ABSTRACT

Title of Thesis: The influence of Lysenkoism on China's genetics: the importance of the 1956 Qingdao Symposium

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In 1956, prompted by Mao Zedong himself, the Qingdao symposium was convened to bring together scientists with training in "Morgan-Mendel" genetics and scientists following the Michurin school. The effects of government policy to this time had excluded the mostly Western-trained geneticists from sharing their training, their skilled imagination and expertise, in building China's agriculture. Michurin genetics, sponsored by Stalin's support of Lysenko since the 1940s, was based on the hypotheses that environmental influences were primary, including the idea of inheritance of acquired characteristics. A study of Soviet influence is pertinent to understanding the importance of the 1956 Qingdao symposium. Doubts were already being voiced in China concerning the validity and sincerity of Soviet dictates and the quality of the advice being given in several realms of Soviet influence. This essay focuses on this event, which introduced a time of free discourse between these two ways of defining how to improve agricultural production, the Morgan-Mendel and the Michurinist.

The influence of Lysenkoism on China's genetics: the importance of the 1956 Qingdao symposium

by

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Thesis submitted to the Faculty of the Graduate School of the University of Maryland in partial fulfillment of the requirements for the degree of Master of Arts

1993

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I. Introduction

In the nine months of September 1971 to June 1972 I was in the People's Republic of China with a group of young Americans on a work-study trip, as guests of the Chinese government and people. A pivotal experience for me was exposure to the self-reliance and hard work practiced by the peasants of Dazhai Commune.[1] The peasants of China had been instructed by Mao Zedong in the early 1960s to "in agriculture, learn from Dazhai." I found that I too had a great deal to learn from Dazhai.

A hope expressed by my father, prior to my departure, was that I might meet his old friend from graduate school, C.H. Li (Ching Hsiung Li; synonymous to: Li Jing Xiong). C.H. Li and my father, Sherret S. Chase both earned their Ph.D.s from Cornell; Li earned his in Botany with a minor in Cytogenetics in 1948, Chase in Botany with first minor in Genetics and second minor in Philosophy in 1947. Both my father and Dr. Li are plant breeders specializing in maize. A wonderful coincidence for me was that Dr. Li had his countryside research station in one of the villages of Dazhai Commune.

In October 1971, C.H. Li was most pleased to meet a child of his good friend. I was invited to visit the village where he had his work and to stay for lunch. We walked in Dr. Li's breeding plot and we walked in the village. We had lunch with two other men of the village in Dr. Li's simple home. They asked me fatherly questions about the life of a teenager.

This visit moved me to consider many things. My perception that there were things I did not know about my father piqued my curiosity! This friend of my father's, a very gentle man, with warm sparkle in his eyes and a firm handshake who was clearly comfortable in this peasant setting, was very interesting. Dr. Li's wife and family lived in Beijing where Dr. Li would return when the harvest was completed. A revelation of the quality of the friendship between Dr. Li and my father was the fact that Dr. Li still carried a photo in his wallet of my eldest sister as an infant, as a memento of this friendship.

What had happened to Dr. Li since his return to China? The momentum of this personal experience guided many of my questions through my sojourn in China.

In spring of 1972, while back in Dazhai for a couple of weeks, I had an opportunity to visit with Dr. Li again. He was in Dazhai Commune to prepare for the

spring planting. Dr. Li responded to my exuberance in a kind and peaceful manner. He was happy to help me to understand what he had the background to answer. I believe that he showed adult wisdom in the face of my youthful enthusiasm. He was proud of me, having followed our group's itinerary. He was aware of the success of our trip toward building understanding and friendship between the Chinese and American people. There were questions Dr. Li did not seem to answer. In retrospect, I understand this better. Dr. Li had a protracted view about the experiences of turmoil in his science. I was brand new to the question and untrained. Today, I am trying to answer these questions myself.

The unanswered questions were related to the experience of Lysenkoism in China. This unique question of interest to me was inspired by my father's career. While in China, I was given an English language copy of Ivan Vladimirovich Michurin's Selected Works;[2] Lysenko claimed his work was in emulation of Michurin. I also read Frederick Engels' "The Part Played by Labour in the Transition from Ape to Man."[3] The thesis of transition of ape to man by means of the requirements of labor revealed a whole new arena of inquiry to my young mind. This expression of Lamarckism greatly intrigued me.

That the big changes in the world are wrought by those who actually sweat out the labor of the world is a very exciting concept to me.

Over these many years I have been compelled to understand this issue from all possible sides, and I have been confident there were more than two sides. I have attempted to develop a personal sense of ownership of the history of genetics, and of the history of mutation theory. The focus of my own driving interest has been understanding of the origin and nature of life. The focus time for this interest in the issue of Lysenkoism in China is the 1956 Qingdao Symposium.

Accomplishments of several of the scientists in this field of genetics are particularly exciting - scientists such as Herman J. Muller, Nicholai I. Vavilov, Sewall Wright, Sergei S. Chetverikov, C.C. Li (Li Ching Chun), and C.H. Li. The historical perception and scholarship of historians E.A. Carlson, William A. Provine, David Joravsky, Bentley Glass, and Laurence A. Schneider have been particularly helpful. The inspiration of my father, S.S. Chase, and C.H. Li has made this inquiry of personal importance. Translation assistance was given by University of Maryland Baltimore County undergraduate Ruby Rong (Chinese name Rong Lu,

listed in the Chinese manner with family name first). My own ability to translate Chinese sources would have been a laborious effort requiring more time than I could find. I hope this research sparks interest in fluent readers of Chinese who may offer additional assessment of this experience in China.

II. Background of Fifty Years of World Genetics

This section is to provide a background picture of how much scientific work and knowledge had accrued internationally in the fifty years prior to the Qingdao Symposium. And it is pertinent to note that this was fifty years of genetic achievements from which the Soviet Union was legally unable to benefit (to be discussed later). Substantial genetics experimentation and evaluation had taken place in the 1920s when "geneticists discovered a way to explain complex characters and individual variations and the tranformation of species, all on the basis of Mendelian concepts."[4]

The specific people I shall focus on are Ivan Vladimirovich Michurin and Trofim D. Lysenko; Thomas Hunt Morgan and Herman J. Muller; and Nickolai Ivanovich Vavilov and Sergei S. Chetverikov.

a. Michurin and Lysenko

I.V. Michurin and T.D. Lysenko really took old folklore as their guidance. Acknowledgment of the

successes of ancient experience and knowledge is important, but stopping with this knowledge degrades the quality of these achievements made in their time. Lysenko used the public's ignorance of science to his advantage.

I.V. Michurin (1850-1935) was born to an impoverished, noble family in the Russian province of Tamov. The Michurin's family wealth was in their orchards. The family raised the fruit to sell for income. The irregular and unstable country economy, the difficult climate, and the family's personal problems added up to failures in the family's efforts to expand their financial possibilities. Michurin was one of seven children, but was the only child to live to adulthood. His mother died of tuberculosis. The unstable father was not able to focus on plans to take his family out of failure. The grandmother tyrannized all members of the family. Michurin had hoped to attend a college-preparatory high school, but was unable to complete the first year of high school (gymnasium). The first paying job Michurin held was as a railroad clerk, then he moved up to signal repairman. Young Michurin was determined to utilize the traditions of gardening with which he had grown up. He was confident that he could overcome the difficulties of the climate and the

economy, and aggressively sought aid for his effort.[5] Intensely driven to improve the fruit trees, in 1888 Michurin quit all other work. He borrowed money to set up a nursery and sold nursery stock to orchardists of central Russia. Michurin had about thirty acres in Tambov, in that time an area of poor and scant land. Boasts of his excellent gardening skills, his ability to select good seedlings, and his ability to initiate and care for successful grafts between fruit trees brought some renown to Michurin's orchard. Potential investors came to visit his orchard and many backed away when they realized the reality of his weed-filled orchard.

Michurin "was convinced...that his practical intuition was the ultimate test of truth."[6] What finally brought favor on Michurin's work was recognition of the value of his plant stock, this recognition followed a visit by N.I. Vavilov in 1920. Michurin's nursery gained "modest support as a breeding station with a staff of seven."[7] Michurin aspired to gain more recognition and easily boasted to the Soviet press which was willing to write him up brightly, as he had recognition through Vavilov of Lenin. In 1925, Michurin was honored as the Father of Apples in the press' celebration of his seventieth birthday.[8]

This aura of Michurin created in the Soviet press

was what appealed to those in China who emulated the Soviet Union. As Michurin assumed the proof of success in his fifty years of experience, he also was generous to those who also assumed his experience to be the truth. Michurin had "the gardener's conviction of the immeasurable diversity and plasticity of living things" whereas scientists considered diversity and plasticity to be measurable.[9] Michurin did not conduct microscopic studies or chemistry studies on his trees. Michurin's perception was that life began with the egg, with subsequent life dependent on what environment in which the egg grew. Michurin "maintained that the transmission of hereditary characters depended on the comparative vigor of the two parents."[10] This belief structure suggests a form of pangenesis,[11] where perfect images of the final individual exist in every cell of the individual.

Lysenkoism is the pseudo-science encouraged and approved by Joseph Stalin (1879-1953) in the Soviet Union from the 1930s until 1956. Scientists in the Soviet Union were hindered from communications with colleagues of other nations. In 1937 Lysenko's agrobiology became politically dominant. The year 1948 saw Lysenkoism become the law, when at the August 1948

Biological Congress of the Lenin Academy of Agricultural Sciences called by Lysenko, Lysenko was able to state that "The Central Committee of the Party examined my report and approved it."[12] Uncompromising Lysenkoism was written into all biological texts from then on. In 1948 Lysenkoism was enacted as law as part of "the great Stalin plan for the transformation of nature."[13] Stalin, as administrator and leader of the Soviet Union, looked to expediency in solving the nation's problems. Lysenko promised a quick increase in the nation's agricultural output and seemed to have some results to match his claims.[14] Approving Lysenko's control of the agricultural genetics program on a national scale in 1948 seemed a way to enforce support from the agricultural scientists, planners, and producers. Lysenko knew where his future was bright, by remaining as much in Stalin's inner circle as he could.[15]

In the context of the turmoil faced by the Soviet Union in the 1930s, quick solutions were unduly attractive. This turmoil included the aggressive rise of Nazism in neighboring Germany to the west, and to the east, efforts to expand by imperial Japan. There were years of Soviet poverty following the horrors and devastation experienced by the Soviet Union during World War I. The resistance to collectivization by the

peasants in the kulaks was considered by Stalin to be justification to use force. And isolation from the world's politically and economically powerful nations magnified Stalin's perception of the Soviet Union's isolation in the world against all "enemies."[16] Stalin, looking for results and being emphatic about retaining personal control over all areas of momentum in solving the nation's needs, was receptive to the claims of Lysenko. Also, Stalin approved Lysenko's battles against the academic circles, because these circles provided power bases separate from Stalin's network. The 1929 speech by Stalin, in which he elevated practice above theory, highlighted the intuitive judgment of those who had proven themselves politically.[17] Lysenko, with grand careerist goals, had packaged his achievements through numerous reports in the popular press to make himself seem the hero.[18]

With the rise of Lysenko as the government favored leader of agricultural genetics, the long, proud, pre-Lysenkoist history of Soviet genetics came to an end as scientists such as Vavilov, A.S. Serebrovskii, N. Kol'tsov, and Chetverikov lost the support they had had. The work of such scientists as Vavilov and Chetverikov required experimentation, evaluation, and verification, and therefore did not always produce quick results. The

results also were presented primarily through scientific journals,[19] so the ordinary public was not fully aware of all the proud achievements in Soviet genetics.

Precursor to Lysenko was the popular agricultural folk hero, Ivan Vladimirovich Michurin who, by using his green-thumb skills at grafting and gardening, had achieved great success with fruit trees. Lysenko insisted that his own work was in emulation of Michurin's accomplishments. This claim was actually a sure way to gain approval and loyalty from the Soviet people, as public perception of Michurin was that he was a comfortable, generous, grandfatherly, grassroots figure who had struggled many years in czarist Russia against great odds to gain support for his fruit tree work, the goal of which was to bring fruit trees to all of Russia's climates.[20] It was with the advent of the Soviet Union that Michurin was encouraged in his work. Michurin's assessment of the base of his agricultural accomplishments was that the environment was the key factor in the unfolding of life. Lysenko considered, in expansion to this, that the environment influences directly resulted in new, desired characters: the inheritance of acquired characteristics.[21] This was as if by shaking up the system of life with the right choice of environment, the desired characteristics would

be displayed.

The famous example of purported success of Lysenkoism was the changing of spring wheat into winter wheat, allowing expansion of the crop to colder temperatures, to colder climates.[22]

As Michurin looked back to ancient routine, T.D. Lysenko (1898-1976) looked to quick solutions, to panaceas. But Lysenko's skill at self-advertisement was his primary asset in his rise in authority. Educated at Kiev Agricultural Institute in the period of the hut lab movement, the Soviet press focused on this "barefoot scientist" early on in 1927.[23] In 1928, Lysenko published his first major article. According to David Joravsky, in this article Lysenko "made a primitive error in statistical reasoning, and he paid almost no attention to the lessons learned by previous investigators."[24] Lysenko responded with embarrassment which he quickly cultivated into angry defiance. The scientific journals were no longer the route by which Lysenko spread his ideas. He resisted any effort to reason statistically and became aggressive in his opposition to the use of statistical analysis. Mathematics terrified Lysenko. Having not had nor accepted training in mathematical concepts, Lysenko

could not comprehend these concepts. When faced with these concepts, Lysenko felt loss of control. Lysenko's solution was to later state that mathematics has no relevance to biology.[25] In 1948, United States geneticist S.C. Harland spoke of his lengthy interview with Lysenko,

> I found him completely ignorant of the elementary principles of genetics and plant physiology. To talk to Lysenko was like trying to explain the differential calculus to a man who did not know his 12-times table.[26]

Lysenko's success came about through the combination of his ability at self-promotion, his boastful claims of quick solutions, and the nation's desperate need for solutions following two years of disastrous losses of wheat, 1928-1929. Lysenko flaunted as his idea the solution of vernalization, the process of soaking then chilling kernels of winter wheat so that winter wheat could be planted for the spring. This technique was already known to be valid and successful. The sensational news was printed in the papers as Lysenko's solution. Lysenko, himself, did not have the experience from which his claims of success came. Lysenko had asked his father to try this treatment. With embarrassment, his father hid the kernels in the snow, then secretively planted the kernels in the

spring, hoping his neighbors would not chide him for his foolishness. The results turned out to be good. Lysenko was lauded.[27] In December 1929, Stalin delivered the speech in which he indicated the elevation of practice over theory. The reality was that now political bosses had control over science.

Lysenko's idea was that adaptive responses to environment cause structural changes capable of being inherited. The essence of inheritance comes from the type of metabolism, the type of relationship with the environment. Following the speech in 1929, Lysenko's authority grew and grew. Stalin recognized in Lysenko someone who would react to political directive. Lysenko's rise fit in with Stalin's administrative goals.[28]

b. Science of Genetics

The question of inheritance of acquired characteristics relies on intuitive judgments and, though important, was an issue toward which honest scientists could differ. The issue of primary importance in the history and the outcome of this discussion has been that of authority.

Examples of inheritance of acquired characteristics

that have been used with some credibility, if viewed from our intuition, include the long-time philosophical proposition posed by Engels, that the transition of ape to man was brought about by the performing of labor,[29] and the observable development of udders on dairy cows may be from both breeding and the action of stimulating the udders by milking, with the result that, from one generation to the next, the size of the udders have increased.[30] Now what examples do we know, still intuitively, that show environmental influence not to be the key factor of change? For hundreds of years in China, women's feet were bound causing the arch of the feet to break and the feet to develop into a tiny, deformed shape. There was no hereditary adjustment for this from generation to generation. The wearing of very restrictive corsets in Victorian England caused cracks in women's ribcages resulting in asymmetrical growth and constriction that caused shortness of breath and fainting. Again, there was no hereditary adjustment from generation to generation.

Lysenko did not have a grasp of concepts as basic as genotype and phenotype. When one is unable to see all the determining factors, and so must rely only on intuition, it is easy to stumble. Other biologists made this separation of hereditary and environmental

influences. The questions of evolution versus individual heredity did continue to be confusing. Scientists thought there must be something more in explanation. Lysenko thought in terms of mysterious vital forces. He avoided the hard disciplines of science and mathematics.

Some of the genetics and cytogenetics definitions are useful to understand in assessing this history. The glossary compiled by Rigomar Reiger, Arnd Michaelis, and Melvin M. Green has been very useful.[31]

Genotype refers to the genetic information contained in the chromosomes of viruses and bacteria, and of plants and animals. The phenotype is the observable properties of an organism produced by the interaction between the organism's genetics (genotype) and the environment in which it finds itself.

A cell is the fundamental unit of biological structure; cells are the building elements of all organisms. Cells show manifold variation in size and form, but in all organisms they conform to a single, fundamental plan. The nucleus is the most prominent body within the cells of plants and animals; it is a membrane bound region that contains the chromosomes and represents the controlling center of the cell. Chromosomes are structures which contain the hereditary

material (DNA). In most organisms the chromosomes occur in pairs. The chromosome number (per cell), shape, and organization are species-specific characteristics. A gene is a unit of genetic material localized in the chromosome, each of which usually codes for a specific protein.

Mitosis is the mode of cell division of nucleus providing for the production of daughter nuclei which contain identical chromosome numbers and are genetically identical to one another and to the parent cell from which they arose. Meiosis is restricted to the germ cells (sex cells), and consists of two successive divisions resulting in the formation of gametes in plants and animals. The chromosome number is reduced in meiosis, each daughter cell now contains only one of each pair of chromosomes. Syngamy, or sexual reproduction, is the union during fertilization of male and female gametes, resulting in zygote formation. The resulting zygote now contains pairs of chromosomes, a complete set from each gamete.

Cytogenetics is the field of investigation which developed from the science of genetics and cytology (cell biology). Cytogenetics is concerned with problems based on the correlation of genetic and cytological features characterizing a particular genetic system.

Essentially the field comprises the behavior of the chromosome during mitosis and meiosis, their origin and their relation to the transmission and recombination of genes.[32]

c. Modern Experimental Genetics

The work in the T.H. Morgan "Fly Room" of Columbia University brought wonderful new discoveries to genetics. This is where, in the 1920s, geneticists discovered how to describe "complex characters and individual variations and the transformation of species, all on the basis of Mendelian concepts."[33] In response to Lysenko's claim about winter wheat, whereby "the conversion of one species into another takes place by a leap", Karl Sax said:

> Lysenko claims to have changed a spring wheat to winter wheat by three years of autumn planting. This change is accompanied by a change in chromosome number from 14 to 21, according to Lysenko. Anyone with even an elementary knowledge of cytogenetics knows that this is utterly impossible. The 14-chromosome wheats carry only genomes A and B, while the 21-chromosome wheats carry genomes A, B, and C. There is no possibility, whatever, of deriving C genomes from the 14-chromosome durum wheat and thus developing a 21-chromosome bread wheat. The only logical conclusion is that Lysenko planted a mixed lot of seed which contained seed of the 21-chromosome spring variety, and that these

were selected over the period of the experiment.[34]

In 1930, R.A. Fisher wrote the book titled The Genetical Theory of Natural Selection. In this text Fisher showed how to use statistical methods to separate the three main sources of observed variability: genetic variation, environmental differences, and the observers' sampling errors.[35]

The traditions that contributed to the development of statistics may be traced directly back to Carl Friedrich Gauss (1777-1855) who applied broad scientific and mathematical expertise and imagination to several questions of probability. Gauss defined the error distribution curve. This table has been found to be applicable in very many different experimental situations. Gauss showed how variation inherent in experimentally derived information could be represented by a bell-shaped curve. Gauss' mathematical formulas allowed development of one statistical method, for quantitative estimation of the errors of the measurement, as Gauss had also developed the method of "least squares, by which the best estimated value is derived from the minimum sums of squared differences in a particular computation."[36]

Charles Darwin's (1809-1882) work on evolution directly stimulated work on statistics. This effort was

in response to the questions of the validity of the concept of continuous variation. As later pointed out by Erwin Schrödinger in his 1944 book, What is Life?, by using a bell curve, it may be seen that the theory of natural selection would mean the population, with mutations, would gradually shift from one base point to another, then to another.[37]

Gregor Mendel (1822-1884), mathematician and excellent experimentalist, had already utilized another method of statistical evaluation; the game of chance approach, counting how often particular distributions of characteristics were displayed.[38]

The Hardy-Weinberg Law (1908) complements the discussion of Schrödinger on Darwin's theory of natural selection. The Hardy-Weinberg Law states that population remains stable. Changes may occur, but the population always stabilizes, unless totally wiped out.

> Without an equilibrium mechanism, human beings and the entire biologic world would be in chaos. Heredity is a conservative force in nature. The stability of the genetic composition of a population must be understood first, if we are to study change.[39]

The strength of the statistics methodology was further developed in the 1930s and into the 1940s. While trying to derive quantitative relations between gene frequencies and properties of natural populations,

the population geneticists (Fisher, Wright, and Haldane) introduced new statistical concepts for evaluating forces such as inbreeding, linkage, and multiple interactions. The stabilization of population includes influences by selection, possible genetic drift, and migration.

Coincidentally, statistics applied to genetics work was initiated in another location as well. In the Soviet Union, Chetverikov (1880-1956) conducted work on evolutionary genetics incorporating the experiences from the Morgan genetics laboratory learned when H.J. Muller brought stocks of Drosophila melanogaster with him to the Soviet Union in 1922 as a gesture of scientific friendship. Chetverikov conducted controlled experiments crossing purebred fruit flies with wild fruit flies and made several exciting discoveries about mutations among the fruit flies. Chetverikov reasoned that natural populations must possess a large amount of hidden or recessive variations which could be of great importance in evolution. Chetverikov's work showed that natural selection can act only when genetic variability, generated by mutations or hybridization, is present. The genetic variability of a population should be viewed as an integrated, cohesive whole.

d. Morgan and Muller

Thomas Hunt Morgan's "Fly Room" of 1905-1915 at Columbia University provided the turning point of experimental evidence for the world community of geneticists. Morgan (1866-1945) himself seemed rather austere, but he managed his scientific team well in that he could delegate possible projects in the research of Drosophila and could rely on the scientific skills and imagination of his team. He had great skill in bringing the separate threads of his team together to form a strong weave for successful achievement of meticulously designed, repeatable experiments. Beyond the basic group of the Fly Room, which included Alfred H. Sturtevant, Calvin B. Bridges, Herman J. Muller, and also Edgar Altenburg and Nettie M. Stevens, participants in this research came from around the world to learn genetics laws from work with Drosophila. As Drosophila has a brief life cycle, the completion time for experiments allowed for results to be evaluated fairly promptly. Tests for more complex life forms could be tested first on Drosophila.

Herman J. Muller (1890-1967), one of the graduate students in Morgan's Fly Room at Columbia University,

brought particularly good insight to the debates and theorizing of the participants in the work of the Fly Room. Muller was also easily able to theorize about what the achievements of the Fly Room meant for the world in 1915. Muller often stood poised in debate with chalk in hand ready to chart possible genetic relations tested in the fruit fly. While teaching at the University of Texas in 1927, Muller devised appropriate research techniques to demonstrate that x-rays caused mutations in fruit flies. Lewis John Stadler (1896-1954) about the same time showed such mutagenic properties of x-rays on corn. Muller's achievement later, in 1946, brought him the Nobel prize in medicine.

Muller was firmly convinced of the materialism of his science and was personally thrilled at the event of victory of socialist revolution in Russia led by Lenin. Muller, often outspoken, eagerly promoted the socialist cause in many arenas of his activity. In 1922, Muller went to the Soviet Union to share his science and, bringing the gift of fruit flies with him, brought the new visions of genetics work to Soviet scientists. Muller felt that he belonged in the Soviet Union. In the early 1930s, Muller accepted a permanent position at the Soviet Academy of Sciences. So enthusiastic about the possbilities suggested by a socialist state, Muller

brought forward one of his pet questions. This was his interest in eugenics, considering that "eugenics in hands of socialists would truly produce a new society of no slavery or bias."[40] This idea is the biological fostering of aptitudes and faculties through genetic selection. Muller, in his confident pride in the Soviet Union, sent a copy of his 1936 book, Out of the Night: A Biologist's View of the Future, to Stalin.[41] Assumption that Stalin was carrying on the tradition of Lenin's educated inquiry, of sympathy to science, was current. But, Stalin, with his narrow-minded background, reacted violently to the fact of this text from Muller. The concern that Stalin had for the recalcitrance of the academic circles was becoming more an issue to Stalin. The other side of "eugenic aims merged with misinterpretations of the new science of genetics" yielded cruelly oppressive and barbarous results in Nazi Germany's efforts to eliminate those who were considered biologically unfit.[42] Stalin looked at Nazi aggression from the west as the Soviet Union's most immediate danger.

At the climactic conference of December, 1936, the official goal was still accomodation of genetics with Lysenko's agrobiology. The conference revealed the impossible inconsistency of that goal. Vavilov was

pushed from efforts at compromise to direct criticism. Muller bravely spoke in defense of modern experimental genetics and pointed out that the ignorance of Lysenkoism may be criticized as closer to Nazism. Muller's words, paraphrased by David Joravsky, were:

> If training alters heredity, then centuries of wretchedness have made the less fortunate classes and races genetically inferior to the fortunate classes and races.[43]

But the nation's administrator had already decided the issue. Lysenko, attentive to Stalin's political goals, was publicly supported by Stalin.

e. Vavilov and Chetverikov

The most prominent geneticist of that era was Vavilov. The fact that V.I. Lenin had expressed pride in Vavilov's work and achievements was disregarded under Stalin. Vavilov was too independent for Stalin's agenda.

Stalin's support of Lysenko showed itself as a mandate to all other nations following socialism. Stalin, as successor of Lenin, was considered the leader of the socialist nations. To the communist world, in the context of the world's turmoil of two world wars and the rise of imperialism, the safety of the smaller

nations and the hopes of workers around the world seemed to be in Stalin's hands. The prevailing notion was that surely the wisdom of the Soviet Union was greater than the wisdom of an individual scientist. To respect and love Stalin dogmatically, unquestioningly, meant that one must be a follower of Lysenkoism.

In the Soviet Union, geneticists were challenged to criticize what was called "their incorrect ideas" and turn to Lysenkoism. Those who resisted were punished and imprisoned. Israel V. Agol was imprisoned and executed. Vavilov was imprisoned and died in the Gulag at Saratov from disease and emaciation. Serebrovskii died in June 1948. As chief plant breeder, Serebrovskii was blamed for all crop failures. Kol'tsov was accused of Nazism and was removed as director of the institute he had founded. Chetverikov was exiled in 1931 to Siberia and imprisoned there for the rest of his life. He died there in 1959.

Stories were told about both Vavilov and Chetverikov, that they selflessly taught and read to others while in prison, even though their health had so deteriorated.

The situation became one of terror for scientists who sincerely wanted to continue their work in service to science and to their nation. Many, to avoid

imprisonment, went into unrelated work. Some, such as Chetverikov, continued inquiry selflessly, recognizing that experimentation and debate were the ways to move the nation's scientific achievements forward.[44]

Nicholai I. Vavilov (1887-1943) tried "to achieve peaceful coexistence between science and Lysenkoism."[45] The quality of success of the frontal attack on science by Lysenkoists was too unbelievable to the geneticists. Theirs was a "highly theoretical discipline, elegantly centered on a few basic concepts and theories"[46] that the Soviet public did not understand and the politicians could not control.

Vavilov, a humane internationalist, had a tremendous spirit and generosity that he brought to all aspects of his work. As a young student, Vavilov studied in England under William Bateson as he searched for disease resistant varieties of farm crops. This study by Vavilov led him to genetics. As written in C.C. Li's memorial to Vavilov:

> Vavilov was best known for his world-wide collections of different varieties and species of cultivated plants, especially those of cereal crops. He made numerous expeditions to various parts of the world, including Persia, Afghanistan, Abyssinia, China, Japan, Central and South America, etc, as well as all corners of the Soviet Union. That vast collection of diversified varieties and species was not only for the immediate purpose of plant breeding,

> but also was useful in the long-term study of taxonomy and evolution of cultivated plants. His collection of plants was the holiest of holies in plant science.[47]

Vavilov had looked to agricultural experience and achievements around the world as his training ground and he eagerly created a store of seed to benefit the new Soviet Union and to serve agricultural science in other nations. Under Vavilov's leadership, a network of research institutes and experiment stations were built up, employing more than 20,000 people.[48] Vavilov was one of the few non-Communists to become a member of the U.S.S.R. Central Executive Committee. The high esteem for Vavilov's work among his colleagues may be understood by the fact that during World War II those who cared for the store of seed collected by Vavilov did not eat any of that grain though they were starving to death.

In 1931, I.I. Prezent, "a highly effective polemical speaker and writer" with whom Lysenko had formed an alliance, published hostile philosophical analysis of eugenics, saying that it led to racism and equated animals to humans, thus degrading man.[49] Several years before Prezent had been in a class of Vavilov's, and had tried to advance by bluff rather than

by study, which Vavilov recognized. At the December, 1936 Session of the Lenin All-Union Academy of Agricultural Science of which Vavilov was the Vice President, a full-fledged attack was launched against modern experimental genetics. The attendant geneticists, convinced that this was still a scientific debate, energetically aired their views. Lysenko, Prezent, and their supporters had been able to orchestrate events and at the end of the Session Lysenko dropped his bombshell, he was able to say that Stalin supported him and had authorized him to enforce what science was practiced. By the end of 1936, all studies on human genetics were suspended in the Soviet Union. An arbitrary decision of Stalin had pre-empted a scientific issue. The deterioration of genetic work was assured, as the administrators of science and education followed the dictates of Stalin. Following this 1937 meeting, Vavilov assisted Muller's escape from the Soviet Union. Muller went to Spain to assist in the Spanish Civil War as part of the International Brigade. Geneticists and others were placed in a situation of terror. Vavilov was arrested while he was collecting wild varieties and species of cereal crops in the foothills of Western Ukraine in August, 1940.[50] He died of malnutrition and emaciation while in prison in

January, 1943. Vavilov had been the main voice for resistance to Lysenko, not as an argumentative voice, but as the voice of reason. Just as Lysenko cast a slur on mathematics as irrelevant to biology, he led the dismissal of several of the Soviet Union's excellent geneticists, many of whom were arrested and died in prison.

Another victim of Lysenko was Chetverikov (1880-1959), who also shared significant generosity with colleagues, students, compatriots. Chetverikov introduced quantitative analysis to the work of Soviet geneticists.[51] Benefiting by his training, culminating at the new Institute of Experimental Biology opened by N. Kol'tsov in 1917, Chetverikov excelled in his genetics work. Kol'tsov was considered an amiable, highly cultured, scientific entrepreneur.[52] Kol'tsov saw experimental biology as able "to keep before it the total problem of life as a whole."[53] The impact of this institute was to bring experimental education to science study. Teams of students worked with their professors to experiment, hypothesize, debate, and challenge results. It was to this institute that Muller introduced Drosophila in 1922. Kol'tsov hired Chetverikov for Drosophila work because he knew "a great

deal about flies,"[54] but Chetverikov when he first started at the Institute did know almost nothing about genetics.

Both Kol'tsov and Chetverikov were born into families of successful entrepreneurs and through the ties of the Moscow merchantry they shared many ties, including a family relation through a mutual cousin. Chetverikov had learned Darwinism in school and "became committed to a career in zoology."[55] Kol'tsov and Chetverikov crossed many paths in their biology work, but Kol'tsov was primarily an experimentalist and Chetverikov was primarily a naturalist.[56]

The group that Chetverikov headed up at the Institute of Experimental Biology were well-trained general theoretical zoologists who divided up Morgan's The Mechanism of Heredity by chapters, to study chapter by chapter, line by line, and who taught themselves English in conjunction with their genetics readings. "The gift of Drosophila from the Morgan laboratory presented the group with an opportunity that it was not then fully prepared to exploit."[57]

The Chetverikov group rapidly absorbed the tremendous collection of genetics work following their training with Kol'tsov in aggressively evaluating information through experimentation and the practical

pressure by Chetverikov to assess whether findings may apply to natural populations.

The work of Chetverikov was cut short by his arrest, but student Timoféeff-Ressovsky took this training with him to Germany, student Dobzhansky took this training to the United States, to Morgan's Fly Room and to California Institute of Technology. J.B.S. Haldane, having heard a presentation by Chetverikov arranged for Chetverikov's work to be translated into English.[58] The leadership provided by Chetverikov's work was continued despite his exile. Kol'tsov selected N.P. Dubinin "who had taken Chetverikov's courses, specialized in genetics, and worked with Serebrovskii on experiments of the structure of the gene" to head up the team and others at the institute to lead the seminars where the activism for debate had been cultivated in the students.[59]

Besides some commentary on the specific achievements of Morgan and Muller, Vavilov and Chetverikov, my main intention in focusing on their work and experiences is to point out that not only were these scientists active in the field of genetics, they were active in the debates that were going on within genetics research. In all the debates, the momentum was toward

an increase in the knowledge of genetics with high hopes for breakthroughs in understanding. The debate was to increase the skill in evaluating this science, the debate was not political. The issue was that verifiable experiments were the focus, not individuals. These scientists recognized that the issue could not be as a boxing match between genetics and politics, in the same arena.

II. Background to Symposium

a. General Relations: Soviets and Chinese

Upon establishment of the People's Republic of China in 1949 many areas of activity became heavily influenced by the Chinese Communist Party opinions of the Soviet Union. The reality for China included the fact that the most significant external support came from the Soviet Union. Also, respect for the Soviet Union's leadership in the world Marxist-Leninist movement was high.

Elements in the Soviet-China conflict included the China-India border dispute, events in Hungary and Poland, support to China's efforts from Albania and Southeast Asian countries, and the reality of Soviet aid to China and other socialist nations.

In the 1950s, China's independent, strong leadership grew and was recognized in the socialist camp of nations. If the issue of "big power chauvinism" had not existed, China's independent leadership would not have strengthened at this time, for this purpose. The big power chauvinism of the Soviet Union presented a conflict in the socialist camp to which China responded,

both by a sense of responsibility to the other socialist nations and by necessity for the survival of China's liberation.

Defined by the Chinese communists, social liberation in China was also national liberation. China had been fighting for over two decades isolated from international support and until the very point of liberation, October 1949, almost always against the advice of Soviet advisors. The momentum of the Chinese revolution was built through mobilization of all segments of the populace, most specifically the peasantry. During the Long March of the Chinese Red Army from the ChingKan Mountains to Yenan, Mao's leadership arose as dominant. At several times of difficult decisions, Mao's leadership cleared the path.

An evaluation here of what Mao's leadership was would be useful. Mao did have an agenda. I suggest that he saw many sides to issues, many paths to steer clear of barriers. The extreme situation that was unacceptable was the possibility of letting go of the revolution, which would have been letting go of China's long desired independence, which would also have been giving in to the poverty of the nation. From those aspiring to authority who were leery of change, no leadership who be forthcoming for independence. From

those who grasped Soviet authority as the only way, there would be no functional leadership provided to the Chinese condition which was very different from the Soviet condition. There were also powers from the time pre-revolution who provided both subtle and overt pressures to return to the old traditional society. Mao's agenda was to respond to the aspirations of the majority of the Chinese people, the laboring people of China. Nay-sayers had to be fought off while dealing with the numerous complexities of promoting political unity. Mao did not consider all of these fronts to be equal sides, but in moving the interests of the nation forward, these fronts had to be faced. This presents the image of Mao as a moderator. Mao firmly believed he was attentive to and responsive to the needs and energy of the Chinese people and he felt emboldened to try big plans. In this framework, Mao was inclined to "open the windows" to let opinions and ideas of more people be expressed. Mao was willing to stand firm to allow the sounding out and security of more voices. Glorification of the working masses was a tool in uniting China's people. The Soviets had come to rely on administrative methods. The Chinese put reliance in methods of persuasion to recruit the masses to respond to the interests of the nation. The Soviet method was a

top/down authority; the Chinese method was to recruit authority by influencing acceptance through education and example.

Long before China's victory, declaration was made by the Chinese Communist Party to all nations that all unequal treaties would be denounced. Before China's liberation, unequal treaties had been established with the Soviet Union by Republican China. The Soviet Union was reluctant to let go of their hold on raw materials and ports and expected payment from China when these were released back to China.

Following the years of civil war, the anti-Japanese war, the devastations of World War II, certainly China was in need of a great amount of aid. The aid arranged with Moscow indicated clearly that the aid was clearly business, that there was no fraternal self-sacrifice on the Soviet Union's part in the pursuit of common objectives as fellow socialist nations.

The Chinese, evaluating Soviet methods at varying times, did not consider the differences to be bad in themselves. The turning point was the Twentieth Congress of the Soviet Communist Party in February 1956, then the evaluation indicated that there was a wide disparity in final aims. The Soviet word reflected the one-sided view of Soviet authority in the world, which

caused the Soviet Union to be as a colonial power over other socialist nations.

The Twentieth Congress was the Soviet Communist Party's response to the March 1953 death of Stalin. In the Soviet Union, change of leadership implied a need for change of policy. In China, effort at reassessment of ineffective or mistaken policies was attempted within the leadership, and seemed to allow greater stability for the advance of China's independence.

In this time period, when China gave aid to other nations, the possibility of profit or advantage to China was not sought as this was clearly disadvantageous to the recipient. Chinese advisors lived as those with whom they went to give aid. China participated with other nations as equals. The aid to China from the Soviet Union coincided with devaluation of the Soviet ruble; advisors brought with them the encumbrances of their already well-entrenched caste system; the Soviet managerial system reflected authoritarian administration; and export-import relations were disadvantageous to China which coincided with the Soviet perspective that all socialist efforts around the world should serve to defend the existence of the Soviet socialist state. The aid from the Soviet Union did not assist China's effort to achieve rapid economic advance,

it rather retarded and restricted development in important areas of industrial manufacture and consumer goods, much as a colonial power.[60]

China, following the Twentieth Congress of the Soviet Communist Party, made a determined effort to not tear apart relations, by suggesting friendly criticisms. China's advice was aimed at removing divisions and strengthening unity in the socialist camp of nations, but the free exchange of opinions was perceived by the Soviet Union as damaging to Soviet authority.

The Soviet Union from the Twentieth Congress called for across the board denunciation of Stalin. In China's case this would have effected collectivization and self-reliance, both policies given strength by Mao's leadership. China's peasants knew success already from collectivization and workers in industry also knew success from united action. This momentum was being built in China on self-reliance and hard work.

In this setting of relations between the Soviet Union and China, the Qingdao Symposium was one more event right on target in building China's independence. Self-reliance had become a national theme developed by Mao, as a way for China's national identity to be reaffirmed.[61]

b. China's Relation to Soviet Science

A number of Chinese geneticists were colleagues of Soviet geneticists. China's geneticists included several who were contemporaries of Agol and Chetverikov and, as part of the world genetics community, they were able to recognize the dilemma faced by their colleagues in the Soviet Union. China's pride in Soviet experience and guidance in genetics had been expressed from the days of Yenan in the 1930s through to 1956 by following the Michurin school. For those who followed the Soviet Union's lead in genetics, one result was that in China, Michurin, perceived as the gentle folk hero, was the one followed by those who pursued the concept of inheritance of acquired characteristics.

For those Chinese geneticists who did not believe in the environment as the key to inheritance, the effort to evaluate the differences and results of such ideas was debated intensely in their work prior to 1949. China had the many years of experience of the Soviet Union to which to look for guidance for China's own policies.

c. Politics in Command

In the Soviet Union, the losses sustained by the devastation of this whole field of science by Lysenkoism influenced the loss of quality in agricultural production, and compounded the lack of knowledge in medical science, which subsequently affected the knowledge concerning the potential of damage caused by radiation in the event of nuclear accident. Another area of science lost to Soviets by Lysenkoism were the fields of statistics and statistical analysis. Mao Zedong strongly espoused learning from past mistakes - "curing the illness to save the patient."[62] This approach was part of Mao's united front efforts that were analyzed for each historical stage, or period, of China's needs. The united front (a non-partisan effort to unite as many people as possible) to aid China's socialist growth was high on Mao's agenda. At any given time in China's history Mao considered that there were clear forces in the society, groupings of people by class, by locale, by interests, that were or could have been united with to move the nation forward. Mao's efforts were to seek ways to unite the greatest numbers of people to make China's advance stronger. In China, from December 1954, the Scientia Sinica, publication of

the Chinese Academy of Sciences published summaries of the discussion on Lysenkoism, published translations of Lysenkoist articles, and mistakes in science, philosophy, and logic were pointed out. By August 1956, fourteen volumes on species and species formation had been published.[63] Training in modern experimental genetics was blossoming around the world with several Chinese students among those studying in many genetics centers. Yenan was not a genetics center, but was the center of the communist revolution from the arrival of the Long March in 1936 to 1949. Yenan was a center of experiments in education, with efforts to expand availability of education to complement the needs of China's revolution. In the Yenan area, A.P. Ivanov conducted training sessions in Michurin genetics.[64] These training sessions were motivational lectures, rousing the audiences' political loyalty and production efforts.

d. Some Influences on China's Views

There is a long history of discoveries, inventions, and assessment of knowledge of science in China's history. China's reverence for education matches this long history of science. As respect for education in

China's culture was high, reception of both the travelling training sessions and the work of the Western-trained scientists was received well by China's people. The severe scorn suffered by scientists in the Soviet Union was not culturally likely in China.

In developing a full perception of the history of agriculturally-related sciences in China, the intense regard for grain is useful for understanding.

Some important aspects of the Chinese point of view have developed over many centuries, and these are deep in Chinese culture. One might understand a great deal by inquiry into food in Chinese culture. Grain, in Chinese **fàn** is of basic importance, with a minimum meal consisting of grain, such as millet, corn, rice, or wheat flour, and some water. The addition of vegetables to a meal, **cài** is to assist the intake of **fàn**. This may be understood by the question "have you eaten?" literally translated as "have you eaten grain?," "**chī fàn le méi yǒu**?"[65] Setaria millet was a major crop in China throughout China's history as clearly evidenced by its presence in the Han Tomb No. 1 at Ma-Wang-tui in Changsha, Hunan province dated at 168 B.C.[66] In ancient texts, mention of grain usually referred to millet. Setaria millet was a major crop in the northern Chinese provinces of Honan, Shandong, Hopei, Shensi, and

Shansi.[67] From the 1500s, new food products from the Americas disseminated into China by way of shipping ports along the Southeast China coast, by land route from Southeast Asia into Yunnan Province, and by the long silk road from Persia and Turkey.[68] Maize was among the most important of these new crops.

Another way to look into Chinese culture is to consider the traditions of family and how these relations have influenced all levels of Chinese activity. The 1930s novel by Pa Chin, entitled The Family, with great sensitivity shows the torment and need of letting go of the old ways of the landlord economy in rapidly changing pre-revolutionary China.[69] This book gives insight about China's continuing influences from patriarchal and manorial traditions.

e. China's agriculture

In the 1950s, agricultural work was influenced by two predominant views; collectivization would be beneficial only after mechanization versus collectivize to transform the land while at the same time raising peoples' livelihood to assist the incorporation of mechanization into China's agricultural work.[70] Mao

Zedong espoused the second approach, collectivization as the key to agricultural advancement.

China's agricultural program from 1949 through to 1956 was heavily influenced by Soviet ideas. The Soviet Union believed that peasants had to be forced to collectivize. This lack of faith in the peasantry had proponents to varying degrees in the leadership of the Chinese Communist Party, leaders who did not really have confidence in the motivations of the people. On the other side, Mao considered that the people were in fact the motive force, the key element in building China's independence and strength. Mao initiated programs to assist this interest by the people.

IV. Chinese Geneticists

a. Michurinists

Luo Tianyu (Loh; Le) (1910-1984) was the leader of the Chinese Lysenkoists. Trained as an agriculturist in Japan, Luo had experience in Yenan, where a science program was initiated that developed into a university, with Luo as head of its biology department.[71] Luo was a communist party member and a young eager follower of the Soviet Union. To follow the lead of the Soviet Union was considered of paramount importance. Luo did this with dogmatism and personal career goals guiding him. Luo treated "Morganist genetics and geneticists" so harshly, giving unbearable treatment.[72]

A significant element of Michurin's appeal to the Chinese was the Chinese receptiveness to planting trees. In Yenan and the broad North China of loess soil, any wood had been gathered for fuel. Time, investment, space for planting was not given in the landlord dominated economy. Those in the position of having to beg could not plan for the future. So, to those organizing to make such changes and plans, Michurin's ideas of planting trees, of planning and caring for

orchards, was very attractive.

This appeal answered many desperate needs. These needs included just having trees again, but in times of dangerous flooding the roots would hold back erosion. Fruit and fuel would be available. Protection to animals would encourage increase of wildlife. And the beauty of trees was very desirable.

Grassroots Michurin Societies were established led by the Ministry of Agriculture to guide local educators and farmers in this new biology.[73] Articles by Michurinists, Zhu Xi (1902-1962), Michurin School of Genetics, 1954,[74] and Fang Zhongxi (1912-1986), Michurin Theory, 1955,[75] show the political focus in teaching this new biology. The correctness of the theory was laid out without question, with no option of scientific debate. To the credit of both Zhu and Fang, neither was particularly polemical. Their interest was in assisting and seeing the growth of China's agriculture.

The collision between the Michurinists and the modern experimental geneticists was exacerbated by exclusion of all laboratory work and research as espoused by Luo. As Schneider explains, Luo

> set mass science above that of intellectuals, saying that the People are genuine materialists, who grasp the answers to things directly, because if they do not understand

> and live by the laws of nature, they die. Since scholars do not operate this way, they are idealists.[76]

b. Modern Experimental Geneticists:

C.C. Li and C.H. Li

Following China's long history of science, in the half century preceding China's revolution, this tradition was cultivated by the work of two American foundations, the Rockefeller Foundation's China Medical Board and the China Foundation for the Promotion of Education and Culture. Wisely the officers of these two foundations realized that an "infrastructure of education, communication, physical plants, and equipment"[77] was necessary to complement the building of scientific institutions and the awarding of scholarships for study in U.S. institutions. Mass education movements in the 1920s and 1930s were complemented by these foundation efforts.[78] Schneider argues that these two foundations,

> were the most important media for transmitting American science to China...since America's wealth and power were considered to be products of science, it was argued that the Chinese nation should emulate America's example.[79]

Fellowships awarded to promising young students brought many young scientists to the United States for advanced coursework in biology, chemistry, medicine, and many

other fields of inquiry. Cornell received many of the students in agricultural fields; Columbia received many of the students in medicine. Many other institutions also granted research assistantships to Chinese students through these foundations. Education for many generations of China's history was lauded by all Chinese, but only in the 1920s did education begin to be accessible to broader numbers of the populace.

The fact of Western-trained versus Lysenkoist was not the only difference among geneticists. Of those trained in the Soviet Union, some may have had experience with Vavilov, Serebrovskii, Kol'tsov, Chetverikov, or Timoféeff-Ressovsky. These Soviet scientists were geneticists with excellent bench practice and field skills and with high standards of experimental controls. In the school led by Kol'tsov with Chetverikov as teacher, students experienced the demands of debate and proof similar to the experiences of Western-trained scientists who studied at Columbia, Cornell, Harvard, Yale, or Caltech (California Institute of Technology).

More important to the quality of genetics knowledge for China in 1956 compared to the Soviet Union in the 1930s was the level of experimental knowledge and expertise cultivated in the world genetics community.

Two of the several modern experimental geneticists from China are C.C. Li (Li Chingchun) and C.H. Li (Li Jingxiong). I focus on these two scientists as they had specific significant influence on the event of the Qingdao Genetics Symposium.

C.C. Li (1912-), as a student and as a teacher, has been eagerly in pursuit of statistical applications to genetical models as a satisfactory way to advance science in service to people around the world.

From 1932 to 1936, C.C. Li attended the University of Nanking, an American missionary school, from which he earned his Bachelor of Science degree. Li then was encouraged to enroll in the College of Agriculture, where he majored in agronomy and minored in forestry. In these studies was Li's first exposure to genetics, plant breeding, and the techniques for conducting and understanding field experiments.[80] In 1937, Li enrolled in Cornell's College of Agriculture where he studied genetics and biometry under H.H. Love. Li was enlightened in his own science imagination by exposure to the writings of Theodosius Dobzhansky and Sewall Wright. In 1940, Li earned his Ph.D. and went on to other institutions for post-doctural studies. In September 1941, Li married Clara Lem of Chicago who was working for the China relief organization. Immediately

afterward, they headed for China. They were caught in the turmoil and devastation of the time. The World War II aggression in Asia by Japan caused tremendous suffering in the areas of C.C. Li's route home. Their journey was disastrous, as they experienced starvation, misery, and fear in the wake of the Japanese. Finally in spring of 1942, the Lis arrived at the home of Clara's brother, in Kweilin.

C.C. Li was attentive to and imaginative about the responsibilities of teaching for China's needs. Li taught first at the Agricultural College of National Kwangsi University. Teaching materials were meager, but Li and his colleague there, T.C. Hsu, were resourceful. The next year the Lis moved to Chengtu, the wartime location of the University of Nanking, where Li taught in the Agricultural College. Li intently studied what population genetics literature he could find. At age 34, Li was invited to chair the Department of Agronomy at Peking University, which position he held from 1946 to 1950.

C.C. Li's energies were involved in assisting the rebuilding of an agricultural program in China, a biology studies program, a student/teacher agenda: all to help China's advance. The timing for China's new biology program coincided with the endorsement of

Lysenkoism in the Soviet Union in 1948, and the founding of China's new government in 1949. China's communists were intent on following the Soviet Union's lead in all areas. In 1949, the three agricultural colleges, Peking University, the Agricultural Institute of Tsinghua, and the Communist Agricultural College were merged to become the independent Peking Agricultural University.

As dean of the largest department, agronomy, at the agricultural institute of highest prestige, C.C. Li was particularly vulnerable to pressure by the Lysenkoists who carried the authority of dogma, of Soviet approval, of politics. The numbers of Chinese Lysenkoists had been small, but expanded rapidly as the ideological battle of the Soviets advanced. This became a purge movement, with C.C. Li as the initial target. The heat against Li caused by this pressure was so intense that Li felt there was no way out; the intensity of the debate had descended to personal abuses.

At that time, 1949 to 1950, C.C. Li and C.H. Li were in the same department, as was Wu Zhongjian, an animal geneticist, who also was outspoken at the later Qingdao Symposium. Since C.C. Li was under attack, he could not speak with his colleagues and friends. C.C. Li did have the "choice" to give in to the pressure

exerted by Luo, to say what he did not believe, "to say Lysenko's genetics is...the ultimate truth...all Morgan stuff are reactionary."[81] Instead C.C. Li ended up in argument, considering that there could be no compromise and that he had to get out.

At the time of the three weeks vacation between Christmas and Chinese New Year, between the first semester and the second semester, when many travel to visit family members, the Lis left for Shanghai to visit C.C. Li's sick mother, without packing rice, books, or bags. They took his mother to her father's house where they said goodbye. They went directly on to Canton to cross the bridge to Hong Kong. C.C. Li had no underground connections, just his own personal drive. In concern for the safety of himself and his family, Li did find a way out, by escaping from China to Hong Kong, and later on, to the United States. The fact of his escape was learned by the leadership of the Chinese Communist Party. A representative of the Chinese Communist Party, of some stature, returning to China from a meeting in India, contacted Li in Hong Kong. They met, Li was encouraged to return with no danger, but rather support and welcome. Li said he was anxious to assist his nation, but Luo Tienyu had failed to carry out Mao Zedong's policy of winning over and uniting with

scientific workers and intellectuals. Li was confident that this should be a turning point for the life of himself and his family.

Li's departure was an embarrassment to the Party. The humbled leadership more aggressively stressed that the need for unity with China's scientists and intellectuals was necessary for China to be successful. After the assessment by the Chinese Communist Party leadership of what had caused C.C. Li's departure, Luo "was reprimanded by high Communist officials for his ruthlessness, impatience, and inability to cooperate with the old-type geneticists and plant breeders."[82]

The attitude toward ideas of foreign countries was a pernicious illness for the Chinese, this xenophobia. Li considered that the West had brought about a great achievement in China, in teaching those exposed to Western ideas to dare to think.

C.C. Li had decided that he was indeed eager to serve his science and his nation; he considered this event of his departure an important turning point and decided that he could give more service from the United States. A scientist of human genetics was needed at the University of Pittsburgh, Muller recommended C.C. Li for the job and assisted in making the arrangements to bring the Lis to the U.S. May 21, 1951 was the date of the

happy arrival of the Li family in Pittsburgh.

The second major target after C.C. Li left China was Wu Zhongjian, but Li's departure inspired a fairly prompt reevaluation by the communist leaders. There were no more spearheaded attacks on any particular individuals. But, there was also no more teaching and no more work directly named genetics work. C.H. Li did continue inbreeding of corn, but his work was referred to as something else. As in the Soviet Union, what caused the stop of genetics work was the administration of science, the administration of education.

C.H. Li (1913-) continued to work under Lysenkoism on his maize inbreeding. He did not teach genetics formally but attended to his nurseries regularly. He indirectly resisted Lysenkoism, as the Soviet maize geneticists did. In 1955, the Soviet Union had a meeting to address what Khrushchev had observed during his visit to the United States, and specifically his visit to hybrid cornfields in Iowa. Without mentioning Lysenkoism, this meeting was actually anti-Lysenko, as the topic was corn genetics and hybrid corn.

The impact of Li's ongoing inbreeding program was that when the opportunity arose for national support to

his work, he was prepared to advance rapidly. Following the Qingdao Symposium, attention to and support of C.H. Li's work increased rapidly.[83] Even the movement of sending intellectuals "down to the countryside" in the 1960s turned out to complement C.H. Li's efforts.

Events of turmoil have occurred often, but Li continues to go to his fields to make his pollinations as usual. Zhou Enlai influenced the decision to establish Li in Dazhai Commune, of Shansi Province, during the Cultural Revolution, where his skill and imagination would be matched with the attention and self-reliance of a motivated workforce. Li had been planting, weeding, caring for, pollinating, and harvesting his research maize for many years already. Hard work, sweat, dirty hands were not new to him. C.H. Li, without arrogance, enjoys the hardwork and sincerity of the peasants. Li, as such a participant, is both an excellent teacher and an excellent student. In Dazhai, Li did key inbreeding work that led to developing maize inbreds and hybrids resistant to the primary maize diseases of China thus allowing significant increases in China's grain production over the past decades.[84]

C.H. Li participated in work during the anti-Japanese war to continue agricultural research and to strengthen China's agricultural technology. He

earned his Bachelor of Arts degree from National Zhejiang University in 1936, then stayed on as a teaching assistant. In April 1937, Li moved to Wuhan University to join H.W. Li's team of cytogeneticists, and he went with H.W. Li when the university moved from Wuhan west to Sichuan, ahead of the invading Japanese. H.W. Li had accepted a position as chief agronomist in charge of cereal production in the war zones and had invited his group to go with him. He was joined by C.H. Li and W.K. Pao. C.H. Li carried a small pot of wheat-rye hybrid seedling across the upper Yangtze River and hilly mountain regions for over a month to transplant into a field at the Sichuan Agricultural Improvement Station.

C.H. Li came to the United States in November 1944 holding a research assistantship to work with L.J. Stadler at the University of Missouri. Li went on to the University of Minnesota to work under C.R. Burnham, then on to California Institute of Technology to work under E.G. Anderson. In August 1945, Li enrolled at Cornell with a research assistantship under the direction of L.F. Randolph. After completion of his doctoral research in 1948, Randolph asked Li to participate in the United States Department of Agriculture research project on the cytogenetics effects

of the Bikini atomic bomb radiation on exposed maize.

Li returned to China in November 1948, hoping to pursue a career of teaching and research in cytogenetics. He first taught at the Agricultural College of Tsinghua University. With the merging of the agricultural colleges, Li became a professor of agronomy and genetics at the Peking Agricultural University in 1949. This was officially his position until 1970, but from 1949 to 1956 Lysenkoism most severely effected agriculture-related genetics research. From 1952, Li let go of work on chromosomes and genes, and focused on his second choice, practical maize breeding. Li had carried some inbred lines back to China with him from the U.S. It is possible still to determine an influence in China's maize production from the U.S. cornbelt.

By 1952, Chinese biologists without exception were criticized. Evaluations of all teaching methods and materials were underway, but Morganist (modern experimental genetics) genetics and research was ended. This situation was administered by the Ministry of Agriculture and led to much waste of energy and talent.

V. The Event of the Qingdao Genetics Symposium

a. The Initiation

In 1956, a fresh breeze was blowing. "Let a hundred flowers bloom; let a hundred schools of thought contend" was put forward by Mao Zedong in his April 1956 speech, "On the ten major relationships".[85] This policy was not printed in the publication of that speech but was later printed as part of "On the correct handling of contradictions among the people."

> We think that it is harmful to the growth of art and science if administrative measures are used to impose one particular style of art or school of thought and to ban another.[86]

Following introduction of this "Double-Hundred" policy, Mao and Zhou Enlai instructed the Communist Party Propaganda Department and the Chinese Academy of Sciences to investigate the influence of Lysenkoism on Chinese science and then to recommend ways to alleviate the problems and correct the mistakes from the enforced practice of Lysenkoism. The director of the Propaganda Department, Lu Dingyi, recommended initiating discussion through publication of analyses of Lysenkoism and related events in the Soviet Union from 1935 to 1956, to

culminate in an educational symposium. The discussions led by the Propaganda Department, the Chinese Academy of Sciences, and the Ministry of Higher Education gave legitimacy to the act of asking questions about Lysenkoism. The Double-Hundred policy served to encourage potential participants and to relieve misgivings among scientists. As the genetics community in the Soviet Union after 1948 was not allowed autonomy to experiment and criticize, one could see an effort to pursue a different path in China. It is an important distinction that China's Ministry of Higher Education sponsored the Qingdao Symposium. China's Ministry of Agriculture was the stronghold of Lysenkoism and certainly did not have the influence to generate confidence in such an invitation.

The Qingdao Symposium was convened to bring together scientists with training in modern experimental genetics and scientists following the Michurin school (Lysenkoists). The central purpose was to encourage Western-trained scientists to participate in developing China's agriculture. Involvement of more highly trained scientists was desired. Study of the Communist Party of China is pertinent to understanding this event. The Michurinists have had significant influence following this event, but no longer with the free reign they held

prior to the event. By the time of the departure of the Soviet experts in 1961, many doubts were freely voiced about how up-to-date and how valid some of the Soviet textbooks were or had been.

b. Location and Attendance

The Qingdao Symposium began August 10, 1956 and lasted for fifteen days. The symposium drew an attendance of over 130 interested individuals to the eastern seaport city of Qingdao (Tsingtao) of Shandong Province. The location encouraged leisure activities of strolls on the beach and swimming, but the untapped energy was so intense that few left the discussions as this event touched the future of most attendees very deeply. There were numerous informal discussions that contributed to the momentum for success. The attendees included experienced biologists and many others from the Chinese Academy of Sciences, the Ministry of Higher Education, the Ministry of Agriculture, and the Ministry of Forestry. The views of the geneticists of both "schools" were freely expressed guided by the Double-Hundred policy. Of the speakers, 48 were biologists; each with different training and practice.[87]

c. Discussion and Sentiment

The opening speeches were given by Tong Dizhou and by Yu Guangyuan. Yu (1915-), an economist and philosopher of science in the Ministry of Higher Education, pointed out the particular importance of separating political issues from scientific arguments. Science is criticism, a continual questioning of hypotheses. Opinions may be resolved only through free discussion and scientific practice. Yu set the stage, encouraging bravery in potential speakers, for indeed bravery was necessary, by saying that "Lysenko's view that 'chance (i.e. probability) is the enemy of science' was philosophically wrong."[88]

The areas of discussion in the symposium were: the material basis of heredity, the relation between heredity and environment, embryonic development, heredity and evolution, and problems in genetic education and research. The discussion of the material basis of heredity "occupied half the time allowed for the symposium,"[89] which seems an excellent indicator of how intense the issue of Michurinism was. The atmosphere of the meeting, although sometimes highly charged with animation among participants, "as a whole was polite and friendly."[90] This was a significant

achievement brought about under the Double-Hundred policy. This policy freed the way for numerous scientists, biologists, agriculturists to cooperate with and learn from each other in advancing science and agricultural production for the nation. Mao had displayed his strength in understanding the needs of the Chinese nation and his ability to inspire a national response. The Double-Hundred policy was published as a call to all Chinese people in Mao's article "On the correct handling of contradictions among the people" in February, 1957.[91]

The genetics symposium at Qingdao was asked to consider these four points: 1) the Hundred Schools policy would be implemented with no imposition of boundaries on the discussion; 2) science orthodoxies and monopolies were impermissible; 3) political attacks under the guise of philosophy must end; and 4) scientists themselves may decide whether philosophy assists science.

C.H. Li, at considerable professional and personal risk, dared to make a big impact at the Qingdao Symposium. The symposium sought to find middle ground for the two "schools", for Lysenkoists and for Morganists. Li pointed out that compromise is based on common language,

> What precisely do you mean by compromise, that we accept half of Lysenko and let them accept half of a gene? Precisely what do you mean by compromise? In all natural sciences there is only one language.[92]

With this one language, C.H. Li has continued the experience of modern experimental genetics. His work may be assessed, examined, repeated by any student of Darwin, deVries, Mendel, Morgan. With this one language, the same science, agricultural production in the Soviet Union, in the People's Republic of China, in the United States, and elsewhere may be advanced.

d. Summary from Qingdao

The importance of the Qingdao Symposium in 1956 was threefold in that China exerted its independence from the Soviet Union, China's science gained some independence from the prevailing political winds, and China was making a conscious statement about its faith in the wisdom of the Chinese people.

As Schneider points out in his summary of this event, "The relationship of Lysenkoism to genetics in China is a case study of the effects of government and Party policies on the practice and development of science."[93] This is the story of China's need to back away from the Soviet Union's negative example, where too

much of science was stifled. This is the story of China's need to allow blossoming of new ideas without turmoil of political strife. To provide a solid foundation of no political strife was and continues to be an arduous task. In China, the need to recruit as resources those who were educated was intrinsic to China's ability to be an independent nation.

The momentum for the success of this conference was because of the direct involvement of Mao Zedong. Mao's invitation and encouragement to "let a hundred flowers bloom, let a hundred schools of thought contend" was inspired in part at his realization that some of China's precious scientists could not practice their skills because of implied political threat. Mao thought this was nonsense.[94] In his effort to remove the cause for this fear he opened the way for free discussion.

The way was not smooth from then on. Not until 1976 was genetics research and education back to normal.[95] And various stages of turmoil have occurred at several times between 1956 and 1976. The main point was that as a result of the Genetics Symposium of Qingdao, there was a turning point for science. The overt political stamp of authority on this science was removed. The freedom to participate in science was

returned to many able practitioners.

The reality was that political strife continued, influencing science decisions. As efforts to squeeze out political authority in the Chinese Communist Party leadership took place, the security of the nation's various day to day activities were influenced too. Where an agricultural production team was pressed to inflate production figures, scientists would also be pressured to comply. Where real achievements of advanced teams would be doubted by nay-sayers, so also creativity and scientific imagination in research would be derided.

The Communist Party was considered as the "engine" to move the nation forward, a stronger engine if the whole nation fueled it. The Communist Party was considered "equal" to the interests of China's laboring people, the peasants and workers. Scientists, intellectuals, artists, if they joined the momentum of this engine, could enjoy support in their work. A rather general inclination of intellectuals and artists evaluated in communist philosophy was the tendency to view their expertise as special, separate, somehow above and beyond the goals of nation-building and independence. If their work assisted nation-building, then there was the opinion that they should be above

criticism. This subjective judgment was experienced in other realms of activity also, rather like someone defining their own job narrowly and looking at other tasks as "that's not my job." Abrupt reactions occurred at several points in China's revolution of "anti-rightist" campaigns.

Dazhai Commune weathered difficulties during these campaigns as careerist Party leaders tried to show just how "correct" they were.

In C.H. Li's scientific work, much of what he did was applied science, actually going to his several research plots to care for the plants. The theoretical science of his work probably appeared balanced in comparison, and he has an unarrogant manner, as both an excellent teacher and an excellent student to anyone interested in this science.

"Contradictions among the people" are not possible to handle correctly when those in authority do not have vision separate from their own career goals. Mao's position in this arena may not be clear, but he felt strongly that,

> What is correct invariably develops in the course of struggle with what is wrong.[96]

e. C.H. Li after Qingdao

In the years since this symposium the work of C.H. Li has been encouraged. In 1966, an epidemic of northern leaf blight in maize led C.H. Li to a stronger focus on disease resistance. The Zhongdan No. 2, from 1977 to 1988 accounted for 11.73 million tons of grain. Li and his associates were awarded a First Class Invention Prize in 1984 for this hybrid.[97]

The impact of C.H. Li's creative work on increasing maize production in China is projected in the following table:[98]

Years	Period (years)	Total area (million hectares-Ha)	Percent hybrid	Average yield (Kg/Ha)	Growth rate (Kg/Ha/Yr)
1952-65	13	15.67	0.04	1588	12.6
1966-75	10	18.59	55.00	2535	102.75
1976-80	5	20.35	70.00	3075	108.00
1981-87	7	20.21	80.00	3945	124.20

Sherret Chase points out,

> Assuming a per capita dietary requirement of about 300 kilograms of grain per person per year and the key role Dr. C.H. Li has played during his professional career in provision of elite maize hybrids to Chinese agriculture, one can estimate that Dr. Li has personally and substantially contributed to the feeding of 100,000,000 or more persons per year in excess of those who could be fed during the period 1952-1965.[99]

VI. The World Community of Genetics: Traditions of Modern Experimental Genetics

Why is it important to understand this history? If geneticists, biological scientists, science administrators, education theorists understand this past, steps into the future may be more effective. Scientists bring different qualities of personal stature and scientific imagination to their work in their efforts to advance the knowledge of science.

The benefits of participation in world debate were significant for the advance in genetics knowledge prior to the Qingdao Symposium. The progression from Mendel, DeVries, Johanssen, Bateson, to Morgan could be assessed. The leaps initiated by insights of Hardy and Weinberg, by Chetverikov, and Fisher, Wright, and Haldane were influential. The mathematical genetical models developed in the time between the Soviet Union's descent to Lysenkoism and the time of China's testing at Qingdao were significant enough to assist the strength of conviction of geneticists such as C.H. Li.

The dilemma of ethics and experimentation procedures were already an answered question for many of the scientists who attended this symposium. Among

scientists there is a wide spectrum of curiosity, training, adventurousness, and personality of scientists who step past the boundaries of bench activity.

This scenario for hatred and misunderstanding made people in different nations and their efforts seem different. A valid discussion for all nations is how does science serve people, nations, peace. What is in science training that may assist achievement of great insight?

Philosophy of science was perceived differently in these decades of rapid change. National security, natural resources, national interests seemed different depending on how far beyond national boundaries the issues were. China had a history of looking beyond her boundaries in education, which has influenced recent history.

Debate is an important training tool for any individual as it encourages development of judgmental skills, allows personal strengths to mature, and promotes boldness toward stating hypotheses in the process of experimentation. Western scientific tradition encourages teamwork and rapport even with disagreement. Without training in debate, the asking of questions and evaluation of information, and without a

sense of personal self-esteem, it may be easy to be influenced politically or otherwise.

The scientists following modern experimental genetics who have played major roles in the events of Lysenkoism culminating at Qingdao were Vavilov, Muller, C.C. Li, and C.H. Li.

Vavilov, at the beginning of all the chaos, was taken by surprise. Vavilov was sincere in his science efforts for the nation and for world agriculture.

Muller came in to the Soviet events full of high esteem and naiveté as he considered that of course Stalin was a scientist curious about the materialism of Muller's field. Muller was taken by surprise with his disillusionment about Stalin. Vavilov assisted Muller's escape.

C.C. Li was in the U.S. at the outbreak of war against Japan and during the early days of the Chinese Communist Party's rise. C.C. Li was enthusiastically receptive to statistical applications of genetics work and was very aware of events in the Soviet Union. The impact of political pressure was, however, somewhat of a surprise to C.C. Li in the real exposure to China's politicized science. C.C. Li's experience in his effort to return to China steeled him against bringing his

family in for more hardship without finding an alternative. Muller assisted C.C. Li in his escape, finding a place for him in the U.S.

C.C. Li's departure was a challenge to the Chinese Communist Party. The facts of C.C. Li's departure and that he felt cornered by physical threat were seriously noted by the Chinese Communists.

C.H. Li was the best prepared to face Lysenkoism in China. He had participated in patriotic efforts during the anti-Japanese war, he had participated in hybrid development training in the U.S. and recognized the successful results in U.S. maize production, and he had understood the impact of the debate in the Soviet Union. C.H. Li returned to assist in building China's agricultural output. He was able to be aggressive in the face of political pressure. C.H. Li allows emulation of scientists such as Vavilov to continue, as he makes the path for scientists who indeed speak the same language wider.

Apparent cases of inheritance of acquired characteristics continue as a scientific curiosity. No longer hindered by the questions of political authority, reasonable scientific debate may proceed.[100] As Dobzhansky pointed out in his The Biological Basis of

Human Freedom,

> Natural selection makes races adapt to their natural environments; artificial selection makes them adapted to human needs or whims.[101]

The Soviet Union paid dearly for the denial of modern experimental genetics. In China, lessons were learned from this mistake. This debate was and is a scientific debate, not an ideological or political debate. Without the stigma of politization, ideas and theories may be debated, experiments devised, conducted, criticized, and achievements credited.

APPENDIX I:

Important Names

from the Qingdao Symposium[102]

Mao Zedong (Mao Tsetung)	(1893-1976)	
Zhou Enlai	(1898-1976)	
Lu Dingyi		
Li Chingchun (C.C. Li)	(1912-)	Cornell 1940s

Attendee:

Tong Dizhou	(1902-1979)	
Luo Tianyu (Loh; Le)	(1900-1984)	Japan

Geneticists

Attendees:

Li Ruqi	(1894-)	Columbia 1920s
Zu Deming	(1905-1985)	Japan 1930s
Tan Jiazhen (C.C. Tan)	(1909-)	Columbia 1930s
Fang Zhongxi (T.H. Fang)	(1912-1986)	England 1940s
Shen Shanjiong	(1919-)	Caltech 1940s

Animal Geneticist

Attendee:

Wu Zhongjian (C.H. Wu)

Specialists in Scientific Breeding

Attendees:

Dai Songren	(1907-1987)	Cornell 1930s
Xi Yuanling	(1912-)	Cambridge 1940s
Li Jingxiong (C.H. Li)	(1913-)	Cornell 1940s
Bao Wenkui (W.K. Pao)	(1916-)	Caltech 1950s
Lu Huilin	(1900-)	Columbia 1920s

Taxonomists

Attendees:

Hu Xiansu	(1894-1968)	Harvard 1920s
Chen Shixiang	(1905-)	France 1930s

Embryology

Attendee:

Zhu Xi (C. Chu/H. Chu)	(1902-1962)	France 1930s

Cytology

Attendee:

Wu Zhaofa	(1904-1957)	US

Microbiologist

Attendee:

Fang Xinfang	(1907-)	Belg,Holl,Fra 30s
Zhou Jiazhi	(1911-)	

Ecologist

Attendee:

Li Jitong	(1897-1961)	Yale 1920s

Biochemists

Attendee:

Wang Debao (1918-) US 1950s

Li Peishan (-)

Meteorologist/History of Science

Attendee:

Zhu Kezhen (1890-1974)

Economist/Philosophy of Science

Attendee:

Yu Guangyuan (1915-)

APPENDIX II:

ORGANIZATIONAL CHARTS

INDICATING STRUCTURE OF SCIENCE IN 1958

John M.H. Lindbeck, "Organization and Development of Science." In Sciences in Communist China, edited by Sidney H. Gould, Publication No. 68 of the American Association for the Advancement of Science, Washington, DC, 1961: 29, 34

ORGANIZATION OF SCIENCE IN COMMUNIST CHINA

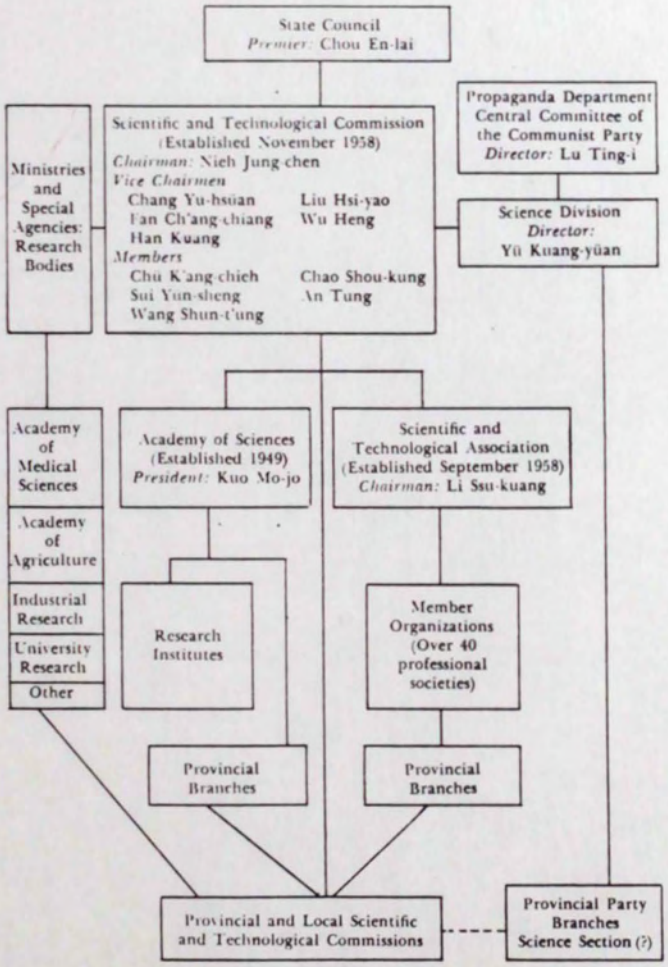
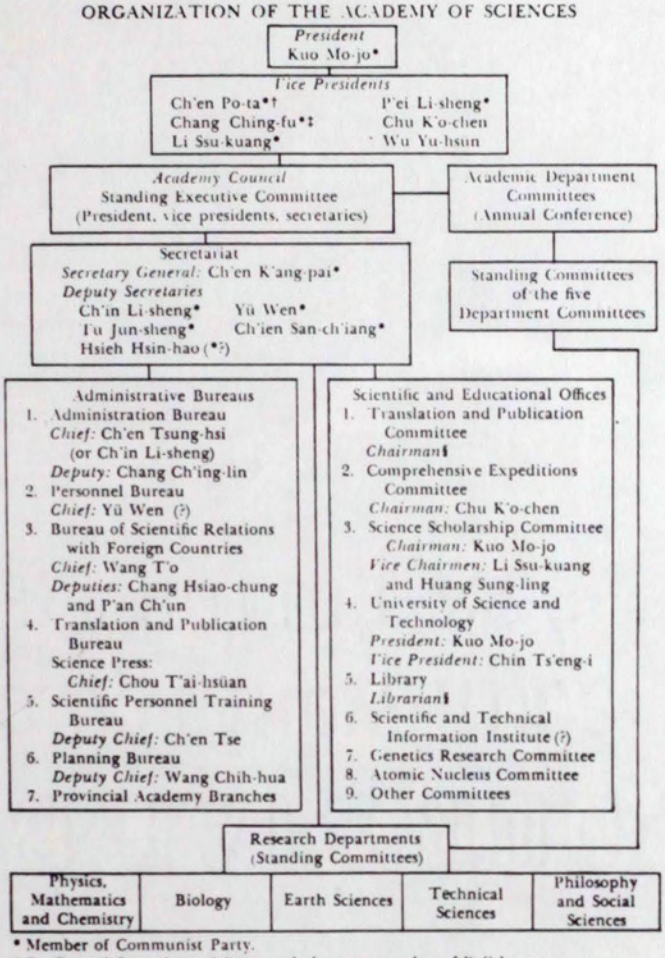


Fig. 1

ORGANIZATION OF THE ACADEMY OF SCIENCES



* Member of Communist Party.
† On Central Committee of Party and alternate member of Politburo.
‡ On Central Committee of Party.
§ Post held by T'ao Meng-ho who died April 17, 1960.

Fig. 2

APPENDIX III:
C.C. LI

TRANSCRIPT OF INTERVIEW WITH LI CHING CHUN
OCTOBER, 1989
SHERRET S. CHASE

December 1, 1989 letter
from Dr. C.C. Li to Dr. Sherret S. Chase:

"If you plan to use this transcript for any purpose other than refreshing our own memory, I think the transcript should be edited."

"I am happy to know that the nomination process of C.H. Li is proceeding nicely."

TRANSCRIPT OF INTERVIEW

INTERVIEW: Dr. Li Ching Chun (C.C. Li); (Population Geneticist, Cornell Graduate and contemporary of C.H. Li), Graduate School of Public Health, Department of Biostatistics, University of Pittsburgh, PA 15261 412/624-5393

CCL: I'm 77; I retired in 1982, so this is almost seven full years, so this coming January will be my eighth year of retirement and they wouldn't let me have the office much longer. Occasionally I publish small papers. I am still reading some things and writing some things. It is hard to change my life, a whole life's habits. When I think, sometimes I like to write a small paper. My wife is here and I have only one son and one daughter, Both are away.

The best single paper on Chinese Lysenkoism is this paper "Genetics in China: The Qingdao Symposium of 1956." This is by a woman, P. Li (Li Peishan). She is working at the Institute of Natural Sciences History of China. She is about seventy years old. I never met her. When I was in Beijing, she was a graduate student in biochemistry and later she joined this institute. According to this description she was also at Qingdao. She knows the conference very much in detail. The most important point she makes is this: In 1956, Chairman Mao declared a new policy: let one hundred flowers bloom, let one hundred schools of thought contend. Now this has got a double hundred policy - a hundred flowers bloom, a hundred school of thought contend - this is generally known, but what I didn't quite know is why he proclaimed this policy. One of the reasons

behind it is genetics. He assigned a number of people to study this problem. He said - he knows the story about me. He said, C.C. Li left Peking University simply because of his disagreement with genetics, but why? He [Mao] appointed a number of people to investigate the problem, and the people are not geneticists, these are Party people, and she was one of them and her boss, Yu - recently also arrested - now in his early seventies, Yu Guangyuan. These are all Party members, but he wanted to study this. They [the Party members] have this advantage, they have all of the Soviet literature. All of Lysenko's papers, speeches, meetings are all shipped to China. Remember the timing. Lysenko enjoys the highest power in 1948. In 1948, that big meeting at the Academy of Agricultural Sciences [in Soviet Union]. It was at that meeting he announced that "my speech was approved by the Central Committee of the Communist Party." And China was liberated in 1949. See, see the timing, very close. So in 1949 there are a number of Soviet Lysenkoists visiting in China. They begin to tell us what to do and how to do it. They are teaching and directing. The result is no good, such as cotton. We have been breeding cotton for years before Lysenko. They said cotton should be dense planted. The cotton plant is quite big. We said, the distance between the plants should be two feet and between rows should be more than three feet, so that you get flowers and cotton. The Lysenkoists say no, there is no competition between members of a species, they are brothers. So dense they should be planted. And finally they get a lot of leaves, no cotton. Foolish things like that. Yet, but anyway, they [the Chinese Party committee] studied the problem. I've heard they made a report, [stating that] "There are serious problems with Lysenko." This is hard to get from Party men. Only Party people can convince Chairman Mao. If I explain to Chairman Mao, he [would] say, "you are an American spy, I couldn't trust you." This has to be done by the Party people, Yu and Li (Peishan), and all, have seen these doubts about Lysenko. Although they are not geneticists, they read Lysenko's stuff and read our stuff and realize there is no comparison. It is due to this that they urge Mao to let Mendelians present their stories. This is why "the hundred schools can contend." At least, "we can not persecute them," like in Russia. Now, how to implement this one hundred flowers bloom policy? They suggested one way to implement it is to call a conference. Let the Lysenkoists and the classical geneticists all come to the same room and debate. No persecution under the conditions there. You can not

call anybody an American spy. We will just talk about genetics. So call a meeting. This is why they called this meeting [at Qingdao, Shandong, in eastern China, in August of 1956]. So this meeting played an important part in the double hundred policy. A hundred flowers bloom at this meeting. A hundred schools contend at this meeting. There are a number of people who were absent. I don't know why. C.H. Li was there. But I know several other prominent geneticists [who were] not there. And the Lysenkoists' leader was not there either. This is the historical background.

This article ["Genetics in China: The Qingdao Symposium of 1956" by Li Peishan, Isis, 1988, 79: 227-236] is the most complete article in English that I know of. So you should read this article in English. The English literature is this article and Schneider's [Learning from Russia: Lysenkoism and the Fate of Genetics in China, 1950-1986, by Laurence Schneider in Science and Technology in Post-Mao China, edited by Denis Fred Simon and Merle Goldman, Harvard Contemporary China Series, Harvard University press, 1989].

They are all I know. The others are mine. This is my report in 1961 at the AAAS. [Genetics and Animal and Plant Breeding, by C.C. Li, in Sciences in Communist China, edited by Sidney H. Gould, Publication No. 68, AAAS, 1961.] They wanted me to review this. The National Science Foundation and several other universities at that time began to exchange scientific literature with China. Finally they accumulate several tons of literature, mostly in Chinese. So, they do not know what to do. Their solution is to distribute it to various people for them to review and have a symposium. About genetics, they found me. They sent me about this much [by hand indicating an immense stack]. I could not find them now. This was about thirty years ago now. This is the only report in English about the activities of the Lysenkoists in China. And I wrote a review of the Qingdao Conference proceedings, that is, I wrote a book review of this, Schneider's booklet [Lysenkoism in China: Proceedings of the 1956 Qingdao Genetics Conference, translators Qin Shizhen and Laurence Schneider. In Chinese Law and Government XIX (1986)]. And this is my book review [Lysenkoism in China, Journal of Heredity 78 (1987): 339-340]. I outline, I review the major outline of the debate at the meeting. A straightforward review of the several topics, such as how useful the Marxism and Leninism philosophy is to natural science. They say that you can get guidance; if you study Leninism you can find the right experimental material and select the right

method.

This [paper] came out last week. This is a staff writer [University of Pittsburgh] who wrote about my life and my difficulty with Lysenkoism in China. So this is the paper [The Life and Times of C.C. Li, by David A. Petechuk, Health Science Review, University of Pittsburgh, October 1989]. And this is my address if you want to write to me later.

And now we come to this question, you know the Nobel peace Prize was awarded to a monk leader in Tibet, the Dalai Lama. And to this, the Beijing government acted very strongly. First, they protested. They called the Norwegian ambassador in Beijing to their ministry of foreign affairs and protested. They said, "what are you people doing?" The ambassador explained to them that the government cannot control the Nobel prize committee, that committee is an independent committee. It is not a government agency. The government has no control over it. If they decide the award goes to Mister A, it goes to Mister A. The government has no say about it. This the communist doesn't believe. In China, everything is decided by the Party; what do you mean, that what your people did, your government cannot control? Later on, the Chinese communists protested again. They said since the award was announced, nothing could be done about that now, but in December when you have the ceremony of giving the award, government officials, especially the king of Norway, cannot attend. This the Nobel committee cannot accept. They said, from the very first year, during the ceremony of awarding, the government officials and the king will attend. So I don't know how to solve this, extremely anti-foreign!

You know the name of that rich name in New York? A Jewish person from eastern Europe. He donated several million dollars, one million per year, not just one million, to subsidize some publications and some research work in the social sciences. Now every Chinese scholar can come to the United States; they can do their research in China. So this money would support the research, support the publication, and so forth. Those who got the grant from this organization are all arrested! They say, you are all CIA spies! And so, why? This money is not from CIA. They said, it is! Now finally, I forgot the name, a Jewish name, he threatened to sue the Chinese government. He said, that's my money. He not only gave to China but he gave money to Hungary, Poland, to every country where they don't support social research. They do support weapons research, they don't support social research. And anybody who gets any help from the United States will

be investigated, not necessarily put in jail. But they will watch you, they will interfere. [SSC - the philanthropist referred to by CCL is, I think, the Hungarian-born American financier, George Soros, currently also the supporter of Harvard Professor Jeffrey Sachs and the "Sachs Plan" for economic reform in Poland.]

This I am afraid; if we nominate C.H. Li this year, at this time, it is more likely to cause him more trouble than honor.

[SSC indicates here that the initiating nomination of C.H. Li has already been made by the president of the Chinese Academy of Agricultural Sciences and seconded by several key Chinese individuals.]

CCL: I didn't know that. This is all right. They are now...he was nominated in China! We are just helping, a seconding nomination. This is OK. I thought that this was without the consent of the Chinese authority.

[SSC - further background on nomination.]

CCL: OK, this is his curriculum vitae, with all his works and so forth. They send you this? [SSC: yes] Since this is initiated by them we can second, yes, yes, we can second. I wouldn't dare to initiate him, since their reactions [might be negative]. We mean to honor this man. The communists might take it otherwise. Yes, this is OK I think. Yes, this is OK.

[SSC - further background.]

SSC: There is still a question. Nominations [for the World Food Prize] are to be made by organizations.

CCL: Yes.

SSC: And, in addition to the [Academy of Agriculture] nomination from China, there are organizations - companies - in the United States which would or will nominate him. Do you think it would be better for the U.S. nominators to simply reinforce the Chinese nomination? And separately, I'm listed by the academy as a seconding individual nominator.

CCL: Yes a seconder, a supporter. That's fine. Yes, that's fine so far. In addition to that, you want organizations? In this country? On the phone you mentioned an association of corn geneticists?

SSC: Well, the company that I worked for is where this started. That's a biotechnology company, DNA Plant Technology. I also wanted to talk to you about a second possibility. You probably know Don Duvick of Pioneer?

CCL: Pioneer Corn

SSC: You knew Bill Brown, I'm quite sure.

CCL: Bill Brown? I know Goodsell.

SSC: Goodsell goes before.

CCL: I know Goodsell.

SSC: Goodsell is no longer living. He was a good friend of mine also.
CCL: He is my teacher!
SSC: I was interested in haploids in corn, and Goodsell picked up that work [for Pioneer] and did some interesting studies of his own, and we became good friends.
CCL: Goodsell lectured in Chinese! Very good Chinese! I had my agronomy course from Goodsell.
SSC: He lectured in Chinese?
CCL: Very good one. At one year [long after], I was in Chicago presenting a paper which is not really about plant genetics. I give up on plant genetics; yes, I'm doing human genetics. After my talk, a short man came to me. I didn't think Goodsell is short when I was a student, but that day, he walked up to me and said, "Dr. Li, do you know me?" I looked at him and said, "no." He said, "I am Goodsell. I was at the University of Nanking." After awhile the old memory comes back, and I can see he is Goodsell. I saw him only once. He told me he is with Pioneers Corn.
SSC: Yes, before going to Pioneer I think he worked as a graduate student with Dr. Stadler.
CCL: Stadler? Yes.
SSC: I think he was one of a number of students - Dr. Stadler was very difficult. A wonderful individual, but for graduate students, he could be a tragedy. The few students who were successful had a lot of stamina.
CCL: You mentioned Brown. He must be younger than Goodsell?
SSC: Brown would be about 75.
CCL: Brown?
SSC: William Brown. He studied with Anderson, not E.G., but Edgar Anderson, and he was a protege of Henry Wallace.
CCL: Yes, there is such a man.
SSC: Now, Pioneer has had a number of scientists in their top administration. William Brown became the president and later chairman of the board. His junior is Duvick, and Duvick is now, my guess, a candidate to be president in the next round. And I will be in touch with him next week if possible. He was out of the country, and when I get back myself, I will approach him as to the possibility--it would be interesting if Pioneer organization would endorse this nomination also. They already have an association with Dr. Li. Pioneer hybrids are already being tested in China. And again this political business worries me. For example, would it be better for a US nominating organization to be a primary nominator or should they endorse, second, the nomination of the Academy? Of course, a US group

might not even know, at this stage, that there will be an initiating nomination from the Academy.

CCL: Everything in China is political. There is no such thing as the individual.

SSC: I was wondering if you could give me some idea of the sorts of difficulties that C.H. Li has faced during his career. I know he has faced many. I have a picture of him as a young man carrying a little pot of millet, of Setaria, [actually a wheat-rye hybrid, Triticale] and apparently he was moving in advance of the Japanese. And he wanted to save his research material, for further cytogenetic study. That is the period of the Japanese take-over. And later, just as he went back home after his period of graduate studies in the United States, the communists took over, and there was that period of turmoil; and then Lysenkoism came in, and then there were a number of other changes and then the Red Guards and the period when intellectuals were "sent down" to work in the country to "learn from the peasants" and he too went down to work. He worked rather well, he was used to working with his own hands on the land with the peasants, and he was able to continue his corn breeding work successfully but still he was forced to "go down," and I was just wondering if you could list the sort of challenges which he must have had to overcome in order to function.

CCL: The details of course, I have no way of knowing, but I know his general attitude. His general attitude reflected very well at the meeting [the decisive Qingdao conference in 1956]. C.C. Tan also spoke several times at the conference; every time he emphasized that the two schools of geneticists should get together, and compromise, "we learn from each other." First, he said, "The Lysenko School and the Morgan School are both very young; so, the two schools should get together and learn from each other." He spoke along this line three times, and finally, according to the meeting report, two [conferees], one is C.H. Li, one is Wu, whom I also know, Wu Zhongjian, who were against this philosophy and against C.C. Tan's suggestion, said there could be no compromise. C.H. Li expressed this attitude through words like this, "What precisely do you mean by compromise? You accept half of Lysenko and let them accept half of a gene? Precisely what do you mean by compromise? In all natural sciences, there is only one language. And there is only one truth. I don't want to fight, but I don't understand what you mean by compromise?" So I know his attitude is very tough, very tough. Both C.H. Li and that Wu as I mentioned in my review, Wu is an

animal geneticist - I mentioned his name here - I purposely mentioned it (my eyes are very poor) - here, I marked it off for you. Wu is this man, who with C.H. Li stood his ground. We were together in the same department for a short period, because whent he communists came, threee agricultural colleges, Peking University, and the Agricultural Institute of Tsing-hua, and the Communist Agricultural College in somewhere else, all three merged into one. They became the independent Peking Agricultural University. At that time, Li and I were in the same department. This was in 1949 and 50. Since I was under attack, we couldn't get together and talk. That was forbidden. If you are under investigation, you are socially isolated. You see nobody, and nobody sees you. So I couldn't see him.

You see this is the communist tragedy. It is very interesting. When the communists want to attack something, they always pick a target. They are not against all geneticists, becasue there are too many of them. They concentrate on one, and if they can liquidate this one, then all the others would be quiet. And the one they choose is me, because I was the Department Head of Agronomy. I teach genetics and biometry. I'm also the Director of the Agricultural Experimental Station. Li is not, and the other geneticists are in the Academy of Sciences. They have nothing to do with agriculture, so they chose me. During that period, all these people have to stay away from me. And at that, I have a choice. I can turn over, I can change my color, I can say Lysenko's genetics is new, progressive, it is the ultimate truth, all Morgan stuff are reactionary. I could have said that. If I said that, I could have kept my position. Probably have good jobs too. But I just couldn't say that. To say something against your own - what you understand to be true, it is very difficult. Without knowing it, I got myself in an argument, and it is once, twice, and we argued all night, and the communists say, "Li is hopeless. Now we have to get rid of him. He is resistant to learning." That means I don't learn new things.

One old party member by the name of Chang; he is associate professor; he is also old party member; they send him to see me after supper. I know there is something - after supper we talked over a pot of tea. We talked until midnight, his suggestion is - he said, "Dr. Li, you just recant." Recant means you criticize yourself, say I was wrong in everything, from now on I will be a new man, and I learn new things. He said, you simply recant, and your problem is over. We will

not get you anymore if you just recant. On the other hand, if you don't - as an old party member and as a colleague - he is an associate professor in the veterinary sciences - he knows genetics. That's why they sent him over to see me. he said, if you don't, you will force the party to do something. I will feel sorry for you. And his final question is, "you tell me why you are so confident of this Mendelian ratio business?" I said, "Take the human blood group. If the mother is of a certain group, and the father of a certain group, we know what are the possible groups of children and the impossible groups. If the child belongs to an impossible group, I can say, your wife has another man, which is a very serious accusation. But I have no other choice. I can say, I have that much confidence in Mendelian law." His color changed and he said, "you say that, that's almost hopeless." He stayed almost all night, because that is his mission. It is no use to fight, you just recant, be a new man, and we will be all together. Probably that was the best thing for me to do. Probably that was the best. But that was the last, that was the straw. After that, I know I have to get out. Yes, yes. No more compromise.

SSC: How did you get out?

CCL: You couldn't really say goodbye. I made up my mind. I didn't even tell my wife at the planning stage. I just sat in my office and think by myself. I have no underground. We have no connection with underground. I do everything myself. You are taking a chance of course. First, I have to wait until a time I have an excuse to travel. My [family] home is in Shanghai, and, in between, in the winter time, when the semester is over, we have about three weeks winter vacation. That covers Christmas and Chinese New Year. And my mother was in the hospital. So I wrote a letter to the Dean. I said, "Since there is the three week vacation, I want to go to Shanghai to see my mother." First, they didn't suspect anything. In China, when your mother is sick, and you want to see your mother, this reason is very strong. This is one way, to choose the proper time. Second, you have to sacrifice your home. Don't pack. If you do any packing, they would say, "If this is a train trip, why should you bother to pack?" Only two days before I leave, I tell my wife. I said, "don't take anything." We sacrifice everything. "Just you and me. We want to save the people, not the things." I said, "I will put up a picture of Mao on the wall." She disapproved of that. She said that is overdoing it. Finally, I didn't pack anything - the curtains, the carpeting, - the most

important thing was the rice. I have a big bag of rice. All were left there without touching anything. My bags, my books, the rice - everything as if nothing has been touched.

Early in the morning, we went. I had bought the tickets, so early in the morning I called a rickshaw and we went to the station. I didn't say goodbye to anyone. I told only two people. One is Lin. I know he wouldn't sell me out. That was already at one o'clock at night. When I knocked on the door, they came out in pajamas, and were very annoyed. "Do you know what time it is?" I said, "I know we are intruding, but I have only one thing to say. I'm not going to see you anymore. Yes, I'm leaving tomorrow."

It is this way I got off. I got to Shanghai. My mother was very happy to see me at the hospital. I didn't lie. Everything I told them was true. My mother is in the hospital. I go to the hospital, the hospital people told me that you can get your mother back home, because there is nothing we can do. She may die in a few days. She may not die. So the next day, I took my mother [to her father's] home [in Shanghai]. And then I asked my mother, I said, "I am leaving tomorrow." My mother disliked that very much. She said, "you haven't been home for several years, yet you just got home. You want to go tomorrow!" I said, "I have my reasons." Now, I told them, if I don't leave in a few days, people will come into your house to search for me. So, the next day, against her will, I bought tickets to Canton and then [my wife and I] crossed to Hong Kong. Yes. And my mother and father didn't believe that. After a week, communist agents came. Where is Li Ching Chun? My mother said, he went to Hong Kong. Left? No, he couldn't be there. He is here. We know the day he arrived. He couldn't just go away so soon. No, she said, he really left. He said, we have to search the house. My Shanghai home has four stories, basement, first floor, second floor and attic. Attic is a full attic with a bedroom. He searched all the way from the basement, floor by floor, and finally they get to the attic. They find all my old books with my name. "See, all his thinga are here so he must be here!" My mother tried to convince him. "He left and he went to Hong Kong empty-handed. He didn't bring anything." They couldn't find me. They finally staked agents around the house and just watched the house. They watched for two more weeks, and finally they were convinced I was no longer there. Amd after they are convinced I am in Hong Kong, they know somehow, they know my brother's address in Hong Kong. They wrote me in Hong Kong. Said, come back. What you did will not

be damaging. You will come back and work as usual. As if nothing happened. Those letters, I didn't answer. They are still trying to get me back! You see I have no underground connections. I'm just a professor. I told my wife they could have got me any time. If they had suspected, the first day there would have been agents for me in the Shanghai Railway Station. It is that easy. But they didn't think that. Yes, they thought, "They will come back before the school opens again." In other words, you can escape through underground organization, or on your own.

There are many prominent people who came out through protection. There were underground organizations, yes, but I didn't have that connection. I just know their psychology. I know, if I just do this and this. Stay 24 hours before them. When their agent got to Hong Kong, I was already in Hong Kong. Just one step ahead of them.

(SSC and CCL - discussion of current events and family matters.)

CCL: This kind of xenophobia; this is a disease. This anti-foreign feeling is definitely a disease. They don't quite realize what the western people did for China. They don't appreciate it. They say, you come here, all you want is a fast buck, that's all. But more than that, the thinking that you do...

SSC: How did C.H. Li do inbreeding during the Lysenkoist period, if Lysenko said inbreeding is "bad?"

CCL: Concerning inbreeding, during Lysenko period; maybe during those years of 49-50, 51, maybe he doesn't do inbreeding or maybe he doesn't call it inbreeding.

SSC: He did continue inbreeding of corn [for development of inbred lines].

CCL: Yes, call it something else. Fortunately, he wasn;t the target. Yes, he was on the side.

SSC: How could he avoid being a target?

CCL: The target according to my information from the party, the first is me. And the second, after my downfall, is Wu, the animal geneticist. He is also anti-Lysenko. That was the number two target. But since I left, everything got quiet, so the movement just stopped. No particular individual was chosen as a target anymore. Yes. Because of this they automatically discontinued their course, no teaching and so forth. And after I left, there are many, many things too.

SSC: I know, there was a period during which Dr. Li and I wrote letters to each other. Then it became difficult because of Lysenkoism and political sensitivities for him to write anyone in the United States. I was at Iowa State, on the staff, then - a

pretty conservative place politically. So we didn;t communicate. We lost touch with each other. It wasn't until 1971 that I had a chance to find out whether he was living. Since then we have s een each other a number of times. He arranged for Kenny [my wife] and me, as individuals, to be invited over in 1975.

CCL: In 1975? You visited Peking?

SSC: Well, yes; the corn belt. We were in Peking and the country districts nearby where corn was being grown. We were also in Shansi Province and up in the north, in and near Kirin and Chang Chun. We travelled by train and car; truck and plane. We got as far south as Shanghai. It was a short trip, two very busy weeks, packed full. We did a great deal. But mostly centered on corn - corn breeding, seed production, corn growing, agricultural organizations. [We also became aware that the two "schools", Lysenkoism and Western genetics, were both being supported at that time; were still "contending." It is interesting that the U.S. Plant Studies Delegation of the National Academy of Sciences in the report of their four week survey made in August-September, 1974, made no mention of the continuing role of Lysenkoism in China. I think, the Chinese being considerate hosts, the itinerary was carefully set up to avoid Lysenkoist contacts.]

CCL: Very good. Did you visit after that?

SSC: I was back later in Beijing, in 1985. I was not able to travel beyond the metropolitan district. I went for a biotechnology conference.

(SSC: Background on SSC's "China" cousins.)

CCL: I don't think there will be any trouble [with C.H. Li's nomination].

SSC: I was reassured by this also. The fact that Liu, the vice-president of the Academy of Agricultural Sciences, was enthusiatic early on, was one of the main reasons that I have been encouraged to do this. I don't know just - I'm going to have to talk to Edward Williams, coordinator of the Prize, for advice from him as to where I should go now. The information that I showed you, though apparently enough for the Chinese nomination, would not be sufficient in this country to qualify a nomination. More background information will be needed. And the Lysenkoist thing is, could be very important to the thinking here, but it is difficult to deal with at the Chinese end.

CCL: We don't mention the Lysenko affair. Yes, you know the recommendation, we just mention his work on corn. We don't mention Lysenko.

SSC: Part of his strength is that he did resist.

CCL: That goes without saying.

SSC: In this country, it doesn't go without saying.

CCL: In this country, you are right. But, if you say so, that will embarrass the Chinese authority. I - my idea is we shouldn't mention Lysenko in our recommendation.

SSC: We could mention the period of difficulty.

CCL: We could take it the other way. He continued to work; on his corn genetics and breeding, that indirectly implies he resisted Lysenkoism. This is what the Soviet corn geneticists did. In 1956, no, in 1955, before the Chinese have the Qingdao meeting, the Soviet Union has a corn meeting too in 1955. They didn't attack Lysenko; they merely talked about corn genetics and hybrid corn, and it was legitimate, beacuse Khrushchev had visited Iowa and brought hybrid corn back. They said, this is Khrushchev's interest, hybrid corn. So they used that at the corn genetics meeting without mentioning Lysenko. It was obviously anti-Lysenko without saying so.

SSC: How about the period of anti-intellectualism? Intellectuals were sent to the country to work with the peasants. Can that be mentioned?

CCL: Yes, that can be mentioned. That was a general policy whether you are a geneticist or not. Yes, that can be mentioned. And their published things you can mention - such as his resistance to compromise at the meeting at Qingdao, that you can mention. That's published record. Communists know that too. Yes, but beyond what the communists themselves publish, we don't mention. At the Qingdao conference, he stood on his own ground. There was no compromise. That I think is strong enough.

SSC: More recently, during the anti-intellectual period, Li was "sent down" to Shansi Province, near Dazhai, and as far as I can interpret the record, what he did was to continue his corn breeding and develop or work with a group, an experiment station. And there he did some of his key breeding work on developing corn inbreds and hybrids resistant to the primary corn diseases of China. There he was working, as he was, with the peasants. This was very appropriate, a creative way. There is no problem in mentioning this, and there would be no problem in going back to the Japanese period, when at great risk and difficulty he saved key breeding material for study [the wheat-rye hybrid].

CCL: That was good against the Japanese.

SSC: You have been very helpful to me today.

CCL: As for me, I was woried that if we don't do it right, we might get C.H. Li in trouble.

SSC: You know the thing cuts both ways. One of the reasons he is such an attractive candidate this year is

that Americans would like to honor a Chinese who is not political, who has done something very important for mankind. And one of the reasons for the timeliness of this nomination is that we are opposed to what the Chinese government has just done to so many of its young leaders.

CCL: Too bad nobody has written a history of Lysenkoism in China. We have several books about Lysenkoism in the Soviet Union.

SSC: I have felt this lack, and that was the reason that last summer I wanted to interview C.H. Li about his experiences. It is very important that his experience be documented and those of others. What Schneider has written is incomplete.

CCL: Very incomplete.

SSC: It is a start.

CCL: At Cornell, there is a geneticist by this name, William Provine. This man studied genetics; now, he is also inthe history department. He is the one who wrote the biography of Sewall Wright. He is awfully interested in history of genetics. He also wrote this book, this collection of Sewall Wright's reprints. He is part of the time in genetics and part of the time in history...

SSC: You have been very gracious to give us so much of your time.

CCL: Thank-you. It is the first time in years to see an old Cornell class-mate. I don't see many people of my age from my own school.

SSC: That was one of the comments C.H. Li made last year, that there are so few of us left! He too is a very loyal Cornellian. Perhaps we've lived too long - and experienced too much!

APPENDIX IV:
C.H. LI

THE NOMINATION OF DR. LI CHING-HSIUNG
(C.H. LI) FOR THE WORLD FOOD PRIZE
(Cover sheet)

Nominating Committee:

Chinese Academy of Agricultural Sciences
30 Baishijiao Road
Beijing, China 100081
Phone 8314433 Ext. 2852
Telex 222720 CAAS CN
Wang Lianzheng
President of the Academy

Date of Nomination: October, 1989

Seconding Nominations:

Prof. Shih Yuantseng
Soil Agronomist
President, Beijing Agricultural University
Beijing, China 100094

Prof. C.C. Tan
Distinguished Geneticist
Genetics Institute
Fu Tan University
Shanghai, China

Dr. Sherret S. Chase
Geneticist and Breeder, Ret.
Box 193, Chase Road, Shokan, N.Y. 12481-0193
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Dr. T.C. Tso
Collaborator, USDA-ARS
Institute of International Development and
Education in Agriculture and Life Science,
Inc.
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STATEMENT PREPARED BY SHERRET S. CHASE, DECEMBER 1989
IN SUPPORT OF THE NOMINATION OF DR. LI CHING-HSIUNG
(C.H. LI) FOR THE WORLD FOOD PRIZE

NOMINEE:

*** Dr. Li Ching-Hsiung (C.H. Li) (Syn. Li Jingxiong)
*** Institute of Crop Breeding and Cultivation
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BIOGRAPHY:

*** Born October 20, 1913 in Soochow, Kiangsu Province, China
*** B.A. 1936; College of Agriculture, National Chekiang (Zhekiang) University, Hongchow (Hongzhou), China

After receiving the B.A. degree, C.H. Li remained at Chekiang University for nearly one additional year as a teaching assistant, then moved to Wuhan University in central China in April, 1937 to join Professor H.W. Li's team of cytogeneticists. (Professor H.W. Li had been a graduate student of Dr. R.A. Emerson at Cornell University in 1929 and was a close friend of Dr. G.W. Beadle.) At Wuhan, C.H. Li demonstrated his interest and competence in research by undertaking his first cytological study, an investigation of gene-controlled development of abnormal pollen mother cells in maize.

Wuhan University personnel removed themselves westward in advance of invading Japanese troops after the outbreak of the Sino-Japanese War on July 7, 1937. Professor H.W. Li decided to accept a position in Sichuan Province as chief agronomist in charge of cereal improvement in the war zones and asked his assistants, of whom C.H. Li was one, to go there as a group. When the group left Wuhan on December 1, 1937, C.H. Li carried with him a key part of his research material, a first generation wheat-rye hybrid seedling dug from the nursery. This progenitor Triticale seedling in its small pot was carried by C.H. Li on foot across the upper Yangtze River and the hilly mountain region beyond for over a month before it could be replanted at the Sichuan Agricultural Improvement Institute. The cytological study made by C.H. Li on this hybrid was published in the journal of the West China Union University.

During the Sino-Japanese War and subsequent World War II, the small group of plant cytogeneticists in West China consisting of H.W. Li, C.H. Li, and W.K. Pao played an important role in strengthening agricultural technology. As early as 1938, C.H. Li initiated work on induction of polyploidy in crop plants by use of colchicine. This productive work was published, in most cases jointly, in the Journal of Heredity 33: 351-355, 1942; the Journal of the American Society of Agronomy 337: 32-54, 1945 (both these papers on interspecific crosses of Setaria); and in the American Journal of Botany 32: 92-101, 1945 (on wheat desynapsis).

*** M.S. 1946; Ph.D. 1948; Cornell University, Ithaca, New York; Ph.D. Thesis: Chromosomal Aberrations Induced by X-rays in Zea mays; Craduate Committee: L.F. Randolph, Otis F. Curtis and H.H. Love.

C.H. Li came to the United States in November, 1944, holding a research assistantship granted by Dr. L.J. Stadler of the University of Missouri. From Missouri, Li shifted first to the University of Minnesota to work with Dr. C.R. Burnham for a semester and then to the California Institute of Technology to work with Dr. E.G. Anderson. He then enrolled at Cornell University, in August, 1945, where he held a research assistantship and pursued his research under the direction of Dr. L.F. Randolph.

Upon completion of his doctoral research in 1948, he was asked by Dr. Randolph to participate in the United States Department of Agriculture research project on the cytogenetic effects of the Bikini atomic bomb radiation on exposed maize. Dr. C.H. Li co-authored two research papers on the Bikini results (Science 108(2792): 13-15, 1948; Genetics 34: 639-646, 1949.)

Before returning to China in September, 1948, Dr. Li spent two additional months, at the California Institute of Technology, as a post-doctoral scientist to enable him to study a pericentric inversion of maize chromosome 9 that he had found in his doctoral research material.

Upon his return to China, Dr. Li joined the Agricultural College of Tsing Hua University in Peking in November, 1948, just six weeks before the Chinese Communist take-over of the city. After liberation, the several agricultural colleges of the region were reorganized as the Peking (Beijing) Agricultural University.

*** Professor of Agronomy and Genetics, 1949-1970; Beijing Agricultural University, Beijing, China

Dr. C.H. Li's expectation upon returning to China had been that he would be able to pursue a career in teaching and research as professor of cytogenetics at the Beijing Agricultural University. The period from 1949 to 1956, however, proved to be a most difficult time for western-trained biologists who wished to pursue studies of genes and chromosomes, and to teach genetics, for this was the period during which the Russian authoritarian genetic dogma, Lysenkoism, was imposed and prevailed in China, adversely affecting biological sciences in general, and, most severely, those engaged in agriculturally-related genetic research.

During the ideological remolding campaign for intellectuals in 1952, biologists, especially western-trained geneticists, were, without exception, criticized. Dr. Li's response was, for the time, to "forget about chromosomes and genes," to avoid formal teaching of genetics, to give up publication, and to concentrate on his second choice, practical maize (corn) breeding, without stressing his goal of maize improvement through inbreeding and hybridization (the Lysenkoist dogma held inbrbeeding to be "bad"). Many of his academic colleagues during this period simply discontinued all professional activity.

In 1956 a break came. From 1949 through 1956 the prevailing policy in China had been to "learn from the Soviet Union." In 1956, Chairman Mao Zedong declared a new policy: "let one hundred schools flowers bloom, let one hundred schools of thought contend." A key reason for declaring this new policy was the "genetics question." Mao Zedong and Zhou Enlai appointed a number of party members, not themselves geneticists, to investigate the Russian genetic literature. This committee reported that there were indeed serious problems. (Reinforcing this conclusion was the fact that Lysenko was removed from the presidency of the Lenin Academy of Agricultural Science in April 1956.) The committee suggested that a conference be held, the Qingdao Symposium of 1956, during which the "genetics question" would be fully examined in free debate.

As a participant in that symposium, Dr. C.H. Li, at considerable professional and personal risk, took a key role in the ensuing debate. There had been much argument for effecting a compromise between "the contending schools." According to the report of the Qingdao Symposium, a few of the participants spoke strongly, and effectively, against some sort of merger. One was Li, two others were Sheng Zujia, a microbiologist, and Wu Zhongjian, an animal geneticist. Dr. C.H. Li said, there could be no compromise. Freely translated, he asked, in effect, "What precisely do you

mean by compromise? That we accept half of Lysenko and let them accept half a gene? Precisely what do you mean by compromise? In all natural sciences, there is only one language. And there is only one truth. I don't want to fight, but I don't understand what you mean by compromise."

The symposium marked the end, not of Lysenkoism but of the Lysenkoist monopoly in China, and the end of the ban on genetics. Though the "two schools" coexisted for many years after 1956 and Lysenkoists individually continued, and continue today, to hold powerful positions in agriculture and general biology, soon after the meeting a withering of direct support for a Lysenkoist "science" occurred.

The distinguished Chinese geneticist, Professor C.C. Tan (Tan Chia-Chen) recently made a fair judgement as to the academic standing and practical contribution of Dr. C.H. Li in saying that "his astounding effort in defending the scientific truth of the gene theory against the fallacious Lysenkoism coupled with the fruitful results of his work in hybrid maize breeding led to nationwide recognition of the hybrid maize breeding effect of heterosis and general acceptance of hybrid vigor theory."

*** Senior Researcher, Maize Breeder, 1971 to present; Institute of Crop Breeding and Cultivation, Chinese Academy of Agricultural Sciences, Beijing, China

Dr. C.H. Li's highly effective work on improvement of maize for China has been both simple in approach and efficient in execution. From the start, he understood the breeding methods and advantages of the inbred-hybrid system of maize improvement undertaken so effectively in the United States; he knew that much of the northeastern agricultural soils and climate of China were very similar to the American "Corn Belt"; he had brought back with him, in 1948, a collection of the then important US inbred lines and in subsequent years was able, through friends in the United States, to obtain additional elite hybrids and other useful breeding materials. From this base and with the complementary addition of indigenous Chinese corn varieties from which inbred lines were subsequently developed, Dr. Li was able to breed a series of highly productive maize hybrids for China. Initially, these were double cross hybrids, as were those in major production in the United States during the same period. More recently, as in the United States, single cross hybrids have come to the fore.

To a remarkable degree, the initial improvement of maize yields through heterosis breeding in China was due

solely to the efforts of Dr. Li and the small group of younger scientists he trained. During these early years, he was often invited to make on-the-spot inspections and to give training courses on breeding and seed production in the countryside. Meanwhile, Dr. Li generously distributed elite inbred lines and basic breeding materials upon the request of plant breeders in other research institutes. In consequence, superior maize hybrids and efficient breeding and seed production techniques were popularized successfully in other regions of China.

The first group of Dr. Li's hybrids, double crosses bearing Nunda numbers (Agricultural University numbers), came into use in the early 1960's. Genetic studies on cytoplasmic male sterilitywere carried on in parallel, leading to gains in hybrid seed production efficiency. By 1965, 333,000 hectares of these hybrids were planted in Shanxi Province alone.

In 1966, an epidemic of northern leaf blight caused by Helminthosporium turcicum badly blasted the corn crop, affecting both the old open-pollinated varieties and many of the new hybrids. This led to the second phase of Dr. Li's breeding efforts, with a stronger focus on breeding for disease resistance. It took Dr. Li and his associates another eight or nine years to develop the elite single cross hybrid, Zhongdan No. 2, which was characterized by its good general performance, wide adaptability and high resistance to both northern and southern leaf blights as well as head smut, a disease that can be very damaging to maize in cold, dry regions of China. Since its first release to farmers, Zhongdan No. 2 has been planted totally to 15.64 million hectares in a period of 12 years, 1977-1988, with a topmost area of 2.078 million hectares in 1986. The total increment of maize grain over local check varities for this period amounted to 11.73 million tons. (A First Class Invention Prize was awarded to Dr. Li and his associates in 1984 for development of this hybrid.

Dr. Li from the beginning of his maize breeding work recognized the high heterotic value of hybrids based on the Reid-Lancaster hybrid pattern, and he closely followed progress in the United States. Many of his high performance hybrids combine an elite US inbred with an elite Chinese inbred of his development. Today in China, as in the United States, the elite inbred, Mo. 17, developed by Dr. Marcus Zuber of the University of Missouri has played a key role in recent maize improvement.

Other phases of Dr. Li's activities, briefly stated, include: 1) The development of a high lysine maize hybrid, Zhongdan No. 206, which was planted to

about 28,600 hectares in 1989, with the grain used primarily as swine feed, and the development of several semi-hard, opaque-2 and quality protein hybrids now ready for seed production and use. 2) Organization in 1983 of a highly successful nationwide coordinating program for maize breeding, for study and exchange of information on the use of exotic germplasm, population improvement for special characteristics in conjunction with inbred development, breeding for resistance to newly prevalent maize diseases and for high oil hybrids. 3) Improvements in seed production technology, including use of cytoplasmic sterility, and more recently, a practical method for use of chromosomal gene sterility. 4) Initiation, at an early date, of winter season breeding program in South China, enabling an increase in the annual rate of breding progress.

It is not to be thought that all this productive work went forward without being affected by the historical movements of the times. From 1966 through 1976, the impact of the "Cultural Revolution" on science was destructive.

In the early days of the "ten-year turmoil," Dr. Li had been "sent down" to the commune of Tachia in Shiyang County, Shanxi Province, from his university to receive "re-education" from the peasants, a common experience shared by many other professors during the same period. This was not as trying as experience for Dr. Li as it was for some of his academic colleagues as Dr. Li is used to working with his own hands and with peasants. Though inescapably an intellectual, Dr. Li is totally without arrogance. It is a compliment to both Dr. Li and the peasants of Shanxi that they worked together with mutual respect and admiration, forwarding the genetic improvement and field performance of maize. Dr. Li was lucky in being "sent down" to the Tachia Commune as it was, during that period, a leader in utilizing advanced production technology. There is some suggestion in the record that Zhou Enlai played a direct role during the "re-education" period in placing Dr. Li at Tachia, where his talents would be both utilized and appreciated.

Of himself, Dr. Li has said, "I need corn and corn needs me too." Thus, new turmoil or old, strong in his belief that in China the improvement of corn production is of key importance, he goes each season to his nurseries to make pollinations as usual, even in the summer of 1989, age 77.

HONORS:

*** Elected 1981 to Chinese Academy of Sciences, Beijing, China, as Academy Member in Biological Sciences

*** Science and Technology Committee Member, 1983 to present; Chinese Ministry of Agriculture, PRC

*** Rewarding Committee Member, 1987 to present; Science and Technology Committee, The State Council, PRC

AWARDS:

*** Awarded, First Class Invention Prize in 1984 for the development of the maize hybrid, Zhongdan No. 2, with multiple resistance to major diseases and with high yield.

PERSONAL CONTRIBUTIONS:

Dr. Li's direct and personal favorable impact on the food supply of the Chinese people comes in two major actions, and in a number of contributory ways; first came his sturdy opposition to Lysenkoism, second, and only possible with the first, came with his development of corn hybrids of superior yield. Third, in importance are a series of minor contributions, from his early work on wheat-rye hybrids (Triticale), on the Setaria millet, on sorghum hybridization, on hybrid maize production technology, and on speciality corns such as quality protein hybrids. In addition, he was able in his early years to increase understanding of the cytogenetics of maize. And he has always, in spite of formal difficulties, been teacher to his colleagues and associates.

To repeat Professor C.C. Tan's evaluation of Dr. Li's academic standing and practical contribution, "his astounding effort in defending the scientific truth of the gene theory against the fallacious Lysenkoism coupled with the fruitful results of his work in hybrid maize breeding led to nationwide recognition of the hybrid maize breeding effect of heterosis and general acceptance of hybrid vigor theory."

*** The impact of Dr. Li's creative work on increasing maize production in China is projected in the following table:

Years	Period (years)	Total area (Million Ha)	Percent hybrid	Average yield (Kg/Ha)	Growth rate (Kg/Ha/Yr)
1952-65	13	15.67	0.04	1588	12.6
1966-75	10	18.59	55.00	2535	102.75
1976-80	5	20.35	70.00	3075	108.00
1981-87	7	20.21	80.00	3945	124.20

*** Assuming a per capita dietary requirement of about 300 kilograms of grain per person per year and the key role Dr. C.H. Li has played during his professional career in provision of elite maize hybrids to Chinese agriculture, one can estimate that Dr. Li has personally and substantially contributed to the feeding of 100,000,000 or more persons per year in excess of those who could be fed during the period 1952-1965.

APPENDIX V:

MAP OF CHINA

Atlas of the People's Republic of China,

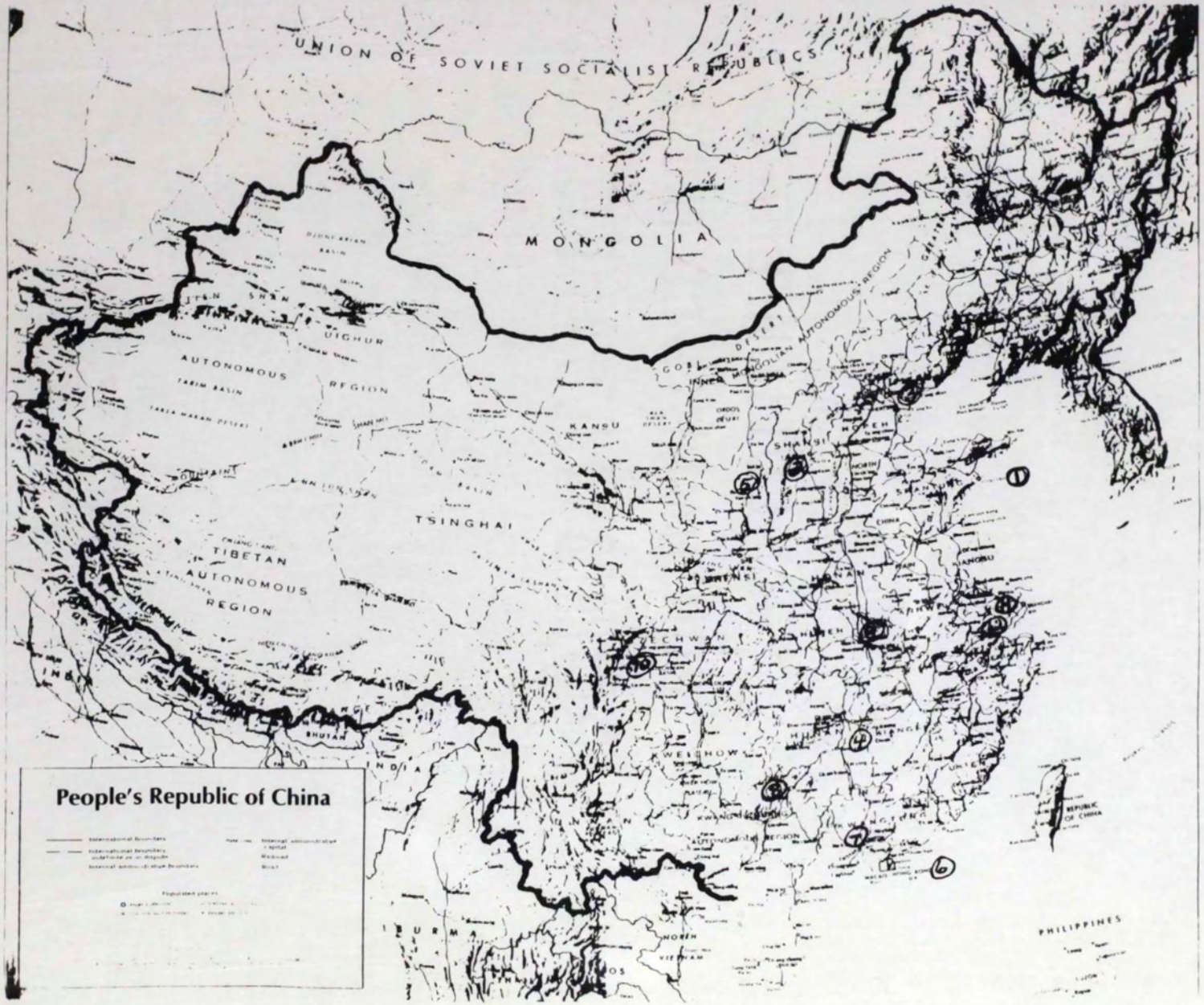
Central Intelligence Agency,

US Government Printing Office, November 1971.

This is a reduction of the comprehensive map to about 1/6 size.

LOCATIONS INDICATED:

1) Qingdao (Tsingtao), Shantung Province
2) Dazhai (in HsiYang County near TaiYuan), Shansi Province (Tachia, Shanxi)
3) Beijing (Peking)
4) ChingKan Mountains, Hunan and Kiangsi Provinces area
5) Yenan, Shensi Province
6) Hong Kong
7) Canton
8) Kweilin
9) Wuhan
10) Chengtu, Sichuan (Szechuan) Province
11) Soochow, Kiangsu Province
12) Hangzhou


People's Republic of China
UNION OF SOVIET SOCIALIST REPUBLICS
MONGOLIA
UIGHUR
AUTONOMOUS
REGION
KANSU
TSINGHAI
TIBETAN
AUTONOMOUS
REGION
SHANSI
KWEICHOW
BHUTAN
INDIA
BURMA
PHILIPPINES

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Thesis: The influence of Lysenkoism on China's genetics: the importance of the 1956 Qingdao symposium

Alice R. Chase Long

Footnote for page 31:

MEIOSIS AND SYNGAMY (modified from L.E. Sharp, Fundamentals of Cytology, McGraw-Hill, 1943, pages 102 and following.)

In all higher organisms (eukaryotes) reproducing sexually, the doubling of the gametic chromosome number in syngamy is compensated by the halving of the resulting zygotic number by meiosis at some other stage in the life cycle. In higher animals, the differentiated products of meiosis are the gametes; eggs or sperm. In higher plants, there is an alternation of generations, sporophytic and gametophytic. The sporophytic generation is the product of the zygote and, through meiosis, gives rise to spores; the gametophytic generation is the product of the spores and, through gametogenesis, gives rise to sperms and egg cells. Meiosis not only accomplishes the reduction (halving) of the zygotic chromosome pairs but is also the stage during which recombination occurs between homologous chromosomes.

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