necessary. To do this he must also realise that every animal in his charge looks to a little corner in his field for its well-being.

At present the consuming public is inclined to lay stress on consumption of ghee much beyond what can be expected in return by way of nutrition. The remaining part of the milk is probably of greater nutritional value. If by spending the same money better nutrients can be bought they should learn to do it.

The economic importance of the dairy industry even in its present decadent state, as mentioned before, is enormous. One of its striking drawbacks is the total lack of interest shown in investigating the causes for many of the difficulties it encounters and in taking the help of modern scientific technic to overcome them. No doubt every ghee packer of importance maintains a room for housing a refractometer and one or two such other apparatus but that is mainly with the object of crossing the legal hurdle. One result of this policy is apparent. The Indian consumer is slowly losing confidence in the genuineness of the products of his own land and is prepared to pay fancy prices for imported articles. It is a tribute to other countries that they take pains to study the Indian requirements carefully and evolve technique to suit that demand. For example, a small import of ghee has already started. In course of time, if the warning is not taken, this is likely to oust a considerable proportion of the indigenous product. If the dairy industry is to advance and thrive, it must harness scientific knowledge to its needs.

Concluding, it may be stated that for the future development of the dairy industry a beginning has to be made from primary stages. Maintenance of just enough animals that can be properly fed, production of better quality of feeding-stuffs, co-operative dairy organisations, organised marketing and scientific research are a few points to be borne in mind, if it is desired to see commercial exploitation of milk a reality.

NATIONAL ACADEMY OF PEIPING

THE British Scientific Mission in China have just forwarded to us a little pamphlet, issued by the National Academy of Peiping, giving an account of the progress of the scientific activities under its auspices in war-time China, during the period 1937-42. The following is an *in extenso* extract of the report which will deeply interest fellow-scientists in this country and in other parts of the world.

"In accordance with an act passed by the Executive Yuan of the National Government, the National Academy of Peiping was established on September 9th, 1929, in Peiping, with the sole purpose of carrying out scientific researches and bringing about their applications. At its foundation, the Academy consisted of nine separate research institutes, namely, the Institutes of Physics, Radium, Chemistry, Materia Medica, Physiology, Zoology, Botany, Geology and Historical Studies and Archæology, and it used to have a staff of more than 200 members, including research professors, assistant research professors, senior and junior assistants and technicians, in addition to about thirty Chinese and foreign correspondent members. Contributions of all branches of work have been published in various languages, scattered throughout almost all the principal scientific journals of the world.

At the outbreak of the present war with Japan, Peiping was immediately taken over by the invaders; and we were then forced to suspend or relinquish our studies. However, in the midst of confusion and distress we succeeded in transferring a portion of the books and equipment of each of our institutes to the South and to places of safety. And, what was even more fortunate, within a few months after the war had reached a state of stabilisation, the Academy was able to resume the larger part of its work in the hinterland city of Kunming in the Province of Yunnan, where it has continued to be in existence up to the present moment. One can now imagine the danger and trouble we experienced in getting through areas of intensive military operations and lines of blockade, on the way from Peiping to Kunming, a distance of more than 2,000 miles by land and sea.

Furthermore, with a great quantity of material on hand, tremendous difficulty was naturally encountered in arranging for transportation, when all means of communication were in a state of disorder.

In spite of the hardships arising from the lack of the necessary equipment, shortage of funds and the constant menace to our personal safety, the work of the Academy is still in progress, to an extent far beyond the most sanguine expectations. Our activities have been vigorously pushed even under the most difficult conditions. Our interest and belief in science do not suffer the slightest diminution. Before going on to the work completed or being done in our institutes during the last five years, which will amply testify the above statements, a few words on the general situation of the Academy as a whole following a period of internal readjustment to adapt itself to the present environment, may be added here.

The National Academy of Peiping, still with its nine institutes, has now a smaller staff of 120 members. The major portion of our funds comes from the Government and amounts to $620,000 annually *plus* a variable monthly addition used to compensate the ever-rising cost of living under which our colleagues and their families must live. Naturally, we have an exceedingly hard time in managing to stretch this money to cover all of our expenditures, although we are also receiving financial aids from the Sino-American, Sino-British and Sino-French Foundation Funds. Regarding our policy in general, we can say that the greater portion of our research activities tends to be practical and economically important to meet the immediate needs of the nation. Our publications, which in former years amounted to nearly fifty kinds of bulletins, journals, memoirs, books and maps, *plus* 800 papers and reports, are still in progress, but on a very much reduced scale owing to the lack of efficient means of printing.

The following will serve to summarize our research work within the last five years in the different institutes. We are rather encouraged to catch a glimpse of the types of researches performed by ourselves since the Japanese invasion and to give our friends some idea of what the scientific workers of China are doing while the nation is being overrun by a catastrophic war.

1. Institute of Physics

To comply with our general policy, the Institute of Physics whose studies were chiefly in photography, spectroscopy, piezoelectricity and geophysics, has recently more and more inclined to attack practical problems that confront us in industry and national defence.

With its spectroscopic equipment, a laboratory of spectrum analysis has been immediately set up to meet the need of the just-beginning metallurgical industry in this country.

In the course of the war, numerous radio stations both fixed and movable have been established, but almost all of them are of quite small power. The wave interference between these stations would be troublesome, if they were not crystal-controlled. The Institute has stabilised more than one thousand transmitters with its quartz oscillators made in our laboratories and thereby it has certainly rendered a service to radio communication in China to-day.

Besides the work mentioned above, the Institute has confined its efforts mainly to the development of applied optics and geophysical prospecting.

When we were computing optical systems and designing optical instruments at Peiping, we keenly felt the need of optical instruments both in times of peace and of war. It was, therefore, decided to devote some of our members to the problems of applied optics and to set up a small optical shop in Kunming. For this purpose optical machinery had to be built, testing instruments to be designed, and craftsmen to be trained. After three years' painstaking work, we have arrived at a state of being able to produce most of the optical parts in good quality.

Optical parts like achromats, prisms and flats have been abundantly supplied to various institutions for educational and research purposes. Microscopes for the general usage of university students are being made in this shop according to the instructions of the Ministry of Education, and two hundreds of them are nearly completed.

In geophysics the establishment of a gravity map of China and the precise determination of longitudes and latitudes had been our two main undertakings. Since our removal to Kunming, although we continued the gravity determinations throughout the province of Yunnan to the borders

of Burma and Indo-China and redetermined the longitude and latitude of Kunming, the attention of our geophysicists, however, has been directed to our mineral resources, and their methods have been immediately put into application.

Our work in geophysical prospecting was mainly the study of metallic ore deposits. Up to the present, five different mining districts have been thoroughly examined by our geophysical field parties employing chiefly magnetic and electrical apparatus. The N.R.C. (National Resources Commission) I-Men Iron Mine was the first one surveyed, and this took us six months of field and office work. Then came the An-Ning Iron Mine, the Kuchiu tin mine, the Lu-Tien lead-silver mine, and lastly the Chaotung lignite field. All of these were successively subjected to geophysical investigation.

These studies have been carried out upon the request of the respective mining organizations whose interest and enthusiasm in geophysical methods are very encouraging. The results have not only greatly altered the concepts of the geologists and mining engineers as to the extent and economic value of these deposits, but also numerous facts and experiences arising from them have opened the door to improvements in the methods of geophysical prospecting. These results are thus also of academic interest.

Co-operating with the Geological Survey of China, we have organized a committee on geophysical work, which publishes all the contributions from the geophysical investigators of the country.

2. Institute of Radium

The Institute of Radium consists of three laboratories, that of chemistry, radioactivity and X-rays. In the two first a great number of Chinese minerals were examined chemically and radio-actively. Protactinium was much studied and its branching ratio redetermined with counters. A detailed study of the absorption coefficients of β-rays especially from UX_2 and RaE revealed the important fact that they have neither a fixed nor a single value, but depend on the thickness of the absorber and the surrounding conditions of the source under measurement.

In our laboratory of X-rays, the work is mainly on crystal analysis. Some improvements on classical methods and techniques have been made. With an induction furnace, some alloys of tungsten and antimony were prepared, and X-ray studies of them are now in progress.

3. Institute of Chemistry

Like most of our other institutes, the Institute of Chemistry has been for the past five years, devoting a large portion of its efforts and time to problems of applied chemistry, in addition to pure chemical researches. Upon this Institute, however, the war seems to have exerted a greater pressure, for the simple reason that here we have to import a considerable amount of chemical reagents from abroad and these are consumed at a rate far beyond our power of replacement. Nevertheless, we have been rather successful in dealing with the situation and are able to carry out our various types of work as outlined below.

In the field of applied chemistry our investigations have been following at least four lines: all of these were problems in which the public was calling for immediate solutions. They are (1) Extraction of dyestuffs from local plants and their application to various textiles, (2) Preparation and manufacturing on a small scale of medicines, utilizing local raw materials, (3) Recovery of used engine oils, replacement of diesel oil by vegetable oil, and preparation of a gasoline substitute from molasses asd sawdust, (4) Miscellaneous experiments such as the analysis of water samples taken from various places in the vicinity of Kunming, the extraction of potash from different kinds of ashes, etc.

In view of the drastic shortage of gasoline, a mobile alcohol plant was brought into operation. Despite its simple design, it steadily produces 200 gallons of 95 per cent. alcohol per day. In co-operation with a soap factory, complete installation of a vacuum evaporating plant has been set up to produce glycerine from the wastes of soap-making.

Concerning pure chemical researches, our attention has been mainly centred on problems of organic chemistry. Topics under investigation, within the period of five years, have been (1) Syntheses of organic compounds related to vitamin K, (2) Molecular rearrangements of organic compounds, (3) Synthesis of rotenone derivatives.

4. INSTITUTE OF MATERIA MEDICA

Research work in this Institute has been concentrated on investigations of Chinese drugs, such as Chinese ephedra, Mahuang, Chinease corrydalis, Pei-Mu, Hsi-Hsin, Mu-Fang-Chi, Shih-Chan-Chu, Yang-Chin-Hua, Kou-Wen, Ta-Ch'a-Yeh, etc. The active principles have been isolated, and their constituent properties as well as the pharmacological actions have been studied. Besides, the Institute also prepares some materials such as ephedrine, vitamin B_1, etc., on the commercial scale for clinical use.

5. INSTITUTE OF PHYSIOLOGY

Researches of this Institute were heretofore confined to pure studies in experimental biology and physiology proper, while special emphasis was also laid on the physiological effects of various Chinese drugs. However, within the last five years, in addition to pure academic work, subjects capable of application in daily life have likewise been successfully investigated. In this connection investigations in the nutrition values of the food-stuffs used by the southwestern inhabitants, experiments on the treatment of Chicken's Cholera by sulfanilamide, as also of typhus by some Chinese medicine from the Pentsao, are of significance.

Problems of local importance are now under investigation, namely, studies on the types of Chinese drugs produced in Yunnan and on the basal metabolism of the Yunnanese people.

6. INSTITUTE OF ZOOLOGY

Researches conducted in this Institute were formerly restricted to the study of seashore animals of China. However, since the removal of the Institute from Peiping to this inland city of Kunming, this same sort of work has had to be directed to the limnological fauna of Yunnan. Thus the fauna of the Kunming lake, of the Erh Hai, the Yang-Tsung-Hai and the Fu-Sian Lake naturally have become our most easily attainable material to be worked on.

To intensify such investigations, an experimental station for lacustral biological studies was started in 1939, under the joint auspices of the Institute and the Commissariat of Reconstruction of Yunnan. Such a station is the first of its kind in China and, in spite of its very brief history, it has been able to make systematic studies of the principal fresh-water fauna of Yunnan, particularly the fishes of these inland lakes, their diseases and enemies, together with the chemical and physical properties of the lake waters. Besides aquatic animals, terrestrial animals like Reptilia and the spiders of Yunnan have also been collected and worked on.

7. INSTITUTE OF BOTANY

Instead of going on with the studies on the plant-life of north, northeastern and northwestern China and its taxonomy, the Institute of Botany began, right after its removal to the interior, to do researches on problems of economic botany. Investigations in topics of agriculture and forestry had already been in progress for several years: topics such as, the distribution of forests, classification and disease of farming plants, and particularly experiments on cultivating drug plants, etc.

Under the joint sponsorship of the Institute and the National Northwestern Agricultural College, a special botanic survey was planned and organized with the aim to do researches on the plant-life of China's northwest, as also on their economic values. In 1940, a botanical garden was brought to completion, inside which our experiments have been performed. Botanical parties have been despatched to the various centres of botanic interest throughout the northwest, particularly, the surroundings of our great western mountain ranges. The material brought back has been abundant and valuable. The entire collection of plant specimens belonging to the Institute now numbers more than 60,000.

8. INSTITUTE OF GEOLOGY

For over ten years our geological work has been going on under a co-operative scheme with the Geological Survey of China. Contributions to the science itself and to the geological work of this country have been countless and prominent, the most outstanding one being the discovery and identification of the fossil remains of the well-known *Sinanthropus Pekinensis* (the Peking Man) with its contemporary vertebrates excavated from the limestone caves at Chou-Kou-Tien near Peiping.

Since 1937, extensive field and laboratory studies have been in progress without any loss of their vigour on account of the war. Detailed mapping of mineral deposits occupies at least for the time being, the

major portion of our time spent in geological work, although stress is equally laid on paleontological studies and studies in other branches of the science, *e.g.*, the excavation and investigation of a complete fossil dinosaurs skeleton (*Lufengosaurus Hucenci* Young) from Lufeng Hsien, Yunnan.

As to our work in mineral deposits, *i.e.*, in economic geology, it can be possibly said that hardly any of the important discoveries and investigations made during the last five years in our western provinces have been carried out without the participation of our colleagues.

With a large accumulation of dependable geographical material on hand, the Institute has also revised completely the map of China for general use, and thousands of the new map are now in circulation among the public.

9. Institute of Historical Studies and Archæology

In recent years the work of the Institute of Historical Studies and Archæology consists of mainly three items, the studies of literary materials in ancient Chinese history; the classification of archæological materials excavated at Pao-Ki-Hsien, Shensi, several years ago, and the collection of historical materials dealing with the inhabitants in the border zones of China.

In 1933, upon the request of the Shensi Provincial Government, there was appointed a committee which in 1934 started an excavation at Tow-Ki-Tai, a ruined site of Pao-Ki-Hsien in Shensi Province, and by 1937 materials of historical significance obtained were the remains of many human dwelling places in the Stone Age, also relics of ancient city walls and of more than one hundred tombs belonging to various ancient periods. With regard to these materials the first of a proposed series of publications, "Studies of Li-Tripods Excavated at Tow-Ki-Tai" by Mr. Su Ping-Ki, has just gone to press; while the report of the excavation is now under compilation.

Regarding the studies of literary materials in ancient Chinese history several important works have been completed within the last three years. They are (1) "The Legendary Period in Chinese Ancient History", a book of seven chapters (in press) by Mr. Hsu Ping-Tchang, being the investigation based upon ancient legends of the Chinese history from Huang-Ti to the Middle Shang Dynasty; (2) "Tsun-Ko-Tsin-Sze-Hwei Tien", by Mr. Hsu Tao-Ling (the name index for the holders of the degree "Tsin-Sze" during the various Chinese dynasties), being a compilation of the historical materials for the last one thousand years.

Papers in relation to all other investigations can be found in our publication "Collected Papers of Historical Studies".

PROFESSOR ALEXANDER SILVERMAN, of the University of Pittsburgh, stated in an address at the Franklin Institute, Philadelphia, on December 16 that glass is proving one of the most versatile of all war materials. It has taken over jobs formerly monopolized by such diverse materials as steel, silk and cork. It functions very much like steel in bullet-proof windshields and turrets on airplanes; glass sutures are replacing silk and gut in certain surgical uses; and a new material, bubble-filled masses of glass foam, has replaced cork in much new heat insulation. This glass foam promises to take up cork's job in life preservers also, for it is practically as light as cork and even more resistant to waterlogging. Unlike air-inflated rubber floats, it is indifferent to puncture; if a bullet passes through it, only the cells in the immediate path are destroyed, and the block floats serenely on. In addition to these more or less novel uses, glass serves the war effort in a hundred of its long-established and more conventional forms, all the way from medicine bottles and factory windows to accurately ground lenses for telescopes, range-finders and periscopes and carefully coloured photographic filters.

(*Science-Supplement*, Dec. 25, 1942.)