GEOLOGY AT RENSSELAER: A HISTORICAL PERSPECTIVE

Address of the Retiring President of the
New York State Geological Association

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Geology is a tradition at Rensselaer. As R.P. Baker (1930) assessed the first one hundred years of the history of R.P.I., he emphasized "in Geology and Mineralogy, of course, Rensselaer was long supreme. From those connected with the Institute came the first standard texts -- the first, you may be interested to know, in which figures and plates were used to supplement the text -- and from them also came the first epoch - making reports. Indeed, approximately half of the notable developments in these two subjects before 1850 were due to graduates of the Institute. They were responsible for the official surveys of Alabama, Delaware, Iowa, New Jersey, New York, North Carolina, South Carolina, Michigan and Wisconsin. In other states their advice and assistance were hardly less useful. Moreover, in a number of colleges and endowed universities as well as in the State universities of Alabama, Iowa, Michigan and Wisconsin, they established a tradition of research, which has been honorably maintained by their successors."

The founder and first senior professor of Rensselaer Amos Eaton has been acclaimed as the Father of American Geology (Fig. 1). Hence geology was allotted prominence early at Rensselaer, as shown on a circular of 1827, which reads "it is now required that each student take two short mineralogical tours to collect minerals for his own use, for the purpose of improving himself in the science of mineralogy and geology." Founded in 1824, incidentally in the same year in which Eaton introduced the term birdseye texture for

Fig.1. Amos Eaton, founder of American geology as well as founder and first senior Professor of the Rensselaer School, later to become known as Rensselaer Polytechnic Institute.

some kinds of limestones (an important descriptive feature still known by this same term today), the advancement of American geology was stimulated in large measure by the strong science curriculum at R.P.I., then known as the Rensselaer School. The school was extremely strong in the geological sciences. By 1860, as an example, seven state geological surveys were headed by graduates of Rensselaer, a number exceeding that of any other university in the United States.

Before the Rensselaer School was founded Eaton completed geological surveys of Albany and Rensselaer Counties (Fig. 2), commissioned by the New York State Agricultural Society, but paid for by the philantropic patroon Stephen Van Rensselaer, eighth and last patroon of a landed estate. Van Rensselaer also supported Eaton's geological survey of the territory adjoining the Erie Canal route during 1823-1824. In 1818 Eaton published a textbook, An Index to the Geology of the Northern States (Fig.3).

GEOLOGICAL

AND

Agricultural Survey

OF

RENSSELAER COUNTY,

IN THE

STATE OF NEW-YORK.

TO WHICH IS ANNEXED,

A

GEOLOGICAL PROFILE,

EXTENDING FROM ONONDAGA SALT SPRINGS, ACROSS SAID COUNTY, TO WILLIAMS COLLEGE IN MASSACHUSETTS.

TAKEN UNDER THE DIRECTION OF THE
HONOURABLE STEPHEN VAN RENSSELAER.

ALBANY:
PRINTED BY E. AND E. HOSFORD, 100 STATE-STREET.
1822.

Fig. 2. Title page of Amos Eaton's geological survey of Rensselaer County(1822); this study was supported by Stephen Van Rensselaer. Amos Eaton's name does not appear on the title page. In the preface he addressed Van Rensselaer (p. vii) "with the ardent hope that my efforts may not have fallen short of your expectations, and that the following report may be useful to those for whom it was intended, I subscribe myself, Your grateful humble Servant, Amos Eaton."

In this book Eaton not only incorporated a time and rock classification scheme, but also introduced a local guidebook, and published a cross section extending from the Atlantic Ocean to the Catskill Mountains (Fig. 4). In 1824 Eaton appealed to Van Rensselaer for $300 as part of the effort to establish the Rensselaer School in Troy. Van Rensselaer provided these funds immedieatly and continued his financial support until 1829 when he ceased direct support of the school. Despite a heavy load of teaching and administration

INDEX

TO THE

GEOLOGY OF THE NORTHERN STATES.

WITH A TRANSVERSE SECTION

FROM CATSKILL MOUNTAIN TO THE ATLANTIC.

PREPARED

FOR THE GEOLOGICAL CLASSES AT WILLIAMS COLLEGE,

NORTHAMPTON, BELCHERTOWN, LEICESTER

AND WORCESTER, (MASS.)

BY AMOS EATON, A. M.

Lecturer on Natural History and Chemistry, Member of the Lyceum of Natural History of N. York.

LEICESTER, PRINTED BY HORI BROWN.

SOLD by WEBSTERS and SKINNERS, Albany; by SIMEON BUTLER, Northampton; and by CUMMINGS and HILLIARD, Boston.

1818.

Price, coloured 75 cents, plain 62 cents.

Fig. 3. Title page of Amos Eaton's Index to the Geology of the Northern States (1818).

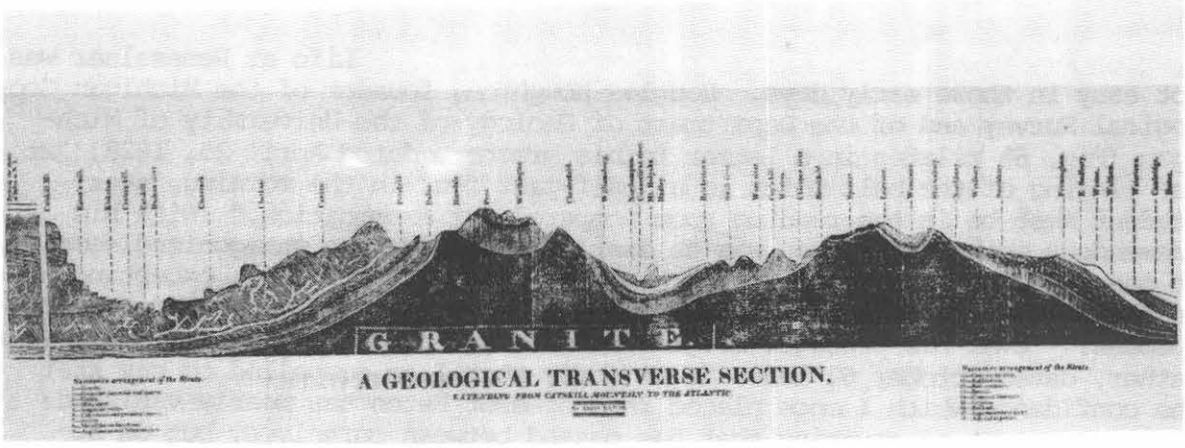
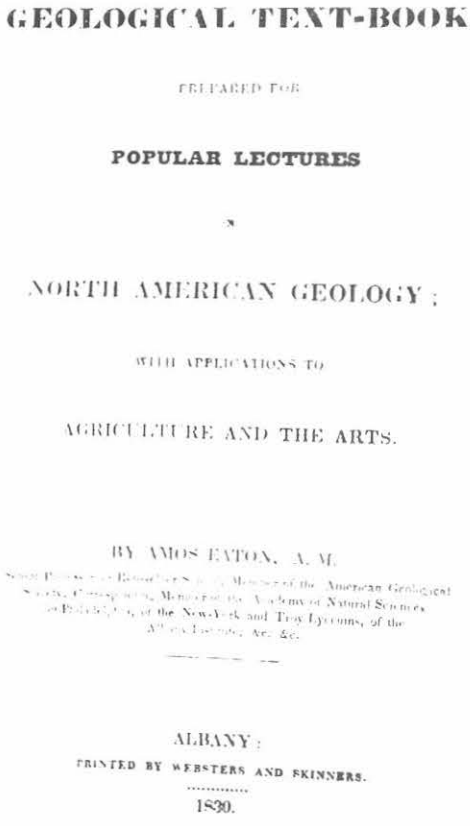


Fig. 4. Amos Eaton's section across the Appalachians extending from the Atlantic Ocean to the Catskill Mountains (1818).

Eaton published in 1830 a Geological Text-Book, Prepared for Popular Lectures on North American Geology (Fig. 5); its second edition appeared in 1832. In the second edition Eaton emphasized the importance of field work, a tradition still cherished at Rensselaer: students: "must be shown the nearest rocks, from day to day."



GEOLOGICAL TEXT-BOOK,

PREPARED FOR

POPULAR LECTURES

ON

NORTH AMERICAN GEOLOGY;

WITH APPLICATIONS TO

AGRICULTURE AND THE ARTS.

BY AMOS EATON, A. M.

ALBANY:
PRINTED BY WEBSTERS AND SKINNERS.
1830.

Fig. 5. Title page of Amos Eaton's Geological Text-Book, first edition (1830).

Eaton took his students on long field excursions into the mountains of New England and along the Erie Canal in the "Rensselaer School Flotilla." At the time of his death in 1842 Eaton had become the most influential American geologist. In 1841 Sir Charles Lyell, father of British geology, made his pilgrimage to visit Eaton at Rensselaer. Eaton likewise received the respects of the Rev. William Buckland, the first professor of mineralogy and geology in the University of Oxford, England. In American geology the period between 1818 and 1836 is known as the "Eatonian Era."

Life at Rensselaer was not easy in those early days. Douglas Houghton, founder of the Michigan Geological Survey and of the Department of Geology of the University of Michigan (Fig. 6) relates in a letter to his brother, dated April 25, 1829, "at the ringing of the bell which is at half-past four in the morning, every student must be in the reading room prepared for examination." With his tremendous enthusiasm Eaton was an inspiring man, yet he antagonized some. In one letter he wrote, "I do not aspire at anything original, excepting in the geology of this country. On this point I am vain of my industry and success." Even his protege, Douglas Houghton, stated in a letter to his father, dated October 6, 1830, "I am sorry that I am compelled to say that the confidence which I once placed in Professor Eaton has nearly vanished; not on account of anything that has passed between ourselves, but on account of his conduct to the students of the last class. The students supported the insults heaped upon them, as long as possible, but it terminated in complete rebellion."

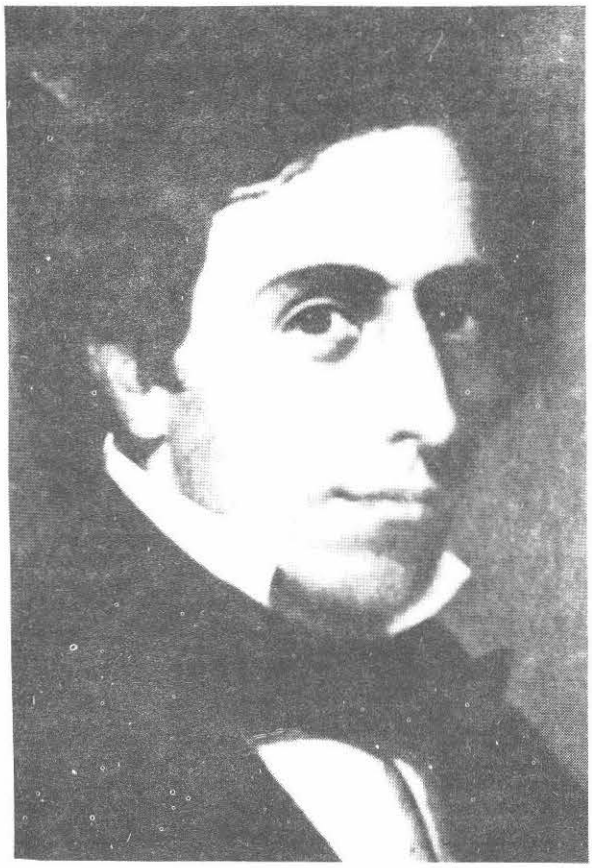


Fig. 6. Douglas Houghton, alumnus and professor of geology at Rensselaer, and later founder of the Michigan Geological Survey and of the geology program at the University of Michigan.

From Rensselaer students carried the geological banner far and wide. In 1830 some patrons of science in Michigan, including General Cass, then governor of Michigan, and Lucius Lyon, Member of Congress, asked Professor Eaton to recommend a lecturer. Lyon, in fact, specifically for this purpose came to Rensselaer. After listening to Lyon, Eaton opened a door adjoining his office and presented his young protege, Houghton. "Mr. Lyon, a man of reserve and much dignity, was surprised at such a presentation. He could hardly believe Professor Eaton in earnest - proposing to send a boy, still in his teens, to discourse on subjects of science, and to address mature men of culture" (Wallin, 1970, p. 3). Retaining his professorship at Rensselaer, Houghton moved to Michigan where his accomplishments not only included founding member and Treasurer of what was to become the American Association for the Advancement of Science as well as founder of the Michigan Geological Survey and the Department of Geology at the University of Michigan, but also Mayor of the city of Detroit. At the age of 36 he drowned on a geological survey in Lake Superior. The Michigan city of Houghton has been named in his honor.

Eaton's successor as senior professor, an office which today incorporates the presidency of the Institute, was George H. Cook, who later became founder of the New Jersey Geological Survey and founder of the Department of Geology of Rutgers University (Fig. 7). Following him in 1850 was Benjamin Franklin Greene, who changed the name to Rensselaer Polytechnic Institute, and divided its academic program into three departments: geology, chemistry and engineering.

Among the most influential alumni of Rensselaer was James Hall, the Father of the Geosyncline (Fig. 8). In 1857 (published in 1859) Hall

Fig. 7. George H. Cook, Eaton's successor as senior professor at Rensselaer and later founder of the New Jersey Geological Survey and of the Department of Geology of Rutgers University.

Fig. 8. James Hall, alumnus and professor of geology at Rensselaer (see Fig. 9), state geologist and state paleontologist of New York, father of the geosyncline, father of American stratigraphy, and father of American paleontology.

"observed that, where the Paleozoic marine strata are thin (thicknesses of only a few hundreds or few thousands of meters), they are flat lying. In contrast within the Appalachians, where strata of the same ages are present, thicknesses of equivalent strata amount to tens of thousands of meters and the strata are not horizontal. Hall hypothesized that the subsidence of the strata within a trough, where they would be extra thick, provided the mechanism for folding them" (Friedman and Sanders, 1978, p. 435). In 1873, James Dwight Dana modified this concept and introduced the term geosyncline. Hall has likewise become known as Father of American Stratigraphy and Father of American Paleontology. Hall earned his Bachelor of Natural Science (1832) and the Master of Arts (1833) degrees at Rensselaer. Probably no other single person exerted a more influential role in the development of paleontology in North America.

Hall is alleged to have literally walked 220 miles from his home in Hingham, Massachusetts, to Rensselaer so that he might enroll and study under the great Eaton. Hall's first job at Rensselaer included whitewashing one of its buildings and tidying up the school; later he became librarian, and by 1835 he was listed as a full professor. Persuaded by Eaton the New York State Legislature established a Geological and Natural History Survey in 1836 to which James Hall was appointed. Hall remained loyal to Rensselaer and gave preference in employment to Rensselaer graduates. Rensselaer alumni George Boyd, Ezra Carr, and Eben Horsford distinguished themselves by mapping 17 1/2 counties or approximately one quarter of the state of New York on foot and horseback over a four-year span. Hall remained on the R.P.I. faculty on a part-time basis for almost 70 years; he was listed as Professor of Theoretical, Practical, and Mining Geology. A plaque on Hall Residence Hall, one of the freshmen dormitories currently in use, attest to his devotion to Rensselaer (Fig. 9). Hall put together an outstanding geologic collection for which the alumni donated the funds to provide the building, known as the Cabinet Building. By 1898, the year of his death, Hall had published 42 books and 260 papers. His 13 volumes of Paleontology of North America remain as a monument to his dedication.

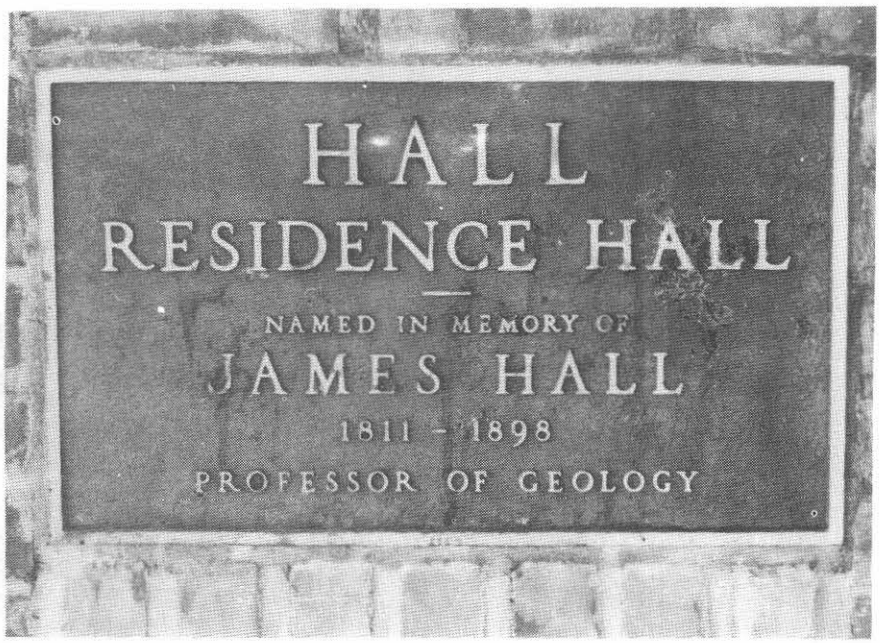


Fig. 9. A grateful R.P.I. named a residence hall, known on Campus as Hall Hall, in James Hall's honor and provided a plaque near entrance to "Hall Hall."

Another early alumnus who became a giant in the nineteenth century was Ebenezer Emmons (Fig. 10). A graduate of Rensselaer in the first class of 1826, Emmons had been inspired by Eaton. Emmons became Junior Professor at Rensselaer, a position he held for ten years, and a member of the New York State Geological Survey in 1836. Later he was state geologist of North Carolina, spreading Rensselaer's influence in American geology through his texts and advocacy of the Taconic system (Fig. 11).

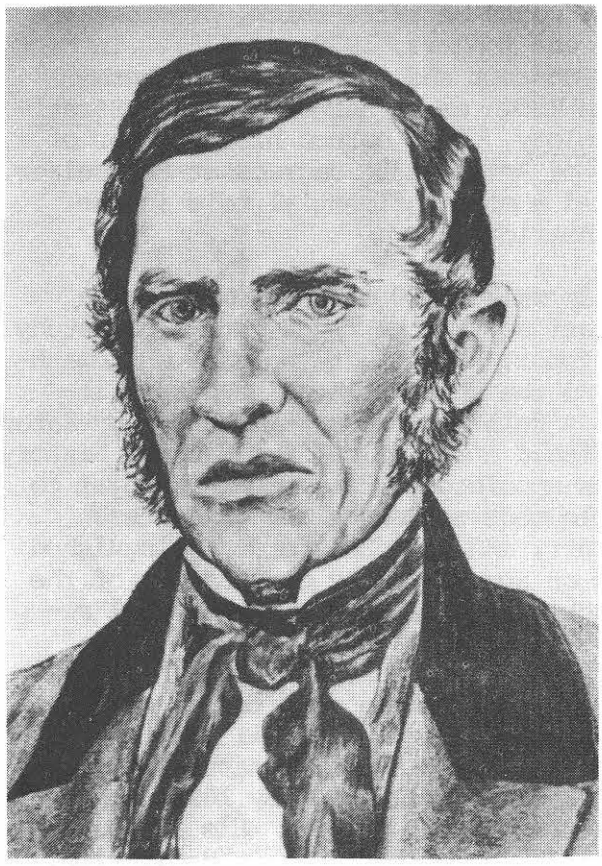


Fig. 10. Ebenezer Emmons, alumnus and Junior Professor at Rensselaer, member of the New York State Geological Survey, founder of the North Carolina Geological Survey, and State Geologist of North Carolina; father of the Taconic System.

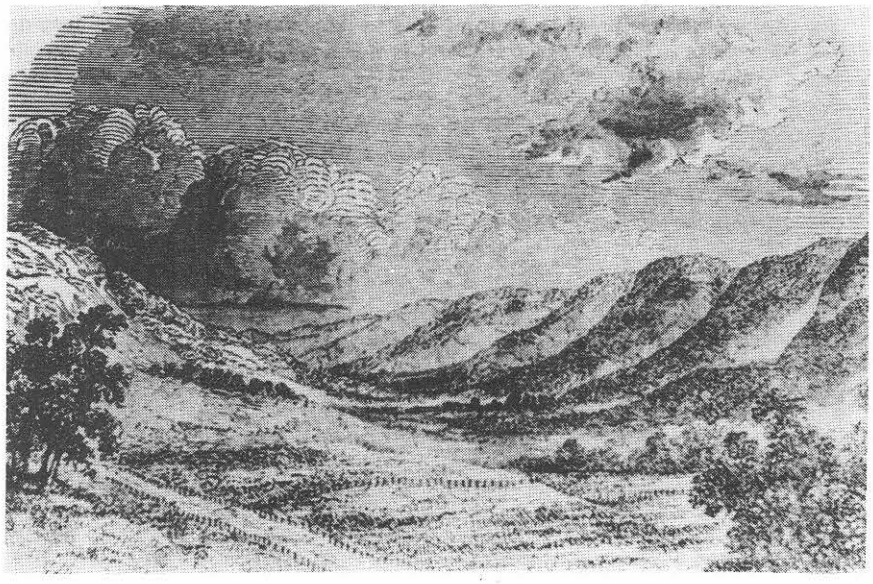
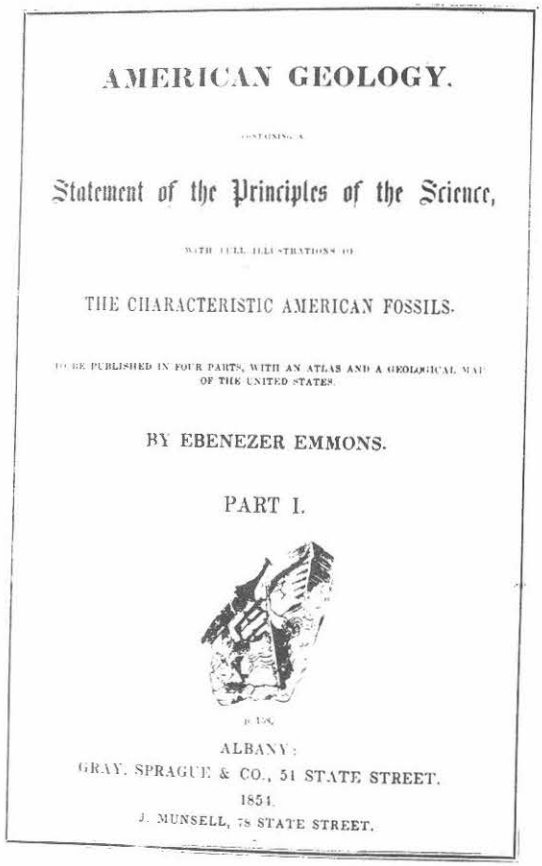


Fig. 11. Drawing of part of the Taconic Range published in one of Emmons' classical studies (Emmons, 1848, p. 75).

Emmons had noted the presence of a group of rocks between the Potsdam Sandstone, the lowest of the sedimentary formations in New York and what was at the time called the Primitive Rocks of Central Vermont. This interval he proposed to call the Taconic System. Emmons acquainted the public with the Adirondack region and gave the names to principal mountains. Classics which Emmons published include Manual of Mineralogy and Geology (1826), Report on the Second Geological District of New York (1842), Natural History of New York (1848), American Geology Containing a Statement of Principles of the Science With Full Illustrations of the Characteristic American Fossils (1854) (Fig. 12), Treatise Upon American Geology (1854), The Swamplands of North Carolina (1860), and Textbook of Geology (1860).



AMERICAN GEOLOGY.

CONTAINING A

Statement of the Principles of the Science,

WITH FULL ILLUSTRATIONS OF

THE CHARACTERISTIC AMERICAN FOSSILS.

TO BE PUBLISHED IN FOUR PARTS, WITH AN ATLAS AND A GEOLOGICAL MAP OF THE UNITED STATES.

BY EBENEZER EMMONS.

PART I.

ALBANY:
GRAY, SPRAGUE & CO., 51 STATE STREET.
1854.
J. MUNSELL, 78 STATE STREET.

Fig. 12. Title page of Emmons' American Geology (1854).

Louis C. Beck was appointed Junior Professor at Rensselaer in 1824 when the school opened, but resigned in 1828 and became state mineralogist of New York in 1836.

As matters stood by 1860 in state geological surveys of the United States, the following Rensselaer alumni held positions of responsibility: New Jersey, G.H. Cook; Virginia C. Briggs, Jr.; New York, E. Emmons, J. Hall, E.S. Carr, E. Horsford, G. Boyd; Pennsylvania, J.C. Booth; Ohio, C. Briggs, Jr.; Delaware, J.C. Booth; Michigan, D. Houghton; South Carolina, M. Tuomey; Alabama, M. Tuomey; North Carolina, E. Emmons; Wisconsin, E.S. Carr, J. Hall; Iowa, J. Hall.

Overlapping with James Hall were Edward A.H. Allen, who served as professor of Geology from 1851 to 1855, and Robert P. Whitfield, who held the same position between 1875 and 1878. A few months before the U.S. Geological Survey was born on March 3rd 1879 C.D Walcott's term as assistant to James Hall in the New York State Geological Survey expired. Clarence King, first Director of the newly formed U.S. Geological Survey, telegraphed Professor Whitfield, asking him about Walcott. Whitfield recommended Walcott, who then moved on to become the third Director of the U.S. Geological Survey, fourth Secretary of the Smithsonian Institute, and founder of the Geophysical Laboratory in Washington. Although Walcott was not an R.P.I. student it was R.P.I. Professor Whitfield's recommendation which led to Walcott's distinguished service to the nation. Whitfield left Rensselaer to become curator of geology at the American Museum of Natural History in New York City. His numerous publications relate mostly to paleontology.

The period between 1859 and 1894 was the tenure of Henry B. Nason (Fig. 13).

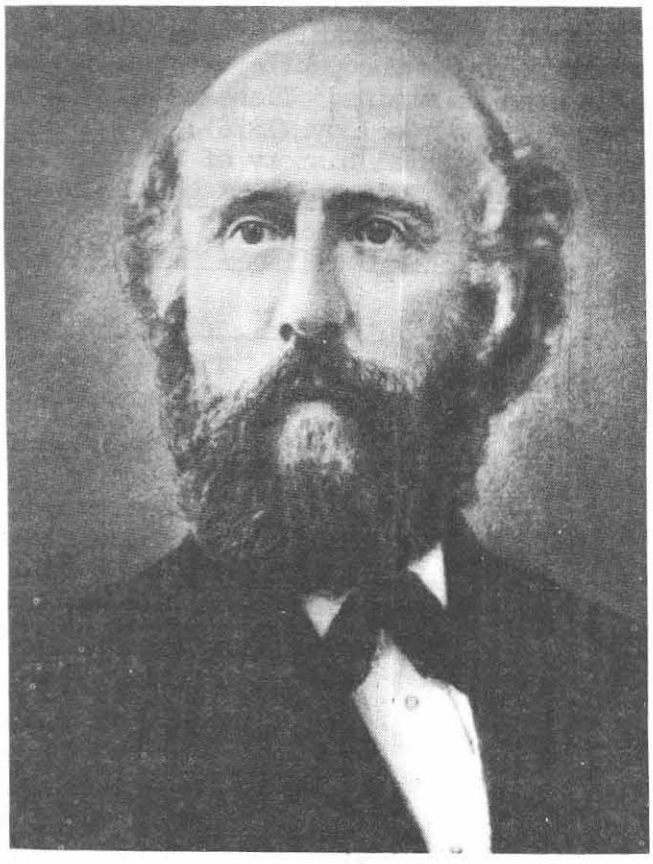


Fig. 13. Henry B. Nason, professor at Rensselaer, renowned mineralogist of his time, who inspired Washington A. Roebling of Brooklyn-Bridge fame to devote much of his life to the science of mineralogy.

Nason was the de facto curator of the vast mineral collections of Rensselaer. Nason acted as agent for Rensselaer in acquiring specimens and with Hall arranged and labelled them. He maintained the tradition of field work. Contemporary records indicate that the extended geological field trips Nason lead each term were extremely popular; in fact, so was Nason. Archivist Samuel Rezneck records that the largest party ever thrown by the Institute was in commemoration of Nason's 25th year year on the faculty. Nason's interest in mineralogy had a profound influence on the scientific advance of mineralogy. Washington A. Roebling of Brooklyn-bridge fame took Nason's course at Rensselaer. Inspired by Nason he embarked on a study of systematic mineralogy which led to a collection of minerals that included not only all known species and sub-species of minerals, but also representives of all the useless names with which some mineralogists have confused and confounded the science. The Roebling collection was donated to the National Museum of the Smithsonian Institute. The liberal terms of the gift and the generous endowment by Roebling's son John allowed for further acquisition of specimens and the preservation of the collection. Roebling's collection was a source of much of the work of E.S. Larsen and H. Berman in their classical The Microscopic Determination of the Non-Opaque Minerals (U.S. Geological Survey Bulletin 848, 1934); the varieties of 75 clay minerals form the basis of much of the modern work of this group. Likewise many rare uranium minerals have been found invaluable in the scientific study in this metal in the 1940's and 1950's. Specimens of this collection have "gone round the world, around and around like a merry-go-round." Continuing to digress on Roebling serves to bring into focus some of the lasting scientific legacies of Nason. Roebling who became Vice President of the Mineralogical Society of America gave $45,000 to the endowment fund of

the Mineralogical Society in 1926 which permitted the society to expand materially The American Mineralogist. He also left a large sum of money for a medal, the Washington A. Roebling Medal for Meritorious Achievement in the Mineral Sciences, which is awarded annually as the highest medal of the Mineralogical Society of America. Some of the recipients of this medal credit Rensselaer for the inspiration which Roebling received (see, as an example, William F. Foshag, acceptance of the Roebling Medal of the Mineralogical Society of America, American Mineralogist, v. 39, p. 296-299, 1954). As a further tribute to Roebling a mineral has been named roeblingite. But now back to Nason. Nason travelled extensively, particularly to mining regions and volcanic areas. Places he visited included Germany, Northern Europe, Finland, Russia, France, Italy, Sicily, California, and Nevada. In 1877 President P. Hayes appointed him juror for the United States government at the Paris Exposition in the Department of Mineralogy. His publications include various editions of Elderhorst's "Manual of Blowpipe Analysis" (1873, 1875, 1876), Manual of Blowpipe Analysis and Determinative Mineralogy (1880) as well as internal Rensselaer publications, such as Semi-Centennial Catalog of Rensselaer Polytechnic Institute (1874) and Biographical Record of the Officers and Graduates of the Rensselaer Polytechnic Institute (1886). Nason's impact was such that he received honorary degrees from Amherst College, Union College, and Beloit College. In the 19th Century mineralogy was considered to be as much part of chemistry as of geology. Nason's influence led to his election to the presidency of the American Chemical Society. Nason's dedication to Rensselaer is memorialized by his private collection of 5,000 rocks and minerals which he donated to the Institute in 1883, the largest single acquisition made by Rensselaer. The present museum of the Department of Geology bears the mark of Nason more than that of any other and remains of interest to students of this important figure in the history of Rensselaer.

Following the death of Nason in 1894, Palmer C. Ricketts, then Director of Rensselaer, wrote to James Hall in a letter dated January 21, 1895: "Dear Professor Hall: The death of Professor Nason makes it necessary for us to get a man to teach mineralogy and geology" (Fig. 14). Hall recommended John M. Clark who became instructor of Geology (Fig. 15). After Hall's death Clark became State Paleontologist and State Geologist of New York, but continued as Adjunct Professor. Clark authored 300 scientific papers, and named 135 genera and 870 new species of fossils.

The vacancy created after Hall's death and the ensuing unavailability of Clark because of his full-time committments with the New York State Geological Survey opened the opportunity for another giant to enter the halls of Rensselaer: Amadeus W. Grabau (Fig. 16). Like his predecessors Grabau had close working relationships with the New York State Geological Survey. With the support and cooperation of the Buffalo Society of Natural Sciences and the New York State Geological Survey, Grabau prepared a Guide to the Geology and Paleontology of Niagara Falls and Vicinity (New York State Museum Bulletin 45, 1901), probably one of the best prepared and most professional of the New York State Museum Bulletins. His title and address in this publication are listed as "Professor of Geology at Rensselaer Polytechnic

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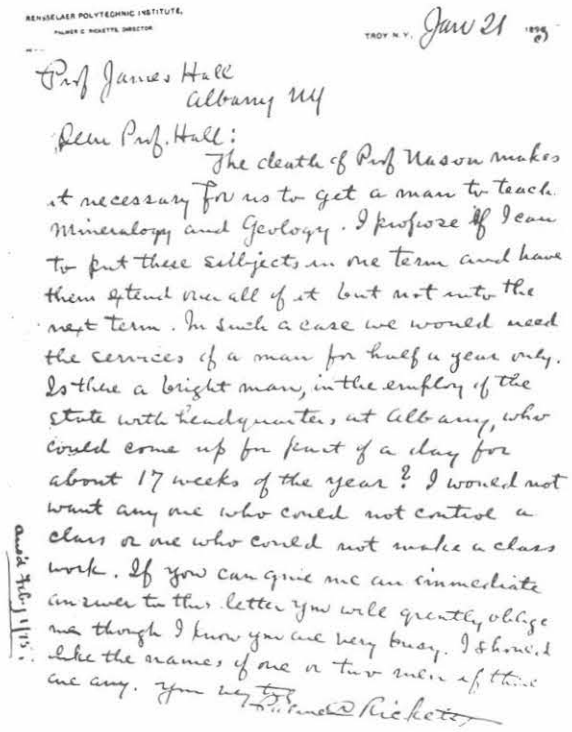


RENSSELAER POLYTECHNIC INSTITUTE,
PALMER C. RICKETTS, DIRECTOR

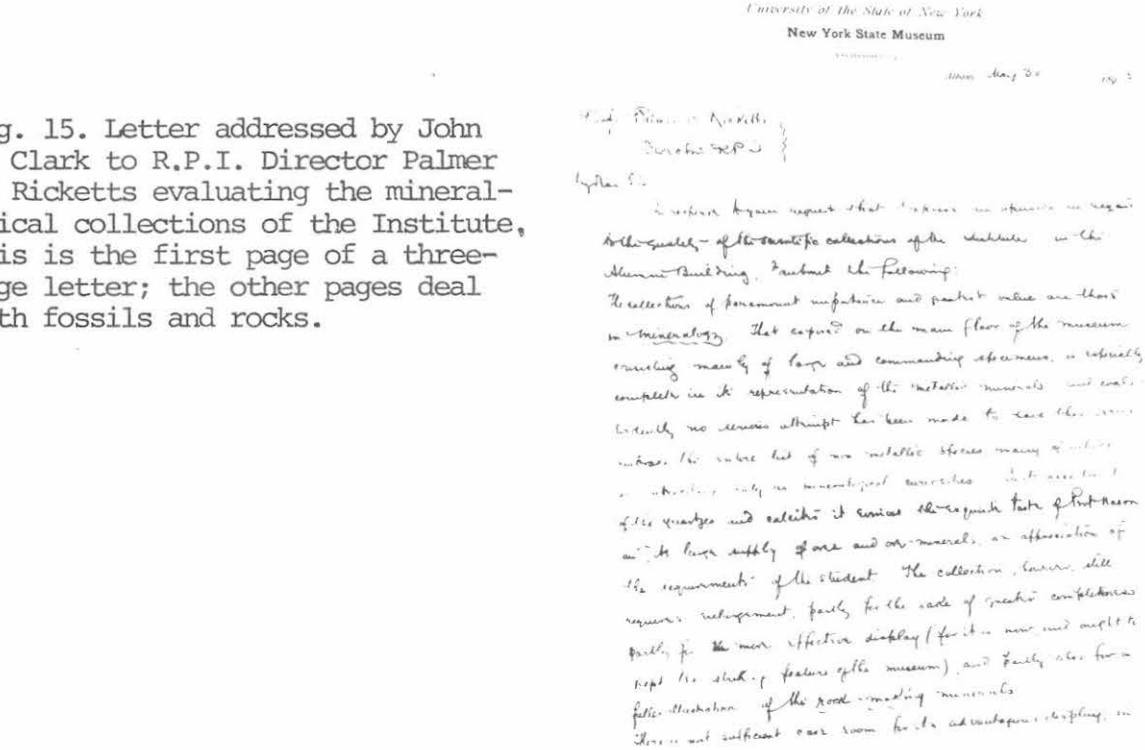
TROY N.Y. Jan 21 1896

Prof James Hall
Albany NY

Dear Prof. Hall:

The death of Prof Nason makes it necessary for us to get a man to teach Mineralogy and Geology. I propose if I can to put these subjects in one term and have them attend one all of it but not into the next term. In such a case we would need the services of a man for half a year only. Is there a bright man, in the employ of the State with headquarters at Albany, who could come up for part of a day for about 17 weeks of the year? I would not want any one who could not control a class or one who could not make a class work. If you can give me an immediate answer to this letter you will greatly oblige me though I know you are very busy. I should like the names of one or two men of this one any. Yours very truly
M. Palmer Ricketts

Fig. 14. Letter written by R,P,I. Director Palmer C. Ricketts to James Hall, following the death of H.B. Nason, requesting a recommendation for a prospective staff member to teach Mineralogy and Geology. John M. Clark became Nason's successor.



University of the State of New York
New York State Museum

Albany May 30 1896

Fig. 15. Letter addressed by John M. Clark to R.P.I. Director Palmer C. Ricketts evaluating the mineralogical collections of the Institute, This is the first page of a three-page letter; the other pages deal with fossils and rocks.

Fig. 16. A.W. Grabau (left) father of American sedimentology, in animated conversation with E.O. Ulrich (right).

Institute," although in the archives of R.P.I. he is listed as Professor of Geology and Mineralogy. In the preface to New York State Museum Bulletin 45 John M. Clark introduced Grabau. Grabau may truly be considered the Father of Modern Sedimentology. To backtrack and digress one of the most-effective pioneers in making the doctrine of actualism useful as a stratigraphic tool for a better understanding of the rock record was the German geologist Johannes Walther (1860-1937) (see Friedman and Sanders, 1978, p. 9-10). His writings present some of the first real data for use in the interpretation of sedimentary strata in the bedrock. Some of Walther's observations form the cornerstone of modern stratigraphy. He explained that lithologies whose antecedent sediments formed beside one another in space, such as point-bar sands beside overbank muds and next to marshes, lie on top of one another in vertical sequence. Geologists neglected Walther's prolific writings; but Grabau picked them up. Grabau's textbook Principles of Stratigraphy (1913), a classic far ahead of its time followed in the footsteps set by Walther. In fact Grabau dedicated his book to Walther. As his writings attest, the pioneer sedimentologist W.H. Twenhofel, continued the tradition of Walther and Grabau. By their philosophy, Twenhofel's influential books, Treatise on Sedimentation (1925, 1932) and Principles of Sedimentation (1939, 1950), assured the continued influence of Grabau. Unfortunately for Rensselaer, Grabau, and American geology Grabau later transferred to Columbia University, where he became a victim of political infighting in the Department of Geology, which led to his emigration (some even say expulsion) from the United States. In retrospect Grabau probably treasured his association with Rensselaer. As an example, in his Textbook

of Geology (1921) he makes sure that from the title page readers realize that he was formerly "Professor of Mineralogy and Geology in the Rensselaer Polytechnic Institute" (note here that in the Rensselaer archives his title is reversed as Professor of Geology and Mineralogy). Among Grabau's other books should be mentioned Geology of the Non-Metallic Mineral Deposits (1920), The Rhythm of the Ages; Earth History in the Light of the Pulsation and Polar Control Theory (1940), and The World We Live In (1948).

In 1924 Joseph L. Rosenholtz was appointed Professor of Mineralogy and Geology (Fig. 17). With the expansion of activity and staff he became Head of the department in 1945. Even before that date Dudley T. Smith joined Rosenholtz in teaching all geology courses (Fig. 18); the two men likewise worked closely in their research. To understand the significance of their research it is necessary to provide some background which takes us back to the 1920's and 1930's. In those days the field of sedimentology was mostly concerned with provenance studies. Heavy minerals can be employed

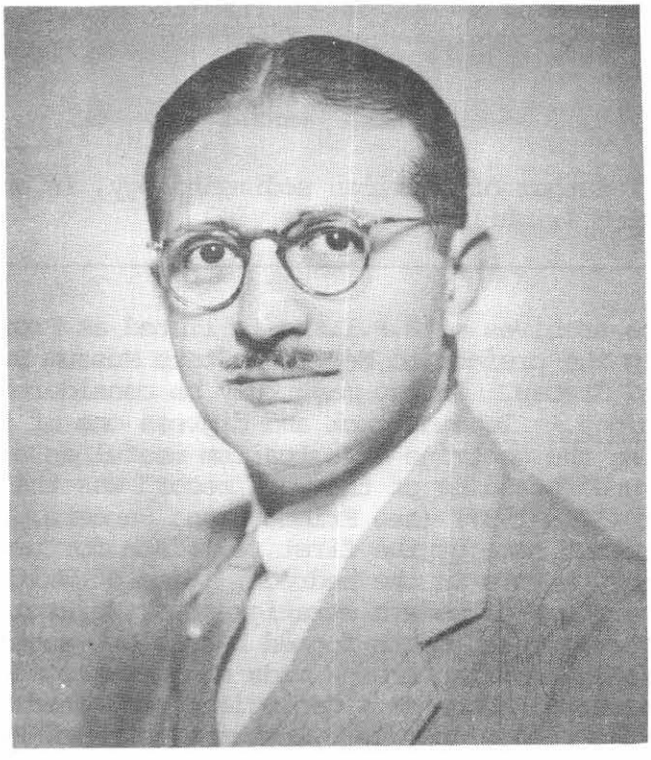


Fig. 17. Joseph L. Rosenholtz, Professor of Mineralogy and Geology, Head of the Department of Geology.

Fig. 18. Dudley T. Smith, Professor of Geology and close associate of Rosenholtz's.

in such studies in a general way to recognize broad catagories of possible parent rocks, or more specifically, to pinpoint the provenance of the particles. A few species of heavy minerals are diagnostic of a particular kind of parent rock; mere identification suffices to determine provenance. When heavy minerals have been determined from a sample network of regional extent, the distribution of certain species may form a distinct areal pattern. In the subsurface heavy minerals have proved to be a valuable means for distinguishing one sandstone from another in single boreholes and in matching sandstones from one hole to another. Such uses are possible even where the provenance of the particle is not known. Heavy-mineral studies of this type were the dominant line in sedimentology of the 1920's and 30's. This work closely depended on careful separations of suites of the heavy minerals. At the time heavy minerals were most commonly separated by means of heavy liquids (liquids having a specific gravity > 2.9). Yet better methods of separation were needed. Many advances in geology have taken place because some new kind of tool or technique has been invented or improved. With it new analytical results could be obtained. Rosenholtz and Smith realized this. With their publications Tables and Charts of Specific Gravity and Hardness for Use in the Determination of Minerals (1931) and especially The Dielectric Constant of Mineral Powders (1936) they helped advance early sedimentology (Fig. 19). Dielectric separation of mineral particles, as developed by Rosenholtz and Smith, became an important technique in provenance studies. W.H. Twenhofel in his influential book Methods of Study of Sediments (1941), co-authored with S.A. Tyler, gives much credit to Rosenholtz and Smith (p. 87-88), and explains their technique in detail and presents their table (p. 87) captioned "Average Value of Dielectric Constant of the Common Minerals as Given by Rosenholtz and Smith." Rosenholtz also developed new techniques for testing the strength of a material from its thermal expansion characteristics and directed a study of the physical properties of rocks and minerals of interest in lunar research. He served as President of the Eastern Section of the National Association of Geology Teachers and of the New York State Geological Association. In 1961 under Rosenholtz's presidency the New York State Geological Association held its 33rd Annual Meeting on the Campus of R.P.I.

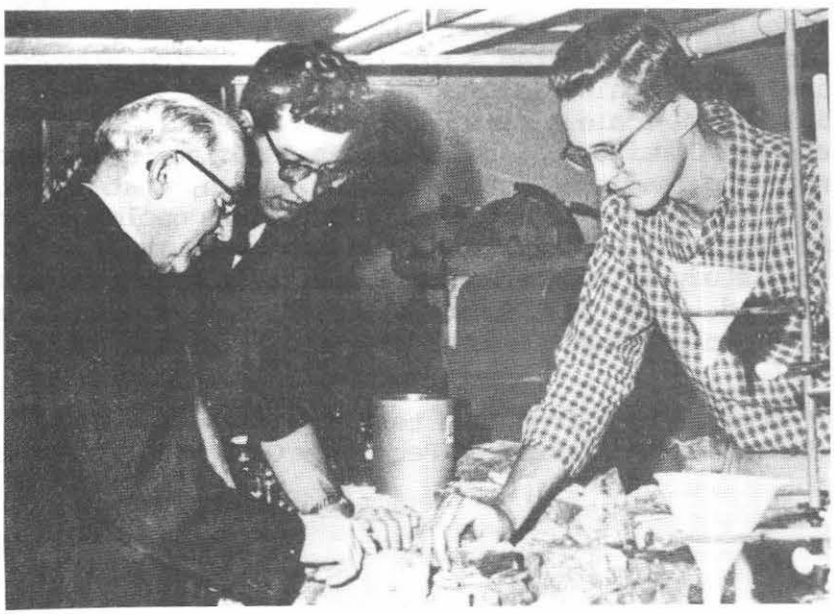


Fig. 19. Joseph L. Rosenholtz instructing students in heavy-mineral techniques. Student at left is George P. Allen, now well-known sedimentologist in France (University of Bordeaux and Centre National pour l'Exploitation des Océans; student at right is Alex Yatsevitch, geologist working in New York State Government.

By 1950 Rensselaer realized the prospect of the fuel problem and started a program known as Fuel Resources, headed by Shepard W. Lowman, a former Chief Research Geologist of the Shell Oil Company (Fig. 20).

Fig. 20. Shepard W. Lowman, Professor of Geology, former Chief Research Geologist of the Shell Oil Company, Head of R.P.I. Fuel Resources program and pioneer sedimentology leader of Project 51, largest-of-all projects of the American Petroleum Institute. Lowman received the highest award of the Society of Economic Paleontologists and Mineralogists. Lowman was recognized as one of the nation's leading authorities in petroleum geology.

In 1952 this program listed six staff members. The options for specialization were in (1) petroleum geology, (2) petroleum geophysics, and (3) geological engineering, subjects which are the most sought after specialties among the sciences even today, almost 30 years later. The choice of Lowman as head of this program was remarkable indeed. To explain this I must briefly digress. Despite an august history of 150 years, sedimentology as a science advanced most rapidly within the last thirty years. This rapid advance resulted from a change of sedimentology as a pure to an applied science. Whereas previously used techniques in oil and gas exploration consisted solely of a search for closed subsurface anticlines, known as structural traps, emphasis shifted to exploration for subsurface stratigraphic traps in which porous and permeable sedimentary rocks are in lateral stratigraphic contact with impermeable sedimentary rocks. Such lateral contacts of different and distinct sedimentary rocks reflect differences in depositional conditions and hence two or more contiguous paleoenvironments. Such recognition of the enormous value of sedimentology as a key to the discovery of stratigraphic traps represented a turning point in the history of the science. Beginning with this recognition in the late 1940's and early 1950's, the first large-scale research projects materialized. The 1947 Report of the Research Committee of the American Association of Petroleum Geologists, under the leadership of Shepard W. Lowman, stated that research in sedimentology is the most-urgent need in petroleum geology. Project 51 of the American Petroleum Institute, established by Lowman, led to a methodical and detailed study of modern depositional environments on a scale not previously attempted. Much of the background of this largest-of-all projects of the American Petroleum Institute was prepared by Lowman, who first conceived the idea.

A classic book emerged from this team effort published as a special volume by the American Association of Petroleum Geologists. Lowman's

background hence was eminently fitted to join the Rensselaer program in the petroleum field. His peers recognized Lowman's contribution and he was bestowed the highest award of the Society of Economic Paleontologists and Mineralogists, namely Honorary Membership, at the meeting of the Society in St. Louis in 1966. His citation read "In recognition of His Many Contributions to Paleontology and Stratigraphy, his Leadership in Research on Recent Sediments of the Gulf of Mexico and his Classic Paper on Sedimentary Facies in the Gulf Coast'". On his death in 1967 the Journal of Sedimentary Petrology published an obituary: a most unusual step as this journal has published no other obituaries before or since. It served to recognize Lowman as a pioneer and leader in the newly important science of sedimentology. In this obituary Lowman was referred to as one of the nation's leading authorities in petroleum geology.

By 1954 the program of Fuel Resources had provided added strength to the geology department. James Robert Dunn (Fig. 21) joined as an economic geologist to develop a program in Mineral Resources, comparable to that of Fuel Resources. Dunn made a reputation not only as an Economic Geologist, but also as an administrator in professional societies. He served as Vice President and is currently serving as President of the American Institute of Professional Geologists. He founded a successful consulting firm known as Dunn Geoscience, of which he is Chairman of the Board. He left Rensselaer after nearly 20 years of service to devote full time to this important and critical field of economic geology.

In 1968 the Department of Geology served as co-host of the Annual Meeting of the Geological Society of America, Northeastern Section. One member of the Department's faculty was the Program Chairman. In 1972 the Department was the host to the Annual Field Meeting of the Society of Economic Paleontologists and Mineralogists, Eastern Section. A special Guidebook was published for this occasion. Between 1964 and 1970 the Department served as home and editorial office of the prestigious national and international Journal of Sedimentary Petrology. A new regional journal Northeastern Geology has begun publication in the Department.

Those currently on the faculty or faculty members who spent only brief periods in recent years at Rensselaer will not be mentioned by name in this historical review. Diversified research and close contact with the students are the hallmark of the Rensselaer Department of Geology. Two textbooks authored in the department, one in petrology and one in sedimentology are widely used all over the world; a textbook in mineralogy is ready for the press. Recognition in research has led to the election of some faculty to the presidencies of national and international geological societies. There is much activity. As Resnick (1965, p. 134) pointed out "Rensselaer Institute from the first acquired a tradition of geological and scientific

Fig. 21. James Robert Dunn, Professor of Economic Geology, Chairman of the Board of Dunn Geoscience, President of the American Institute of Professional Geologists.

instruction which has persisted and grown to the present day."

This history has been written for publication on the occasion of the 51st Annual Meeting of the New York State Geological Association and the 71st Annual Meeting of the New England Intercollegiate Geological Conference. For the first time in their histories both associations have met together on one campus: another first for the Rensselaer geology program.

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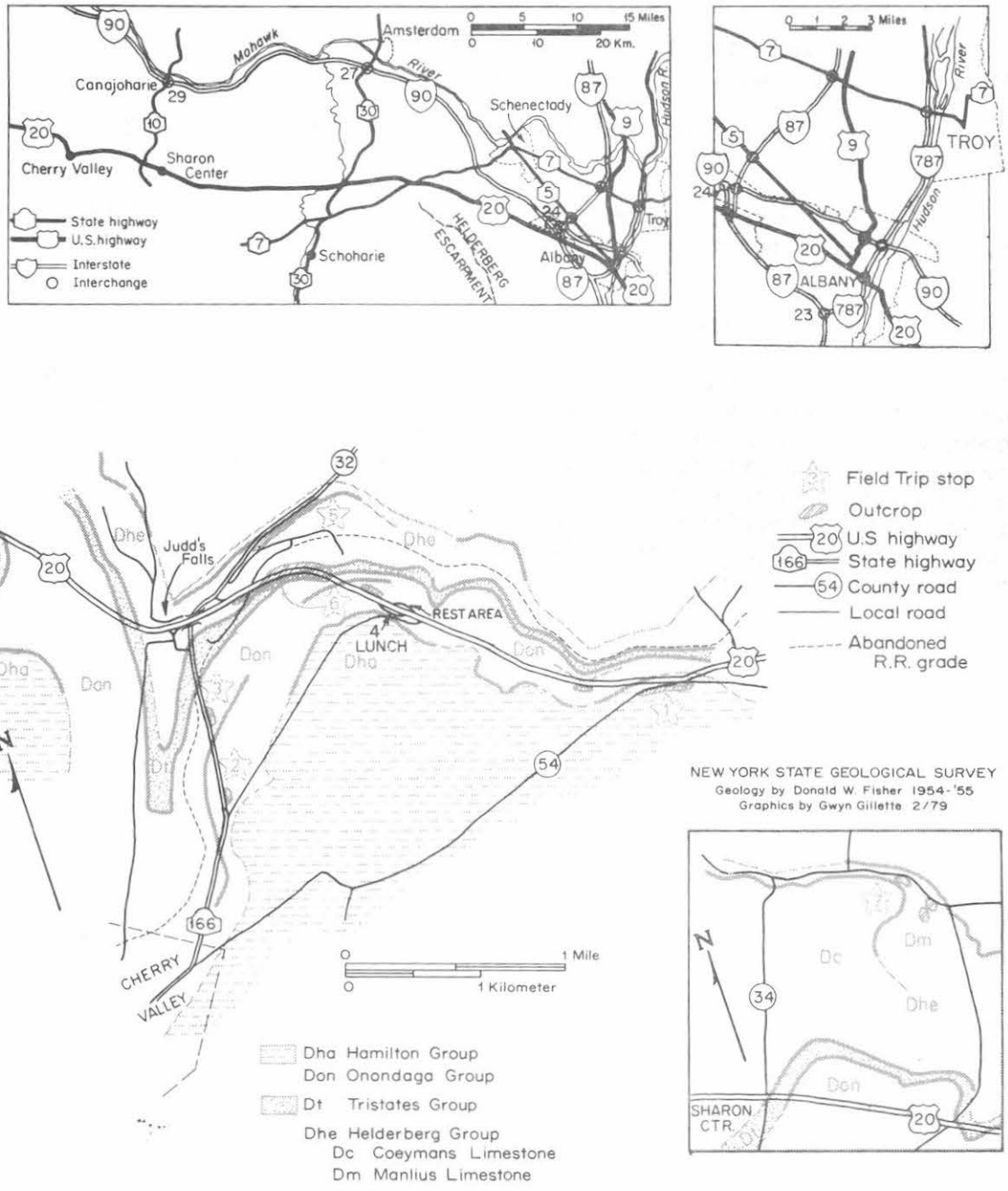

Figure 1. Index map: location of Cherry Valley area with respect to Albany-Schenectady-Troy region; detail of field trip stops shown in lower enlargements.