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- COMMUNIST CHINA -

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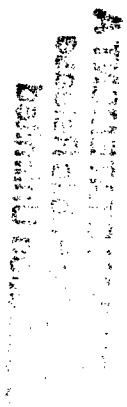

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THE GROWTH OF THE INSTITUTE OF HYDRO-GEOLOGY AND ENGINEERING-GEOLOGY SINCE THE ESTABLISHMENT OF THE COUNTRY

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/Following is the translation of an article by Chang Keng-sheng in Shui-wen Ti-chih Kung-ch'eng Ti-chih (Hydro-geology, Engineering-geology), No. 10, 12 October 1959, pages 7-8./

The study of hydro-geology and engineering-geology, regarded as an important component of geological work, can be said to be a blank spot during the early period of liberation. The Kuomintang reactionary regime left behind for New China merely a few technicians, an exceedingly small number of dam-sites and some data on the survey of underground water in a few scattered cities. It is needless to say that any scientific research work relative to this study was left behind.

After liberation, our country's national economic construction showed leaping progress under the correct leadership of the party and Chairman Mao and work in hydro-geology and engineering-geology was speedily developed in line with the needs of construction. It was also gradually absorbed into state plans. In the field of hydro-geology, the work progressed from the investigation of underground water resources in a few localities to the research on the multi-purpose utilization of regional underground and surface water resources; in the field of engineering-geology, the work progressed from surveys conducted on the engineering-geological conditions for a certain factory foundation and a certain dam to the comprehensive engineering-geological surveys of areas with varying degrees of complexity in geological conditions, large river-valley programs and giant water conservancy and electric power centers (such as the Yangtze and Yellow Rivers Valley projects; and the survey work at the San-men Gorge, the Yangtze River Gorges, the Hsin-an River and Tan River water conservancy hubs).

Following the all-out development of hydro-geological and engineering-geological survey work, rich data and experiences were accumulated. This created favorable conditions for scientific research in

hydro-geology and engineering-geology and promoted the rapid development of research in these two fields to meet the objective needs of national economy.

In 1954, work was started in the hydro-geology and engineering-geology bureau of the ministry of geology to set up a research organization in hydro-geology and engineering-geology. Besides cooperating with the Peking University in making a study of the engineering-geological conditions of porphyric rock at the dam-site for the Ch'u-chan-tien reservoir on the tributary of the Huai River, the research organization also assisted in the engineering-geological survey of the Hsin-an River and the San-men Gorge Dam on the Yellow River.

In 1955, the party central committee formulated a 12-year plan for scientific research (1956-1967) and it enabled all the science and technology of our country to achieve leaping progress. Scientific research work in hydro-geology and engineering-geology, as in other sciences, moved forward a giant step under the leadership of the party. On the basis of research work in hydro-geology and engineering-geology being the practical and final objective and meaning, all the specialized studies were separately generalized into two great central problems; namely, the study of the formation, movement, system of movement and quality of the underground water in China and the study of the engineering-geological problems of the major engineering and construction areas of China. This embraced the various kinds of hydro-geological problems and the various kinds of special engineering-geological problems requiring research and solutions which are closely related to production within the 12-year period. In order to adapt itself to the objective situation of the great development of science and technology and to insure the implementation and completion of the science program, the ministry of geology set up, in 1956, on the foundations of its original research laboratory, an institute of hydro-geology and engineering-geology. During the early stages of its establishment, several specialized research groups such as the research group on hydro-geology in the arid areas of China, the research group on loess in China, the research group on karsts, the research group on geology for water conservancy projects, and the water and soil analysis laboratory were directed to assume some of the production assignments as well as the completion of related specialized research work. For example, the karst research group was responsible for the completion of geological survey and layout work of the San-men Gorge area and production work in solving the problem of transudation at the site of the Kuan-t'ing Dam.

In early 1957, due to work requirements, some of the specialized research groups such as the hydro-geological map layout and research group and the underground railway research group were gradually added. A considerable amount of new instruments were added to the facilities of the laboratories and there was a great deal of improvement in laboratory methods. Particularly, a further clarification of the direction of development and the nature of the laboratories was achieved. For instance, the water qualitative analysis laboratory changed from its form-

erly pure conduction of analysis of the chemical composition of underground water to the analysis and research, in many aspects, of the physical characteristics and chemical composition of underground water and the engineering-geological phenomena related to underground water (the degree of corrosion of limestone type rock), and as a result, took a step forward in the direction of multi-purpose research on underground water; the soil analysis laboratory also changed from pure soil study to the analytical research of the physical objectives of the various types of soil and its significance in soil study and also gradually moved onto the path of soil research.

During the 1957-1958 period, due to the development of hydr-geology and engineering-geology and the urgent needs of production, the institute added research groups on hydro-geology of ore deposits and on mineral water to carry out separate investigations and hydro-geological research on ore deposits in the northern and southwestern areas of our country and on the mineral water in the vicinity of Peking. Simultaneously, an office of scientific intelligence was established to begin scientific intelligence work in hydro-geology and engineering-geology.

Nineteen fifty-eight was the year of the great leap forward in agricultural production and in the various aspects in our country; brilliant victories were achieved on all the various fronts. In order to meet, within a short period, the new demands put forth by the great leap forward in industry and agriculture for hydro-geological and engineering-geological research work, the institute added research groups on hydro-chemistry, radio-active hydro-geology, underground water kinetics, study of underground water movement and on technical methods as well as other specialized research groups. These newly-established specialized research groups not only filled in certain blank spots in our country's hydro-geological and engineering-geological studies, but also enabled these studies to advance on the path of relatively better progress.

Specialized research work was gradually developed, for during 1955, the major specialized study was merely research conducted on the porphyry of Ch'u-shan-tien in Honan. In 1956, the number of specialized research subjects was greatly increased. Among the major subjects were the research of hydro-geological conditions in the Ho-hsi drought area in Northwest China, the compilation of a 1:3,000,000 scale hydro-geological map of China, research on underground water in the Peking municipality (to match the Peking Underground Railway project), hydro-geological research on the Ku-sheng-tai Coalfield in North China, and research on hydro-chemistry and underground water kinetics of the Kuan-t'ing Reservoir. In our country, research on the hydro-geological conditions in drought areas is of utmost importance, for it points the way to the solution of the problem of water resources needed by agriculture, municipalities and industries in the drought areas and it is of great scientific theoretical significance. Comprehensive research on the Lung-tung loess in Northwest China, research on the limestone karsts in

the area of the Yangtze River Gorges, engineering-geological problems of the Peking Underground Railway and supplementary prospecting and research on the problem of seepage at the Kuan-t'ing Reservoir were conducted in the field of engineering-geology. All these are related to the characteristic geological problems of China and are work of extremely great importance to the engineering construction designs and plans in the loess and karst areas.

In addition, considerable specialized research was conducted in the aspect of practical methods such as the gathering of information on methods for analyzing a grain of loess, plastic experimentation, experimental methods on the degree of the relative solubility of limestone, methods for determining certain ions in the qualitative analysis of water, etc.

Following the rapid development of work, a considerable number of new items were added to research work in 1957. Among those of major importance were: the problem of karst between the Yangtze and Ch'ing Rivers, research on engineering-geological conditions of the various types of dam-sites in China, research on the limestone karsts of the Chia-ling River at Chungking, and research on the mineral-spring waters of Hsiao-t'ang-shan in the vicinity of Peking. In the aspect of map-making, the compilation of a 1:500,000 scale hydro-geological map of China was started.

A great leap forward condition appeared in specialized research work in 1958; besides the specialized projects previously conducted, more new subjects of research and the research of new studies were carried out. These were: the hydro-geological research in the Inner Mongolian region, compilation of a 1:4,000,000 scale zonal map of underground water in China, hydro-geological research on ore deposits in the coastal region of Northeast China, research on mineral spring water in Inner Mongolia and Hopei, research on hydro-chemical methods for detecting ores in the Nan-ling region of Kwangtung, research and the gathering of information on methods concerning radio-active hydro-geology in a certain locality, research on the movement of underground water in such localities as Inner Mongolia, Honan and Peking, the gathering of information on the question of underground water balance, the setting-up of research on underground water kinetics and the establishment of a laboratory. At the same time, work was conducted in the field of engineering-geology on the study of the properties of loess at the San-men Gorge Reservoir and the study of the problem of re-building reservoir banks, work on the T'ao River diversion and water conservancy project in Kansu, research on the engineering-geological conditions at two comparative dam sites at the Yangtze River Gorges, and research on the tundra in the Amur River Valley and some other problems on engineering-geology.

In vigorously conducting technical revolution, all the comrades in the institute joined in the movement for a gigantic revolution in technology with a high degree of enthusiasm and fully displayed the spirit of daring to think and to do. For instance, the technical me-

thods group created, tested and improved more than a dozen instruments used in hydro-geological field work and instruments and tools used in laboratory work in engineering-geology, such as an electrical water-level meter, an electrical water-temperature meter, an electrical instrument for checking the degree of mineralization of underground water, an instrument for extracting soil in its original state, a hydro-electric comparator and many other instruments. Many improvements and new inventions in the field of laboratory instruments also appeared in the laboratories, such as the design of a three-way instrument for checking shear and discharge pressure in soil research, thus breaking down the view that a single type of instrument can only be used for a single type of laboratory test (shear or discharge pressure), and fully developing the capabilities of existing equipment. In the field of qualitative analysis of water, trial-production was carried out on the Forward Leap No. One and No. Two qualitative water analyzers and the light intensity in the analyzers was improved.

In 1959, in response to the call of the party to strive for a still greater leap forward in hydro-geological and engineering-geological research, besides continued work on the completion of some of the overlapping research work during the fiscal year, research was also initiated on the hydro-geological conditions of ore deposits in the salt lakes of Tsinghai and Northern Tibet, the division of the hydro-geological types and forms of ore deposits in China, research on loess in Northern Shensi, research on the karsts of Southwest China, research on the types of foundations of high-water levees in China, compilation of a 1:4,000,000 scale map of artesian water zones in China, etc. By the end of July, great successes had been achieved in this work.

Since the establishment of the country, considerable results have been achieved in hydro-geological and engineering-geological research work within a few short years. The scientific level of research work has also been raised considerably. For example, research on the hydro-geological conditions of the drought areas in the Northwest, as a result of systematic analytical research conducted along the Kansu Corridor for the past several years, presented a clear understanding of the systems of distribution, formation and movement of underground water and the water problem of industry and agriculture in this area has been solved. With respect to the research of hydro-geological conditions in Central Inner Mongolia, it has been clearly determined that underground water exists extensively in the pastoral area, that the underground water is mainly buried in the strata of the tertiary period and that the main hydrous strata is in the central and lower Oligocene epoch, thereby pointing out the direction for solving the problem of water resources of the "water-lacking grasslands." This is of great significance to the supply of water in the pastoral area. The divisions of the hydro-geological types and forms of ore deposits is of great significance in directing the future selection of hydro-geological prospecting methods for ore deposits in the field and the arrangement of work assignments. It also lays a foundation for the further develop-

ment of hydro-geological research work on our country's individual ore deposits. The map of China's underground water zones (1: 4,000,000 scale) was compiled on the basis of the research conducted on the large volume of hydro-geological data gathered in production work during the past several years and after scientific analysis and consolidation. It is one of the component maps on our country's natural regions and is of great significance to our country's economic construction plan.

For instance, the specialized work on loess research in China in the few recent years, with the loess in the eastern part of Kansu as an example, carried out comprehensive research of the geological characteristics and the engineering-geological nature of loess. This enabled work methods in loess research to gradually become systematized and much data and opinions regarding the causes, formation and the engineering-geological nature of our country's loess was presented.

The specialized work on the research of water conservation engineering-geology, in the course of solving the geological problems of the unprecedentedly large-scale hydroelectric power construction work -- the Yangtze River Gorges hydroelectric power station -- is of decisive importance to the selection of the site for the Yangtze River Gorges dam through research on the geology of the area, on the properties, physiognomy and the geological structure of the crystalline rock of the Huang-ling anticline, the rule of distribution of the (weathered shell?) of crystalline rock in the area of the San-tou-p'ing dam, the engineering-geological conditions of the river valley, the rules of development and geological structure of karsts in the area of the Nan-chin-kuan dam and research on such aspects as basal pits and the effusion volume of water in tunnels.

The development and achievements in scientific research in hydro-geology and engineering-geology, like production work, is inseparable from the enthusiastic and selfless assistance given by the Soviet experts. During the early period of the establishment of the institute, regardless of whether it be the formulation of plans for research, organization, or the direction of development, guidance and assistance was received from the hydro-geological and engineering-geological experts of our ministry. In the past two years, in the agreement signed between the Chinese and Soviet governments on Sino-Soviet cooperation and Soviet assistance in carrying out important scientific and technological research projects in China, there were two projects which dealt with hydro-geological and engineering-geological properties of China's loess and the other was the research on the hydro-geological conditions in the drought areas of China. This will open up a broader path for research work in hydro-geology and engineering-geology, and will enable our country's hydro-geological and engineering-geological research work to become more closely related with scientific work in this field by the great Soviet Union. Thus, it has a more profound significance to the development of this science in our country.

In line with the current situation of a still greater leap forward in our country's industry and agriculture and besides the contin-

ation of the work of completing some of the extremely important specialized research projects, the institute of hydro-geology and engineering-geology shall develop some of the important theories and problems of our country's hydro-geologists and engineering-geologists such as the theory of the formation of underground water, particularly the change in water quality in drought and semi-arid areas; the problem of underground water zones; the theory of the rule of movement of underground water; the problem of subterranean flow; the problem of deep-strata underground water; the utilization of mineral water and underground thermal capacities; the problem of ore identification detected through hydro-chemistry; the problem of radio-active hydro-geology; the problem of underground water kinetics; hydro-geological inspection methods and the gathering of technical information (such as physical probe methods and the use of radio-active isotopes) and the research on new instruments and equipment used in hydro-geological investigations; the problem of regional engineering-geology; the problem of geological theories and the engineering-geological problems in the construction of water conservancy projects.

It can be predicted that under the leadership of the party and under the guidance of the aims of "employing the task to lead the way for science," "giving equal stress to the apex and the base" and "walking on two legs," scientific research work in hydro-geology and engineering-geology shall rise to a higher level and achieve more brilliant achievements in theory as well as practical meaning.

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