtley enrolled at Denison University, at that time allied with the American Baptist Convention. There were a number of reasons for the transfer: 1) concern, on the part of grandparents, about the education being offered at the "Godless" University of Chicago; 2) an excellent financial package, arranged by Prof. Frank Carney of Denison; and 3) most critically in Kirtley's view, the allure of going to college with so many attractive young women. Denison was not an unknown quantity for the Mathers because Asher, Kirtley's older brother, was there and Kirtley had visited the campus to speak with Prof. Carney, of the Department of Geology and Geography. Apparently he checked out more than just the curricular offerings. He later married a Denison woman, taught on the faculty, and developed a lifelong association with the college and with Granville.

The key to Kirtley's educational experience at Denison was Prof. Frank Carney. Evidence indicates that Carney was everything that a fine professor at a liberal arts college should be. He was well trained, completing his Cornell Ph. D. in 1909,

he was an excellent teacher who used his own extensive collection of lantern slides to illustrate his lectures, and he was a worthy 'model' of the professional geologist who also embodied the attributes of the cultivated gentleman. Carney's course on "Geographic Influences" was innovative and difficult, yet popular. In essence it was a treatment of human ecology. For students who went on to become professional geologists or geographers, Carney's broad-ranging but intensive courses served as superb bases upon which to build a mature understanding of the natural world. Prof. Carney also introduced his best students to research on significant geologic topics. He suggested that Kirtley tackle the vexing question of the origin of the Black Hand Gorge, a scenic narrows through which the Licking River flows. The product of that research was Kirtley's first published scientific paper (Mather 1909) and his first professional talk before a scientific association — the 1908 meeting of the Ohio Academy of Science. Prof. Carney may not have fully understood the enthusiasm which his young protégé had for the project: the Black Hand Gorge area was a favorite picnic and courting ground for Denison students. Kirtley, Marie Porter (his wife-to-be) and their friends were only too happy to have a reason to take the 15-mile interurban ride from Granville to Hanover and spend research/recreation time in the Gorge. College days were enjoyable but serious academic work was not slighted. Phi Beta Kappa honors were bestowed on both Kirtley and Marie. The potential to become a college professor was evident as Mather won prizes for his debating club, the Franklin Literary Society, and earned the yearbook's assessment of his loquacity, "I love to wind my mouth up, I like to hear it go." Other extracurricular activities included work on the college newspaper and service as an officer in 3 organizations: the C. L. Herrick Geological Society, the Republican Club, and the YMCA campus group.

By the Fall Term of 1909 Kirtley was professionally and personally mature enough to take full advantage of the stellar faculty available at the University of Chicago. He has stated that his first year in graduate school was the turning point in his intellectual life. It is easy to see why. He became immersed in the super-charged atmosphere created by T. C. Chamberlin, R. D. Salisbury, W. W. Atwood, and Stuart Weller. During the next academic year he pursued course work, assisted Atwood, and took on his first solo teaching assignment, the Spring 1911 course in Historical Geology. Summers found Mather and Atwood doing field work in the San Juan Mountains of Colorado. Atwood and Salisbury were not overjoyed to hear, in the spring of 1911, that Kirtley planned to drop out of graduate school in order to earn the money required to marry Marie Porter. He was firmly committed to returning to finish the Ph. D. but equally firm in his resolve to take 2 or 3 years off from the relatively non-remunerative life of a graduate student. Mather's script worked out almost to the letter. The Chicago faculty supported his candidacy for a job at the University of Arkansas; the Mather/Porter marriage took place on 12 June 1912; research toward the Ph. D. progressed while at Arkansas; summer work with Atwood and the USGS in Colorado continued in 1913 and 1914; and the Ph. D. was awarded to him, magna cum laude, in 1915. The dissertation (Mather 1915) concerned the Morrow Group (Pennsylvania) of Arkansas and Oklahoma. The one negative note in the 4-year interlude was that Prof. Drake and the young Prof. Mather did not get along very well at Arkansas. Thus, when Drake rejected Mather's request for a leave of absence for the 1914-'15 academic year in order to finish up at Chicago, Kirtley resigned from the Arkansas faculty.

Outside of formal academics there were also persons and events which influenced the scientist who was to be at the center of so many political and religious controversies. For someone almost universally characterized as a sunny optimist, Kirtley harbored a rather dark view of the news

media. It began when Asher and a friend were playfully carrying the 10-year old Kirtley along the street-car tracks. The Chicago papers the next day contained a lurid account of how 2 men were seen dragging a woman toward Lake Michigan. Not only was there a degree of hysterical exaggeration, the direction of transport of the 'body' was opposite to the facts.

More constructive educational opportunities were offered by the sociological environment of South Chicago at the turn of the century. Demographics of the area ensured that the high school would contain Irish, Italian, and Polish Catholics; Anglo-Saxon Protestants; European Jews; and southern blacks. Throughout his long life, Mather never wavered from the tolerant attitude he had developed in the melting pot of South Chicago. A summer (1904) job in a barbed-wire factory, earning $3.75 for a 55-hour week, sufficed to argue for escape from such tedium through education. Work with the Census Bureau in 1910 was a forceful introduction to Chicago's underbelly of prostitution, flophouses, and the situation of the immigrant steelworkers. A different sort of education occurred in the American West as Kirtley learned the ropes, literally, about field work on horseback. For a young geologist there is no better way to grow professionally than to work in the field with gifted mature geologists. In the pre-Harvard years Kirtley Mather had his share of superb tutors and colleagues: Wallace Atwood, J Harlen Bretz, Morris Leighton, Kenneth Heald, James Gilluly and John Reeside, Jr., were among his coworkers. Music and the theater were important to the liberally educated Mathers, but Marie was the professional in the musical realm. Kirtley did, however, reach a pinnacle of dilettante achievement: he was a spear carrier in a Chicago production of Verdi's *Aida*.

POST-DOCTORAL AND PRE-HARVARD PEREGRINATIONS

In the 9 years between earning a Ph. D. (1915) and accepting a position at Harvard University (1924), Kirtley Mather divided his professional time between academic appointments and a variety of field projects. The academic positions were at Queen's University, Kingston, Ontario, Canada, and Denison University in central Ohio. Field-based research and consulting were done in many parts of the western hemisphere: Colorado, Oklahoma, Tennessee, Bolivia, Mexico, and Alaska. A World War I stint in the U. S. Army Engineer Corps, as geological consultant to General Pershing, was derailed when the Army lost the requisite papers until Armistice was declared. Captain Mather served in the Army Reserve Corps for his tour of duty. There is a hint of disappointment in his personal letters that it was not a more active role.

Because the bridge to a continued position at the University of Arkansas had been burned by the June 1914 resignation, the recently credentialed Dr. Mather had to look elsewhere for a teaching position in 1915. When Jesse B. Hyde, a name well known to Ohio geologists, resigned from Queen's University, Ontario, in order to take a position at Western University (the precursor of Case-Western Reserve University) he contacted Kirtley, alerting him to the possible slot. The long interval between applying and winning the position at Queen's was somewhat nerve-wracking for the Mathers, as well as for supportive faculty at Chicago, but the offer came through just before the 1915 summer field season began. The Canadian experience was very positive. Kirtley's teaching was well received, field work with the Ontario Bureau of Mines was rewarding, and faculty collegiality was high in spite of the fact that a young American was on the staff while Canadians were fighting in Europe. It was also a productive time: Dr. Mather's publications began to multiply and the Mather family expanded with the birth of Florence, the first of 3 daughters.

One of the articles written while at Queen's University is of particular interest as a harbinger of future controversy and a clue to Kirtley's fundamental beliefs.

"Parables from Paleontology" was published in the April 1918 *Atlantic Monthly* and was more of an essay than a professional paper on paleontological subjects. The underlying theme was that organic evolution and "survival of the fittest" are not opposed to the Christian doctrine of brotherhood. That was a refrain which ran through many of the Mather lectures down through the years. It was also the mix of science and theology which was to get a young Harvard professor invited to the Scopes Trial of 1925.

Summer employment by the USGS evolved as the war in Europe slowly embroiled American interests. In 1915 the Atwood/Mather team pursued its geomorphic and glacial geology investigations in the San Juan Mountains of Colorado. That work continued in 1916 but a portion of the support had to be diverted to defense-related projects. By the summer of 1917 the United States was formally at war and the USGS threw its human resources into the effort to find petroleum resources. Assignment to the Allen County, Kentucky, field was Kirtley's introduction to petroleum geology. It was also the first time he had received the advice to make himself known to the local people so that he would not be shot as an "infernal revenuer" if field work led him into the area of a moonshine still. The Osage Country of Oklahoma was the next project for 1917. The boom there was noteworthy for several reasons: the Osage Nation owned the land and actually received its fair share of the income; the anticlinal theory of oil accumulation was verified; and K. F. Mather began his valuable association with K. C. Heald. Long hours, hard work, and excellent geological insight led to the discovery of 40-some pools of oil during the Osage project. Such efforts did not, however, dissuade the irate and righteous citizens of Tulsa from arresting the "draft-dodging" geologists as they came out of a Saturday evening movie in August, 1918. Little suspecting that the Vigilantes were on the warpath, the geologists had left their identification papers at the base camp. Rescue came in the form of one of the "officers" who turned out to be a petroleum geologist. Shortly thereafter Kirtley had his misadventure trying to enlist in the U. S. Army Corps of Engineers. As he would find over the next 5 decades, sometimes it was difficult to be a patriot.

Summer geologizing and the academic position at Queen's had been going very well but such tranquility was not to last. An invitation came from Clark Chamberlain, President of Denison University, to replace Frank Carney as professor of geology. The 1917-'18 academic year was already under way at Queen's and Kirtley refused to abandon his obligations and his friends. After repeated offers from Chamberlain, and much familial consultation, it was finally decided to return to Denison beginning in September of 1918. If ever there was an idyllic relationship between an alumnus and his alma mater, the Mather/Denison linkage could serve as a model. There was a chemistry between the institution and the individual which translated into a lifelong record of service and reciprocated honor. Mather was exceptionally active in alumni affairs; he was Graduate Manager of the entire sports program; he returned frequently to Granville in order to give speeches; he remained an unusually strong supporter of the college until his dying days; and he is buried at the Maple Grove Cemetery in Granville. All of that in spite of a series of unpleasant skirmishes with President Chamberlain and disgust at the way in which his colleague, Dr. S. I. Kornhauser, was treated by Chamberlain and the Board of Trustees.

The "Kornhauser Affair" of 1922 is not the stuff of positive public relations, but it merits a few words as an illuminating example of how Kirtley Mather conducted his life. Kornhauser was a Jew with a Harvard Ph. D. in biology. He was respected by his colleagues and his teaching was very well received by the students. In spite of such success and the expectation that repeated contracts would be given to productive faculty members, Pres. Chamberlain did not offer him a renewal in 1922.

The suspicion was strong that the heat generated by a 1920 questionnaire from the Lorain Baptist Association may have been a factor in Chamberlain's stance. While the questionnaire was not anti-Semitic in any overt sense, it certainly took the tack that liberalism of all stripes was a concern at Denison. To the faculty's credit, not one of the active members saw fit to return the questionnaire. The pressure for retrenchment was felt, however. Kirtley was among the faculty members and students who came to Kornhauser's active defense. The WASPish cliché that "some of my best friends are Jews" had been literally true for Mather since his youth, but, beyond defending personal friends, Kirtley perceived the fundamental issues of religious tolerance, due process, open communication, and the long-term health of his alma mater. In the end, the Kornhauser-Mather faction lost the battle and Kornhauser went to the University of Louisville. In the larger context, the war was slowly won as the Chamberlain administration was replaced and the injustice of the situation was recognized by a wide audience. Several Mather attributes were well displayed by the incident: loyalty to friends and to the long-term best interests of institutions; fervent belief in tolerance in regard to religion, race, gender, or political persuasion; and a surprising combativeness when faced with controversial issues from which lesser persons would have retreated.

The 1918-1924 period at Denison also bears witness to Mather's leadership potential and his ability to get a great deal accomplished while wearing many hats. He took on the Editorship of the *Journal of the Scientific Laboratories of Denison University,* was elected Permanent Secretary of the Denison Scientific Association, scheduled all intercollegiate athletic events and oversaw the finances of the athletic program, was elected first president of the local chaper of the American Association of University Professors (a postlude to the Kornhauser trauma), and taught a heavy load. The teaching was most rewarding, even if it meant 511 student-contact hours in the Fall of 1921, because of the excellence of the students and the constant feedback of compliments. Edgar W. Owen, C. Langdon White, Carey Croneis, A. Nelson Sayre, Howard Jefferson, Alonzo W. Quinn, and L. Don Leet were among the Denison students who studied with Kirtley.

The Denison years were interrupted by 2 adventurous, dangerous, remunerative, and life-changing expeditions to the oil fields of Bolivia. The adventure began, in the Summer of 1919, when Kenneth Heald asked the Richmond Levering Company to hire Kirtley as a member of the team which was to investigate the oil potential of eastern Bolivia. In addition to being a unique professional opportunity, the job offered $1,000 a month plus expenses; not bad for a professor making less than $3,000 a year. The first expedition was a highly successful 6 months: significant oil accumulations were found; a Permocarboniferous tillite was recognized; Heald and Mather authored papers for the *Bulletin of the Geological Society of America* and the *Geographic Review;* and Mather was offered a second assignment in Bolivia. In Granville, Ralph Lusk was performing KFM's teaching duties (Lusk would earn a Harvard Ph. D. in geology in 1927) and Marie gave birth to Julia Carolyn ("Judy") on 16 March 1920. By June of 1920 Kirtley was off on the second trip, this time to northern Bolivia. Again, the expedition had its successes, but they were sorely won. Travel through the tropical jungle was difficult and hazardous. Kirtley's record of 113 bites by mariwi bugs — on one hand — did not receive much sympathy from his colleague, who had 131. More serious was an infected bite on the leg which led to blood poisoning and the decision by the local medic to amputate. The Mather courage, stubbornness, and wide-ranging knowledge came to the rescue as Kirtley and his Yurucare Indian guide applied steaming compresses to the

leg. Within 2 days he continued the trek with both legs intact.

The prime personal consequence of the Bolivian adventures was that Reginald Daly invited Kirtley to come to Harvard to repeat the talk on Bolivian geology which he had given at the 1922 meeting of the Geological Society of America. In April 1923 the invitation came to teach at Harvard for the 1923-'24 academic year; by January 1924 the offer was to accept a tenure-track positon in Cambridge. Other good offers had been turned down out of loyalty to Denison but the Harvard opportunity was a plum not to be refused by a quietly ambitious 35-year old. As always, Kirtley made sure that his obligations were met. Ralph Lusk was retained to teach at Denison while Mather was on leave in the Fall of 1923; the already-slated work for the USGS, in Alaska, was accomplished from June to early October of 1923; and Daly volunteered to teach introductory geology at Harvard until Kirtley arrived from Alaska. The transition scenario was complex but by late September 1924 the Mathers were installed in the Cambridge area and ready to begin a long and happy association with Harvard University.

THE 1925 SCOPES TRIAL

Before considering a few highlights of the Mather years at Harvard, it would be worthwhile to take a trip in time back to Dayton, Tennessee, in July 1925. The events surrounding the trial of John T. Scopes (1900-1970) have been recounted by numerous authors (Ginger 1958, Tompkins 1965, Scopes and Presley 1967 and de Camp 1968). Variations exist as to the details but the general nature of the confrontation between William Jennings Bryan and the anti-evolution forces versus Clarence Darrow and the pro-evolutionists is well known. Less well known, because Judge John T. Raulston did not allow them as admissible evidence, are the statements made by 8 expert witnesses for the defense. The "Statement by Kirtley F. Mather, Chairman of the Department of Geology of Harvard University" is a 23-page document which introduces the author as a life-long Baptist and professional geologist. The text is a masterful outline of earth history and the evidence for evolution, interspersed with first-person accounts of how the geologic record supports evolution and the antiquity of the earth.

How did Mather become involved with the famous "monkey trial"? He got himself invited. A letter was sent to Roger Baldwin, founder of the American Civil Liberties Union and coordinator of the Scopes defense, noting that what the defense really needed were some scientists of stature who also had unassailable credentials as religious persons. Guess who got invited. This is not to suggest that Kirtley intruded into the case, nor that he had not considered exactly the same questions before, nor that he was a publicity seeker. It does indicate that he was willing to go to the barricades in defense of what he believed and, as his 20 full scrapbooks attest, he was not one to shy away from publicity.

That the defense had gained a valuable witness who had given much thought to the reciprocal implications of organic evolution and religious belief may be seen in the papers he had written well before the Scopes trial. Views expressed in "Parables from Paleontology" (1918) are echoed throughout the Scopes affadavit: "Underneath the ancient warfare between theology and science, lurking in the distrust of 'high criticism,' there is an unvoiced, but very real, fear that in the last analysis the doctrine of the survival of the fittest in the struggle for existence is diametrically opposed to the conception of the brotherhood of man; that evolution according to Darwin and de Vries and Weissmann is the antithesis of Christianity according to Christ and John and Paul." (Mather 1918). But the fear of evolution is not necessary because the final result of evolution is congruent with God's will. "That the administration of the universe is going forward

according to a consistent plan is a conclusion reached alike by the man of religion and the man of science." (Mather 1918). The paleontological record shows that life has progressed through time; thus it is instructive for modern society to understand the paleontological evidence which, the author felt, points unambiguously to increased cooperation among the higher animals. It was all very much in line with Christ's fundamental message. "But whereas in the past selfishness was the measure of fitness, in the future survival value will be determined by breadth and depth of love." (Mather 1918). In "Revolution vs. Evolution: the paleontologist renders his verdict," Mather attempted to weave politics, science, and religion together in order to reach the conclusion that "it requires no unusual acumen to see that this next milestone in the progress of life will be safely passed only by those who specialize in the art of cooperation, as opposed to selfishness, and in the practice of kindly thoughtfulness for others, regardless of their color, race or creed." (Mather 1921). The message of cooperation between science and religion, as well as among humans of differing background or belief, was a Mather theme which predated and postdated the Scopes trial, even it it did not succeed in persuading the Fundamentalists and liberals at Dayton to lay down their verbal weapons.

Because the written statements of the defense witnesses were not part of the public record it was incumbent upon the authors to voice their comments in a forum outside of the courtroom. The ever-innovative Mather not only published his contributions (Mather 1925, 1926a, 1926b), he also used the radio to air his concerns about "Evolution on Trial." The program, broadcast by station WNAC on 11 December 1925, had a high impact on the listeners. One correspondent admitted to having completed only 4 years of school but typed an earnest page of questions: (Punctuation and spelling are not corrected. The letters are in a file labelled "Brickbats and Bouquets"; Denison University Archives.) "Another question good sir please. Why do professers and sience man want to convince world they descend from monkey and then say descend is to go down like the dictionary says . . . Please mister professer i ruther think me some thing a little lower than them angels than to think i got monkey blood in my veins." More typical was the letter from an M. D. who said, "You have given my radio set a new lease of life; I am often tempted to sneak it down (to the) cellar and apply the axe, when all too rarely, something inspiring and enlightening comes through and deters me."

John T. Scopes was a quiet man caught up in a media event. When Kirtley was asked if Scopes hadn't been "used" by the liberals, it struck him that although there had been no desire to hurt Scopes, little thought had been given to what he might do if the guilty verdict was handed down. Conversations with Scopes convinced Mather that the best solution was to give the young biologist the needed financial backing for him to pursue the academic career of his choice. The John T. Scopes Scholarship Committee was formed, with David Starr Jordan, widely known as President of Stanford University but also a prominent ichthyologist, as national chairman and Kirtley Mather as secretary and workhorse. Approximately $4,000 (1925 value) was collected and Scopes spent 2 years in the Department of Geology at the University of Chicago. He went on to a professional career as a petroleum geologist.

The major participants in the "Great Monkey Trial" are no longer with us but the issues are as contemporary as the stories in today's newspaper. Debates continue about evolution "versus" Creationism. Some of the language is new ("scientific creationism" might have caused both factions at Dayton, Tennessee, to scratch their heads), but the underlying motivations and ways of looking at the world are very much the same. In his 88th year Kirtley Mather was still answering reporters' ques-

tions (Landon 1976) about the trial and explaining the relevance of that now-distant event to modern society.

THIRTY ACTIVE YEARS ON THE HARVARD FACULTY

From 1924 to 1954 Kirtley Fletcher Mather was a member of the Department of Geology at Harvard University. For another quarter of a century he was Professor Emeritus — a term not to be confused with rocking-chair-style retirements. The Mather name served Kirtley well at Harvard. Along with Harlow Shapley, he felt that he was one of the few "barbarians" from the Midwest who became faculty members at Harvard during the 1920s. Although there may have been some jealousy on the part of established faculty toward the newcomer with the old honored name, the typical reception in Cambridge was warm and supportive. There were times, as in the *Harvard Lampoon* cartoon of 19 September 1940, when the association with Cotton Mather was recalled, but even in the *Lampoon* the comparison was favorable to Kirtley. In the early 1970s, just prior to his move to New Mexico, Mather was still giving invited lectures to Prof. Stephen Jay Gould's classes in introductory geology. Gould (1978) recalled that the lecture hall overflowed when Mather spoke and that the brief finale of each semester's lecture concerned the spiritural nature of man. In the tumultuous days of 1968-'69 the students seemed attentive but not fully engaged with such musings; by the early 1970s their involvement with the issues raised was total. Mather did not fit the mould of most professors at prestigious research-oriented megaversites. He was bright, articulate, and very hard working — requisite attributes — but he was a generalist, not a world figure in a particular subdiscipline. He often made the observation that he was one of the last of the "19th-century naturalists." That modest claim was not completely correct but it was a valid description of his background and general approach to science of the earth. Mather's first professional work had been on the geomorphology and glacial geology of Colorado; his Ph. D. dissertation concerned classical problems in paleontology; and his work in petroleum geology focused on field reconnaissance, stratigraphic interpretation, and straightforward structural analysis. There was no shying away from the new, however, and during his first years at Harvard Mather found himself having to do a "quick study" on seismology when he became Director of the Harvard Seismograph Station from 1926 through 1930. Other Mather characteristics which set him apart from many of his colleagues were thoroughly Midwestern origins, his deep and quite visible commitment to his Baptist heritage, and his willingness to take time from strictly geological pursuits to work on YMCA projects, write popularized accounts on scientific subjects, and become involved with political issues which often had highly controversial aspects. It is conceivable that some Harvard colleagues entertained reservations about certain of these contributions, but the individual was greater than the sum of his professional parts so that Kirtley enjoyed great respect from the students and faculty members who got to know him.

As a teacher Kirtley earned both respect and affection. Some students wrote him while they were still enrolled in his courses, many wrote soon after graduation, and some waited for decades before something prompted them to communicate heartfelt thanks for all that they had learned, about geology and about life. Recurrent themes (*Harvard Crimson* 16 January 1934) are how well prepared Mather always was, how superb his organization and delivery were, and how valuable it was to observe a member of the science faculty who concerned himself so deeply with spiritual and social issues. The field component of geology was stressed. One spectacular option for students who could afford it was the 1928 field program in the Alps. Students received dual training in

mountain climbing and geology. The finale was a climb of the Matterhorn. Laboratory exercises received constant attention and a number of lab manuals in physical and historical geology were published by Mather and his colleagues. Beyond knowledge, hard work on preparations, and communication abilities, Mather displayed an abiding concern for individual students. C. Langdon White was a student and field assistant for Mather during the Denison years. He received a Ph. D. in Geography from Clark University, where Pres. W. W. Atwood had established a fine program. White's (1980) first-hand analysis of Mather the teacher is worth quoting: "Kirtley Mather was more than an eminent geologist, brilliant and productive scholar, able researcher, fascinating writer, and stimulating and interesting lecturer, or even master teacher. He displayed to the maximum degree the human aspect of the profession — a quality absent or nearly absent in so many teachers. He came closer than anyone I have known to exemplifying the whole man." For all of these reasons the Mather classes in geology were extremely popular over the decades and many lectures were given to a standing-room-only audience.

Administrative duties descended upon Mather in his second year at Harvard, when he was appointed Departmental Chairman. The abilities to deal with people and to handle multiple problems and voluminous correspondence with ease were part of Mather's persona. Such gifts were recognized by the Harvard administration, and from 1933 to 1941 Mather served as Director of the Summer School. That post took Kirtley away from geologic research in the summers, aside from forays into the field to work with his graduate students. Careful planning, innovation, and the creation of numerous cultural and recreational opportunities for the summer term characterized the Mather administration. Years later a director of the Summer Program would write that every time he had a good idea he would go to the files and find that Kirtley had instigated a similar program 30 years before. Even such weighty crises as the shocking proliferation of young women wearing short shorts in the august Harvard Yard were handled with aplomb by the post-Puritanical Mather. Cotton Mather's reaction can only be imagined.

All facets of education concerned KFM. Top priority went to his own students, but Harvard and Radcliffe graduates were already ensured of a superb education if they made the requisite effort. What about the many intelligent adults who never had the opportunity to receive a college education? Or the well-educated older people who might welcome the chance to interact with current ideas in the sciences, arts, and humanities? Adult education seemed to be the answer. In 1933 Kirtley Mather helped organize and served as President of the Boston Center for Adult Education. With Dorothy Hewitt, the Director, he wrote a valuable book on *Adult Education, A Dynamic for Democracy* (1937).

Throughout Mather's career, teaching and administrative duties were quite heavy. But they were in some ways just the tip of the productivity iceberg. A bibliography of strictly geological research papers would not begin to indicate the volume of work being turned out as he accepted speaking engagements, wrote articles explaining his stance on religion and science, reviewed an astounding number of books (close to 1,200) and fought for a wide spectrum of political causes. By the 1950s, national honors, with their associated obligations, were the pirates of time. A term as President of the American Association for the Advancement of Science (1951) and 4 terms as President of the American Academy of Arts and Sciences (1957-1961) are examples of the esteem accorded to Mather by the scientific community.

OF GOD AND NATURE'S ORDER

When Whitehead contended that the order which allows science to reach signifi-

cant conclusions about the Universe points to the existence of some Supreme Order, he was articulating the views of many scientists. Kirtley Mather devoted much of his time, intellect, and spirit to spreading just such a message. His religious training was Baptist, but his theology was far removed from the fundamentalism of a William Jennings Bryan or Jerry Falwell. God's work was to be seen in Nature, but simplistic arguments from Design were not part of the Mather doctrine. At the heart of the issue was what might be called a Christian realist's optimism: optimism that religion and science were more in concert than at war, and optimism that some day the social concept of "Christian brotherhood" would be understood and accepted by humanity at large.

For the better part of 90 years Mather thought about, wrote about, and discussed what he saw as the rich interactions of science and religion. As a youth in Chicago he assumed leadership roles in Sunday School and Baptist Young People's Union discussions. In college the learning and commitment accelerated and a lifelong association with the work of the YMCA began. Leadership in the lay activities of the Fayetteville Baptist Church fell to Kirtley and his bride during the years (1911-'14) at the University of Arkansas. By the time he arrived at Harvard, a number of articles had been published which contain the nucleus of Mather's thoughts on the mutual relevancies of evolution, religion, and science. After the Scopes Trial he became something of a celebrity in circles interested in hearing what a respected scientist had to say about religion. Debates with the Rev. Dr. John Roach Straton of New York's Calvary Baptist Church and, at the other end of the spectrum of beliefs, with Bertrand Russell, served to keep his views in the limelight. Over the years he gave innumerable speeches to groups, graduating classes, and conferences. Four years after his retirement Kirtley was still addressing and chairing such gatherings as the Second Seminar on Science and the Spiritual Nature of Man. At the graveside services marking the end of Kirtley Mather's long life, his brother William quoted a passage from *Science in Search of God* (1928) which sums up a key aspect of his worldview: "God is no longer hiding behind the gaps in our knowledge . . . The more we know about the world in which we live, the better is our understanding of him, the truer is our comprehension of his character."

The debate about evolution presents one of the clearest examples of Mather as arbiter between scientific perspectives and religious beliefs. He was fearless in his defense of the scientific method and the validity of evolution as a process. He also was unswerving in his feeling that there was an Administration of the Universe and that organic evolution was a process whereby humans could come to understand "the spiritual power and eternal force, (which God) has used and is using now to effect his will in nature." (Mather 1969). Whereas William Jennings Bryan had claimed that evolution was the greatest threat to religion in 1,900 years, Kirtley Mather took the optimistic view that the evolutionary parade was demonstrating the worth of altruism, cooperation, and the artistic, inquisitive, and philosophical drives which characterize humans at their best. He avoided ad hominem arguments but he quite forcefully told the antievolutionists that they were wrong. Their errors included: (1) lack of knowledge about what evolution truly was; (2) a series of logical errors; (3) ill-grounded fears about the implications of evolution for religion; (4) shoddy use of such terms as "theory" and "Darwinism"; and (5) un-called-for egotism when considering the species *Homo sapiens*. When engaged in a one-on-one debate, as with Rev. John Roach Straton of New York's Calvary Baptist Church, Kirtley made sure that his own Baptist credentials were spelled out, but astutely managed to keep his side of the discussion on firm scientific grounds as he used his eloquence and deep knowledge of both

the Bible and modern paleontology to gain advantage in the exchange.

It is probably evident by now, but it may be worth emphasizing the point that Kirtley Mather was a highly integrated person whose statements and actions came from a complex amalgam of beliefs, knowledge, widsom, and concern about what was happening in the universe. Thus his religion, science, and social consciousness were expressions of a rather rare wholeness in viewing the world. Just as his religious and scientific training mutually informed his analysis of evolution, his teaching of geology reflected many inner thoughts (Mather 1951), and his liberal politics followed from his concepts of what society should be.

A SCIENTIST'S CONCERN WITH SOCIAL ISSUES

It is not feasible to recount all of the times in which Kirtley Mather's conscience dictated a confrontation with authorities. At Denison he took on the President and Board of Trustees during the 1922 "Kornhauser Affair." At Harvard it required a direct statement from President Conant to make Kirtley sign the 1935 Teacher's Oath demanded by the Massachusetts legislature. During the 1950s there were numerous headlines reporting on the battles between KFM and the forces represented by Sen. Joseph McCarthy. For those who knew the real man it was an understandable paradox which could not be comprehended by those who read only headlines or heard only derivative accounts. The ever-smiling Christian gentleman and respected professor also had a steel backbone and very strong notions of right and wrong. The man who was labeled as a "Red-ucator" and pictured, with 49 other prominent Americans, in a 1949 *Life* magazine feature on presumed dupes of Communism was never quoted when he warned of the evils of Communism. Nor were his reasons for supporting the "fronts" ever discussed. Was a 1936 desire to aid the Spanish Loyalists in their fight against Fascism to be translated into a 1950 membership in the Communist conspiracy? Many people accepted such logic. Mather was secure enough at Harvard and secure enough within himself to keep on speaking up whenever he felt it was required. Gould's (1975) observation, in an article on irrationalism as the true enemy of science, that "the Yahoos never rest" is germane here: the bigots, the anti-evolution extremists, and the vigilantes of the McCarthy era were constantly berating Mather for sins he had never committed. To consider Mather as un-American or anti-Christian is irrational and counter to all the evidence. It is a measure of the man that the intended victim not only outlived most of his adversaries, he did so with his honor intact.

Tolerance is central to the concept of world brotherhood. For Mather it was an active virtue from youth to old age. A 1918 letter to his friends from college days includes the aspiration that "black, white, and tan persons" may some day find total camaraderie. As an undergraduate he was greatly incensed at an Ohio farmer's bigoted reaction to a Chinese-American student in a geology field party. In 1937 a group of visiting Nazi students was shocked to hear the director of the Harvard Summer School formally lecture them on the error of the evolving German political system. In 1952, a decade or so before the civil rights movement was making substantial headway in the Deep South, Kirtley Mather gave the commencement address to the graduates of Atlanta's Morehead College. A world perspective is evidenced by his years (1957-1960) as delegate to the World Council of the Young Men's Christian Association, with a desk in the Secretariat Building of the United Nations.

Tolerance toward Mather and his liberal ideas was not a virtue exhibited by a number of politicians and self-appointed defenders of a self-defined brand of Americanism. Some of the letters received by Mather were so vicious and unreasoning that an objective observer has to infer more

darkness in the spirit of the sender than in the deeds of the recipient. The old adage about smoke and fire might, however, make that objective observer wonder what sins the professor had committed. Here was a man who had called Jane Addams a modern saint, had been invited to dinner at the White House by Eleanor Roosevelt, had attended a testimonial dinner for Dr. W. E. B. DuBois, had personally interviewed Marshall Tito, and was head of the American Civil Liberties Union in Massachusetts for 4 stormy years. That is not a record to endear one to conservatives. Several other answers can be suggested: 1) he had joined or sponsored, particularly in the 1930s, a number of groups which were definitely on the left side of the political spectrum; 2) as an internationalist he advocated dialogue with the Soviet Union; 3) as a free thinker he refused to submit to such political devices as the Massachusetts Teacher's Oath, thereby earning a reputation as a "troublemaker" early in his tenure at Harvard; 4) because of his own self-assurance and courage he never folded under pressure — thus the troublemaker image escalated as he took on the American Legion, Sen. McCarthy, the Jenner Subcommittee, and the House Un-American Affairs Committee; and 5) the whole premise that guilt was demonstrated by association worked to brand many Americans as Communist dupes or fellow travelers even if they had never belonged to a real Communist Party group or had never advocated a single un-American act. The fact that many of the organizations on the Attorney General's list of the late 1940s and early 1950s had no association with the Communist Party did not bother the vigilantes. Nor were they slowed down by the Supreme Court's verdict that the mode of generating the list was unconstitutional. A victim's recourse was minimal. When *Life* magazine fingered 50 Americans for their pinkish to reddish taint, the writers and lawyers on the *Life* staff were careful to use phrases, in fine print, which could allow sidestepping of any lawsuits. When Kirtley Mather appeared before a closed session of the Jenner Subcommittee and apparently performed very well, dispelling any concerns with his political stance, the press was not allowed to publish the proceedings. It was all very insidious in its "Catch-22" nature: one could be accused of being un-American by people who used some of the most un-American measures imaginable.

An activist academic who is indomitable and spends 60-some years speaking his mind from a highly visible pulpit acquires so many "battle stories" that just a few examples will have to suffice to illustrate his involvement with social issues. The Teacher's Oath controversy of 1935, the events surrounding the February 1951 cancellation of an interdenominational speech scheduled for Syracuse University, and Mather's activities as President of the American Association for the Advancement of Science are 3 illustrative cases. In the summer of 1935, the Massachusetts legislature passed Statute Chapter 370: "An Act requiring that an oath or affirmation be taken and subscribed to by certain professors, instructors and teachers in the colleges, universities and schools of the Commonwealth." This Teacher's Oath had been formulated, by State Rep. Thomas A. Dorgan and others, as a roadblock to the "Red-ucators" who were thought to be poisoning the minds of America's youth. All 40,000 teachers and professors were supposed to sign the oath or lose their jobs in the Commonwealth of Massachusetts. Many educators found the oath offensive but few rebelled. Mather led those few. On 4 October 1935, James B. Conant issued a statement to the press which read, "The Act appears to make it mandatory for the institutions concerned not to permit any citizen to teach who fails to carry out the Provisions of this Act, and Harvard University has so assumed since the Act was passed. It is out of the question for Harvard University as an institution to consider not obeying the law." Conant wrote a note to Mather explaining his sorrow at the situation but leaving no doubt that it would be best if the Oath was signed.

Kirtley obeyed the law but went the proponents one better by adding the rider that he also supported the Declaration of Independence and the Kellogg-Briand Peace Pact. Such creativity did not please the hardliners. The *Boston Post* (3 December 1935) headlined, "Mather only teacher who has changed oath — Harvard denies noted geologist may lose his position as result of controversy." By December 1935 he complied with the proper format, but succeeded in getting in the last word (Mather 1936): "Despite the serious issues involved in compliance with this statute, there is still much humor in the situation. Having taken this oath twice, once as a Harvard professor and once as a Radcliffe professor, I was congratulating myself that I was twice as patriotic as the majority of my colleagues in the teaching profession, until I learned that one of my friends had sworn allegiance 4 times since October first, inasmuch as he teaches in 4 different institutions in the state. I am chagrined by the thought that he is twice as patriotic as I!" The *Harvard Crimson* of 27 November 1959 featured Mather's role in the 25-year old controversy when 2 professors lost their posts because they refused to sign the oath.

In February of 1951 Mather was to speak to the interdenominational student brotherhood banquet at Syracuse University. Just before the event was to take place Dean Charles Noble of Syracuse reluctantly informed Kirtley that because of objections raised by the Father Gannon F. Ryan, the Roman Catholic chaplain, it seemed inadvisable to go ahead with the planned speech. Father Ryan's view was that Mather held political beliefs which were somehow not acceptable for the keynote speaker. The evidence for such a conclusion came from a list of "Red-ucators" given to Father Ryan by a "concerned alumnus" of Syracuse. In the end, Ryan's veto was honored for the banquet but Mather was invited to speak on "Christianity and Democracy" at the Protestant services in Hendricks Chapel on the Syracuse campus. The *Daily Orange* of Monday, 19 February 1951 reported: "Capacity audience enthusiastic at Mather 'Democracy' sermon . . . A University official happily summed up the general reaction with this: 'Perhaps it was better this way. Two thousand people heard the sermon this morning, instead of merely 400 overstuffed banqueters . . .'" The sequence of events received coverage by the *New York Times* and a number of major newspapers. The episode demonstrates the climate of the time and fragile nature of freedom of speech. Guilt by association and judgment by peer pressure made it very difficult for the full spectrum of political views to be voiced. Mather's analysis of the Teacher's Oath controversy, quoted in the *Houston Post* of 16 October 1935,could serve as a summation of his 1951 response to the Syracuse contretemps: "The real danger which democracy faces in America today is a result of the increase of undemocratic tactics in the guise of loyalty to democratic ideals."

By the 1950s the man who had been black-listed by politicians and dis-invited by chaplains was honored by his scientific colleagues with election as President of the American Association for the Advancement of Science (1951) and a 4-term Presidency of the American Academy of Arts and Sciences (1957-1961). The titles of a number of articles published in the 1950-'54 period illustrate the range of concerns which Mather brought to the attention of scientists throughout the country.

1950: "The social implications of science": *Bull. of the Atomic Scientists,* v. 6, no. 7

1950: "Education for a changing world": In: *Proceedings of the Stillwater Conference on the Nature of Concepts, Their Inter-Relation and Role in Social Structure*

1950: "Man and the Earth that supports him": In: *The Nature of Man,* A. W. Loos (ed.), *The Church Peace Union and the World Alliance for International Friendship through Religion*

1951: "The physical sciences": In: *College Teaching and Christian Values,* P. M. Limbert (ed.)
1952: "The problem of anti-scientific trends today": *Science,* 15 May 1952
1952: "Scientists in the doghouse": *The Nation,* 28 June 1952
1952: "The common ground of science and politics": *Presidential Address,* A.A.A.S. meeting in St. Louis; In: *The Maturing of American Science,* 1974, R. H. Kargon (ed.), reprint
1953: "Christian faith and natural science": *The Christian Scholar,* v. 36 (2)
1954: "Hunger or plenty for the future?" *Amer. Scholar,* v. 22 (4)
1954: "Methods of improving college teaching: the natural sciences": In: *The Thorne Lectures,* Hofstra College, 2 March 1954
1954: "Specialists in the academic community": *Educational Horizons,* 32 (4)
1954: "The scientist's responsibilities for the interpretation of concepts to laymen": *Science,* 5 March 1954

The integration of religion, science, social conscience, and education had been and would remain central issues for Mather; during the years at the elected apex of American science, he was able to reach a wide audience with his insights. Judging from the written responses (Archives of Denison University), particularly to the articles in *Science,* the scientific community was highly receptive to his analysis of the contemporary scene.

AUTHOR AND CONSUMMATE REVIEWER

Kirtley Mather wrote more than a dozen books, published over a span of half a century. The earliest books were collections of lectures or radio scripts. During the 1930s the author's concern with education was evident as he produced a lab manual for geology, a seminal work on adult education, and a valuable compendium on the history of geology. As his active teaching career came to an end in the early 1950s, Mather and his colleagues formulated lab manuals for physical and historical geology which profited from the senior author's long experience in the classroom and laboratory. After a decade of retirement, Kirtley published the award-winning book *The Earth Beneath Us.* The revised edition incorporated modern views on plate tectonics and was published when the author was 87 years old. The Mather legacy includes:

1928: *Old Mother Earth*
1928: *Science in Search of God*
1930: *Sons of the Earth*
1932: *Physiography and Quaternary Geology of the San Juan Mountains, Colorado:* U.S. Geol. Surv. Prof. Paper 166 (With W. W. Atwood)
1934: *Laboratory Manual of Physical and Historical Geology* (with C. J. Roy)
1937: *Adult Education: A Dynamic for Democracy* (with Dorothy Hewitt)
1939: *A Source Book In Geology* (with S. L. Mason)
1944: *Enough and to Spare*
1949: *Crusade For Life:* The John Calvin McNair Lectures, Univ. of North Carolina
1950: *A Laboratory Manual for Geology:* I, Physical Geology (with C. J. Roy and L. R. Thiesmeyer)
1952: *A Laboratory Manual for Geology:* II, Historical Geology (with C. J. Roy)
1961: *The World In Which We Live*
1964: *The Earth Beneath Us* (translated into French, German, Italian, and Dutch; winner of the 1964 Thomas A. Edison Award and the 1964 Book

Award of the Geographic Society of Chicago
1967: *A Source Book In Geology, 1900-1950*
1975: Revised edition of *The Earth Beneath Us*

The range of topics considered in Mather's published articles is quite exceptional. A partial list includes: geomorphology; glacial geology; the geography of Bolivia; the internal structure of the earth; the origin of life; the moon as a geologic entity; petroleum as a factor in world politics; types of oil traps; and how to use an alidade. Such a listing does not even mention the topics which received most of Mather's attention: science and religion; societal issues; and explaining science to the lay public.

A bibliography which includes a dozen books and more than 250 published articles represents an active life of the mind. In the case of Kirtley Mather, however, a full appreciation of his productivity and Renaissance breadth can only be gained by recognizing that in addition to his professional, avocational, and familial duties, he found the time to write approximately 1,200 reviews. The number seems superhuman, even in the context of 50 years of reading and writing. Prof. Raymond Siever (1978), an eyewitness to the phenomenon, gives a helpful account: "Those mornings in the smoking room (of the Harvard Geological Museum) I first saw what I had heard about, Kirtley's legendary fast reading, at a speed that would put Evelyn Wood's reading institute to shame. As soon as the book was finished and put down, the fountain pen was picked up and the review was written, rapidly and with free-flowing style. I never could get over that." Volume of books read and speed of reaction to them do not, of course, guarantee analyses which capture the essence of a work or illuminate its strengths and weaknesses. Here is where the reader was rewarded by the Mather abilities to comprehend the key aspect of complex issues and to write concisely but eloquently. More than once an author wrote to say that Kirtley's review was particularly appreciated. Most of the reviews appeared in the *Scientific Book Club Reviw,* the Scientist's Bookshelf of *American Scientist,* or the *Key Reporter* (the quarterly newsletter of Phi Beta Kappa). Robert Millikan, Arthur Compton, Kirtley Mather, and other prominent scientists created the Scientific Book Club in 1929. The expressed goal was to communicate the content and excitement of science to the public and to scientists in all subdisciplines. Mather was chairman of the editorial committee. The July 1954 issue of *American Scientist* contains a retirement-inspired "Valedictory" by Kirtley which outlines his thoughts about the process of reviewing books. It can still be read with profit by anyone concerned with the art of reviewing.

A long life and association with important figures in the sciences and society made it likely that Mather would be in a position to write memorials of major contributors to the development of modern geology in America. When the *Dictionary of Scientific Biographies* was being prepared during the 1970s he wrote the articles on T. C. Chamberlin, R. A. Daly, S. F. Emmons, A. F. Foerste, Waldemar Lindgren, G. P. Merrill, R. D. Salisbury, and C. R. Van Hise. Among others who were remembered in various memorials are W. W. Atwood, Kirk Bryan, and K. C. Heald. Intellectual interest and educational concern were factors in the development of source books in geology which highlighted key writings of authors who had been important in the development of the geosciences. Harlow Shapley, Mather's colleague and friend, was deeply interested in the history of science and apparently was a catalyst for the Mather and Mason source book of 1939. In 1967 the Mather-edited *Sourcebook in Geology,* 1900-1950 was published.

RETIREMENT AS REBIRTH

Retirement is one of life's milestones which can presage decline or open doors to

new opportunities and accomplishments. For the youthful in spirit who also have the intellect and health to respond to the gift of time, the retirement years can be productive as well as enjoyable. Exuberance and intellectual curiosity were Mather hallmarks and thus it is not surprising that his quarter century of retirement was rich in productivity and in pleasure. Reading, writing, traveling, giving speeches, receiving honors, fighting for human rights, teaching and learning — all continued in the period from 1954 to 1978. Low points and sorrows also occurred. In 1968 Kirtley underwent major surgery to evacuate a subdural hematoma (blood clot on the brain). His recovery was superlative but the dynamo had been slowed down. Marie Porter Mather, college sweetheart and wife of 59 years, died in 1971. The trials were severe but the man was indomitable. On 31 May 1977 he married Muriel Speare Williams in a ceremony at Harvard Memorial Church which was characterized by the pastor (Gomes 1978) and those in attendance as being singularly joyful and memorable.

What better project for a retired teacher and administrator than to organize retired associates into a resource pool for lectures and institutes on significant issues, including the topic of retirement? Kirtley was a founder and President (1964-1974) of the Oliver Wendell Holmes Association (OWHA). The Association's motto was a quotation from Justice Holmes: "The subtile (sic) rapture of a postponed power." Its stated purposes were to help people prepare for retirement and to make the years in retirement creative and rewarding. By 1966 the OWHA had conducted a number of institutes on such topics as "Science and Man"; its registry of lecturers numbered 60; and trustees of the Association included Margaret Mead, Harlow Shapley, and leading American industrialists and academics. The August 1968 neurosurgery caused a hiatus in Mather's involvement, but he picked up the reins and continued as active president until Marie's condition deteriorated to the point where she needed constant attention. By the early 1970s the 10-year old experiment with education for older adults had fallen on the hard times related to the economic downturn and drying up of grants. By 1974 the OWHA ceased to exist as a separate organization. Sidney Wallach, the Executive Officer of the Association, wrote Kirtley in 1977 that a description of a new institute for learning after retirement had made him think, "Shades of OWHA! I think you are to be congratulated on the seeds you helped sow."

In addition to his efforts on behalf of the OWHA, Mather was a founder and sole President (through 1975) of the Center for Integrative Education. The organization published *Main Currents in Modern Thought*. He was also a force in the Institute on Religion in an Age of Science (IRAS), a group which included Ian Barbour, Theodosius Dobzhansky, Elisabeth Kübler-Ross, and Jonas Salk. Promoting Enduring Peace, Inc. was yet another organization in which Mather was active as President and member of the national advisory board. Speaking engagements were not limited to OWHA-sponsored meetings. The "retiree" was a Phi Beta Kappa Visiting Scholar, a Danforth Visiting Lecturer, and gave presentations on behalf of the American Academy of Arts and Sciences and the American Association for the Advancement of Science.

As a boy Kirtley was able to travel on his father's railroadman's pass; as a young man he traveled all over North and South America doing field work in geology; and as a mature scholar he was a frequent visitor to Europe. Retirement made the penchant for travel that much easier to schedule. Consider just 2 years, 1960 and 1964. The famous caves of the Dordogne Valley in France were the first highlight of the 1960 trip. Marie's diary goes on in vivid detail to recount the two septuagenarians' eventful itinerary through France to Geneva (YMCA business) and Scandinavia. As President of the American Academy of

Arts and Sciences, Kirtley was a guest of the Royal Society (London) for the 1660-1960 Tercentenary Celebration. The trip culminated with the 21st International Geological Congress in Copenhagen. In November 1964 the Mathers left Cambridge for an around-the-world business and pleasure trip. The sequence of stops included London, Bombay, Delhi (site of the 22nd International Geological Congress), Tehran, Tel Aviv, Jerusalem (for a meeting with Polly Van Leer of the Van Leer Foundation), Cairo, Nairobi, Hong Kong by way of Singapore and Manila, Tokyo and Kyoto to Hiroshima, Honolulu, Albuquerque, Granville, and, by mid-April 1965, Cambridge. A reading of the Mathers' travelogues explains in large part how they could keep up such a pace: they lived for each moment, were constantly open to new experiences, and had that combination of intellect, patience, and tenacity which characterizes the best travelers.

Is it safe to picture our 75-year old professor emeritus on a cruise ship playing a vigorous game of shuffleboard, far removed from the dark clouds of controversy? No, neither shuffleboard nor escape from real-world issues were part of the Mather style. In 1966 the Broward County (Florida) School Board cancelled an OWHA presentation by Mather because it had received anonymous notes that his political leanings were too controversial. The talk was titled "The Impact of Science on Modern Life" and was finally given under private sponsorship. Mather's letter to the editor of the *Ft. Lauderdale News* (24 January 1966) was firm, but not pugnacious, in pointing out the questionable tactics used, the questionable sources cited, and the total lack of willingness on the part of the school board to recognize his many positive contributions to the scheduled topic. The *Miami News* of 28 January 1966 editorialized that "Broward Flunks This One" and the *Miami Herald* 2 days later proclaimed, in an editorial labeled "Shadows Know a Sad Answer," that it took but one telephone call, offering derivative information that never was verified, to undermine what should have been an event of benefit to all intelligent people in the area.

During the "real" retirement years in New Mexico, 1971 to 1978, Mather continued to be involved with reading, writing, and teaching. He was a Visiting Professor (part-time) at the University of New Mexico and a speaker at such gatherings as the Twenty-One Club in Albuquerque. His last public lecture was in November 1976; the subject was "The Scopes Trial and its Aftermath."

ENERGIZING A DYNAMO

It is as difficult as it is fascinating to delve into the question of what causes certain people to attain eminence in their chosen field of endeavor. The mystery can be particularly complex if one rules out family status and connections, a cutthroat attitude of upward-mobility-at-all-costs, or a willingness to compromise principles in order to gain an immediate goal. Without pretending to enter the domain of rigorous psychohistory, I would like to consider a few factors in the human equation which contributed to the success of a railroad agent's son whose career is devoid of a desire for gain at the cost of others and whose principles remained intact throughout a very long life.

Ability is one *sine qua non* of most success stories. From his early days in Chicago, Kirtley Mather demonstrated the intellectual gifts of good memory, creativity, and ability to analyze which are often prerequisites to achievement in academics. Ability must be nurtured at some stage: for some people the nurturing is life-long; others succeed only after breaking out of an oppressive environment. Kirtley was blessed with supportive parents, an exceptional chain of teachers, colleagues of the highest caliber, and 2 bright, independent, yet supportive women as "life's companions." Native ability may be well served by what is called luck or by the serendipity of meeting the right people at

the right time. Kirtley was not given to false modesty, so when he claimed that his path to Harvard was paved with fortuitous contacts the contention deserves some attention. It is true that his major professor at Chicago, Wallace Atwood, moved to Harvard and no doubt was instrumental in having Reginald Daly consider Mather when a position was available. It is also true that Mather's high principles and institutional loyalty made him turn down a 1921 offer to leave Denison in order to go to Clark University as Dean of the College. Marie and Kirtley agreed that it would be unfair to depart from a college which had been generous in granting leaves for the 2 Bolivian expeditions. Had he gone to Clark, it is unlikely that he would have been sought by Harvard in 1923. Given those 2 bits of fortune, however, it must be noted that Atwood would not have utilized the Old Boy network unless he had great confidence in his protégé, and Harvard certainly would not have pursued someone whom they had considerable opportunity to see in action as a guest lecturer and visiting professor unless the candidate's promise was evident.

Internalized beliefs can play a role in an individual's performance. It is something of a cliché but the concept of a Protestant work ethic seems to have been very real for Mather. He was a direct descendant of Puritans and although he did not share their view of the universe he seems to have retained their commitment to productivity in the service of God. Middlekauff's (1971) description of Richard, Increase, and Cotton Mather rings true for Kirtley: "And a few (contemporaries) sensed what was significant in all 3 Mathers — their desire to fuse piety and intellect, to pursue ideas with the heart as well as with the mind, and to bring their thinking constantly to bear on their love of God." The 20th-century Mather was a world traveler whose lifelong optimism had to survive encounters with the poverty of eastern Bolivia or Calcutta and the poverty of spirit displayed by many of his political adversaries in the United States. One of the foundations of such a non-jaundiced view of the world was the belief that the Administrator of the Universe had made it abundantly clear that cooperation among people could lead to the cumulative betterment of humankind. Calvinist beliefs in predestination and helplessness of the individual human were not the templates of Kirtley's faith. He was a doer whose heart and mind engaged whenever he perceived injustice being done. His theater of operation was the world. One positive consequence was involvement at the national and international leadership level of such groups as the YMCA. The negative repercussions came from an internationalist attitude which voiced support for the Loyalist forces in the Spanish Civil War or argued for communication with the intellectuals of the Soviet Union. Not all Americans had quite so broad a concept of world brotherhood. The depth of Mather's charity and civility is evident from the fact that even when accosted in the vilest of terms or when denounced for presumed transgressions, he did not lose a sense of perspective and humor.

Ability and a strong set of principles are not the only elements of the Mather personality. Self-assurance, drive, integrity, a degree of competitiveness, and a soupçon of showmanship were part of the total man. Survival in the tropical jungles of Bolivia or the intellectual jungles of the McCarthy era would not have been possible without the toughness derived from self-confidence. Integrity and combativeness are evident in the letters exchanged between Mather and Denison officials during the Kornhauser affair. Worldliness characterized the decision to turn the publication crank while at Queen's University, his first post-Ph. D. position. Innovative creativity combined with a showman's flair when Mather made the first educational films using sound or when he initiated a radio series on topics dealing with evolution and geology. A discerning audience can, of course, recognize the limits of show-

manship. It is obvious that generations of Harvard students responded even more to the information conveyed, the richness of cross-disciplinary integration, and Kirtley's infectious joy of learning than simply to the excellent packaging of his lectures.

Humans and their actions are too complex to explain with a brief list of attributes. For people who knew him or for anyone reading his voluminous writings, Kirtley Mather can only be understood as a synergism. The range of his interests and abilities is impressive when catalogued, but the spirit of the man was greater than any list of accomplishments can convey.

CONCLUSION

Kirtley F. Mather was a scientist with a religious spirit and a social conscience. Colleagues who knew him well and those who came into fleeting contact with him were struck by his human warmth and the richness of his knowledge. In a memorial prepared by 4 Harvard geologists (Gould, Kummel, Thompson and Siever 1980) and entitled "One of Harvard's Most Inspired and Inspiring Teachers" the observation was made, "None of this can convey a proper sense of the wonderful person that Kirtley Mather was. He had — even for a Harvard professorial renaissance man — a remarkable breadth of intellectual interests, from all the sciences to the humanities and religion." Prof. Stephen Jay Gould was 26 when he first met Kirtley, then 78. In speaking of their 10-year association, Gould (1978) said, "Kirtley remained a man of my time," and he captured the essence of his senior colleague when he went on to recount how Mather's joy of learning, depth of insight, and quality as a human were sufficient to generate a response which could best be described as love for a unique person. A newspaperwoman in Albuquerque, after a brief interview, entitled her report (Kailer 1977) on the 89-year old Mather, "Order, Charm, Assurance Flow from Resident Sage." The bouquets came from all who got to know the man; the brickbats were delivered by people blinded by political or religious bias. One lesson to be learned from a biography of Mather is that many people are too willing to condemn persons or ideas they do not understand. The more optimistic response is to celebrate the life and contributions of a respected scientist whose involvement with the world transcended disciplines.

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