NATIONAL ACADEMY OF SCIENCES

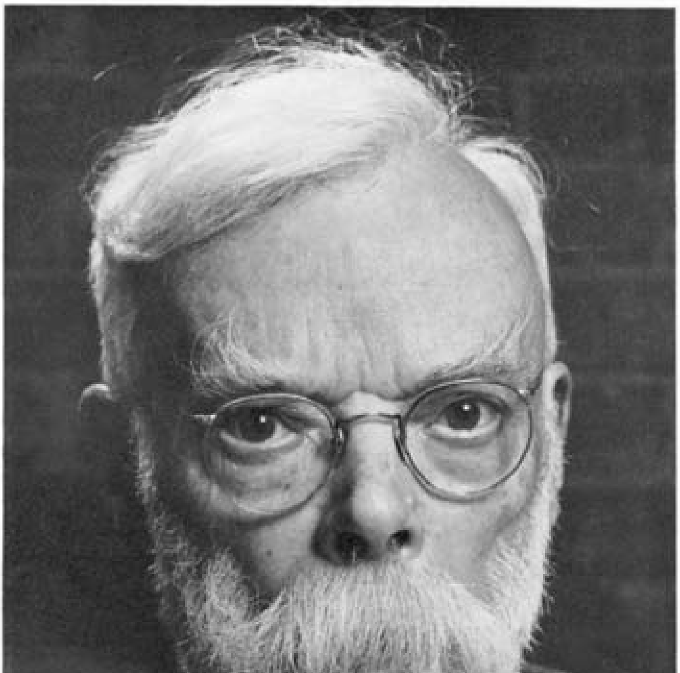
ANDREW COWPER LAWSON

1861—1952

A Biographical Memoir by

PERRY BYERLY AND GEORGE D. LOUDERBACK

Biographical Memoir



Andrew C. Lawson

ANDREW COWPER LAWSON

July 25, 1861—June 16, 1952

BY PERRY BYERLY AND GEORGE D. LOUDERBACK

ANDREW COWPER LAWSON was born in Scotland at Anstruther, a village on the Firth of Forth, July 25, 1861, the first of a family of ten. In his sixth year his parents moved to Hamilton, Ontario, where he received his early education. The father died when Andrew was young, and as eldest son he was more a father than a brother to his sisters and brothers. Andrew's mother was a correspondent for a Glasgow newspaper, writing principally on the life and ways of Americans. As such she traveled a good deal, leaving young Andrew with even more responsibility. He was admitted to the University of Toronto in 1879, but for financial reasons remained at the Collegiate Institute of Hamilton and worked as a reporter on the Hamilton *Spectator*. He entered the University in January 1881 as a sophomore, and supported himself by tutoring and occasional newspaper writing. At the close of the semester he answered an advertisement for an assistant on a weekly paper in Montreal, and was accepted on the basis of his newspaper experience. Arriving at the office, he was surprised to learn that it was a financial sheet, *The Shareholder and Insurance Gazette,* a field of which his knowledge was "extremely limited." However, he so favorably impressed the proprietor that by the end of summer he was offered a permanent editorship at an increased salary. But he felt that his editorship of a financial paper was a sham, resigned, and decided to go back to the University.

As acting editor he had three days a week free, and he used them

to become acquainted with the geological features of the surrounding country. He collected minerals and Paleozoic fossils and was thrilled by the recognition of glacial phenomena and evidence of subsidence and elevation of the land. At the opening of the fall semester at McGill University he attended some lectures on geology and mineralogy and was particularly impressed by Dawson.

At his boarding house there was a medical student with whom he used to talk in the evenings. As a result Lawson got the idea of going into medicine. He attended some of the lectures and spent some time in the laboratories, where he was accepted as if he were a regular student. He was particularly attracted by the later-to-become-famous Osler, of whom he asked permission to attend his laboratory, telling him that he was considering taking up the study of medicine. Osler had a small class and gave him a friendly welcome. One afternoon Lawson found Osler with his apron on and sleeves rolled up, examining a liver. He said it belonged to a patient of his, an old lady, who had just died. Previously relatives had demanded consultants, and each in turn, to the number of five, had disagreed with Osler's diagnosis and treatment. A post-mortem had been held to settle the question, and here was her liver! And here, he said, as all ten fingers dove into it, was the proof of his diagnosis, and with great glee he held it up for Lawson's inspection. On the way home to his boarding house Lawson felt rather squeamish and abandoned all thoughts of studying medicine; geology thereby gained another votary!

Lawson received his B.A. degree at Toronto in 1883 as gold medalist in natural science. He immediately joined the staff of the Canadian Geological Survey and was assigned to field work about the Lake of the Woods. The work covered three field seasons, and was followed by two seasons in the Rainy Lake region. These studies resulted in a new interpretation of the Precambrian. The Laurentian, previously regarded as the oldest known formation and made up of metamorphosed sediments, was discovered to be a granite with well-exposed intrusive relations to metamorphic rocks, chiefly volcanic, but in part sedimentary, formerly referred to the Huronian but dis-

tinguished therefrom by Lawson under the name Keewatin. At Rainy Lake another sedimentary series was found underlying the Keewatin, which he named Coutchiching and recognized as the oldest rocks of the region. These ideas were considered rank heresy, and his report of 1887 was blue-penciled out of all resemblance to what he had intended to say. It was only after a hard fight, his first of many geological contests, that he salvaged the essential part for publication. He decided to present his ideas to the International Geological Congress in London in 1888, and there he was gratified and encouraged by a kindly reception and the acceptance of his views as a point of departure for further studies of Precambrian geology.

For several years he had attended the regular sessions at The Johns Hopkins University and in 1888 he received the Ph.D. degree. Following this he took up field studies in the Lake Superior region. The result was a paper in the first volume of the *Bulletin of the Geological Society of America* on the pre-Paleozoic surface of the Archaean terranes of Canada, which first recognized the peneplanation of the continental basement on which the Paleozoic rocks were deposited.

Early in 1890 Lawson resigned from the Canadian Survey, moved to Vancouver, and set up as a consulting geologist. He studied the coal fields at Nanaimo and on the Queen Charlotte Islands. On his return to Vancouver he found an invitation from Professor Joseph Le Conte to join the Geology Department of the University of California, which he accepted. He was appointed Assistant Professor of Mineralogy and Geology in October 1890. He remained a member of this department for the rest of his life, becoming Associate Professor in 1892, Professor in 1899, and Professor Emeritus in 1928.

As to Lawson's California appointment, Professor Le Conte explained that he brought this able young man to the University to develop the scientific side of the subject so that he could devote himself to the philosophical side. Lawson lived up to the expectation. He found the unsolved problems of his new surroundings very stimulating and spent all the time available, either alone or with his students, in observation, mapping, and interpretation of Coast Range geology,

to the understanding of which he contributed much. He was so wrapped up in this work that the first Mrs. Lawson, when asked what his religion was, said, "He is a geologist."

His chief university work in the first years at Berkeley was the organization of instruction in mineralogy and petrography and the development of a systematic field course in geology (as distinguished from field excursions)—the first such course in the West and possibly in America—and in interesting advanced students in the detailed study of the Coast Ranges. He also established the first scientific publication series at Berkeley, the *Bulletin of the Department of Geology, University of California,* now in its forty-fourth volume, and was its editor for thirty-five years. The first number appeared in May 1893, a paper on the geology of Carmelo Bay by Lawson and Posada (a student), in which it was shown that the Miocene rocks, described by the California Geological Survey as intruded and metamorphosed by granite, lay unconformably on the granite, and although folded were not metamorphosed. The activity engendered by Lawson's enthusiasm is indicated by the fact that in two years ten papers appeared in the Bulletin, seven by his first small group of graduate students: Charles Palache, F. L. Ransome, and H. W. Fairbanks.

LATER RESEARCH

In the summer of 1891, on the invitation of the Minnesota Geological Survey, Lawson leveled the abandoned strands on the north coast of Lake Superior and studied the anorthosites of the Minnesota coast and the Logan sills of Thunder Bay. The reports were published within the next two years. Having become interested in the raised beaches observed in his Carmelo Bay study, he made reconnaissance trips along the whole coast of California and described the widespread occurrence of these beaches and their indications of recent diastrophic movements in "The Post-Pliocene Diastrophism of the Coast of Southern California" (1893) and "The Geomorphogeny of the Coast of Northern California" (1894). In 1902 he published, in

collaboration with Charles Palache, "The Berkeley Hills," the result of detailed study over some ten years, followed by "The Eparchean Interval," a plea for the importance of that time break, two petrographic papers entitled "Plumasite" (1903) and "The Orbicular Gabbro at Dehesa" (1904), "The Geomorphic Features of the Middle Kern" (1906), "The Tehachapi Valley System," and "The Copper Deposits of the Robinson Mining District" (1906). These titles indicate his wide geological interests at the time.

The great California earthquake of April 18, 1906, created a demand and an unusual opportunity for a scientific study of the phenomena. The Governor of California appointed a State Earthquake Investigation Commission of eight members, and at its first meeting Lawson was elected chairman. He organized the field work to get as complete coverage as possible, and many geologists and others contributed their services and reports of their observations. Lawson spent the winter of 1906–1907 in Washington compiling and editing these reports and prepared an introduction, a section on the geology of the coast system of mountains, and many explanatory statements and summaries to weld the work into an organic whole. It was published in 1908 by the Carnegie Institution of Washington. A second volume on the mechanics of earthquake was prepared by H. F. Reid, a member of the Commission, and published in 1910. Altogether the report was the most complete and informative treatise that had been published on a great earthquake and stands as a milepost in the development of an understanding of earthquake origin and mode of action. It initiated the theory of elastic rebound of the origin of tectonic earthquakes.

In 1911, at the request of the Director of the Geological Survey of Canada, Lawson spent the summer in a restudy of the Rainy Lake region and recognized that the granites classed as Laurentian were actually of two widely different ages, the one pre-Huronian, the other post-Huronian. The latter was given the name Algoman. Well-preserved Lower Huronian fossils were found and reported in "The Geology of Steeprock Lake, Ontario" (1912). At the Toronto meet-

ing of the International Geological Congress (1913), Lawson presented "A Standard Scale for the Pre-Cambrian Rocks of North America."

In 1914 the U. S. Geological Survey published the *San Francisco Folio,* which included five quadrangles in the San Francisco Bay region, the product of field work from time to time, between 1891 and 1911, by Lawson with the assistance of various students.

For several years Lawson was particularly interested in the western desert region, and this resulted in a number of significant papers: "The Recent Fault Scarps at Genoa, Nevada" (1912), "The Petrographic Designation of Alluvial-Fan Formations" (1913), and "The Epigene Profiles of the Desert" (1915). His continuing interest in the origin of ore deposits was shown by "Is the Boulder Batholith a Laccolith?—A Problem in Ore Genesis" (1914) and "Ore Deposition in and near Intrusive Rocks by Meteoric Waters" (1914).

In the early 1920s Lawson developed an active interest in isostasy. He believed that the importance of isostatic adjustment in many geological processes and as the determinative agent in the production of certain structural relations and topographic forms was not adequately recognized. Encountering some doubts and even opposition to some of his contentions, he became a persistent and vehement crusader for his ideas, and almost all of his publications from then on were devoted to the furtherance of the subject. They include a number of general theoretical papers which develop the logical geologic consequences of isostasy with reference to mountains, deltas, fluctuations of sea level, et cetera, and a similar number of papers in explanation of the origin of structural and geomorphic features of specific geographic entities such as "The Continental Shelf off the Coast of California" (1924), "The Cypress Plain" (1925), "The Cordilleran Shield" (1928), "The Atlas Mountains of Morocco" (1931), "The Isostasy of the Uinta Mountains" (1931), "Insular Arcs, Foredeeps, and Geosynclinal Seas of the Asiatic Coast" (1932), "The Eparchean Peneplain" (1934), "The Sierra Nevada in the Light of Isostasy," (1936), "Mississippi Delta" (1942), and "Sea Bottom off the Coast of California" (1950), some eighteen papers in all.

AT THE UNIVERSITY

With the gradual increase in students and staff of the department and the change in his major interests, Lawson changed his subjects of teaching. The three fundamental lines that he organized when he first came to Berkeley were successively passed on to others: mineralogy by 1901, petrography by 1906, and field geology by 1915. In 1898 he took over general physical geology from Le Conte and later he organized courses in economic geology (1900) and the physical geology of North America (1902), and a seminar on the geology of California (1904). The first three of these, together with a graduate seminar called Inorganic Geology, organized in the early nineties, he continued until his retirement. This seminar, based on the exposition and discussion by the students of assigned papers, was for them a valuable experience and the one they best remembered because of the characteristic sharp Lawsonian criticism to which their reports and reasoning were subjected.

Lawson took an active interest in faculty affairs and served on various committees, especially the editorial and library committees, of each of which he was chairman for a number of years. On the death of Dean Christy he accepted temporarily (December 1914) the deanship of the College of Mining, which he held for three and a half years, during which he developed a new and more flexible curriculum for the college. In 1919 he took an active part in a movement that resulted in a reform in the organization of the faculty of the University and its relation to the administration.

OTHER ACTIVITIES

Lawson was a great believer in travel to broaden one's knowledge of geology by firsthand acquaintance with its expression in various parts of the world. He traveled widely in North America, Europe, Africa, and Australia, and visited Java, India, and Japan.

In 1898-1899 he took a leading part in organizing the Cordilleran Section of the Geological Society of America and was its first Secretary (1900-1905); Chairman (1907-1911). He was away from Cali-

fornia when the Seismological Society of America was organized in 1906, but was elected First Vice-President of the new society and took an active part in its affairs on his return.

Lawson was a penetrating observer and a stimulating and fertile thinker. He approached a new problem with an open-minded scientific attitude and was ready to consider any suggestions. But once having arrived at a conclusion, by however slight a preponderance of evidence, he would defend it vigorously against all opposition. This gave rise at times to sharp and even acrimonious debate. Because of the definiteness and positiveness of his statements and his ability of quick retort, he was considered an effective expert witness in court cases.

Many stories were told by his students and colleagues about the colorful professor. Some were stories told about old professors in most universities. But one he acknowledged. In a mining trial the opposition lawyer said, "Professor Lawson, do you mean to say that you know what goes on in the bowels of the earth?" The answer was, "Young man, the earth has no bowels!"

Throughout his professional life he was a consultant in economic geology and had visited most of the mining camps of North America. He was also consulted on a number of engineering projects.

In addition to geology, he had a number of other interests. He was one of the founders of the Faculty Club and for many years was a regular and active attendant of the Kosmos Club and the Berkeley Club, both discussion groups of wide range.

His hobby was the collection of paintings and, in the course of his travels in Europe and America, he purchased many that appealed to him. He also enjoyed building activity, and when his art collection became large enough he personally constructed an art gallery addition to his home. His interest in nature was not simply scientific. He had a deep feeling for its beauty and serenity as is evidenced by certain poems which he wrote. His verses, however, were not limited to the appreciation of nature but were on various themes which gave evidence of his kindly, sentimental, and philosophical traits only

rarely shown otherwise to his aquaintances. Three of his poems follow:

The Scavenger

I looked in the eyes of Death and found nor hate
Nor love; no passion there, but purpose clear;
A gaze serene that brooked of no debate,
Nor any knowledge had of human fear.

"O Death!" I asked, "What may thy purpose be?"
"I clear the way for Life," Death said. "All things
Obey the unchanging law of change through me;
Through me each hour another cosmos brings."

"And Life? O Death! What may Life's meaning be?"
"Life is the meteor gleam of Soul sublime,
In solitary flight through eternity,
Impinging on the atmosphere of Time."

"And Soul? O Death!" But Death's eyes wavering fell.
"I'm but the scavenger. I cannot tell."

Esdraelon

Ay! Blush, O fateful field of Esdraelon
And let your poppies hide their heads in shame!
Here grappled hate with hate in days long gone;
Here lie the pawns of Conquest's greedy game.

Here Egypt drove her armies o'er the pass
That leads from Sharon's plain; and swarming down
Between the tels laid low the Syrian mass,
That hoped Thutmose's pride in blood to drown.

And since that day the kings of East and West
Have met before the hill of Nazareth
For slaughter, in their sorry, regal quest
To prove the potence of the reign of Death.

From Carmel to the Sea of Galilee,
The poppies blush that ever kings should be.

The Vale of Tyringham

O! Vale of Tyringham! The wooded hills,
That girdle round about your meadows green,
Are beautiful as hope that life fulfills;
Your vistas lovely as are thoughts serene.

From Cobble's crest the sunset is the same
As long ago—the berry patch unchanged.
The grassy glades with flowers are all aflame,
As when in joyous youth your slopes I ranged.

How fragrant are the memories that float
Upon the breeze that softly moves the pines!
The gale! How it recalls great days remote,
As by my blazing hearth a friend reclines.

Ah! Long ago, when faith was unrestrained,
Not memories, but hopes my soul sustained.

PERSONALIA

One of the authors (Byerly) of this memorial developed an entirely different relationship with Lawson than did the others in the department. He could disagree with Andrew and not arouse his ire. It came about in this fashion. When Byerly was a young instructor (Lawson's last appointee before he became emeritus) Lawson came to him saying, "My interest in isostasy is leading me to embark on certain mathematical calculations. You must check them and criticize so that I will not make a fool of myself." The first such criticism was made by young Byerly in fear and trembling. Lawson flushed and pounded on the table, shouting, "We won't get angry!" The day finally came when Byerly could say, "This reasoning is unsound," only to meet with the mild rejoinder, "I know, but I am too far committed to the idea to abandon it now."

Professor Lawson's relations with Professor Bailey Willis of Stanford University were a matter of interest and sometimes of concern to their younger colleagues. Up to the time of the construction of the Golden Gate Bridge their relations were formally cordial except for open arguments in scientific meetings. Byerly remembers riding in the late Father Macelwane's Model T Ford with Lawson and Willis (Macelwane at the wheel) from San Francisco to Palo Alto. Such a ride was not conducive to anything except anxiety. However, Willis made one cryptic remark that Byerly has not forgotten: "Professor Lawson, I recently had the privilege of voting at the time of your election to the National Academy of Sciences." How he voted was undisclosed. However, when Lawson rather than Willis was chosen as geologist for the new bridge, relationships were broken openly. Willis used the San Francisco weekly, the *Argonaut,* to attack the geological location of the bridge. Thereafter the two men did not attend the same meetings or speak to each other. But several years after Willis died, Andrew put up Willis's picture in his office.

Willis had always claimed that the major faults of California curved with depth toward the Pacific, joining in a major thrust at depth. Lawson had seen in the arcuate form of California's coast line the outcrop of a thrust dipping inland. The last major manuscript Lawson brought to Byerly to criticize presented the Farallon Islands as being on the lip of a thrust dipping under the Pacific. Byerly cried out, "You can't do this—it agrees with Willis and not with Lawson!" A slow, rare smile crept over Andrew's face. "You know, Byerly, occasionally Willis was right, and this is one of those cases."

When Lawson entered, saying, "Byerly, write me the equation of a hill," he was met by consternation. However, the request was met, as a 1939 reference indicates.

On the approach of Andrew's ninetieth birthday, his old student and his second in command of the department in the old days, Professor George D. Louderback, conceived the idea of collecting from those who had been his graduate students letters of congratulation.

Since Professor Lawson had become irked at Louderback regarding certain ideas on faulting and earthquake intensity which the latter had published, Byerly had to front in the matter, but the labor of love was George Louderback's. Some sixty letters were collected (one from a man older than Lawson). Most of the letters harked back to long ago. One was from Eleanora Knopff. As an entering graduate student, she went to see her adviser, Lawson, telling him what she planned to do in her graduate work in geology. Said Lawson, "Young lady, pack your bag and go home—a graduate student here does what I tell him to do. I do the planning." George Louderback had the letters bound in soft leather, but the presentation had to be made by younger men, for it was feared Lawson might refuse it if he knew whose labor it represented.

Lawson was a Fellow of the Geological Society of America (President, 1926) and the American Association for the Advancement of Science, a member of the Society of Economic Geologists, American Academy of Arts and Sciences, Seismological Society of America (President, 1909), National Academy of Sciences (elected in 1924), and American Philosophical Society, and an honorary member of the American Association of Petroleum Geologists. He was chairman of the Division of Geology and Geography, National Research Council (1923-1924). His accomplishments were recognized by the award of the honorary degrees of D.Sc., University of Toronto (1923), LL.D., University of California (1935), and D.Sc., Harvard University (1936), and of the Hayden medal of the Philadelphia Academy of Natural Sciences (1936) and the Penrose medal of the Geological Society of America (1938).

In 1889 Lawson married Ludovika von Jansch of Brüun, Moravia, while he was still on the Canadian Geological Survey. She died in 1929. In 1931 he married Isabel R. Collins of Ottawa. He had four sons by his first wife and one by his second. He died June 16, 1952, and is survived by his widow and three sons.

Andrew Cowper Lawson lived a long and active life, during which he contributed abundantly and significantly to geology and the train-

ing of geologists. His was a remarkable personality of many facets: stimulating, provocative, friendly, crusty, kindly, irascible, the positive influence of which was felt by all with whom he came in contact.

KEY TO ABBREVIATIONS

Am. Geol. = American Geologist
Am. J. Sci. = American Journal of Science
Bull. Geol. Soc. Am. = Bulletin of the Geological Society of America
Bull. Natl. Research Council = Bulletin of the National Research Council
Bull. Seismol. Soc. Am. = Bulletin of the Seismological Society of America
Bull. Univ. Calif. Dept. Geol. = Bulletin, University of California, Department of Geology
Bull. Univ. Calif. Publ., Dept. Geol. = Bulletin, University of California Publications, Department of Geology
Bull. Univ. Calif. Publ., Dept. Geol. Sci. = Bulletin, University of California Publications, Department of Geological Sciences
Geol. Nat. Hist. Survey Canada, Ann. Rept. = Geological and Natural History Survey of Canada, Annual Report
Geol. Survey Canada Mem. = Geological Survey of Canada, Memoir
J. Geol. = Journal of Geology
Minn. Geol. Nat. Hist. Survey Bull. = Minnesota Geological and Natural History Survey, Bulletin
Proc. Canadian Inst. = Proceedings of the Canadian Institute
Proc. Geol. Soc. Am. = Proceedings of the Geological Society of America
Sci. Mo. = Scientific Monthly

BIBLIOGRAPHY

1885

Report on the Geology of the Lake of the Woods Region, with Special Reference to the Keewatin (Huronian?) Belt of the Archean Rocks. Geol. Nat. Hist. Survey Canada, Ann. Rept. Vol. 1, Report CC. 151 pp.

1886

Some Instances of Gneissic Foliation and Schistose Cleavage in Dikes and Their Bearing upon the Problem of the Origin of the Archean Rocks. Proc. Canadian Inst. (3), 4:115–27.

1887

Geology of the Rainy Lake Region, with Remarks on the Classification of the Crystalline Rocks West of Lake Superior: Preliminary Note. Am. J. Sci. (3), 33:473–80.

1888

Report on the Geology of the Rainy Lake Region. Geol. Nat. Hist. Survey Canada, Ann. Rept. Vol. 3, Part F. 182 pp.

Notes on Some Diabase Dikes of the Rainy Lake Region. Proc. Canadian Inst. (3), 5:173–85; Am. Geol., 1:199–211.

With F. D. Adams. On Some Canadian Rocks Containing Scapolite, with a Few Notes on Some Rocks Associated with the Apatite Deposits. Canadian Record of Science, 3: 185–201.

1889

Foliation and Sedimentation. Am. Geol., 3:169–78, 276–79.

1890

Note on the Pre-Paleozoic Surface of the Archean Terranes of Canada (with discussion by J. W. Spencer). Bull. Geol. Soc. Am., 1:163–73.

Note on the Occurrence of Native Copper in the Animikie Rocks of Thunder Bay. Am. Geol., 5:174–78.

The Internal Relations and Taxonomy of the Archean of Central Canada. Bull. Geol. Soc. Am., 1:175–93.

1891

With F. T. Shutt. Petrographical Differentiation of Certain Dikes of the Rainy Lake Region. Am. Geol., 7:153–64.

Lake Superior Stratigraphy. Am. Geol., 7:320–27, 388.

The Archean Geology of the Region Northwest of Lake Superior. Fourth International Geological Congress, London, 1888, Compte Rendu, pp. 130–52.

1893

The Anorthosites of the Minnesota Shore of Lake Superior. Minn. Geol. Nat. Hist. Survey Bull., No. 8, pp. 1–23.

The Laccolitic Sills of the Northwest Coast of Lake Superior. Minn. Geol. Nat. Hist. Survey Bull., No. 8, pp. 24–48.

Sketch of the Coastal Topography of the North Side of Lake Superior, with Special Reference to the Abandoned Strands of Lake Warren. Minn. Geol. Nat. Hist. Survey, Twentieth Annual Report, pp. 181–289.

The Cordilleran Mesozoic Revolution. J. Geol., 1:579–86.

The Geology of Carmelo Bay. Bull. Univ. Calif. Dept. Geol., 1:1–59.

The Post-Pliocene Diastrophism of the Coast of Southern California. Bull. Univ. Calif. Dept. Geol., 1:115–60.

The Norian Rocks of Canada. Science, 21:281–82.

1894

The Geomorphogeny of the Coast of Northern California. Bull. Univ. Calif. Dept. Geol., 1:241–71.

A Multiple Diabase Dike. Am. Geol., 13:293–97.

Note on the Chehalis Sandstone. Am. Geol., 13:436–37.

1895

Sketch of the Geology of the San Francisco Peninsula. U. S. Geological Survey, Annual Report, pp. 399–476.

A Contribution to the Geology of the Coast Ranges. Am. Geol., 15:342–56.

1896

On Malignite, a Family of Basic Plutonic Orthoclase Rocks, Rich in Alkalies and Lime, Intrusive in the Coutchiching Schists of Poobah Lake. Bull. Univ. Calif. Dept. Geol., 1:337–62.

1897

The Geology of San Francisco Peninsula. J. Geol., 5:173–74.

1900

Review of *The Geology of Minnesota,* volume 4, by N. H. Wichell and others. Am. J. Sci. (4), 9:149–54.

1901

Joseph Le Conte. Science (n.s.), 14:273–77.

1902

With C. Palache. The Berkeley Hills, a Detail of Coast Range Geology. Bull. Univ. Calif. Dept. Geol., 2;349–450.

The Eparchean Interval: a Criticism of the Use of the Term Algonkian. Bull. Univ. Calif. Publ., Dept. Geol., 3:51–62.

1903

Plumasite, an Oligoclase Corundum Rock near Spanish Peak, California. Bull. Univ. Calif. Publ., Dept. Geol., 3:219–29.

1904

The Geomorphogeny of the Upper Kern Basin. Bull. Univ. Calif. Publ., Dept. Geol., 3:291–376.

The Orbicular Gabbro at Dehesa, San Diego County, California. Bull. Univ. Calif. Publ., Dept. Geol., 3:383–96.

1906

The Copper Deposits of the Robinson Mining District, Nevada. Bull. Univ. Calif. Publ., Dept. Geol., 4:287–357.

The Geomorphic Features of the Middle Kern. Bull. Univ. Calif. Publ., Dept. Geol., 4:397–409.

The Geomorphogeny of the Tehachapi Valley System. Bull. Univ. Calif. Publ., Dept. Geol., 4:431–62.

With others. Preliminary Report of the State Earthquake Investigation Commission. 20 pp.

1908

With others. The California Earthquake of April 18, 1906: Report of the State Earthquake Investigation Commission. Carnegie Institution of Washington Publication no. 87, 1(1): xvii, 254 pp; 1(2): pp. 255–451.

1911

On Some Postglacial Faults near Banning, Ontario. Bull. Seismol. Soc. Am., 1:159–66.

1912

The Geology of Steeprock Lake, Ontario. Geol. Survey Canada Mem., 28:7–15.

The Archean Rocks of Rainy Lake. Geological Survey of Canada, Summary Report 1911, pp. 240–43.

The Recent Fault Scarps at Genoa, Nevada. Bull. Seismol. Soc. Am., 2:193–200.

Report on the Geology and Underground Water Supply of Livermore Valley. In: *The Future Water Supply of San Francisco, a Report by the Spring Valley Water Company,* pp. 223–30, San Francisco, California.

1913

The Petrographic Designation of Alluvial-Fan Formations. Bull. Univ. Calif. Publ., Dept. Geol., 7:325–34.

The Gold of the Shinarump at Paria. Economic Geology, 8:434–48.

Gold and Coal Mines of Nova Scotia. Bulletin of the Mining and Metallurgical Society of America, 65:281–82.

The Archean Geology of Rainy Lake Restudied. Geol. Survey Canada Mem., 40. 115 pp.

1914

Description of the San Francisco District: Tamalpais, San Francisco, Concord, San Mateo, and Hawyards Quadrangles. U. S. Geological Survey, Geologic Atlas, folio number 193. 24 pp.

A Standard Scale for the Pre-Cambrian Rocks of North America. Twelfth International Geological Congress, Toronto, 1913, Compte Rendu, pp. 349–70.

Is the Boulder "Batholith" a Laccolith?—A Problem in Ore Genesis. Bull. Univ. Calif. Publ., Dept. Geol., 8:1–15.

Ore Deposition in and near Intrusive Rocks by Meteoric Waters. Bull. Univ. Calif. Publ., Dept. Geol., 8:219–42.

1915

The Epigene Profiles of the Desert. Bull. Univ. Calif. Publ., Dept. Geol., 9:23–48.

1916

The Correlation of the Pre-Cambrian Rocks of the Region of the Great Lakes. Bull. Univ. Calif. Publ., Dept. Geol., 10:1–19.

1921

The Mobility of the Coast Ranges of California; An Exploitation of the Elastic Rebound Theory. Bull. Univ. Calif. Publ., Dept. Geol., 12 (7): 431–73.

1922

Isostatic Compensation Considered as a Cause of Thrusting. Bull. Geol. Soc. Am., 33:337–51.

1924

The Continental Shelf off the Coast of California. Bull. Natl. Research Council, 8 (44). 23 pp.

The Geological Implications of the Doctrine of Isostasy. Bull. Natl. Research Council, 8 (46). 22 pp.

1925

The Cypress Plain. Bull. Univ. Calif. Publ., Dept. Geol. Sci., 15 (6):153–58.

1927

Folded Mountains and Isostasy. Bull. Geol. Soc. Am., 38:253–73.
The Valley of the Nile. University of California Chronicle, 29:235–59.

1928

The Cordilleran Shield. Third Pan Pacific Science Congress, Tokyo, 1926, Proceedings, pp. 371–88.

1929

Some Huronian Problems. Bull. Geol. Soc. Am., 40:361–83.

1930

The Classification and Correlation of the Pre-Cambrian Rocks. Bull. Univ. Calif. Publ., Dept. Geol. Sci., 19 (11):275–93.

1931

The Isostasy of the Uinta Mountains. J. Geol., 39:264–76.
The Atlas Mountains of Morocco. Sci. Mo., 32:97–115.

1932

Insular Arcs, Foredeeps, and Geosynclinal Seas of the Asiatic Coast. Bull. Geol. Soc. Am., 43:353–82.
Rain-Wash Erosion in Humid Regions. Bull. Geol. Soc. Am., 43:703–24.

1933

Geology of Middle California. Sixteenth International Geologic Congress, Washington, D. C., Guidebook 16, pp. 1–12.

1934

The Eparchean Peneplain: an Exploitation of the Doctrine of Isostasy. Bull. Geol. Soc. Am., 45:1059–72.
Physiography of the Moroccan Atlas. Fourteenth International Geological Congress, Madrid, 1926, Géologie de la Méditerranée Occidentale, 5 (1):1–14.

1935

Is the Killarney Granite Different in Age from the Algoman? Science (n.s.), 81:515.

1936

The Sierra Nevada in the Light of Isostasy. Bull. Geol. Soc. Am., 47: 1691–712.

1938

The Isostasy of Large Deltas. Bull. Geol. Soc. Am., 49:401–16.

The Flotation of Mountains: a Theory of Orogenesis. Sci. Mo., 47 (5): 429–38.

1939

Memorial to Henry Ward Turner. Proc. Geol. Soc. Am., 1938, pp. 201–7.

Subsidence by Thrusting: the Discussion of a Hypothetical Fault. Bull. Geol. Soc. Am., 50:1381–93.

1940

Isostatic Control of Fluctuation of Sea Level. Science (n.s.), 92:162–64.

1941

Another Note on the Isostatic Control of Fluctuations of Sea Level. Science (n.s.), 93:326–27.

Memorial to Oscar H. Hershey. Proc. Geol. Soc. Am., 1940, pp. 195–200.

1942

Mississippi Delta, a Study in Isostasy. Bull. Geol. Soc. Am., 53:1231–54.

1948

Some Further Implications of the Doctrine of Isostasy. Bull. Geol. Soc. Am., 59:197–209.

1950

Sea Bottom off the Coast of California. Bull. Geol. Soc. Am., 61:1225–41.

1951

With Perry Byerly. Biographical Memoir of Harry Fielding Reid, 1859–1944. National Academy of Sciences, In: *Biographical Memoirs,* 26:1–12.