Am. J. Hum. Genet. 74:789–792, 2004

OBITUARY
Ching Chun Li (1912–2003): A Personal Remembrance of a Hero of Genetics

Aravinda Chakravarti

McKusick-Nathans Institute of Genetic Medicine, Johns Hopkins University School of Medicine, Baltimore

Ching Chun Li (1912–2003)

Ching Chun Li, affectionately known as "C.C." the world over, was born on October 27, 1912, in the seaside village of Taku, outside Tientsin in northeastern China, and died in the wee hours of October 20, 2003, in Mount Lebanon, outside Pittsburgh. His life essentially covered all of genetics from its earliest beginnings to the completion of the human genome sequence. C.C.'s scientific life was a remarkable transition and adaptation from plant breeding to population genetics to biostatistics to human genetics. He made fundamental and lasting contributions to each of those fields of research and has been honored by the American Society of Human Genetics (ASHG) by being elected its president in 1960 (Li 1961) and being awarded the 1998 ASHG Award for Excellence in Education (Chakravarti 1999; Li 1999). C.C. Li is survived by his wife Clara, his daughter Carol, his son Steven, Steven's children Jeffrey and Juliet, and innumerable admirers.

C.C. Li was a truly remarkable scientist, scholar, and educator. These are three very distinct roles, and most of us struggle with any one of them, but C.C. excelled in each. He once told me that none of this was easy, and he worked hard at all three roles. He has left behind an

Address for correspondence and reprints: Dr. Aravinda Chakravarti, McKusick-Nathans Institute of Genetic Medicine, Johns Hopkins University School of Medicine, Broadway Research Building, Suite 579, 733 North Broadway, Baltimore, MD 21205. E-mail: aravinda@jhmi.edu

© 2004 by The American Society of Human Genetics. All rights reserved.
0002-9297/2004/7405-0002$15.00

important scientific legacy; he cultivated a broad, perceptive, and realistic view of the role and meaning of genetics in society; and he was a remarkably gifted teacher of genetics and statistics, both in the classroom and through his 10 textbooks.

I do not wish to write this remembrance as simply an account of all of C.C. Li's scientific accomplishments but rather as praise of my hero in genetics. I wish to convince you that he should be yours as well. There are two reasons for this choice. First, there are a number of accounts of C.C.'s life and work, written by his colleagues and students, that do provide his scientific background and accomplishments (Spiess 1983; Chakravarti 1999; Majumder 2004). There is also a detailed oral interview that C.C. gave to the University of Pittsburgh campus newspaper (Steele 1998); this is remarkable, since C.C. seldom revealed any details about himself and disliked being the topic of conversation. There is much to add to his existing scientific legacy, but I suspect the history of genetics will be better served by objective analysis, by science historians, of his published papers, manuscripts, and correspondence with his peers. (C.C.'s papers and extensive correspondence with H. J. Muller, Sewall Wright, Bentley Glass, Theodosius Dobzhansky, James Crow, Newton Morton, Richard Lewontin, Arthur Jensen, and others are archived at the American Philosophical Society, Philadelphia.) I have no doubt that his contributions will be viewed highly. Second, I knew C.C. Li as a mentor, colleague, and friend and carried on the longest collaboration with him over 13 years. Consequently, I might provide a different, but not necessarily better, perspective of his contributions to our young science.

The single most defining event in C.C. Li's life was his confrontation with Chinese Lysenkoists in 1949. That affair provides a critical separation of C.C.'s life into the periods before and after 1949.

Prior to 1949, C.C. had an intellectual existence not unknown to scientists. He obtained his undergraduate degree in agronomy at the University of Nanking (1932–1936), obtained a Ph.D. in plant breeding and genetics from Cornell University (1937–1940), and obtained further training in mathematics and statistics at the University of Chicago, Columbia University, and North Carolina State College (1940–1941). He also met his wife, Clara Lem of Oshkosh, WI, at the University of Chicago International House. The newlyweds returned to China in 1941, where C.C. Li mounted a contemporary and vigorous genetics research and training program at the University of Nanking (1943–1946). It was there that the Li teaching style and skills became apparent, through his writing of *An Introduction to Population Genetics* (Li 1948). This was the first time that the emergent (and frequently arcane) ideas of R. A. Fisher, Sewall Wright, and J. B. S. Haldane about population genetics were brought to and made understandable to a much larger audience. The book caught the attention of H. J. Muller, the founding president of ASHG, who got it reviewed by James F. Crow in the *American Journal of Human Genetics,* to great acclaim. Historically, population and human genetics have developed largely in parallel, with only furtive connections. It is significant to note that C.C.'s 1948 book starts with segregation analysis of human families and then goes on to cover the gamut of population genetics, with frequent reference to problems in human genetics. He was fast gaining recognition in China and, by 1946, at age 34 years, was named professor and chairman of Agronomy at National Peking University. But then, his life was rudely interrupted.

In 1949, the arrival of the Communist government in China was accompanied by the wholesale adoption of Soviet thought and action. The rise in the Soviet Union of the pseudoscientist Trofim Lysenko, who touted the inheritance of acquired traits, stemming from the personal support provided by Stalin, made supporters of Mendel and Morgan enemies of the state and decimated Soviet genetics (Joravsky 1970). Tragically, it decimated many brave and brilliant *geneticists* as well, including L. E. Levit, who mysteriously disappeared in the 1930s, and N. I. Vavilov, who mysteriously disappeared in 1942 and subsequently died of malnutrition (Li 1987*c*). This repressive environment was soon to reach China, where Lysenkoism, under the leadership of Luo Tianyo, was upheld as *the* genetic theory compatible with dialectical materialism (Li 1987*b*). Suddenly, supporters of Mendel were in utter mortal danger, since they violated the essential political philosophy of the State. Despite knowledge of this, C.C. Li continued to write, teach, and *defend* genetics. But even a C.C. could not stop the political power of a bogus science. In 1949, he was forced to resign because of his defense of genetics. He wrote to his friend Theodosius Dobzhansky about the plight of genetics in China, published as a poignant piece in the *Journal of Heredity,* entitled "Genetics Dies in China" (Li 1949). To save his family from danger (he was very aware of Vavilov's fate), C.C. and his family began a long, dangerous, and fateful escape across China—on foot (Steele 1998)—and arrived in free Hong Kong, without any official papers, in March 1950. H. J. Muller, once again, intervened on C.C.'s behalf, this time rescuing him by appealing, in person, to the United States Embassy in Hong Kong to allow the Lis to emigrate to America. C.C. never forgot Muller's kindness and named his newborn son Steven Muller Li. Steven, half-jokingly, once confided to me that this scared him away from genetics forever.

This story, with much greater detail (Spiess 1983; Steele 1998), has been told before, but it bears retelling. The incidents not only exposed the essential humanity and bravery of C.C. Li, but they also shaped his thinking

forever and made his support for objective science resolute. I cannot remember, during my acquaintance with him, whether there was anything he ever thought of or did that did not involve an unfettered and unconditional support for free and objective science. He was younger in 1949, but he always remained quite prepared to risk it all for the *defense* of what we take for granted on a daily basis. In these heady days of genetics, when success is frequent, fun, and brilliant and our dreams of what we can do are ever-expanding, it is worthwhile to be reminded, perhaps daily, that our science needed to be defended at a time not so long ago. Some, like Levit and Vavilov, gave their lives; others, like C.C., nearly succumbed. This defense is the major and primary legacy of C.C. Li, to whom each of us, scientist or not, is deeply indebted. His lesson is important, because our science may need to be defended again.

The events of his life altered C.C.'s science as well. Prior to 1949, his research was significant but dealt with many matters of genetic detail. But after his arrival in America and his being hired by the University of Pittsburgh, where he spent the rest of his scientific career and life, his works assumed much broader themes and ideas. He performed significant research in Pittsburgh, and his favorite paper, as recounted to me on August 14, 2003, was the much-acclaimed theory for calculating identity-by-state probabilities for any pair of relatives by use of stochastic matrices (Li and Sacks 1954). In an obituary, Majumder (2004) has carefully documented many aspects of C.C. Li's science and publications. Consequently, I will outline only four major pieces of scholarship by C.C. that exemplify his broad-theme approach: each of them is a scientific parable.

In 1960, C.C. Li delivered the presidential address to the ASHG, entitled "The Diminishing Jaw of Civilized People" (Li 1961); the title is taken from the famous 1892 book *Hereditary Genius* by Sir Francis Galton. C.C. discussed how Sir Galton, who was against the theory of inheritance of acquired traits, replaced the existing view with a more biological view, but one based on a set of equally dubious scientific "facts." The address specifically discussed the biological dangers of radioactive fallout—which was, in 1961, foremost on the minds of all people—and the needs of objective science, even by those who were against nuclear arms. C.C. was very well aware that the only thing one could defend was objective science.

The major raging debate in 1970 was on the inheritance of IQ, and supporters and detractors of genetic inheritance engaged in exchanging bitter vitriol. C.C. wrote, as was by now expected of him, a lucid and brilliant review, entitled "A Tale of Two Thermos Bottles" (Li 1970), of how both genes *and* the environment were necessary to explain the existing data. The essay is timeless; it's a clear and modern exposition of multifactorial inheritance, but it emphasizes objective science. The paper expounds the view that an additional need for science was to reconcile apparently contradictory "facts": two apparently disparate observations to the untrained viewer—one thermos keeping hot things hot and another keeping cold things cold—explained by a single common scientific phenomenon. As he admonished me once, "Aravinda, we are geneticists, not hereditarians; we need to account for the environment." He was a plant breeder for too long not to see that the environment acted on genes. He saw and lived science not only as discovery but as the framework for assimilating disparate observations into a synthetic whole.

C.C.'s China experience did not figure in the daily exchanges he had with people around him, and he seldom spoke or wrote about it. However, 1987 turned out to be too much for him. He knew that 1987 was the 100th anniversary of the birth of N. I. Vavilov, whose ghost had haunted him since 1943. So C.C. wrote a moving commentary, entitled "To the Memory of the Fallen Nikolai Ivanovich Vavilov (1887–1943)" (Li 1987*c*), to remind each of us of the giants on whose shoulders we stand and of the gates they guarded. He labored hard on that manuscript. Although he was by then typically sharing all of his ideas and manuscripts with me, this one was a secret to me until he presented it at a genetics retreat at Pymatuning.

However, C.C. did not live in the past, and he was always open to new ideas and perspectives. He had always been curious about explaining the sudden occurrence of a genius among a family of otherwise meager achievement, a Carl Frederick Gauss or a Ramanujan. He explained that he did not discount their environment but that these geniuses could not or did not get the reinforcement that they could have used and, in any case, this merely represented gene segregation. These ideas did not awaken in him again until an encounter with the psychologist David T. Lykken, who showed C.C. traits that show random concordance in DZ twins but near-100% concordance in MZ twins! These traits were termed "emergenetic" and were hypothesized to arise from the chance combination of very large numbers of genes (Lykken 1982). C.C. published an elegant paper, entitled "A Genetical Model for Emergenesis: In Memory of Laurence H. Snyder (1901–1986)" (Li 1987*a*), in which he demonstrated the family and population consequences of such a genetic model. This was a return to a theme he first explored in 1953 to show the general properties of recessive inheritance (Li 1953). He noted that many fully genetic traits will show hardly any familiality, so that the search for their genes cannot be restricted to family studies. Moreover, the underlying genetic variation at these genes must be very common. This is a topic of great contemporary interest and debate. It is interesting that this connection between population-

genetic principles and trait inheritance in human pedigrees was first tackled by C.C. Li in his 1948 book.

Each of the above four Li publications shows both the contemporary and timeless nature of his research and his scientific contributions. He was a master in more ways than one and in more areas than one. He taught us all, and he taught us more than one thing. He was a giant, physically and intellectually, who perceptibly changed the world he occupied. In the last 6 years, he began to lose his sight, his hearing, and his concentration, of which the last was most frustrating to him. But he never lost his will and never lost sight of who he was. In 1998, at age 86 years, he received the Excellence in Education award from the ASHG. Although physically weak, he still spoke with a clear, unwavering voice on "the natural enemies of natural science" and on dealing with the "defense of natural science against its enemies" (Li 1999, p. 16). And he reminded us about Vavilov and that genetics had been under official attack for about a third of its existence. None of us was present to hear N. I. Vavilov's defiance of the Lysenkoists in 1939, when he uttered (Medvedev 1969)

> We shall go to the pyre;
> we shall burn;
> but we shall not retreat
> from our conviction.

But many heard C.C. repeat those same words in Denver in 1998, words I presume he must have quietly recited many, many times before. We hope that the words will be only a painful reminder to geneticists and that we will have no occasion to need them ourselves.

I cannot end this remembrance having given you the impression that C.C. Li was only a serious and grave man. Nothing could be further from the truth. He had a beautiful smile, a big laugh, and he was funny, witty ("Can I have another microphone, this one has a Chinese accent"), and caring. He was a great cook and gardener, a passionate baseball fan (with many stories of the Pittsburgh Pirates in old Forbes Field), and an ardent soccer fan, and he really enjoyed his grandchildren. And he did have a mischievous sense of humor. He told me that scientists had long sought to test whether the biblical story of Eve being created from Adam's rib could be tested by counting ribs in males and females. Eventually, some scientists did do just that; of course, they did not find a difference. "But," C.C. asked me, "what if they had?"

Acknowledgments

I express my heartfelt thanks to Carol Li, Eliot Spiess, and Shukti Chakravarti for comments and clarifications about C.C.'s life, the dates of major events, and comments on earlier drafts. I am also indebted to my classmate Partha Majumder for his personal obituary of C.C. Li.

References

Chakravarti A (1999) Professor Ching Chun Li, courageous scholar and educator. Am J Hum Genet 64:14–15

Joravsky D (1970) The Lysenko affair. Harvard University Press, Boston

Li CC (1999) 1998 ASHG award for excellence in education: remarks on receiving the ASHG award: science and science education. Am J Hum Genet 64:16–17

——— (1987*a*) A genetical model for emergenesis: in memory of Laurence H. Snyder, 1901–1986. Am J Hum Genet 41: 517–523

——— (1948) An introduction to population genetics. National Peking University Press, Peking

——— (1970) A tale of two thermos bottles: properties of a genetic model for human intelligence. In: Cancro R (ed) Intelligence: genetic and environmental influences. Grune & Stratton, New York, pp 162–181

——— (1949) Genetics dies in China. J Hered 41:90

——— (1987*b*) Lysenkoism in China. J Hered 78:339–340

——— (1953) Some general properties of recessive inheritance. Am J Hum Genet 5:269–279

——— (1961) The diminishing jaw of civilized people. Am J Hum Genet 13:1–8

——— (1987*c*) To the memory of the fallen Nikolai Ivanovich Vavilov (1887–1943). J Hered 78:343

Li CC, Sacks L (1954) The derivation of joint distribution and correlation between relatives by the use of stochastic matrices. Biometrics 10:347–360

Lykken DT (1982) Research with twins: the concept of emergenesis. Psychophysiology 19:361–373

Majumder PP (2004) C.C. Li (1912–2003): his science and his spirit. Genet Epidemiol 26:81–87

Medvedev ZA (1969) The rise and fall of T. D. Lysenko. Columbia University Press, New York

Spiess EB (1983) Ching Chun Li, courageous scholar of population genetics, human genetics, and biostatistics: a living history essay. Am J Med Genet 16:603–630

Steele B (1998) In defense of scientific freedom: an oral interview with Li Ching Chun. University Times, University of Pittsburgh 31:3–4