Serge Lang, 1927–2005

Jay Jorgenson and Steven G. Krantz

> *Editor's Note:* This is the first part of a two-part article. In part two, which will appear in a later issue, the authors discuss the mathematical accomplishments of Serge Lang and the impact of those achievements.

On September 12, 2005, the mathematics community lost Serge Lang, who passed away in his apartment in Berkeley, California. Lang was well known as a mathematician, and also as an educator and political activist. The main force in Serge's life was his enthusiasm for mathematics. In a world of vagaries and irrational passions, he saw mathematics as a noble pursuit that represented honesty and goodness. Within mathematics alone, Serge had many facets—a researcher, an expositor, a popularizer, and a teacher. Generations of mathematicians around the world know the name Serge Lang through his numerous books and articles.

For those individuals who knew Serge, one striking feature most everyone noted was the compartmentalized manner in which he showed himself to anyone: His mathematical colleagues were told virtually nothing about his personal life, his family knew very little abut his mathematical research, his political allies were only slightly informed of his mathematical interests, and even his closest friends were unaware of each other's presence in his life.

As we prepared this article discussing the many aspects of Serge's life, we chose to follow Serge's method of "file-making", where the reader is informed through the presentation of original documentation. We have sought to bring out a full picture of Serge's life by inviting contributions from a large number of individuals who knew him well. For the editors, it was fascinating to witness the diversity of these reminiscences; they represent a broad range of interests and achievements. It is clear that, with Lang's passing, we have lost someone unique and irreplaceable.

After Lang's passing, Yale University president Richard C. Levin wrote about Serge, "While having someone like this in the community is not always easy, it is salubrious." It is entirely possible Serge would have agreed with this assessment, perhaps even assigning a letter grade for President Levin's summary.

To repeat, our article is an attempt to follow Lang's insistence for an honest and complete representation, allowing readers to draw their own conclusions. With this said, we have no doubt that a common judgment will be drawn by everyone: With Lang's death, the mathematical world, and beyond, has lost someone without equal, and in time we will better understand the significance of Lang's life.

On Serge Lang's retirement from Yale University in the spring of 2005, Yale president Richard C. Levin honored him with these words:

> Serge Lang, A.B., California Institute of Technology, Ph.D. Princeton University, faculty member at Yale since 1972: Your primary love has always been number theory and you have written, by one colleague's estimate, over 50 books and

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With the assistance of numerous contributors.

monographs, many of them concerned with this topic. Several of your monographs are the only, or nearly the only, book treatments of their important subjects. Your famous theorem in Diophantine equations earned you the distinguished Cole Prize of the American Mathematical Society. Your textbooks also have garnered accolades. Your calculus for undergraduates went through many editions in the seventies and eighties, and your algebra textbook is a standard reference in the field. So prodigious are you as a scholar that there are actual jokes in your profession about you. One joke goes: "Someone calls the Yale Mathematics Department, and asks for Serge Lang. The assistant who answers says, 'He can't talk now, he is writing a book. I will put you on hold.'"

In your character, you are uncompromising in your insistence on what you perceive as logical consistency and rhetorical honesty, and you have questioned much received wisdom and many authorities in the external world as well as here at Yale. You are an excellent and deeply caring teacher, and in honor of this several years ago you received the Dylon Hixon Prize for teaching in Yale College. Your students keep in touch with you years after they graduate and one has created an endowed fund in your honor. Among your many monographs there is one called *The Beauty of Doing Mathematics*, a collection of three dialogues you gave in Paris in the '80s. Yale is grateful to you for the passion with which you understand, practice and profess the mathematical arts, and wishes you well as you continue your lifelong engagement with their illimitable splendors.

Serge Lang was born near Paris on May 19, 1927. His family lived in St. Germain en Laye. Serge's mother was a concert pianist and his father was a businessman. His sister, with whom Serge maintained an affectionate relationship all his life, currently lives in Los Angeles and is a stage and film actor. Serge's twin brother was a college basketball coach.

The family decided when Serge was a teenager to move to Los Angeles, California. Serge attended Caltech as an undergraduate and finished with a B.A. degree in physics in 1946. After spending 1.5 years in the U.S. Army, Serge entered graduate school at Princeton University in philosophy. He abandoned that study after one year and turned his
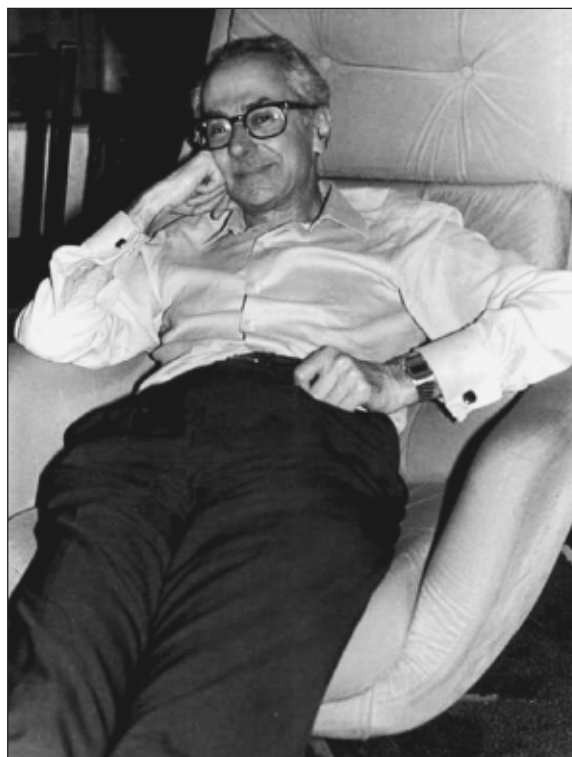
attention to mathematics. That attention never deviated (except occasionally for his politics) for the rest of Serge Lang's life.

At Princeton Serge Lang fell under the spell of the great algebraic number theorist Emil Artin. Along with John Tate, a fellow student of Artin, Lang developed a passion for algebra and algebraic number theory. In later years, Lang and Tate co-edited the collected works of Artin. Lang earned his Ph.D. in 1951.

Lang's first academic position was as an intructor at Princeton. Lang also had an instructorship at the University of Chicago from 1953 to 1955. Lang's first permanent position was at Columbia University beginning in 1955. In addition to producing some terrific mathematics and directing five Ph.D. theses, Lang became passionately involved with the politics of the time (in protest against the Vietnam war). Serge ultimately resigned his position at Columbia in 1971 (without yet having arranged for another job) in protest against Columbia's treatment of anti-war protesters. It is also remarkable that, during his tenure at Columbia, Lang directed two Princeton Ph.D. students: Marvin Greenberg (1959) and Newcomb Greenleaf (1961).

After leaving Columbia University, Serge Lang landed a job at Yale University (beginning in 1972), where he spent the remainder of his career. Lang directed nine additional Ph.D. degrees while at Yale. He was awarded the AMS Frank Nelson Cole Prize (1959) for his mathematical research and the AMS Leroy P. Steele Prize (1999) for his writing. He was elected to the National Academy of Sciences in 1985.

Although Lang's first mathematical loves were algebra and number theory, his interests rapidly expanded to cover an astonishing panorama of modern mathematics. Areas that he influenced include number theory, algebraic geometry, diophantine geometry (in which he was a pioneer), diophantine approximation, differential geometry, analysis, hyperbolic geometry, Arakelov theory (in which he was a pioneer), modular forms, and many other areas as well. The scope of Lang's books and papers is astonishing not only for its magnitude but for its breadth.

Serge Lang resigned from the AMS in 1996 in a dispute concerning an article in the AMS *Notices* by Denise Kirschner. He retired from Yale in the spring of 2005.

It gives a sense of Serge Lang to quote from his formal note of acceptance for the Steele Prize (which in fact had to be heavily edited because it was formulated in such strong language):

> I thank the Council of the AMS and the Selection Committee for the Steele Prize, which I accept. It is of course rewarding to find one's works appreciated by people such as those on the Selection Committee. At the same time, I am very uncomfortable with the situation, because I resigned from the AMS in early 1996, after nearly half a century's membership. On the one hand, I am now uncomfortable with spoiling what could have been an unmitigated happy moment, and on the other hand, I do not want this moment to obscure important events which have occurred in the last two to three years, affecting my relationship with the AMS.
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> … …
>
> Torn in various directions, sadly but firmly, I do not want my accepting the Steele Prize to further obscure the history of my recent dealings with the AMS.

Serge Lang was a remarkably energetic individual with eclectic and broadly ranging tastes. In addition to his passion for mathematics he loved music and the arts. He himself was an accomplished pianist and lutenist, and he enjoyed playing in public. He took a keen interest in politics, especially as it manifested man's inability to face the truth. Lang loved to bring down individuals who obfuscated, who hid behind their rank, or who abused power. He engaged in a great many rather public battles with a wide-ranging collection of people, from social scientists at Harvard to researchers at the National Institutes of Health to education researchers at Stanford. As Lang himself put it, he "put scholarship in the service of action to stop the nonsense."

Serge also was a prolific writer. He wrote more than 120 research articles and sixty-one books (and this does not count multiple editions and foreign translations). In fact he has 198 citations on MathSciNet. It is amazing to examine the range of mathematical topics covered by Lang's opus: calculus, real analysis, complex analysis, differential geometry, algebra, algebraic geometry, diophantine geometry, hyperbolic geometry, math talks for undergraduates, the heat kernel, and much, much more. Perhaps Lang's most famous and most influential book is *Algebra*, now in its third edition. In it, Lang single-handedly reorganizes and revitalizes this fundamental and central subject. The book has had an enormous impact.

Serge Lang was a man with incredible focus and self-discipline. Mathematics and politics (which he called "troublemaking") were his primary interests, and everything else was secondary. As he grew older, he felt that he had to conserve his energy and he set other interests aside. He made hard decisions and stuck by them. As an example, when he decided to stop listening to music, he put all his recordings on the shelf, never to be picked up again.

It is astonishing how Lang's books affected people at all levels. One high school teacher who regularly used Lang's calculus book in his teaching said this:

> As a high school teacher, I used this text with great success several times for both AP Calculus BC and AP Calculus AB courses. It is my favorite calculus text to teach from, because it is very user-friendly and the material is presented in such an eloquent way. There are no gratuitous color pictures of people parachuting out of airplanes here. Opening this book is like entering a temple: all is quiet and serene. Epsilon-delta is banished to an appendix, where (in my opinion) it belongs, but all of the proofs are there, and they're presented in a simple (but not unsophisticated) way, with a minimum of unnecessary jargon or obtuse notation.

A somewhat recondite joke is the query "Why did Bourbaki stop writing?" The answer is that they discovered that Serge Lang is one person. Lang's output of text connected to his many political disputes was voluminous. He also has some unpublished books of a political nature (others of his political tracts were actually published). Lang liked to say that the best way to learn a new topic is to write a book about it.

Perhaps Serge Lang's greatest passion in life was learning. For Serge, learning manifested itself in many guises; but one of the most important of these was his teaching. He saw himself as a role model for his students, and he spent a great deal of time with them. He often said that the best way to learn about a university was to eat in the student cafeteria. He did so frequently. He often took his students out to eat, or invited them to his residence to listen to music. Although he did so quietly and discreetly, Serge was known to provide financial assistance to students and mathematicians who were in need. Serge is remembered fondly for entreating his students, cajoling his students, screaming at his students, and especially for throwing chalk at his students.

Serge's graduate courses frequently followed the track of the book he was currently writing. His undergraduate courses could be more freewheeling. An important point to note is the joy that Serge Lang derived from all things mathematical. It can certainly be said that most of us mathematicians experience some sort of "high" when we learn to tackle and tame new ideas. As we get older, we become more jaded; as a result, this "high" is harder and harder to achieve. Not for Serge. He was truly engaged and fulfilled when he discovered new ideas on any level, be that an illuminating problem for one of his undergraduate texts or an insight into a new mathematical landscape. As a result, Serge Lang always remained mathematically young.

Serge Lang spent the fall of 2004 at U. C. Berkeley as a Miller Visiting Professor. He gave a number of lectures and made his presence known in many other ways. As an example, budget cutbacks had caused severe curtailment of departmental teas. People now had to *pay* daily for their beverages and cookies. Serge quietly contributed a substantial amount of money so that the Monday teas would be lavish: many fine cakes and pastries and lots of nice things to drink. Certainly this had a very positive effect on departmental life, and Serge asked for no particular credit for this gesture.

Serge had wide-ranging interests. He visited Berkeley every summer for the past several decades (in fact he kept an apartment there) and he would attend colloquia in departments ranging from physics to history to political science to medicine to mathematics. Of course he did not simply *attend*. His habit was to confront the speaker with detailed and probing questions. Frequently the sessions would become so heated and protracted that intervention was necessary.

One memorable incident—just to illustrate the eclecticism and vehemence of Serge's interests—has Serge threatening to clobber with a bronze bust a very distinguished Princeton mathematician in the Fine Hall Professors' Lounge because the

Ph.D. Students of Serge Lang

Marvin Greenberg	Princeton	1959
Newcomb Greenleaf	Princeton	1961
Warren May	Columbia	1963
Stephen Schanuel	Columbia	1963
William Adams	Columbia	1964
Bernard Berlowitz	Columbia	1966
Allen Altman	Columbia	1968
Joseph S. Repka	Yale	1975
David E. Rohrlich	Yale	1976
Donald T. Kersey	Yale	1980
Jing Yu	Yale	1980
Minhyong Kim	Yale	1990
William A. Cherry	Yale	1993
Michael J. Nakamaye	Yale	1994
Lisa A. Fastenberg	Yale	1996
Eliot P. Brenner	Yale	2005

latter would not accede to the self-evident assertion that the Beatles were greater musicians than Beethoven.

At Yale in 2001, Serge was invited to be the keynote speaker at a Pierson College Master's Tea. He dressed in a courtier's outfit and regaled the packed room with his theory of the similarities between Elizabethan music and classic rock of the 1960s. Lang illustrated his points by playing (classical LP records of) *Ding Dong the Witch is Dead*, a 1969 hit by the Fifth Estate, a 1612 piece by Michael Praetorius, and *We Can Work it Out* by the Beatles (1965).

Serge loved to challenge people—friend and foe alike—just for the sake of challenging them. As an instance, James Borger recalls

> I remember one time when I was a grad student, I was standing next to him at tea while he was explaining to a first-year student that analysis is just number theory at infinity. I said, "Come on, that's not true." He immediately turned up the volume, challenging me to stop bullshitting and give an example. I said, "OK, p-adic analysis," and then walked away. But I've always wished I had stayed to see what his reaction would have been. We need more trouble makers like him.

In 1998 Serge Lang published a book called *Challenges*. This editor (Krantz) found the volume to be particularly inspiring, for it recounted, from Lang's personal perspective, some of his most involving and exciting political battles. The book is truly outstanding for its honesty and incisiveness. Two particular battles that stand out are

The Case of Ladd and Lipsett. In the late 1970s the distinguished social scientists Everett Carll

Ladd Jr. and Seymour Martin Lipsett set out to evaluate the American professoriate. They concocted a questionnaire to be distributed across the country, asking professors detailed questions about how they plied their trade, what values they held as members of the academic profession, and so forth. Their results were published as *The 1977 Survey of the American Professoriate* in 1979. Lang found the questionnaire, and the premises for the study, to be repugnant. He conducted a massive effort to discredit their work. In fact Lang published a rather massive tome, *The File* (Springer-Verlag, 1981), containing all his correspondence and information about the battle. In the end, Lang caused Ladd/Lipsett to lose much of their funding and a great deal of their credibility.

The Case of Samuel P. Huntington. In 1968 Samuel P. Huntington wrote a book entitled *Political Order in Changing Societies*. In it Huntington uses what might charitably be characterized as pseudomathematical hucksterism to "prove" that South African society in the 1960s was a "satisfied society". Serge Lang decided that nothing could be further from the truth, and in any event Huntington's methodology was suspect if not corrupt. He conducted a vigorous campaign to derail Huntington's credibility, and he twice successfully blocked Huntington's election to the National Academy of Sciences.

Serge Lang was quite proud of his efforts to instill a sense of truth and honor into our public discourse. For years after his battle with Huntington, he would give his students "Huntington tests" to ascertain their ability to think critically. Serge's battle cry was to demand whether his listeners knew "a fact from a hole in the ground". Evidently Serge did. In a particularly earthy moment, Serge liked to say that "he was inside the tent pissing in" (with allusion to Lyndon Johnson commenting about J. Edgar Hoover). For each of his battles, Lang would create what he called a "File". This was a detailed and copious collection of all his correspondence and all his data connected with any given case. Often a file would consist of several hundred pages of closely knit text. Lang would, at his own expense, send copies of his files to mathematicians and other interested parties all over the world. The Serge Lang files have been a staple of mathematical life for over forty years.

Serge Lang said of himself

> I personally prefer to live in a society where people do think independently and clearly. One of my principal goals is therefore to make people think. When faced with persons who fudge the issues, or cover up, or attempt to rewrite history, the process of clarifying the issues does lead to confrontation, it

creates tension, and it may be interpreted as carrying out a "personal vendetta" ...I regard such an interpretation as very unfortunate, and I reject it totally.

Serge spent hours every day on the telephone, wheedling, cajoling, instructing, and most often yelling. His collaborators relate that Serge would often phone several times a day—*every day*. He would learn what was the best time to phone and then phone regularly at that time. Often one would pick up the phone and hear "*Serge!* Let me continue to instruct you about ..." But it should be stressed that Serge was disciplined to the extreme. He did not waste time. It was amazing to watch him eat lunch in five minutes and dash back to his office to resume his writing.

In the last twelve years of his life Serge Lang developed a deep and energetic program to fight the current directions of research on the disease AIDS (Acquired Immune Deficiency Syndrome). A naive assessment of Serge's position is that HIV does not cause AIDS. But this would be an injustice to Serge. First of all, he was very careful. He very rarely made an error of fact. Secondly, he was quite a subtle thinker. His cause and his complaint, in fact, was that the search for a cure to AIDS had become politicized. At a certain point, the federal government simply commanded the National Institutes of Health to declare that HIV caused AIDS. The causal mechanism had not been identified, and the connection not logically established. To be sure, there is considerable *ad hoc* evidence of a link between HIV and AIDS. Certainly many of the modern treatments for AIDS are premised on that link. But Serge's assessment was that the existing data analysis does not support the conclusion that HIV causes AIDS.

The present article is a celebration of the life of Serge Lang. We present a number of vignettes, contributed by mathematicians, former students, colleagues, and friends. These are divided into pieces about Serge the man, pieces about Serge the writer, pieces about Serge the tilter at windmills, and pieces about Serge the mathematician. Our aim is to give a well-rounded picture of what a diverse and multi-faceted person we have lost. He was in many ways a thorn in our collective sides, but he was a friend to us all.

Memories of Serge Lang

Friedrich Hirzebruch, Max-Planck-Institut für Mathematik

Serge Lang was a close friend of my wife and me, of our three children, and even of some of our grandchildren. We miss his frequent telephone calls—"It's me"—the last one was on September 10, 2005. We shall miss his visit next summer and all the following summers.

My wife and I met Serge 53 years ago in Princeton when he and I were 25 years old. We became good friends. It was old Europe that all three of us liked. Serge rarely spoke about his personal past, but by asking questions we slowly learnt the basic facts. He came with his father and his sister from Paris to the United States after France had been occupied by Germany. He was a soldier in the U.S. Army from 1946 to 1947 and was stationed in Italy and Germany for part of the time. The fact that his life was disturbed by the Nazi war was not a barrier between us. How little Serge spoke of himself can also be seen from the *Curriculum Vitae* in his *Collected Papers*. The CV has thirteen brief lines, from the first one, "1927 born" to the last one "1972–present Yale".

We kept close contact with Serge, also after our return to Germany. In the summer of 1955 he visited us in the house of my parents in Hamm (Westfalen) (see top photo, right).

I was appointed to the University of Bonn in 1956 and began the series of *Arbeitstagungen* where the speakers are chosen by "public vote" at the beginning of the meeting. With very few exceptions Serge attended all Arbeitstagungen until 2003. During the thirty Arbeitstagungen I organized from 1957 to 1991, Serge gave thirteen lectures. The second photo from the top, right, shows Serge lecturing at one of the Arbeitstagungen. The next photo down shows him at some other Arbeitstagung activity.

During each of the twenty-five years from 1979 to 2003, Serge spent one month in Bonn, usually June; in addition, he came for three sabbatical fall terms in 1993, 1997, and 2000. He financed his June visits from 1984 to 1989 by the funds of his Humboldt Prize.

He had a stable routine: In the summer he went from Yale to Europe. For many years he visited Paris for a month until he stopped. "To everything there is a season," he used to say. In other years he went Zurich or Berlin. He never omitted Bonn until the season also ended for the Max-Planck-Institute. In 2004 and 2005 he only visited us privately for a few days. After his European visit he went to Berkeley where he enjoyed the cooler climate and where we met him in a number of years.

During his visits to Bonn he gave many lectures, in seminars on his own research and for students of beginning and advanced level. In an official report to me (13 February 1997) he wrote as follows: "While at the Max-Planck, I also visit other mathematicians, both in Germany and elsewhere such as Holland. I have substantial contacts with students. I used to lecture every year in your analysis course. Last year I lectured to the high school class of Karcher's son. Thus my days at the Max-Planck, regularly for one month in June every year, and once for four months in fall of 1993, have been important periods in providing proper environment for establishing mathematical contacts at all levels, as well as learning and doing mathematics."

Serge also lectured once to my algebra course (120 students) where I used his algebra book. When I came to the lecture hall, I saw that the official student representatives were selling cheap photocopied versions of Serge's book. I told them that this was illegal. The students said "The author is far away." I replied "You are wrong. He will be here in two minutes, because he is taking over my lecture today." Serge came and did not make a great fuss about it. He even signed some of the copies before he began his lecture. Serge also lectured to the public. He wanted not only to teach mathematics, but also how to be critical and responsible. "I want to make people think." Among the public lectures I mention the "Beauty of Mathematics". He explained the hyperbolic 3-dimensional manifolds with cuspidal ends which are like the arms of an octopus. The bottom photo above shows Serge sitting at my desk in our home drawing octopuses. Behind his back there is one shelf with 40–50 of his books. When he presented me a new edition of one of his books, he threw the old edition into the wastepaper basket from where I retrieved it later.

Mathematics was the most important part of Serge's life. He worked with great self-discipline for
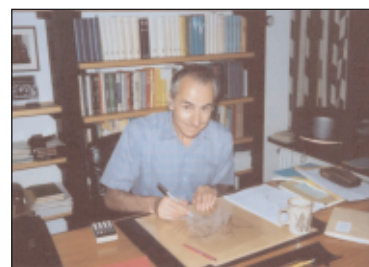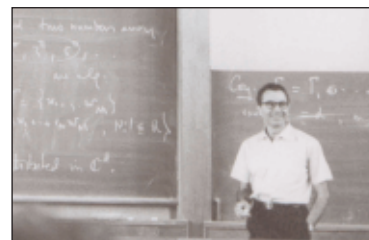
many hours seven days a week. I admired the way he could turn courses into books and how he continuously did fundamental research. In the early years there was time for the piano (including composing), for playing guitar and lute, for going to concerts, to the theatre and opera, and to enjoy literature. We could often do all this together with him when visiting him in his apartment in New York, where he played his piano compositions for us, and when we went out in New York to the theatre. Similar activities took place in Bonn during his visits. He enjoyed the musical life around Bonn. But then came the time of the file making. He was able to give up things he loved and to concentrate on the two parts of his later life (mathematics first and then political work). All other things had to go. "To everything there is a season." The file concerning *The 1977 Survey of the American Professoriate by Ladd and Lipsett* developed from 1977 to 1979. Serge put a lot of time and energy into it. We always received Serge's mailings in installments of 20-30 pages. It was exciting reading, full of suspense. Other files followed. The mailings came regularly, the last one on the day of his death. It was certainly not easy to discuss the files with him in such a way that he did not begin to yell. "Ich bin ein unbequemer Mensch," he said. We admired his sincere way to rely only on facts, "to distinguish a fact from an opinion." He fought for honesty and precision in research and in journalism. He hated "big shots who throw their weight around". He objected to covering up because of collegiality.

His heritage is his *Collected Papers*, his scientific and his political books. But we miss Serge as a friend.

Norbert Schappacher, University of Strasbourg

Two years ago, I gave a seminar in Zürich on the topic of intellectuals among twentieth-century mathematicians. My list included the Englishman G. H. Hardy, the Germans E. J. Gumbel and E. Kamke, the Frenchman L. Schwartz—and the French-born American Serge Lang.

The term intellectual (*intellectuel*) used here is a French invention of the Dreyfus affair, from the final years of the nineteenth century. Emile Zola, Anatole France, Marcel Proust, and others were the first self-declared intellectuals. The expression has a built-in partiality: it is only used for people whose opinions you sympathize with, and whose opinions and ways of expressing them are loathed by those who are on the other side.

Serge Lang was an intellectual in this European sense of the word, and he was one of the rare mathematicians of the second half of the twentieth century who can lay claim to this epithet. If colleagues sometimes felt he was overdoing things, this may actually confirm what he represented.

But Serge Lang lived and acted in the U.S. where no heritage of intellectuals exists, in spite of literary figures like Arthur Miller. So Lang had to cut one out for himself, as the Yale professor who made *The New York Times* by blocking Samuel Huntington's admission to the National Academy of Sciences. In doing so he was surely helped by the ambient climate of the late 1960s and 1970s, the Free Speech Movement, etc. But his personal device, "the file", was his own creation.

Let me add something more personal: The most wonderful thing about Serge was that he was always around, and meeting him would always matter. I first saw him as a young student in Bonn during the Arbeitstagungen of 1970 and 1971; I went to his talks because I knew the name from his *Algebra* book. At the time I did not understand the least bit of the mathematics he was talking about; but I distinctly remember the presentation: his talk seemed to be about presenting things from the right point of view, which others working in the field had failed to see or to adopt.

I kept meeting him over the years in many places, and each time I was greeted by his charm and thrilled by his intensity. The last two summers I invited him for talks to Darmstadt and Strasbourg. Even though he would never complain about mediocre accommodation or food offered to him, Serge enjoyed being taken out to good restaurants. At least by the time we got to dessert he invariably had to raise his voice (for instance, because I still would not understand his way of putting to rest the philosophy of the Vienna circle, that he had figured out after a few months as a student of philosophy), and posh people around us would start raising their eyebrows. I loved this kind of scene (with him, not in general), and I will now miss it a lot.

Barry Mazur, Harvard University

In 1958, at Princeton, I had accidentally slipped into the room in which Serge was giving his seminar in Abelian Varieties; I was transfixed by the metallic urgency, the vitality, of the voice of this chalk-wielding person; I understood absolutely nothing of the subject, but was instantaneously convinced, with that utterness of conviction that is the gift of ignorance, that abelian varieties—whatever they were—were of breathtaking importance, and furthermore, of breathtaking importance to me. That Serge (a "mathematical grown-up") would, shortly afterwards, collar me and request a series of private lectures in differential topology was astounding to me. I treasure the halting lectures I gave

him, as a rite of passage, of immense importance. And Serge did this sort of thing, through the decades, with many of the young: he would proffer to them gracious, yet demanding, invitations to engage as a genuine colleague—not teacher to student, but mathematician to mathematician; he did all this naturally, and with extraordinary generosity and success. Serge was a gadfly with formidable tenacity. That we are *personally responsible* for the web of compromises that we have all come to accept, and to think are inevitable, is something he would never let us forget. That we, as editors or referees of journals, make our judgments based on some presumed social, or sociable, contract (e.g., no political articles in a math journal) does not let us off the hook when asked to examine without prejudice the underpinnings of our (usually only implicit) social contracts. Serge seemed to be, over the decades, of one age, and that age was young (with its virtues and drawbacks). He had, when he played the piano, something of a brilliant French articulation to his style, and there was a hint of this in everything he did, from his walking gait (staccato) to the way in which he pronounced certain key words in mathematics, like *idea* which, from Serge, would sound like *EYE-dee,* which has a kind of platonic zing to it.

Over decades of mathematics Lang was led, more specifically, by an over-arching vision, which he pursued through the agency of various fields of mathematics. The vision, baldly put, is that *geometry* is an extraordinarily striking dictator of qualitative *diophantine* behavior. The still open *Conjecture of Lang* in higher dimensions continues to serve as a guiding principle to the way in which the grand subjects of geometry and number theory meet, just as Serge himself served as an inspiror of generations of mathematicians, and a spokesman for intellectual honesty.

Paul Cohen, Stanford University

I was a graduate student when Serge Lang arrived in Chicago as an assistant professor. My interests were tending towards number theory, but were not very focused. The arrival of Serge made a huge difference to me and to many other graduate students. He immediately gave courses in algebraic geometry and in algebraic number theory, also I believe, accompanied by a constant output of notes. Suddenly I had a different idea of what mathematical research was. One could just attack problems without a huge background of knowledge. His lectures were entertaining, of course, but also a little intimidating to the poor souls who might ask silly, or too elementary, questions. It was advisable to be nimble enough to dodge flying chalk coming from his direction. Another powerful

memory is watching him in classes by André Weil on abelian varieties. Whereas the rest of us were totally cowed by Weil's personality, Lang seemed to be able to follow anything and even to make corrections and amendments to Weil's presentation. This seemed to me to be nothing short of miraculous. After Serge left Chicago to pursue his very illustrious career, I had only intermittent contact with him. When we did meet, the memory of those early days in Chicago would come flooding back, and in a way, he was a powerful force in my life. From a distance, of course, I watched his erratic battles and even was very rarely a victim of some of his outbursts. But his textbooks, his successes, gave me great pleasure. I regard him as a great mathematician, much more than an expositor, as I believe some regard him. I don't know if we will ever see his like again, with anything approaching the enormous energy and insight which he brought to everything he touched.

When I learned of his death, a profound sadness came upon me. It was a feeling of incompleteness, that somehow I could not express my closeness to him personally, nor help him avoid some of his more acrimonious disputes. But Serge would have scoffed at such thoughts, and said that he managed perfectly well.

Stephen Smale, University of California, Berkeley

I had met Serge Lang by 1960. In fact in that year he initiated a very nice offer to me to leave Berkeley to join the faculty at Columbia University, which I accepted. During the three years I spent at Columbia I became close friends with Serge and it was his support and friendship that helped make the Columbia years such a memorable period.

During my first years back at Berkeley, I became involved in the Free Speech Movement and especially the Vietnam anti-war protests. In this period I invited Serge for a visit and we shared an office for a year (1966–67, I believe). I introduced him to some local activists and Serge himself became a political activist, writing a book on the Bob Scheer campaign for political office.

During the following decades we kept in touch especially during his summer visits to Berkeley. I tried without success to get a permanent appointment in the mathematics department for Serge. We got along well and I seemed to have some immunity from his occasional outbursts of anger. I saw much less of Serge in the last decade partly because of my life in Hong Kong and Chicago.

While leaving to others assessments of Serge's mathematical research, I want to make some brief remarks on other contributions.

Serge's Books: My opinion is that these books were a great contribution to mathematics. He gave copies of almost all to me, and I frequently used some for textbooks in courses I was teaching. They were characterized by economy and elegance and were written from a broad point of view, mathematics as a whole. I especially enjoyed his graduate analysis book. This was a book written for students in mathematics, (and mathematicians, not just analysts) and reached the heart of the subject quickly. In contrast, other texts I have encountered spend a semester or even a year on foundational material as a step in the training of an analyst. On the other hand, his book on differential geometry had the virtue of giving infinite dimensional foundations to the subject, which I found important in my own research.

Serge's Teaching and Inspiration to Students: Serge made a special and constructive effort to reach out to students of all ages. For example, he wrote a mathematics book for high school students and gave annual lectures to math club students at Berkeley. His contributions included making elementary expositions of topics in current research. On two different occasions Serge gave lectures—in German!—to Don Zagier's wife's son Bernhard's school class. The talks were enjoyed by all, and greatly increased Bernhard's prestige with both his teachers and his classmates.

Serge's Files: These files and their accounts contained extensive documentation of hypocrisy of "The Establishment", in science, in and outside of mathematics. Although acknowledging their positive role in science I sometimes disagreed with him in these matters. In particular, though his critique of the AIDS bureaucracy sometimes made sense, it was hard to go along with his attack on the HIV theory of AIDS.

In ending, let me emphasize how big an influence Serge has been in my life and how much I will miss him.

John Coates, Cambridge University

I think Serge's most remarkable quality as a colleague was his unstinting support for young mathematicians. I personally benefited from this myself when I was a young postdoc at Harvard in about 1970, and Serge came as a visitor for a semester, shortly after he had resigned from Columbia. We tend to forget when we are more established in the mathematical world how precious it is when one is trying to make one's way in research to have the support and encouragement of an older mathematician. Serge was not at all distant to young people, but went out of his way to find out what one was thinking about, and took time to discuss his own ideas and feelings about the subject with one.

We only wrote one small joint paper together (on diophantine approximation on abelian varieties), but his encouragement and friendship came at a crucial time in my own mathematical evolution, and I have always been immensely grateful for it. The second striking quality of Serge's was that he really did live for mathematics, and somehow his belief in the goodness of the endeavour to do mathematics was profoundly moving.

Dorian Goldfeld, Columbia University

Of the many people who had serious interactions with Serge, I am one of those who came away with fierce admiration and loyalty. In the mid-1960s, I was an undergraduate in the Columbia engineering school on academic probation with a C–average. In my senior year I had an idea for a theorem which combined ergodic theory and number theory in a new way, and I approached Serge and showed him what I was doing. Although I was only a C–level student in his undergraduate analysis class he took an immediate interest in my work and asked Lorch if he thought there was anything in it. When Lorch came back with a positive response, Lang immediately invited me to join the graduate program at Columbia the next year, September 1967. In the fall of 1967 I found an unfixable error in my ergodic-number theoretic theorem. Lang was not at all perturbed. He said these things happen all the time and encouraged me to move on to something else. The following year Serge refused to discuss mathematics with me or with anyone else. He said he was taking a year off from mathematics and doing politics instead, but he kept encouraging me to prove theorems and told me to talk to Gallagher, who became my official advisor.

Despite his kindness to students, everyone close to Serge has seen him explode, and this happened to me on several occasions. For example, in 1992 I organized a special year on number theory at Columbia University. I invited some of the well-known established leaders of the field such as Bombieri, Lang, Mazur, Manin, Schmidt, Szpiro, as well as many younger people. Lucien Szpiro was chief editor at *Asterisque* and invited me to submit a proceedings of the conference to *Asterisque*. Lang become utterly infuriated and blew up at me when *Asterisque* refused to accept his paper with Jorgenson, which I previously had invited him to submit. I ultimately told *Asterisque* that I would resign as editor of the proceedings and withdraw my own submitted paper unless they accepted the Jorgenson-Lang paper. *Asterisque* refused to budge, and I immediately followed through on my threat. The proceedings were, nonetheless, eventually published. My paper and the Jorgenson-Lang paper

were published in 1994 by Springer-Verlag as a book.

I was very shaken for several days when I heard that Lang is with us no more. He has had a profound influence on my life and I will miss him enormously.

Jay Jorgenson, City College of New York

During the past fifteen or so years, Serge Lang and I were colleagues, co-authors, and close friends. Since Serge was known to never discuss his personal life, it is my inclination to not comment on our friendship beyond the mathematical collaboration. For instance, the reporter for the *New York Times* who interviewed me for Lang's obituary did not understand why I would not answer questions regarding Lang's family. Whereas I do feel compelled to respect his privacy after his passing, I have decided to accept the invitation of Steven Krantz and include comments regarding my own interactions with Serge.

As with so many others, I first learned the name *Serge Lang* as an undergraduate mathematics major when I purchased textbooks for my mathematics course. I met Serge for the first time in 1987, during my second year in graduate school at Stanford. I remember the level of excitement among the graduate students in anticipation of Serge's talk at Stanford. It was thrilling to see his energy during his lecture. Lang seems to be someone, I remember thinking, who has discovered what will give him the most out of life, namely his mathematics and his politics (what he himself called "trouble-making"), and he is doing it.

In 1990 I joined the faculty at Yale as a Gibbs instructor, and during that spring semester I gave a graduate course which Lang attended. As I had expected, from the audience Serge directed my lectures for himself, insisting on immediate changes in notation and topics. In one particular lecture, I presented an evaluation of spectral determinants on elliptic curves which avoided the usual approach, namely Kronecker's limit formula, and instead relied on a trick I developed in my thesis. Lang was silent during the entire presentation. When I finished, he insisted that I wait in the classroom so that he could go to his office. When he returned, he had two papers with him, one by Artin from 1923 and another by himself from 1956. He pointed out that the technique I presented in the setting of heat kernels on elliptic curves was conceptually identical to Artin's ideas in the setting of *L*-functions of number fields and Lang's ideas in topology, in the context of the characteristic polynomial in linear algebra. That conversation grew into our first joint paper which was published in Crelle's journal in 1994.

During the summer of 1990, Lang called me every day, several times, as he traveled through Europe and to Berkeley. We always spoke about mathematics, and he challenged me on the same point I attempted to make to him earlier: Why did I believe that one can use heat kernels and heat kernel techniques, perhaps formally in a way to be developed, in a wide range of mathematical questions? We discussed, argued, and debated, as only Serge could, until he returned to Yale that fall. He invited me to lunch one of the first days he was back. During lunch he asked if I would be willing to work with him on the mathematics we discussed. One cannot imagine my thoughts at that moment. To have a senior mathematician express interest in one's ideas is remarkable enough, but to have Lang say he wanted to work with me simply cannot be described. I found out later a more touching aspect to that conversation with Serge. Apparently, in 1988 Lang had told some faculty at Yale that his mathematical abilities were gone, and he couldn't continue; after we began working together, he then would comment to others that our work was keeping him alive.

During the first few years of our joint investigations, we spent countless hours developing a long-term program of research. Serge was a very private person, more so than I have seen with anyone else. Although I knew his private telephone numbers, I never called him at home, though he would not hesitate to call me at any time. It was very rare that he mentioned his family or his non-mathematical, or non-trouble-making, interests. We became friends, and we made a point of talking, perhaps quite briefly, each morning when he arrived in his office, each evening when he left to go home, and many times during the day.

I left Yale in December 1996. Serge was hospitalized in December and later in February, and he insisted that I visit him each day to continue our mathematical conversations. His February stay in the hospital was reported in the Yale student newspaper, and the dean of Yale College, a person Serge very much disliked, was quoted as saying that Lang was an excellent mathematician. I showed Lang the article while he was still in the intensive care unit, and, when he read the dean's comments, he screamed, "That * * * * * * * * isn't qualified to judge." Serge was stunned when his outburst resulted in my expulsion from his hospital room until the next day. As in so many other instances, Serge was right, but perhaps his message could have been delivered differently.

Later in the spring of 1997, as I was seeking employment for the upcoming year, Serge asked me to visit him at Yale so we could discuss our projects. At the time, I considered leaving academic mathematics and seeking a career change away from a university environment. We discussed the
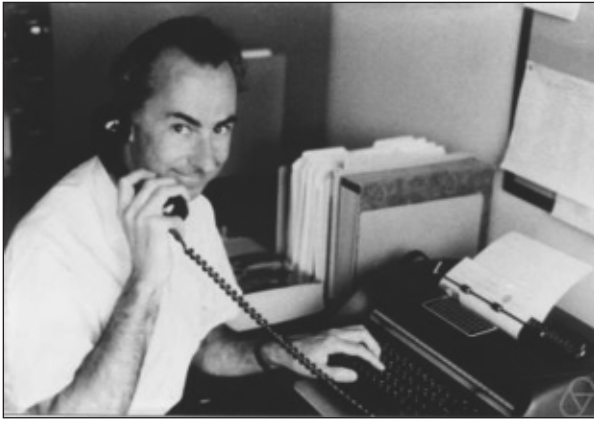
Lang at Berkeley.

matter in detail, and Serge pointed out to me the effect it would have on him if I were to quit mathematics. At the end of the day, I honored his request to continue our program of study and promised to not seek a nonacademic position.

We spent less time together during the next two years when I was at Oklahoma State during 1997–98 and in Greece during 1998–99. In the fall of 1999, I accepted a position at the City College of New York, in part because it allowed me to visit Serge frequently, which I did on most weekends. At that time, we began focusing our ideas, even going so far as writing a document for ourselves, establishing a "wish list" for our mathematical program. We created an outline of the articles, monographs, and books which must be completed in order to fulfill the steps of the program which we envisioned. One of the earliest words my son knew was "Serge", which he said each time the phone rang; frequently, my son was right, and indeed the call was from Serge.

It was evident to me, even in 1999, that at age 72 Serge was growing tired. Even though the learning process did keep him alive, time was catching up with him. He was always very sharp, with fascinating ideas and insight. However, he left the office earlier in the evening, and he required rest during the day. Without acknowledging the act, we altered the pace of our work, finishing what we could given the energy he had. When he was at Yale, I visited him most weekends, and when he was in Berkeley, I traveled there to continue our work.

Most everyone saw Serge as the forever young, highly energized individual. For the most part, he did not allow many people to see that time was affecting him. The fact that hardly anyone noticed that Serge was aging was, I believe, another manifestation of his level of privacy.

In August 2005, we completed another book. On the day we submitted the manuscript to Springer-Verlag, Serge was excited. To me, he momentarily regained his youth as I knew it when we delivered the manuscript to the post office. That day I saw again the dynamic person I remember lecturing at Stanford during my graduate school years. However, when we returned to the office, he needed to rest, and that evening during dinner he directed the conversation away from the specific ideas for our next project. Instead, he spoke of his wish that I always pursue our program of research, hopefully arriving at the goals we set for ourselves. During the next weeks, we spent time revising our wish list and reviewing our original mathematical plan. We continued to speak several times each day, up to and including September 12, 2005, the day Serge died.

Having spent so much time with Serge, there are many stories I could tell. Serge had many sides which affected everyone, including me, many different ways. He had friends and enemies, and perhaps I inherited some of both. As he pointed out to me quite some time ago, it is possible that my association with him was both positive and negative for me. Serge once told me that he made certain personal decisions early on in his life, and he stuck by those decisions. For me, I stand by my decision to work with Serge. He was a close and loyal friend, and I believe that I was for him. Serge was a part of my daily life for nearly fifteen years, and for me his absence is great.

Paul Vojta, University of California, Berkeley

Although I had seen Serge at Harvard once or twice in the Common Room (invariably arguing with someone), I first met him when I went down to Yale to ask him to write a letter of recommendation for me. At one point in the discussion, he asked me about my definition of integral point. I started to describe Serre's idea of an infinite set of points with bounded denominators, but he angrily interrupted me: "I don't know what an integral point is, and neither do you!!!" However, later on that day he added a flattering paragraph to his new edition of *Diophantine Geometry* describing work in my thesis on integral points relative to a divisor with sufficiently many irreducible components.

Later, upon hearing about my conjectures, he called me up and invited me to come to Yale. I was a little hesitant about this, given his propensity for anger, but my advisor Barry Mazur convinced me that I should accept.

During my time at Yale, I gave two or three graduate courses. Serge always sat in the front row, paying close attention to the point of interrupting me midsentence: "The notation should be functorial with respect to the ideas!" or "This notation sucks!" But, after class he complimented me highly on the lecture.

While on sabbatical at Harvard, he sat in on a course Mazur was giving and often criticized the notation. Eventually they decided to give him a T-shirt which said, "This notation sucks" on it. So one day Barry intentionally tried to get him to say it. He introduced a complex variable Ξ, took its complex conjugate, and divided by the original Ξ. This was written as a vertical fraction, so it looked like eight horizontal lines on the blackboard. He then did a few other similar things, but Serge kept quiet—apparently he didn't criticize notation unless he knew what the underlying mathematics was about. Eventually Barry had to give up and just present him with the T-shirt.

Once, close to the end of my stay at Yale, I was in his office discussing some mathematics with him. He was yelling at me and I was yelling back. At the end of the discussion, he said that he'd miss me (when I left Yale). Now that he has left, I will miss him, too.

Gilles Lachaud, Institut de Mathématiques de Luminy

I met Serge Lang in 1972, during the AMS symposium on Harmonic Analysis on Homogeneous Spaces, held in Williamstown. He had just left Columbia for Yale, and I was with Paris 7.

At that time, French and American universities were a hotbed for the antiestablishment ideas, and Serge was involved in the Free Speech Movement. Also, he was writing his book on $SL(2, \mathbb{R})$: thus, in Williamstown, we discussed both alternative politics and spherical functions.

In my mind, Serge was a hunter, in mathematics as in his political and social struggles. He was chasing a precise game and nothing was able to make him deviate from this goal.

As a polemicist, he was very proud of the File process, consisting of bringing lies on some topic to full light by sending letters to opponents, to wait for contradictions in the answers, and to send Xerox copies to all the people involved in the contest. He was sure that victory would emerge from this confrontation.

The special feature was that he wanted to work along scientific lines and to prove the statements he was defending, an uncommon and irritating position outside the mathematical community. His model was in mathematics, as opposed to social sciences, about which he used to say: "In mathematics you cannot say, 'I disagree with this statement.' You can say, 'this is false' or 'this is of poor interest,' but there is no disagreement to express whatever."

Among American mathematicians, Serge was one of those who were closest to France: the souvenirs of his life during his youth with his parents were enduring, in particular vacations on the Mediterranean seashore. Later in his life, he became a member of the Bourbaki group, stayed in France and lectured at length, in Paris and elsewhere.

In some respects, Serge was rather austere. But he had a cheerful and authentic enthusiasm for mathematics: this is reflected in his books, and this enthusiasm was contagious.

At the beginning of 2005, we exchanged our wishes by phone. As usual, he was infuriated, this time by his own illness: he was conscious of his bad health, and desperate not to be able to fulfill before his death the program on zeta functions he had in mind, after twenty years of work on analysis on groups.

We miss a great intellectual figure, and I miss a friend.

Roger Howe, Yale University

Books: Serge wrote an extraordinary array of books, from widely used texts, including calculus texts, and even a high school geometry text, to standard references, to monographs which are the only treatment of their subject in book form.

The topics tend to cluster around algebra, and especially Diophantine equations, which were his great love in mathematics, but they span a remarkable range.

For a long time, his practice was to give each year a graduate course on a new topic, and at the end, to turn the notes into a book. He had an amazing capacity to boil a subject down to its essence, which he often formulated with a few axioms or properties. He was a consummate axiomatizer. As he reached his late 70s, he gave little sign of slowing. His last several books presented joint work with Jay Jorgenson on applications of the heat equation to analysis on symmetric spaces, with a view towards automorphic forms.

Files: Besides books, a lot of Serge's literary effort went into making files which chronicled his fights. Serge loved a good fight and he didn't have trouble finding them. He was especially concerned with honesty, especially honesty in public rhetoric. Serge would coordinate multi-party correspondence, organizing sets of letters into packets, and circulating them with supplementary documents to a "cc list" of parties to the correspondence and other interested readers. At the end of the fight, he collected the whole into a file, and gave it a title.

Serge thought of his files as documentation of the way life works today, and especially of his First Law of Sociodynamics: the power structure does what it wants when it wants, and looks around later for justification. Serge was willing to follow

his principles and beliefs (almost) wherever they led.

Students and Teaching: A third focus of Serge's energy was teaching and students. Generations of Yale undergraduates benefited from his teaching in the broad sense. He spent hours outside of class talking with undergraduates, about mathematics, politics, music, anything. He frequently ate meals with undergraduates in the Yale dining halls. He was especially concerned with promoting clear thinking. He often found that students who came to him had been confused by poor education, but that by appropriate challenges he could help them to become independent thinkers. He referred to this process as "Recycling their brains".

Serge's attention to undergraduates was a part of his concern for the advancement of younger people generally. It was a habit with Serge to encourage younger mathematicians and be interested in their work. That was certainly so for me. I recall with gratitude his wholehearted enthusiasm for my work, and his help in promoting it, and I know of many others who similarly benefited.

Gisbert Wüstholz, Eidgenössisches Technische Hochschule, Zurich

Presumably my most expensive investment in mathematics as a student was a book with the title *Algebra* by an author whose name was Serge Lang. A former schoolmate had recommended it to me as a very modern new tract in algebra. He had entered university one year before me and just started with a course in algebra where the book had been recommended. Certainly the top of my list of favorite mathematics books would be *Algebra* by Serge Lang. The reason I like it so much is that it had a clear vision for modern and conceptual mathematics and this was put together with much mathematical taste.

It was exactly ten years later at the Arbeitstagung in 1978 in Bonn when I first met Serge personally. At the time everybody talked about "Bombieri-Lang", a paper which influenced enormously the research in transcendence. For us young students in number theory it was a big challenge to try to understand the difficult methods from geometric measure theory, the theory of plurisubharmonic functions and L^2-estimates. It took us away from the classical methods in transcendence theory and taught us that you need mathematics as a whole to formulate and to prove interesting new results in transcendence theory.

At that Arbeitstagung I talked quite a bit to Serge and he eventually helped me to find a post-doc position in Wuppertal. There I got into contact with people in algebraic groups and this helped me

to enter into another area which had been opened by Serge: he had started in 1962 with a series of papers in transcendence theory out of which another book resulted in 1966 which turned out—at least in my eyes—to be the most influential book (*Introduction to Diophantine Approximations*) that he ever wrote.

Even the *abc* conjecture, one of the favorite subjects of Serge, has now been incorporated into transcendental context, and this indicates how important Serge's impact into diophantine geometry and transcendence has become. He had created the frame of a very active and broad area to which he substantially contributed, he had the right mathematical visions and supported enthusiastically any progress.

For many years Serge visited me at Zürich. He gave numerous talks in my seminar and to undergraduates, and he enjoyed visiting us at our house. Only one thing I never forgive him: when he together with Schinzel once had been guests at our house in Bonn he came after the main course into the kitchen where I had started to prepare a soufflé Grand Marnier. Without stopping he talked to me and distracted me so much that at the end the soufflé did not rise in the oven. I did not want to offer it to the guests but Schinzel forced us to eat it since he would not agree to throw away food. After this I essentially stopped cooking soufflés.

Jürg Kramer, Humboldt University

I had my first encounter with Serge Lang as a student in an indirect way: after having just finished my first two years as an undergraduate with the "Vordiplom" in mathematics at the University of Basel (Switzerland), Martin Eichler proposed a seminar on Lang's new book on modular forms. Since I was just a beginner in the subject, the book made me work quite hard, but anyhow, as a result I became strongly interested in the subject. Six years later, just before completing my Ph.D., Eichler asked me to accompany him to the "Arbeitstagung" taking place in June 1984 in Bonn. After arriving at the entrance hall in front of the big lecture hall at Wegelerstrasse 10, one of the first persons to meet was Serge. At the time, it was quite impressive for me to have been personally introduced to this world-known mathematician. What I didn't know at the time was that this was the start of a relationship lasting for more than twenty years.

In fact, when I returned to Bonn in 1985 to visit the Max-Planck-Institut für Mathematik (MPIM), I was caught by surprise when I met Serge again during his regular trip to Europe in June and that he immediately remembered me; as a consequence, we started to talk about mathematics, first on a quite "innocent" level. Our mathematical communication

intensified in the years 1987/88, when I was giving a course on "arithmetic surfaces" at MPIM, while at the same time Serge was preparing his book *Introduction to Arakelov Theory*.

After having completed my "Habilitation" at ETH Zürich (where Serge was also visiting on a regular basis since the late 1980s), I moved to Humboldt University (HU) in Berlin in 1994. From 1995 until 2003, Serge regularly visited HU in late May/early June for one week. During this period of almost ten years, we got to know each other more closely and our relationship deepened. In Berlin, aside from his traditional talk in our number theory seminar (demonstrating the ubiquity of the heat kernel in the last years), he was intensively arguing, discussing, and interacting with our graduate students. In addition, he always generously offered talks to gifted high school students. In particular, the high school students consider his unexpected death as an infinite loss, and it is very sad that this tradition has come to such a sudden end.

Although Serge tried to stay away from close personal relationships, it seemed to me that in his last years when coming to Berlin the ties between him, my wife Ruth, and myself got somewhat closer. We will surely miss him.

David E. Rohrlich, Boston University

Shortly after Serge's death a few people suggested to me that I write something about his mathematical contributions. The suggestion apparently stemmed from a concern that obituaries would focus on Serge's eccentricities and temper tantrums rather than on the highlights of his career. Later, when I was invited to contribute something to the present article, I decided to intertwine my personal reminiscences with some glances at Serge's mathematics, partly because I was mindful of the concern that had been expressed to me, but partly also because Serge's passion for mathematics was in my view an essential part of his persona. However, the length of my submission ended up exceeding the stipulated limit, and the editors excised large portions of it, including all of the mathematics. For that I had only myself to blame, but the problem was that the mathematics had been the glue which joined one paragraph to the next, and with the glue removed, the entire piece fell apart like a Brunnian link. So I withdrew my submission. But in doing so I realized that this little episode was somehow a fitting memorial to Serge, for one of his noteworthy eccentricities was his proclivity for quarrels with editors. He could be very hard on editors, and he certainly would not have withdrawn a submission without a fight; in fact, his fights with editors were a significant component of some of his files. As with so many of Serge's "eccentricities", his

stance here was based on principle—in the present case, a defense of an author's right to self-expression free from gratuitous editorial intervention—and what converted integrity into eccentricity was simply his stubborn insistence on continuing to do battle far beyond the point where the battle seemed worth fighting. But you had to hand it to Serge: he had the courage of his convictions. We can probably all learn something from his example.

Marvin Jay Greenberg, University of California, Santa Cruz

I was Lang's first Ph.D. student. Officially, Emil Artin is listed as my thesis advisor, but he left Princeton for Hamburg three years before I wrote my thesis. What Artin did was ask Lang to commute from Columbia to Princeton in academic year 1956–57 to continue teaching algebraic geometry, which Artin began toward the end of his graduate algebra course—an extraordinary request and an extraordinary acceptance on Lang's part. So Lang taught a course at Princeton on Abelian varieties, in the style of A. Weil, and after a few weeks, I was his only student.

Lang went away to Paris the following year, and when he returned after that, we continued meeting informally at Princeton. He told me a conjecture of his about Abelian varieties he wanted me to prove for my thesis. I had no idea how to do so, and I was extremely busy teaching four elementary courses at Rutgers that year. Then he confronted me, as he is famous for doing, and shouted at me that if I did not show some progress with his conjecture in the next two weeks, I would no longer be his student.

The following weekend, in my attic room in New Brunswick, after rereading Lang's thesis, I suddenly had a flash of insight on how to solve that problem. I needed a few more weeks to write out all the technical details, but when I told him I had the solution, he was delighted. He took me out to a fine Spanish restaurant in NYC and treated me to paella, which I'd never eaten before. He invited me to his apartment overlooking the Hudson River and played Bach's dramatic Partita #6 (which I'd never heard before) and a Brahms Rhapsody for me on his grand piano. I felt as if he had lifted me into an exalted new world of excellence.

I remained on good terms with Lang for quite a few years after I left Princeton for Berkeley. Many people were turned off by his aggressive personality, but I always enjoyed that immensely, particularly his brutal honesty and taunting sense of humor. He once told me bluntly that I would never become a great mathematician because I was afraid of making mistakes. He certainly made plenty of

them in the first editions of the many books he dashed off so quickly. John Rhodes once told me: "Serge Lang writes great books badly."

Shoshichi Kobayashi, University of California, Berkeley

With no more than amateurish interest in number theory, my mathematical contact with Serge Lang is mostly through hyperbolic complex analysis. With his several conjectures and his introductory book on hyperbolic complex manifolds, he was the best promoter of the subject.

In 1985 I participated in the AMS Summer Research Institute on number theory at Humboldt State University, Arcata, in northern California. Thanks to Serge, I was invited to give an introductory talk on hyperbolic complex analysis, including Noguchi's partial answers to the function-theoretic analogue of the higher dimensional Mordell conjecture as formulated by Lang.

Since Serge was the only one driving back to Berkeley on the last day of the workshop, I accepted his offer of ride with trepidation. As I had expected, his driving was like his typing—fast. He drove German-style, flashing the headlights whenever slow-moving cars blocked us, which happened to be all cars ahead of us. We were back in Berkeley by 10:00 p.m. As a result, the only thing I remember from the workshop is this experience.

In 1987, Serge published *Introduction to Complex Hyperbolic Spaces* with Springer-Verlag. While writing this book, he called me, not day and night, but 9 in the morning. Quickly he found out my morning routine and the most convenient time. So usually I answered when the telephone rang around 9. When my wife answered, he invariably said "Is Kobayashi out of the shower yet?" When he stopped calling after several months, my wife said "I guess Serge finished his book."

Without Serge, the summer in Berkeley will no longer be the same. I miss him.

Hung-Hsi Wu, University of California, Berkeley

Serge Lang's life is easy to characterize: it was 90 percent mathematics and 10 percent scientific politics. I happen to be one of the few mathematicians who forged a friendship with him through politics, thereby getting a glimpse of a side of him that was perhaps denied other mathematicians.

For a mathematician to have any kind of friendship with Serge, it is a given that it could not have been completely divorced from mathematics. I was no exception.

While I had known about Serge since my undergraduate days at Columbia when he was still with that institution, my first meeting with him was in Berkeley around 1987, when he called to talk about Nevanlinna theory. At the time, he was still campaigning against Huntington's election to the National Academy of Sciences. In any case, Serge and I began political discussions with increasing frequency after that. He was at Yale, of course, and I was at Berkeley, but Serge was never shy about using the phone. While I sometimes had reservations about the tone of his writing, there was never any doubt in my mind about its substance. It may surprise some that a firebrand like Serge could use any encouragement, as it did me, but I discovered that fighting the kind of lonely battle that he did, he probably found it easier to listen to someone sympathetic to his views than to engage in a shouting match twenty-four hours a day. From time to time, he would sound me out on his strategies. One consequence of all these phone conversations was that I was privy to all his fights since about 1990, including the denouement of the Huntington case, the Gallo case, the Baltimore case, and of course the still-ongoing HIV controversy.

Because I had no strong mathematical connection with Serge, our relationship could afford to be more relaxed. Each time he called my home when my wife and I were out, he would leave a message reprimanding us for "goofing". Serge was famous for getting along with young people. He and my son were great pals, and each time my son would as much as ask a question about mathematics, a few days later a book or two on that subject would arrive from Springer-Verlag. The author of those books was of course Serge Lang.

In the last year of his life, his big fights were still over HIV. One involved his submission of a survey to the *Proceedings of the National Academy of Sciences* on the state of HIV research and government actions on the so-called anti-HIV drugs. He and I knew from the beginning that it would get nowhere, but the cavalier way in which his survey was rejected was stunning. I went to his office when word had just come and, perhaps owing to similar frustrations in my own work in mathematics education, I lost it and said in less than polite language that I had had it. In an instant, his role and mine were reversed and he soothed me with the philosophical observation that life was hard and that we just move on.

The last I heard from Serge was a phone call on September 3, 2005, after he had left Berkeley for New Haven. Four days after he passed away, his last file on HIV and the *Proceedings of the National Academy of Sciences* arrived. It was addressed to my son. He lived his life on his own terms to the very end.

Lisa R. Goldberg, Morgan Stanley

High Expectations

Serge Lang believed that young people have a special ability to see the truth. He was a champion of youth, and his students loved him. In January 2005, Serge submitted a brief op-ed piece and a dense four page advertisement to the *The Daily Californian*, the U.C. Berkeley campus newspaper. The topic was a Serge standard: growing dissent against the orthodox position that AIDS is a disease and it is caused by the HIV virus. The ad contained supporting documentation for the op-ed piece, which had previously been rejected. The submission was accompanied by a personal check to pay for the ad.

Serge had been disseminating information on HIV and AIDS for roughly twelve years. *The Daily Cal* was a natural outlet for Serge's challenges. After some back and forth, Serge received a rejection letter explaining why his material could not be published in *The Daily Cal.* Here are some excerpts that are pieced together from *The Daily Cal* file, which contains a copy of the rejection letter and Serge's response.

Daily Cal: We are confident that you understand all newspapers must have the flexibility as a business to reserve the right to refuse any advertisement, letter to the editor, op-ed or press release at the discretion of their publishers.

Serge: In fact, I know that newspapers have the power to refuse advertisements, letters to the editor, op-ed or press releases, and I have known it for a long time. It's not exactly secret information.

Daily Cal: These are the things we do to protect our readership.

Serge: I call this position Nannyism.

Daily Cal: Clearly it would have been a serious ethical error if we had elected to publish all or a portion of any op-ed letter to the editor that referenced an advertisement specifically designed to clarify or provide back-up data for the op-ed.

Serge: What you find "clear" I do not. In fact, I take an opposite view. You might have stated more accurately "clearly to us" to make your assertion more precise, instead of pretending to a universal ethical standard, applicable to others, and implying that I asked you to do something unethical.

The reply is pointed and funny throughout. Evident in every line are Serge's high expectations of the *Daily Cal* staff members. As far as he was concerned, they may as well have been running *The New York Times*, or the world for that matter.

Serge was a champion of youth, but he had plenty of energy left over for grownups. The *Daily Cal* file closes with a letter to the dean of the U.C. Berkeley School of Journalism. This time, the topic was journalistic responsibility. Serge stated some of his concerns, drawing examples from the media coverage of HIV and AIDS. As always, his high expectations were in evidence. He asked, non-rhetorically, "How does one make up for defective reporting over two decades?" And he signed the missive "Informatively yours, Serge Lang."

Allyn Jackson, Notices *Deputy Editor*

"It's me": This is what some of us in the AMS headquarters office would hear every now and again when our phones rang. No greeting, no name: Of course it was Serge Lang. Probably the very first time he called me he announced his name, but never again. When I got that first call, I mentioned it to a mathematician acquaintance, who said, "Watch out, you are in the room with the snake." Indeed, it was with some trepidation that we AMS staffers would take these calls. Usually Lang would rail on about whatever issue he was currently campaigning about, and we would give noncommital replies to avoid getting drawn into a debate with this tireless debater. But after a while he would soften up and crack a joke or tell a story; once he related to me the plot of a play he had seen. Sometimes he would end the call with a whimsical closing along the lines of "Toodle-oo". Carol McConway, a former AMS employee with whom I worked on the *Notices* many years back, received calls from Lang on a regular basis. She told me that in one conversation he remarked that she was very smart and asked where she had gone to college. Carol, like many of the highly intelligent and capable women on the AMS staff, had never gone to college. "Aha," Lang replied. "That's why you are so smart. You were not ruined by the educational system." Lang befriended another former AMS employee, Terry Drennan, who worked in the editorial department. When Terry got into a serious scrape with her boss, Lang stood up for her.

I was one of the many recipients of Lang's innumerable and lengthy "files". He sent me masses of documentation about his campaign about

HIV/AIDS. As I recall, he never stated that he believed that HIV does not cause AIDS. Rather, he advocated the need to view this hypothesis with skepticism and rigor. He poked holes in research papers and other writings that uncritically assumed the hypothesis to be true. At some point I looked carefully at one of the AIDS research papers that Lang had denounced; this particular one had been written by the prominent AIDS researcher David Ho, together with some colleagues, and had been much cited in the subsequent literature. I became convinced that Lang was right in saying that the paper lacked rigor and used mathematics inappropriately. This is how it was with Lang's campaigns: He *always* had a valid point. Yes, he was obsessive, he could be antagonistic, he had a bulldog-like attachment to his causes and sometimes lacked a sense of proportion. And the solutions he proposed to the problems he identified were often totally impractical and naive. Still, whenever I took the time to examine his analysis of those problems, I found myself concluding that he was basically right.

I do not believe Lang pursued his causes out of a desire for fame or notoriety. Rather, he was horrified by the falsity he found all around him, and he would not let others turn their eyes from it. We have lost a person with a highly attuned sense of what is truthful and what is sham, and it is a profound loss indeed.

John Ewing, Executive Director, American Mathematical Society

I had contacts with Serge over many years, beginning when I was editor of the *Mathematical Intelligencer* (and he insisted on publishing a long, long article). My kids got to know him by phone—he called me at home on and off for more than a year.

Later as executive director I came in contact with him, largely because of his dispute with the *Notices of the AMS* (about HIV). Serge always called the office and simply said, "It's me." Everyone here knew who that was. When I explained that the ED doesn't make editorial decisions, he insisted that the "higher ups" at the AMS could do whatever they wanted. He often sent material related to various things, and always mentioned that he was sending it to the "higher ups". Phone conversations were always long, protracted affairs.

But even with long phone calls and huge quantities of written material (we have a giant file here), Serge was really a charming guy whom I instinctively liked and admired. The world is better off having had him fight for his causes, with passion and indignation.

Joseph Gerver, Rutgers University

I met Serge Lang in 1967, my sophomore year at Columbia, when I took his multivariable calculus class. This was before the days of unified calculus. All of us were math majors and many of us were spoiled by our high school experience of learning math with very little effort. So Lang would frequently throw chalk at us, or yell.

I often ate dinner at the Gold Rail with Richard (now Susan) Bassein and Eli Cohen, and if Lang was also eating there he would always join us and usually pick up the tab. Sometimes we would talk about math. Lang did not think logicians were true mathematicians, because no real mathematician would worry about whether a proof made use of the axiom of choice. Why shouldn't you use the axiom of choice? It's obviously true! Think about it! How could you not be able to construct a set by choosing one element from each set in a collection of sets? Just do it!

We also talked about politics, music, life. He shared with us his growing unease about the Vietnam war and what he viewed as Columbia's complicity in it, although he made a point of never discussing politics in class. He offered advice about unrequited love: If at first you don't succeed, try, try again, but after the third time, if you still don't succeed, give it up!

Rarely, he took someone seriously who was merely pulling his leg. Dorian Goldfeld, at that time a postdoc at Berkeley, once reported gleefully that Lang had posed him a problem which he had in fact been working on for months and had already solved. Goldfeld told him with a straight face that he would think about it, and the next day presented Lang with the solution. Astounded, Lang asked him how he had managed to find the answer so quickly, and Goldfeld explained that he had used ginseng, which greatly enhanced his mental powers. Lang excitedly promised to try it himself, but reported disappointedly a few days later that ginseng had had no discernable effect on his brain.

In the summer of 1968, I was on vacation with my parents in Berkeley. Lang was there as usual, so my folks invited him for dinner. Naturally the conversation turned to the demonstrations at Columbia and the other student protests around the country, many of them against the war. Although my mother was opposed to the war in Vietnam, she deplored the excesses of some of the demonstrators, which she attributed to their permissive upbringings. "But what about France?" Lang objected. "And Poland? Even in Poland students are protesting against the government, and you can be sure they weren't raised permissively! Young people don't want to be used by their governments. All over the world, students are fighting for their freedom!"

Peter Duesberg, University of California, Berkeley

About twelve years ago I received a package of "files" from Serge Lang. The files objected to the Washington-style cover up of the scandal surrounding the American discovery of the hypothetical AIDS virus. Impressed by the thoroughness and mathematical logic of his case, I sent my own file in response: "Dr. Lang," I wrote, "the political scandal about who discovered the hypothetical AIDS virus is from a scientific point of view no more than a distraction—a catchy story about who stole whose fake diamonds. The scientific challenge, however, is whether AIDS is a viral or a chemical alias lifestyle epidemic, caused by the long-term consumption of recreational drugs and anti-viral drugs such as the inevitably toxic DNA chain-terminator AZT."

Not much later Lang and I became allies in the AIDS debate. Lang gave seminars on AIDS, wrote for the *Yale Scientific*, included two AIDS chapters in his book *Challenges* (1998) and generated a steady flow of AIDS files, the last of which arrived here only after his death. But only now, on the sad occasion of his death, is Lang's AIDS engagement presented as an Achilles heel of a mind that seemed otherwise irrefutable in its high standards of accuracy and precision not only by the politically correct *New York Times* and *Yale Daily News*, but even by several of his mathematical peers.

In view of this I take a last stand on behalf of our colleague, who cannot do this anymore, trying to inform his survivors with "primary evidence", rather than "condition them" with government handouts, as Lang would have said. Even if one virus could cause the twenty-six infectious and non-infectious (!) diseases that are now defined as AIDS, the following would be true:

1) AIDS would be contagious. But, there is no case report in the peer-reviewed literature of even one doctor who ever contracted AIDS from one of the 929,985 (2004) American AIDS patients in twenty-three years. Moreover, not even one of the thousands of AIDS virus researchers ever contracted AIDS from their "deadly virus", as the *New York Times* calls it.

2) AIDS should appear within days to weeks after infection, because the AIDS virus, like other viruses, replicates with multiplication rates of 100 to 1,000 within twenty-four hours. But AIDS is said to appear only five to ten years after infection by its hypothetical viral cause.

3) The epidemic would spread randomly like all viral epidemics. But AIDS cases in the U.S. and Europe are highly nonrandom, 80% are males, of which 1/3 are intravenous drug users and 2/3 are male homosexual users of toxic, recreational drugs like nitrite inhalants and amphetamines and are prescribed DNA chain-terminators.

4) The epidemic would have formed a classical bell-shaped time curve, increasing exponentially and then declining exponentially owing to natural immunity within weeks to months, like a seasonal flu. Instead AIDS increased slowly over a decade and has since leveled off, without ever inducing immunity against itself.

Thus AIDS fits a lifestyle—but not a viral epidemic. I hope, therefore, that those who saw Lang's AIDS engagement as an Achilles heel might reconsider.

I already miss Lang as an ally in the politically incorrect debate on the cause of AIDS. And I hope that you all let me join you in missing the *Mensch* that was hidden behind the machine. *Au revoir* Serge Lang!