Alexandre Grothendieck 1928–2014, Part 2

Michael Artin, Allyn Jackson, David Mumford, and John Tate, Coordinating Editors

This is the second part of a two-part obituary for Alexandre Grothendieck; the first part appeared in the March 2016 *Notices*.

Yves Ladegaillerie

Alexandre Grothendieck after 1970

At Villecun

Starting in 1973, Alexander Grothendieck lived in Villecun, a hamlet near Lodève (about 60 km from Montpellier), in an old and shabby house. The house lacked comfort, but, as he said, it had a soul. I used to go there to do mathematics or simply to visit. Evenings were lit with an old oil lamp, and there was goat's milk and locally produced organic food, which Alexander used to eat with chopsticks, a habit he acquired in Vietnam. He was mainly vegetarian.

His house was open to everyone: students, ecologist pals, and sometimes a Buddhist monk with his prayer-drum. Later this monk caused some Kafkaesque legal headaches for Alexander, who was accused of "helping a stranger in an irregular position" when the monk's visa had lapsed. Alexander never refused to offer this kind of help, as he himself had been stateless for much of his life and understood such problems very well.

For a while, Alexander drove an old Citroën 2 CV, at first without a driver's license, for he had failed the test several times. He also used to ride a moped, and once he collided frontally with a car in a turn while he was looking for an apricot in a bag behind him; he had multiple fractures in one leg. He was anesthetized by acupuncture and, to avoid amputation, grudgingly accepted antibiotics.

Photo by Winfried Scharlau.

Grothendieck lived in this house in Villecun from 1973 until 1979.

He used to sleep on a pallet on the floor. He told me he felt well on it, as he had felt well on the one at the internment camp, which had at one time been his only shelter. In Montpellier he used to sleep at our home in a sleeping bag on the floor, steadfastly refusing a good bed.

Teaching at the University of Montpellier

As a professor in the College of Sciences, he was very accessible and did the same work as everyone else, with diligence and devotion. On his old typewriter he typed handouts that he generously distributed to all.

Later, when he and I were in charge of preparing some students for the competitive "Agrégation", we had to come up with extended problems for them to work on. During the entire year, Alexander came up with only one problem, for he developed it with endless questions and generalizations.

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DOI: http://dx.doi.org/10.1090/noti1361

His lectures were of absolute clarity. He spent a lot of time explaining basics, but also flew high into mathematics. In the third cycle the level of the students at Montpellier was rather low for such a teacher, who until then had taught very high-level, selected students, most of them French *normaliens* (that is, students from the École Normale Supérieure). He became discouraged and requested a position at the Centre National de la Recherche Scientifique, which required no teaching.

Working with Grothendieck after 1970

In 1970, as a twenty-two-year-old *normalien*, I received a PhD at the Institut Henri Poincaré and got a position as an assistant professor at the University of Montpellier. As soon as he arrived in 1973, Grothendieck suggested that I work with him on surface topology. So I was his twelfth and last student for a "Thèse d'Etat", which I passed in 1976. He spent a great deal of time and showed exemplary patience in introducing me to his way of doing mathematics. The relationship with him went beyond scientific activity. He often came to our home and played with our children.

I will never forget the two of us doing math by the light of the old oil lamp.

Working with Grothendieck was an amazing experience for the young man I was. I will never forget the evenings spent at Villecun, the two of us doing math by the light of the old oil lamp. In Paris I had had as professors some of the most brilliant mathematicians of the time, from Schwartz to Cartan, but Grothendieck was completely different, other-worldly. Instead of translating things into another language, he thought and spoke directly in the language of modern structural mathematics, which he had contributed greatly to creating.

In the 1980s I gave many seminar talks on the work of Thurston and Teichmüller spaces. Alexander was interested in this and built his conjectural theory of the Galois group of $\bar{Q}/Q$, which he described in his *Esquisse d'un programme*. At this time I was surprised to see him, for the first time, making many drawings.

After 1984, when he got a position at the CNRS, we did not see him often in Montpellier. He retired in 1988 and withdrew to the Pyrénées in 1990. We decided to respect his wishes for solitude.

What Was Grothendieck Really Looking For?

In Montpellier, a few disrespectful people joked that Grothendieck had a direct line to God. More seriously, I have long wondered about his way of being. The tragic destiny of the father—the anarchist and the enemy of all law who had lost an arm and who abandoned his son to pursue his own ideas, as well as the presence of the prideful yet dependent mother—no doubt deeply affected Grothendieck's mental structure. Throughout his life he sought laws and forms, always beginning by naming, with infinite care, the things that he saw. He first found them in the domain of mathematics, which brought him great successes as well as mental stability. After the crisis of May 1968, he turned to ecology and the mother-earth, throwing himself, as was his way, headlong into the struggle. He tried but failed to live in a community.

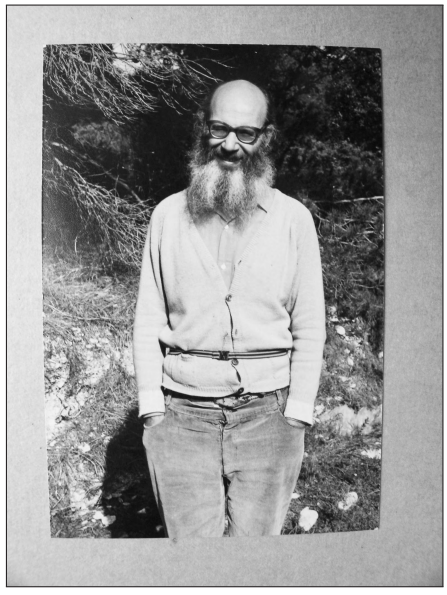

Photo by Erika Ifang.

Grothendieck in the 1980s, when he was professor at the University of Montpellier. In 1988 he retired and in 1991 withdrew to the Pyrénées in solitude.

At the end of the 1980s and in the 1990s, after writing *Récoltes et Semailles*, he was in a deep crisis, on the verge of the abyss. He wrote letters that made us fear the worst about his condition. He said finally that he had found something he called God, and he wrote a book, dedicated to his sons, in which he essentially says that God is in us, the author of our dreams. His quest was probably basically that one, that of his profound being whose symbolization was difficult for him because of his personal history, leading to the very edge of psychosis.

Seeking serenity in his retreat in the Pyrénées, Alexander Grothendieck lived quite tranquilly. He died in November 2014 and finally found peace. He gave us a lot. Beyond his mathematical genius, he was a kind and generous man; he is entitled to our eternal admiration and respect.

Stephen Lichtenbaum

Alexander Grothendieck first visited Harvard in the fall of 1958, when I was an undergraduate. He gave a course in the cohomology of sheaves, which I tried to follow, briefly and unsuccessfully. He was a very dramatic figure with his shaved head and turtleneck sweaters, and everyone could sense something amazing about to be born.

When Grothendieck came back to Harvard in the fall of 1961, I was a graduate student and much better

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prepared. John Tate had given a course the year before on the theory of schemes (preschemes at the time), almost certainly the first such course in the United States and perhaps anywhere. Grothendieck created all by himself a whirlwind of mathematical activity, giving two seminars (on local cohomology and Picard schemes) and one course (on local properties of maps from one scheme to another). We students used to say that he could write new mathematics faster than we could read it.

In his course, almost every day Grothendieck would start off by writing the same thing on the board he had just erased. He would write an X, representing a scheme, a vertical arrow down from X, labeled f and representing a map, and a letter Y, representing another scheme, the target of the map f from X. One day John Fogarty got to class early, erased the board himself, and replicated Grothendieck's X, f, and Y. Grothendieck then came in, looked at the board, smiled, erased the board as always, and proceeded to write his usual X, f, and Y.

Grothendieck was always very approachable and loved to talk about mathematics. I had been thinking about the cohomology of coherent sheaves on algebraic varieties, and the following question occurred to me. Was it true that an irreducible variety X of dimension d was complete if and only if there existed a coherent sheaf F on X whose d-th cohomology group was nonzero? This was known for curves, which was a good start. I thought that, before working on it, I would look for Grothendieck in the common room to find out if the answer was already known. Grothendieck suggested that the projective plane minus the origin might be a counterexample, but I told him that I knew the result in that case. He said then he would have to think about it. In two days he saw me again in the common room and very happily told me that it was true, he had proved it, and that the proof in fact was a consequence of results he was presenting in his seminar on local cohomology. However, as some compensation, this result is sometimes referred to as "Lichtenbaum's theorem".

Grothendieck was perhaps the world's greatest exponent of "the right way of looking at things". He emphasized that it is not enough to state a theorem that two objects are isomorphic; the isomorphism should be natural, which presumably means functorial. His definitions and constructions (Hilbert schemes, Picard schemes, Grothendieck topologies, including étale and crystalline, the theory of motives, and many others) totally transformed the study of algebraic geometry, but these ideas have had a far-reaching impact even beyond classical algebraic geometry. The étale topology was first developed in order to construct a cohomology theory for varieties of characteristic p that satisfied a trace formula and Poincaré duality and, following Weil, could then be used to prove the rationality of the zeta function of varieties over finite fields. However, it also turned out to be an indispensable tool for the study of number rings and schemes of finite type over number rings.

It was a great privilege to be able to listen to Grothendieck lecture, and his work has always been a source of great inspiration to me. Serre, in a letter to Grothendieck, speaks of his "enveloping a problem and dissolving it in a rising tide of general theories." This worked better for Grothendieck than for the rest of us, but it is still perhaps something that we others can dream about.

Pierre Lochak

An Enticing Maze of Bridges

Tous les chevaux du Roi
Pourraient y boire ensemble…

Indeed, as this old song you were fond of puts it, the fountain is large enough for the king's entire cavalry to quench its thirst therein. You have left so much behind, Alexandre, you who seemed to always forge ahead, never taking stock of anything until you left this world that was never truly yours—"*le grand monde mathématique*," as you would later derisively refer to it—ceaselessly wandering, planning, building, whether in the large, so it would be huge as the doomed cathedral in Beauvais, or in the small: accommodating, fitting out, polishing down to the last detail, only to leave everything behind, untiringly ready to soar up into the unknown, *l'inconnu*, *das Unbekannte*, your only love. What did you expect from life? More, of course, but more of what? You looked, you sounded so utterly different from Rilke, whom you once passionately translated; yet the opening lines of the eighth *Duino Elegy* could have been written for you:

Mit allen Augen sieht die Kreatur
das Offene. Nur unsre Augen sind
wie umgekehrt und ganz um sie gestellt
als Fallen, rings um ihren freien Ausgang.

(The creature gazes into openness with all
its eyes. But our eyes are
as if they were reversed, and surround it,
everywhere, like barriers against its free passage.)

Except that your way into the magical Open was not so much via the animal, but rather in your marveling at a very special creature: *le petit d'homme*. Perhaps it was a different time altogether, and you had had more opportunities to contemplate babies than Rilke had?! Perhaps tiny Moses—if not tiny Mowgli—could figure an approximation in flesh and blood? But were *you* really free of all those barriers? Oh, yes—or at least not far from being free!

Before you hid from the eyes of the world, you made the most of your fleeting moment on this miserable planet; after all, so many fairies hovered over your crib—except there was no crib really, only a dubious blanket. So much to experience, so much to enjoy, so much to endure.… You did it all. Your three great discoveries, in chronological order (quoting you): mathematics, women, meditation:

Dans le mitan du lit,
La rivière est profonde.

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The river flows deep in the midst of its bed, and you did drink from the fountains of our life, with no restraint, *goulûment*.… Of making books there could be no end for you, but never did you become quite weary of the flesh. You always retained a soft spot for apples. As for mathematics, it was always with you, in you. Yet the gift of solitude was the only one you would openly claim. After all is said, there was one gesture that was yours, completely: pointing to the *obvious*, fearlessly. An affine scheme is the spectrum of a ring, *any* ring; why confine oneself to "geometric rings" or weird ad hoc animals? Of that very definition you once wrote that before you no one had stooped low enough, stripping all the conditions. Sorry, Alexandre, but perhaps there remained a trace of complacency in this declaration, of *fatuité*, one of your most terrible inner enemies, a hydra with innumerable heads. Perhaps also you forgot that your formidable technical powers made possible certain things that, for poor—fearful?—us, sadly are not. But let's not quibble; quibbling was not your thing, arguing was not your thing, dialectics was not your thing, mediation was not your thing, maybe gnosticism always was. And let us be honest: listening to your next of kin was not your thing either; too "next", too close, too crowding. Perhaps again the gift—the curse sometimes?—of solitude. Perhaps.… But you believed our minds are cluttered with knowledge, much like worldly possessions famously prevent the rich man from crawling through the eye of the needle. You would not quite say, "Come, follow me," but rather "Come, look around you and listen to the silence," and the world of mathematics will open before your eyes. But in the end that world, or rather that strange paradise, could not fulfill you, you who wrote that the most daring mathematical innovation was still only "intellectual," not "spiritual."

Satan exists; God does as well.

You looked around, at *our* world, at *das Diesseits*, and what you saw simply horrified you. Look around! But how can you bear what you see?! Still pointing at the obvious.… *There* was your mission, a word we cannot avoid, you simply had to discover it and start prophetizing. But how can we bear it all? Gradually you became haunted by His pervading presence, the Evil within, *le Mal*, and it would slowly come to life, acquire dreadful features, those of Satan, *der Verfluchte*. In the end you wrote just as much on *Le Problème du Mal* as you did on mathematics. And yet you had also met God and beautifully told us about these encounters. There were few of these, but they were so convincing, so inescapable. Satan exists; God does as well. They are at war, at every moment, everywhere. One day that war will end, but for now, Satan has and will retain the upper hand, be it in an underhanded way, inside each and everyone of us: and this tune was heard twenty, perhaps thirty centuries ago, a whisper that will forever roam the streets of our cities. Inside each and everyone of us… Or almost. For you explicitly listed "mutants," these men (no woman in your list; why not Marthe, the one you once loved?) who, like you, had a mission to fulfill, mutants who were sent to this valley of tears in order to prepare for the great mutation, when Satan will loosen his grip. Men you admired, famous, from Darwin to Krishnamurti, from W. Whitman to R. Steiner and Freud, or less famous, from C. F. S. Hahneman to F. Carrasquer or Eddie Solvik. If I were in the mood for numerology—and I know for a fact that *you* sometimes were—I would note that you listed 18 mutants, one half of 36, the number of the hidden *tsadikim* your grandfather knew so much about; the anonymous pillars of our world. But then, could you possibly be added to the list?

So She—or should I perhaps write He, *der Tod*?—came to get you in the end; not the evil One, *le Maudit*, *der Verfluchte*, not He who, you said, turns down here into an accursed world, a swirling carousel of egos. In the end She quietly tiptoed, the way She always does and always will. Oh, but I forgot; *le lyrisme*—your word again—lyricism, was never your thing. In truth you positively hated any trace of it, like yet another mask to be torn off. Let me sober down then, the way you told Her to, the way you looked Her straight in the eyes, rejecting the last slippery, treacherous words. May you rest in a hard-fought and all too well-deserved peace:

Et nous y dormirions,
Jusqu'à la fin du monde.

Barry Mazur

Thinking about Grothendieck

During the early 1960s Grothendieck's conversations had a secure calmness. He would offer mathematical ideas with a smile that always had an expanse of generosity in it. Firm feet on the ground, sometimes barefoot. Transparency: his feelings toward people, toward things, were straightforwardly felt, straightforwardly expressed—often garnished with a sprig of morality. But perhaps the word "morality" doesn't set the right tone: one expects a dour or dire music to accompany any moral message. Grothendieck's opinions, observations, would be delivered with an up beat, an optimism, a sense that "nothing could be easier in the world" than to view things as he did. In fact, as many people have mentioned, Grothendieck didn't butt against obstacles, but rather he arranged for obstacles to be dissolved even before he approached them. The mathematical road, he would seem to say, shows itself to be "the correct way" by how easy it is to travel along it. This is, of course, a vastly different "ease" from what was an intellectual abomination to Grothendieck: something he called, with horror, *tourner la manivelle* ("cranking it out").

Simplicity was a great virtue for him—in ideas, in material possessions, in food. The main objects in his living room when he lived in an apartment at Résidence Gratien in Bures-sur-Yvette were a wrought iron statue of a goat, a large urn filled with oil-cured black olives, a small, somewhat rickety table on which perched his typewriter.

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You could meet him on the way from market during the weekly market day in Bures, carrying only one ample bag of grapes, eating them as he walked and offering them to you.

His hospitality was startling. Later, when he lived near the RER stop Massy-Verrière, he once invited an entire family who needed lodging to stay in his basement and to bring with them their in-laws. He helped them install a taramasalata machine there to give them some economic activity.

In encountering a shopping mall when he visited Cambridge, MA, his only utterance was an Elizabethan "Let us flee." How sparing he was in any activity other than mathematics during the sixties! As a result, some of his nonmathematical experiences at that time had revelatory force for him. He returned to Bures from Paris one day, saying that he'd just seen the first movie he had seen in twelve years (*Butch Cassidy and the Sundance Kid*) and was struck by its moral complexity. The one nonmathematical book I know he was reading with intense respect at that epoch was a volume entitled *History of the Jews* (I've forgotten its author or the language in which Grothendieck was reading it). John Tate writes that *Moby Dick* was Grothendieck's favorite novel.

After Grothendieck officially left the Institut des Hautes Études Scientifiques (IHES), he did show up at the IHES a few times. Gretchen and I would invite him for lunch in the pavilion we were staying at in the Résidence de l'Ormaille. The predominant theme and message of his conversation at these lunches was how much he felt mathematics to be a siren song, a distraction, and how I should free myself from it to open up to a wider psychologically aware existence. I would give counterarguments.

The mathematical talks I had with him, as I remember them now, were largely, perhaps only, about viewpoint, never about specifics (with the exception of a conversation about differential structures on conjugate complexifications of an algebraic variety over a number field). Grothendieck's message was clear throughout: that everything important will follow easily, will flow, from the right vantage. It was principally "the right vantage", a way of seeing mathematics, that he sought, and perhaps only on a lesser level its by-products.

People have written about Grothendieck's intense category-theoretic genius. The phrase "category-theoretic", as far as it goes, is correct as a very vague pointer to Grothendieck's attitude, where, for example, Yoneda's Lemma plays such an important role. Yoneda's Lemma asserts that an object X of a category is determined (up to unique isomorphism) by the functor that records morphisms from *each* of the objects of that category to X. Or, in more evocative terms, a mathematical object X is best thought of in the context of a category surrounding it and is determined by the network of relations it enjoys with *all* the objects of that category. Moreover, to understand X it might be more germane to deal directly with the functor representing it. This is reminiscent of Wittgenstein's "language game", i.e., that the meaning of a word is determined by, in fact is nothing more than, its relations to all the utterances in a language.

Treating objects as functors was second nature to him, but that was the least of it; Grothendieck's view goes much further than that. For example, as if it were the most natural thing in the world, the mathematical objects X that he dealt with would often be defined directly in the context of all possible families of variations X_t of those objects (e.g., S-schemes rather than algebraic varieties). One of his many great innovations gives us a deep understanding of what it means to pass from a global view of an object to a more local view of "locales" in the object or, going the other way, to agglomerate from the local to the global.

These words, of course, hardly begin to touch on the grandeur of the person he was or of the ideas he has taught us.

William Messing

In the late autumn of 1963, Grothendieck's name was mentioned by a friend who was a first-year graduate student at Penn and was taking a course given by Shatz. I promptly bought EGA [*Eléments de Géométrie Algébrique chapitre I*], and, entirely ignoring its admonition "il est recommandé au lecteur de ne se reporter au chapitre 0 …," I read it, albeit with difficulty, over the next year and an half. At Princeton, as a graduate student, I was lucky to have a good relationship with the mathematics librarian, Anne Kenney, who kept in her office the PamC collection of unpublished and poorly circulated seminar and course notes. Many items were, as far as I know, unavailable outside Paris and Cambridge. She guarded these treasures closely but permitted me to check out many of them, including individually bound fasicules. In this manner I was introduced to FGA, SGA1, SGA2, SGA3 (then SGAD), SGA4 (then SGAA) [FGA=*Fondements de la Géométrie Algébrique*, SGA=*Séminaire de Géométrie Algébrique*].

The first time I encountered Grothendieck was when, in the early autumn of 1966, he gave three lectures at Haverford College. The first lecture was elementary, although at the break for tea I overheard one undergraduate say to another, "Why doesn't he cut out the bullshit and define 'field'." It was during the second lecture that he referred to Deligne as "a bright young Belgian who has proved that a coherent topos has enough points." The third lecture was devoted to explaining his May 1966 Pisan letter to Tate on crystals and the conjectural relation with Barsotti-Tate groups. At the time, this lecture was over my head, and it was not until the summer of 1967 when, at the Bowdoin conference on algebraic geometry, Oda gave Katz and me copies of the letter to Tate, with its amazing "commentaire terminologique", that I had a glimmer of understanding of what my early research would be devoted to.

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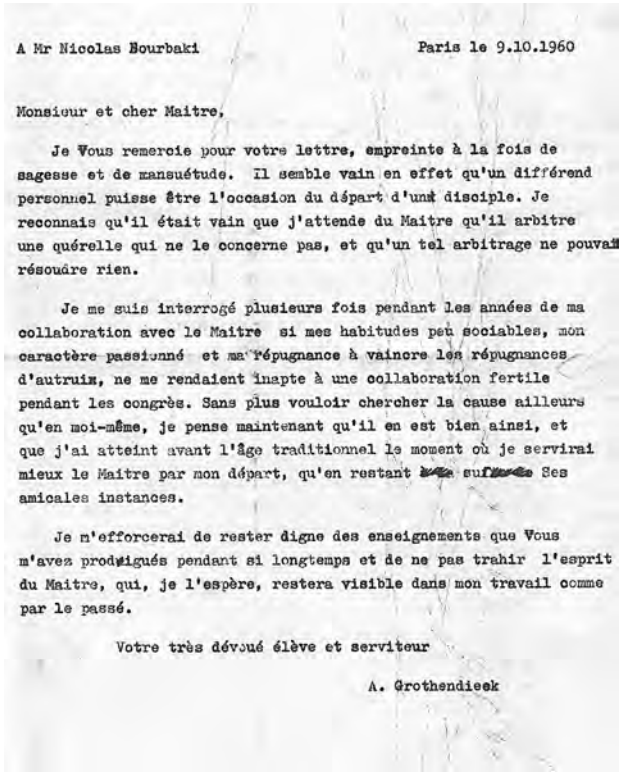

A Mr Nicolas Bourbaki Paris le 9.10.1960

Monsieur et cher Maitre,

Je Vous remercie pour votre lettre, empreinte à la fois de sagesse et de mansuétude. Il semble vain en effet qu'un différend personnel puisse être l'occasion du départ d'un disciple. Je reconnais qu'il était vain que j'attende du Maitre qu'il arbitre une quérelle qui ne le concerne pas, et qu'un tel arbitrage ne pouvait résoudre rien.

Je me suis interrogé plusieurs fois pendant les années de ma collaboration avec le Maitre si mes habitudes peu sociables, mon caractère passionné et ma répugnance à vaincre les répugnances d'autruim, ne me rendaient inapte à une collaboration fertile pendant les congrès. Sans plus vouloir chercher la cause ailleurs qu'en moi-même, je pense maintenant qu'il en est bien ainsi, et que j'ai atteint avant l'âge traditionnel le moment où je servirai mieux le Maitre par mon départ, qu'en restant sujet à Ses amicales instances.

Je m'efforcerai de rester digne des enseignements que Vous m'avez prodigués pendant si longtemps et de ne pas trahir l'esprit du Maitre, qui, je l'espère, restera visible dans mon travail comme par le passé.

Votre très dévoué élève et serviteur

A. Grothendieck

Scanned image courtesy of William Messing.

In 1960 Grothendieck resigned from Bourbaki.

Translation of Letter of Resignation from Bourbaki:

To Mr. Nicolas Bourbaki
Paris October 9, 1960
Dear Sir and my dear Master,

I thank You for your letter, marked by both wisdom and clemency. Indeed it seems pointless that a personal disagreement could be the occasion for the departure of a disciple. I recognize that it was pointless for me to wait for the Master to arbitrate a quarrel that did not concern him and that such arbitration would resolve nothing.

I have asked myself many times over the years of my collaboration with the Master whether my lack of social skill, my impassioned character, and my repugnance for overcoming the repugnance of others, did not render me unsuitable for a productive collaboration during the meetings. No longer wanting to search for the cause anywhere except in myself, I now think that it is better this way and that I reached earlier than the traditional age the moment when I would better serve the Master by my departure, rather than remaining as a result of His kind insistence.

I will endeavor to remain worthy of the teachings that You for so long lavished upon me and not to betray the spirit of the Master who, I hope, will remain visible in my work as it has been in the past.

Your very devoted pupil and servant,
A. Grothendieck

Scanned image courtesy of William Messing.

William Messing writes: "In the folder where I found [Grothendieck's letter of resignation from Bourbaki], I found Grothendieck's handwritten notes for his June 22, 1971, Collège de France lecture, in which he proved that Barsotti-Tate groups and truncated Barsotti-Tate groups can be infinitesimally lifted. This theorem is based upon the deformation-theoretic formalism developed in the second volume of Luc Illusie's thesis *Complexe Cotangent et Déformations II*, **Springer Lecture Notes, volume 283, and is used crucially in my thesis** *The Crystals Associated to Barsotti-Tate Groups: With Applications to Abelian Schemes*, **Springer Lecture Notes, volume 264."**

During July 1970 there was an algebraic geometry summer school at the Université de Montréal featuring four series of lectures by Abhyankar, Artin, Grothendieck, and Nagata. I devoted essentially all my effort to following Grothendieck's lectures on Barsotti-Tate groups and discussing them with him. July 20, 1970, was also the birth of the Survival group and movement. I was at the time, and remain, politically on the extreme left, and the syndicalist orientation in opposition to nuclear arms and environmental crimes was appealing to me. Thus, I became Survival's treasurer for the North American continent. My wife, Rita, and I invited Grothendieck to dinner. As Montreal had adequate Jewish cuisine, we served bagels, cream cheese, lox, and sturgeon. Grothendieck was enchanted, reporting that he recalled bagels from his early childhood in Berlin but had not had them since. At David Lieberman's request, Grothendieck gave an extra lecture on motives. Originally scheduled for an hour, it lasted more than three. In this lecture Grothendieck stated carefully a variant of Ogus's absolute Tate cycle conjecture, namely, that absolute Tate cycles should be algebraic cycles, and said he had more confidence in this than in either the Hodge or the Tate conjecture.

In January 1971, I visited Grothendieck in Kingston, Ontario, where he was lecturing at Queen's University. I

stayed in his small studio for three days, during which time we discussed my forthcoming thesis, other mathematics, and Survival. In my 1964 Buick we drove three hours each way to visit Alex Jamieson, an Iroquois activist living on a reservation in northwestern New York State. Jamieson was involved in a dispute with the government over violation of treaty rights, and Grothendieck wanted to understand the issues so that Survival could assist Jamieson. Jamieson invited us to have dinner with him and his family, who were, to put it mildly, not living on Easy Street. The family's meal that evening consisted of canned soup to which fried pork fat had been generously added. Grothendieck, who was a vegetarian at that time, was able to respectfully decline to partake. I managed, with considerable effort, to consume a modest amount.

Grothendieck arrived in Princeton on April 12, 1971, and gave a talk on topoi and new foundations for topology and a talk on Survival and the responsibilities of scientists. This second talk led to heated discussion, and some participants expressed the view that Grothendieck should stick to proving theorems. Susan and Eric Friedlander invited Grothendieck, Taffy and Phillip Griffiths, Serge Lang, and Rita and me to dinner on Tuesday, April 13. Grothendieck told me, as though it was obvious, that he fasted on Tuesdays. Nevertheless, he came to dinner and ate nothing, but, with a big smile, asked Lang whether he or Sammy (Eilenberg) were yet married.

Having defended my thesis in early May, I traveled with Rita, who was then in her ninth month of pregnancy, and our Saint Bernard dog Dagger, arriving at the IHES on June 6, 1971, for a six-month visit. Later that week Grothendieck invited us for dinner at his Massy-Verrières house, where we met his wife, Mireille, and their three children. As Rita was not yet proficient in French, English was spoken, and Grothendieck and Mireille corrected each other's pronunciation, while the Messings attempted to remain neutral. I attended Grothendieck's Collège de France lectures on June 8 and June 15, but was unable to attend the June 22 lecture, as our son, Charles, was born that day at the American Hospital in Neuilly. Early that evening, Grothendieck called, noting that I had not attended his lecture, and when I told him why, he congratulated us. A few days later he showed up at our Ormaille pavilion with an infant's outfit for Charles, explaining that Mireille had selected it, having more expertise than he did.

Over the course of that summer I went on Tuesday evenings to Grothendieck's house, where Survival would meet. In early August during the traditional *vacances*, I brought my parents to his house to meet him, and with his own family *dans la campagne*, he was a fine host. During the autumn, there were Survival meetings both at his house and in Paris apartments. These were attended by both Chevalley and Samuel on a regular basis.

We spent the summer 1972 again at the IHES, and on July 13 I received a telephone call from Grothendieck, inviting me to come to the friend's apartment where he was staying with Justine. While we talked, I noted that he was becoming increasingly impatient as he watched her trying to delicately remove the tinfoil seal on a plastic container of milk. This was stress provoking for both of them, and Grothendieck resolved the issue by poking his thumb through the foil so that Justine could finally drink some milk. The number of words that I have been permitted forces me to refer to pages 1201–1203 of A. Jackson's November 2004 *Notices* article on Grothendieck for additional remarks.

Let me close by briefly discussing *Récoltes et Semailles* and my reactions to it. Since November 1985, when I first saw it, I have strongly felt that Gide's "please do not understand me too quickly" is essential when discussing this text. Malgrange's immediate reaction was "One does not cite Newton each time one takes a derivative." Accurate, but irrelevant. This voyage of (self-) discovery is unlike any other text I know. It is simultaneously a passionate cry of anguish and a meticulously detailed reflection on Grothendieck himself, as well as on his interactions and relations with other individuals, particularly mathematicians. I return to it regularly.

Let me quote from a text found in my office on February 6, 2015. It is titled "Réflexions Mathématiques, by Alexandre Grothendieck" (n.b., the "re" rather than "er") and dated December 13, 1985:

> After a twelve years' silence, the time has come for the author's works of maturity, with his vision and style renewed. Here is a day-by-day account of an explorer's travel—going on through the very act of writing—with occasional reflections on the travel (as well as on the traveler and on the manifold world around him) recapturing its genuine nature of an impassioned adventure, rooted in life.

David Mumford

Recollections of Grothendieck

I learned math in the 1950s and loved both its clean, elegant foundations and the wonderful zoo of constructions that it spawned. In algebraic geometry the zoo was well populated (see Semple and Roth, for example) but the foundations were a mess. Oscar Zariski and André Weil knew that classical geometry had to be merged with the power of algebra and with the challenges of number theory, but both produced what felt like Rube Goldberg Machines to do this. Enter Grothendieck—schemes and functors arrived like a blast of fresh air. Clearly he was doing it right.

And Grothendieck himself was a blizzard. Here are two stories about his visit to Harvard in 1959 that illustrate aspects of the man. First, he paid no attenton at all to conventions. I have failed to confirm the first by searching the Harvard archives, but what I recall clearly was Oscar telling us he was having trouble arranging Grothendieck's visit. An oath that you would not work to foment revolution was required on entry to the USA. Grothendieck demurred. But maybe, he suggested, he

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could collaborate with us from jail if they allowed him enough books and visitors? Fortunately an alternate solution was found. He always pursued his own path. Another instance was when, at a conference in Mumbai, we were taken to the famous sculptures at Elephanta Island; he disappeared, going off instead to visit the local fishing village. How the people lived was more interesting to him than dead stones.

I have never met anyone who wrote so fast, on a black-board.

Secondly, his dedication to his work was total. Students saw this and put on a skit at Christmas time. In it a student asks an unnamed professor if he might start a seminar to explain such and such a theory. "Good," says the professor, but every hour of the week is checked and has a conflict. "How about Sunday at 11?" says the prof. To understand how hilarious this was you need to place yourself in Yankee territory in the 1950s: Every God-fearing soul would be in church at 11 on Sunday! They knew this was Grothendieck. His intensity was such that he worked anytime, any place, whether it was writing or lecturing, and he was always ready to explain his ideas and work with anyone.

Speaking of his seminars, I have never met anyone who wrote so fast, so fluidly yet legibly on a blackboard. A Chinese student told me it was called "grass writing" in Chinese—the imprint of gusts of wind blowing across a field of grass. It felt as though in the handwriting you could see the speed with which his thoughts raced. While this was inspiring, my main problem was that in every iteration of his theories, he generalized things a bit further—Why noetherian? Why separated? etc. Personally, I needed a sturdy place to make into algebraic geometry home base and not have to worry about vast stretches of theory where I had no examples to act as guideposts. On the other hand, Mike Artin, Hei Hironaka, and I had been trained by Oscar and had a font of examples from Enriques's *Le Superficie Algebriche*, so we became the go-to guys when Grothendieck needed to see if there were easy counterexamples to a conjecture. Our reward was wonderful explanations of his new ideas in his letters to us.

I spent the spring of 1968 at the IHES and attended his lectures. The beautiful glass-walled lecture room, set amidst gardens and forests of the Bois Marie, was an idyllic setting in which to learn to follow oral French math ("ash-uhn de eegrek", $H^1(Y)$). But at that time, Grothendieck was already looking beyond the airtight world of math, fasting a day every week out of respect to the Vietnamese, including the day he invited my wife and me to dinner. One sensed that his *Éléments* were on a divergent path and could never be finished. So it turned out. I wish I had been closer personally to him and knew better the series of quests that engaged him. I have never met anyone as deep and as passionate.

Photo courtesy of the estate of Friedrich Hirzebruch.

Grothendieck in 1961.

Jacob Murre

The first time I saw Grothendieck was in 1955 in Chicago, where he gave a lecture, and the next time was in 1958 at the International Congress of Mathematicians (ICM) in Edinburgh. On both these occasions I had only a superficial contact with him.

In the spring of 1959, Nico Kuiper, who later became director of the IHES but at that time was a professor at the University of Wageningen in the Netherlands, invited Grothendieck for a lecture. After the lecture Nico invited us to his house, and there Grothendieck and I had a long discussion. At that time the Picard variety was a topic of central interest. The Picard variety had been constructed algebraically by Matsusaka, Weil, and Chow, but in positive characteristic Igusa had discovered a number of mysterious pathologies. Grothendieck knew about these facts. I asked him if he was able, with his new theory of schemes, to explain this behavior and to remove the pathologies. He told me that as yet he had not been thinking seriously about this problem because the Picard theory would be treated only in chapter XII [*sic*!] of EGA. However, he told me that he certainly would solve these problems! I did not say much, but I was very skeptical. However, as we know now, Grothendieck fulfilled his promise and completely clarified the matter, of course not in EGA XII, but in his two beautiful Bourbaki lectures in 1962. There he constructed the Picard *scheme*, which does have all the good properties and from which it becomes clear why the Picard *variety* had these pathologies.

Already in 1958 I had been very impressed by Grothendieck's lecture in Edinburgh at the ICM. However, I am a student of Weil (I was on a fellowship at the University of Chicago in 1954–56 in order to study algebraic geometry with Weil), and, thinking of all the efforts I had

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made to learn the "Foundations", I hesitated very much to make the "transition from Weil to Grothendieck". Finally, I decided to ask advice from Weil himself; I admired him very much and felt sure that he would give me the right advice. Weil had moved already to the Institute for Advanced Study in Princeton. In the spring of 1960 I visited him, and during a walk in the woods around the institute I asked him his opinion. Weil said to me: Grothendieck is very strong; he has done things "none of us" has been able to do. Weil's advice was clear (and great!). So I started to study schemes (new foundations again!).

Grothendieck invited me to visit the IHES. I was there for the first time in 1962, from January until June. At that time Grothendieck's seminar (it was SGA2) was still in Paris. Here are some recollections from that period. Arriving before the lecture, one could be almost sure that Serre was already there in lively discussion with Grothendieck. Dieudonné was present and also Néron, who was that year a visitor at the IHES, and there were of course the French students and some foreigners. For the first couple of weeks, after Grothendieck's lecture, Néron also lectured on his theory of "Néron models".

Grothendieck was always busy, discussing either with Serre or with his students, so during these Tuesday seminar days I did not have much opportunity to talk with him. However, Grothendieck invited me to come and discuss at his home. At that time he was living in Paris on the Ile de Jatte. I was there a couple of times and also met his family there.

During these visits I came alone, and hence I had full opportunity to ask him questions. No matter how simple my questions must have been for him, Grothendieck always answered patiently. Of course I asked him often to explain parts of his work, which in the final written version is often so general and overwhelming. However, when he explained it to me, his point of departure was always a natural concrete problem, and his ensuing steps became understandable and natural. It was great to hear him explain his marvelous ideas and to see how his brilliant mind attacked the problems. These visits to his place, first in Paris and in later years in Bures and Massy, were great, and I treasure them most among my mathematical recollections.

One of the first things I asked him was why he had developed the theory of schemes. The theory of algebraic varieties was (and still is!) a beautiful theory full of deep theorems and challenging problems: why schemes? Grothendieck answered me as follows. He said these nilpotent elements are in algebraic geometry *by nature*. Neglecting them, i.e., killing them, is artificial, a brutal amputation that might lead to confusion and pathologies. By contrast, by taking the nilpotent elements into account, these pathologies will disappear by themselves, and moreover the nilpotent elements provide us with powerful new technical tools to attack problems!

His answer opened my eyes! Grothendieck did not develop the theory of schemes for the sake of generalization, *but he did see that in order to understand algebraic varieties you do need schemes*, and this was the reason (or at least one of the reasons) why he developed the theory of schemes. How right he was! To mention only one example, think of the above-mentioned problems with the Picard *variety* in positive characteristic. In order to see what is going on—*also for varieties*—you need the Picard *scheme*. And concerning the power of nilpotent elements, think of Grothendieck's brilliant method of studying the algebraic fundamental group of an algebraic curve in positive characteristic by lifting the curve, via nilpotent elements, to characteristic zero.

In my opinion Grothendieck's main strategy in mathematics was to place the problem in its *natural setting and context*; this often requires generalizing the problem, but this generalization is by itself not the main objective.

As is well known, the IHES moved in 1963 to Bures-sur-Yvette, and Grothendieck and his family moved also to Bures and later to Massy. During the period 1963–69, I visited the IHES regularly but usually only for short periods. During these visits most of my discussions with Grothendieck centered around questions of representability and around the algebraic fundamental group.

The last time I visited him at his house was in 1969 in Massy. As usual during my visits I asked him also about the current status of the Weil conjecture. He said, in 1969, that he would not be surprised if one of "these young persons" (he mentioned Deligne and Bombieri) would come up with a solution, because he thought that *only one new idea would be sufficient* to overcome the difficulty. As we now know, he was right, but the idea was very different from what he had hoped for!

The last time I met Grothendieck in person was at the ICM in Nice in 1970. By that time his interest had shifted from mathematics to ecology and to "Survivre". I attended with him one of the meetings of Survivre, and walking back with him after the meeting, I said to him that my impression was that a large part of the participants did not share at all his idealism and that they grouped around him only because of his fame. Of course, he strongly disagreed.

After 1970 I still corresponded with him, not frequently however, and sometimes there were interruptions of more than a year. It was a friendly correspondence, not on mathematics but only on commonplace things. I lost contact with him in 1991 when he withdrew to the Pyrénées.

Of course I admire Grothendieck as one of the greatest mathematicians of the twentieth century. But I admire him also for other things: for instance, for his sincere anxiety for the future of humankind, for his principled stand against militarism, and for his refusal to compromise his convictions, thereby accepting all the—often bitter—consequences for himself.

I want to, and actually do, remember him the way he was during the time that I met him in Paris and in Bures: a genius, generous, helpful, optimistic, and cheerful. I find myself privileged to have met him and to have known him.

Valentin Poénaru

Alexander Grothendieck was always known to me as Shurik. He had a unique style of doing math. While normal mathematicians proceed from bottom to top, starting with worked-out examples, he proceeded exactly the other way around. He tried to find first the correct level of generality at which a mathematical problem had to be stated. He called that the "just level" (*le niveau juste*). For him, "logically correct" and "morally just" were essentially synonymous.

For Shurik, when facing a math problem, the important thing (and as far as he was concerned the hardest) was to identify the good statement at its proper level of generality. And from then on it was only moral that the proof should flow naturally and freely.

I will quote now, freely, from him. Do not try to crack a mathematical problem like a hard nut with a hammer, but rather let it dissolve like a piece of sugar in a cup of tea. Also, try sometimes to forget your problem, which looks too hard, and let it just sit dormant in your mind, like a fruit that must ripen. And never work at only one single problem at any given time; you might just turn blindly around, on the same spot, without ever advancing.

Here now are some metaphors that I or friends of mine have used, at various times, concerning Grothendieck's style. Usually, mathematicians like to walk along narrow little paths in unknown landscapes, looking for beautiful scenery or just for precious stones, but when Shurik wanted to get somewhere, he started by building a highway. Where some mathematicians might build an acrobatic bridge between two distant mountain tops, Shurik would just fill up the space between.

One has to be a Grothendieck to be able to function this way, and to the best of my knowledge nobody else ever did it. Clearly also, it is quite taxing on the one who does do it.

I do believe that at some point he got tired of the way in which he was doing things. This fatigue, in addition to personal problems into which I will not go, made him bifurcate out of mathematics for a long time.

Years later, a second Grothendieck reappeared, with a much less formal mathematical style. Although he hardly published anything at this time, what he did again had a tremendous impact both in mathematics and very likely in physics too.

I will only say here a few words about one of his last pieces, "Dessins d'enfants". This is a pure gem and totally surprising. With minor restrictions, a connected graph on a surface corresponds canonically to a number field. Riemann, Weierstrass, and Dedekind would have loved this. The discovery was quite up their alley, but it was left for Shurik to find.

I will move now to another topic concerning Shurik. We will move back in time, to October 1969 or 1970. It was my birthday, and my wife, Milen, had planned a small birthday party, to which she invited a couple of good old friends of mine. So, she invited Shurik and his wife, Mireille, and also an old childhood friend of mine, Mircea Dumitrescu, who had then recently escaped from Romania. Since both for Shurik and for Mircea, this first encounter was very important, I have to say a few words concerning Mircea. He had once been a very good medical doctor, but then he turned, in a big way, to molecular biology. There was certainly nothing very ecological nor particularly virtuous about him. He was passionate about molecular biology, but, except for the human species, his interest in plants or animals was minimal.

But Mircea was brilliant, and to my tremendous surprise, his encounter with Shurik established a great friendship at first sight.

Mircea very rapidly convinced Shurik that he had missed something big: the rich complexity of genetic material DNA and RNA and of proteins, which all meant life.

Shurik invited him for four months to the IHES, with the specific purpose of learning molecular biology from him. So, Mircea came and gave a very beautiful series of lectures. Apart from Shurik, the public consisted of Egbert Brieskorn, Barry Mazur, David Ruelle, and me of course, plus occasional visitors.

We were all amazed, not only by Shurik's initial total ignorance of any science outside mathematics but also by the speed with which he caught up.

I believe that out of this contact with the biological sciences, Shurik developed his attitude regarding the fragility of the resources of the planet and conceived of the movement he called "Survivre".

With this came from Shurik a strong demand that his mathematical friends should stop doing math and join him in his new mission. And he certainly could be very uncompromising; as a consequence I saw much less of him after the beginning of the 1970s.

His friendship with Mircea continued to be strong, but Mircea's life was actually a sad affair. Mircea had big, glorious research plans, but they stayed just that, unfulfilled plans.

In the summer of 1987 Mircea died of lung cancer, a consequence of his chain-smoking. But about two weeks before, while Mircea was lying on his deathbed, Shurik came to be with his friend for three days and to prepare him for the next world. I was abroad at the time, and later I learned from Mircea's mother that Shurik had performed some religious rituals, presumably Buddhist, with prayers, incense, and holy dancing.

Shurik was a charismatic person, an immensely powerful, complex, and impressive personality. I often compare him in my mind with a hero from a Dostoyevsky novel.

He was certainly, to a large extent, part of a certain French mathematical tradition, and he had a strong, albeit conflictual, bond to Bourbaki. But mainly and foremost Shurik was himself. Almost all French mathematicians come either from the École Normale or from the École Polytechnique, but Shurik never had access to any such niceties. In some sense he always was a lone outsider.

He, of course, also consistently refused honors others tried to bestow on him.

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With Grothendieck goes one of the mathematical giants and also a great human being.

Leila Schneps

Grothendieck: Beyond the Self

> And he said, Go forth, and stand upon the mount before the Lord. And behold, the Lord passed by, and a great and strong wind rent the mountains, and brake in pieces the rocks before the Lord; but the Lord was not in the wind, and after the wind an earthquake; but the Lord was not in the earthquake.
>
> And after the earthquake a fire; but the Lord was not in the fire: and after the fire a still small voice.
>
> *1 Kings 19:11–13*

I've heard it too often: Grothendieck was mad in the latter half of his life, he was crazy, he spewed out thousands of pages of insane ravings. Though admittedly it sounds better in French, the country of Lacan and psychoanalysis raised to a philosophical art: *Il était fou, Tout ça c'était de la folie. Il était paranoïaque*, because he believed that his mathematical legacy was being intentionally buried by those he considered his heirs. *Il était schizophrène*, because he heard voices crying out to him.

Before the diagnoses and the reassuring medical terms, it is worth asking where the temptation to use them comes from. I have an answer to propose, which I hope does not sound too grandiose, but I have come to it after what seems an infinity of conversations, arguments, even quarrels on the subject. It's very simple, and this is what it is: it is easier to diagnose Grothendieck than to listen to him.

Diagnosis is safe, because one is on the side of the doctor, and it is the patient who is lost in the endless forest of deeper understandings that we don't necessarily want to explore, or even if we do, certainly not from the inside.

Grothendieck left, in his thousands of pages of writings, innumerable messages, innumerably repeated. For my part, I found much in them difficult to comprehend, difficult to hear, difficult to accept, difficult even to want to accept; for his part, I believe he found them difficult to express, at least in such a way as to be understood by others. Although they were present in hidden forms within everything he ever wrote, still he continued to reformulate them until the end of his life, perhaps wishing that he might finally, after so many failures, manage to penetrate consciousnesses other than his own. Or perhaps he was simply talking to himself.

The messages changed in both form and content over the years, and yes, there were periods in which they took the shape of high-flown phrases about the imminent end of the world. But the essence was always the same and worth listening for; what's more, their echo can be heard even from the earliest years of Grothendieck's mathematical career.

If I were to express it in a single short phrase, it would be something like this: Before thinking, trying, acting, stop everything and simply lend an ear to what is. For Grothendieck, this ability to set aside the self and just listen, natural to children but rare in adults, was the ultimate creative faculty. He perceived this faculty, which he aspired to cultivate in himself to the highest degree, in those individuals that he characterized as "mutants" in his long and beautiful reflection *La Clef des Songes* from the late 1980s. Here he is describing one of them, a man for whom he felt intense admiration and kinship: A. S. Neill, founder of the Summerhill school.

> It seems as though by some continually-renewed miracle, in all "sensitive" situations, his ego-screen simply melted away without a trace, yielding its place to a sharp and immediate perception of what was going on, and simultaneously, without any intervention of conscious thought, let alone actual reflection, the "right act" would emerge[....] One feels an incredible flexibility in him, an extraordinary lightness in his relation to a daily life that for him, the awakened, is like an incessant provocation to creativity. (*La Clef des Songes*, N 322)

"He didn't see the same things as obvious that we do" is the way Michel Demazure puts it, recalling years of study under Grothendieck. But it goes deeper than that. If all of Grothendieck's writings can be considered as transmissional, none of them are ever felt or presented as revelations of higher understanding to the ignorant. Grothendieck felt himself as able to see, not things that were visible to him and hidden from others, but things that were visible to everyone, as manifest and as evident as the sky. His knowledge was acquired not by straining and reaching, but by letting go, or as he put it, stooping. And he felt himself possessed of an unusual propensity to stoop.

His knowledge was acquired not by reaching, but by stooping.

A large proportion of his writing is devoted to attempting to explain why most people do not seem to perceive those things that to him were so obvious. Habits of mind, fear of failure, danger of wounding self-esteem, and plain old classical shame—after coming to perceive all these forces at work in the people around him, he eventually learned to recognize them in himself and to feel their strength and their influence. He knew himself to be filled with fear and resistance like everyone else; he merely thought of himself as more willing (not more able) than most to accept the lacerations that come with the discovery of one's own imperial nakedness.

Nor did he consider himself to be unique in this—rare, yes, but certainly not alone. His monumental seven-hundred page supplement to *La Clef des Songes* lists

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many others whom he felt possessed a similar quality: some acquaintances of his, others known to him through their writings, some world renowned, others obscure private individuals, all of them, in his own words, "mutants", looking straight in the face a reality that Grothendieck described as a "spectacle ahurissant," a stupefying spectacle.

Whatever I look at and no matter how objective I feel I am being, what I see is influenced by what I am. Everything I look at deserves a second, more honest, look (and another and another, without end); while the ego cannot be eliminated, its role can at least become—a little bit—visible. It's not that these ideas are new to humanity, but hearing them is not the same as living them. Grothendieck lived them, and through him they also became part of my reality.

John Tate

I first met Alexander Grothendieck in the fall of 1957 when I was in Paris on a junior faculty sabbatical year from Harvard. He was very welcoming, even inviting me to dinner at his home with his partner, Mireille Dufour. We became friends. From now on, I'll refer to him by his nickname Schurik.

Our math intersected a bit then, as indicated by the title of his paper "Sur une Note de Mattuck-Tate" (*J. Reine Angew. Math.*, 1958), in which he generalized our result and rediscovered the fact that the quadratic form induced by the intersection of divisor classes on a surface is of type $(1, n-1)$.

Schurik's mother died in December 1957 after suffering for many years from tuberculosis. Their relationship had been complicated. Much later, in a letter to Winfried Scharlau, he wrote that her death was a deliverance for both of them. But it affected him deeply. He said that it had made him contemplate leaving mathematics to write poetry in German, his native tongue.

Sometime during the spring of 1958 Schurik held a seminar in mid-morning. My recollection is that one day he arrived fifteen or twenty minutes late, explained that he had been up all night, and proceeded to define what came to be known as a scheme. I am puzzled by this memory because two years earlier, in a letter to Serre dated February 16, 1956, he mentions "arithmetic varieties obtained by gluing together spectra of commutative Noetherian rings." Perhaps he had spent the sleepless night planning the first chapter(s?) of EGA. In any case, he announced that project to the world at the ICM in Edinburgh in the summer of 1958.

That fall and winter Schurik visited Harvard, giving a course on sheaf theory. When Mireille asked him for something to read to improve her rather weak English, he suggested his favorite novel, *Moby Dick*! Schurik and Mireille married in Cambridge. This was easy, involving one or two visits to the city hall, whereas in France it would have been more difficult, since he was stateless. Why did they bother to marry? I believe Schurik felt that as legal head of a family he might be able to have more influence in the rearing of his first child, Serge, who was living with his mother, Aline Driquert, in Nancy. It also made their children "legitimate": Johanna, who was born that winter in Cambridge, and his sons, Alexandre and Matthieu, in the following years.

Not being a French citizen, Schurik could not hold a faculty position in France. Fortunately, this problem was solved by Leon Motchane, who created the IHES. In a letter dated March 17, 1959, Schurik wrote "the existence proof for the 'institute' is now complete, as D. and I got our first check when coming to France. Everyone seemed surprised and relieved, I must say!" (D. being Dieudonné.)

In relocating because of his position at the IHES, Schurik wanted a telephone at his new place. At that time in France this could take many months. Schurik got one quite quickly by writing to the phone company on stationery that he had printed with letterhead indicating that he was a medical doctor who saw patients by appointment only. I was reminded of this by rereading an old letter from him, in which he mentions that his daughter, Johanna, was using that stationery to do her "abstract painting", and adds "the trick worked, and I got the fone [*sic*] at last, to everybody's amazement."

On several visits to the IHES during the 1960s, our families became good friends. Last fall his two sons reminded me of my playing with them and letting them show their strength by pushing me over.

At Easter 1964, in passing through Paris on my way to a conference in Clermont-Ferrand on geometric tendencies in algebra and number theory, organized by Marc Krasner, I looked in on Schurik and found him painting eggshells. One of these, decorated with diagrams and formulas related to his work, is still preserved in my care.

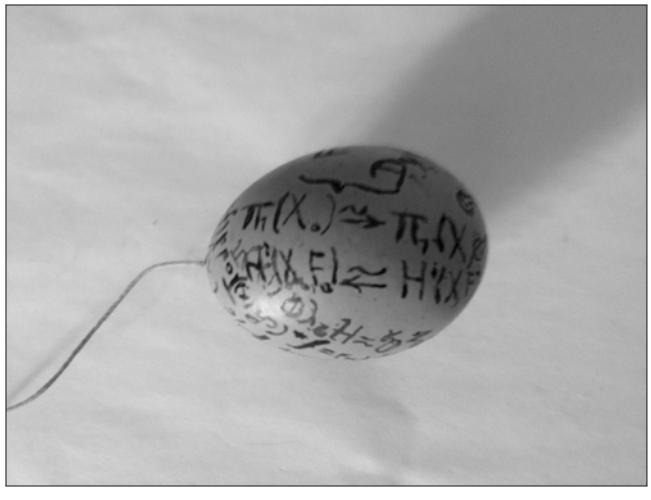

Photo courtesy of John Tate.

Grothendieck painted eggshells with diagrams and formulas related to his work.

In the spring of 1981 on the way back from a meeting in Luminy, I stopped to visit Schurik, who was then living in a little farmhouse, Les Aumettes, near a field of lavender, a bit east of Avignon. He seemed obsessed with his dreams

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and was faithfully recording them. He had a small car and sometimes drove to Montpellier, where as I recall he said he was discussing math with students, in particular, what has become known as *dessins d'enfants*.

Carol and I were in Europe in late September and early October 2014. After thirty-four years, I had a strong desire to see Schurik one last time, and we traveled to the little village of Lasserre in the foothills of the Pyrénées, where he spent the last twenty-five years of his life. Fortunately, his two sons, Alexandre and Matthieu, with whom I had played in the 1960s, were there with him, for he was ill, and his four French children were caring for him on a rotating basis. He was almost deaf and blind. There was no way for me to speak with him, and it would probably only have upset him if I had tried. He died a month later.