AUGUST 2013 | VOL. 23, NO. 8

CELEBRATE GSA'S 125TH ANNIVERSARY

GSA TODAY

1888 125 2013 Years

CELEBRATING ADVANCES IN GEOSCIENCE

A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA®

J. William Dawson
(1820–1899)

Florence Bascom
(1862–1945)

1888

1891

1935

1945

1961

1972

2013

GSA TODAY

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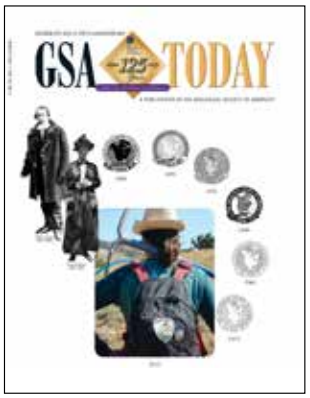
CELEBRATING OUR LEGACY

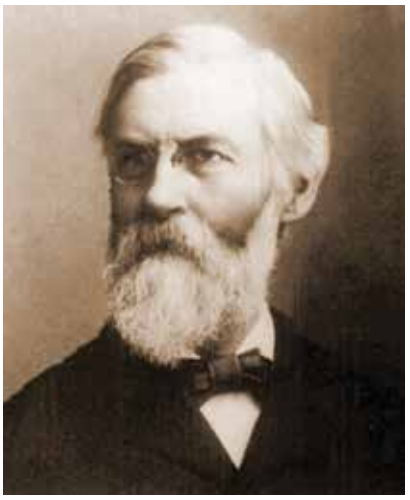


Cover: The evolution of GSA and GSA's seal over time. Pictured: GSA co-founder and 1893 GSA President Sir J. William Dawson and Florence Bascom, the first woman elected to GSA Council (image from the Sophia Smith Collection, Smith College).

THE GEOLOGICAL SOCIETY OF AMERICA®

Errata:

- In the June 2013 issue of *GSA Today* (v. 23, no. 6, p. 40), the cosponsor of the Penrose Conference "Predicting and Detecting Natural and Induced Flow Paths for Geothermal Fluids in Deep Sedimentary Basins" was incorrectly listed as "National Research Council." The National Science Foundation is the cosponsor of this Penrose Conference.
- The affiliation listed for the recipient of the 2013 Randolph W. "Bill" and Cecile T. Bromery Award for the Minorities, Reginal W. Spiller, was listed incorrectly in the July 2013 (v. 23, no. 7, p. 14) issue of *GSA Today*; the correct affiliation is Azimuth Energy LLC.



J.J. Stevenson

Preface

As GSA celebrates its 125th Anniversary, *GSA Today* is taking a look back at key presidential address articles that demonstrate the spirit, work, and thought put into creating the Society as it is today. Most presidential addresses are posted online at **www.geosociety.org/aboutus/pastPresidents.htm.**

PRESIDENTIAL ADDRESS OF J.J. STEVENSON

GSA Bulletin, v. 10, p. 83–98 (26 February 1899)

Read before the Society 28 December 1898

OUR SOCIETY

CONTENTS

EARLY INVESTIGATIONS

Several travelers of the eighteenth century, among them, especially, Guettard, Alexander, and Schoepf, gave more or less important information respecting the geological structure and mineral resources of our country; but geological work, properly so called, began only with Maclure's studies in 1806. Born in Scotland, Maclure came to this country in early youth, and, embarking in business, acquired a fortune long before reaching middle age. He returned to Europe to spend several years in the study of natural science, but came again to America in 1806 to take up his geological work, which continued until 1808.

The publication of his results, presented to the American Philosophical Society on January 20, 1809, led others to make studies, and soon afterwards there appeared numerous papers dealing with geological subjects. Professor Samuel L. Mitchell, a devoted follower of Werner, infused much of his enthusiasm into a group of youthful students in New York and induced Professor Archibald Bruce to establish the American Journal of Mineralogy, which, beginning in 1810, reached its fourth and last number in February, 1814. Though small and short-lived, this journal served a useful purpose; it contained good papers by Ackerly, Gibbs, Godon, Mitchell, Silliman, and others; it did much to nurse the scientific tendency which led to founding the New York Lyceum of Natural History in 1817, and some have thought that it aided in like manner the founding of the Philadelphia Academy in 1812. Bruce's Journal was succeeded in 1818 by Silliman's American Journal of Science, which from the beginning exerted a notable influence on the development of geological thought and work in our country.

By 1820 students of geology had become so numerous that the American Geological Society was organized in New Haven, Connecticut, where meetings were held certainly until the end of 1828.* The last survivor of this society died in New Haven only a few weeks before the formal organization of our Society, in 1888. The prominent men of 1820 were Ackerly, Bruce, Cornelius, Cleaveland, the two Danas, Dewey, Eaton, Gibbs, Godon, Hitchcock, Maclure, Mitchell, Rafinesque, Schoolcraft, Silliman, and Steinhauer, but there were some young men who began to publish within two or three years afterwards and who were destined to occupy prominent places in geological literature; of these Emmons, Harlan, Lea, Morton, Troost, and Vanuxem were already engaged in investigation.

Before another decade had passed, there were groups of geologists in New England, New York, and Pennsylvania; while Olmstead and Vanuxem had made preliminary surveys in North Carolina and South Carolina, Troost had begun the survey of Tennessee, and Hitchcock that of Massachusetts.

In 1832 the Pennsylvania geologists, feeling much in need of an official survey of their state, organized the Geological Society of Pennsylvania to arouse public interest, and so to bring about the survey. The volume of publications contains papers which attack geologic and economic problems of the first order. The investigations were not confined to Pennsylvania, but committees were appointed to examine important matters in other states that the worth of geological work might be made obvious. Beyond doubt, the efforts of this society had much to do with securing the first geological survey of Pennsylvania, though no member of the society was appointed on the staff.

It is the fashion now and then to laugh at these old papers. True enough, in the light of our present knowledge, many of the statements respecting Appalachian structure are absurd, but they were made by men who without state aid, without instruments, and without maps laid a foundation upon which the keen-eyed men of the first Pennsylvania survey built that superstructure which endured close reëxamination by the second survey and proved the honesty and ability with which the work had been performed.

It is the fashion now and then to laugh at these old papers

THE ASSOCIATION OF AMERICAN GEOLOGISTS

But geology was becoming too broad in scope and its workers too numerous to be embraced by a mere local society, even though the list of correspondents was as large as that of the active members. The work in Massachusetts was approaching completion; that in New Jersey had been completed; the surveys of Maine, Connecticut, New York, Pennsylvania, Maryland, Delaware, Virginia, Ohio, Michigan, and Indiana had been begun, and before 1840 New Brunswick, Rhode Island, and Kentucky were added to the list. Several of these surveys had large corps of workers pushing their studies with all the enthusiasm of a new calling. In the Appalachian region of Massachusetts, New York, Pennsylvania, and Virginia serious problems were encountered, which could not be solved within the compass of a single state. A right understanding of the work done in one state was necessary to a right understanding of the work done in the adjoining state. Correspondence proved a failure; incidental or casual talks led to

* I am indebted to Professor H.S. Williams for information respecting this society.

misunderstandings; systematic conference was necessary, with generous contribution by each of his knowledge to the other.

On April 2, 1840, as the result of a conference held in Albany in 1839, eighteen geologists met at the Franklin Institute, Philadelphia, and organized the Association of American Geologists, with Professor Edward Hitchcock as the first chairman. Among them were the state geologist of Massachusetts, six geologists of the New York survey, six of the Pennsylvania survey, two of the Michigan, and three not connected with any public work. Mr Martin H. Boye is the only survivor of the eighteen. The succeeding meetings in Philadelphia and Boston were attended by many geologists, of whom only Boye, O.P. Hubbard and J.P. Lesley remain. A volume published in 1843 contains several papers which made a deep impress on American geology. In it are the five great memoirs on Appalachian conditions by the Rogers brothers; Hall's noteworthy discussion of the Mississippi basin section; Hitchcock's elaborate discussion of the drift, as well as numerous contributions by other members.

But the geologists were not permitted to flock by themselves

Professor Hall said on one occasion that the inspiriting effect of these meetings could not be overestimated. As one of the youngest members, he was impressed by the mental power of those great men, all untrained in geology except Taylor, whose instruction under William Smith proved advantageous in many ways, but very disadvantageous in others, as it had provided him with a generous stock of well set opinions. Though wholly self-taught, working the country sparsely settled, without barometers, without railroad cuts, oil borings, mine shafts, or any of the helps so necessary for us, those men had elaborated systems, had made broad generalizations, had learned much respecting the succession of life, and had discovered the keys which in later years were to open mysterious recesses in European geology.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

But the geologists were not permitted to flock by themselves. The advantages of contact were so manifest that the naturalists asserted their claims to relationship with sufficient energy to secure admission in 1841, and the name Association of American Geologists and Naturalists appeared in the constitution adopted at the 1842 meeting. The number of scientific men was still comparatively small, and in most of the colleges the several branches of natural science were embraced in one chair, so that there were many professors who could lay claim to the title of geologist, physicist, naturalist, or chemist, as they pleased. Men of this type, as well as physicists, chemists, and mathematicians, constantly urged the propriety of broadening the scope of the association so as to admit workers in all branches of the sciences.

In 1842 the first series of surveys practically came to an end, and the geologists were scattered, many of the younger men being compelled to enter other callings. The Association held its meetings regularly, but its strength diminished, and in 1848 it yielded to the outside pressure, becoming merged into the American Association for the Advancement of Science, which threw its doors wide open to all entertaining an interest in any branch of science. The first meeting had a roll of 461 members.

Comparatively little was done in geological work between 1842 and the close of the civil war. Professor Hall maintained the New York survey, after a fashion, but at very considerable pecuniary cost to himself; surveys were carried on in a number of states, but except in Illinois and California they were mostly reconnaissances by small corps; the annual appropriations in several instances were little more than enough to pay traveling expenses, so that the work and the reports were practically gifts to the states; the federal government sent topographic expeditions to the western country, most of them accompanied by a surgeon who had more or less knowledge of geology. Under such conditions the number of geologists did not increase, and when the American Association was divided into sections, in 1875, the geologists and naturalists became, not Section A, but Section B [*sic*].

The annual appropriations in several instances were little more than enough to pay traveling expenses, so that the work and the reports were practically gifts to the states

DEVELOPMENT OF GEOLOGICAL WORK AFTER THE CIVIL WAR

The rapid development of the country's internal resources during the war and the attendant growth in manufacturing interests made necessary increased efficiency in scientific training, and enormous gifts were made to our leading institutions for that purpose. The importance of geological knowledge had become very evident during the development of iron, coal, and oil resources, and the geologist found himself elevated suddenly from a place surrounded by suspicion to a post of honor. As an outgrowth of the restless activity due to the war came anxiety to learn more accurately the resources of our western domain beyond the hundredth meridian. The War Department, through its engineer corps, organized the Fortieth Parallel Survey, in charge of Clarence King, and two years afterward authorized Lieutenant (now Major) George M. Wheeler to undertake what afterward became the United States Geographical Surveys West of the Hundredth Meridian. Mr King's survey was primary for geological work, that of Lieutenant Wheeler primarily for topographical work, but each in its own field did all the work, geological or topographical, necessary to the accomplishment of the allotted task. The Interior Department had charge of Dr F.V. Hayden's surveys, beginning in 1867, as well as the work prosecuted by Major J.W. Powell after 1870. The consolidation in 1879 of all organizations then existing into the United States Geological Survey put an end to useless rivalries and made possible the formation and execution of broad plans requiring a high grade of preparation in those engaged on the work.

While these surveys were advancing in the far west, great activity prevailed in the older area. Within a decade after the war ended state surveys were undertaken in New Hampshire, New Jersey, Pennsylvania, Ohio, Indiana, Kentucky, Michigan, Wisconsin, Minnesota, Iowa, Missouri, and other states, while the Canadian survey, which had gone on uninterruptedly from the early forties, was made more extended in character. Several of the state surveys, being well supported by generous appropriations,

employed large corps of assistants, paid and volunteer, and were prosecuted with great energy. Under these conditions Section E, that of the Geology and Geography, grew rapidly and soon became one of the strongest in the American Association for the Advancement of Science.

Geologists were increasing in numbers, but opportunities for making personal acquaintance were few

The conditions which rendered imperative an association of geologists in 1840 were the present conditions in 1880, but more oppressive. The problems of 1840 were chiefly those of a narrow strip within the Appalachian area; those of 1880 concerned the whole continent. Geologists were increasing in numbers, but opportunities for making personal acquaintance were few. Meetings of societies in midsummer could be attended only by those who were not connected with official surveys or were detached for office work. Workers were gathering into little groups on geographical lines and there was danger that our geology would become provincialized. Members of one group regarded those of another with a feeling not altogether unrelated to suspicion; letter-writing took the place of personal communication, with too often the not unusual result of complete misunderstanding, with the attendant personal irritation or worse.

THE GEOLOGICAL SOCIETY OF AMERICA

In 1881 the tension was such that several geologists connected with official surveys urged the formation of a geological society to bring about closer bonds among geologists, and they succeeded at the meeting of the American Association in securing the appointment of a committee to consider the matter. The geologists of the country were consulted and a report showing that the consensus of the replies favored the organization of such a society was presented in 1882, as well as in 1883, but without any result. The Association's committee on the International Geological Congress considered the question in 1887 and announced approval. Professors N.H. Winchell and C.H. Hitchcock, as chairman and secretary of the 1881 committee, issued a call asking geologists to assemble in Cleveland, Ohio, on August 14, 1888, to form a geological society.

A large number of geologists and other members of Section E assembled on the afternoon of that day. Professor Alexander Winchell presided and Dr Julius Pohlman was secretary. An earnest discussion respecting the type of society to be founded occupied most of the afternoon. The plan suggested in the call looked only to an expansion of Section E of the American Association by holding meetings at times better suited than summer to the convenience of geologists. A difference of opinion, however, quickly developed, for some knew that no such expedient would suffice, because the conditions called for something more definite. Loyalty to the American Association, which for forty years had been the bond between scientific men, held many back from an extreme position; yet every one recognized that little injury could come to the Association, as at best only a few geologists could attend summer meetings. In any event, it was clear that the interests of geology required the formation of a society with severe restrictions upon membership and with publications which would be a credit to American science. A compromise prevailed, whereby the original members entitled to take part in organization must be members of Section E of the American Association, and that all members of Section E might enroll prior to the first meeting, if they so desired. This last provision caused not a little anxiety, as membership in any section of the Association predicates nothing more than a friendly feeling for science—whatever that may mean.

Members of one group regarded those of another with a feeling not altogether unrelated to suspicion; letter-writing took the place of personal communication, with too often the not unusual result of complete misunderstanding

A committee** was appointed to prepare a plan of organization with a provisional constitution. The committee's report on the morning of the fifteenth provoked debate, as the provisional constitution placed a positive limit upon the membership by permitting after the organization only working geologists and teachers of geology to become members and by requiring a three-fourths vote for election. The organization was to be effected when the list of original members contained one hundred names. The provisional constitution, with a few unimportant amendments, was agreed to unanimously, and the committee was continued as a committee of organization. The details of arrangements were placed in the hands of Professors A. Winchell and Stevenson.

Happily the high dues and a general belief that no society could be formed on the proposed basis kept the list of Original Fellows from being swollen by those whose relation to geology began and ended with attendance upon the American Association's meetings. The committee was enabled from the very outset practically to choose the men who should make the Society. The required number having been obtained by the 1st of December, a meeting was held at Ithaca, New York, on December 27, 1888. Only thirteen were present, but ballots of preference had been received from seventy-two Fellows, in accordance with which the organization was completed by the election of—

President……...	James Hall.
Vice-Presidents……	James D. Dana. Alexander Winchell.
Secretary……...	John J. Stevenson.
Treasurer……..	Henry S. Williams
Councilors……	John S. Newberry. John W. Powell. Charles H. Hitchcock.

The matter of publication was discussed at great length, but no definite decision could be reached, and a committee was appointed to consider the whole question, with instructions to

** This committee consisted of Alexander Winchell, J.J. Stevenson, C.H. Hitchcock, John R. Procter, and Edward Orton.

present a report at the summer meeting. Another committee was appointed to prepare a permanent constitution, to be presented at the next meeting.

The Advisory Committee on Publication, another name for Professor W J McGee, made an elaborate investigation of the whole question of publication, and in August, at Toronto, presented the report, accompanied by a printed example of the form recommended. This report was adopted, and at the close of the following meeting Professor McGee was chosen as the first Editor, that the recommendations might be carried out faithfully. Our Bulletin, which marked a new stage in scientific publications, owes its excellence of form and accuracy of method to his indefatigable presence. His determination to secure exactness in all respects proved not wholly satisfactory to many of us, but before he demitted his charge the justice of his requirements was conceded on all sides. The discipline to which the Fellows of this Society were subjected by the first Editor has served its purpose, and editors of other scientific publications have found their labors lightened and their hands strengthened in efforts to produce similar reforms elsewhere. His mantle fell upon Mr J. Stanley-Brown, who inherited a double portion of his spirit, so that the high standard of the Bulletin has been maintained without abatement.

American geologists are no longer a disorderly lot of irregulars marching in awkward squads

Fears and misgivings abounded when it was discovered that this Society was a success from the start. The American Association for the Advancement of Science had been the one society for so many years that attempts at differentiation seemed to be efforts to cut away the pillars of scientific order; but the fears were merely nightmare; our Society has proved itself an efficient ally of the association.

Our net membership at the close of the first year was 187. The new constitution placed severer restrictions on membership by requiring a nine-tenths vote for election, the ballot being by correspondence and shared in by all the Fellows. This has kept the number within reasonable limits, and we now have 237 Fellows, our roll including almost all of those who by strict construction of our constitution are qualified for membership.

Owing to the rigid administration of our affairs by Professor Fairchild and Dr White, who have piloted us for eight years, our financial condition is satisfactory and the income from the permanent fund now goes far toward covering the cost of administration.

Throughout, the Society has held closely to investigation. The recondite problems—those of little interest to many, of no interest to most—are those which have held the attention of our Fellows—work in pure rather than applied science; there has been no trenching upon the field of the mining engineer. As a storehouse of fact and of broad, just generalization, the volumes of our Bulletin are excelled by those of no similar publication.

We close our first decade justly gratified by success and full of hope for the future. Some of those who led us and gave us reputation at the beginning are no longer with us. Hall, Dana, and Winchell, the first three Presidents, passed away in reverse order; Cope, Cook, Sterry-Hunt, Newberry, and a few others have gone from us, but the Society retains its membership with changes unusually small, showing no ordinary degree of physical force and *esprit du corps* on the part of its Fellows. As we look back, we recognize how far this Society has been of service to us as men. In not a few instances misunderstandings have been removed and coldness or suspicion has been replaced by personal friendship. American geologists are no longer a disorderly lot of irregulars marching in awkward squads, but a form of reasonably compact body, though as individuals they may owe allegiance to Canada, the United States, Mexico, or Brazil. Every one of us has felt the inspiriting influence of personal contact.

RELATION OF GEOLOGICAL WORK TO THE PUBLIC WELFARE

But our Society has to do with the world outside of itself and outside of its immediate line of thought. It must have more to do with that world in the future if the outcome for science is to be what it should be, for the time is approaching rapidly when we must seek large sums for aid in the prosecuting of our work. To retain the respect of the community and to retain influence for good, we must be able to justify the existence of a society devoted to investigation as distinguished from application. The question, "Cui bono?" will be asked, and the answer cannot be avoided.

This is a utilitarian age—not utilitarian as understood by those who bemoan the decay of esthetic taste, or of those who feel that in the passing of Aristotle and Seneca there has come the loss of intellectual refinement, or of those others who bewail the degeneracy of a generation which has not produced a Kant, a Newton, an Aristotle, a Laplace, a Humboldt, or an Agassiz—all regarding the decadence as due to the degrading influence of material development and overpowering commercial interests.

The assertion of a lost intellectual refinement and of depraved esthetic taste is but the wail for an abandoned cult

These pessimists stand at a poor point of view, where the angle of vision is narrowed by many lateral projections. One may say without fear of successful contradiction that, in so far as actual knowledge is concerned, students of our day receiving graduate degrees in the more advanced universities stand on a somewhat higher plane, each in his own group, than did the celebrated men just named. The student now reaches beyond where they ended, and still is at only the threshold, for in most instances years of labor are required of him before he can receive recognition as an efficient co-worker. Men towering far above their fellows and covering the whole field of knowledge will never be known again. Kant, Newton, and Humboldt stand out from their fellows as sharply as light-houses on a level shore; but there are many Kants, Newtons, and Humboldts today. Prior to the last seventy-five years the field of actual knowledge was insignificant, and a man possessing large powers of observation grasped the whole. Seventy-five years ago one man was expected to cover the whole field of natural science in an American college. Should any man pretend today to possess such ability he would expose himself to ridicule.

It may be true that this century has given to the world no great philosopher—that is, no great philosopher after the old pattern—but one must not forget that philosophy has to face a difficulty which was unknown in the last century. The unrestrained soaring of philosophers into the far-away regions of mysticism is no longer possible, for facts abound and the knowledge which is abroad in the land must be considered in any well constructed system. Some have maintained, if not in direct statement, certainly in effect, that study of material things unfits one for metaphysical investigation. Undoubtedly it would hamper him in some kinds of metaphysical research, as it would fetter him with a respect for actualities, but it would fit him well for other kinds. Aristotle, Kant, and, in our own time, McCosh and Spencer attained to the high position as philosophers, and in each case possessed remarkable knowledge in respect to material things.

The assertion of a lost intellectual refinement and of depraved esthetic taste is but the wail for an abandoned cult; it is but a variation of the familiar song which has sounded down the generations. The world was going to destruction when copper ceased to be legal tender, as well as when Latin ceased to be the language of university lectures; art disappeared when men ceased idealizing and began to paint nature as it is; religion was doomed to contempt when the Bible was translated into the vulgar tongue, and the pillars of the earth were removed when the American republic was established.

But in a proper sense this is a utilitarian age. Everywhere the feeling grows that the earth is for man—for the rich and for the poor alike; that those things only are good which benefit mankind by elevating the mental or physical conditions. Until the present century the importance of the purely intellectual side of man was overestimated by scholars, and matters connected with his material side were condemned. With our century the reaction was too great, for even educated men sneered at abstract studies as absurdities, while they thought material things alone worthy of investigation; but the balance is steadying itself, and at each oscillation the index approaches more closely to the mean between the so-called intellectual and material sides. Even devotees of pure science no longer regard devotees of applied science as rather distant relations who have taken up with low-born associates.

There appears at first glance to be very little connection between great manufacturing interests on one hand and stone-pecking at the roadside or the counting of striæ on a fossil on the other

There appears at first glance to be very little connection between great manufacturing interests on one hand and stone-pecking at the roadside or the counting of striæ on a fossil on the other; yet a geologist rarely publishes the results of a vacation study without enabling somebody else to improve his condition. About twenty years ago one of our Fellows began to give the results of reconnaissance studies made during vacations. These concerned certain fault lines, and the notes included studies upon coal-beds and other matters of economic interest involved in the faults. The coal-beds were all bought up, railroads were constructed, mines were operated, towns were built, a great population was supplied work at good wages, and many men were enriched. According to the latest information, no one has offered to reimburse the geologist his expenses, nor has any paper in the whole region suggested that the geologist had anything to do with bringing about the development.

Geological work in this, as in other lands, was originally vacation work, but eventually the investigations became too extensive and the problems too broad for the usually limited means of the students. Meanwhile it became manifest, as in the case just referred to, that important economic results were almost certain to follow publication of matters discovered by geologists, so that men interested in economics were ready to assist in securing state aid to advance geological work. As one of our Fellows remarked the other day, economic geology has been the breastwork behind which scientific geology has been developed by state aid.

Geological work in this, as in other lands, was originally vacation work

Ducatel's reconnaissance proved the importance of Maryland's coal field, and the survey was ordered; the Pennsylvania Geological Society discussed coal-fields until the legislature gave the state a survey; the geologists of New York promised to settle finally the question of the occurrence of coal within the state, and so in many other states.

Appointments were made, though in most instances the geologists were physicians and appointed as acting surgeons in the army

The United States Geological Survey had a somewhat different origin, for the economic side did not attain importance until a late period. Soon after the annexation of California the necessity for a railroad communication with the Pacific became apparent, and the Congress ordered exploration of several lines across the Rocky Mountain region. At that time, the early "fifties," the perplexities of American geologists had reached a maximum. Most of the old state surveys had come to a close—rich in economic results and still richer in problems to be solved only by elaborate investigation too extended and too costly for those days. The observations made by Wislezenus and army officers in New Mexico, by Fremont and Stansbury farther north in the Rocky Mountains and Plateau regions, as well as by Culbertson and Norwood in the Dakota country, had stirred the curiosity and awakened the interest of geologists everywhere. Strong pressure was brought to bear on the Secretary of War for appointment of geologists to positions on the several parties. The efforts were successful and the appointments were made, though in most instances the geologists were physicians and appointed as acting surgeons in the army. This was an important advance in scientific work, for almost without exception exploring parties under the War Department from that time were accompanied by naturalists. The civil war brought the western work to a close; but when peace returned it was taken up

again, and geology was recognized as a necessary part of it, until at last the fragmentary works were placed in one organization and the survey established as it now exists.

The credit for the economic outcome of the scientific work is due to the geologist alone

In all of the later geological surveys the element of economics entered more largely into consideration, and was emphasized in the legislative enactments. Men recognized that geological investigation had led to the discovery of laws most important from the economic standpoint, and they were anxious to have the knowledge utilized in a broad way.

Looking over the history of the old surveys, one sees clearly that their origin was due solely to a desire for solution of problems in pure science. The credit for the economic outcome of the scientific work is due to the geologist alone, to whom the appropriations were given, practically as a gift. The legislators smoothed their consciences by loft speeches respecting the duty of the commonwealth to foster the study of nature, but they generally had an aside to be utilized as justification before their constituents, "especially when there is a very reasonable chance that something of value will be discovered to the advantage of our commonwealth."

ECONOMIC RESULTS OF OFFICIAL SURVEYS

The New York survey had for its possible outcome the determination of the coal area. The work was completed with great exactness, for it proved that the state contains no coal area whatever. Though only negative in results for the state, this survey has proved of incalculable service to the country at large, for it first elaborated the lower and middle Paleozoic section. The scientific work continued along the biological line defined accurately the vertical limits of fossils and provided means for removal of difficulties where the succession is incomplete, and for tentative correlation in widely separated localities, an apparatus whose usefulness cannot be overestimated from an economic standpoint.

If the man who makes two blades of grass grow where only one grew before be a public benefactor, what shall be said of the geologist who turns a desert into a garden?

If the man who makes two blades of grass grow where only one grew before be a public benefactor, what shall be said of the geologist who turns a desert into a garden? This was done by the first survey of New Jersey, which differentiated and mapped the marls of that state, giving a complete discussion of their nature and value. Great areas of the "white sand barrens" have been converted, not into mere farm lands, but into richly productive garden spots. In later years the second survey, now almost forty years old, did, as it is still doing, admirable work along the same lines. The study of the structural geology gave a clue to the causes of restrained drainage, and in not a few instances showed that relief from malaria could be obtained with unsuspected ease, and that many miles of noxious swamps could be converted into lands well fitted for residence.

The first survey of Pennsylvania was purely scientific in inception and execution; economic questions had little of interest for its head, and in the work their place was very subordinate to those in pure science; yet the outcome was inevitable. The study of the Appalachian folds and the discovery of the steeper northwesterly dip revealed the structure of the anthracite region and made it possible to determine the relations of the anthracite beds; the vast extent of the bituminous area and the importance of the Pittsburg coal-bed were ascertained during the search for facts to explain the origin of the Coal Measures; the ores of the central part of the state were studied with rigorous attention to detail, that the problem of their origin might be solved; but these and other scientific studies brought out a mass of facts which were seen at once to possess immense importance, and the reports were published broadcast. New industries were established; old ones previously uncertain became certain and developed prodigiously; the coal and iron interests moved at once to the front, so that within two or three years after the survey ended "tariff" became the burning political question throughout the state. The results of the second survey were even more remarkable in their influence upon the development of the commonwealth and the increased comfort of the population.

Unquestionably the importance of the deposit became known to capitalists very largely through the reports of this survey, though at that time economic geology had no charms for its head

Among the earliest result of the first survey of Michigan was the determination of the value of the salt lands and the announcement of iron ore in the upper peninsula. The successors to this survey, under the United States supervision, made studies of numerous localities and determined the excellence of the ores. Unquestionably the importance of the deposit became known to capitalists very largely through the reports of this survey, though at that time economic geology had no charms for its head. Much of the enormous development of the Lake Superior iron region was due to the influence of the later survey between 1869 and 1873.

The first Ohio survey, made sixty years ago, was at greater disadvantage than the Pennsylvania survey, yet in the first year the coal area was defined, and during the second the geologists determined the distribution of the several limestones and sandstones which, as building stones, have become so important. The second survey was made effective at once by the tracing and identification of the Hocking Valley coal, which brought into the state a vast amount of new capital and changed the face of a whole district. The third survey determined the distribution of oil and gas, the relations of the coal-beds, and the characteristics of the clay deposits in such fashion as to remake the manufacturing interests of the state.

The Mesabi and Vermillion ranges of Minnesota contain deposits of iron ore which for the present at least appear to be even more important than those in northern Michigan. Almost fifty years ago J.G. Norwood, while studying the easterly end of the

region, discovered the Mesabi ores. A few years later Whittlesey, after a detailed examination farther west, predicted the discovery of similar ores—a discovery actually made in 1866 by Eames, who was then state geologist and engaged in studying the Vermillion range. Though not utilized at once, these announcements were not forgotten, and systematic exploration was begun in 1875, when the need of high-grade ores at low prices made necessary the opening of new areas. Almost at once the then recently organized state geological survey determined the extent of the ore-bearing region, differentiated the deposits, and removed erroneous impressions respecting the extent and distribution of the ores. The effect of these discussions and the positive fixing of areas has been to increase development and to cheapen ores of the best quality so far that Bessemer steel can be manufactured more cheaply in the United States than elsewhere, in spite of the fact that wages are still higher, not simply numerically, but in purchasing power, than in any other iron-producing country. An examination of the reports which have brought about this result compels one to say that anxiety for economic results does not appear to have been the impelling motive during the work. There were perplexing geological problems to be worked out and the solutions could be discovered only by the most painstaking work. This investigation led to the economic results.

The United States Geological Survey retained its original character for a number of years, the studies being devoted almost wholly to pure science. There were those who looked on the elaborate petrographical work as merely an elaborate waste of public funds; who, like the member of the Ohio legislature, regarded fossils only as "clams and salamanders" and considered the diagrams of sections as merely bewildering humbug, while they asserted that attention ought to be given to other matters, which, however, they were not always ready to designate. But the outcome of these studies was inevitable. Petrography has its applications now in the investigation of building stones, and it has proved of service in aiding to determine the source of precious metals at more than one important locality. The determination of fossils has led to proper definition of the great coal horizons of the Upper Cretaceous; the close study of stratigraphical relations made possible a wide development of artesian-well systems in the Dakotas, just as similar work in England led to the same practical result, while the study of climatic and structural conditions was brought to bear on the great problem of our arid lands with no mean results.

The United States Geological Survey retained its original character for a number of years, the studies being devoted almost wholly to pure science. There were those who looked on the elaborate petrographical work as merely an elaborate waste of public funds… the diagrams of sections as merely bewildering humbug

But these illustrations must suffice, not because they exhaust the material, for every official survey on the continent affords illustrations, but because this is an address, not a history, and already the allotted time has been exceeded.

It is the old story—the same in geology as in other branches. The kind of work for which this society stands lies more closely to the welfare of the community than is supposed even by men in high position and of far more than average intelligence. This work is responsible in large part for the industrial progress of our continent, which we must regard, in spite of protests from those who lament the dominance of commercialism, as the force which has made possible our great advance in physical comfort as well as the equally great advance in literary culture and esthetic taste. Coal, iron, and oil, chief among our products, have been so much the objects of minute study by closet investigators that improvement in processes of manufacture has not been a growth, but rather a series of leaps.

We give all honor to applied science, yet we cannot forget that it is but a follower of pure science. The worker in pure science discovers; his fellow in applied science utilizes; the former receives little credit outside a narrow circle; pecuniary reward is not his object and rarely falls to his lot; the latter has a double possibility as an incentive, large pecuniary reward and popular reputation in case of noteworthy success. The two conditions are well represented by Henry, the investigator, and Morse, the inventor and promoter.

We give all honor to applied science, yet we cannot forget that it is but a follower of pure science

Men are ignorant of their debt to closet workers because the facts have never been presented. As geologists and as citizens of no mean countries we ought to present this matter clearly to men whose fortunes have come through application of principles discovered by obscure workers. Such men are quick to perceive the justice of the claim and usually are ready to pay a reasonable interest on the debt.

The world must advance or retrograde; it cannot stand still. Continued advance in physical comfort and intellectual power can come only through intenser application to investigation along the lines of pure science, which can be made possible only by affording increased opportunities for research as in our colleges and the expansion of research funds held by societies such as this.

Mentoring Tomorrow's Geoscience Leaders

GSA is proud to provide mentoring programs at all its meetings. At the Section Meetings, students are invited to participate in both the Roy J. Shlemon Mentor Program in Applied Geology and the John Mann Mentors in Applied Hydrogeology Program. These popular events, supported by the GSA Foundation through gifts from Roy J. Shlemon and John Mann, are designed to extend the mentoring reach of individual professionals from applied geology.

Mentors and students meet in a relaxing, informal setting to discuss applied geology or hydrogeology careers over a free lunch. The mentors, who come as volunteers, are professionals in these fields (check out the "Mentor Hall of Fame" at www.geosociety .org/mentors/hof.htm).

This spring, the Shlemon Program funds, in addition to financial assistance from the GSA Northeastern Section, provided lunches and a place to converse to 480 students and 52 mentors; the Mann Program welcomed 305 students and 33 mentors. Both mentors and students leave these events expressing feelings of personal and professional growth. New friendships are made and professional contacts are established that will last well into the future.

GSA's Education & Outreach Program gratefully acknowledges the following mentors for their individual gifts of time and for sharing their insight with GSA's student members. **To learn more** about these programs, or to be a mentor in the future, please contact **Jennifer Nocerino,** jnocerino@geosociety.org.

The Roy J. Shlemon Mentor Program in Applied Geology

Helping Mentor Students Since 2000

NORTHEASTERN SECTION

Steven Arcone, U.S. Army Cold Regions Research and Engineering Laboratory
Peter Beblowski, New Hampshire Hazardous Waste Remediation Bureau
Charles Crocetti, Sanborn Head and Associates Inc.
Mark Dobday, GeoTesting Express Inc.
John Dougherty, CDM Smith
Abigail J.T. Fopiano, Geosphere Environmental Management Inc.
Marjorie Gale, Vermont Geological Survey
Frank Getchell, Leggette, Brashears & Graham Inc.
Sarah Yuhas Kirn, New Hampshire Department of Environmental Services Oil Remediation and Compliance Bureau
Sarah Leedberg, Shell Exploration & Production Company
Jim Lewkowicz, Weston Geophysical Corp.
Anne Lightbody, University of New Hampshire
Daniel A. Maeso, Haley & Aldrich
Michael Matthews, Pennsylvania Department of Transportation
David Mirakian, Shell Exploration & Production Company
Brad Murray, Jacobs Associates
John Nelson, Massachusetts Water Resources Authority
Susan Price, Murphy Risk Services
Bob Stewart Jr., ExxonMobil Exploration Company
Lori Summa, ExxonMobil Upstream Research Company
Raymond Talkington, Geosphere Environmental Management Inc.

SOUTHEASTERN SECTION

Brandon Ashby, Cardno Entrix
Robert Denton Jr., GeoConcepts Engineering Inc.
Robert Fuhrer, Alpha Engineering Group PSC
Richard MacKenzie III, ExxonMobil Exploration Company
Bernd Rindermann, HSA Engineers & Scientists
Peter Wampler, Grand Valley State University

SOUTH-CENTRAL SECTION

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James Bené, R. W. Harden & Associates Inc.
Thomas E. Ewing, Yegua Energy Associates LLC
Stephanie Saldana, Texas Commission on Environmental Quality
Eugene Szymanski, Chevron Corporation
Charles M. Woodruff, Woodruff Geologic Consulting Inc.

NORTH-CENTRAL SECTION

Dick Berg, Illinois State Geological Survey
Mark A. Petrie, Michigan Department of Environmental Quality
David Saja, The Cleveland Museum of Natural History
John C. Steinmetz, Indiana Geological Survey
Andrew S. Turner, Graymont Inc.
Mark S. Wollensak, Hamp, Mathews & Associates Inc.

ROCKY MOUNTAIN SECTION

Kevin Boggs, CH2M HILL
Todd Dallegge, WPX Energy
Virginia S. Gillerman, Idaho Geological Survey
James W. Granath, Consulting Structural Geologist
Paul Morgan, Colorado Geological Survey

CORDILLERAN SECTION

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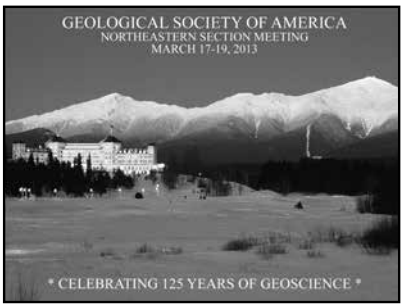
Bill Cole, Geoinsite Inc.
J. Reed Glasmann, Willamette Geological Service
Greg McDonald, National Park Service
Ante Mlinarevic, California DWR, DOE, GSB, Project Geology Section
Michelle Sutherland, AMEC

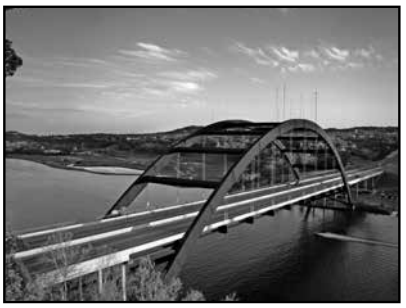
2013 NORTHEASTERN SECTION



2013 SOUTHEASTERN SECTION

Palominito Islet, Puerto Rico. Image courtesy seepuertorico.com.

2013 SOUTH-CENTRAL SECTION



Loop 360 Bridge at Sunset, Austin, Texas, USA. Photo by Dan Herron, HerronStock.com. Used with permission of the Austin CVB.

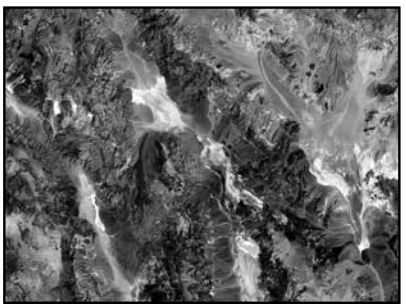
2013 NORTH-CENTRAL SECTION

Kalamazoo, Michigan. Round-topped towers are the Radisson Plaza hotel.

2013 ROCKY MOUNTAIN SECTION

Morrow Point Reservoir. Photo courtesy U.S. National Park Service.

2013 CORDILLERAN SECTION



Death Valley, California, USA. Image courtesy NASA.

The John Mann Mentors in Applied Hydrogeology Program

Helping Mentor Students Since 2004

NORTHEASTERN SECTION

Peter Beblowski, New Hampshire Hazardous Waste Remediation Bureau
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Abigail J.T. Fopiano, Geosphere Environmental Management Inc.
Frank Getchell, Leggette, Brashears & Graham Inc.
Sarah Yuhas Kirn, New Hampshire Department of Environmental Services Oil Remediation and Compliance Bureau
Jeffrey Marts, Emery & Garrett Groundwater
Jennifer A. Marts, New Hampshire Department of Environmental Services
John Nelson, Massachusetts Water Resources Authority
Jeremy Nicoletti, New Hampshire Geological Survey
Susan Price, Murphy Risk Services
Raymond Talkington, Geosphere Environmental Management Inc.
David Wunsch, Delaware Geological Survey

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Mike Purcell, California Department of Water Resources
Timothy M. Ross, California Department of Water Resources
Beth Weinman, California State University, Fresno

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Photo by Bret Webster.

GSA's Connected Community Member Directory 2.0

We are delighted to report that GSA's Connected Community continues to grow, with new groups forming week in and week out. Take full advantage of the power of GSA's online resources and join your colleagues today.

Getting started is easy. Simply type **community.geosociety.org** into your web browser and click on "Help" for instructions on how to log in. As a reminder, GSA members already have a profile in the Connected Community, populated from our member database—all you have to do is activate it. Completing your profile is simple, quick, and painless. Adding profile information takes less than five minutes for most members, and privacy settings allow you to share or protect information as you choose.

Member Directory 2.0

GSA's Member Directory 2.0 offers powerful ways for users to network and join specialized communities. Individual detailed profiles are used in targeted searches and automatically matched to people that share similar backgrounds and common areas of interest. To get the most out of your membership experience, fill out your interactive profile to ensure that you are providing other GSA members with the information that you want them to know about you. The more information you put into your profile, the easier it is for other members to find you and connect.

HOT TIP: Upload a professional picture. Pictures are worth a thousand words, so make sure the image best represents you and what you want to accomplish.

Want to Build Your Professional Network?

You've completed your profile on the Connected Community, so now what? Find your people: GSA's Member Directory 2.0 allows you to connect with more than 25,000 members, empowering you to build a valuable professional network that you can access from anywhere in the world. Search the Member Directory and connect others who share your interests.

After logging in to the Connected Community, you will arrive at the home page. In the main navigation, choose "Directory." If you know the name, organization, or e-mail address of the individual you are looking for, enter it here and choose "Find Member." Find your person, and click on the link to add this person as a contact.

HOT TIP: Click on their name or their picture to view their profile.

Did You Know? You can send someone an e-mail right from this page—it will go to their Connected Community inbox as well as the e-mail address that is on file in GSA's member database. Your inbox holds all invites and messages that you have sent as well as incoming invites and messages sent by other GSA members. You can easily see your invitations to connect and accept or decline. Messages will also be automatically sent to your regular e-mail box (e.g., Microsoft Outlook, Gmail, AOL, or Yahoo account).

Did You Know? When you have messages waiting, an envelope icon will appear in the Welcome Box in the top right-hand corner of each page, as well as below your name on your profile page.

Search by Enhanced Criteria to Locate Contacts

GSA's Member Directory 2.0 includes an "Advanced Search" function featuring a robust suite of professional networking capabilities. You can search by city, state, or country—this is useful for finding others in your area that you may want to connect with locally. Or perhaps you'd like to find a colleague you went to school with. Query an individual based on his or her education. You can also search for people based on primary professional interest and publications. Finally, if you know someone is part of a specific group on the Connected Community, you can search for a member of a group by choosing the community type and selecting the community name.

HOT TIP: Use the Likeness Meter to have the Connected Community automatically match you to other members who have similar backgrounds and interests. This is one of the reasons it is so important to complete your profile—the platform uses a formula to calculate how closely your profile matches other profiles to make these recommendations.

See the June 2013 *GSA Today* (p. 24–25; www.geosociety.org/gsatoday/) for an introductory article on GSA's Connected Community.

Network and Interact

A network is meant to be a quick way to find people with whom you'll want to connect. It lets you know how many other people share something in common with you and helps you find these people. Networks link people to each other based on matching criteria in their Directory 2.0 profiles. The Connected Community automatically forms networks on such data as location, job history, and education history. You may also define your own custom demographics and form networks from these.

Next month in *GSA Today* we'll talk more about how the new Connected Community platform allows members to easily interact and communicate online through "Discussions." Watch the GSA homepage for our next webinar on how to use the Connected Community.

HOT TIP: The GSA OPEN FORUM is a place for everyone to post questions, photos, videos, or share thoughts.

Extend your Annual Meeting Networking with GSA's Connected Community

Attending GSA's 125th Annual Meeting in Denver? GSA's new Connected Community allows annual meeting attendees to stay connected during and after the meeting. You can use the site to

- **Update your profile** so that people can find you for networking purposes;
- Search and connect with people you've met so that you can **stay in touch**;
- Post messages to discussions and **keep topical conversations going beyond the meeting**;
- **Join groups** of like-minded people who want to work together to improve and innovate; and
- **Post your presentations, pictures, documents, videos, or other content** that you feel will help other participants in the GSA Community.

HOT TIP CHALLENGE: Register for the GSA 125th Anniversary Meeting and activate your profile with a photo in the Connected Community to make the most of your meeting experience.

We Believe in the Power of GSA's Connected Community!

community.geosociety.org

2013–2014 GSA-USGS Congressional Science Fellow Announcement

Anna K. Mebust

GSA is pleased to announce the selection of Anna K. Mebust as the 2013–2014 GSA-USGS Congressional Science Fellow. Mebust received a B.A. from Pomona College in 2008, majoring in both chemistry and mathematics. Her research at Pomona investigated the development of thin film gas microsensors to be used in air-quality monitoring. As part of this project, she was awarded a summer fellowship at the NASA Jet Propulsion Laboratory in Pasadena to work on the development of the Electronic Nose (ENose), a sensor deployed on the International Space Station to monitor onboard air quality. Also during her time at Pomona, Mebust was inducted into Phi Beta Kappa and Sigma Xi.

Mebust earned her Ph.D. in physical chemistry from the University of California at Berkeley in August 2013. Her dissertation research employed remote sensing measurements to identify and quantify sources of variability in emissions of pollutants from wildfires. This variability has important implications for air quality and climate but has previously proved difficult to study. Mebust developed a novel technique using satellite data to study these emissions, and she earned a prestigious graduate fellowship from the Department of Energy Office of Science in 2010 for this work. Mebust's research in atmospheric chemistry has ties to diverse fields like biogeoscience, meteorology, and climate, giving her the broad earth-science background required for this fellowship.

Mebust has extensive leadership and communication experience both inside and outside of academia. She taught a variety of classes as both an undergraduate and graduate student. At Pomona, Mebust captained the ultimate Frisbee team and received a leadership award from the mathematics department. While at Berkeley, she held numerous teaching and leadership positions as part of the ballroom dance team. As a communicator, Mebust is especially talented at adjusting her language to convey important concepts at appropriate levels—her work teaching chemistry, mathematics, ultimate, and dance has primarily been aimed at beginners, and she also designed a new website for her research group at Berkeley, targeted toward early-career scientists. These skills will serve her well in the coming year as she articulates scientific concepts to legislators, constituents, and other non-scientists. Mebust is extremely honored to be selected as the 2013–2014 GSA-USGS Congressional Science Fellow and is very much looking forward to using her scientific background and communication skills to make a concrete difference in public policy and to improve lines of communication between policy makers and researchers.

THE GEOLOGICAL SOCIETY OF AMERICA®

USGS science for a changing world

Joint GSA Penrose/AGU Chapman Conference Report

THE GEOLOGICAL SOCIETY OF AMERICA

AGU CHAPMAN CONFERENCE

Coastal Processes and Environments under Sea-Level Rise and Changing Climate: Science to Inform Management

14–19 April 2013 • Galveston, Texas, USA

CONVENERS:

John B. Anderson, *Dept. of Earth Science, Rice University, Houston, Texas 77005, USA; johna@rice.edu*

ORGANIZING COMMITTEE

Margaret Davidson, *Coastal Services Center, National Oceanic and Atmospheric Administration, Charleston, South Carolina 29412-9110, USA; margaret.davidson@noaa.gov*

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Torbjörn E. Törnqvist, *Dept. of Earth and Environmental Sciences, Tulane University, New Orleans 70118, Louisiana, USA; tor@tulane.edu*

Acceleration of sea-level rise (SLR) in response to global climate change is well underway. Current global SLR averages ~3.0 mm/yr, although the actual rate varies globally. In comparison, sea-level curves indicate that SLR was only a fraction of a millimeter per year over the past few thousand years. The increased rate of global SLR is exacerbated on a regional scale by decadal-scale oscillations that are due to climatic and oceanographic controls, varying wave climate (wave height, period, and direction), increased subsidence due to subsurface fluid extraction, and anthropogenic alterations in sediment supply to coasts—in particular, the alteration of sediment delivery and distribution within deltas. Coastal response to these changes is occurring at alarming rates, resulting in billions of dollars in damage to infrastructure, massive taxpayer funding for recovery, degradation of ecosystems, and, in the worst case, loss of life, as experienced in major storms. Scientific understanding of the causes and magnitudes of coastal change is far from the level needed to confidently predict future change.

On 14–19 April 2013, 84 coastal scientists and social scientists from twelve countries gathered in Galveston, Texas, USA, for the first joint GSA Penrose/AGU Chapman Conference. The conference venue was the historic Strand Area of Galveston, where approximately 6,000 people perished during the "Great Storm" of 1900 and where SLR, diminished sediment supply, and human influence threaten the sustainability of the island.

The first four days of the conference were devoted primarily to talks and poster sessions aimed at synthesizing the state of knowledge on (1) the causes, impacts, and record of sea-level rise, coastal subsidence, severe storms, changes in wave climate, sediment delivery and dispersal in coastal systems, and biological influences on coastal sedimentology and morphology; (2) the status of numerical models needed to predict coastal change; and (3) societal impacts of coastal change. A half-day field trip focused on the upper Texas coastal barriers and bays and on sustainable strategies for Galveston Island. The final day was devoted to discussion of how science can and should inform the public and policy makers about the realities of SLR and coastal change and how scientists can be more effective in initiating appropriate policy responses.

At the beginning of the conference, it was determined that the results should be conveyed in a way that captured the essence of the presentations and discussions with minimal rhetoric. Scribes were assigned to highlight key findings, and their results were compiled into bullet statements that were discussed and agreed on by the group on the last day of the conference.

SEA-LEVEL CHANGE

1. Acceleration of SLR in response to global climate change is well underway; the rate of sea-level rise during the twentieth century is the highest rate in the past 2,000 years. The rate of global SLR is expected to increase in the twenty-first century, although the magnitude is uncertain.
2. Rates of sea-level rise are not constant. For example, at ca. 14.6 ka, a rapid rise of ~20 m occurred within ~340 years (Meltwater Pulse 1A, MWP-1A), highlighting the potential for rapid contributions to SLR by ice sheets.
3. Major challenges remain in understanding sea-level change at the regional level. This is due to uncertainties associated with glacial isostatic adjustment (GIA), steric changes and dynamic ocean processes, and tectonics.
4. The study of past sea-level changes is pertinent for testing climate and ice-sheet models under different forcing conditions. Estimations of past sea level during previous warm

periods provide constraints on the magnitudes of SLR and the ice mass balance of the Greenland and Antarctic ice sheets.
5. Oceanographic controls on oscillation in sea level exert significant control on coastal change at sub-centennial time scales. In some areas, these oscillations are driven by climatic oscillations that are understood and therefore predictable. In other areas, the causes are uncertain.

TROPICAL CYCLONES

1. It is unknown if the magnitude and intensity of tropical cyclones in the Atlantic and Gulf coasts will increase in the future. Nevertheless, SLR will exacerbate flooding from tropical cyclones.
2. Tropical cyclones result in punctuated response of coasts to SLR and variations in sediment supply (tipping points in coastal evolution). The relationships between storm magnitude and duration and sand erosion and transport, and hence shoreline recovery, are poorly understood.
3. Changes in wave climate (wave height, frequency, and direction) can profoundly impact coasts, even in a stable sea-level scenario. The relationships between wave regime and climate oscillations are well established in some regions, and therefore predictable, but in other regions, such as the U.S. West Coast, remain problematic.

COASTAL EVOLUTION

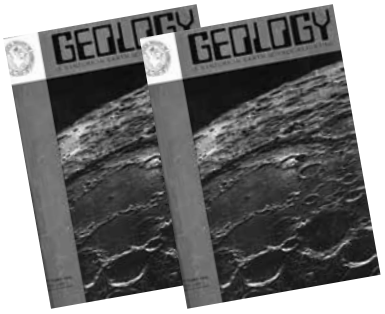
1. Vertical land motions are generally dominated by shallow processes over deep processes in low-gradient coastal settings, with locally significant, decadal-scale changes in subsidence driven by oil, gas, and water extraction.
2. Deltas of the world (e.g., Asia, Europe, Gulf of Mexico) are experiencing unprecedented change that is due to anthropogenic influence—in particular, alteration of sediment delivery and distribution, local land-use, and increased subsidence.
3. Sediment type and the volume of sediment delivery in response to climate change are important in both deltaic and non-deltaic coastal settings. Organic and terrigenous sediment accumulation determines the upper limits of accretion rates.
4. Sea-level rise leads to pervasive shoreline retreat. Numerical models indicate that that shoreline response can be as much as 1000 m per 1 m rise. However, actual rates of response have been highly variable in the past, and current rates of change are highly variable across relatively small stretches of coastline. This variability highlights the importance of other factors in regulating coastal response to SLR. These include sand availability, substrate conditions, frequency and magnitude of storm impacts, and the antecedent topography across which these shorelines are migrating.
5. Given the complex response of coastal systems to SLR, passive inundation models do not accurately portray magnitudes of change. Furthermore, these models convey the message that SLR is a prediction and not an ongoing process and detract from the importance of rates of rise in coastal change.
6. Biological processes are important to mitigate and control landform evolution and therefore coastal change.
7. The impacts of SLR include coastal flooding, groundwater contamination and saltwater intrusion, and related soil salinization that can extend tens of kilometers inland (e.g., in the Venice lagoon region).
8. Human modification can strongly modify natural functioning and response to climate change. Such modifications have resulted in accelerated erosion of shorelines, complete loss of wave-dominated and bayhead deltas, dramatic loss of wetlands, increased coastal flooding, and increased vulnerability to storm impact.

SOCIO-ECONOMIC IMPACTS OF SEA-LEVEL RISE AND COASTAL FLOODING

1. To understand vulnerability and resilience to environmental hazards, we must understand not just the physical impact of the hazard, but the way that physical impact affects the activities by which people make their livelihood. Well-intentioned policies and infrastructure projects that fail to understand these connections often end up futile or even counterproductive.
2. Coastal flooding poses significant socio-economic and environmental threats globally, and future climate and socio-economic change drivers will only exacerbate these impacts.
3. There is a need to generate geohazard and coastal vulnerability maps. These are user friendly and more useful to the public and planners than reports, figures, and model outputs. These maps must be updated using more sophisticated coastal monitoring that relies on the latest technologies in order to provide the best adaptive strategies for coastal sustainability.
4. Coastal protection involves maintenance costs that increase with time. Energy scarcity and cost need to be integrated into societal programs to deal with climate change.
5. Education and engagement of stakeholders is critical for success. Incorporating science into the decision-making process requires the identification of knowledge gaps and understanding of how these gaps can be filled.
7. Coastal sustainability requires coordination among governmental, regional, and municipal institutions and agencies with overlapping fields of interest and responsibility.
8. Coastal response to global climate change is a global issue. There is a need to increase international collaboration to expand our knowledge and to assist those countries where change is occurring at alarming rates but where scientific information is critically needed to mitigate change. An example would be the Philippines, with tens of thousands of kilometers of coastline and a large population that is subject to multiple geohazards, but with very few coastal scientists. Bangladesh is an example where international collaboration is working effectively, with UK-funded and U.S.-funded research being presented at the meeting.

ACKNOWLEDGMENTS

Thanks to the cosponsors of this conference, whose financial contributions enabled a high level of participation by students, young scholars, and international scientists. These include The Geological Society of America, the American Geophysical Union, the Geological Society of London, the Society for Sedimentary Research, and the Shell Center for Sustainability of Rice University. We would also like to thank John Geissman, past president of The Geological Society of America, for his encouragement and support in making this conference a success.



Geology—Past & Future REVISITED

Editor's note: The following is a reprint of the first three sections of a series of articles highlighting the 10th anniversary of the first issue of *Geology*, as published in *Geology* in December 1983 [v. 11, no. 12, p. 679–691, doi: 10.1130/0091-7613(1983)11<679:GAF>2.0.CO;2]. Author affiliation notations are as originally published in 1983.

GSA Today will be reprinting these sections over the next few months as the Society continues to celebrate its 125th anniversary.

INTRODUCTION

E.M. Moores, *Editor,* Geology

When *Geology* began publishing in September 1973, it was an important innovation in earth science literature—a short-article, fast-publication medium intended to bridge the gap between the widespread but spotty private circulation of preprints and the established traditional journals, such as the *GSA Bulletin*. In the past decade several other similar publications have sprung up, but we believe that *Geology* has been and will continue to be a trend setter.

This special issue commemorates the tenth anniversary of *Geology*. The earth sciences have been changing for the past decade at a rapid, even revolutionary rate, and the time had come to step back and try to gain some perspective on their development. The following short essays on different fields or subfields of earth science address the questions (1) What were the predicted new frontiers of the field in 1973? (2) How in fact did matters develop? In other words, how did events compare with predictions? (3) On the basis of the perspective acquired from the answers to the questions above, what predictions would you make for the next decade?

The essays below* clearly do not cover the entire range of earth science. We hope, however, that they will stimulate others to reflect on both the recent past and the future of geology in all its subfields. If you think that something important was omitted, send us a letter. We will publish appropriate comments in a future issue as space permits.†

OVERVIEW

John C. Maxwell, *Department of Geological Sciences, University of Texas, Austin, Texas 78712*

Future historians of science will recognize the past two decades as an era of exploration unique in history. Two huge and virtually unknown regions became accessible—the 70% of the solid earth beneath the oceans through the availability of drilling ships capable of operating in deep water far from land, and space, especially the planets, courtesy of Sputnik and follow-on sophisticated space vehicles. The findings of these exploration programs, especially those from the oceans, drastically reoriented geologic thinking. The concept of a relatively placid earth, in which vertical motions control most geologic processes, was replaced by the dynamic earth of "plate tectonics," characterized by lateral movements measured in thousands of kilometres [*sic*].

Very expensive equipment, such as a drilling ship, focuses the research commitments of many individuals and institutions. When the *Glomar Challenger* became available, therefore, a program for vigorous exploration of the oceanic crust was carefully planned, including correlated operations by geophysical surveying ship and submersibles. Many important discoveries were quite unexpected. An outstanding example was the

*And in following issues of *GSA Today.*

†Send brief comments to gsatoday@geosociety.org. Should this article spark a longer comment, please consider writing a *GSA Today* Groundwork or science article; learn more at www.geosociety.org/gsatoday/.

recognition of an extensive, thermally driven circulation of sea water through hot, newly formed crust, significantly altering the chemistry of both water and crustal rocks, and producing concentrations of metallic sulfides similar to known ore deposits.

An important objective for the exploration of Earth's moon and the inner planets was to obtain clues to the first 800 m.y. of Earth history. Much was learned, of course, but observations of the most important planet for this objective, Earth's near-twin Venus, are sketchy and of marginal value. The continuing exploration of Venus is urgent unfinished business.

During the next decade, areas and phenomena for which plate tectonics give little guidance will receive increasing attention. In effect, we are merging into the post–plate-tectonics era. Two regions will receive particular attention—continents and the mantle below the lithosphere.

In spite of some 200 years of observations, the composition, structure, age, and origin of continental crust below shallow levels is essentially unknown. The simple two-layer model of a "granitic" upper and "basaltic" lower crust is obviously wide of the mark, as demonstrated by chemical and isotopic studies of igneous rocks and contained xenoliths, and by well-organized and continuing programs of deep seismic reflection profiling. It seems probable that the continents will be extensively explored by these and other means and that eventually a companion program of deep drilling will be instituted to calibrate and give reality to the geophysical data.

From thermal arguments it seems clear that sublithosphere convection must occur, but whether as a cause or a result of plate motions and whether shallow, deep, or multilayered cannot yet be determined. World-wide gravity data and high-quality digital, three-dimensional earthquake seismic data are required to approach the problem. The collection and analysis of both types of data are now technically feasible. Such data, yielding density distribution and geometry of mantle in homogeneities, can then be combined with data on behavior of mantle materials at the requisite temperatures and pressures (also attainable) to establish constraints for models of convection and thus provide a framework for understanding the dynamics of the earth. Perhaps then such enigmas as the apparently random movement of crustal plates and the generation of continental crust can be rationalized within a model of a dynamic Earth.

OIL AND GAS RESOURCES: HUBBERT'S CURVES REVISITED[§]

Paul A. Bailly, *Mineral Industry Consultant, Denver, Colorado 80219*

By 1973, M. King Hubbert's predictions of the peaks in crude oil and natural gas production in the conterminous United States, offshore included, had proved quite accurate. The oil peak occurred in 1970, 14 years after the 1956 discovery peak, approximately as he predicted from 1967 data, at 3.4 billion bls/yr, 13% higher than predicted. The gas peak took place in 1973, a few years earlier than he predicted from 1972 data, at 22.6 trillion ft^3/yr, 6% lower than predicted. These peaks provided a strong vindication of Hubbert's mathematical curve fit of historical production, reserves, and discovery data.

Hubbert's curves as published can also be read to estimate production after reaching the peaks. This is an exercise that Hubbert, in his cautious way, would find inadvisable, yet such estimates for 1973 and 1981 (the last year for which reliable data are available) turned out to be close to actual results, although somewhat high for oil and low for gas. Hubbert's message that U.S. crude oil and gas production would start declining in the late 60s and the late 70s, respectively, was deprecated by quite a few—but perhaps OPEC used these forecasts when it planned the timing of its first historical oil price increase.

In my opinion, Hubbert's resource model for relating the human economic activity of exploration and production to the natural endowment has flaws, like all resource modeling efforts, yet his predictions were quite accurate for several reasons: (1) The predictions were made after the U.S. conventional oil and gas industry had reached maturity; the life-cycle model of mineral commodities conceptualized by D.F. Hewett could be reasonably applied. (2) There is, so far, only one physical method for checking geologic predictions about oil and gas occurrences: drilling; it constitutes the major cost of discovery. (3) A considerable body of reliable data was available, starting with the first oil discovery in 1860 and starting in the 1900s for gas; such data were amenable to quantitative operational analysis. (4) Gas and oil produced to date occur in simple natural settings definable as a few generally valid deposit types. (5) The discovery peaks had already been passed, thus allowing quite reliable predictions of the production peaks. The inflection points on the production rate curves had also been passed, thus allowing good curve fitting, an impossibility before the inflection point is reached, unless one has a reliable estimate for ultimate recoverable resources. (6) Oil-derived products and natural gas are destroyed by users and are not recyclable.(7) The peak extrapolations involved only short periods of temporal projection, for which alternate curve-fitting made little difference.

Hubbert's oil and gas predictions in the lower 48 states retain great value to strategic planners and policy makers. However, his approach does not tell us where to look for new discoveries. That can be accomplished only by direct assessment of basins and regions which integrate the judgment of experienced geologists with the evaluation of the related uncertainties. This is the approach of the USGS; it is also the first step in designing exploration programs that will discover future producible resources.

Hubbert rendered an invaluable service in relentlessly insisting that U.S. oil and gas production would peak and decline in the near future, that the USA was moving at a fast pace toward depletion, and that oil and gas as sources of energy would be but a small bump on the curve of human use of energy over the millennia. For that, the world owes a great debt to M. King Hubbert, a great earth scientist and resource philosopher.

[§] See the June 2007 *GSA Today* Groundwork article by Eric S. Cheney and Marianne W. Hawkes, "The future of hydrocarbons: Hubbert's peak or a plateau?" (http://www.geosociety.org/gsatoday/archive/17/6/pdf/i1052-5173-17-6-69.pdf), for an analysis of this topic.

GSA Foundation Update

P. Geoffrey Feiss, GSA Foundation President

A rewarding part of working with the GSA Foundation includes meeting students who benefit from programs supported by GSA members. The Roy J. Shlemon and John Mann Mentor lunches, mentioned previously in this issue, bring hundreds of students together with professional geoscience mentors over brown-bag lunches. The lunch format offers students an informal setting to pose questions about making the leap from student to geoscience professional. It's clear the mentors enjoy the chance to engage with students and share their experience and opinions in a peer-to-peer Q&A format.

The peer-peer interaction between students and mentors is an excellent example of GSA members supporting each other and advancing the profession. In addition to lunch and advice, students receive a short message from GSA Executive Director Jack Hess encouraging them to join and be active in our professional society. Consider the benefits GSA members and partners made possible in 2012 through their support of Society-managed programs:

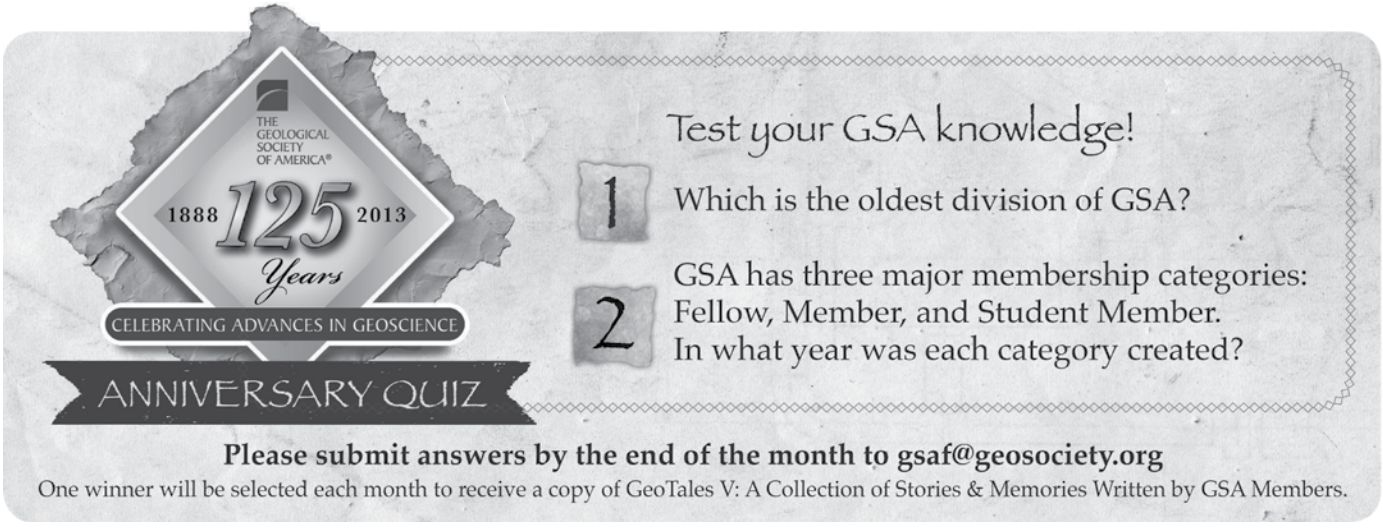
- Placing more than 100 GeoCorps™ America geoscientists with natural resource agencies;
- Awarding more than 300 research grants, averaging US$1,800;
- Mentor programs for student members;
- Geoscience career track programs at GSA meetings; and
- Providing curriculum and teaching instruction to thousands of K–12 geoscience educators

Jack's message of participation is also timely because GSA will launch its annual membership renewal effort in September. The Foundation is grateful to the thousands of members who choose to make a gift to the GSA Foundation as part of their renewal process. Each year, members donate more than US$200,000 to GSA programs and priorities through renewal gifts averaging US$50. Perhaps you or a colleague benefited from a GSA program or grant, or you simply understand the importance of these efforts to advancing the geosciences. Your decision to make a gift at renewal delivers, in combination with other members, career and life-changing results for current and future GSA members. Thank you for your support!

Learn more about GSA programs and funding opportunities at **www.gsafweb.org.**

Want to make a gift using your credit card? Use the GSA Foundation's secure website.

Questions? Please contact Chris Tallackson, ctallackson@geosociety.org, +1-303-357-1007.



Classified Ads

Positions Open

PEVEHOUSE CHAIR IN GEOSCIENCES
TEXAS TECH UNIVERSITY

The Dept. of Geosciences at Texas Tech University invites applications for the Pevehouse Chair in Geosciences. The purpose of this endowed position is to support innovative research and education that are broadly aligned with petroleum geosciences and may include geophysics, structural geology, geomechanics, sedimentology, petrophysics, and organic geochemistry. A Ph.D. in geosciences or closely allied field is required, as is a record of research as demonstrated by professional publications. The chair holder will conduct a vigorous, externally funded research program, direct graduate student research, and teach undergraduate and graduate courses in his/her specialty. The position is expected to be filled at the tenured Full Professor level.

Texas Tech is a state-supported, graduate research-oriented university with over 32,000 students. The Dept. of Geosciences consists of 24 tenured/tenure-track faculty, with teaching and research emphases in solid earth geosciences, atmospheric science, and geography. It offers degree programs in solid earth geosciences at the B.S., M.S., and Ph.D. levels. The chair will join a dynamic, growing department with more than 200 undergraduate majors and more than 60 graduate students. Texas Tech is committed to growth in disciplines aligned with hydrocarbon geology through addition of at least one junior faculty position.

The Department computer labs are equipped with GIS, geologic mapping/modeling, and seismic processing/interpretation software packages. Available experimental/analytical facilities include a stable isotope laboratory, XRD, XRF, analytical SEM, TEM, laser ablation ICP-MS, a heat flow lab, and remote sensing spectroradiometers In addition, the Dept. of Petroleum Engineering maintains experimental and analytical facilities in petrophysics, drill fluids, cement, enhanced recovery, and reservoir simulation, as well as X-ray CT/nuclear magnetic resonance imaging lab.

Lubbock is located on the Southern High Plains in close proximity to the Permian Basin. The city has a population of over 225,000, and the semi-arid climate is conducive to outdoor activities. Cultural amenities include musical, theatrical, and sports events, and the city offers numerous options for shopping and dining. The city also offers the best healthcare facilities in the region, including the university's Health Sciences Center. The cost of living is low compared to national norms.

Applicants must first go to the university's employment website, http://jobs.texastech.edu. There, go to "Search Postings," search for requisition number 87107, and fill out the necessary forms in applying for the position online. Next, applicants should submit a letter of application, curriculum vitae, a statement of teaching and research interest, and names and contact information (including e-mail address) of at least three professional references. These documents should be uploaded to the employment website and we request that copies by e-mailed or sent directly to Dr. Calvin Barnes, Pevehouse Chair Search Committee, Dept. of Geosciences, Texas Tech University, MS 1053, Lubbock, TX 79409-1053.

Additional information on the department can be found at www.depts.ttu.edu/gesc/; e-mail questions regarding the position to cal.barnes@ttu.edu. Review of applicants will begin immediately and continue until the position is filled.

Texas Tech University is an affirmative action/equal opportunity employer, committed to excellence through diversity. Texas Tech welcomes applications from minorities, women, veterans and persons with disabilities.

ASSISTANT RESEARCH SCIENTIST
GEOCHEMICAL AND ENVIRONMENTAL RESEARCH GROUP (GERG)
TEXAS A&M UNIVERSITY

Duties include contributing to the research mission of the Geochemical and Environmental Research Group (GERG) and the Dept. of Oceanography at Texas A&M University through research involving resource geosciences. Collaborate with faculty, scientists, technicians, engineers, and students at GERG and others elsewhere in the department and University who are involved with similar areas. Efforts include proposal development in their area of expertise. The successful candidate is expected to identify and seek new interdisciplinary research opportunities through collaborative proposals to local, state, and federal agencies and industry. This position is expected to contribute to the teaching and mentoring mission of the University and College of Geosciences by serving on graduate student advisory committees and engaging undergraduate/graduate students in research opportunities. The estimated distribution of effort for this position is:

- Develops new funding opportunities through proposal writing, technological developments, and establishing collaborations with other academic and commercial entities (30);
- Enhances technical capabilities through method development and marketing (20);
- Contributes to increasing the Dept. of Oceanography and GERG's resource geoscience capacity through interdisciplinary collaborative efforts with academic and commercial entities (5);
- Participating in multidiscipline research proposal planning and preparation (5);
- Interpretation of scientific data for reports and publications (25);
- Engages in effective communications, presentations, and public relations (5);
- Serves on various college and departmental committees and represents GERG at various state and national associations (5); and
- Other duties as assigned (5).

SUPERVISION. Received: Director; Given: Potentially staff associated with research projects.

EDUCATION AND EXPERIENCE. Required: Ph.D. in related field with postdoctoral experience. The position requires a background in resource geosciences. Preferred: Ph.D. in geological or chemical oceanography with three years of postdoctoral experience; cruise experience; and success in obtaining research funding.

LICENSES, CERTIFICATES, OR REGISTRATION. Required: None.

EQUIPMENT. Typical: Working knowledge of geochemical analytical instrumentation, quality assurance/quality control procedures.

KNOWLEDGE, ABILITIES AND SKILLS. Typical: Excellent oral and written communication skills; management experience

TO APPLY: Submit by e-mail attachment: CV, statement of research interests names and e-mail addresses of at least three references to dunham@geos.tamu.edu.

This position will be open until filled by the suitable candidate.

ADJUNCT INSTRUCTOR
UNIVERSITY OF OREGON

The University of Oregon is soliciting applications for a sabbatical-replacement adjunct instructor to teach Introductory Geology (Geol 10X or 20X) and Geology core courses such as Introduction to Field Methods (318), Mineralogy (331), Petrology (332), Hydrogeology (Geol 4/551), Surveying (410/510), and Summer Geology Field Camp (450). Candidates may apply to teach either three courses (0.5 FTE) or six courses (1.0 FTE), depending on experience and areas of expertise. Preference will be given to candidates who can start fall term (Sept. 16, 2013) and/or extend into summer 2014 to teach part of our summer field camp. Ph.D. required.

Please send vitae and letter of interest to: Head, Dept. of Geological Sciences, 1272 University of Oregon, Eugene, OR 97403-1272, USA, or send PDF files to arbeiter@uoregon.edu. Reference hiring pool 13054. Screening of applications will start in late July and will continue until the positions are filled.

The University of Oregon is an Affirmative Action/Equal Opportunity Employer. The Dept. of Geological Sciences is committed to achieving excellence through cultural diversity. We actively encourage applications from women, people of color, and individuals from underrepresented groups.

TENURE TRACK POSITION IN
ECOHYDROLOGY, TEMPLE UNIVERSITY

The Dept. of Earth and Environmental Science is entering a period of growth with plans to implement a Ph.D. To move toward that goal, the department seeks to fill two tenure-track faculty positions to begin in August 2014. One of the positions will be in the area of ECOHYDROLOGY. See separate advertisement for ENVIRONMENTAL ISOTOPE GEOCHEMISTRY position. Exceptional candidates holding a Ph.D. are encouraged to apply at any level (assistant, associate, or full professor).

Possible areas of expertise for the ECOHYDROLOGY position include coupled hydrological and ecological processes involving water, energy, carbon, sediment, and nutrient fluxes, as well as the ecological impacts of contamination. Candidates with expertise in urban stormwater management, watersheds, or wetlands are of particular interest. The individual is expected to use a combination of field-based data collection and modeling approaches to quantify ecohydrologic impacts of human development. Mentoring of undergraduate and graduate students and securing external funding are expected. Applicants must have a Ph.D. in a relevant science or engineering discipline and will be

expected to teach courses for majors in geology and environmental science.

Applications should include a CV, statement of teaching goals, a research plan, names and addresses of at least three references, and selected reprints. Instructions for uploading applications materials are at http://ees.cst.temple.edu/. Send a letter of intention to apply and any inquiries to Laura Toran, Chair, Search Committee, ltoran@temple.edu. We request application material be submitted by **Sept. 16, 2013.** Temple University is a state-related research intensive university with an undergraduate enrollment of about 28,000. More information on our department is available at www.temple.edu/geology/. Temple University is an equal opportunity, equal access, affirmative action employer committed to achieving a diverse community (AA, EOE, M/F/D/V). The department specifically encourages applications from women and minorities.

TENURE TRACK POSITION IN STABLE ISOTOPE GEOCHEMISTRY TEMPLE UNIVERSITY

The Dept. of Earth and Environmental Science, with nine tenure track faculty, is entering a period of growth with plans to implement a Ph.D. Toward that goal, the department seeks to fill two tenure-track faculty positions AT ANY RANK to begin in August 2014. One of the positions will be in the area of STABLE ISOTOPE GEOCHEMISTRY. See a separate advertisement for the ECO-HYDROLOGY position. Applicants must have a Ph.D. in a relevant science or engineering discipline. We welcome applicants with interests in the use of stable isotopes to address issues related to climate change, nutrient cycling and ecological tracers, petroleum or ore deposits, and atmospheric/groundwater contaminants.

The successful candidate is expected to establish a stable isotope laboratory and develop a multidisciplinary research program in their specialty supported by internal and external funding. We are seeking individuals who will complement and expand departmental strengths in geochemistry, hydrology, mineralogy, structural geology, sedimentology, and stratigraphy. The new faculty member will teach courses in geology and environmental science and be actively involved in undergraduate and graduate (M.S. and Ph.D.) research and mentoring.

Applications should include a CV, statement of teaching goals, a research plan, names and addresses of at least three references, and selected reprints. Instructions for uploading application materials are at http://ees.cst.temple.edu/. Send a letter of intent and any inquires to David Grandstaff, Chair, Search Committee, grand@temple.edu. We request application material be submitted by **Sept. 16, 2013.** Temple University is a public, Pennsylvania state–related research-intensive university located in north Philadelphia, with a diverse student community and total enrollment of about 37,000. More information about our department is available at www.temple.edu/geology/. Temple University is an equal opportunity, equal access, affirmative action employer committed to achieving a diverse community (AA, EOE, M/F/D/V). The department specifically encourages applications from women and minorities.

TENURE-TRACK INSTRUCTOR CURATOR, DEPARTMENT OF EARTH SCIENCES THE UNIVERSITY OF NEW BRUNSWICK FREDERICTON CAMPUS

www2.unb.ca/earthsciences/

The Dept. of Earth Sciences at the University of New Brunswick invites applications for a tenure-track Instructor/Curator position to begin 1 Jan. 2014.

The successful applicant will have a minimum of a master's degree in the Earth Sciences and a record of, or potential for, excellence in teaching. Experience in teaching first and second year geoscience courses would be an asset. The applicant will also be responsible for the operation of the Quartermain Earth Sciences Centre museum and the curating of the museum and departmental collections. Experience with museum curating and display development would be an asset.

Applicants should submit a cover letter, full curriculum vitae, and a statement of teaching experience and philosophy. Applicants should arrange to have letters of reference submitted by three or more referees familiar with their teaching experience or potential.

Applications may be sent by regular mail or email to Dr. Cliff Shaw, Chair, Dept. of Earth Sciences, University of New Brunswick, 2 Bailey Drive, Fredericton, NB Canada, E3B 5A3; e-mail: lodge@unb.ca; fax: 506-453-5055.

The deadline to apply is Sept. 15, 2013. Review of applications will begin immediately.

All qualified candidates are encouraged to apply; however Canadian citizens and permanent residents will be given priority. Applicants should indicate their current citizenship status.

The University of New Brunswick is committed to the principle of employment equity. This position is subject to budgetary approval.

VISITING ASSISTANT PROFESSOR OF GEOSCIENCES HAMILTON COLLEGE

The Geosciences Dept. at Hamilton College seeks applicants for a 3-semester, non-tenure-track **Visiting Assistant Professor of Geosciences** to begin in Jan. 2014 and to extend through the end of spring semester 2015. The successful candidate for the 3-semester term must have a Ph.D. in the geosciences with a broad background in sedimentary geology and related field experience. Teaching responsibilities will include a required course in sedimentary geology, a topical introductory course in geology, and one or more electives in the candidate's specialty. The candidate will be expected to advise undergraduate research projects.

Our program in sedimentary geology is supported by an isotope ratio mass spectrometer with elemental analyzer, a scanning electron microscope with EDS analytical capabilities, a small research vessel for inland lake studies equipped with a variety of sonar and coring devices, a full-time departmental technician, and by four supportive colleagues with diverse research interests.

A candidate interested in the position and who meets these requirements should submit: (1) a cover letter that addresses his/her qualifications for the position; (2) a statement describing his/her teaching philosophy; (3) a statement of research interests; (4) a complete *curriculum vitae*; and (5) letters from three professional referees who know the candidate well and understand the expectations of a competitive liberal arts college to Assoc. Professor David Bailey via the Interfolio system at https://secure.interfolio.com/apply/21873. Review of applications will begin Sept. 15 2013 and continue until the position is filled.

Hamilton (www.hamilton.edu) is a residential liberal arts college located in upstate New York. Applicants with dual-career considerations can find other Hamilton and nearby academic job listings at www.upstatenyherc.org. Hamilton College is an affirmative action, equal opportunity employer and is committed to diversity in all areas of the campus community. Hamilton provides domestic partner benefits. Candidates from underrepresented groups in higher education are especially encouraged to apply.

Opportunities for Students

Ph.D. Student Fellowship, Georgia State University, Atlanta, Georgia. A Ph.D. Fellowship is available in the Dept. of Geosciences at Georgia State University. The fellowship will lead to the degree of Ph.D. in Chemistry (geology specialization), although all coursework and research activities will be in geosciences. The exact area of work is open, but should focus on the mineralogy and geochemistry of lacustrine sediment for application in paleolimnology and paleoenvironmental reconstruction. The lab has focused particularly on authigenic clays and other minerals in evaporative, saline, or alkaline environments, particularly in East Africa, but advanced students with other ideas are invited to apply. Requirements include an M.S. degree in geosciences or related field, some experience or strong desire to learn sedimentary (including clay) mineralogy and geochemistry, and acceptance into the Ph.D. program. Available research facilities in the department include a brand new Panalytical XRD, XRF, ICP-AES, AA, BET, and others (erl.gsu.edu). SEM, TEM, NMR, FTIR, PCR, and other facilities are available in other departments. The stipend is US$20,000 per year. Teaching opportunities are available but are not part of this assignment. Start date is negotiable. Georgia State University is a growing urban research university in the dynamic heart of downtown Atlanta. The Dept. of Geosciences is an interdisciplinary program addressing a wide variety of questions around the world in geology and geography (geosciences.gsu.edu). For more information please contact Dan Deocampo at deocampo@gsu.edu or +1-404-413-5759.

Boost Your **CAREER!**

NEW

Geoscience Career Program

GSA's new Geoscience Career Program will connect industry and students in a day of progressive sessions, including a student workshop to prepare for job searches; a morning session for students to discuss their research with sponsoring companies; and the popular Geology in Industry lunch panel. In the afternoon, students will have a chance to learn about the companies, their unique cultures and work environments, and the types of geoscience careers available. The program concludes with an evening reception for student research presenters, sponsoring corporations, and recently graduated GSA members.

All program attendees must register.
For a full program description and registration, go to **www.geosociety.org/GeoscienceCareerProgram/.**

For details on corporate participation, contact Debbie Marcinkowski, +1-303-357-1047, dmarcinkowski@geosociety.org.

For information on student participation, contact Jennifer Nocerino, +1-303-357-1036, jnocerino@geosociety.org.

FUTURE GSA ANNUAL MEETINGS

Vancouver, British Columbia, Canada:
Abstracts deadline: 29 July 2014
19–22 October 2014

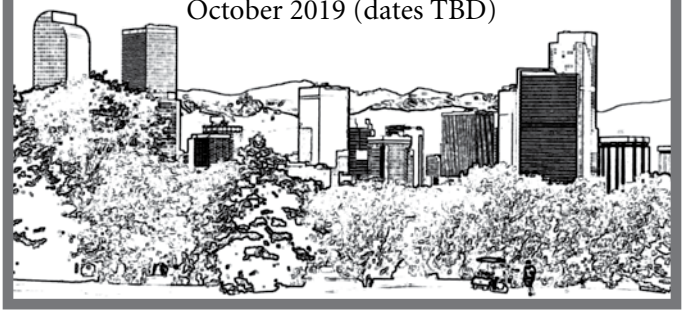
Baltimore, Maryland, USA:
1–4 November 2015

Denver, Colorado, USA:
25–28 September 2016

Seattle, Washington, USA:
22–25 October 2017

Indianapolis, Indiana, USA:
4–7 November 2018

Denver, Colorado, USA:
October 2019 (dates TBD)



1932 GSA moves into its first "permanent" office at 419 W. 117th Street, New York (aka Geological Society of America House)

GSA MENTOR PROGRAMS

GEOLOGY IN INDUSTRY

This is now part of GSA's Geoscience Career Program (see p. 23)

Sun., 27 Oct., 11:30 a.m.–1 p.m.

Undergraduate and graduate students will enjoy a FREE lunch with a panel of mentors representing various industries. These mentors will answer questions, offer advice about preparing for a career in industry, and comment on the prospects for current and future job opportunities with their companies.

WOMEN IN GEOLOGY

Sun., 27 Oct., 5–6:30 p.m.

Addressing key issues faced by women in geology, this informal gathering begins with brief remarks by a few women geoscientists, followed by time for networking, sharing ideas, and getting to know other women geoscientists and geosciences educators. Appetizers provided.

GEOLOGY IN GOVERNMENT

Mon., 28 Oct., 11:30 a.m.–1 p.m.

This popular program provides a FREE lunch for undergraduate and graduate students with a panel of mentors representing a variety of government agencies. These mentors will answer questions, offer advice about preparing for a career in government, and comment on the prospects for current and future job opportunities with their agencies. Also, come to learn more about GSA's GeoCorps program!

STUDENT NETWORKING LUNCHEON

Tues., 29 Oct., 11:30 a.m.–1 p.m.

This luncheon for undergraduate and graduate students is supported by industry donations and organized by GSA, the American Geosciences Institute (AGI), and the Prospectors & Developers Association of Canada (PDAC). Students: This is an exciting opportunity to network with 40+ geoscience professionals! They will answer questions, offer advice about career plans, and comment on job opportunities within their fields. Pre-registration is necessary, and you must bring your luncheon ticket to be admitted.

JOHN MANN MENTORS IN APPLIED HYDROGEOLOGY PROGRAM

This program underwrites the cost for 25 students to attend the Hydrogeology Division Luncheon and Awards Presentation and meet some of geoscience's most distinguished hydrogeologists. Students eligible for this honor are those who have (1) indicated a professional interest in hydrology/hydrogeology on their GSA membership application, and (2) registered for the Annual Meeting by 23 September. The first 25 students who respond to an e-mail invitation on 25 September based on these criteria will receive FREE tickets for the luncheon.

Full program descriptions are online at **www.geosociety.org/mentors/.**
Questions? Contact Jennifer Nocerino, jnocerino@geosociety.org.

5th Annual PHOTO CONTEST

Submissions due: 15 August

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Profiting from the past: Are fossils a sound investment?

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The role of the amateur collector in the field of paleontology has been controversial to say the least. Additionally, the value of rare, museum-quality vertebrate fossils and object d'art invertebrate fossils appears to be, at least from anecdotal evidence, quickly rising. Both factors continue to fuel the debate regarding the problematical relationship between amateur collectors, professional paleontologists, and commercial fossil dealers, especially as important fossils disappear from the research community into private collections. Complicating this issue is the poorly understood value of many of the fossil specimens that commercial dealers claim are ideal investments.

Commercial dealers have long claimed that fossils are an excellent investment opportunity, and other sources, including the *New York Times*, have remarked that fossils have outperformed other investment options (McClain, 1996). Additionally, anecdotal evidence of dramatic increases in fossil prices, especially for rare vertebrate fossils, is common in large-circulation financial magazines (Rohleder, 2001).

The appeal of fossils as an investment strategy is apparent when reviewing online commercial fossil sites. For example, for more than 30 years, one dealer has offered a list of "Four Good Reasons to Invest in Fossils" that includes "As a straightforward investment opportunity, fossils outperform many other options" (Two Guys Fossils, www.twoguysfossils2.com). According to dealers, the reasons that fossils are an excellent investment option are simple. Many commercial suppliers and online investment guides state that fossils are becoming more rare (Mountain Megalodons, www.mountainmegalodons.com/St.Mary.html; Wise Bread, www.wisebread.com/three-alternative-investments-for-long-term-enjoyment-and-appreciation; Best Way to Invest, www.bestwaytoinvest.com/stories/trex-skinnyfossil-trading; Nick's Fossils, http://www.nicksfossils.com/investing-in-fossils.htm) and that demand is, and will continue to be, greater than supply (Fossil Facts and Finds, http://www.fossils-facts-and-finds.com/megalodon.html). Other online sources state bluntly that fossils do not depreciate (E-How, www.ehow.com/how_2042338_sell-fossils) and that "even lower priced fossils hold their own with regards to investment potential" (Fine Fossils, www.finefossils.com).

The primary focus of our research for this paper was to compare fossils as an investment to several other common investment options. In doing so, we could test the hypothesis that fossils are an ideal investment option; further, we could assess the validity of two current investment perceptions summarized by a popular fossil investment guide: "The demand for high quality megalodon teeth far exceeds the supply. As a result the price of these rare teeth has been steadily increasing year after year making these fossils good investments that will gain value over time" (Fine Fossils, http://www.fossils-facts-and-finds.com/megalodon.html)—and a commercial dealer who specializes in "investment-grade" fossils: "The greatly limited supply of fossils means that their prices will hardly ever decline significantly, so there is little need to hedge investment risks" (Fine Fossils, www.finefossils.com).

To test these assertions, we collected more than 1,000 selling prices during 1991, 2001, and 2011 from commercial dealers and private sellers to establish a mean commercial value for four different fossils: one small and one large Neogene shark tooth, a Devonian trilobite, and an Eocene fish (see GSA Supplemental Data[1] for a full description of the fossil selection criteria). Each fossil was selected for study because it was commercially abundant during each 10-year time period and in demand by collectors but not necessarily by universities and museums. Additionally, we selected fossils that were *specifically described by commercial dealers as investment-worthy* and not museum- or research-quality fossils (many of which appear to have increased in value over time but are not often sold more than once). As a result, the data set represents a collection of fossils that are most often described, represented, and sold as investments, even though many may only be purchased as collectibles or display pieces.

The increase or decrease in selling price between fossils was compared to a similar investment in Standard & Poor's 500 stocks and a 20-year certificate of deposit with a return of 2%. An "assemblage" fossil investment, in which one fossil was purchased in 1991 (at the mean current selling price) from each group, was also compared to these indices. These other investment strategies are selected because they represent two distinct options. The S&P 500 represents investment in the broad stock market with risk of

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[1] GSA supplemental data item 2013265, a full description of fossil selection criteria, is online at www.geosociety.org/pubs/ft2013.htm. You can also request a copy from *GSA Today*, P.O. Box 9140, Boulder, CO 80301-9140, USA; gsatoday@geosociety.org.

Figure 1. Value of the four fossils during the 1991–2011 study (left), two *C. megalodon* teeth from the data set (center), and value of the fossil "assemblage" compared with two other investment options (right).

loss of principle. The CD represents a risk-free investment with no risk of loss of principle.

Although the highly publicized sale of unique fossils such as the *Tyrannosaurus rex* "Sue" or *Tarbosaurus bataar* (which has subsequently been seized by Federal authorities for repatriation to Mongolia) leads the public to believe all fossils are increasing in value, our findings suggest that the fossils most in demand by collectors have decreased in value over the past 20 years. An investment in any of the fossil groups would have had a negative return after 10 years, and the "assemblage" value fell over the 20-year period by 6.7% (Fig. 1). However, this masks two distinct trends: For the 10 years to 2001, the "assemblage" shed 26% of its value. Over the following 10 years, the "assemblage" value rebounded 26%. The total "assemblage" value of the fossils fell from US$996 in 1991 to US$737 in 2001 and to US$930 in 2011. By contrast, the S&P 500 grew 237% from 1991 to 2011. The more pronounced growth occurred between 1991 and 2001 (216%). This coincided with the longest post–World War II economic expansion in U.S. history and a "bull" market for equities. The 10 years to 2011 yielded positive, albeit far less robust growth of 6%. An investment of US$996 in 1991 in an S&P index would have returned US$3,156 by 2001 and US$3,360 by 2011. A CD offering 2% for 20 years would return 49% (investing US$996 would have yielded US$1,214 by 2001 and US$1,480 by 2011).[2]

The largest misconception held by many private fossil collectors and potential investors is that the supply of fossils is severely constrained—perfectly inelastic, in economic terms—and that this supply constraint will lead to rising values. However, the supply of fossils, that is the number of fossils available in the marketplace, is actually increasing, which is having the opposite effect on values. Since 1990, the number of commercial fossil dealers and the availability of fossils to private collectors have increased substantially (Browne, 1994; McClain, 1996; Rohleder, 2001). Nevertheless, some investment guides go so far as to assure potential buyers that fossils "are becoming more rare" (Wise Bread, www.wisebread.com/three-alternative-investments-for-long-term-enjoyment- and-appreciation) and that "the source for these specimens is rapidly becoming depleted at an exponential speed" (Paleodirect, www.paleodirect.com/pgset2/investmentfossils). Although the *New York Times* described a "boom in fossil sales and prices" (Browne, 1994), the increased supply of many fossils has driven prices down. The supply of *Carcharocles megalodon* teeth, for example, has increased substantially during the past 20 years. In 1991, the majority of commercially available large shark teeth came from phosphate mines in North Carolina and Florida, beach collecting, or a handful of offshore (Florida) or river (South Carolina) sites. By 2011, fossil shark teeth were available from these same sources as well as numerous other river deposits, including the St. Mary's and Savannah in Georgia and the Potomac in Virginia. *C. megalodon* teeth are also available from international sources in Chile, Peru, and Italy.

Both supply and market availability of the Moroccan trilobite have also increased. Before 1991, the supply of such fossils was limited to a few large commercial dealers (e.g., Black Hills Institute of Geological Research; Paleosearch Inc.; and Prehistoric Journeys Inc.), and sales were primarily through trade shows and printed catalogs. The existence of a relatively small number of suppliers can produce a monopoly effect wherein higher prices result from a "take it or leave it" approach to selling. By 2001, however, the Internet made such fossils significantly easier to find and compare, and greatly increased the number of sellers and buyers in the marketplace. Today, sellers and buyers trade across large distances in a relatively costless environment. This is analogous to an increase in the market supply of fossils, which exerts downward pressure on prices. Furthermore, the Internet has significantly lowered the search costs involved in the purchase of fossils. Buyers may now gather price information from greater numbers of potential sellers without incurring significant cost. This mitigates any potential supply monopolies and brings greater competition to the marketplace as sellers now compete with each other—not just regionally, but nationally and even internationally. As sellers compete for business, greater competition leads to lower prices for buyers.

Finally, one invidious aspect of investing in fossils, especially fossils rarer than discussed in this study, is the ethical issues

[2] These results do not adjust for inflation. Adjusting for inflation will lower the returns for each investment type, but the relative performance will be unchanged. The best investment will remain the best, and the worst will remain the worst. In the interests of clarity and brevity the inflation adjusted results are not shown.

arising from collecting fossils of interest to scientists. The growth of private fossil ownership has led the Society of Vertebrate Paleontologists to condemn many commercial dealers and such public fossil outlets as Amazon.com (Ebeling, 2000). Perhaps one further point for debate available to concerned geoscientists should be the actual validity of the claims offered by commercial dealers—that all grades of fossils increase in value over time.

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Editor's Note

GSA's Policy Regarding Sale of Fossils and Specimens at GSA Meetings

GSA requires that the sale by exhibitors of fossils and specimens extracted from cave formations be limited to those obtained ethically and legally. Exhibitors who sell such items must certify that they meet the standards of the Paleontological Resources Preservation Act and/or the Federal Cave Resources Protection Act, which state:

Fossils: The sale of any paleontological resource that has been excavated or removed from federal land in violation of any provisions, rule, regulation, law, ordinance, or permit in effect under federal law is prohibited.

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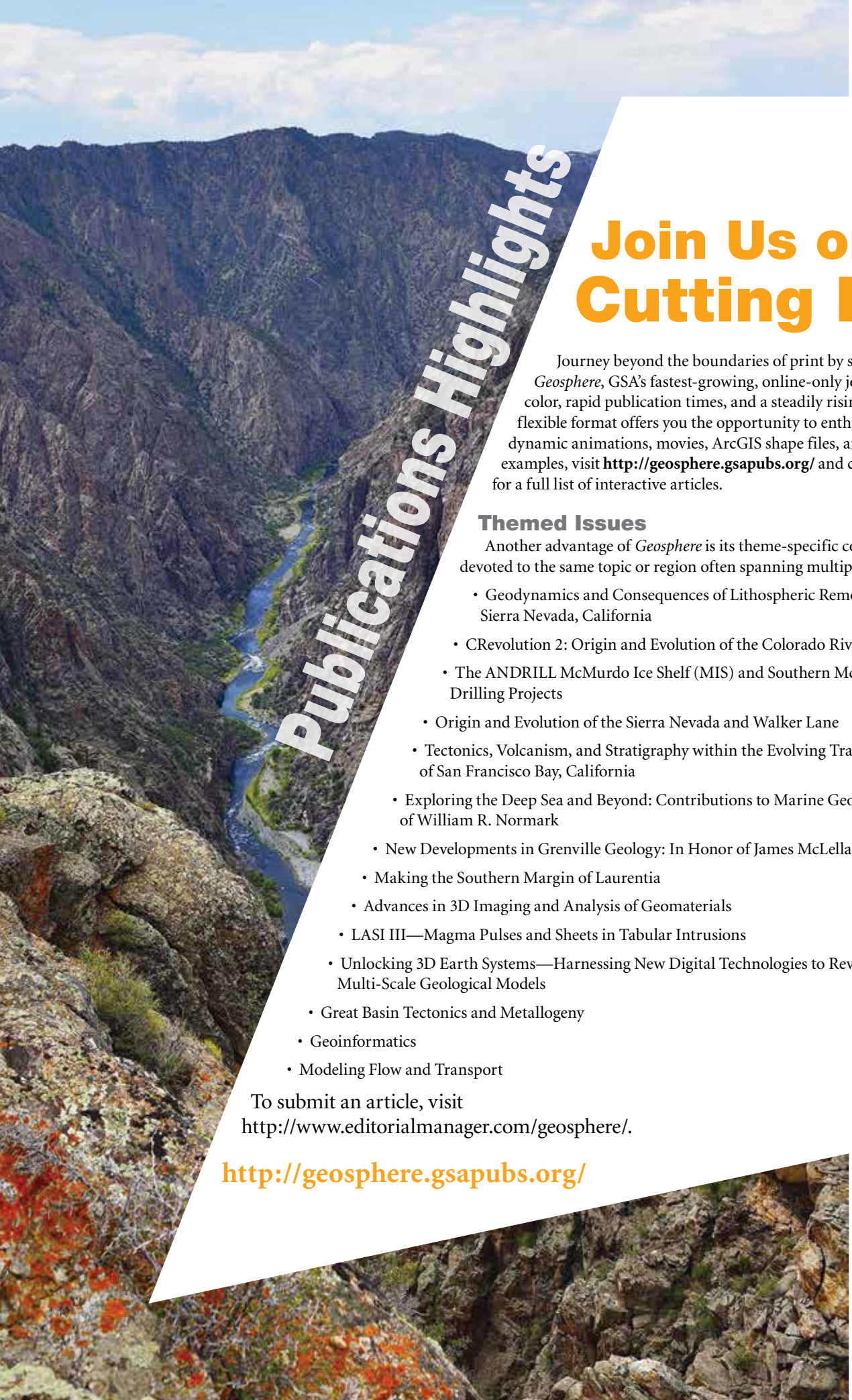
GSA likewise requires certification that specimens from foreign countries offered for sale were likewise obtained in compliance with all relevant local laws and regulations, including those governing the export of specimens for sale abroad.



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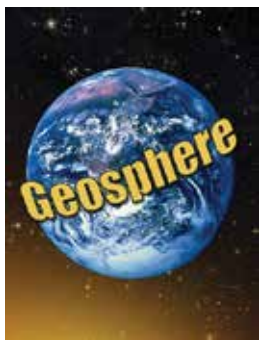

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