

State of Connecticut

PUBLIC DOCUMENT No. 47

TWENTY-SECOND BIENNIAL REPORT
OF THE COMMISSIONERS OF THE
STATE GEOLOGICAL AND NATURAL
HISTORY SURVEY

EDWARD L. TROXELL, Ph.D., Director

Bulletin No. 71

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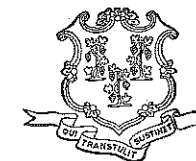
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Printed by the State Geological and Natural History Survey

1947

**State Geological and Natural History Survey
of Connecticut**

COMMISSIONERS

JAMES L. McCONAUGHY, *Ph.D., L.L.D., L.H.D.; Governor of Connecticut*
CHESTER R. LONGWELL, *Ph.D., L.L.D.; Professor of Geology, Yale University*
ARTHUR H. HUGHES, *Ph.D., L.H.D.; Dean of Trinity College*
JOE W. PEOPLES, *Ph.D.; Professor of Geology, Wesleyan University*
RICHARD H. GOODWIN, *Ph.D.; Professor of Botany, Connecticut College*
JOHN B. LUCKE, *Ph.D., Department of Geology, University of Connecticut*

DIRECTOR

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RAYMOND S. THATCHER
State Comptroller

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**Twenty-second Biennial Report of the
Commissioners**

OF THE

State Geological and Natural History Survey

1945-1946

BULLETIN No. 71



HARTFORD

Printed by the State Geological and Natural History Survey

1947

LETTER OF TRANSMITTAL

Hartford, Connecticut

January 8, 1947

His Excellency, James L. McConaughy,
Governor of Connecticut
Hartford, Connecticut

Sir:

I have the honor to transmit to you herewith in behalf of the Commissioners of the State Geological and Natural History Survey for the General Assembly, in compliance with past custom, the twenty-second biennial report of the Survey, covering the two years ending December 31, 1946.

Respectfully submitted,

EDWARD L. TROXELL,
Director.

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TWENTY-SECOND BIENNIAL REPORT
OF THE
GEOLOGICAL AND NATURAL HISTORY SURVEY
OF CONNECTICUT

EDWARD L. TROXELL, Ph.D., *Director*

This, our first peace time report, marks an important occasion for the State Geological and Natural History Survey. Reconversion is in itself an event for any state agency; for the Survey it heralds an extensive reorganization; it tells of an implicit change in policy and of an increased activity and usefulness.

The purpose and function of the Survey, as defined by law, is the examination of the geological formations and the investigation of the animal and plant life, with respect to their economic and educational value, and the preparation of special maps and reports. Broadly interpreted this permits us to carry on research in all natural science, to promote the economic development of all our resources in botany, zoology, and geology, and it charges us to promulgate scientific information along these lines for the benefit of our people and for the advancement of the prestige of the State.

The Law Governing The Commission

The law constituting the commission governing the Survey was revised in 1945. Instead of the presidents of our educational institutions, ex officio, serving as trustees, it calls for the appointment of faculty members by the heads of the five great colleges and universities of the state; these, together with the governor, comprise the Commissioners. We have these six representative men whose training is in keeping with the responsibilities and highest traditions of the Survey. Their presence on the board lends prestige to the Agency and is an inspiration to the staff workers.

The present law, governing the appointment and duties of the Commissioners, prescribes that:*

*House Bill No. 1145, Public Act No. 301, General Assembly, 1945, Section 2227.

"Each person so designated, upon acceptance of such office, shall serve as such commissioner without further appointment until his removal from the state, death or resignation, unless sooner removed for cause. Any vacancy occurring in the membership of the commission shall be filled by a new designation by the president or other administrative head of the institution from whose faculty the vacated membership was originally drawn. Said commissioners shall have general charge of the Survey, and shall choose as superintendent of the same one of the appointed members of the commission, and may appoint such assistants as may be necessary. The compensation to be paid such superintendent and such assistants shall be determined pursuant to the provisions of section 804e of the 1939 supplement to the general statutes, as amended. Each member of the commission shall serve without compensation, but shall be reimbursed for expenses incurred in the performance of official duties, except that the superintendent of said commission shall be compensated in the manner prescribed."

The Commissioners

James Lukens McConaughy, Governor of Connecticut 1947; born 1887.

Studied at Yale, Bowdoin, Dartmouth, Columbia, Ph.D.; LL.D., Trinity, Williams, Amherst, Dartmouth, Rutgers, Yale, Wesleyan; L.H.D., Muhlenberg, Knox. President of Wesleyan University and Commissioner of the Survey 1925-1943. President, United China Relief, 1942-1946. Offices of Strategic Services, Washington. Trustee: Northfield Schools, Vassar College, Pratt Institute. Phi Beta Kappa.

Chester Ray Longwell, born 1887.

University of Missouri, B.A., M.A., LL.D.; Yale, Ph.D., 1920: Captain Field Artillery, World War I; from Assistant Geologist to Geologist, U. S. Geological Survey 1920-1945; National Academy of Sciences; Vice President, Geological Society of America; Professor of Geology, Yale University, Chairman of Department, 1938-1946. Special research: mountain structures; thrusts in the Basin and Range Province; the Triassic of Connecticut.

Arthur Howard Hughes, born 1906.

Johns Hopkins, B.A., M.A., Ph.D., 1931; L.H.D., Trinity. Studied in Vienna, Trinity College Faculty since 1935; Dean, 1941 — ; Acting President, 1943-1945. Phi Beta Kappa. Special work: geography of Connecticut.

Joe Webb Peoples, born 1907.

Studied at Vanderbilt, B.A., M.S.; Northwestern; Princeton, Ph.D., 1932; Lehigh University faculty, 1933. Economic Geologist in An-

thracite Region, 1933-1935; Chairman, Dept. of Geology, Wesleyan University, 1935-1941. On leave 1941-1946 while on full time duty with U.S. Geological Survey as specialist on chromite. Professor, Wesleyan, 1946. Special investigations: Devonian stratigraphy; geophysical prospecting for coal; Stillwater igneous complex and especially its chromite deposits.

John Becker Lucke, born 1908.

Princeton, B.S., (maxima cum laude); M.S., Ph.D., 1933. Navy Commendation Ribbon, 1945, ". . . highly intelligent photographic interpretation . . . invaluable service . . . in keeping with the highest traditions of the United States Naval Service." Geologist, soil surveyor, extensive field work in the west. Faculty, West Virginia University, John Marshall College; Chairman, Dept. of Geology, University of Connecticut, 1940 — ; Member, Connecticut Defense Council. Commission, Navy, 1943-1946.

Richard Hale Goodwin, born 1910.

Harvard, A.B., M.A.; Ph.D., 1937. Student, University of Copenhagen; visited various European laboratories. Faculty, University of Rochester; Professor of Botany, Connecticut College, 1944 — ; Director, Connecticut Arboretum. Extensive field work in the west, also in Central America and Africa. Special interests: plant physiology, soil conservation.

Raymond Earl Baldwin, Governor of Connecticut and Commissioner of the Survey, 1939-1941, 1943-1947.

Senator Baldwin, as a state officer has been interested in and most loyal to the Survey. When the law governing the agency was destined to be changed two years ago it was through his wisdom that the commission was kept within the jurisdiction of the educational institutions. The State and the Survey now lose him as an executive but they and the nation will profit by his transfer to Washington.

For the first time in many years the Commissioners held meetings in 1946; here plans and policies were discussed that make up a considerable part of this report. Governor Baldwin met with us in the spring; he was unable to be present at the meeting in October because of the pressure of duties as governor and as nominee for the United States Senate.

The experience and training of the commission, as now constituted, will offer a wealth of scientific and executive ability; the members are in a position to make valuable contribution to the conduct of the Survey and to the shaping of its future policies.

TOPOGRAPHIC MAPS FOR CONNECTICUT

Almost every endeavor of our Survey, almost every human activity in the state, is ultimately dependent on our maps. They are needed in prospecting, in reconnaissance; they give us a synoptic picture of the ground, an overall view, showing the relation of the parts. Therefore, our mapping program and the supplying of topographic maps have deep significance for us.

One is impressed with the wide use of maps, for all of us are surveyors of sorts. We are prone to locate objects on the landscape, to measure distances; we are concerned with areas and we want to see the lands, at times, in the third dimension. With the new Government topographic maps we can observe the length and breadth, the height and depth; we can estimate cubical contents and can measure volumes for excavations and fills.

The appraisal of our mineral resources must be based on geological study; geological study will depend on field work and for successful field work we must rely upon accurate maps.

History of Mapping Program: The revision of our relief maps has been before us many years. In 1941, the first biennium of the present director, in cooperation with the research department of the Development Commission, we belatedly brought before the Assembly a measure designed to support the Federal Government in its revision of Connecticut maps. In 1945, again at a late hour, in cooperation with Dr. Morse S. Allen and many state agencies and others, we urged the State to take part and have financial responsibility in the mapping program of the Government. While the Judiciary Committee of the Assembly gave its approval at that time funds were not forthcoming and the measure failed.

Early in 1946 the remapping of the state was brought to the attention of the Legislative Council; at a meeting of the Council, attended by Professor Chester Longwell of Yale, a Commissioner, it was voted to recommend the measure to the Assembly in 1947. The bill will again propose that the State contribute \$50,000 each biennium for four years in a cooperative plan with the Federal Government, to complete the mapping of the state on the scale of two inches to the mile and with a ten foot contour interval.

At the hearing before the legislative committees in 1945 one was impressed with the wide use of, and interest in, topographic maps; the need for maps of any sort, and more particularly good ones, is recognized among officials, professional groups, and many others. They will use them for planning the extensive State projects such as highways, water supply systems, in forestry, public health and in the development of mineral deposits. It was felt that this important work of revision should be carried through with the least possible delay, especially since a considerable portion of the mapping of the state has already been completed.

Two meetings were held at which State and Government officials were present and in addition a number of individuals representing industry, education, et cetera. All were enthusiastic about securing these new maps, maps of greater accuracy, of larger scale, and of smaller contour interval. Some of those present expressed the need for these maps in two or three capacities. Most striking, perhaps, was the statement made by the State Board of Health that good maps are absolutely essential to the successful operation of the Board; they serve in the interpretation of drainage, water supply, disposal and in every phase of sanitation.

Support for the Project: This topographic mapping was inaugurated during or just before the war by the Federal Government and considerable progress had been made. Sharing by the State of the costs will not only be just and fair but it will expedite the completion of the program. To date some 55 quadrangles have been completed; the field surveying has been finished for some 64 more. Eventually the whole state should be included in the plan; the southwest corner, mapped under the direction of the Army during the war, should be incorporated in the general system so that all maps will be of the same scale, have the ten foot contour and measure two inches per mile.

In any consideration of this program of remapping the state it should be kept in mind that even though we share in the costs of the field work on a 50-50 basis with the Federal Government, this is indeed a small portion of the total cost. The field data are taken to Washington and there studied and transcribed into a control map; from that point on the much greater expense of printing, is taken over entirely by the U.S. Geological Survey and the completed maps are supplied to us at a cost of about 20¢ per copy.

Excerpts and Statements on Mapping: Here are presented some of the quotations and comments taken from letters contributed by those who are in a position to appreciate the value of good maps in our state and who

supported the bill calling for cooperation between the State and the Federal Government in remapping Connecticut:

Governor Raymond E. Baldwin: "The idea strikes me very, very favorably and I shall look into the matter personally. I can appreciate the tremendous importance it will have in connection with your work."

Edgar L. Heermance, Secretary of the Forest and Park Ass'n.: "Please register my support . . . The completion of this mapping is very much needed, as it is indispensable for engineers, surveyors, assessors, foresters, etc. The value to Connecticut will be worth many times the \$50,000 specified in the bill as the State's share in the project."

Dr. Arthur Hughes, Dean of Trinity College: "The project is one of great importance for the Survey as well as for other State and local interests. If I may cite my own case as an example, I should be particularly pleased to have at hand a set of maps of Connecticut on a large scale in order to facilitate my study of place-names within the State. In my opinion this project will meet a long felt need in our State and is eminently justifiable."

Dr. Victor L. Butterfield, President of Wesleyan University: "This is indeed a very gratifying proposal and I am more than glad to urge its passage. It seems to me that we have been considerably behind the times in our failure to get the state adequately mapped and I should presume that we ought, by all means, to do so now . . . It is not only a matter of having an accurate knowledge of our terrain and resources as a matter of principle, but in the development of technology it seems more than likely that such knowledge might prove of practical significance to us."

Sidney A. Edwards, Managing Director of the State Development Commission: "In our industrial, recreational, residential, and mineral development work this commission would be greatly benefited by having up-to-date maps from which to work."

Dr. Russell P. Hunter, Superintendent, State Board of Fisheries and Game: "May I ask you to register this Department as favoring the completion of the new series of topographical maps. These maps are very useful to our Department in planning for game and fisheries management. The many changes which have occurred since the state was last mapped by the Geological Survey have made the old series of maps very difficult to use."

A federal official concerned has made the statement that he is ashamed of the old maps in Connecticut and would withdraw them.

A Recommendation by the Legislative Council: Report of November 20, 1946, p. 88, Topographic Maps of the State:

The United States Geological Survey, engaged in the work of preparing topographic maps of the entire State of Connecticut early in World War II, was obliged to curtail this activity at the close of the war, due to lack of funds. That portion of the work done had cost the Federal Government about \$700,000, and it is estimated that an additional sum of \$200,000 will be required to complete it in a period of four years. The Federal Government will supply funds for one-half of the estimated remaining cost, provided the State furnished the other half. This will necessitate a biennial appropriation of \$50,000 in 1947-1948 and calls for the same amount in 1949-1950.

The original topographic maps of Connecticut made in the 1880's are inadequate, are inaccurate and often seriously in error; they have comparatively small scale and were prepared by methods now considered obsolete. The need for maps is recognized among public officials, professional groups and many others. They are used for planning all extensive outdoor engineering projects such as highways, water supply systems, and housing developments; also in forestry, public health work, the study and development of mineral deposits, and are immensely popular and useful to the citizenry of our State.

Our neighboring States of Massachusetts and New York have for years availed themselves of the privileges extended by the Federal Government under the cooperative plan. This is a project from which the State will derive substantial benefits at relatively little expense; the printing of the maps, a major item of expense, is done by the Federal Government.

We feel that essential work of this nature should be concluded with the least possible delay, especially in this instance where a very substantial portion of the work has been completed. We accordingly recommend that enabling legislation be enacted by the General Assembly of 1947 toward the making of a complete map of the State and keeping it up to date.

Persons and Agencies Favoring the Mapping Program:

ALLEN, MORSE S., *Author of the Bill, Trinity College*
 ALEXANDER, DONALD, *Park and Forest Board*
 BREWSTER, JAMES, *State Librarian*
 BUCK, HENRY W., *President Society Civil Engineers*
 COX, WILLIAM, *State Highway Commissioner*
 EDWARDS, SIDNEY, *Managing Director, Development Commission*
 FORTUNE, MARK, *Secretary Post-War Planning Board*
 HEMENWAY, CHARLES C., *President A.A.A.*
 HUNTER RUSSELL P., *Superintendent, Fisheries and Game*
 KIENHOLZ, RAYMOND, *State Forester*
 LONGWELL, CHESTER R., *Chairman, Department of Geology, Yale*
 MANNING, H. R., *Highway Department*
 ROGERS, WILLARD, *President Development Commission*

SCOTT, WARREN J., *Board of Health*
 SHEPARD, ODELL, *Author on Connecticut Natural History*
 STAACK, JOHN G., *Topographical Division, U.S.G.S.*
 TROXELL, EDWARD, *Director, State Geological Survey*
 URQUART, ROSS V., *State Police*
 WILEY, C. N., *Connecticut Technical Council*
 WISE, WILLIAM S., *Water Board*

THE RESEARCH PLAN AND PROCEDURE

Several works of an extended nature are before us; the mapping problems, both topographic and geologic; the discovery and listing of our major natural resources; the storing up of technical data; the lending of aid in many scientific investigations; the writing of new bulletins. The rapidity with which these can be accomplished will depend upon the number of workers, the time they can spare for research and the financial support from the state.

Mutual Aid and Assistance: As has been our policy in the past we shall rely largely on the faculty members and students of our colleges and universities, together with the scientists in other state agencies, for the technical assistance we need. It has been difficult recently, and especially during the war, to maintain a staff of investigators. Even now the heavy teaching load of our educational institutions takes up the time and energies of potential workers; they can not as yet follow their inclination to indulge in research activities. We earnestly hope that the urge to do research will again supply us with the technical assistance we need.

A tradition of the Geological and Natural History Survey has been to secure the best technical and scientific service possible, to support the workers in the field, to carry the expenses, to advise and to lend the weight of our influence and reputation in their endeavors. The workers, in turn, give generously of their free time in laboratory work, study and writing, an arrangement that furnishes mutual advantage and benefit. The results of this cooperative plan is the published bulletins that have been so popular and useful, not only to our citizens, but which have also gained national and international renown.

GEOLOGICAL NEEDS CONTEMPLATED

Certain phases of geological work in the state deserve special consideration in any future planning: we need a text on the minerals, the completion of a geological map, and a revision of the treatment of the general geology. One of the most important bulletins in the history of the Survey

was published just 40 years ago (1906) on the general geology of the state. This popular book was widely read and studied, but it has now been long out of print. Copies in our libraries and elsewhere are still extensively used and we have frequent requests for the book and for the details of its contents.

It would be worth while to reprint the same bulletin, except for the fact that great progress has been made in the science and the newer data, the modern facts and theories, should be incorporated. Extensive field work has been done already in the western part of the state by Agar, Cameron and Wheeler; in central Connecticut by Longwell, Krynine and others; and in the eastern portion by Foye, Peoples, Mikami, Digman, Dow and Aitken; much of this should be included. The work of Flint on glaciation gives him an overall knowledge of our geology that would be of great value in any new summation. So much has been done that a new treatment is not only warranted, but the need for the book and its subject matter makes its writing imperative.

Just previous to the war a committee of geologists of the state was appointed for the consideration of both the bulletin and an areal map. A comprehensive plan was drawn up and sections of the state were assigned to different workers; due to the war and the removal from Connecticut of some of our scientists the project was abandoned; it should be pressed forward now with vigor.

A Geological Map: A general map of the geology of the state would be of great importance to us at this time and it would furnish a background and basis for the writing of the new manuscript on the geology itself - the rock structure and its distribution. Such maps are being sent to us from many other states and there is frequent call for one of Connecticut. One hesitates to recommend the printing of a map until the whole state has been surveyed and every detail of the geology has been worked out; but, always, a map is merely a report of progress and if we wait for perfection the much needed map will never be published.

Bulletin on Minerals: In 1931 Dr. John Frank Schairer composed a bulletin on the Minerals of Connecticut; this was immediately a success and now for some time that first issue has been out of print. We would be justified in reissuing this same copy just to satisfy the great demand but, again, there has been so much additional work done in the state on our minerals, it would be unfortunate not to take advantage of all this new information.

Dr. Horace Winchell of Yale has been asked to take the responsibility of re-editing Bulletin No. 51 on the minerals of the State. We Sincerely

hope that this will be one of the first projects of our active program; a bulletin on the minerals might be made available in a short time. The rewriting of the general geology of the state and the drawing of an areal map of the rock formations will probably be delayed a few years.

Suites of Minerals: At our January meeting Dr. John Lucke, Commissioner at the University of Connecticut, proposed that we secure a collection of minerals from our own sources and supply them to interested individuals, to schools, et cetera; the project seemed eminently worth while. Through the activities of Robert Brandenberger we now have more than a score of mineral species in lots of a hundred each. It is our plan to have at least three dozen different minerals when the collecting is completed, a hundred pieces of each species, together with a printed guide ready for distribution soon. Each suite may be secured to a board so that the specimens can be numbered, labeled and displayed; or they may be in containers where they can be taken out for examination and study.

We predict that the demand for these suites of minerals will far exceed the supply in the first issue and that we may have to duplicate the collection over and over in the near future. Mr. Brandenberger, aided by the Mineralogical Club of Hartford, did exceedingly well in this collecting; he has provided many of the rarer minerals in quantity, several that are luminescent under the ultra violet light. He has already contributed a descriptive statement for many of the species and has offered his assistance in the further writing of the mineral guide.

A Seismograph in Connecticut: The Survey, in cooperation with Trinity College, has been working for years toward the securing of a seismograph for the State where none exists now; due to a generous gift from a citizen of the State, a friend of the College, Mr. Ned Griffith Begle, of Greenwich, the funds are furnished for the purpose.

It should be pointed out that in the past many individuals have lent their influence to this purpose; particularly Senators Lonergan and Danaher have made valiant efforts to have such an instrument installed in Connecticut from Government funds and at one time the United States Senate voted favorably on the measure.

The presence of a seismograph will not only enable us to detect the earth tremors in this section, determine their direction and origin, assist in the study from these evidences of the structure of the earth, but it may help us to understand the Moodus Noises, so famous in south-central Connecticut, and the prevalent disturbances in the Deep River-Chester vicinity. Although the seismograph will be installed at Trinity College,

it will be a source of great interest to the Survey and to the people of the State. All the studies and technical work will be carried on in cooperation with the U.S. Coast and Geodetic Survey. A letter from the Acting Director, 11 December, 1946, states: "It is our earnest desire that you establish and operate a station that will . . . serve as a cooperative station, associated with . . . this Bureau . . ." The State will be further indebted to the Trinity College authorities who have in the past furnished the rooms and incidental equipment for the Survey and now have achieved this further end.

A Magnetometric Survey: One of the developments of World War II was the invention of an instrument capable of detecting the presence of submarines from the air. It has been suggested by Dr. Joe W. Peoples, Commissioner at Wesleyan University, that the use of a magnetometer here in the state might be very helpful in adding to our understanding of the geological structures. This would supplement Dr. Longwell's studies in a gravity survey, revealing some interesting major features of the earth's crust. It is presumed that if a magnetometric survey were made, particularly if the instrument were used at different altitudes, it might give important information on the Triassic rocks especially and even be used in distinguishing the rock formations of the eastern and western highlands. In other states a cooperative plan has been worked out with the Federal Government for making such a survey and it is conceivable that we might unite in such a study here.

SUPPORT IN BOTANY PROVIDED

It is a privilege for the Survey to have been able to contribute to some interesting work on the plants and trees of the state. Through the efforts of Dr. Richard Goodwin, Commissioner at Connecticut College and Director of the Connecticut Arboretum, the services of Mr. Kaleb Jansson of Groton have been obtained for the collecting and displaying of specimens of native plants.

The Arboretum, just completing its fifteenth year, was established for the purpose of bringing together a collection of all the woody plants native to our state. Special work has been done already on the raspberries and blackberries and some thirty species have been added to the collection not previously represented. Moreover, the seeds of quite a number of our native trees have been secured, particularly the oaks and hickories, which will be germinated in the nursery.

The Chestnut Trees: Similarly the Commissioners have taken an interest in the restoration of our chestnut trees, almost completely destroyed by a

blight early in the century. This very worthy project has been under investigation for many years by Dr. Arthur H. Graves at his farm near Hamden and now the Survey is supporting that work.

In 1911, when the trees were first affected, Dr. Graves began a study of the disease and sought for a proper care and treatment. After many years of research he conceived the idea of crossing our native trees with those from China and Japan; by breeding, selecting and cultivating, he has reached the point where many new, productive types have been developed. Remarkable success has crowned his efforts; many sizeable trees are prospering at his Mt. Carmel Plantation today, and this very year he reports the collection of some 200 pounds of the nuts - perhaps the greatest crop since early in the century when the trees were first blighted.

Here is a comment in a letter written by Dr. Raymond Kienholz, State Forester, that has a bearing on our desire and need to support the work of Dr. Graves:

"I am sure it would be greatly appreciated if the Geological and Natural History Survey could give some financial assistance to the carrying out of this project over a long term of years. Naturally, we are all interested in the outcome of this experiment."

It is the purpose of the commission to support this work on the restoration of the chestnuts until such time as it may be taken over more satisfactorily by some other state agency.

The Tree Census: For a number of years the Survey has supported a piece of research in connection with our forests under the direction of State Forester Kienholz. We have employed men who, following the strip method, have made careful count of the tree types throughout the state in representative areas; this was reviewed in detail in our Biennial Reports, Bulletins Nos. 66 and 67. Precaution was taken to do over some of the earlier work and the field survey is now completed. The data are in the hands of the State Forester and, when time permits a careful examination and study of these, it will lead to a manuscript to be published in bulletin form for the Geological and Natural History Survey.

ACTIVE FIELD INVESTIGATIONS IN GEOLOGY

The constructive work of the Survey, even though greatly curtailed by the demands of a great war, has been of considerable importance and extent. Our workers have covered a wide field in recent years, from zoology to botany to geology; the study of our trees and plants has had practical

and scientific importance; the investigation of our minerals and rocks, in both the realm of economic geology and pure science, has occupied our attention. Some of these projects, especially in geology, are completed and the reports are in our hands, even though they have not been published. Other studies are in progress and all are essential to the pleasure, education and welfare of the citizens of Connecticut.

Program of Field Studies: During the biennium and late as 1946 for all of them, Dr. Harry Mikami, Messrs. William Horney, Charles Hendel III, and Ralph Digman were doing geological work for the State as they pursued their studies for advanced degrees at Yale. Similarly Miss Janet Aitken did field work of a petrographic nature while studying at the University of Connecticut.

The achievement of these students has particular significance for us: while they do not have the long experience usually deemed essential in research, they were able to do the detailed work under the wise direction of professors in our educational institutions who furnish counsel and guidance without any cost to the State whatsoever. Frequently it has happened in the past that research begun under the jurisdiction of faculty advisers has developed into important reports as the work proceeded.

Recorded Field Data: Messrs. Mikami and Horney have worked together on many problems in the state; of particular interest are their reports on the quartz vein of Stoney Creek, on the garnet deposits of West Redding, on the loess fields in the region of Hartford, and on other mineral objectives. Dr. Harry M. Mikami, of Japanese parentage, wrote a thesis and completed his graduate work at Yale University; he served the State Survey and his Country well during the war in the search and procurement of mineral products. Only through the support of the Survey, as he says, was he enabled to carry on the field work and prepare materials for his studies; his dissertation on Connecticut rock formations is now a part of our record. A detailed statement of the work of Dr. Mikami and of Ralph Digman was given in our last biennial report; Mr. Digman is continuing this work.

The summary on the quartz of Stoney Creek consists of nine pages and two large maps, a map and index of the topography and geology, and another map and section showing the genesis of the deposit and its structure. The garnet area of West Redding was studied in detail and the final report consists of six pages, two figures and two maps. This garnet would seem to offer a readily accessible industrial mineral which can be used as an abrasive or otherwise.

Loess, a fine wind-blown sand ranging up to 1/100 of an inch in the size of the larger grains, has been discovered widely in the region of Hartford in a radius of 10 to 15 miles. Here we have a sand that shows in its analysis a quality equal to the molding sands widely used in Connecticut which are shipped in from without the state; and here is a possible industry awaiting only the magic of technical development.

We are following with great interest the reopening of the kaolin deposits of West Cornwall and have had the opportunity to advise with the owners and engineers in the development of that unusual formation. In this kaolin we have a substance, akin to clay in its composition and uses, of considerable abundance and in a rare, concentrated form. The kaolin is a product of the weathering of pre-existing beds of arkose.

We have been called to examine carefully the red sandstone quarries of the Simsbury region. We have visited the pyrophyllite formation, acres of an asbestiform mineral in Satan's Kingdom, near Nepaug, having been advised by experts on the possibility of commercializing this mineral and have a carefully made analysis in our records.

Geological Studies in Progress: The purpose of an investigation on the Hebron gneiss of eastern Connecticut, by Miss Janet Aitken, instructor at the University, is to determine the structure and origin of the rocks of the area. Here is a problem, indicated in the old Bulletin No. 6, which will undoubtedly lead to drastic changes in the areal map published in 1907. This will involve a more exhaustive study than was ever made before in this area and is made possible and is expedited by the numerous outcrops of rock.

Miss Aitken will attempt to determine the areal extent, study the mineralogy and the structure, correlate and interpret the data. The intricate geology is difficult to decipher, but it is definitely a worth while project. This is a sample of the detailed work we have in mind that will contribute to a volume on the general geology, replacing Bulletin No. 6, and to a new areal map of the state.

The Rev. Michael D. Lyons is giving part time to a study of the pegmatites near and extending out from the famous Branchville Quarry. While this will include some general geology and structure, it is intended more as a search for the characteristic minerals, those that might have commercial value: mica, feldspar and beryl. This seems to be a promising venture and we look to the final report with great interest.

Dr. Horace Winchell of Yale, a new member of our staff, has been making many trips into various parts of the state to collect information on the

local geology: the Branchville area, the old barite quarry and the New Haven Trap Rock Quarry, both in Cheshire; he has visited the old copper mine in the Northern part of Bristol, recently opened up, thought to contain two or three per cent of copper ore along with appreciable amounts of silver and even gold.

The Survey has been advising with the Government as represented by Lieutenant W. A. Slagle on the caves of Connecticut. Spelaeology will have importance in an atomic age and, although our underground caverns are much limited, we might be able through these studies to contribute to the welfare of a coming generation of the State in another war.

OUR IMMEDIATE NEEDS

Always, of course, the monetary side of conducting an investigation is an important factor. The State authorities have graciously supplied additional funds from time to time in an emergency, and at this biennium we are considering further permanent expansion. A problem second to the securing of money for expenses is the finding of workers who can carry on the type of research we would have. This is a matter which will have to be worked out subject to the demands of our educational institutions and such State agencies as have supplied us with technical assistance in the past. There is much work to be done and every effort will be made to increase the number of those who want to indulge in scientific research.

Lack of Publications: Perhaps our most pressing need now is support in the publication of bulletins; manuscripts prepared by investigators in past years still lie fallow in our hands. Throughout the war printing was a most difficult problem and the publication of our bulletins came practically to a standstill.

No manuscript was printed between the publishing of the Twentieth and Twenty-first Biennial Reports, 1942 to 1944. Only one technical bulletin, No. 68, on the mosquitoes, has been printed since 1942; this in spite of the fact that we have many more excellent reports on hand that should be made available to the public.

We now have three manuscripts in press and a dozen or more papers that have been waiting for years for printing authorization. Although these three bulletins have been "in press" for some time the present outlook is not favorable for their printing in the near future because of the difficulties in the publishing business and because of the lack of ready funds with the Comptroller for this phase of our educational promotion.

It is disturbing to note the scarcity of published works coming out in the name of the Geological and Natural History Survey. This is especially unfortunate because the Agency enjoys a splendid reputation over the nation and in many parts of the world, where our bulletins are favorably known. Inquiries for our bulletins and requests for scientific information have come to us from many parts of the country and from foreign lands, specifically: Brazil, Costa Rica, Netherlands, Czechoslovakia, Hawaii, Russia, et cetera.

THE FUNCTION OF THE SURVEY

Progress in scientific work will come only through knowledge; it must be our objective, therefore, to gain as much of information as possible and pass that information on; that will make for progress. We must have in mind the saving of our resources through the study and exploring of them; knowledge of values, of extent and of uses will accomplish this. All are necessary. It is not conservation, it can not be economy, if we are ignorant of what we have.

One of the functions of the Survey is to supplement the other State agencies, to aid them in every possible way. Similarly we have helped industries in the past by giving them expert advice, by forewarning, by encouraging, by supplying information. The Survey has at its call scientists of the highest quality; these experts can make detailed studies with a minimum of effort and a maximum of value and the State contributes this service without charge.

As is always the case, our staff has been called upon to assist in many things dealing with natural history: supplying information, furnishing field data, submitting reports, giving informations on many geological and other problems. We have attended State conferences where matters of scientific interest have been discussed, hoping to contribute from our studies to the general welfare and to the solution of difficult problems.

Although, during the war, our efforts were turned to an intensified search for strategic products, we continued with the routine tasks and gave attention to projects of longer duration; even in war we were aware of our post-war needs.

Looking to the Future: Remote as war seems to us at the present time, we must take stock of our assets, our resources, on a hundred to one or on a thousand to one basis, on the chance that in some future emergency the need will be increased a thousand-fold. A war, possibly more devastating than the last, may increase our wants almost infinitely.

The lack of minerals in quantity is indeed a challenge to us here in Connecticut; where quantity is lacking there may be quality, however, that will reward our efforts; it is our duty to find out. New developments in technique and new processes encourage us to hope for returns where values have been lacking heretofore. Industrial trends make values, new uses make new needs for idle products.

Of course, we should have a comprehensive plan of exploration, have in mind the making of an exhaustive study of all our geological formations, of all our plant and animal life; have a knowledge of their content, their inter-relations, their significance, that in the light of future needs, may furnish something of great value and importance.

The State is obligated to continue its investigations for various reasons: there is almost limitless time for it to await returns; as with the Federal Government we are working for the public, both its immediate needs and its future safety and welfare. There is value in carrying on our search for the sake of gaining knowledge; sometimes a discovery made in conjunction with pure science leads to a great economic enterprise. Thus the sciences pay their debt to industry for their early nurture; this is our opportunity and duty.