

# The Engineering Geologist



THE  
GEOLOGICAL SOCIETY  
OF AMERICA

THE QUARTERLY NEWSLETTER OF THE ENGINEERING GEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA

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At the beginning of our next 25 years, we are reminded to look at our past accomplishments as the foundation for the future. We have been privileged to have leadership with vision and it is our goal to continue with a responsive approach to geology and the needs of man. Your chairman, officers, and committee members welcome all suggestions. The vitality of our Division depends on the contribution and support of all members.

One of the most active members of the Division and the Society is Dr. Robert F. Legget. Dr. Legget's address at the 25th Anniversary Luncheon in Minneapolis was enthusiastically received and we are pleased to highlight his address in this issue of *The Engineering Geologist*.

Gordon W. Prescott  
Chairman

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## "1947-1972-1997"

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*A talk given at the 25th Anniversary Luncheon meeting of the Engineering Geology Division of The Geological Society of America, Minneapolis, Minnesota, Tuesday, November 14, 1972. This copy, slightly revised after the talk, typed January 15-17, 1973.*

Robert F. Legget  
531 Echo Drive, Ottawa 1, Canada

This happy gathering marks a real milestone in the history of the Division of Engineering Geology of the Society. I am one of those who consider that important milestones should be appropriately marked, just as we are doing today by assembling together for this special function, if only because (in the old words):

Milestones

tell us two things worth the knowing,

Where we've been and where we're going.

Although, therefore, in our talks together we normally look forward, this is one occasion on which a brief glance backward will be in order. We can then see to whom we are indebted for all that has been done and get some perspective for what now lies ahead.

The names of the chairmen who have guided the Division through its first quarter century of service are listed in the leaflet that is before you so let us go back even beyond the first date that appears in that list. Throughout his many years of service to the Society as its Secretary, Dr. Charles

P. Berkey must have made the significance of geology as applied on engineering works a matter that was at least familiar to his fellow officers. When he became President in 1941 he devoted his presidential address, as many of you will know, to the place of *The Geologist in Public Works*. If there are any younger members of the Division who have not yet read this splendid paper, let me commend it to them as at once a guide and an inspiration.

Dr. Henry Aldrich followed Dr. Berkey but was also the first permanent Secretary of the Society, the personal friend of many of us. I have been privileged to consult with him about the start of the Division. He recalls being consulted by the late Sidney Paige, one of the earliest geologists to serve with the U.S. Corps of Engineers. He was also consulted by Roger Rhoades who tells me that in the early days of the Tennessee Valley Authority there was "a vigorous group of young engineering geologists gathered together by Major E. C. Eckel, the father of our mutual friend who is now the Executive Secretary of the (Society). . . . Some of us were impatient to find sanctuary with some organization that would give identity to our geological specialization, which was catching on at a rapid rate in engineering groups such as the Corps of Engineers, the Bureau (of Reclamation) and the TVA, in the United States, and with similar groups elsewhere."\*

Roger Rhoades, therefore, also consulted with Henry Aldrich at the annual meeting of the Society in Chicago in

1946 and some form of 'rump meeting' must have been held. This was kindly remembered for me by Art Cleaves (who was there); he recalls the other two 'founders' that I have mentioned, as well as the late Parker Trask and Ed Burwell, Bill Irwin, and Shailer Philbrick—a most happy roster of names well known to many of us. It was found that there was already in existence the Cordilleran Section. With this precedent and with the assistance of Dr. Aldrich, a petition for the formation of a new Division of Engineering Geology was drafted and quickly signed, submitted to the Council, and approved with only a very slight change in wording. I find it of special interest to know that the motion for approval was seconded by that good friend of so many of us, Jim Gilluly.

The Executive Secretary has very kindly dug into the records for us with the result that I can include as Appendices a copy of the appropriate Minute of Council, from December 1946, and also a copy of the original Petition with its splendid roster of signatures: Charles P. Berkey, R. M. Leggette, Chas. P. Theis, H. Ries, John W. Vanderwilt, Irving B. Crosby, Sidney Paige, Roger Rhoades, George P. Woollard, T. T. Quirke, and Olaf L. Rove. To the instructions of the Council a provisional set of By-laws was drawn up by Roger Rhoades, Art Cleaves, and George Woollard and approved by the Council at their meeting in April 1947. The Division was then in business with Dr. Berkey as its first Chairman, Sidney Paige as Vice-Chairman, and Roger Rhoades as Secretary, an appointment requested by Dr. Berkey so that he would be spared burdensome matters of routine. The Division arranged its first meeting as a part of the Annual Meeting of the Society for 1947 which, by chance, was held in Ottawa, Canada. A further contribution of Ed Eckel to this record is a copy of the programme for this first meeting which is also reproduced as an Appendix. Dr. Berkey presided. One of those present at the meeting was Dr. Andrew Lawson who made some impromptu remarks. Nine papers were presented and such was the interest generated that the last paper, scheduled to start at 12:55 p.m. was not actually delivered until 1:17 p.m., a fact to which I can testify since I was this last speaker on that very cold morning, twenty five years ago, in Ottawa.

Such were the beginnings. There are now also Divisions for Coal Geology, Geomorphology, Hydrogeology, and Geophysics, all well accepted integral parts of the Society. There have been regular meetings of our Division at every annual meeting of the Society since 1947, and at quite a number of the meetings of Sections, especially in more recent years. Some of these have been good, some not so good. It may not be making any invidious distinction to note particularly the meeting sponsored by the Division in 1959 at Pittsburgh for which Ed Eckel had arranged a symposium on the geology of the nuclear test sites. This fine set of papers attracted an audience of well over four hundred, as I recall it, and may well have marked the 'coming of age' (so to speak) of the Division.

Concurrently, the Division has devoted much effort to

a publication policy, the results of which you will find listed in the commemorative leaflet. It is good as far as it goes, but it really does not go very far. The Case History series, for example, broke new ground for GSA. It provides an admirable medium for short progress papers, of real use in the practice of engineering geology but not major contributions to knowledge such as the usual type of GSA paper. The series was accepted, with some hesitation, by the Society and has done well, each issue (I understand) being self-supporting financially . . . but only eight have been published over a period of fifteen years. The Review volumes were started with the high hope that they would prove to be *annual* reviews of major topics in engineering geology, there being more than enough such topics to provide material for annual volumes with no repetition of subject before ten-year intervals—or so it was optimistically thought. Two such volumes only have been issued in the ten-year interval.

And what of papers, given to divisional meetings and later published in the Society's *Bulletin*, or in some other appropriate medium? There must have been, at the very least, two hundred and fifty such papers presented; I suspect that a detailed survey would show a total closer to four, or even five hundred. The number published can be numbered in a few tens. Some may have been published in remote journals but the Division has no record of them. (And let me make clear that I am 'talking to myself' too, since two of the papers I have presented to the Division have yet to be published—but they will be!) Let me assure you that I have not fallen headfirst into the 'Publish or Perish' trap. Rather do I raise this whole matter of publication for what I deem to be a most important reason.

To our meetings we attract only the 'converted', quite naturally, those who know what engineering geology is, what it can do, and how vital it is in all environmental studies as well as in the prosecution of civil engineering

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## THE ENGINEERING GEOLOGIST

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### *Division Officers - 1973*

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works. But there are still all too many geologists, both within and outside this Society, who think of applied geology exclusively in terms of mining and petroleum. There are still many who regard engineering geology as a very amateurish sort of activity; some, indeed, who still think that it has no place at all within GSA. We are not going to convert such colleagues by having meetings, no matter how good, between ourselves. We must provide them with the evidence that is now so widely available of the achievements of this most important application of the science to which we are all so devoted—and that means scholarly publications. I am well aware of the devoted but abortive efforts of many former executives. I would be failing in my duty today, however, if I did not sound this clarion call—to every single member of the Division—to record the vital information that we know to be available in our special field.

Quite apart from this vital general reason, there is also the professional responsibility upon all of us to share our experiences and hard-won new knowledge with fellow-workers in a way that has always distinguished the profession of civil engineering. It requires a lot of hard work—we all know it—but it does not need any cumbersome committee activity to engender it. I have some experience of the difficulties of getting much active committee work going for the Division, with our continent-wide membership, our many other activities, and a regular divisional meeting only once a year. The Division can, however, develop an esprit-du-corps within its membership (through the Newsletter and in other ways) as to the eminent desirability of sound publication, to professional benefit, to the advantage of the Division and the satisfaction of the individual. I commend, in particular, the idea of a real attempt to put the Review volumes on an annual basis, of publication of Case History volumes at the very least once a year, and the gradual development of a sound tradition that all good papers presented at our meetings shall be published within a year after delivery. Not only is the *Bulletin* available as the medium *par excellence* with very prompt publication after acceptance, but there are also the *Bulletin of A.E.G.*, the *Canadian Geotechnical Journal*, and the *Quarterly Journal of Engineering Geology*, all anxious to receive good papers for consideration, as I happen to know.

This, then, is the situation as I see it today—much good accomplished but much yet to be done. Lest you think me discourteous on an occasion such as this, let me remind you of John Milton's famous words: "For he who truly magnifies what hath been nobly done and fears not to declare what might be done better gives ye the best covenant of his fidelity." I assure you of my fidelity to the Division and all that it stands for in the years ahead. Shakespeare has reminded us for all time that "What's past is prologue; what to come, is yours and my discharge." How perceptive those ancient words can be seen to be yet once again as we now look ahead to the next twenty-five years, to the day when this Division (or its successor) will mark its fiftieth anniversary.

It is almost certain that the population of the world will have doubled in that short space of time. Without any doubt, the cities of the world will have at least doubled in size. Your government has officially stated that by the year 2000 this country will have used up an additional 140,000 square miles of land for urban development. What do 140,000 square miles represent? The combined areas of England, Wales, Scotland, and Czechoslovakia! That is the immediate prospect, the fantastic increase that is already speeding up. And you and I know that this must inevitably call for geological advice in association with civil engineering on a scale that has rarely even been dreamed of up to now. What can even now be foreseen?

Let us look first at wide horizons and then work back to our domestic affairs. We hear talk already of the 'global village' that the world is becoming. Some may think that this is just a poetic figure of speech only, but all who have had the privilege of participating in international scientific activities will know that in the field of science, at least, we can indeed think and talk of 'One World', with little thought given to the iron or bamboo curtains. In August last, the International Association of Engineering Geology sponsored the sessions on engineering geology at the XXIV International Geological Congress in Montreal. How I wish that all of you could have been there—to see speaker after speaker, from all round the world, from Australia, Northern Ireland, Germany, and North America to mention just a few that first spring to mind, stand up and share experiences that recognized no barriers of language, no artificial frontiers.

The I.A.E.G. is well launched, with an energetic President from France (Dr. Arnould) in succession to the revered Dr. Zaruba of Czechoslovakia. It can do great things, especially if it receives the unstinting corporate support of both the U.S.A. and Canada, as I trust that it will very shortly. Already an international Working Party is at work developing standards for the preparation of engineering geological maps. And this is but a beginning. We must be there—to help and to receive the incidental benefits. And so we must have our own house in order. There is here also much to be done.

In the first place, I note with regret a growing tendency to compartmentalize geotechnical activities. With the steady growth in the complexity of every science, and the demands upon its practitioners, this trend is inevitable but I suggest that it must be fought tooth and nail, and must be halted in its traces. I use a derivation of that good word 'Geotechnique' which (I am glad to think) we have accepted in Canada completely, possibly because we have the high privilege of being a bilingual country and so of generally appreciating the nuances of this word. But one has no need to be a linguist to appreciate that one simply cannot, for example, draw a dividing line between soil mechanics and rock mechanics. The slight divorce here must be healed so that the materials that constitute the earth's crust can be studied from the engineering point of view with no artificial barriers of segregation. And both soil and rock can only be studied

in this way against a proper appreciation of their geological origin. I get really quite worried when I read (as I do all too frequently of late) esoteric papers in the field of soil mechanics without the slightest reference to geology in them, written as though soil was an ideal material manufactured with a high degree of quality control.

Are we, perhaps, to blame? It is so easy to come to regard engineering geology as an end in itself, rather than as a bridge between the science of geology and the practice of civil engineering. Let me switch metaphors and say that we should be a leaven to civil engineering. . . . but as I say that, you may think that I am going to launch into a dissertation on the action of bacteria in the weathering of rocks! I could easily do so, with a superb example from near my home in Ottawa, . . . but what I have in mind is rather that it is part of our job to see to it that no civil engineering project, no planning—urban or regional—is ever started without at least an appreciation of the influence that local geology may have upon it. When special studies are necessary, then the engineering geologist has his rightful part to play as one of the team of professional workers always and inevitably associated with civil engineering projects.

I am led to urge this in view of the neglect of geology in so many, but by no means all, current civil engineering papers, a neglect to which I have already referred. This is in such strange contrast to earlier practice—as I saw recently, once again, when browsing through some old volumes of the Transactions of the American Society of Civil Engineers. In the volumes for one decade around the end of the last century, I found papers on such topics as the Weathering of Building Stones, with eminent *geologists* taking a lively part in the recorded discussions, descriptions of landslides including a 'splendid' one at Portland, Oregon, complete with an account of the remedial drainage works; an account of test borings made all the way up Broadway in New York City (this in 1893!); and even a paper, given to A.S.C.E., by the Professor of Geology at Stanford University (then Dr. J. C. Branner) on "Geology and its relation to Topography". This strange title almost conceals the value of this wide-ranging review of the importance of geology in engineering. Here are some words as recorded in the discussion of this fine paper: "In geology, as taught to engineers today, it is not so much a matter of fossils and the dead past, as it is of placing in their hands the key to many of the topographical structures with which they will have to deal in the future, and the making clear to them the development of the surface of the earth that is all about them." The speaker? Professor J. F. Kemp of Columbia University, a predecessor of Dr. Berkey. And this was eighty years ago.

So there is missionary work for us still to do! The pace of progress is today so rapid that it will be difficult enough to keep up with advances, let alone make up for the time that has been lost. But this must be done, for as we all know well, when dealing with the ground no two situations are ever the same. No computer will ever take over that exercise of experienced judgement that alone can make the

decision, on the spot, as to whether a foundation bed is satisfactory or not. The most sophisticated 'fast-tunnelling' machine will be useless unless the geology along the route it has to follow has first been determined as accurately as possible and is followed every inch of the way, in view of all the vagaries of Nature to which we are all so accustomed but which some of the new rapid tunnelling enthusiasts seem never even to have heard about.

To do all that lies ahead we need to be united. Here we do have two immediate problems to face but let us be encouraged by what others have done under like circumstances. Through sound leadership, A.S.T.M. has enabled soil and rock mechanics workers to join forces in the sharing of experience that goes towards the framing of Standard Test Methods. The Intersociety Committee on Rock Mechanics (on which GSA is represented) shows what can be done in an even wider field. There should, therefore, surely be some way in which the good work of this Division and the similarly excellent efforts of the Association of Engineering Geologists can be brought together in harmony. Many of us are, happily, members of both organizations. I was present at one of the very first meetings of the (old) California Association of Engineering Geologists from which AEG has developed, and so I know well the initial impetus that set it on its path. But with the broadening horizons ahead of all of us, there is so much to be gained by working together and nothing (at least in my view) that need be lost. Constitutions, under such circumstances, are not sacrosanct; they are merely instruments. Possibly, therefore, with some adjustments in both organizations a society could be developed combining the best of both but adhering in some appropriate way to The Geological Society of America, the link with which is of such inestimable value. Good thinking is already being done in this general direction. I wish future officers well in their efforts but urge haste upon them; tomorrow may be too late.

What we are to do about the so-called "Environmental Geologists", I simply do not know. Never have I seen such a tautological bandwagon get so far off the ground so quickly, if you will allow me again to mix my metaphors. Mixed metaphors are but the least of the examples of loose talk to which we are now all so subject from amateur and uninformed environmentalists. To a degree, we have ourselves to blame. Long ago, we should have made crystal clear to the public and not just to ourselves that geology *is* the science of the environment; that those concerned with its applications have always been concerned also with the protection and conservation of Nature; that engineering works inevitably disturb the ground but that engineers and geologists, if not starved of funds and working together, can see to it that such works are not a disfigurement but, frequently, an adornment of the environment. Let me make crystal clear my full support (not only now, but throughout my professional life) for the attention that must necessarily be given to the conservation of renewable resources and which, at long last, has now come to be generally recognized. But

I do grieve to see such a semantically unsound term as 'environmental geology' recruited to this effort, if only because of the reflection that it so lamentably casts upon geology as a whole, as if geologists (other than those few who use the term) had never taken thought at all for environmental protection. Let us just hope that it will quickly disappear from normal usage.

The future waits! What challenges lie ahead for all of us and especially for the younger members of the Division who can look forward to that fiftieth anniversary which will come just before this century, at the striking of a clock, becomes the twenty-first. The world will be a different place, its cities covering twice the area they do today. Let us hope that they will be good cities, in which life can be enjoyed as in the regions around cities, protected and conserved as truly natural environment. Geology has a real part to play in ensuring such sound urban and regional development. The members of this Division should be in the van of those who help in this building for the future.

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\*I wish to acknowledge with real appreciation the assistance so kindly given in connection with the start of the Division by Dr. Aldrich, Ed Eckel, Art Cleaves, Shailer Philbrick, and Roger Rhoades, who has kindly permitted me to quote from a long and interesting letter he sent to me in view of his unavoidable absence from the Minneapolis meeting.

—R.F.L.

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## APPENDIX A

### *Petition to the Council of The Geological Society of America:*

We, the undersigned, desirous of creating a Section on Engineering Geology, and on behalf of a larger group known to have equal deep interest in such a Section, respectfully petition the Council to authorize the creation of such a Section in accordance with the appended By-laws which are believed to meet the requirements of Section VI of the By-laws of the Society.

We respectfully call attention to Article IX of the appended By-laws of the Section which indicate the procedure to put such a Section into immediate operation.

March 20, 1947

Charles P. Berkey, R. M. Leggette, Chas. P. Theis,  
H. Ries, John W. Vanderwilt, Irving B. Crosby,  
Sidney Paige, Roger Rhoades, George P. Woollard,  
T. T. Quirke, Olaf N. Rove

## APPENDIX B

### Engineering Section

Secretary Aldrich read a petition signed by 11 Fellows of the Society, asking the Council "to authorize the creation of a Section on Engineering Geology, in accord with Section VI of the By-Laws." The purpose of the Section had been stated "to improve and promote the application of geology to engineering works, where the most effective realization of the engineering objective depends on geological interpretation of the natural conditions to which engineering structure or plan must be adapted." Vice-President Buddington suggested that the wording be modified to read, "the promotion of the science of geology as applied to engineering work."

Motion to grant the petition with this slight change in purpose was made by Councilor Anderson, seconded by Vice-President Gilluly and carried. Query was raised as to probable expenses of the Section, which would be cared for by the Society, and Treasurer Hotchkiss commented that they would be expected to approximate the expenses of the Cordilleran Section. Motion carried.

## APPENDIX C

### WEDNESDAY MORNING, BANQUET ROOM

C. P. BERKEY and ROGER RHOADES, *Cochairmen*

#### ENGINEERING GEOLOGY

1. 9:00 Business meeting and round-table discussion
2. 10:30 WILLIAM IRWIN: *Application of field and laboratory geology to engineering works*
3. 10:45 ROGER RHOADES: *Some fields of ignorance in Engineering Geology*
4. 11:05 RICHARD C. MIELENZ, KENNETH T. GREENE,\* and ELTON J. BENTON: *Chemical test for reactivity of concrete aggregates with cement alkalies*
5. 11:20 ROBERT H. NESBITT: *Geology in concrete aggregate technology*
6. 11:40 STAFFORD C. HAPP: *Geology of Kanopolis Dam, Kansas*
7. 11:55 ROBERT E. BARNETT: *Effectiveness of geophysical explorations at Ft. Randall Dam, South Dakota*
8. 12:15 SHAILER S. PHILBRICK: *Relationship of cyclothem to dam design*
9. 12:35 C. P. BERKEY: *Geological contributions from the deep tunnels of New York*
10. 12:55 M. W. BARTLEY and R. F. LEGGETT:\* *Glacial geology at Steep Rock Lake, Ontario, and associated engineering problems*

\*Indicates speaker.

\*\*No abstracts available for these papers.



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