of this line or lines awaits the spectroscopists, but we know that the radiation is atmospheric from its irregular behavior throughout the night.

A communication from Dr. V. M. Slipher confirms the presence of this strong infrared radiation in the night sky, but he has not yet determined the wave-length. A rough comparison of the observed relative galvanometer deflections along the spectrum of the sky with the deflection from a star of spectrum dF7 is as follows:

Wave-length	3,530	4,220	4,880	5,700	7,190	10,300
Deflections, dF7	8	8	10	8	8	8 mm
" Sky	8	5	5	8	13	112 mm

Also, compared with other regions of the spectrum, the infrared has varied from summer to summer somewhat as follows:

1941	60
1942	80
1943	112

One is naturally suspicious of a connection with the sunspot cycle.

Even with this handicap of the sky radiation the new color system which we call C_3 can be used on the brighter nebulae, and we have started of course with M31, the Andromeda nebula, just to see what would happen. It turns out that there is a difference in the color of the two sides of the nebula which, if interpreted as the effect of space reddening like that in the galaxy, gives at once the ratio of total to selective absorption. The new results may be summarized briefly. Let A_{pg} be the total photographic absorption, E_1 the old, E_3 the new, and E the international color excess, respectively. Then the different relations and the basis for each are as follows:

(1)	$A_{pg}/E_3 = 2.01 \pm 0.10$	(p.e.)	Andromeda nebula
(2)	$E_3/E_1 = 3.86 \pm 0.13$		Reddened B stars
(3)	$A_{pg}/E_1 = 7.8 \pm 0.5$		(1) × (2)
(4)	$E/E_1 = 1.90 \pm 0.12$		Seares, A stars
(5)	$A_{pg}/E = 4.1 \pm 0.4$		(3)/(4)

The weak step in the sequence is presumably in (4), the ratio of the international to the photoelectric scale. The result by Seares is from 52 A-type stars near the north pole, and is actually the ratio of the colors C/C_1 rather than the color excesses E/E_1. The latter ratio is probably higher than the former. Unfortunately, nature has given us few B stars in the vicinity of the pole, and the interstellar absorption there is too small to give a reliable comparison of the two scales of space reddening.

It should be emphasized again that these results depend upon the assumption that selective absorption in the Andromeda nebula is the same as in the galaxy, also that the apparent surface brightness of the nebula for the regions measured would be symmetrical about the nucleus if there were no such absorption. However, the ratios in equations (3) and (5) look reasonable and the value $A_{pg}/E = 4.1$ will probably be welcomed by those who have claimed that a higher value of this ratio does not agree with the conclusions from star counts and other evidence in the galaxy.

Incidentally, if we assume that the absorption is caused by a thin layer near the median plane, these photoelectric results are in agreement with the view that the main dark lane of the nebula is on the near side, and therefore that the direction of rotation is such that the arms of the spiral are trailing.

I have included these examples from photometry not so much to illustrate the application of the law of diminishing returns as to show some efforts to combat that law. Perhaps the difference between the law of diminishing returns and the law of increasing returns is merely the difference between looking backward and looking forward. It has been well said that just as soon as a problem becomes easy it ceases to be research; if you are doing real research you are likely to be in difficulties most of the time. We have it from Bobby Jones that there is no easy shot in golf. If it is easy to get your ball on the green you should be aiming at the pin.

If I were to draw any moral from these remarks, it would be to remember that it takes only a slight improvement over what has gone before to open up entirely new opportunities. If the law of diminishing returns seems to prevent us from doing something better, we can always try to do something different.

OBITUARY

HERMAN LEROY FAIRCHILD
1850–1943

ON the 29th of November Emeritus Professor Fairchild, of the University of Rochester, long an outstanding figure in American geology, passed on at the age of 93 years. Professor Fairchild was the last of a famous geological group belonging to an earlier generation, boasting many names that will be remembered as long as geologic science, as we know it, lasts.

For more than 70 years he devoted his life to education in science—teaching, lecturing, organizing, advising, investigating and writing—all with marked success. His more than 200 published writings covered a wide field and shed luster on the institution that he served with great devotion for more than a half century. He contributed much to organized science. No one in his time was more continuously engaged or more successful in developing scientific organizations to larger usefulness. He was a constructive person. Whatever he touched seemed to be improved. Every

organization grew. And it was at least in part his enthusiasm and confident service that made them grow.

In his early years, fresh from college, he became secretary of the New York Academy of Sciences. For sixteen years he was secretary of the Geological Society of America. For very many years longer he maintained close administrative and advisory relations with the American Association for the Advancement of Science, becoming a member of its executive and policy committee. He was the guiding spirit of the Rochester Academy through more than a life-time. His intimate knowledge of the steps that led to their founding and development in each case made him the natural authority on their history, and his volumes are everywhere consulted on these matters.

To Harmon C. and Mary A. Bissell Fairchild the boy named Herman Le Roy was born on April 29, 1850, at Montrose in northeastern Pennsylvania, where his boyhood and youth were spent on a farm, and where also, he secured from country schools the foundations of an education that gave bent to a long lifetime of surprisingly productive effort and wide influence. It should be noted, also, that he began at this time to show interest in geology by making a collection of fossils of his own. Later he was to develop special interest and reputation in glacial history and the interpretation of surface features of the lands affected by those events.

At the age of sixteen he began teaching in a country district school, boarding around, where he developed a liking for public speaking and a facility of expression that was to make him a powerful figure in later years. After three winters of this elementary work he was employed an additional year as clerk in a local railway freight office, but this seems to have been strictly a side issue, probably to raise funds for college. For at the age of twenty, he entered Cornell University, where he completed a regular college course and earned a B.S. degree in 1874.

Not much is known of his activities there. But it appears from subsequent events that he must have developed special competence in exposition and indulged his gift in public speaking, for it is recorded that he was a competitor for a prize in oratory. The very same year he began public lecturing, which he followed as a personal interest with marked success through all other changes for more than fifty years.

His chief life's effort, however, was spent in teaching in established educational institutions and in scientific and civic endeavor growing out of these relations. His 276 titles, several of them books and monographs, furnish a measure of his productive scholarship. Immediately upon completing his college course at Cornell, he was engaged as a teacher of natural sciences in Wyoming Seminary, at Kingston, Pa., and while there he married Miss Alice Egbert.

After only a couple of years at this place near his boyhood home, he found opportunity to continue educational and scientific work in New York City. In that city and vicinity he gave more than a hundred lectures in schools and other institutions in the first year. This was followed by a year as instructor in geology at Vassar College, and several years in Cooper Union. In that time, also, he became secretary and editor of the New York Academy of Sciences and in 1887 published a history of the Academy, which to date is the most authoritative statement of its development dating from Colonial to recent times.

During this time also he came in close contact with the American Association for the Advancement of Science. He was local secretary of the first New York meeting in August, 1887. Thereafter he held many posts in that rapidly growing organization. He was local secretary for the Rochester meeting, 1892; secretary of the council, 1893; general secretary, 1894, and member of the executive committee or committee on policy for more than thirty years. In the meantime, also, he served with the late J. McK. Cattell and others on revision of the constitution and rules, and published a brief historical account of the association in SCIENCE (Vol. 59, 1924).

He was an active member of that organization through a critical period characterized by integration and realignment of expanding scientific interests. Thus he came to be intimately concerned with developments that led to the founding of the Geological Society of America out of the overflow from Section E, which still continued to operate. He was one of the thirteen original founders of the new Geological Society as already noted, and he with Dr. Alexander Winchell formulated its first constitution and by-laws. Soon thereafter, he became secretary of the Geological Society, and was its effective administrative head for sixteen years, serving through its early formative years and probably impressing on it more of his ideas than any other man. After his retirement from the secretaryship he was honored by election to the presidency in 1912, and later was the author of its only History, which was published under the title "The Geological Society of America, A Chapter in Earth Science History," New York, 1932.

At the age of 38, long before these later events, and close upon his engagements in New York City, Fairchild had accepted a call to the University of Rochester, where he was to spend the rest of his long life. He became professor of geology and natural history there in 1888–1896 and professor of geology, 1896–1920. For ten years he was secretary of the faculty, and for thirty years curator of the Geological Museum, containing the famous Henry A. Ward Collection of geological material. In 1920 he became emeritus professor. Thus for more than twenty years he had

lived in retirement from full academic service, but his activities other than teaching were continued and he was honored conspicuously at various times in these later years. A bronze portrait bust was presented to him in 1932 by the Rochester Academy of Sciences, and in 1938 he was honored by the first award of the Rochester Municipal Museum, which took the form of a silver medal for civic achievement.

Through all his active years he continued public lectures on geology and energetically pursued investigation in his favorite branch of that science, becoming an outstanding authority on glacial geology, especially the glacial history of his own state and adjacent region. He was an official member of the New York State Geological Survey for many years and was author of several of its bulletins.

Professor Fairchild was an exceedingly active and influential man. He was widely known for his enthusiastic earnestness and evident confidence in the worthwhileness of his undertakings. No one who saw his powerful figure in action in his prime would have imagined that he had been physically frail as a child. Yet that is in the record. With the passing of youth, however, aided doubtless by his persistence in out-of-door life and in following his geological field studies, he had grown greatly in physical strength and in like measure in intellectual power. His presence was encouraging and he was welcome wherever he went. He always had an interesting contribution to make, and usually made it with telling effect. In a controversy or conference he was habitually on the winning side. But his influence was always thrown to the side that stood for orderliness and for serious-minded cooperation and for sound service in the public interest, no matter what difficulties had to be faced.

He was a born teacher with a distinct flair for popularizing. He was a far-sighted organizer and an adviser of unusual competence. He has left an indelible mark greatly to his own credit and much to to the benefit of at least four outstanding scientific organizations of this country—the American Association for the Advancement of Science, the Geological Society of America, the New York Academy of Sciences and the Rochester Academy of Sciences, and they have all lavished honors upon him. He served one of the outstanding colleges of university grade for more than fifty years, helping materially in giving it high standing in science—in the meantime making steady contribution to a better knowledge of his special branch of geologic science.

The writer of this brief note has special reason to feel his loss, for Fairchild was his earliest predecessor in one of these fields. Three years ago, in honor of his ninetieth birthday, the Geological Society presented him with a volume of letters to which he made response under date of May 1, 1940, in the following terms, "In the flood of messages and gifts, anent April 29th, the choicest and most highly appreciated is the handsome volume of letters from the Fellows of the Geological Society. This is the capstone of my scientific monument. For this I am deeply grateful to you. And I send thanks and appreciation to your office aids and the writers of the letters." By this time Professor Fairchild's physical disabilities interfered with his own reading. But of this he wrote: "with great pleasure I have listened to the reading of these cherished messages. Memory is quickened by the mention of old-time happenings, and emotion is stirred by the words of friendship, affection, approval, commendation and praise. I wish I could send personal individual reply to each writer."

Professor Fairchild long outlived the closest associates of his active days. A new generation has come into full possession of the fields since his formal retirement. He belonged to a period in which the public was beginning to take live interest in geologic science, and, to a large following, he was its prophet. He belonged to a time, also, when there was a growing need of conference and discussion. Investigation blazed with discovery. Principles were formulating. New forces were becoming engaged in factual search and the urge for meetings-together became a compelling force. In this situation Fairchild's special abilities came into fortunate relation and his talents were applied with telling effect.

He is survived by his second wife, Minnie C. Michael, whom he married in 1924, and two daughters, four grandchildren, and one great-grandchild.

In memory of a poetically gifted daughter, who died in early womanhood, the Lillian Fairchild Fund was established by him, providing an annual award to a young artist poet or writer. His own works are his memorial—these together with the affection lingering in the hearts of those who had listened to his vibrant voice and who had fallen under the spell of his impressive personality and had caught his message.

CHARLES P. BERKEY

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DEATHS AND MEMORIALS

DR. CHANCEY JUDAY, since 1931 until his retirement with the title emeritus three years ago professor of limnology at the University of Wisconsin, died on March 29 at the age of seventy-two years.

DR. KURT LAVES, associate professor of astronomy, emeritus, of the University of Chicago, died on March 25 in his seventy-eighth year.

DR. ROBERT ANTHONY HATCHER, who retired in 1935, after serving for twenty-seven years as pro-