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SCIENTIFIC INFORMATION REPORT

CHINESE SCIENCE

(17)

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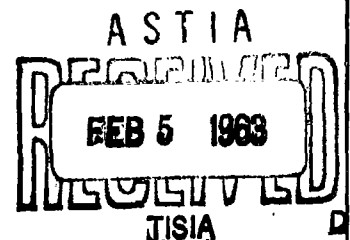
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SCIENTIFIC INFORMATION REPORT

Chinese Science (17)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics, are issued monthly. The fifth series, Chinese Science, is issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every 6 weeks. Individual items are unclassified unless otherwise indicated.

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AGRICULTURAL SCIENCES

IMPORTANT PHYSIOLOGIC RACES OF WHEAT RUSTS IN CHINA -- Peiping, Chung-kuo Chih-wu Pao-hu K'o-hsueh (Plant Protection Science in China), Science Publishers, 1961, pp 306-318

> [The following is a summary translation of an article, "Studies on the Physiologic Races of Three Species of Wheat Rust Found in China," by Wang K'o-ning (3076/0668/1380), Institute of Plant Protection, Chinese Academy of Agricultural Sciences. The author's bibliography, consisting of nine Chinese works, is omitted.

Chinese reseach on the physiologic races of wheat rust fungi was started in 1932 but it was not until after liberation that any research results were obtained which were of use in agricultural production. Studies on Physiologic Races of Stripe Rust, Puccinia glumarum

Fang Chung-ta (2455/0022/6671) was the first person in China to undertake research on the physiologic races of the stripe rust fungus of wheat, Puccinia glumarum. Using eight German strain-typing hosts, he typed 27 strains of stripe rust collected in Yunnan Province and classified them into nine physiologic races. Subsequent Chinese research was conducted at the Nanking Agricultural College, at the Institute of Microbiology of the Chinese Academy of Sciences, and at the Institute of Plant Protection of the China Academy of Agricultural Sciences during the period 1950-1958.

In any survey of the physiologic races of wheat rust fungi, the first problem encountered is how to raise the post-estivation viability rate of the organisms. Large batches of stripe rust fungi are available only in May, at which time greenhouse temperatures are too high for their propagation or survival. Therefore, methods must be devised to preserve them for propagation and study in cooler weather.

One method of preservation that was used by Fang Chung-ta and Ch'en Nai-yung (7115/6621/3938) was refrigeration at 2-4 degrees centigrade under 40 percent relative humidity, controlled by the use of sulfuric acid. Five or six months later, the infected blades containing the organisms were transferred to a warm, insulated vessel for several hours. The spores were then scraped off the blades and used in inoculations. According to Fang and Ch'en, the viability rate by this method was about 38 percent. The same method was employed by the Institute of Plant Protection of the China Academy of Agricultural Sciences to keep alive 190 specimens of well-developed spores of stripe rust and 61 samples of less healthy spores. The viability rates were 53 and 30 percent, respectively, indicating that the condition of spores upon collection is an important factor in their keeping quality.

1

A better method was tested by the Institute of Plant Protection and the Institute of Microbiology. In 1957, fresh spores kept in vacuum ampoules that were hermetically sealed and refrigerated at 2-4 degrees centigrade for 6 months had a viability rate of 75 percent. In 1958 the viability rate after 6 months was above 60 percent by this method, as compared with about 10 percent by ordinary methods.

The second problem encountered in a survey of physiologic races is how to record plant reactions to rust. To solve this problem. [Chinese scientists], using Owen's scale and Gassner and Straib's scale as references, initially used six symbols to represent six degrees of reaction as follows: "0" for immunity if [an inoculated] plant does not fall prey to rust but keeps its green color; "0;" for high degree of resistance if the attacked plant shows only signs of spotted wilt without developing summer spore pustules; "1" for a high degree of resistance characterized by development of a few small pustules of the summer stage with wilt around the pustules; "2" for moderate resistance characterized by summer stage pustules, normal in appearance but sparsely distributed on leaves which are discolored or wilted; "3" for moderate susceptibility if pustules of the summer stage are abundant and normal in appearance and blades shown chlorosis; "4" for susceptibility if summer stage pustules are normal in appearance and exceedingly abundant, but there is no discoloration of leaves. Lu Shih-i (7120/1597/5030) subsequently proposed adding the symbol "X" to the scale to represent a mixed type of reaction as when a plant demonstrates susceptibility and resistance either concurrently on different leaves or during different stages of growth.

In typing wheat rust fungi according to physiologic race, it was found that the reaction of a single wheat variety often varied under different conditions of light and temperature, rendering difficult the analysis of experimental results. It was therefore necessary to investigate the effects of light and temperature on the stripe-rust-resistance of wheat so that conditions for stabilizing plant reactions might be drawn up. Although much foreign research had previously been undertaken on this subject, it was not clear what research results would apply to conditions in China. Lu Shih-i and Li Kao-hsiang (7812/5221/5046) conducted studies relative to the problem and found that as temperature gradually rose, wheat varietes gradually changed their responses from susceptible to resistant, with critical temperatures varying with the combination of wheat variety and physiologic race. They concluded that the typing of stripe rust according to physiologic races should be carried out under controlled temperatures with 15 degrees centigrade being optimal.

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Between 1950 and 1958, 213 strains of stripe rust were typed in China. Results indicated a high degree of variability and many phyto-pathogenic forms were clearly distinguished by the use of strain-typing hosts of German and other origins. For example, Fang Chung-ta and Ch'en Nai-yang, using Heines Kolben and other varieties of wheat, divided 18 strains of stripe rust collected in Northeast China into five forms; Lu Shih-i et al., using Tsao-yang-mai and five other wheat varieties, divided 55 strains of stripe rust collected in Hopeh and Shansi provinces into 16 forms; the Institute of Plant Protection of the China Academy of Agricultural Sciences, using Pi-ma No 1 and six other wheat varieties, divided 130 strains of stripe rust collected in various provinces into seven forms.

In analyzing their research results, Chinese scientists arrived at the following conclusions:

1. The German strain-typing variety which is known as Chinese 166 demonstrated a high degree of susceptibility to every strain of stripe rust tested without exception. This was in contrast to previous reports in the literature to the effect that this variety of wheat showed immunity to most of the dozens of different physiologic races of stripe rust against which it was tested abroad. This indicates that the pathogenic forms of stripe rust which exist in China are distinctly different from those found in other countries and comprise an indigenous line. It also shows a correlation between the formation of pathogenic forms and the microorganism's host - the wheat variety. Adaptation to the host plant is also an important factor. Chinese 166 is a Chinese vernacular wheat variety which is nonresistant to Chinese phsyiologic races of stripe rust due to the latter's long-time adaptation to it.

2. Several years' experience has proved that the strain-typing hosts from Germany cannot be used satisfactorily to type Chinese strains of stripe rust. Most of the German typing varieties, which included Chinese 166, Michigan Amber, Carstens V, Vilmorin 23, Bon Fermier, Peragis, and Heines Kolben, will not identify accurately the physiologic races of Chinese strains of stripe rust. the few varieties that can be used are Blerouge d'cosse, Strubes Dickopf, and Spaldings Prolific.

3. Typing hosts which can better reflect China's actual situation [with respect to stripe rust physiologic races] than can the German typing hosts may be found among other foreign and Chinese wheat varie-ties. For example, Pi-ma No 1 and five other Chinese wheat varieties clearly distinguish the stripe rust physiologic races, T'iao-chung (2742/0022) [literally, Stripe China] No 1 (attacks Pi-ma No 1 wheat) and T'iao-chung No 2 (attacks Hsi-nung 6028 wheat), respectively, from other races.

3

[A chart showing the pathogenicity of the above-mentioned races, reportedly two of the more important ones in Cuba, to various varieties of wheat is given in the article but omitted here.]

Currently, the most important pathogenic forms of stripe rust found in China, whether from the standpoint of breeding for rust-resistance or from that of production, are T'iao-chung No 1 and T'iao-chung No 2. This conclusion is based on the results of strain-typing work conducted indoors and outdoors and of field surveys variations in striperust-resistance seen in specific varieties of wheat. It has been found that the pathogenicity of either race is unique and usually produces a plant response opposite to that produced by the other. The most important characteristic of T'iao-chung No 1 is that it will attack wheat varieties of the Pi-yu (Quality) and Sheng-li (Triumph) lines with degrees of pathogenicity varing within the line. For instance, within the Pi-yu line, it induces a "4" reaction in Pi-ma No 1 wheat, but only a "1-2" reaction in Pi-ma No 4 wheat. Within the Sheng-li (Triumph) line, the wheat varieties most suscep-tible to the T'iao-chung No 1 race are Hua-pei 497 and Hua-pei 9986; but Hua-pei 187 is only slightly susceptible. Besides attacking the above-mentioned major lines, the stripe rust race, T'iao-chung No 1, is also pathogenic to the Hsi-pei No 54, Hung-yu, and Tsao-hung-yu wheat varieties as well as to the 3037 (Hope x Turkey) line, but does not attack the Chung-nung 28 variety or its derivatives.

The stripe rust race, T'iao-chung No 2, on the other hand, is nonpathogenic to the wheat varieties described above as being suscep-tible to T'iao-chung No 1, but it is definitely pathogenic to the following wheat varieties: Chung-nung 28, Hsi-nung 6028, Hsi-pei-chen No 2 (Hsi-pei 302 x Hsi-pei 6028), 5CK 1-3-4 (which is a Pi-yu No 6 x Hsi-nung 6028 cross), and Su-lien O-kuan (5685/5114/7709/6034) [literally, Soviet Goose] No 186. In the past decade of breeding research, Chinese scientists have used Pi-yu (Quality), Sheng-li (Triumph), and Chung-nung 28 as the principal sources of rust-resistance, thereby developing many improved varieties of wheat. Among them, Pi-ma No 1 and 4, and [Hsi-nung] 6028 have become important varieties in the winter wheat-growing regions, while other varieties such as Shih-chia-chuang 407, Nung-ta 183, Hua-pei 187, and 5CK 1-3-4 have just recently been released for growing.

According to available records, the physiologic race T'iao-chung No 1 is distributed throughout Shensi, Kansu, Shansi, Honan, Hopeh, and Anhwei provinces. Its frequency of occurrence and pattern of spread are reflected in its attacks on Pi-ma No 1 wheat grown in those areas. (See the following paragraph.) The distribution of the T'iao-chung No 2 physiologic race in Wu-ch'ing and Shih-chi-chuang, both of Hopeh Province, has been confirmed. Distribution in

Honan Province is suspected on the basis of reports that in 1957 and 1959 the Hsi-nung 6028 variety of wheat, which was growing in the Hsin-yang (Honan Province) Agricultural Research Institute's testing plot for the observation of variations in rust-resistance of wheat varieties, was severely attacked by stripe rust. However, the causative organism was not collected for typing [so its physiologic race was not established.]

The improved wheat variety, Pi-ma No 1, which was released for growing in Shensi Province as a tested stripe-rust-resistant variety, began to show extensive signs of stripe-rust-susceptibility in 1956. Studies were conducted to determine the cause. Spores from infected plants in Wu-kung, Shensi Province were isolated and cultured. In the spring of 1957, Wang K'o-ning [author of the present article] et al. used the spores in inoculation experiments for comparison with seven strains of stripe rust obtained from other areas. In repeated tests it was found that only the form of stripe rust found in Shensi Province attacked Pi-ma No 1 wheat, indicating that the latter's "loss" of stripe-rust-resistance was due to mycotic variation.

Whether the physiologic race which attacks Pi-Ma No 1 (i. e., T'iao-chung No 1) came into existence by continuous modification and adaptations to host, or whether it originally existed and multiplied through the process of [natural] selection is not definitely known. However, present data lends credence to the latter theory. For instance, released for growing in various provinces, Pi-ma No 1 wheat showed susceptibility to stripe rust in Honan Province in 1951; in Kansu Province every year between 1950-1955, with as much as 25-40 percent of the entire crop affected in 1953; but in Shensi Province, which has had the longest history and greatest acreage in the cultivation of that variety, it did not begin to rust until 1953, 2 to 3 years later than that cultivated in other areas. It is believed that the population of the T'iao-chung No 1 race was null in the area where Pi-ma No 1 wheat was originally developed, but that it multiplied rapidly as acreage in its suitable host, Pi-ma No 1, was increased. Therefore, Pi-ma No 1 wheat was observed as having lost its rust-resistance.

There are many physiologic races of stripe in China, but no complete list can be presented at this time as those who heretofore did the typing did not use standard materials. Research in recent years has brought to light several wheat varieties which are suitable for use in China as strain-typing hosts. They are: Pi-ma No 1, Nan-ta 2419, Tsao-yang, Hsi-pei No 54, 2D, Nung-ta No 6, Lo-ch'un (5012/2504) [literally, Russian Spring] L. 128," Trigo Eureka F. S. S., and Strubes Dickopf.

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Studies on the Physiologic Races of Stem Rust, Puccinia graminis

Chinese research on the physiologic races of stem rust, Puccinia graminis, began in 1932 but little was actually done before liberation. The work was intensified immediately after liberation, with Peking Agricultural University collaborating with the former North China Agricultural Research Institute in 1949-1951. Thereafter, until 1958, Peking Agricultural University and Northeast Agricultural Research Institute, at times collaborating with each other and at times working independently, carried out studies on stem rust prevalent in the spring wheat-growing region of the Northeast. In the past 10 years, 2,436 specimens were typed. Results show that the physiologic race, designated as "Kan-chung (4452/0022) [literally, Stem China] No 1" is the leading one in China. From 1959 to 1958, 73.8-94.8 percent of all strains of stem rust typed each year were found to belong to that race. The physiologic race, Kan-chung No 6, was found in high percentages among the strains typed in the years 1947, 1948, and 1957. By inoculating Bigleaf Barberry with stem rust, Wang Yun-chang (3769/0061/4545) et al. produced two new physiologic races; Kan-chung No 4 and Kan-chung No 5.

The two most important physiologic races of stem rust next to Kan-chung No 1 are Kan-chung No 2 and Kan-chung No 3. Kan-chung No 2 was first discovered in Peiping in 1957, and it appeared every year between 1959 and 1958 except in 1953 and 1954. Field and laboratory studies showed that some varieties of spring wheat, for example, Ho-tso No 6, while being completely immune to Kan-chung No 1, are highly susceptible to Kan-chung No 2. The Kan-chung No 3 race was detected in Northeast China in 1952 and thereafter, but so far it has not been found in North China. The pathogenicity of this race is particularly high. Among 30 varieties of spring wheat that are resistant to Kan-chung No 1 and are grown in the Northeast, 27 are not resistant to Kan-chung No 3.

The following spring wheat varieties grown in the Northeast are highly resistant to Kan-chung No 1 and 2 but susceptible to Kan-chung No 3: Malili-to [Chinese inred line of Merit], Kan-su No 96, Sung-huachiang No 1, Sung-hua-chiang No 2, Pai-lo-t'o /Chinese inbred line of Pilot/, and T'u-pu-ch'i (4422/0008/7871) /literally, "bald, uneven"/. Several other spring wheats, while susceptible to Kan-chung No 3, respond to the physiologic races, Kan-chung No 1 and No 2, respectively, as indicated below: Ho-tso No 1-5, tolerant, susceptible; Ho-tso No 6, highly resistant, susceptible; Ho-tso No 7, highly resistant, highly resistant. Obviously, the wave-like occurrences of these physioligic races have a direct effect on the apparent rust-resistance of spring wheats released for growing in the Northeast. If the Kan-chung No 3 count rises drastically, the present rust-resistant varieties will undoubtedly lose their rust-resistant property.

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Kan-chung No 1, as reported by Wang Huan-ju (3769/3562/1172), is the most important form of stem rust in the Northeast, attacking wheat crops every year. The periodicities of waves of Kan-chung No 2 and No 3 are indefinite. In 1955, Kan-chung No 3 made up 9.9 percent /of all samples collected for typing/ but no Kan-chung No 2 was found. Conversely, in 1956, 9 percent was Kan-chung No 2 whereas only a few samples proved to be Kan-chung No 3. In Northeast China, summer spores of Puccinia graminis cannot overwinter north of Hsiung-yueh /N 40° 10', E 122° 08'/, so that annual stem rust menaces in the Northeast seem to originate outside that area. According to analysis of material collected in 1955, the centers of the Kan-chung No 3 menace in 1955 were in the Tun-hua, Kirin Province and San-chao /probably abbreviation for Shang-san-chao, approximately N 42° 41', E 129° 15'/ areas. Since the physiologic race Kan-chung No 3 has never been found in North China, how and whence it is spread to Northeast China should be studied.

In the selection and breeding of improved wheat varieties with rust-resistance it is well to keep in mind that the chief stem rust races in North China are Kan-chung No 1 and No 2; in Northeast China, Kan-chung No 1, and especially Kan-chung No 2 and No 3. Kan-chung No 6 attacks at the same time as does Kan-chung No 1, but being of similar pathogenicity, it may be considered as the same race.

Studies on Physioligic Races of Leaf Rust, Puccinia rubigo-vera

In 1941-1942, Wang Huan-ju used international strain-typing hosts to analyze the physiologic races of leaf rust, Puccinia rubigo-vera, which was collected in Yunnan Province, and found the most prevalent race to be No 123. Other important races were "Yeh-chung (0673/0022) /literally, "Leaf China"/ No 1" and Yeh-chung No 2. These three physiologic races are distinguished by the plant responses they invoke: No 123 brings out the high resistance of the Carina and Loros wheat varieties; Yeh-chung No 1, the susceptibility of Carina and the high degree of resistance of Loros; and Yeh-chung No 2, the susceptibility of both these wheat varieties.

During 1949 and 1951, when Peking Agricultural University was collaborating with the former North China Agricultural Research Institute in research on the subject, Wang Huan-hu and Liang Hsun-sheng (2733/6064/3932) conducted a survey of all physiologic races of the leaf rust Puccinia rubigo-vera found in China. The results were reported as follows:

In 1949, a total of 157 samples typed consisted in 139 of No 123 and 18 of Yeh-chung No 1. In 1950, a total of 160 samples typed consisted of one No 57, one No 63, five No 68, 67 No 123, 45 Yen-chung No 1, and 41 Yeh-chung No 2. In 1951, a total of 100 samples typed consisted of three No 77, 50 No 123, 36 Yeh-chung No 1, and 10 Yeh-chung No 2.

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In 1957, the Institute of Plant Protection found that all of 55 samples collected in eight municipalities and provinces, including Hopeh Province, belonged to the No 123 form.

The foregoing data indicates that No 123, Yeh-chung No 1, and Yeh-chung No 2 are the major physiologic races of leaf rust in China and should be considered as the principal targets in breeding for leaf-rust-resistance. These races have wide distribution throughout North China, East China, Southwest China and the Northeast. Other physiologic races which have been identified are known /simply/ as No 1, No 63, No 68, and No 118. No 118 was found only in 1958 -- in one of the samples collected in Peiping and two of the samples collected in Kuei-yang. Of special interest is the fact that the physiologic races No 10 and No 77 were collected in Harbin and Chia-mu-ssu, respectively, in 1951. Their /ranges of/ pathogenicity are greater than those of other physiologic races found in China. The former attacked five out of eight strain-typing varieties; the latter, all eight.

In strain-typing work carried out over a long period of time,' Wang Huan-ju and Liang Hsun-sheng found that the leaf rust physiologic races, No 1, No 63, No 68, No 123, Yeh-chung No, and Yeh-chung No 2, were pathogenic forms with similar properties. In the autumn, when light and temperature conditions were most suitable for the typing of leaf rust races, most of the samples typed out as No 123. But in other seasons when environmental conditions were less favorable, any one race would invariably register on the typing-hosts as No 1, No 63, Yeh-chung No 1, Yeh-chung No 2, or No 68. This phenomenon was confirmed by Wang and Liang in experiments undertaken to elucidate the influence of temperature on plant response to pure lines of leaf rust grown on strain-typing hosts. They also typed and retyped several selected lines at different times of the year to observe variations. Initial results seemed to indicate that the above-mentioned physiologic races were actually environmental variants of a /single/ group of physiologic races. But further study yielded other results which contradicted this view. For example, when 16 strains of the physiologic race No 123, collected from different locations, were used to inoculate 87 young wheat plants, the following varieties, /which are not regular strain-typing hosts,/ each gave a different type of reaction: Yu-p'i, Li-ying No 3, No 6, Pullman 225, Berkeley Rock, Oro, Yogo, Silver Sheep (C. I. 2496), Red Wave (C. I. 3500), Clarkan (C. I. 8858), Bon Fermier, Russian 47, Blue Corn, Webster, Mu-101, and Central Agr. 891. This indicated that merely using the few (eight) international strain-typing hosts will not give a true picture of all the physiologic races of Puccina rubigo-vera which occur in China. Research on this subject is continuing.

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Discussion

To make future investigations on the physiologic races of wheat rusts meet the needs of China more adequately, attention should be given to the following points:

1. Use as strain-typing hosts those varieties of wheat which have been, or are about to be, released for growing in China, supplementing them with international typing hosts that are suitable. Varieties that can be used for typing stripe rust races were listed /above7. Those which presently can be used for typing stem rust races are Reliance, Einkorn, Vernal, Sung-hua-chiang No 1, Mai-li-to, Ho-tso No 6, and Kansu 96. Good strain-typing hosts for leaf rust races are yet to be determined since the international typing hosts, Brevit and Hussar, have proved to be ineffective and Carina, Loros, Mediterranean, Malakof, and Webster are readily influenced by temperature and light.

2. Greenhouse studies should be carried out in conjunction with field observations, keeping records of weather conditions.

3. The resistance of wheat varieties in the seedling stage, as well as in the full grown stage, should be tested. The use of tiny, transparent isolation chambers to inoculate full grown plants in the field will minimize the hazards of spreading epidemics of rusts. One type is the hygroscopic microchamber for the isolation of single spores which was designed by Li Chen-ch'i (2621/2182/2978) of Northwest Agricultural College.

NEW AGRICULTURE APPARATUS DEVELOPED -- Peiping Kuang-ming Jih-pao, 7 Dec 62, p 1

The Chinese Research Academy of Agricultural Mechanization has, after 3 years of continuous research, developed several new pieces of equipment for use in water control and field work. This equipment is now in trial production.

The Model 280 internal combustion water pump and a jet-type deep-well pump have been developed for use in water control and irrigation. The Model 280 pump can raise about 100 tons of water per hour 8 meters, enough to irrigate 200 mou. The pump can be used to raise water 6-12 meters. As far as its ability to raise water and its flow rate are concerned, the pump is similar in performance to internal combustion-centrifugal pump systems, but it is less expensive. The jet-type deep-well pump is simple in construction, containing only 16 parts, is light in weight, repairs are infrequently needed, and it has a long life. It is capable of raising 8-13 tons of water per hour 18-34.5 meters.

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The research academy has also developed China's first domestically produced suspension grain drill. It was designed particularly for wheat, but it can also be used for corn, soybeans, kaoliang, and millet. This drill is capable of sowing 18 mou per hour. Other tools were developed for wheat harvesting and potato tilling.

LIAONING AGRICULTURAL SCIENCE INSTITUTES DEVELOP NINE NEW VARIETIES OF WHEAT -- Peiping, Kuang-ming Jih-pao, 19 Nov 62, p 2

The Liaoning Branch of the Chinese Academy of Agricultural Sciences and the Plant Immunization Laboratory of Mukden Agricultural College, after ten years of hybridization work, have developed nine new rust-resistant varieties of wheat suitable to the Liaoning spring wheat areas. Wheat rust has been prevalent in Liaoning for many years, especially stem rust. From a great number of primary materials, these two institutes selected eight varieties for parent stock: Kansu 96, Ho-tso No 2, Mai-li-to /Chinese line of Merit/, Thatcher 1720, C. T. 609, H 46145, Kenya, and "Lei-ch'ieh-shen-szu" /probably a Chinese approximation of a foreign name/. They developed five hybrid combinations and, from the hybrid progeny of these, selected individual plants and lines that were rust resistant and possessed excellent horticultural ch characteristics. The plants were examined in the laboratory and the weak plants discarded. After years of rigorous selection, nine varieties were finally chosen. These were lines whose rust resistance was relatively strong, horticultural characteristics relatively good, and genetic nature stable. They were named: Nien-tzu No 3, 37, 45, 49, 51, 52, 66, 86, and 87.

To verify the adaptability of the new varieties, researchers made yield comparison tests in Mukden, Liao-chung, Ch'ang-t'u, and Chin-hsien, in Liaoning Province, and in Pai-ch'eng-tzu, in Kirin Province. The local tests showed the nine new varieties' resistance to stem rust is relatively strong; they are resistant to leaf rust and root rot and can withstand drought. Five varieties are early maturing, the growing period being 78-80 days. The yields, in general, surpassed or were close to those of the experimental areas. The local tests also showed that Nien-tzu No 49, 51, and 52 are suitable to the Liao-chung--Mukden area; Nien-tzu No 37 and 66, to the northern Liaoning areas; and Nien-tzu No 86 and 87, to the Pai-ch'eng-tzu area of Kirin.

Prof Wu Yu-san (0702/0645/0005), a responsible leader in this work, has also been doing theoretical research. His views have appeared in Chung-kuo Nung-yeh K'o-hsueh /Chinese Agricultural Sciences/, No 9, and Liao-ning Nung-yeh K'o-hsueh Lun-wen Hsuan /Liaoning Agricultural Sciences, Selected Articles/, No 1. He points out the close relationship between the cycles of physiological strains of wheat rust mold and the stability of rust resistant varieties of

wheat. He points out that conditions are favorable to the formation of new rust strains and that the new strains can reduce wheat resistance to rust and even cause the disease to break out on a large scale. He indicates that distribution of wheat varieties, substitution, and change of planting area are important factors in changing the cycles of the strains. To guard against the prevalence of rusts, it is necessary to grow varieties that have general resistance, which are more capable of resisting many different strains of rust; to complete a rational program regarding the use of varieties; to formulate rotation procedures; and to strengthen investigation, analysis, and research regarding mold strains.

CHU CHIANG DELTA STUDIED BY HYDRAULIC ENGINEERS -- Peiping, Kuang-ming
Jih-pao, 4 Dec 62, p 1

During the past year, the Wuhan Hydraulic Engineering and Electric
Power College has been working with concerned Kwangtung provincial units
in studying irrigation of the low and sandy areas of the Chu Chiang delta,
and irrigation water control systems. Other units engaged in the work
included the /Kwangtung Provincial/ Research Institute of Hydraulic Engineer-
ing and Water Power (Shui-li Tien-li K'o-hsueh Yen-chiu Yuan; 3055/0448/7193/
0500/4430/1331/4282/4496/7108) and the /Kwangtung Provincial/ Research In-
stitute of Agricultural Sciences (Nung-yeh K'o-hsueh Yen-chiu Yuan; 6593/
2814/4430/1331/4282/4496/7108)

In the area of low, sandy fields, the river network is dense and the
fields are usually lower than the rivers themselves, tidal waters mix
with the irrigation water, and the water flow rate is highly variable;
in addition, each year, during the period June-September, the storms and
high tides adversely affect agricultural production. So concluded the
research workers studying the low, sandy fields.

The Kwangtung Provincial Scientific and Technological Society and
the Kwangtung Provincial Department of Agriculture have assigned personnel
to study the causes of fertility loss in the high, sandy fields of
Kwangtung Province. The organizations part cipating included South China
Agricultural College, the South-Central Institute of Soils, and the South-
Central Institute of Geography. These scientific workers, after a study
of the problem, have recommended using sea water to fertilizers these areas
by trapping the inflowing waters by means of a system of flood gates, thus
utilizing the organic and inorganic matter contained in sea water.

PEIPING AGRICULTURAL UNIVERSITY STUDENTS GIVEN PRODUCTIVE EXPERIENCE --
Peiping, Kuang-ming Jih-pao, 30 Nov 62, p 2

During 1962, the 460-odd fourth-year students in Peiping Agricultural
University is Departments of Agricultural Gardening, Plant Protection, etc.,
spent the period from spring planting to autumn harvest in gaining practical
experience under the direction of 85 university teachers. The students worked
in 8 state farms, 9 peoples' communes, 7 research units, and in one factory,
in addition to working in the school's laboratories and experiment stations.
The students were assigned the following tasks: complete their production
training and write a report on it, and carry out a small-scale research project
and report on it. Students working in different specialties underwent different
production training programs Students of plant pathology, entomology, and
crop breeding, for example, emphasized local problems on which they did special
research; students of plant physiology and agricultural microbiology spent
most of their time in laboratories working on special research projects. One
student of plant physiology and biochemistry spent his time studying poly-
peptides in wheat, peas, and soybeans. Students of entomology, working in
Anhwei Province, discussed methods of combating the rice borer.

Of the 85 teachers that participated, 60 were professors or assistant professors, the others were lectures. Among the teachers participating was Chou Ming-tsang (0719/2494/3647), chairman, Plant Protection Department. Over ten students participated in projects in Mongolia and Anhwei Province under Chou's direction. Ts'ai Hsu-ling (5591/2485/7325), chairman, Agronomy Department, wo ked with four students on wheat seed selection. Assistant professor Chang Shu-chen (1728/2885/2830) also participated.

AGRICULTURAL SCHOOL GRADUATES WORK IN PEIPING AREA -- Peiping, Kuang-ming Jih-pao, 29 Nov 62, p 2

In the last few days, over 500 1962 graduates of agricultural colleges throughout China have arrived in Peiping to work in the surrounding area. This number is greater than in any previous year. These graduates come from over twenty higher agricultural schools; they include specialists in agronomy, vegetables, pomology, animal husbandry and veterinary medicine, plant protection, agricultural mechanizayion, agricultural hydraulic engineering, agricultural meteorology, and agricultural economics.

Over 100 students were assigned to research units specializing in agronomy, animal husbandry and veterinary medicine, forestry, and vegetables. Work in soils and fertilizers was also strengthened. Many graduates were assigned to agro-technical extension stations, animal husbandry and veterinary work stations, and seed stations.

Other students are engaged in the improvement of saline soil, water and soil conservation in mountainous areas, utilization of urban waste waters, propagating improved strains of crops, and in reforestation.

AGRICULTURAL EXENTSION AND VETERINARY MEDICINE STATIONS STRENGTHENED --
Peiping, Kuang-ming Jih-pao, 7 Dec 62, p 2

Agriculture extension stations, seed stations, and animal husbandry and veterinary medicine stations in Chekiang and Liaoning provinces have recently been strengthened. Thirty-four improved strains are now being propagated by Chekiang provincial extension stations; 24 new improved strains are now being bred. The over 500 agricultural extension stations in Liaoning Province are now being strengthened and located more rationally; since April 1962, over 200 cadres have been assigned from agricultural administration organs, scientific research organizations, and from schools. Seven hundred 1962 graduates of higher agricultural schools have also been assigned to extension stations in this province. Of the over 3,300 technical cadres in Liaoning extension stations, 15 percent are highly trained, 55 percent are of an intermediate level of training.

HONAN AGRICULTURAL COLLEGE ESTABLISHES VETERINARY HOSPITAL -- Peiping, Kuang-ming Jih-pao, 4 Dec 62, p 2

This semester, the Department of Veterinary Medicine, Honan Agricultural College, converted its veterinary medicine station to a veterinary hospital in order that it might better serve the needs of the people's communes The station's buildings were improved, its apparatus supplemented, and a chemical laboratory and X-ray examination laboratory were established; more veterinarians were added to the staff. Li Hua-san (2621/5478/0005) is vice-president of the hospital and Li T'ieh-yuan (2621/6993/0337) is also on the staff.

HEILUNGKIANG AGRICULTURAL INSTITUTE DEVELOPS CONTOUR PLOW -- Peiping, Kuang-ming Jih-pao, 26 Nov 62, p 2

The Institute of Soil and Fertilizers, Heilungkiang Provincial Institute of Agricultural Sciences, and the Heilungkiang Provincial Institute of Agricultural Mechanization have jointly developed a seven-plowshare contour plow for use in the hilly land of Heilungkiang Province. This plow is now being test produced by the Heilungkiang Provincial Agricultural Machinery Plant (Hei-lung-chiang Sheng Nung-yeh Chi-hsieh Ch'ang; 7815/7898/3068/4164/6593/2814/2894/2750/1681).

MUKDEN AGRICULTURAL COLLEGE IMPROVES STANDARDS -- Peiping, Kuang-ming Jih-pao, 9 Dec 62, p 2

In order to improve the standards of Mukden Agricultural College's teaching assistants, it was decided in 1960 to initiate a program of formal observation of teaching assistants. The program has achieved it goals; during 1962, a definite improvement in standards was shown by the 26 teaching assistants at the college.

Su Yung-liang (5685/3057/0081), a teaching assistant in the Agricultural Machinery Teaching and Research Section, Machinery and Electricity Department, was observed by Prof Chang Ts'ung-kao (1728/1504/7559). This year, there are six teaching assistants in the Animal Husbandry Department, according to vice-chairman Wang Tsung-yueh (3076/1350/6460). Ch'en Ying-ch'iao (7115/3467/2890), teaching assistant in materials and mechanics, was adivsed to review such topics as field theory, complex functions, and mathematical physical equations, so as to improve his foundation in higher mathematics. Liu Fu-chin (0491/5958/6855) a teaching assistant in the Microbiology Teaching and Research Section, while working under the direction of instructor Chao Wen-hung (6932/2429/3163), at first did not meet the standards in such basic experimental work as preparing dyed specimens of bacteria and diluent separation of nitrogen-fixing bacteria After further training, Liu was able to come up to standard.

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LHASA INSTITUTE OF AGRICULTURAL SCIENCES PROPAGATES CROPS -- Peiping, Jen-min Jih-pao, 3 Dec 62, p 2

During the past few years, the Lhasa Institute of Agricultural Sciences has introduced over 2,250 new varieties of grains and over 1,100 new varieties of vegetables In addition, over 30 improved strains of grains tolerant of cold have been experimentally propagated. This institute has also increased the number of varieties of vegetables common in Tibet from 19 to over 40.

NEW STRAINS OF COTTON DEVELOPED BY SHANSI RESEARCH INSTITUTE -- Peiping, Kuang-ming Jih-pao, 6 Dec 62, p 2

For the past few years, the Shansi Research Institute of Cotton has been working on the development of improved strains of cotton Two of these, the "Yun-ch'eng No 1" and the "Yun-ch'eng No 3" have been released for propagation; "Yun-ch'eng No 2" requires further testing The research took place in Yun-ch'eng Hsien, Shansi Province.

NEW PASTURE GRASSES INTRODUCED IN INNER MONGOLIA -- Peiping, Kuang-ming Jih-pao, 2 Dec 62, p 1

The Inner Mongolia Animal Husbandry Department and the Inner Mongolia Institute of Animal Husbandry and Veterinary Medicine (Hsu-mu Shou-i K'o-hsueh Yenchiu So; 3964/3668/3757/6829/4430/1331/4282/4496/2076) have, in the past three years, in the past three years, introduced new grasses to the prairie areas of Inner Mongolia; in all, over 20 improved strains of pasture grasses are now being used Experimental stations have been set up at Hu-lun-pei-erh-meng, Hsi-lin-kuo-le-meng, and I-k'o-chao-meng to test these improved types of grasses

KANSU RESEARCHERS PROVE THE EFFECTIVENESS OF GREEN FERTILIZERS -- Peiping, Kuang-ming Jih-pao, 19 Nov 62, p 2

The Institute of Soils and Fertilizer, Kansu Provincial Academy of Agricultural Sciences, has been observing and experimenting with 82 kinds of green fertilizer crops in certain places in the provinces and has proved that quite a few grow very well, with the result that crop yields are increased and the soil enriched. After more than 5 years of observation and experiment, institute personnel have proved that common mignonette, Fenugreek trigonella, a variety "mao" (3029) of tecoma, and alfalfa are excellent green fertilizers found in Kansu Province and that a variety "chien-she" (4628/5286) of pea, Sinkiang wild pea, and Sudanese sorghum are very adaptable to various localities in Kansu. Since 1961, institute personnel have experimentally planted more than 2,000 mou of common mignonette in wheat fields in such places as

Wu-wei, Yung-ch'ang, and Yu-men. These fields had never been planted in a green fertilizer crop before, but the mignonette crops grew extremely well. Also, in Wu-wei and other places, they planted Fenugreek trigonella after the wheat was harvested and the results were good. They planted tecoma with corn, and after the corn was harvested, the tecoma grew 25-40 millimeters high and yielded 386-2,250 chin per mou. This series of research experiments produced a great deal of scientific data.

It was only a few years ago that green fertilizer research and promotion of its application on a large scale were undertaken in Kansu. The peansats welcome organic fertilizers rich in nitrogen. It not only increases grain output and improves soil fertility, but it also plays a definite role in improving saline soil, sandy soil, and soil containing shale. According to data from Ho-hsi Plateau farmland, land planted in mignonette for 2 years showed a decrease in salt content and an increase in fertility. Since 1957, 1,500 mou of poor and sandy wheat land in the Huang-yang-ho area has been planted in mignonette; which, on the average, more than doubled the output of wheat. Besides this, trigonella planted in wheat fields can be used either as fertilizer or as hog food; in the case of the latter, the hog manure can be used as wheat fertilizer.

KIRIN AGRICULTURAL UNIVERSITY COLLECTS BOTANICAL SPECIMENS -- Peiping, Kuang-ming Jih-pao, 26 Nov 62, p 2

The Botany Teaching and Research Section, Kirin Agricultural University, has been collecting specimens for the past few years. They now have over 20,000 specimans, representing over 1,300 species, twice as many as when the teaching and research section was first established. The botanical specimens now on hand are considered sufficient for teaching needs

FOREIGN LANGUAGE FACILITIES IMPROVED AT PEIPING AGRICULTURAL MECHANIZATION COLLEGE -- Peiping, Kuang-ming Jih-pao, 4 Dec 62, p 2

The Foreign Language Teaching and Research Section, Peiping Agricultural Mechanization College, has opened a foreign language reading room this semester. The reading room contains foreign periodicals, magazines, dictionaries, and other foreign language reference works

ITALIAN AGROCHEMISTS ARRIVE IN CHINA -- Peiping, Jen-min Jih-pao, 6 Dec 62, p 4

Two Italian professors of agrochemistry, Lo-ti-ni /Lodini?/ and Ma-erh-kao-li /Margoli?/, arrived by plane in Peiping 5 December 1962; they are visiting China at the invitation of the Commission for Cultural Relations with Foreign Countries.

BIOLOGICAL AND MEDICAL SCIENCES

NEW DRUGS DESCRIBED -- Peiping, Ta Kung Pao, 19 Nov 62, pp 2, 3

/Information on the first two new drugs described below appeared in advertisements; on the third, in a brief article./

1. Huan-lu-kua (0958/3048/2588-3900), or Cyclochloroguanide, is manufactured in tablet form by the T'ang-shis-i (0781/2168/5030) Consolidated Pharmaceutical Plant, Canton. The drug is used in the prevention and treatment of tertian, quartan, and malignant malaria.

2. Tan-ch'a-chien (9054/5420/4354), or Choline Theophyllinate, is a new (1962) product of the Hsin-hsin (2450/2450) Pharmaceutical Plant, Tientsin. The drug, available in either powder or tablet form, is used for treatment of cardiac asthma, bronchial asthma, heart failure, constriction of the heart, angina pectoris, coronary disease, cardiac and renal edema, hypertension, etc. Its toxicity is lower than that of aminotheophylline: its solubility in blood, greater.

3. T'o-k'p-la-ssu (2094/0668/2139/2448) /probably the Chinese approximation of "Toclase," trade name for Carbetapentane, described in Merck Index as an antitussive/ is a new product of the Peking Pharmaceutical Plant. The drug is used for cough due to respiratory infection. Its antitussive strength is stronger than that of codeine, but it is not habit forming.

CHINA PHARMACEUTICAL SOCIETY DISCUSSES NEW DRUGS AND AID TO AGRICULTURE -- Peiping, Kuang-ming Jih-pao, 21 Nov 62, p 2

The two major topics discussed at the conference of the Chinese Pharmaceutical Society held recently in Peiping were the search for new drugs and aid to agriculture. Forty papers were presented at the conference.

Huang Ming-lung (7806/7686/7898), presented a paper, "Structural Changes in Steroidal Hormones." Lei Hsing-han (7191/5281/5060) gave a report, "The Present Situation in the Synthesis of Parasitic Disease Drugs and Future Prospects." After the special reports were presented, the conference formed groups to discuss drug synthesis, herbs, and pharmaceuticals. Chi Ju-yun (1518/3067/6663) discussed the theoretical approach to the search for new drugs from the point of view of molecular structure, and the density of electronic distri bution, with the drug synthesis group. The herb group discussed the search for new drugs among traditional Chinese drugs, popular drugs, Chinese traditional prescriptions, popular prescriptions, and local plants. All groups discussed the need for full support of agriculture.

RESEARCH CONDUCTED ON SYNTHESIZING NEW DRUGS -- Peiping, Kuang-ming Jih-pao, 21 Nov 62, p 2

Huang Ming-lung (7806/7686/7898), Shanghai Institute of Organic Chemistry, is presently engaged in research on developing new methods of synthesis for pharmaceuticals more advanced than cortisone and cortisol. Huang has been engaged for the past few years in the devlopment of methods of synthizing cortisone and other steroidal hormones.

FIRST GRADUATES OF TIBET MEDICAL COLLEGE -- Peiping, Kuang-ming Jih-pao, 30 Nov 62, p 2

The Tibet Medical College held graduation ceremonies for its first group of indigenous students on 10 November 1962. The graduation class consisted of 73 persons, including Uighurs, Kazakhs, Uzbeks, Tatars, Sibo, and Russians. Over half the students graduated with honors. Party or Youth League members make up 58.5 percent of the graduates.

CHINESE STUDY ELECTRO-ENCEPHALOGRAPHY -- Peiping, Kuang-ming Jih-pao, 2 Dec 62, p 2

The Institute of Psychology, Chinese Academy of Sciences, is using electronic apparatus to analyze brain waves, according to Lu Sheng (7120/8508).

ITEMS ON CHINESE TRADITIONAL MEDICINE TO BE PUBLISHED -- Peiping, Kuang-ming Jih-pao, 30 Nov 62, p 2

The Shanghai Municipal Research Library of Chinese Traditional Medicine is preparing a set of historical works on Chinese medicine to be published by the Shanghai Science and Technology Press.' This library, established July 1956, now has 39 persons employed in research, their average age is 73. One of the persons whose work will be published is 73-year-old Feng Ch'i (7458/7496), a practitioner of chinese traditional medicine, now at Pao-t'ou Hospital No 3. Other persons submitting treatises include library vice-president Chang Tsan-chen (1728/6363/5256), and library personnel Kuo Pai-liang (6753/2672/5328), Chang Ju-wei (1728/3067/0251), Ho Ti-ts'ung (0149/6611/3827), and Chang Mu-ch'i (1728/1970/1477).

CHINA ENTOMOLOGY SOCIETY CONFERS -- Peiping, Kuang-ming Jih-pao, 8 Dec 62, p 1

The China Entomology Society held its 1962 conference recent in Canton. The conference formed six groups to discuss, among other topics, regi onal systems of insects, insect ecology, biological control measures, and insecticides.

The insect physiology group discussed the sterilization of insects by the use of ionizing radiation. The group discussing combating insects by biological means discussed the use of the Teleas phalaenarum; this method has been found to be effective, further research, however, is needed. This group also discussed the use of microorganisms in the combating of insect pests. The insecticide group discussed the prediction of toxic effects of insecticides.

CHINA ZOOLOGY SOCIETY CONFERS IN CANTON -- Peiping, Kuang-ming Jih-pao, 6 Dec 62, p 1

The China Zoology Society held a conference during the middle of November 1962 in Canton to discuss zoological ecology and taxonomy. This is the first conference of this nature to be held by the society since its inception. The conference also discussed how zoology could be of assistance to agricultural development. It was decided that this could be done in two ways: (1) The provision of scientific data by surveys of marine resources, land animals, and birds; (2) Studies of the ecology of animal and bird pests, as well as of animal and bird parasites.

FAUNA OF THE CH'I-LIEN SHAN STUDIED -- Peiping, Kuang-ming Jih-pao, 22 Nov 62, p 2

A zoological survey team of the Northwest Plateau Institute of Biology (Hsi-pei Kao-yuan Sheng-wu Yen-chiu So; 6007/0554/7559/0626/ 3932/3670/4282/4496/2076), Chinese Academy of Sciences, is presently studying the Fauna of the Ch'i-lian Shan. Their studies will include surveys of the species, number, and distribution of the animals and birds of this region.

The Ch'i-lien Shan is the only area in China in which the Felis uncia Schreber, Equus hemiosus hemiosus Pallas, and the "pai-ch'un-lu" /4101/0782/7773; literally, "white-lipped deer"/ are found. The latter, along with the Mactra sulcataria, are found at elevation between 3,500 and 5,000 meters, in forested areas. In addition, there are a great many other deer in the area, including the musk deer. The Ovis canadansis is also found in the Ch'i-lien Shan; this species is widely distributed in China but its numbers are few.

TECHNICAL SCIENCES

HIGHER-LEVEL CORRESPONDENCE COURSES OFFERED IN COAL MINING -- Peiping, Kuang-ming Jih-pao, 19 Nov 62, p 2

Higher-level correspondence courses in coal mining have been offered since 1956. At that time, seven correspondence stations were set up under the direction of the Peiping Mining College and the Northeast Engineering College. In 1957, the Ho-fei Engineering University established a correspondence section under which there were four correspondence stations. In 1959, the Sian Mining College set up a correspondence section with three correspondence stations under it. Since 1961, China has had over 2,800 correspondence students studying the five /mining?/ specialties. Since 1961, the correspondence courses have offered a 5-year course of instruction; students submitting satisfactory graduation design theses and successfully defending them have been graduated.

At present, each of the correspondence stations is assigned a definite number of full-time and part-time instructors and cadres. Upon the initiation of the program in 1956, the administration was divided into three levels. The Ministry of Coal Industry assigned responsibilities, carried out planning, and fixed the number of personnel and budget of each of the stations; the correspondence sections of each of the schools enrolled the students, drew up the course of study, and assigned instructors; the correspondence stations carried out the work. Because of the rapid development after 1960, the Ministry of Mining Industry transferred the responsibility for administration to the local coal mining administrative bureaus. -- Feng Hsien-min (7458/0341/3046)

T'AI-YUAN ENGINEERING COLLEGE OFFERS SPARE-TIME INSTRUCTION -- Peiping, Kuang-ming Jih-pao, 19 Nov 62, p 2

Many instructors at T'ai-yuan Engineering College also teach courses in the night school. In addition, correspondence courses are also offered by the college. The night school offers courses of instruction in two specialities, power generation and distribution, and machine building; the correspondence course offers one specialty, civil engineering. The night school was established in 1956. At present there are over 450 students enrolled; recently, over 130 students graduated. Over 40 instructors are assigned to the night school and the correspondence course, in order to guarantee the scholastic quality of the enrollees.

Prof Liu Hsi-kuang (0491/6932/0342), chairman of the Civil Engineering Department, and Assistant Professor Hsu P'u (1776/3877), vice-chairman, Machinery Department, both teach in the night school and the correspondence course. Lecturer Tuan Chun-shan (3008/0193/1472), of the Civil Engineering Department, has taught in the night school and correspondence course since 1956, handling courses in the civil architecture specialty such as "Architectural Engineering Drafting" and Descripture Geometry."

Many of the students in one of the courses in the Power Generation and Distribution specialty are technicians at power plants and electrical machinery plants; these are in the course to improve their theoretical knowledge.

One of the students of architecture in the correspondence course had a paper of his included in T'ai-yuan Kung-hsueh-yuan Hsueh-pao (T'ai-yuan Engineering College Journal).

EVENING CLASSES BEGUN AT HARBIN INDUSTRIAL UNIVERSITY -- Peiping, Kuang-ming Jih-pao, 19 Nov 62, p 2

Classes are being held for the first time this semester at the night school of Harbin Industrial University. Of the 20 courses offered, 13 are being taught by lecturers and assistant professors of the university.

Assistant Professor Ch'en Ch'en-wen (7115/6186/5113), deputy chief of the Machine Parts Teaching and Research Section, is giving the course on machine parts. Chou Ting (0719/1353), deputy chief of the Chemistry Teaching and Research Section, is giving the lectures in the chemistry course and is also handling one of the recitation periods.

The courses of instruction at the night school are somewhate less demanding than those offered by the university proper. Lecturer Hu Shih-feng (5170/0013/7364) teaches some of the courses in the materials and mechanics curriculum.

EARTH SCIENCES

CH'ANG-CH'UN GEOLOGY COLLEGE HOLDS CONFERENCE -- Peiping, Kuang-ming Jih-pao, 3 Dec 62 p 2

Sixty-eight papers and reports, many of which concerned agricultural production, were offered at the second conference held by the Ch'ang-ch'un Geology College.

Yang Ch'eng-t'ien (2799/2052/3944) and Ts'ao Huan-yun (2580/3462/ 0061), both of the Hydrology and Engineering Geology Teaching and Research Section, Engineering Geology Department, presented a paper entitled "Causes of Salination in the Sungari River-Liao Ho Plain." This arid area of western Kirin Province was the object of a 1:50,000 hydro-geologic survey, made during 1961 by instructors and students of the Engineering Geology Department.

Yu Ch'eng-hua (0060/2052/0553) and Wang Ping-ch'en (3769/4426/1820) coauthored a paper, "Delination of the Hydro-Geologic Regions of the Northwest." These two authors, along with Liu Chin-shan (0491/6855/1472), jointly prepared a paper, "Problems of Back-Flow Calculation." Prof Yu Chien-chang (0205/1696/4545), Palaeontology Teaching and Research Section, Geology Department, also participated in the conference.

PEIPING GEOLOGY COLLEGE CONTINUES STUDY AT CHOUKOUTIEN -- Peiping, Kuang-ming Jih-pao, 7 Dec 62, p 2

Students and instructors of Peiping Geology college continue to study Choukoutien, the village once inhabited by the Peking Man. So far this year, over 1,500 students have visited the site.

CHEMISTRY AND CHEMICAL TECHNOLOGY

Theoretical Development

On the basis of the investigation presented in a previous report
[1], the mechanism of ultra-violet induced crosslinking of polyethylene
in the presence of a sensitizer may be briefly stated as follows.
Ultra-violet irradiation of a linear saturated high-molecular polyethy-
lene (PH) in the presence of a sensitizer basically forms a cross-
linked polymer (P-P) with simultaneous formation of an unsaturated
polymer (P=). The formation of such products must be examined as
the result of recombination or disproportioning of macroradicals
(P·), formed as the result of liberating a hydrogen atom from the
polymer molecules through ultra-violet induced excitation of the
sensitizer [A]* to the triplet state. The RH radicals thus formed
may recombine with each other or with the macroradical P·, breaking
off the radical processes. In the absence of destructive processes,
the mechanism of the radical reactions may be graphically expressed
in the following simplified form:

Rate of Reaction

1. Photolysis	$A \xrightarrow{h\nu, k_1} [A]^*$		$k_1 I_a [A]$
2. Initiation	$PH + [A]^* \xrightarrow{k_2} P\cdot + \dot{R}H$		$k_2 [PH][A]^*$
3. Recombination	$P\cdot + P\cdot \xrightarrow{k_3} P{-}P$		$k_3 [P\cdot]^2$
	$P\cdot + P\cdot \xrightarrow{k_4} P{=}{+}PH$		$k_4 [P\cdot]^2$
Disproportion	$\dot{R}H + \dot{R}H \xrightarrow{k_5} RH{-}RH$		$k_5 [\dot{R}H]^2$
4. Rupture of Chain	$\dot{R}H + P\cdot \xrightarrow{k_6} P{-}RH$		$k_6 [\dot{R}H][P\cdot]$

In the above equations, k and the parentheses denote respectively the constants of the rates of reaction and of the concentration; I_a is the effective intensity of absorbed light.

Let us introduce the kinetic equations:

$$
\left.
\begin{aligned}
-\frac{d[A]}{dt} &= k_1 I_a [A] \\[4pt]
\frac{d[A]^*}{dt} &= k_1 I_a [A] - k_2 [PH][A]^* \\[4pt]
\frac{d[P\cdot]}{dt} &= k_2 [PH][A]^* - 2k_3 [P\cdot]^2 - 2k_4 [P\cdot]^2 - k_6 [\dot{R}H][P\cdot] \\[4pt]
\frac{d[\dot{R}H]}{dt} &= k_2 [PH][A]^* - 2k_5 [\dot{R}H]^2 - k_6 [\dot{R}H][P\cdot] \\[4pt]
\frac{d[P{-}P]}{dt} &= k_3 [P\cdot]^2 \\[4pt]
\frac{d[P{=}]}{dt} &= k_4 [P\cdot]^2 .
\end{aligned}
\right\}
\tag{1}
$$

If the theorem of the stationary state of the radicals is applied in the process of photosensitized crosslinking, i.e.,

$$
\frac{d[A]^*}{dt} = \frac{d[P\cdot]}{dt} = \frac{d[\dot{R}H]}{dt} = 0,
$$

and the reaction of the rupture (4) may be disregarded, then the rate of

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the formation of crosslinked and unsaturated polymers depends mainly on the effective intensity of the absorbed light I_κ and the concentration of the sensitizer

$$\frac{d[P\!-\!P]}{dt} = \frac{k_3}{2(k_3+k_4)} \cdot k_1 I_a[A] = K_c \cdot k_1 I_a[A],$$

(2)

$$\frac{d[P\!=\!]}{dt} = \frac{k_4}{2(k_3+k_4)} \cdot k_1 I_a[A] = K_d \cdot k_1 I_a[A],$$

(3)

where K_c and K_d are taken as equal to $\dfrac{k_3}{2(k_3+k_4)}$ и $\dfrac{k_4}{2(k_3+k_4)}$, whence $\dfrac{K_c}{K_d} = \dfrac{k_3}{k_4}$.

Equations (2) and (3) demonstrate that under the above conditions, the rates of the formation of $[P\!-\!P]$ and $[P\!=\!]$ are linearly dependent on I_κ , whereby $\dfrac{[P\!-\!P]}{[P\!=\!]} = \dfrac{K_c}{K_d}$. It must be noted that, when taking into account the reaction of the rupture(4) or under conditions of nonstationary state , results of the exposition lead to another dependence, which we should investigate empirically during a change in light intensity.

Under the given light intensity, solution of equations (2) and (3) is made in accordance with the change in the effective intensity of the absorbed light I_κ in the reaction process.

Change in the Effective Intensity of Absorbed Light

In the simultaneous presence of the sensitizer $[A]$ and the light-filtering substance $[B]$, the system of absorbed light may be graphically presented as in the illustration. According to Bayer-Lambert's law of absorption, during the intensity of incident light I_o and the intensity of light penetrated , the total intensity of absorbed light I will be

$$I_{abs} = I_a + I_b = I_0(1 - e^{-\epsilon_a'[A] - \epsilon_b'[B]}).$$

(4)

The intensity of light absorbed by the agent was subtracted here, since

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this part of the light does not participate in the reaction and may be applied as a constant in the reaction process.

In equation (4), I_α is the effective intensity of absorbed light, capable of photolysis of the sensitizer; I_h is the intensity of light absorbed by a filtering agent, ineffective for photolysis of the sensitizer; ε is the extinction coefficient; l is the thickness of the agent.

From equation (4)
$$I_\alpha = I_0(1 - e^{-\varepsilon_\alpha l[A]-\varepsilon_b l[B]}) - I_0(1 - e^{-\varepsilon_b l[B]})$$
$$= I_0 \cdot e^{-\varepsilon_b l[B]} \cdot (1 - e^{-\varepsilon_\alpha l[A]}).$$

(4')

The entire process of photosensitized crosslinking may be divided into an initial and a final period, depending on whether the automatic light-filtering effect has the dominant role.

1. The initial period of the reaction is that in which the automatic light-filtering effect may be disregarded. It may be assumed that $[B] = 0$, i.e., $I_h = 0$ in equation (4). Then equation (4') reduces to the form:

$$I_\alpha' = I_0(1 - e^{-\varepsilon_\alpha l[A]}),$$ (5)

i.e., in the initial period, the effective intensity of absorbed light I_α' depends only on the concentration of the sensitizer. When the initial concentration of the sensitizers $[A_0]$ is sufficiently high, complete absorption actually takes place at the beginning of the reaction. (cf Figure 6 in the previous work $[1]$) and $I_\alpha' \simeq I_0$. Moreover, from the equation of the kinetics of the sensitizer $[A] = [A]_0 e^{-k I_0 t}$, it follows that the concentration of the sensitizer diminishes according to the exponential function, and I will be reduced according to the function $I_0(1 - e^{-\varepsilon_\alpha l[A_0] \exp(k_1 I_0 t)})$ relative to the absorption period t as shown by the sloping dashed curve in Figure 6 of the previous report.

2. The final period is that in which the automatic light-filtering effect plays an important role. In this period, the concentration of the

sensitizer was already reduced according to the exponential function to the minimum value $[A']$, and further, it changed little in a sufficiently prolonged interval of irradiation time. Thus, $1 - e^{\epsilon_a l[A']} \simeq \epsilon_a l[A']$, and equation (4) reduces to :

$$I''_a = I_0 \cdot \epsilon_a l[A'] \cdot e^{-\epsilon_b l[B]}, \qquad (6)$$

i.e., in the final period, the effective intensity of the absorbed light I''_{α} depends on the concentration of the filtering agent $[B]$.

The automatic light-filtering effect in the final period is obviously connected with the products of the photolysis of the sensitizer. Since the reactions k_1 and k_2 are similar to each other, let us take $\dfrac{d[B]}{dt} = k' \dfrac{d[P^=]}{dt} = k'K_a k_1 I_a[A'] = k'_b k_1 I_a[A']$, where $k'_b = k' K_a$. Substituting equation (6) here and applying the original conditions $[B] = 0$ where $t = 0$, and by integrating, we obtain

$$[B] = \frac{1}{\epsilon_b l} \cdot \ln(K'_b K_a[A'] \cdot I_0 t + 1), \qquad (7)$$

where $K'_b = k'_b \epsilon_b l$.   Substituting equation (7) back into (6), we obtain

$$I''_a = \frac{\epsilon_a l[A'] \cdot I_0}{K'_b K_a[A']I_0 t + 1}, \qquad (8)$$

i.e., under prolonged irradiation, I''_{α} diminishes during the irradiation time t.

Kinetics of the Initial and Final Periods of the Reaction

Inasmuch as the automatic light-filtering effect influences the effective intensity of absorbed light and , likewise, the kinetics of the process of photosensitized crosslinking, the terms I'_{α} and I''_{α} may then be substituted into equation (2) to obtain the relationship of the concentration of the crosslinked polymer $[P - P]$ to the irradiation period in the initial and

final periods, separately.

1. In the initial reaction period, when the automatic light-filtering effect may be disregarded. Substituting equation (II-3') into (III-2), we obtain $\frac{d[\text{P—P}]}{dt} = K_c k_1 I_0 [A_0] e^{-k_1 I_0 t}.$

By integrating and applying the original conditions $[\text{P— P}] = 0$ when $t = 0$, we obtain $\ln\left\{1 - \frac{[\text{P—P}]}{K_c[A_0]}\right\} = -k_1 I_0 t.$ Since the value of $\frac{[\text{P—P}]}{K_c[A_0]}$ is small in the initial period, it is then possible to expand the logarithmic function into a series to the first member, and $[\text{P—P}] = K_c k_1 [A_0] I_0 t,$

$$(9)$$

i.e., the concentration of the crosslinked polymer $[\text{P— P}]$ is linearly dependent on t.

2. In the final reaction period, when the concentration of the sensitizer is already diminishing to a certain small and almost constant value $[A] \simeq [A']$. Substituting it and equation (8) in (2), we obtain

$$\frac{d[\text{P—P}]}{dt} = \frac{K_c k_1 I_0 \sigma_d l [A']^2}{K_b' K_a [A'] I_0 t + 1}.$$

By integrating and applying the original conditions, we obtain

$$[\text{P—P}] = \frac{K_c[A']}{K_b'} \ln\{K_b' K_a [A'] I_0 t + 1\}. \qquad (10)$$

By analogy, it is possible to obtain

$$[\text{P}^=] = \frac{K_d[A']}{K_b'} \ln\{K_b' K_a [A'] I_0 t + 1\}, \qquad (11)$$

i.e., both the concentration of the crosslinked polymer and the concentration of the unsaturated polymer have a linear dependence on a certain logarithmic function t , or , approximately, ln t.

Thus, it may be considered that, in the process of photosensitized crosslinking of polyethylene, the relationship of the crosslinked polymer

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to the irradiation period varies in the initial and final periods, depending on whether the automatic light-filtering effect has the dominant role.

In the initial reaction period, when the sensitizer plays the main role, i.e., photolysis of the sensitizer does not depend on the automatic light-filtering effect, the formation of the crosslinked polymer is determined by photolysis of the sensitizer. In a concentration of the sensitizer sufficiently large for complete absorption of the incident light, [P— P] is linearly dependent on t, when photolysis of the sensitizer is conducted by the reaction of the first order (II). At the same time, [P — P] also depends on the original concentration of the sensitizer.

In the final period of the reaction, when the automatic light-filtering effect has the important role, the concentration of the sensitizer already diminishes to a certain small value because of photolysis, and [P - P] has a linear dependence on a certain logarithmic function t or, approximately, ln t.

The kinetic equations set forth above may be proved by experimental measurement of the concentration of crosslinked polymer during different irradiation periods.

Experimental Part and Method of Processing the Data

Preparation of the samples and the irradiation methods were described in the previous report [1]. The change in the properties of the samples subjected to irradiation for a different period is determined by the methods described below. From this, the degree of crosslinking and the relationship of crosslinking to destruction are calculated or approximately estimated.

1. Method of Solubility

Purified xylene was selected as the solvent, with 0.1 percent addition of phenyl-β-naphthylamine as an antioxidant. The samples were subjected to boiling in a reflux condenser exposed to carbon dioxide in the dark for 4 days. Then heat extraction by xylene for one day and by alcohol for another day. The extraction time is established by the attainment of constant solubility of the sample. The gel obtained after extraction was dried under vacuum at a temperature not exceeding 50 degrees to constant weight. The yield of the salt s=1 - g is computed from the yield of gel g.

According to Charlesby's theory on the solubility of polymers crosslinked by radiation [2], the average index of crosslinkage γ in a mass of polyethylene may be calculated by the yield of the salt s:

$$\gamma = \frac{1}{(s + \frac{1}{\sqrt{s}})},$$

The value of γ at the gel point is 0.50.

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If the crosslinking process is accompanied by destruction, then, according to Charlesby [2], the calculation may be as follows. Assume that the dose of irradiation $R = \int I_\alpha dt$, where I_α represents the function of the time t, where p_0 and q_0 are constants of the rate of destruction and crosslinkage per unit of irradiation dose. Then, after attainment of the gel point, the average index of crosslinkage, accompanied by destruction, will be:

$$\frac{1}{\bar{\gamma}'} = \frac{p_0}{q_0} + \frac{1}{q_0 u_1} \cdot \frac{1}{R},$$

where u_1 is the degree of polymerization. From the graph $\left[\frac{1}{\bar{\gamma}'} \sim \frac{1}{R}\right]$ we obtain the value of the ratio of destruction to crosslinkage $p_0 \, q_0$.

2. Method of Swelling

The gel obtained by the solubility method swells for 4 hours in purified oxylene at 81 degrees + 0.1 degree centigrade, in the absence of oxygen and light. Then the swelling ratio Q is determined by the weight method.

According to the Flory-Huggins theory [3] on the swelling of cross-linked polymers, the average effective number of crosslinked polymer segments per unit volume $\left(v_e / V\right)_g$ may be estimated from the swelling ratio Q, and the number average molecular weight of crosslinked segments in the gel $(\bar{M}_c)_g$:

$$\left(\frac{v_e}{V}\right)_g = \frac{0.5 - \mu}{Q^{5/3} V_1} \; ; \quad \left(\frac{1}{\bar{M}_c}\right)_g = \left(\frac{v_e}{V}\right)_g \cdot \frac{1}{\rho_g},$$

where V_1 is the molal volume of the solvent in the swollen gel; μ is the constant whose value is taken at 0.33 [4]; ρ_g is the gel density.

3. Viscosimetric Method.

The salt solution obtained by determining the solubility is precipitated in n-propyl alchol. The precipitate is dried and dissolved once again in redistilled p-xylene. The intrinsic viscosity [n] is determined at 81 degrees + 0.02 degrees centigrade, without the influence of oxygen and light, with the aid of a ubbelohde-type viscosimeter, in order to determine the viscosity at an elevated temperature. We shall use the following equation [5] to compute the number average molecular weight according to the viscosity $\bar{M}_n$,

$$\eta = 1,053 \times 10^{-3} \bar{M}_n{}^{,63} \left(\partial \Pi / \ell \right).$$

If the value $\bar{M}_n$ of the polyethylene is near the value of the average weight $\bar{M}_w$, then $\left[\frac{1}{\bar{M}_n} \sim \frac{1}{\bar{M}_w}\right]$, being the average weight or the viscosimetric number of macromolecules.

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4. Thermodynamical Method

The samples in the form of a pile of discs with an area of 1 cm^2 and 0.5 cm thick are placed in a thermodynamical apparatus, converted from the Hoppler consistometer. Their mechanical deformation is determined at a controlled rate of temperature increase (50 degrees centigrade per hour) whereby the load amounts to 329 g/cm^2. The compression ratio at 150 degrees centigrade (in the field of high-elastic deformation) was taken on the obtained thermodynamical curve.

According to the approximation equation of Wall's theory on rubber elasticity, the average effective number of crosslinked polymer segments per unit of volume $\bar{V}_e/V$ /6/ may be approximately estimated from the compression ratiox at a constant stress τ, and the average molecular weight of the crosslinked segments $\bar{M}_c$

$$\frac{\bar{V}_e}{V} = \frac{\tau}{RT\left(a - \frac{1}{a^2}\right)} \; ; \quad \frac{1}{\bar{M}_c} = \frac{\bar{V}_e}{V} \cdot \frac{1}{\rho}$$

where T is the absolute temperature; R is the gas constant; and ρ is the mass density.

Results and Discussions

The theoretical exposition stated above may be experimentally proven if it is known that any empirically determined parameter, serving as a measure of the average degree of crosslinking, is directly proportional to the concentration of crosslinked macromolecules.

Initial Period

When the automatic light filtering effect is negligible and the sensitizer plays the dominant role, then, according to equation (9), $\bar{\gamma}$ is linearly dependent on the irradiation period $\bar{\gamma} \sim K_i t$, where K_i is the general constant, dependent on the method of expressing the experimental parameters. It is clear from figures 1 and 2 that certain intervals of the irradiation time, both parameters maintain good linear dependence on the irradiation period.

1. Average Index of Crosslinking in the Polyethylene Mass $\bar{\gamma}$

Figure 1 indicates that for the two concentrations of the sensitizer (normal 1.0 and 2.0 percent) the curves $\bar{\gamma} \sim t$ are linear and pass through the gel point $\bar{\gamma} = 0.5$. This proves that crosslinkage of macromolecules occurs at once at the moment irradiation begins, and the gel point is quickly obtained, which is an advantage of photosensitized crosslinking.

The scope of these curves (the slope of a curve for a 2 percent concentration of the sensitizer is less than for one percent) behaves counter to the theoretically proposed one. This is explained in that exposition of the kinetic equations was made with a disregard for the rupture reaction. When the concentration of the sensitizer is sufficiently high and $k_6 > k_3$, the number of crosslinked macromolecules may be decreased.

The irradiation period covered by the two lines may be different, since the phases of complete absorption of the incident light differ. On the basis of the given ultraviolet absorption spectra (cf. Figure 6 in the preceding report), the percentage of penetration in the $250 \mathcal{M} \mu$ field for the sample containing one percent of the sensitizer equals zero after 30-minute irradiation. In the case of 2 percent of the sensitizer, the percentage of penetration remains at zero even after 50 minutes of irradiation.

2. Average Number of Molecules for Viscosity $1/\overline{M}_\eta$ in Polyethylene Salt

No gel is formed for a period of up to 100 minutes during irradiation of unsensitized control samples. The intrinsic viscosity of the salt (completely soluble) diminishes greatly in the beginning and then gradually becomes constant with the increase in the irradiation period. The corresponding cure $\frac{1}{\overline{M}_n} \sim t$ is shown in Figure 2. This indicates the presence of the process of "pure photolysis", which takes place at the "weak spot" in the polymer chains [7]. Although this process occurs simultaneously with the photosensitized crosslinking, it may, nevertheless, be examined separately as another photolytic process, independent of the crosslinking process. Thus, by subtracting this part of the reaction from the entire process, there remain the results for pure photosensitized crosslinking.

Subtracting the curve $\frac{1}{\overline{M}_n} \sim t$ obtained in the control samples from the curve $\frac{1}{\overline{M}_n} \sim t$ obtained in the present straight line, indicated by the dashed line in Figure 2. The average number of macromolecules according to viscosity per unit weight increases during the irradiation period. This indicates that crosslinking takes place, first of all, in macromolecules with comparatively high molecular weight, a fact which coincides with the concept of the probability of random crosslinking. During elimination of the crosslinked high molecular part in the form of gel, a low molecular part remains in the salt. The greater number of low molecular particles remaining per unit of weight, the greater the number of crosslinked macromolecules.

Final Period

When the automatic light filtering effect has the important role, and t will have the following relation, according to equation (10).

$$\log (Kt + 1).$$

When the irradiation period is sufficiently high and $Kt \gg 1$, $\bar{\delta}$ is approximately linearly dependent on $\log t$, as was experimentally obtained in the first report. From the graph $\bar{\delta} \sim \log t$, it is possible to calculate the constant K and then to construct the graph $\bar{\delta} \sim \log (Kt + 1)$. As indicated in figures 3-7, during a comparatively long irradiation period, certain experimental parameters have a linear dependence on $\log (Kt + 1)$. The irradiation period applied in the experiments is still not sufficient for formation of unsaturated macromolecules. Therefore, the aforementioned automatic light filtering effect must take place mainly at the expense of the products of photolysis of the sensitizer. [1]

1. Average Index of Crosslinking in the Polyethylene Mass $\bar{\gamma}$

The curve $\bar{\gamma} \sim \log (K't + 1)$ is linear (Figure 3). K' equals 1.0. The experimental points in Figure 3 are obtained from two series of experiments (with the same nominal concentration of the sensitizer -- one percent -- but irradiated by different models of ultraviolet lamps).

Extrapolation of the curve $\dfrac{1}{\bar{\gamma}} \sim \dfrac{1}{\log(K't + 1)}$ (Figure 4) intersets the ordinate with the break $p_0/q_0 = 0.37$. This indicates that the ratio of destruction to crosslinking is 0.37.

Figures 3 and 4 evidence that during short irradiation, the experimental points do not fall on the extrapolation line of the curve $\bar{\gamma} \sim \log (K't + 1)$. As was shown avove, this takes place in view of the dissimilar development in the initial and final periods of the reaction.

2. Average Effective Number of Crosslinked Segments Per Unit of Volume of Polyethylene Gel $(\bar{\nu}_e / V)_g$

$(\bar{\nu}_e / V)_g$ is linearly dependent on $\log (K''t + 1)$ (Figure 5), identical with K'' (cf below). K'' equals 0.001. This indicates that both experimental methods -- the method of swelling and the thermodynamical method -- are comparable, and the experimentally obtained parameters have the same value. However, proceeding from the theory of elastic networks, which serve as the basis for both methods, both parameters may serve only as a relative measures.

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3. Average Number of Macromolecules Per Viscosity in Polyethylene Salt $\frac{1}{M_n}$

After elimination of the gel from the mass of irradiated polyethylene, the remaining salt contains noncrosslinked macromolecules and molecules which are crosslinked but have not yet attained gel points, i.e., macromolecules unconnected with the gel. Therefore, $\frac{1}{M_n}$ may be examined as an indirect measure of the degree of crosslinkage $\underline{/3/}$. The graph $\frac{1}{M_n} \sim \log (K''' t + 1)$ gives a straight line (Figure 6). K''' equals 0.009. This once again corroborates that crosslinkage occurs, first of all, among macromolecules with a comparatively high molecular weight. In proportion to the course of crosslinking, the macromolecules remaining in the salt have an ever smaller molecular weight, or the number of low molecular macromolecules per unit weight becomes ever larger.

4. Average Effective Number of Crosslinked Segments Per Unit Volume of Polyethylene v_e/V.

The values of $\bar{v}_e /V$ obtained from the thermodynamical curves are plotted on the graph against $\log (K''''t + 1)$. As a result, there is obtained a straight line, where K'''' equals 0.001, identical to K''.

There is a slope on the lower part of the curve. An analogous phenomenon was also discovered by Charlesby $\underline{/8/}$ in his investigation of irradiated crosslinkage of rubber by the method of the modulus of elasticity. Charlesby related this to the effect of end chains and involvement between the chains during a small degree of crosslinkage.

From all the foregoing, it follows that the experimental result have good coincidence with the kinetic exposition in the final period, as well as in the initial.

Conclusions

In utilizing benzophenone as a sensitizer, the process of photosensitized crosslinking of polyethylene may be divided into an initial and final period depending on whether automatic light filtering effect plays an important role. The rate of the formation of crosslinked macromolecules in the initial and final periods obtained by the kinetic exposition coincides with experimental results of the change inthe physicomechanical properities of polyethylene after crosslinking.

1. In the initial period, when the automatic light filtering effect does not affect the photolytic process of the sensitizer, during complete absorption of the incident light, the degree of crosslinkage is linearly dependent on the irradiation period.

2. In the final period, when the automatic light filtering effect has a considerable influence on the photolytic process of the sensitizer, the degree of crosslinking is a certain logarithmic function of the irradiation period $\ln(Kt +1)$ outside of the relation that the automatic light filtering effect occurs at the expense of the photolytic products of the sensitizer or in view of the formation of unsaturated polymers.

3. It was observed that destruction occurs simultaneously with the process of photosensitized crosslinking. Photosensitized crosslinking occurs, primarily, between macromolecules with comparatively large molecular weight.

Bibliography

1. Liang Ying-ch'iu, Wang Hsia-yu, Fan Ch'ui-ch'ang, Chiang Ping-cheng, and Ch'ien Pao-kung, "Ultra-Violet Induced Crosslinkage of Poly-ethylene in the Presence of a Sensitizer," Scientia Sinica, Vol 11, No 7, Jul 62, pp 903-916

2. Charlesby, A., Atomic Radiation and Polymers, 172 Pergammon, London, 1960, p 533

3. Flory, P. J., Principles of Polymer Chemistry, Cornell University, New York, 1953, Chapter 13

4. Harris, I., Journal of Polymer Science, Vol 8, 1952, p 353

5. Trementozzi, Q. A., Journal of Polymer Science, Vol 23, 1957, p 887

6. Epstein, L. M., Journal of Polymer Science, Vol 26, 1957 p 399

7. Oakes, W. G., and Richards, R. B., Journal of the Chemical Society, 1949, p 2929

List of Graphs

MATHEMATICAL AND PHYSICAL SCIENCES

STUDY ON DIRICHLET'S PROBLEM -- Peiping, Scientia Sinica, Vol 11, No 11, Nov 62, pp 1475-1479

[The following is a full translation of the Russian--language article "Necessary and Sufficient Conditions for Uniqueness of Dirichlet's Problem on the System of Elliptic Equations of the Second Order With Constant Coefficients." The coauthors are Ting Hsia-hsi (0002/1115/3971) of the Institute of Mathematics, Chinese Academy of Sciences; Ma Ju-nien (7456/3067/1819), affiliated with Chung-shan University Journal; Wang K'ang-t'ing (3769/1660/1694) of the South-China Engineering College; and Chang T'uang 91728/0681) of the Institute of, Chinese Academy of Sciences. A resume of this article was published in Science Record, Vol 3, No 4, 1960.]

1.

Let us examine the system of the equation

$$Lu = A \frac{\partial^2 u}{\partial x^2} + 2 B \frac{\partial^2 u}{\partial x \partial y} + C \frac{\partial^2 u}{\partial y^2} = f, \qquad (1)$$

where A, B and C are second order matrices whose elements are real constants, and u and f are two-dimensional vectors with components which are real functions.

Assume that system (1) is elliptic in the sense of I. G. Petrovskiy [1]. That is, for any real number the characteristic polynomial

$$P(\lambda) \equiv \det | A + 2 B + C \lambda^2 | \neq 0. \qquad (2)$$

In this work we shall examine the uniqueness of Dirichlet's problem in any closed limited region. At the same time, we shall note that such a problem is actually applied, for instance, in the theory of plane elasticity [2].

A. V. Bitsadze [3] pointed out an example indicating that the condition of ellipticity is not sufficient for the given problem.

M. I. Vishik $/4/$ proved that determination of the symmetrical part (denoted by $M(L)$) of the matrix $A + 2B\lambda + C\lambda^2$ for any real λ is a sufficient condition for the proposed problem. He called it the condition of strong ellipticity. However, as A. V. Bitsadze $/3/$ pointed out, strong ellipticity is still not a necessary condition.

Professor Hsing-mon [sic] proved that the condition

$$\det|A + 2Bb + Cc| > 0, \quad (\text{при } b^2 < c), \qquad (3)$$

where b and c are arbitrary real numbers, being necessary for the uniqueness of Dirichlet's problem in any limited region, formed by closed curves of the second order, and posed the hypothesis that the given condition is also sufficient. We proved this hypothesis under his direction.

In the process of completing this work, we noted that Vishik $/4/$ had an analogous hypothesis. However, he proved his only in the case when A, B, and C all have the form $\begin{pmatrix} \lambda - \mu \\ \mu \ \lambda \end{pmatrix}$.

2.

Analyses and Proof

1. Necessity of Condition (3).

The uniqueness of the solution is the equivalent of the uniqueness of the zero solution of a similar problem.

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Let us examine a closed curve of the second order on a plane:

$$x^2 + 2bxy + cy^2 - 1 = 0. \quad (b^2 < c)$$

Let

$$u = \mu(x^2 + 2bxy + cy^2 - 1),$$

where μ is a two-dimensional constant vector, which is to be determined.
Obviously,

$$Lu = (A + 2Bb + Cc)\mu,$$
$$u/\Gamma \, n|_{\Gamma} = 0 = 0.$$

From the uniqueness of the zero solution of a similar problem, there
immediately emerges the fact that condition (3) is necessary.

2. Let us transform system (1) into the canonical form.

If the characteristic polynomial of system (1)

$$P(\lambda) \equiv |c|(1 + \lambda^2)(k^2 + \lambda^2), (k^2 > 0), \qquad (4)$$

we shall then call the system normally elliptic. Comparing the coefficients
on both sides of (4), we obtain the following equivalent conditions:

(i) $|A| = k^2|C| > 0$
(ii) $|A + B| = |A| + |B|$
(iii) $|C + B| = |C| + |B|$ $\qquad (4')$
(iv) $|A - C| = 4|B|.$

It is known from algebra that system (1) is transformed into the
canonical form by the nondegenerate linear transformation of the arguments.
Subsequently, we shall propose that system (1) already has a canonical form,
i.e., it satisfies the conditions (4').

3. The connection of the conditions of ellipticity (2) with condition (3).
When $\dot{B} \leq 0$, and by using the conditions (4')— (ii), (iii), we have

$$|A + 2Bb + Cc| = |A + Cc| + 4b^2|B|$$
$$\geq |A + Cc| + 4c|B| \quad (b^2 < c)$$
$$= |A + 2B\sqrt{c} + Cc|.$$

Therefore, condition (3) is contained in the condition of ellipticity(2).

When $B > 0$, condition (3) is independent of condition (2) and

equivalent to the following condition:

$$|A + Cc| > 0. \quad (C > 0)$$

4. When $B| > 0$, we denote

$$K = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} B^{-1}.$$

After multiplying both sides of system (1) at K, it is transformed into a system of strong ellipticity. Thus, the uniqueness is proven. In fact, in this case, we have

$$KB = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}, \quad .$$ According to conditions (4')—(ii) and (iii), KA and KC must be symmetrical. Therefore

$$\det|M(KL)| = |KA + KC\lambda^2| = \frac{1}{|B|}|A + C\lambda^2| > 0.$$

5. When $|B| < 0$, we denote

$$K = \begin{pmatrix} \begin{vmatrix} a_{11} & a_{21} & a_{22} \\ b_{11} & b_{21} & b_{22} \\ c_{11} & c_{21} & c_{22} \end{vmatrix} & \begin{vmatrix} a_{11} & a_{12} & a_{21} \\ b_{11} & b_{12} & b_{21} \\ c_{11} & c_{12} & c_{21} \end{vmatrix} \\ \begin{vmatrix} a_{12} & a_{21} & a_{22} \\ b_{12} & b_{21} & b_{22} \\ c_{12} & c_{21} & c_{22} \end{vmatrix} & \begin{vmatrix} a_{11} & a_{12} & a_{22} \\ b_{11} & b_{12} & b_{22} \\ c_{11} & c_{12} & c_{22} \end{vmatrix} \end{pmatrix}$$

KLu will also be a system of strong ellipticity. Indeed, it is easy to see in this case that KA, KB, and KC are symmetrical, Thence, according to (4), it is possible to compute

$$|K| = -|B|[(|A| + |C| - 4|B|)^2 - 4|A||C|] > 0.$$

Therefore

$$\det|M(KL)| = |K||A + 2B\lambda + C\lambda^2| > 0.$$

6. In the case $|B| = 0$, without loss of generality and to simplify the calculations, consider that $C \simeq 1$. Thus, the following three terms are possible:

(a) $b_{ij} \neq 0 (i, j = 1, 2)$

We shall prove that the zero solution is unique for a similar problem. Let $K = B \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$

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Thence, by virtue of the fact that KB is a zero matrix, and $KA = \delta K$, where δ is a characteristic root of A,

$$KL_u \equiv \left(\delta \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) Ku = 0,$$

we have $\qquad\qquad Ku = 0$.

After calculating by using this relationship, the original system is transformed to

$$\left(\delta \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) u = 0.$$

Hence we obtain that $u = 0$.

(b) $\widetilde{b_{12}} \neq 0$ (или $b_{21} \neq 0$).

In this case

$$A = \begin{pmatrix} a_{11} & a_{12} \\ 0 & a_{22} \end{pmatrix}, \quad B = \begin{pmatrix} 0 & b_{12} \\ 0 & 0 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

whereby

$$a_{11} + a_{22} > a_{11}a_{22} > 0.$$

Thus, obviously, $u = 0$.

(c) $b_{ij} = 0 \, (i, j = 1, 2)$.

If $\left[a_{12}a_{21} = 0\right]$ then, by analogy to condition (b), we shall obviously have $u = 0$.

If $\left[a_{12}a_{21} \neq 0\right]$ then we denote

$$K = \begin{pmatrix} 2a_{21} & a_{22} - a_{11} \\ a_{22} - a_{11} & 2a_{12} + \dfrac{(a_{22} - a_{11})^2}{a_{21}} \end{pmatrix}.$$

Thence, KA and KC are symmetrical and

$$|K| = (|A| - 1)^2.$$

Therefore,

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When $/A/= 1$, KLu is a strong ellipticity.

When $/A/=1$, we have KA=K. Discussions analogous to case (a) lead to u=0.

Bibliography

1. Petrovskiy, I. G., "Sur l'Analyticite des Solutions des Systems d'Equations Differentielles," Mathematics Handbook, Vol 5, No 47, 1939, pp pp 3-70

2. Muskhelishvili, N. I., Certain Basic Problems in the Mathematical Theory of Elasticity, Moscow-Leningrad, 1954, Chapter 2, p 40

3. Bitsadze, A. V., Mathematical Successes (published in Chinese), Vol 4, No 3, 1958, 321

4. Vishik, V. I., Mathematics Handbook, Vol 29, No 71, 1951, p 615

PROMINENT ASTRONOMER DISCUSSES HIS LIFE -- Peiping, Kuang-ming Jih-pao, 21 Nov 62, p 2

Chang Yu-che (1728/6877/0772), president, Purple Mountain Observatory was re-elected chairman of the board of directors, Chinese Astronomy Society, at the 1962 conference of the Chinese Astronomy Society. Chang presented a report entitled " Observations of Seven Variable-Brightness Asteroids" at this conference.

Chang, now 60 years old, discovered his first asterioid in 1928 while studying abroad; it was asteroid No 1125, named by him "Chung-hua No 1" (China No 1). Before turning to astronomy, Chang studied mechanics and architecture while abroad. He returned to China in 1932 and taught at a university. While waiting to go to Purple Mountain, the advance of the Japanese forces in World War II drove him to K'un-ming and later to Chungking and Ch'eng-tu.

During 1941, Chang went to Kansu Province to observe a solar eclipse. After World War II, he went to the US to study. In May 1948, he left the Aleutian Islands for India to observe a solar eclipse. Chang returned to China as a member of a delegation from the American Physical Society that was visiting Chekiang Province.

Since his return, Chang has been studying asteroids at Purple Mountain Observatory, using their 60-centimeter reflecting telescope that was restored after the liberation. Since then, Chang and his fellow workers have discovered 31 asteroids, naming them Purple Mountain No 1-31."

In addition to works on astronomy, Chang's bookshelf contains many works by classical Chinese authors.

DIFFICULTIES OVERCOME BY PHYSICS DEPARTMENT, CHUNG-SHAN UNIVERSITY --
Peiping, Kuang-ming Jih-pao, 4 Dec 62, p 2

At the beginning of the present school year, the Physics Department, Chung-shan University, decided to raise its standards in the instruction of new students because the new students' records were better than those of past students. This gave rise to certain difficulties, for example: students in the difficult course, "Higher Mathematics," which meets eight times each week were also assigned 30 required outside topics. The students encountered difficulties in fulfilling these stringent requirements. The instructors formed a special team to study the problem; an assistant professor told them they ought not disregard the abilities of the students in seeking to improve the quality of instruction. As a result, the instructors slowed the pace of their teaching; for instance, the difficult topic of "vector quantities," in the "Higher Mathematics" course, was dealt with in two separate lecture periods.

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MISCELLANEOUS

ENROLLMENT INCREASED AT CHINA PEOPLE'S UNIVERSITY -- Peiping, Kuang-ming
Jih-pao, 4 Dec 62, p 2

Five thousand new students were enrolled this year at China People's
University. This is 2 1/2 times the number enrolled previously. The
students came from Peiping, Hopeh, Shantung, Shansi, Liaoning, and
Kiangsu provinces, as well as from Inner Mongolia.

STATE COUNCIL MAKES FURTHER APPOINTMENTS -- Peiping, Jen-min Jih-pao,
29 Nov 62, p 2

On 17 November 1962, the 121st Session of the State Council appointed
Chang Tzu-kao (1728/1311/7559), Chao Sang-hsiung (6392/6078/3574), Kao I
(7559/3085), and Li Shou-tz'u (2621/1108/1964) vice-presidents of Tsinghua
University.

PEIPING TEACHERS UNIVERSITY INDOCTRINATES INSTRUCTORS -- Peiping, Kuang-ming
Jih-pao, 4 Dec 62, p 2

At present, Peiping Teachers University has almost 800 teaching
personnel studing at Marxist-Leninist Spare-Time University, where they
are receiving political instruction. In addition to young instructors and
general cadres, the students of this spare-time university include older
instructors. The president of Marxist-Leninist University is Ma Chien-man
(7456/1696/3046), who is also deputy party secretary and vice-president
of Peiping Teachers University.

CONFERENCE ON EDUCATIONAL FILMS OPENED -- Peiping, Kuang-ming Jih-pao,
18 Nov 62, p 2

The National Scientific Educational Film Conference recently convened
in Peiping under the auspices of the Ministry of Culture and the National
Scientific and Technological Commission. The purpose of the conference
is to increase dissemination of scientific knowledge, particularly in the
field of agriculture, and to draw up plans for 1963. At present, over
500 persons work in Peiping or Shanghai in either of the two scientific
educational film studios or the agricultural film society. It has been
estimated that total film attendance up to 1961 was in excess of 3 billion
persons.

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Some of the films made in the past few years are as follows: "Group Treatment of the Paddy Rice Pest Schoenobius bipunctifer," "Lung Removal," and "Direct-Vision Repair of the Heart's Ventricular Septum Under Low-Temperature Conditions."

Scientists participate directly in the preparation of many scientific filsm. Mathematician Hua Lo-keng (5478/5012/1649) has participated in films dealing with linear planning. Instructors from Tsinghua University and East China Textile Engineering College organized a special team to participate in the preparations of the film "Profile Reading on Profile graphs."

SCIENTIFIC AND TECHNOLOGICAL SYMPOSIA HELD IN TIENTSIN -- Peiping, Kuang-ming Jih-pao, 3 Dec 62, p 2

During September-November 1962, over 400 symposiums were held in Tientsin; over 1,000 scientific and technological specialists attended. In addition, representatives of various municipal executive committees such as the Tientsin Municipal Scientific and Technological Committee, attended these symposiums in order to listen to the opinions of these scientists and technicians. The main emphasis of the symposiums was production trends.

Among the topics discussed were improving the properties of polyethylene chloride plastic products. Small-scale electrical machinery for use in agriculture was the main topic of the electrical machinery conferences.

Also stressed was scientific research in support of agriculture in such fields as water conservancy, soil improvement, plant protection, and tool use. Yang Shih-hsien (2799/4258/0341), a chemist and president of Nan-k'ai University, expressed several important opinions on approaches to developing the basic resource base of the chemical industry and increasing the supply of agrochemicals. Chang Kuo-fan (1728/0948/5642), a physicist and vice-mayor of Tientsin, as well as being chairman, Tientsin Municipal Society of Science and Technology, played an active part in the symposiums as did P'an Ch'eng-hsiao (3382/2110/1321), a mechanical engineer and president of Tientsin Engineering College.

SCIENTIFIC AND TECHNICAL CONFERENCES HELD IN CHUNGKING -- Peiping, Kuang-ming Jih-pao, 7 Dec 62, p 2

So far during 1962, nine large-scale or medium-scale scientific and cultural special reports, lectures, and symposiums have been held in Chungking. Topics for special report conferences included "rockets

and Satellites." Symposiums were held on "How Drugs Are Compounded."
Pharmaceutical and public health groups have been invited to hold symposiums
on the marketing of medicinal materials and to report on the national con-
ferences on hepatitis and cervical camcer.

CONFERENCE ON STANDARDIZATION CLOSES -- Peiping, Kuang-ming Jih-pao,
20 Nov 62, p 3

The seventh session of the conference of delegates of standardization
organizations of socialist countries closed in Peiping on 18 November 1962,
after 7 days of discussions. During the conference, standards were set
in some fields, experiences in standardization were exchanged, and plans
for the future were discussed. The conference was attended by delegates
from Albania, Bulgaria, Hungary, the GDR, China, the Democratic People's
Republic of Korea, Mongolia, Poland, Rumania, the Soviet Union, and
Czechoslovakia. Delegates from the Democratic Republic of Vietnam and
Cuba were present as observers.

POLISH HYDRAULIC ENGINEERING DELEGATION ARRIVES IN PEIPING -- Peiping,
Jen-min Jih-pao, 7 Nov 62, p 5

A three-man Polish Hydraulic Engineering Delegation, led by Chief
of the Polish Water Conservancy Bureau Ko-lo-hu-erh-ssu-chi [Chinese
transliteration] arrived in Peiping by plane, on 5 November 1962 to
visit China, at the invitation of the Chinese M$_1$nistry of Water Con-
servancy and Electric Power.

SCIENTIFIC DELEGATION FROM HUNGARY ARRIVES IN CHINA -- Peiping, Jen-min
Jih-pao, 3 Dec 62, p 3

A Hungarian scientific and technological delegation, lead by Laslo
Feldi, First Vice-Minister of Light Industry, arrived in Peiping on
2 December 1962. The delegation will attend the seventh meeting of the
Sino-Hungarian Commission for Scientific and Technological Cooperation.
Lo is Vice-Minister of Light Industry and chairman of the Chinese section
of the committee.

CHINESE SCIENTIFIC DELEGATION RETURNS FROM ALBANIA -- Peiping, Jen-min
Jih-pao, 4 Dec 62, p 4

The Chinese scientific delegation that, under the leadership of
Chou P'ei-yuan (0719/1014/3293), department committee member in the
Chinese Academy of Sciences, had been in Albania in order to attden a
conference of Albanian specialists left Tirana for China on 1 December
1962. The delegation had been in Albania 3 weeks.

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EDUCATIONAL LEVEL OF HO-CHE MINORITY NATIONALITY IMPROVED -- Peiping,
Kuang-ming Jih-pao, 30 November 62, p 2

The Ho-che is one of the smallest minority nationalities in China.
Over 50 years ago they numbered around 2,000 persons; by the time of the
revolution, their numbers had dwindled to somewhat over 300 persons. At
present, their population is more than doubled the population prior to the
liberation, due to efforts to raise their level of education and public
health. Some Ho-che are now physicians, teachers, and university students.
At least one is at Ch'i-ch'i-ha-erh Teachers Junior College.

BIOGRAPHIC INFORMATION

/The following biographic information on selected Chinese Communist scientific and technical personnel was taken from sources cited in parentheses./

CHANG Fu-chu; author of article, "Use of Anionite for Determining Available Phosphates in Soils," in Russian. (Moscow, Pochvovedeniye, No 10, Oct 62, pp 101-104)

CHANG Kuang-yin; author of article, "Observation of the Dispersion Effect of Reflection Bands in CdS Crystals," in Russian. (Leningrad, Academy of Sciences USSR, Optika i Spektroskopiya, Vol 13, No 5, Nov 62, pp 701-707)

CHANG Po-sheng (1728/0130/5116), professor, Northwest University; author of an article, "The Mosaic Structure of the Earth's Crust," (Peiping, Kuang-ming Jih-pao, 11 Dec 62, p 2)

CHANG Sheng, Moscow State University; author of dissertation for the scientific degree of Candidate of Biological Sciences," Maintenance and Migration of Boron, Iodine, Vanadium, Chrome, Magnesium, Cobalt, Nickel, Copper, and Zinc in Certain Soils, Plants, and Natural Waters in the Steppe Landscape of the USSR and of the People's Republic of China," in Russian. (Moscow, Vechernyaya Moskva, 15 Nov 62, p 4)

CHAO Te-chen (6392/1795/5271)
LI Shih-o (2621/1102/6166)

 Both of the Department of Biochemistry, Institute of Experimental Medicine, Chinese Academy of Medical Sciences, Peiping; coauthors of article, "Some Properties of Phosphate-Activated Glutamisase in the Thymus and Thymo-Lyphosarcoma and the Inhibitory Effects of Synthetic Glutamine Derivatives to the Enzyme Activity," received for publication on 24 October 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao /Acta Biochimica et Biophysica Sinica/, Vol 2, No 1, Mar 62, pp 49-57)

CH'EN Hsieh-ch'ang, Mathematics Institut, Moscow; author of dissertation for the scientific degree of Candidate of Mathematical Sciences defended on 6 April 1961, "On the Completeness of the System of Functions $\{z^\prime \log z\}$ on Curves and in Regions of Complex Plane," in Russian. (Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 5, Sep/Oct 62, p 209)

CHEN K'o-ming, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; coauthor with V. A. Chuenkov of article, "On the Proceeding of Breakdown in Semiconductors," in Russian. (Moscow, Akademiya Nauk SSSR, Fizika Tverdogo Tela, Vol 4, No 11, Nov 62, pp 3054-3064)

CH'IU Kuo-hsiung (6726/0948/7160)
YIN Hung-chang (3009/1347/4545)

    Both of Institute of Plant Physiology, Chinese Academy of Sciences, Shanghai; coauthors of article, "Studies on Photophosphorylation, III. Photophosphorylation of Chloroplasts in Flashing Light," received for publication on 26 December 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 67-74)

CHU Tse-ming
HAO Ch'eng-chang
TUNG K'uei-t'ang

    All affiliated with the Ch'ang-ch'un Institute of Vaccine and Serum; coauthors of article, "Incidence of Asiatic Influenza Type A2 During 1957-1960," in Russian. (Moscow, Zhurnal Mikrobiologii, epidemiologii, I Immunobiologii, No 12, Dec 62, pp 19-22)

CHU Yu-t'ung, Institute of Petrochemical and Gas Industry imeni I. M. Gubkin; coauthor with V. D. Ryabov and V. L. Weiser of article, "Interaction of Toluene With Phenylacetylene," in Russian. (Moscow, Doklady Akademii Nauk SSSR, Vol 147, No 3, 21 Nov 62, pp 639-642)

FANG Cheng-san, professor, Institute of Geography, Chinese Academy of Sciences, Peiping; author of article, "Erosion on China's Loess Plateau," in Russian. (Moscow, Priroda, No 11, Nov 62, pp 107-109)

HSIAO Li, Laboratory of Biochemistry of Hormones and Hormonal Regulation, Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR; author of article, "Effect of ACTH and Reduced Triphosphopyridine-Nucleotide on the Biosynthesis of Androgenes and Corticosteroids in the Adrenal Glands," in Russian, (Moscow, Problemy Endokrinologii i Gormonoterapii, Vol 8, No 6, Nov/Dec 62, pp 17-22)

HSING Tieh-wei, Moscow State University; author of dissertation, "Mineralogical Composition of Finely Dispersed Soil Particles on the Northern Slope of the Tien Shan in China," in Russian. (Moscow, Vechernyaya Moskva, 15 Nov 62, p 4)

HSU Ching-hua (1776/0079/5478), Institute of Biochemistry, Chinese Academy of Sciences, Shanghai; author of article, "The Negentropy Intake of Biological Systems (As Shown by the Problems of Protein Nutrition)," received for publication on 4 October 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao /Acta Biochimica et Biophysica Sinica/, Vol 2, No 1, Mar 62, pp 11-20)

HSU Lieh-t'ien; author of article, "State of Surgery for Diseases of the Heart and Vessels in China," in Russian. (Moscow, Grudnaya Khirurgiya, No 2, Mar/Apr 62, pp 31-34)

HU Kuo-ting; author of article, "On Information Quantities," in Russian. (Moscow, Akademiya Nauk SSSR, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 7, No 4, 26 Oct 62, pp 447-455)

HUANG Hua-min, Moscow State University; coauthor with N. P. Shusherina And R. Ya. Levina of article, "δ -Lactones and δ-Lactams. 29. Catalytic Cycloisomerization of δ -Ketonitriles in 3.4-Dihydropyridone-2," in Russian. (Moscow, Zhurnal Obshchey Khimii, Vol 32, No 11, Nov 62, pp 3599-3601)

HUANG Wen-ch'i, Candidate of Agricultural Sciences imeni V. I. Lenin; coauthor with Academician I. V. Larin of article, "Increase in Yields on Complex Solonets Pastures in Semideserts Upon Application of Mineral Fertilizers," in Russian. (Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, No 11, Nov 62, pp 64-67)

KUO K'ai; coauthor with F. L. Litvin of article, "Undercutting of Circular Bevel Gears," in Russian. (Moscow, Stanki i Instrument, No 11, Nov 62, pp 31-34)

LANG Chang-hsin, Moscow Institute of Petrochemical and Gas Industry imeni I. M. Gubkin; author of article, "On Determining Filtration Resistances During Nonstationary Filtration of Gas," in Russian. (Baku, Izvestiya Vysshikh Uchebnykh Zavedeniy, Neft' i Gaz, No 11, Nov 62, pp 47-52)

LI Li (2621/0500), president, Chungking Ferrous Metallurgy Design Academy (Hei-se Yeh-chin She-chi Yuan; 7815/5331/0396/6855/6080/6060/7108), Ministry of Metallurgical Industry; died 1 December 1962. (Peiping, Jen-min Jih-pao, 4 Dec 62, p 6)

LIU Yu-t'ang; author of article, "Influence of Beryllium and Other Bivalent Cations on Certain Intermediate Reactions of Glycolysis," in Russian. (Moscow, Voprosy Meditsinskoy Khimii, Vol 8, No 4, Apr 62, pp 392-395)

LU P'ing (7120/1627), president, Peiping University; gave an address, "December Ninth," to the students and teachers of the university. (Peiping, Kuang-ming Jih-pao, 10 Dec 62, p 2)

LU Yang (7120/3152), Wuhan Hydraulic Engineering and Electric Power College; author of an article, "Concentrating on Lectures." (Peiping, Kuang-ming Jih-pao, 8 Dec 62, p 2)

P'AN Chia-hsiu (3382/1367/4423), Institute of Biochemistry, Chinese Academy of Sciences, Shanghai; author of article, "Some Improvements on the Technique of Qualitative Analysis of Amino Acida, II. Two-Dimensional High-Voltage Electrophoresis and High Temperature Chromatography, Small Paper Chromatography, and Agar-Electrophoresis," received for publication on 5 October 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 27-32)

P'an Chia-hsiu (3382/1367/4423)
HSU Chun-Chieh (1776/0193/2638)
JEN Mei-hsien (0117/2734/6513)

    All of the Institute of Biochemistry, Chinese Academy of Sciences, Shanghai; coauthors of article, "Some Improvements on the Technique of Qualitative Analysis of Amino Acida I. Rapid Hydrolysis and High Temperature Paper Chromatography," received for publication on 5 October 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 21-26)

SHEN Yun-kang (3476/0336/6921)
SHEN Kung-mou (3476/7255/2804)

    Both of the Institute of Plant Physiology, Chinese Academy of Sciences, Shanghai; coauthors of article, "Studies on Photophosphorylation, II. The Light Intensity Effect and the Intermediate Steps of Photophorsphorylation," received for publication on 18 December 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-we Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 59-66)

SU Yu'ch'eng, Moscow State University; author of dissertation for the scientific degree of Candidate of Mathematical Sciences defended on 17 January 1961, "Asymptote of Solutions of Certain Degenerating Quasilinear Hyperbolic Equations of the Second Order," in Russian. (Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 5, Sep/Oct 62, p 209)

TAI An-pang (2071/1344/6721), professor, chairman, Chemistry Department, Nanking University; cited for his achievements which include the coauthoring of a textbook for higher schools on inorganic chemistry. (Peiping, Kuang-ming Jih-pao, 10 Dec 62, p 2)

T'AN Jun-sheng (6223/3387/3932)
YEN Fu (0917/4395)
LI Shih-o (2621/1102/6166)

all of Department of Biochemistry, Institute of Experimental Medicine, Chinese Academy of Medical Sciences, Peiping; coauthors of article, "Activities of Phosphate-Activated Glutaminase in Tumour Tissues," received for publication on 24 October 1961. (Peiping, Sheng-wu Hsua-hsueh yu Sheng-wu Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 41-48)

T'AN Man-ch'i, Biological-Soil Faculty, Moscow State University; coauthor with Yu. A. Vladimirov and F. F. Litvin of article, "On the Problem of the Role of Excited Conditions and Nature of Ultraweak Luminescences in Biological Systems," in Russian. (Moscow, Akademiya Nauk SSSR, Biofizika, Vol 7, No 6, Nov/Dec 62, pp 675-682)

T'AO Li-t'eng, author of article, "On ehe Problem of Calculating and Recalibrating Measuring Diagrams for Automatic Bridges," in Russian. (Moscow, Priborostroyeniye, No 11, Nov 62, pp 8-9)

T'AO Tsung-chin (7118/1350/2516)
TSAI Hai-liang (6528/3189/2733)
LI Ts'ai-hung (2621/2088/3163)
CH'IEN Li (6929/0500)
WANG Ju-t'ang (3769/1172/2768)

All of the Institute of Biochemistry, Chinese Academy of Sciences, Shangai; coauthors of an article, "A Simple Fraction Collector," received for publication on 23 October 1961. (Peiping, Sheng-wu Hua-hsueh yu Sheng-wu Wu-li Hsueh-pao, Vol 2, No 1, Mar 62, pp 75-78)

TS'UI Meng-yuan, Institute of Physical Chemistry, Academy of Sciences USSR; coauthor with V. V. Azatyan and A. B. Nalbandyan of article, "Determination of the Rate Constant of Reaction Between Atomic Oxygen and Ethane," in Russian. (Moscow, Doklady Akademii Nauk SSSR, Vol 147, No 2, 11 Nov 62, pp 361-364)

WANG Chih-ta; author of article, "Approximation Method for Calculating the Dynamics of Free-Piston Gas Generators," in Russian. (Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 5, May 62, pp 112-123)

WANG Shou-ju, All-Union Scientific Research Institute of Viticulture and Wine Making,"Magarach," Yalta; author of article, "A Physiological Characteristic of Drought Resistance of Some Varieties of Grape," in Russian. (Moscow, Akademiya Nauk SSSR, Fiziologiya Rasteniy, Vol 9, No 6, 5 Nov 62, pp 70C-711)

WU Chung-wei (0702/0022/0251); author of an article, "Independent Experimenting, Abstracting, and Hypothesizing." (Peiping, Kuang-ming Jih-pao, 4 Dec 62, p 2)

WU Hua-mo; author of article, "Asymptote of Numerical Solution of Cauchy Problem for One Quasilinear Equation of the First Order," in Russian. (Moscow, Akademiya Nauk SSSR, Zhurnal Vychislitel'noy Matematiki i Matematicheskoy Fiziki,: Vol 2, No 6, Nov/Dec 62, pp 1114-1117)

WU Mei-yen; coauthor, with T. Zharova and Z. A. Rogovin, of an article, "Synthesis of Cellulose Esters With Methylphosphinic Acid," in Russian. (Moscow, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1820-1824)

YANG Ch'ung-shih (2799/1504/1395), director, Support Laboratory, Tientsin Municipal Institute of Vegetables; conducting research on pest and disease control. (Peiping, Kuang-ming Jih-pao, 26 Nov 62, p 2)

* * *

7 September 2004

Ms. Roberta Schoen
Deputy Director for Operations
Defense Technical Information Center
7725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

Nancy Dotacsa for

Sergio N. Alcivar
Chief, CIA Declassification Center,
Declassification Review and Referral
Branch

Enclosures:
1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)

Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	Fldr	Doc	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date
AD0335308	78-03117A	194	1	23	4363	Scientific Information Report Chemistry And Metallurgy (26)	3/7/1963	71	Approved For Release	3/25/2004
AD0335625	78-03117A	197	1	3	4460	Scientific Information Report Chemistry And Metallurgy (27)	4/4/1963	51	Approved For Release	3/25/2004
AD0336825	78-03117A	199	1	26	4562	Scientific Information Report Chemistry And Metallurgy (28)	5/9/1963	70	Approved For Release	3/25/2004
AD0332150	78-03117A	183	1	5	3916	Scientific Information Report Chinese Science (11)	10/4/1962	52	Approved For Release	3/29/2004
AD0332434	78-03117A	183	1	40	3951	Scientific Information Report Chinese Science (12)	10/19/1962	59	Approved For Release	3/29/2004
AD0332795	78-03117A	184	1	37	3988	Scientific Information Report Chinese Science (13)	11/5/1962	48	Approved For Release	3/29/2004
AD0333069	78-03117A	186	1	7	4028	Scientific Information Report Chinese Science (14)	11/16/1962	30	Approved For Release	3/29/2004
AD0333148	78-03117A	187	1	19	4078	Scientific Information Report Chinese Science (15)	11/29/1962	44	Approved For Release	3/29/2004
AD0333835	78-03117A	189	1	6	4144	Scientific Information Report Chinese Science (16)	12/21/1962	65	Approved For Release	3/29/2004
AD0334108	78-03117A	190	1	2	4179	Scientific Information Report Chinese Science (17)	1/10/1963	56	Approved For Release	3/29/2004
AD0334105	78-03117A	191	1	12	4230	Scientific Information Report Chinese Science (18)	1/18/1963	25	Approved For Release	3/29/2004
AD0334378	78-03117A	192	1	21	4277	Scientific Information Report Chinese Science (19)	2/1/1963	27	Approved For Release	3/29/2004
AD0334433	78-03117A	193	1	22	4322	Scientific Information Report Chinese Science (20)	2/15/1963	28	Approved For Release	3/29/2004
AD0335021	78-03117A	194	1	37	4377	Scientific Information Report Chinese Science (21)	3/8/1963	59	Approved For Release	3/29/2004
AD0335847	78-03117A	198	1	33	4526	Scientific Information Report Chinese Science (22)	4/18/1963	61	Approved For Release	3/29/2004
AD0336327	78-03117A	200	1	3	4578	Scientific Information Report Chinese Science (23)	5/2/1963	68	Approved For Release	3/29/2004
AD0337167	78-03117A	201	1	26	4643	Scientific Information Report Chinese Science (24)	5/23/1963	95	Approved For Release	3/29/2004
AD0337777	78-03117A	202	1	27	4687	Scientific Information Report Chinese Science (25)	6/6/1963	52	Approved For Release	3/29/2004
AD0338474	78-03117A	203	1	27	4727	Scientific Information Report Chinese Science (26)	6/20/1963	83	Approved For Release	3/29/2004
AD0338687	78-03117A	204	1	32	4772	Scientific Information Report Chinese Science (27)	7/5/1963	80	Approved For Release	3/29/2004
AD0339386	78-03117A	206	1	4	4820	Scientific Information Report Chinese Science (28)	7/17/1963	32	Approved For Release	3/29/2004
AD0339147	78-03117A	207	1	11	4862	Scientific Information Report Chinese Science (29)	7/30/1963	48	Approved For Release	3/29/2004
AD0340927	78-03117A	208	1	35	4924	Scientific Information Report Chinese Science (30)	8/21/1963	53	Approved For Release	3/29/2004
AD0341855	78-03117A	209	1	43	4974	Scientific Information Report Chinese Science (31)	9/5/1963	46	Approved For Release	3/29/2004
AD0342464	78-03117A	210	1	38	5013	Scientific Information Report Chinese Science (32)	9/16/1963	43	Approved For Release	3/29/2004
AD0342608	78-03117A	211	1	36	5054	Scientific Information Report Chinese Science (33)	9/27/1963	41	Approved For Release	3/29/2004