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MAIN FILE

IN THE SERVICE OF THE NATIONAL ECONOMY

- COMMUNIST CHINA -

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IN THE SERVICE OF THE NATIONAL ECONOMY

Following is a translation of an article written by Chi'en Hsuenhsien in Priroda (Nature), No 10, 1959, pages 67-69./

In China research in the field of mechanics is a relatively new branch of knowledge. It was not until 1956 that an independent institute was established on the basis of the Mechanics Laboratory of the Institute of Mathematics of the Chinese Academy of Sciences.

Thanks to government support, the last three years have seen the development of this new scientific institution whose staff of more than two hundred includes such outstanding scientists as Professor Kuo Yun-huai, who has made a valuable contribution in the field of aerodynamics, Professor Ch'ien Shou-i (mechanics of soils), Professor Lin T'un-chi (hydrodynamics), and Professor Li Min-hua (theory of plasticity).

Prior to the establishment of the institute, we had no experience whatsoever in organizing work on mechanics. The majority of the young staff scientists were graduated only recently from higher educational institutions. Naturally, they did not yet possess adequate skills, and were not familiar with problems of engineering practice. Even the older staff scientists of our institute, the majority of whom recently returned from the United States, did not have a very clear idea of the demands placed upon scientific work in solving the problems of building in our country. And yet research in the field of mechanics is closely associated with engineering. It is difficult to specify the correct direction for the development of mechanics if one does not know the problems arising in production. Under these conditions, scientific work can easily become divorced from practice and become pointless. In 1958, under the slogan for the general policy "Bending every effort, thrusting ahead, let us build communism on the principle of more, more rapidly, better, and more economically," an all-people's movement called "The Great Leap" was launched throughout the country. Industry and agriculture developed rapidly. As compared to the huge growth in other branches of the economy and culture,

our institute was lagging somewhat behind. In order to improve the work of the institute we ideologically mobilized the entire collective so as to make it aware of the tasks posed before science -- before workers in the field of mechanics -- by the building of socialism. Our slogan is "to compete with time, to free ourselves from false ideological fetters, and more boldly to attack the most difficult problems. On the other hand, we took steps to improve Party leadership so as to ensure the introduction of a Party spirit into scientific work. All of the laboratories function on a comprehensive basis. In each of them there are workers in the different fields of mechanics required for the fulfillment of quotas. They are putting all of their efforts and knowledge into the solution of the problems posed for them.

But what are the problems on which our Institute of Mechanics is now working?

One of the chief tasks is working on problems of theory necessary in solving the problems posed in industry and agriculture, carrying out more meaningful theoretical research, and improving experimental technique in the field of mechanics. The institute is doing research on hydromechanics, particularly as applied to hydroturbines. The construction project for the hydraulic complex in the region of the Sanhsi Gorge on the Yangtse River, to be initiated next year, will be on a huge scale. The design and manufacture of the huge hydroturbines require the development of a spatial theory for designing vanes, taking into account the effect of viscosity, developing forms of vanes with the most useful hydrodynamic characteristics. The construction of aerodynamic tunnels is also required in order to do this work and test the results of theoretical investigations.

In accordance with the requirements imposed by the electrification of the rural areas of China, a group of staff scientists has designed a small hydroturbine to be operated under low pressure (0.3 - 1.0 meters).

The laws of the aerodynamics of the propeller were taken into account in designing the hydroturbine. The turbine built on this basis under laboratory conditions showed rather large revolutions. It is important to be able to couple a hydroturbine directly to the rotor of the generator without intermediate mechanisms. This is of great significance for agricultural hydroelectrification, since the simplified design facilitates the construction of these stations. At the present time this work is not completed; but we hope that upon completion our electric power stations will be widely used in the rural areas of China.

Work is also being done in developing and improving the blades of windmills. The large-scale utilization of the energy of the wind is of great importance in developing the economy of arid regions, where there are strong winds.

A special group to work on problems associated with the construction of large hydraulic complexes in our country was created at the institute. Its tasks consist in analyzing the three-dimensional stresses on dams by the method of photoelasticity, computations for the "flutter" ~~/?/~~ from the interaction of the floodgate and the water. A great deal of work is being done in the field of the seismic resistance of dams; e.g., calculating the stress within the dam for a horizontal shift of the soil.

Problems of mechanical strength being studied at the institute include vibrocreep at high temperatures and under complex loads, vibrocreep in the vanes of turbines, and fatigue under random loads. Also, another group of young scientists, in collaboration with workers of the chemical industry, is studying a method of obtaining nitric acid directly combining nitrogen from the air by means of shock waves.

Certain staff scientists at the institute engaged in work on oscillatory processes, have made a great contribution to ensuring seismic stability in the construction of the buildings of new plants and foundations for machines and machine tools.

The Laboratory of Universal Measurements, which does research in the behavior of bodies under static loads, was established in 1958. Also, the laboratory has the function of developing new measuring techniques in the field of mechanics for the other laboratories of our institute, and designing the corresponding apparatuses based on electronics. It should be emphasized that the Soviet Union rendered great assistance in the establishment of this laboratory. We intend in the future to invite experienced Soviet specialists to supervise this work, since it will be necessary to provide our laboratory with more measuring equipment.

The institute is also working on methods of exploiting mines; e.g., research on thermal drilling; i.e., drilling with the aid of high-speed and low-temperature currents. The chief emphasis is on studying the stability of combustion in thermal drilling, and the possibility of replacing oxygen by air as an oxidizer, together with studying the temperature stresses in rock. A joint group consisting of representatives from those organizations interested in this work was formed for purposes of studying thermal drilling.

Six months ago the institute began working on problems associated with large-scale directed blasting of rock in mines. During this period, small-scale blasting tests have been made. At the present time efforts are being concentrated

on developing principles of modelling, on the manufacture of models, and studying the effect of? blasting on rock blowout. This work is being done in order to ascertain the pattern of distribution of the speed of dispersion of particles of rock when blasting, and the ratio between this speed and the quantity of explosives, and to determine the useful energy of the explosives producing the blowout.

A special section for studying production processes has been set up at the institute. Naturally, this work does not relate directly to mechanics; but it is very important, since it includes the planning and coordination of industry, construction, and transport using methods of modern mathematics, electronics, and computer engineering. The main emphasis is on quality control of products at textile plants, including the rational utilization of various kinds of raw cotton. Also, research is being done on planning the construction of the hydraulic complex in the Sanhsi Gorge on the Yangtse River; in particular, selecting the site and the types of vessels most suitable for comprehensive utilization of the multistage reservoir in combatting flood waters, the production of electric power, etc.

Three years have passed since the establishment of the institute. But the experience accumulated during those years has shown us that however difficult the problems facing us, we will solve them. Our Party has set for us a goal which it is a matter of honor to reach: that of approaching and overtaking the world level in the field of science by 1967. In this struggle we are not alone; we are supported by the entire camp of socialism. The aid which is being selflessly rendered to us by the Soviet Union is great. The agreement on scientific-technical cooperation between the KNR Peoples' Republic of China and the USSR also involves certain problems in the field of mechanics. This will endow us with even greater strength, and will inspire us to even greater successes in gaining the heights of science.

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