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LUCIEN LE CAM 1924–2000

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Lucien Le Cam died at the age of 75 on April 25, 2000, at a hospital near Berkeley, California, after a brief illness. The statistical community lost one of its most original thinkers. His work has had a profound impact in our field. Statisticians recognize him as a brilliant mathematician. His students, colleagues and friends remember him for his kindness, generosity and integrity.

Le Cam was Professor of Mathematics and Statistics at the University of California at Berkeley. He stayed at Berkeley for fifty years. His retirement in 1991 hardly interrupted his daily routine. He went to his office every day and was active until the very end. In the last few months of his life, his colleagues noticed his deteriorating health. Yet in January he made detailed arrangements for the award of the "Loève Prize in Probability" and planned the award reception. Perhaps he sensed that his end was near for he labored to finish some editorial work on a festschrift for a former student, Thomas Ferguson. He continued working until the day he was hospitalized. Also, just hours before he was taken to the hospital, he sent me via e-mail a batch of corrections to the second edition of the book *Asymptotics in Statistics* (L1990)[1]. Four days later, Professor Le Cam passed away. The book was published posthumously in August, 2000. As a former student of his, I was most privileged to be his coauthor on this work.

Un fils de paysans. Le Cam, the second of three sons, was born on November 18, 1924, in Croze, Creuse, Limousin, in central France. His parents were decent and hardworking farmers with only a few years of elementary school education. Shortly after his birth, the family moved to Felletin, a small town in central France. He grew up on a 75-acre farm that his parents leased. His family was not wealthy but self-sufficient; they owned about a half dozen cows. Sending Le Cam and his brothers to secondary school proved to be a serious financial challenge for his parents; financial considerations played an important role in shaping Le Cam's future. Le Cam often recalled with regret that although his elder brother, Jean, was a brilliant student, he was deprived of opportunities to further his education. Jean had easily passed the competitive state examinations for scholarships, but the authority denied him the scholarship on the grounds that

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[1]Reference citations preceded by L refer to the list of Le Cam's publications and writings on pages 683–687.

his parents could afford the school expenses by selling their cows. Determined not to subject themselves to further humiliation, their parents sent both Jean and Lucien to a Catholic boarding school in Guéret, called Notre Dame. When he was 13 his father died. Lucien's mother took over the farming and raised the three sons. Jean and the youngest brother had to quit school to help out on the farm; the youngest brother never liked school anyway. Both of them became farmers and Jean eventually became mayor of Felletin. The priests at Notre Dame decided to keep Lucien on and pay for his room and board. He stayed there for seven years until his graduation from high school. His favorite subjects were chemistry and physics, and he looked for opportunities to sneak into the lab in the evenings to perform experiments. The teacher saw him and enlisted him for assistance running experiments. His extraordinary mathematical ability also caught the attention of the teachers. He could integrate $1/\sqrt{a + bx + x^2}$ and discovered that the roots of algebraic quadratic integral equations were given by periodic continued fractions. For special consultations, the school sent him to l'Abbé Mirguet, a mathematician-priest, who recommended calculus books to Le Cam. Le Cam was also blessed with a photographic memory that made learning Greek and Latin easy. He said that he could remember in English Kuratowski's topology book, which was written in French, complete with the number of the page.

After high school, it was decided that he would attend the seminary in Limoges and become a priest. But he endured it for only one day. He was told that he had to receive permission from the priests to read his chemistry books. He returned home the next day. This decision was a turning point in his life; he turned away from the priesthood and turned to statistics via Paris by chance.

After he left the seminary, it was too late in the year to get into the nearby university in Clermont-Ferrand. The chemistry labs were full. His only option was to go to the lycée in Clermont-Ferrand (a lycée is a standard public secondary school in France) which had an appendage with training programs in mathematics beyond the high school curriculum for the examinations for the École Normale, Polytechnique and other engineering schools.

However, it was also too late there. All the beds were taken. He was able to get free noon meals but had to rent a room to attend the lycée. At the lycée, he completed the two-year program in fairly classical mathematics. One day in a book store he saw *Eléments de Mathématique* by Bourbaki. It contained symbols such as intersection and union which he had never seen, and it was a book of results without proofs, just the statements. His curiosity led to his lifetime passion for reading Bourbaki books of mathematics. That undoubtedly influenced Le Cam's mathematical development and his way of writing mathematics.

After the lycée, he went to Paris to take an entrance examination for the École polytechnique. But registration for the examination required a proof of his being "truly" French. That was in 1944 during the German occupation when the system was designed to exclude Jews from applying. Unable to obtain the document in time to prove his grandfather's French ethnicity, he decided to take the exam for the

École normale supérieure (which required no proof). He passed the written exam but failed the oral part. That ruled out both schools. His next move was to register at the University of Paris. It required no entrance examination, simply a nominal registration fee, to become a student. The French had a flexible system that allowed students to get a *licence* (university diploma) by examination. Le Cam quickly took exams in calculus and rational mechanics, and needed a third one to get a *licence*. With permission from George Darmois, he was able to take the statistics examination without ever taking any statistics courses. Within a few months, he received a *Licence es Sciences* in 1945.

Through the introduction of Darmois, Le Cam worked as a statistician at what is now known as Electricité de France for the next five years. Pierre Massé, then an official in the French Government (who became Minister in charge of planning for all of France after the war), was involved in the nationalization of the electric system. He invited Michel Loève and Etienne Halphen, a mathematician and a Bayesian statistician, to work on applications of statistics in hydrology. Halphen recruited Le Cam and Georges Morlat to his group. The problems encountered by this group included the evaluation of probabilities of excessive discharges, the evaluation of probabilities of excessive droughts and the development of optimal management procedures for the hydroelectric reservoirs. For these problems, a mathematically tractable description of the random structure of stream flow was needed. For this purpose, Le Cam introduced characteristic functionals (after, but independently of, Kolmogorov) for point processes to study (a) rainfall distributions in time and space and (b) the way to propagate rain along land and streams. The result was published in *Comptes rendus des séances de l'Académie des Sciences*, communicated by Emile Borel. This was Le Cam's first publication (L1947), at the young age of 23.

Le Cam recalled that period fondly and maintained contact with some of his former colleagues. He said that Halphen was a scholar with tremendous intuition [see also Seshadri (1997)]. Halphen later turned to theology which was just the opposite of what Le Cam did [see Albers, Alexanderson and Reid (1990)]. Their boss, Pierre Massé, was encouraging and flexible. Le Cam was able to go to the university to attend seminars regularly, and also to participate in a study group which included Edith Mourier, Colette Rothschild and Jean Fourgeaud to discuss papers (including some from the *Annals of Mathematical Statistics*). He became even more involved when Darmois asked him to find speakers for the weekly seminar Darmois was in charge of after Fréchet's retirement. At one of the seminars, he met Jerzy Neyman, who later invited him, through Fréchet, to visit Berkeley as a lecturer for a year.

Le Cam arrived at Berkeley in 1950. A one-year visit turned into 50 years as Neyman urged him to stay to work for a Ph.D. The dean caved in to Neyman's request by allowing Le Cam to revert the status of lecturer to graduate student in 1951. Le Cam wrote his Ph.D. thesis in six months, was appointed Assistant Professor of Mathematics in 1953 and produced his first Ph.D. student, Julius

Blum, the same year. However, when Blum submitted his thesis, the dean intervened. He would not allow a new Ph.D. to be the thesis advisor of a student and appointed another senior professor to be Blum's *official* advisor.

Le Cam's Berkeley days were chronicled in Lehmann (1997). More on Le Cam's life can be found in two interviews: Albers, Alexanderson and Reid (1990) and Yang (1999). Also see Brillinger and Yang (2000). Le Cam's mathematical education was described by himself in a letter in Pollard, Torgersen and Yang (1997).

A brief description of Le Cam's theoretical work. A major part of Le Cam's scientific contribution is in the domain of statistical decision theory, especially the asymptotic part of the theory. He was a principal architect of modern statistical asymptotic theory. Building on the methods and insights of the founders of modern theoretical statistics, Le Cam developed a unifying theory for decision theory, based on the concept of a distance between statistical experiments. His work is summarized and organized in the monumental book *Asymptotic Methods in Statistical Decision Theory* (L1986).

Besides mathematical statistics, he made fundamental contributions to probability theory and applications.

It is impossible for me to describe Le Cam's enormous amount of work that crosses several fields. I can only attempt to highlight a few in chronological order, knowing very well that this does not do justice to his many contributions. A more technical description of Le Cam's statistical work is provided by van der Vaart (2002). Some of the following remarks are drawn from my correspondence and communication with Le Cam over the years.

Le Cam's first important contribution was the introduction of "characteristic functionals" in 1947 before his arrival at Berkeley in 1950. A subsequent and related publication on modeling precipitations in the Fourth Berkeley Symposium (L1961) is widely cited in the atmospheric and hydrologic sciences. These models are known as Le Camian models of rainfall because they laid the foundation for the current development of many stochastic rain models; see Gupta and Waymire (1993). Still in the same domain, it was uncovered recently that the paper by Joffe, Le Cam and Neveu (L1973c) is also a contribution to the genesis of multiplicative cascade models for high intensity rain cells. Cascade models, originating in statistical turbulence, are usually attributed to developments by Kolmogorov, Yaglom, Mandelbrot and others; see Ossiander and Waymire (2000).

In the seven-year period after the publication of his Ph.D. thesis in 1953, until promotion to full professor in 1960, he wrote many ground-breaking papers and introduced numerous seminal concepts, besides producing nine Ph.D.s. The speed of Le Cam's accomplishments is truly astounding. The extension of Wald's decision theory (L1955), the concept of weak convergence of stochastic processes (L1957), the locally asymptotic normal (LAN) theory and contiguity (L1960a), the deficiency and distance between two experiments (L1964a), approximations for the Poisson binomial distribution (L1960c, d), among numerous others, were all introduced during that period. In fact, Le Cam's distance was introduced in 1959 in an IMS Special Invited Lecture. The slow publication process delayed its appearance (L1964a).

In his decision-theoretic and asymptotic investigations, Le Cam acknowledged in his book (L1986):

> The ideas and techniques used reflect first and foremost the influence of Abraham Wald's writings. Another influence was that of Jerzy Neyman, who asked a variety of questions but who also promoted my academic career. Some other easily discernible influences are those of Jaroslav Hájek and Charles Stein. Not so visible, but indispensable, were the teachings of Etienne Halphen, who attempted (without success) to convert us to the Bayesian creed long before it became fashionable, but who also taught us a great deal about the interplay between theory and practice.

His asymptotic investigation began with his Ph.D. thesis. According to Le Cam, (as is well known) his thesis problem came up in a discussion with J. L. Hodges, Jr., who observed that R. A. Fisher's assertion about the asymptotic superiority of MLE could not be entirely correct. Le Cam conjectured that it was correct "almost everywhere Lebesgue" for any given sequence of estimators. Neyman asked him to prove it. In his thesis he proved that Bayes estimates for one-dimensional parameters possess two asymptotic "optimality" properties: local asymptotic minimaxity and local asymptotic admissibility. He then showed that maximum likelihood estimates for one-dimensional parameters inherit both properties by being "close" to the Bayes estimates. To establish the closeness, he had to prove a theorem about the asymptotic normality of posterior distributions. Le Cam's theorem uses the L_1 distance and is about conditioning on the whole sample $X_1, \dots, X_n$. As Le Cam put it, his theorem made precise an old theorem of Laplace, and it was *not* proved by Bernstein (1946) or by von Mises (1931). Their theorems are about different kinds of conditioning (the posterior of θ given the sample mean $\bar{X}_n$, not given all the $X_1, \dots, X_n$) and both use a weaker form of convergence of cumulative distributions. However, Neyman insisted that Le Cam's theorem be called "Bernstein–von Mises theorem," a name now attached to various related theorems [see, e.g., historical notes in Le Cam and Yang (L2000a), Chapter 8].

Also in response to Neyman's inquiry, he looked into the problem of generalizing Neyman's theory of best asymptotically normal (BAN) estimates and the theory of $C(\alpha)$ tests (Neyman coined the name in which "C" is for honoring Cramér, while "α" refers to the significance level in Neyman's construction of optimal similar tests for composite hypotheses [see, e.g., Neyman (1979)]). Le Cam (L1956a), following Wald's approach (1943), generalized both Neyman's and Wald's results. He formally introduced the definition of asymptotic sufficiency and devised an estimation procedure that produces not a single but a class of estimates which all have asymptotic optimality properties similar to those of the maximum likelihood estimates as proved by Wald.

The conditions in Le Cam (L1956a) were further weakened in his fundamental paper, "Locally asymptotically normal families of distributions" (L1960a). The i.i.d. assumption is no longer required. Asymptotic investigation is carried out under the LAN conditions. (Actually, in this paper the LAN conditions are a part of the DAN conditions that Le Cam introduced for differentially asymptotically normal families of distributions.) Then if consistent estimates, say θ_n^*, exist [see, e.g., the thesis of Kraft (1955), one of Le Cam's students, or Le Cam and Schwartz (L1960b)] Le Cam's estimation procedure would produce a class of estimates that will be asymptotically normal, asymptotically sufficient, asymptotically locally minimax and have other good properties. The estimates are obtained by making a linear-quadratic expansion of the log likelihood in the vicinity of θ_n^*. Take for the new estimate the point that maximizes the linear-quadratic expansion. This estimation procedure was further elaborated for example, in Le Cam (L1974, L1977b, L1986) and Le Cam and Yang (L1988b, L2000a) and is now widely used under the name of the one-step estimator.

The LAN theory is one of Le Cam's most recognized works. The LAN conditions led to Jaroslav Hájek's proofs of convolution and minimax theorems, which were quickly generalized by Le Cam. These broad results are usually called the Hájek–Le Cam convolution and local asymptotic minimax theorems [see Le Cam's recollections (L1998a) on his contacts with Hájek]. These theorems have since been taken as the standard of evaluation of statistical methodology.

While working on the LAN conditions, Le Cam also investigated a fundamental problem of statistical decision theory. Building upon the work of others on the comparison of statistical experiments, particularly the Blackwell–Sherman–Stein theorem and Blackwell (1951, 1953), Le Cam introduced unifying concepts of deficiency and a "distance between experiments."

The Le Cam distance and deficiencies are fundamentally important in that they make approximations and asymptotics fit well into Wald's theory of decision functions (1950) that Le Cam had generalized in a landmark paper (L1955).

In 1969, Le Cam introduced the Hellinger transform of an experiment, which is an extremely important technical tool. See historical notes in Le Cam and Yang (L2000a), Chapter 3. In the same paper, he introduced the concept of "weak convergence of experiments," a by-product of the Le Cam distance. It is shown by Le Cam (L1969) and Torgersen (1970) that the weak convergence of experiments is equivalent to ordinary convergence of finite-dimensional distributions for likelihood ratios. This convergence is significantly weaker than weak convergence of likelihood ratio processes because it does not require tightness of the processes, a concept invented by Le Cam (L1957). One of many important consequences of weak convergence of experiments is that it implies the Hájek–Le Cam asymptotic minimax and convolution theorems.

Recent results on the asymptotic equivalence (in the sense of weak convergence of experiments in Le Cam distance) of nonparametric density estimation and nonparametric regression with Gaussian experiments, as obtained for instance in the works of D. Donoho, I. Johnstone, L. Brown, M. Nussbaum, M. Pinsker and others, have revealed the scope of Le Cam's mathematical structure. Using the convergence of experiments one can evaluate the minimax risk for infinite-dimensional parameters in certain cases by showing the global asymptotic equivalence of, for example, density estimation with certain Gaussian experiments where the minimax estimator is known.

In probability theory, Le Cam (L1957) studied convergence of measures on topological spaces and gave what may be the first usable definition of (bounded) Radon measures on completely regular spaces. The techniques and the concepts (tightness, τ-smooth and σ-smooth) that Le Cam introduced are the ones in use today in mathematics. See the historical note in Bourbaki (1969), Chapter 9 of the volume on Integration. He was also a pioneer in the investigation of approximations for the Poisson binomial distribution (L1960c, d). This research area has experienced rapid growth in recent years; see, for example, the book by Barbour, Holst and Janson (1992). Following the work of Kolmogorov, Le Cam also obtained several new inequalities in problems of approximation of distributions of sums by infinitely divisible ones (L1965a). Detailed developments may be found in Arak and Zaitsev (1988).

In the 1970s, Le Cam (L1973a) introduced the concept of metric dimension. He recognized later that his definition of metric dimension was akin to Kolmogorov's definition of metric entropy. With the metric dimension, he proposed a new method of constructing estimators for arbitrary parameter spaces. This estimation procedure provides upper bounds on minimax risk [Le Cam (L1975a)], without having to worry about passages to the limit. In contrast, the Hájek–Le Cam theorems provide asymptotic lower bounds.

The concept of metric dimension has had far-reaching consequences. It has provided a nice unification of studies of "speed of convergence" [see, e.g., Donoho and Liu (1991)]. As refined and extended by Birgé and others, this has provided a most flexible and reliable tool for understanding efficient estimation of high-dimensional parameters such as curves and other functional parameters [see, e.g., Donoho (1997)].

Another key notion introduced by Le Cam (L1974a) is the "insufficiency number." He studied the "information in additional observations." It decreases as the number of observations n increases and the "insufficiency number" measures how far the first n observations are being "sufficient" for the $n + r$ ones. Le Cam showed that his "deficiency" of (L1964a) is smaller than the "insufficiency" number of a subexperiment.

The importance of Le Cam's theory has been widely recognized as is evidenced by the central role it plays in numerous scholarly tracts and texts and by the numerous citations of his papers. The following are examples of books either devoted to specific topics that Le Cam introduced or have substantial coverage of Le Cam's theory: Arak and Zaitsev, *Uniform Limit Theorems for Sums of Independent Random Variables* (1988); Basawa and Prakasa Rao, *Statistical*

Inference for Stochastic Processes (1980); Basawa and Scott, *Asymptotic Optimal Inference for Nonergodic Models* (1983); Bickel, Klaassen, Ritov and Wellner, *Efficient and Adaptive Estimation for Semiparametric Models* (1993); Greenwood and Shiryavev, *Contiguity and the Statistical Invariance Principle* (1985); Hájek and Šidák, *Theory of Rank Tests* (1967); Ibragimov and Haśminskii, *Statistical Estimation* (1981); Janssen, Milbrodt and Strasser, *Infinitely Divisible Statistical Experiments* (1985); Roussas, *Contiguity of Probability Measures* (1972); Strasser, *Mathematical Theory of Statistics* (1985); Torgersen, *Comparison of Statistical Experiments* (1991); van der Vaart, *Asymptotic Statistics* (1998).

Le Cam's theory and work had a transforming influence on mathematical statistics and lifted the field to a new level. For his pioneering work and monumental contributions, Le Cam received an Honorary Degree of Science from Université Libre de Bruxelles in Brussels, Belgium, in 1997. One cannot help noticing that he was honored rather late in life.

Neyman and applied research. Throughout his life, Le Cam remained very close to Neyman. He was a coeditor with Neyman and Betty Scott of the celebrated *Berkeley Symposia*. His last collaboration with Neyman was a coedited book, *Probability Models and Cancer* (L1982), in which Le Cam introduced a stochastic model for cancer detection. Prior to his death, Neyman appointed Le Cam as his Associate Director of the Statistics Laboratory that Neyman established in 1938. After Neyman died, Le Cam took over the weekly Neyman seminar until his retirement in 1991. Following Neyman's tradition, he funded the high tea for the seminar and the drinks at the women's faculty club on the Berkeley campus.

Because of Neyman's interest, Le Cam had been involved in cancer research and became much more committed to it in the early 1970s when his daughter was stricken with bone cancer and had to have a leg amputated and later, a lung removed. Le Cam's extraordinary knowledge of cancer quickly gained the respect of the attending physicians and some of the people at the Mayo Clinic. He was invited to participate in research in a clinical trial of a group of young children with osteosarcoma, including his daughter [see Albers, Alexanderson and Reid (1990)]. The result of the trial and the related immunology research have been published in a series of papers in medical journals. This highly successful clinical trial was reported in the press.

Other than cancer research, Le Cam investigated the effects of radiation on living cells (with unpublished work) and sodium channel modeling. Le Cam's attitude toward applied work was that it is hard to do applied work in which one has to worry about the nitty-gritty.

A teacher and mentor: a scholar without academic ambition. Le Cam was Chairman of the Statistics Department and also the department graduate advisor at Berkeley during 1961–1965. I was a student there at the time and met with him for academic advising. I discovered in Le Cam an incredibly organized advisor who discussed the curriculum with me and wrote down possible choices of courses year by year for the next few years. As a newly arrived foreign student, I was pretty lost and that piece of paper guided me well.

Students called him "Mr. Le Cam," better yet in the seventies, "Monsieur," and in the nineties, "Lucien," marking the passing of the good old days. He was well known for giving deep and mathematically difficult lectures. Most of us did not have the necessary background for his courses.

He never lectured from notes. I remember well my first class in his asymptotics course. He wrote on the blackboard seventeen different types of convergence of probability measures. The sixteenth was L_1 convergence and he said that it is useful. We had never heard of many of the types of convergence he showed us. Then Erik Torgersen (Le Cam's student) showed us Billingsley's notes on weak convergence (prepublication of his book). We found some of the types in there.

If his lectures were an overview, outside the classes he was extremely generous with his time and ideas. His office door was always open. Anyone could walk in at any time to ask him questions. Students' questions were taken seriously and the discussions could go on for hours. Sometimes upon request he would provide long written answers and even provide new theorems.

Officially Le Cam had 38 Ph.D. students, including prominent names in our field. His legendary broad knowledge was reflected in the wide range of his students' thesis topics: mathematics, statistics, probability theory and others. For instance, his students Odd Aalen wrote a thesis in biostatistics, and Jim Schmidt in radiation physics. Notably, Aalen's point process approach to survival analysis used in his thesis has become a standard research method in biostatistics. His thesis has stimulated tremendous interest among the theoretical people to work on biostatistics problems and has provided an impetus to the current development of semiparametric analysis.

Thirty-eight Ph.D.s is really a gross undercount. Actually, Le Cam had many defacto Ph.D. students. He treated all students alike and made no distinction between his and other professors' students. He persuaded some discouraged students, who left Berkeley without finishing their theses, to come back and then helped them to finish their theses. His generosity and kindness nurtured numerous scholars around the world.

Le Cam was known as the students' protector. Students knew they could count on him for help and would go to him when they had personal difficulties. His style was strictly academic while his mentor Neyman's was more fatherly. For instance, through Neyman, Le Cam met Harry Romig's daughter, Louise. Harry Romig was a pioneer in statistical quality control and a good friend of Neyman. When Le Cam announced that he and Louise were going to marry, Neyman tried without success, by asking Harry Romig, to postpone the wedding until Le Cam finished his thesis. Although Neyman did not get his way, the quality of Le Cam's thesis did not suffer either, despite a quick submission.

Le Cam gave plenty of guidance on education and theses. As for general interaction with students, that typically took place in the coffee room during the lunch hour. Le Cam was a fixed point in the coffee room and had a preferred seat at a big conference table where many graduate students, professors, visitors and secretaries ate lunch. Loève was one of the regulars. During lunch, you could hear different opinions on current events since many different nationalities were present at the table. That was back in Campbell Hall before the department relocated to Evans Hall. You could always find Le Cam there during the lunch hour. In Evans Hall, the lunch crowd had dwindled, but Le Cam kept the tradition. He was there on the last day before he was hospitalized. Le Cam kept a routine schedule from which he rarely deviated. He would go home at 4 pm—his last day was no exception. That evening Louise had to take him to the hospital where he never regained consciousness. He passed away four days later.

Le Cam rarely talked with students about things like career planning or the future. His view toward such was not unlike his remark made in a panel discussion on statistical inference and the future of statistics (L1968): "Unfortunately, I gave a lot of thought to the problem, and I have strictly no idea what is in store for the future of statistics. The more I think about it, the less I know what inference means. All I will be able to say is something about some of the stuff I'm going to do in the next year or the following years, and even that may not turn out to be correct, because beyond the next year things will change." I think this very much reflects his personality, as he was an unassuming scholar. He was a man without academic ambition and detested entrepreneurship in academia. You could sense his annoyance with rules and promotions in the footnote of his paper (L1970b), "The paper is submitted in partial fulfillment of the promotion requirement of the University of California, Berkeley."

Back then, to a group of students, Neyman and Le Cam were in some way like co-advisers. I was one of those lucky ones. My thesis topic of modeling the propagation of an infectious disease with stochastic processes was one of Neyman's interests. Under the guidance of Le Cam, I attacked the problem using point processes and intensity functions. I had to report to Le Cam weekly on what I had done, but he usually did most of the talking. He sent me to Neyman's classes and I also attended Neyman's Wednesday night seminars on stochastic modeling. Sometimes the discussion continued until almost midnight, and then he took us out for a snack. In summertime, Le Cam would go to his country house that he and Louise built themselves. In his absence, he would assign a senior graduate teaching assistant to discuss mathematics with me.

My reading assignments were Natanson from Le Cam and Anatole France from Neyman. Neyman said that my education would not be complete without knowing French. (It is still incomplete.) Neyman socialized with students, but Le Cam hardly did. After my thesis defense, Le Cam chatted with me for a while and asked me a strange question, "Who are your friends in the department?" The next day, a note appeared in my mailbox. Lucien invited me and my husband to dinner. I saw all my friends at the dinner.

Taking a stand. Lucien was very modest about his own achievements but took a strong stand for what he believed in. A beneficiary of free education, he fought hard against the university's tuition hike. Indeed, he believed in free education and learning. He was concerned with spiraling book prices. To do something about it, he negotiated a deal with his publisher to bring the price of his book down by foregoing the author's royalty. This was his 1986 book that he spent over 30 years writing.

Lucien was renowned among his colleagues, administration and students for upholding strong standards of fairness. A man of deep social conscience and conviction, he was vocal in the anti-Vietnam-War movement, even though this put him at risk of losing his government research grants. He supported the students' Free Speech Movement in the mid-1960s. He was a strong advocate of women in statistics. On the issue of race, his stand is unmistakably stated in a long, sardonic letter to the ASA regarding a racial survey that ASA sent out to its own members as well as to the IMS members. Le Cam was President of the IMS (1972–1973) at the time. The following are some excerpts from his letter.

> This is to apologize for a rather intemperate letter I mailed you yesterday. In the meantime, I had a change of mind and tried to decide how I would answer truthfully you(r) question about race. So I did some research and here are the results.
>
> . . . since race is genetic in characterization it is important to look back upon one's ancestors. Few of them were known to me. However I was born of peasant family whose components were issued from the Brittany part of France. The male of the species there has been known to wander about, even as far as Newfoundland in the 15th century. However the female of the species was rather sedentary. Thus it is a logical assumption that by and large my racial characteristics are those which belong to the majority of the people in that region. From all historical counts that is an admixture of Celts, Latins, Normans and other Teutonic tribes, with a dash of Chinese and a pinch of Arab . . . .
>
> Once upon a point in time, I tried to explain this to our American consul who asked my race. After a bit of debate he wrote down Caucasian. Not being born in the Caucasus, I objected. He said that was the standard denomination white skinned people who are not Jewish. On that I said I might be interested in studying the Jewish faith, was not particularly enclined to embrace it, but did not realize that this was any more genetic than my inability to speak Hebrew. It took a bit of doing, but he agreed and completed the line by "obnoxious about it." Thus that last bit is my race, I guess, and it will continue to be until somebody else than Shockley claims it has any relevance.
>
> Of course I do not deny the validity of classification by phenogenetic traits for police purposes. If a small leukodermic, malachoptic, melanotrychic, bachycephalic individual afflicted with hereditary alopecy and prognathism commits a crime, perhaps one could characterize him as such in order to find him.
>
> However, I feel quite convinced that the best that can be done for the purpose of scientific societies is to ignore irrelevancies, and fight those who would implant them.
>
> Cantankerously yours,
>
> Lucien Le Cam

A collaborator. My collaboration with Lucien (L1990) was prodded by Professor Shanti Gupta at Purdue when I was visiting his department in 1986. I was translating Lucien's Montréal Notes (L1969) from French to Chinese at the time. Shanti thought it would be a good idea to publish an English version of it. But that would be a different matter. Shanti, who would not take "No" for an answer, picked up the phone in his office and phoned Lucien about it. Lucien felt that the translation would not do because the Montréal notes were too old. With Shanti's power of persuasion, we started the project. In the late 1950s, Lucien had planned to write a book on statistical decision theory with his student Tom Ferguson. However, the plan had to be abandoned, in part because of the inconvenience of communication between two cities. Unlike in the 1950s, our project was possible through fax and e-mail which allowed long-distance collaboration. Our book published in 1990 is an update and expansion of the Montréal notes.

We intended to write a reader-friendly book. That would mean a more detailed exposition of Lucien's theory and ideas, and a focus on a limited number of topics. Lucien was incredibly open to suggestions and he wanted them. I took his request, "If you don't like it, just yell!" seriously. So, critique I did. If he did not like a proposed insertion, he would typically say, "Ooh, let the reader think." My own experience in reading Lucien's work is that, once I understood the material, I began to appreciate his style of making mathematical ideas lucid without being cluttered by technical details. At that time, I found it difficult to make changes or insert details. My particular cases in point are his elegant paper on "Central limit theorem around 1935" (L1986a) and his thesis (L1953).

The wonderful opportunity of working with and learning from Lucien gave me an easy access to ask him all sorts of questions which resulted in several investigations. One of them was the question under what conditions the LAN conditions could be preserved as a result of information loss due to, say, censoring, mixing and contamination (L1988b).

The work on the second edition of the 1990 book progressed very slowly. To my deepest regret, Lucien did not see the second edition of his book in print.

Le Cam inspired all of us through his own pursuits to strive for knowledge and self-fulfillment. The way he lived his life as a scholar and a human being will forever leave an example for us to learn from. As his student, I always felt nurtured, encouraged and challenged. It was a profound honor and a most special privilege to have worked and interacted with Lucien.

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