Grothendieck at 80, IHES at 50

Allyn Jackson

On March 28, 2008, Alexander Grothendieck turned eighty years old. Coincidentally, the day before that date was the kick-off of the fiftieth anniversary celebration of the Institut des Hautes Etudes Scientifiques (IHES). The names of Grothendieck and IHES will forever be linked, for he and Jean Dieudonné were the first professors appointed to the institute when it was founded by the businessman Léon Motchane in 1958. Grothendieck was really the one who launched the IHES as a thriving international center for mathematical research. With his abrupt resignation from the institute in 1970 he began a process not only of severing ties to the IHES and the mathematical community but of isolating himself from his friends and family, and indeed from all of human society, as Winfried Scharlau describes in his article "Who is Alexander Grothendieck?" in this issue of the *Notices*. Grothendieck's life today, spent in self-imposed isolation in a remote village in the Pyrenées, seems especially distant from the IHES in this anniversary year, as the institute celebrates its ever-rising profile as an established meeting point for researchers. Still, Grothendieck's impact on the IHES, and its impact on him, remain strong to this day.

Much has changed for the IHES in the past half-century. From a tiny two-professor enterprise that in 1958 did not even have its own quarters and that appeared to have a pretty precarious future, the institute has grown into a leading international center for mathematics and theoretical physics with a small but outstanding permanent faculty of six professors—half of them Fields Medalists—and an active visitor program. As befits its status in the world of research, the IHES is marking its sesquicentennial in grand style, with a year-long series of events in Paris, Chicago, New York, Japan, and China. Another part of the celebration is an exhibition, called *Les Déchiffreurs* in French and *The Unravelers* in English, which explores the lives and thoughts of people who do fundamental research. The exhibition will open in Paris in September and will travel to New York City in November. An accompanying book, with the same title as the exhibition, has been published in French by Belin, in English by A K Peters, and in Japanese by Springer. In honor of the fiftieth anniversary, mathematician and philanthropist James Simons, together with his wife Marilyn, gave the IHES a 6 million euro (about US$9 million) challenge gift. In addition, the institute has begun a fundraising campaign with the aim of collecting 20 million euros over the coming five years.

That the kick-off of the IHES anniversary celebration fell on the day before Grothendieck's eightieth birthday was pure coincidence: The date was dictated by the schedules of the invited speakers, particularly some high French government officials with jam-packed calendars. Unsurprisingly, Grothendieck did not attend, but his presence was keenly felt. Valentin Poénaru, a retired professor at the Université de Paris Orsay and a friend of Grothendieck's during the 1970s, attended the celebration and said he was struck by the strong presence of the "absent house-ghost" (Poénaru has written a brief memoir about Grothendieck, which also appears in this issue of the *Notices*). Grothendieck's name arose in many of the private conversations among attendees as well as in the lectures, particularly those by Yuri Manin, David Mumford, and David Ruelle, each of whom spoke extensively about Grothendieck and the importance of his work. His presence will grow yet stronger in this anniversary year, with the decision by the IHES to publish his massive treatise *Récoltes et Semailles*. The entire work has been available for some time on the Internet but has never appeared in published form in the original French (a

Allyn Jackson is senior writer and deputy editor of the Notices. Her email address is axj@ams.org.

Japanese translation was published in the 1990s). It is expected to come out in autumn 2008.

In his *Notices* article, Scharlau carries out a careful examination of what he sees as the probable causes of Grothendieck's withdrawal from the mathematical community. David Ruelle, a retired IHES physics professor who overlapped for some years with Grothendieck, provides his own perspective in his book *The Mathematician's Brain* (Princeton University Press, 2007), which contains a chapter about Grothendieck. Ruelle traces Grothendieck's withdrawal and isolation in part to his having been an outsider in the French system of research. In this system, Ruelle writes, "it is all important whether you are from the Ecole Normale [Supérieure] or the Ecole Polytechnique, in whose lab you were accepted, whether you are at the CNRS [Centre National de la Recherche Scientifique], the academy, a suitable political party, and so on." Being part of such a group means one can count on its help. Ruelle goes on to say:

> In the case of Grothendieck, he was nothing (not even having at the time French or any other citizenship). He was nobody's responsibility; he was just an embarassment.
>
> Understandably, some people would like to blame Grothendieck's exclusion entirely on Grothendieck himself: he went crazy and left mathematics. But this does not fit with the known facts and their chronology. Something shameful has taken place. And the disposal of Grothendieck will remain a disgrace in the history of twentieth-century mathematics.

IHES professor Laurent Lafforgue was appointed to the institute in 2000, long after Grothendieck's departure. He agrees that what happened to Grothendieck was "shameful" but is skeptical that being an outsider in the French system was an important factor. Grothendieck's overwhelming personality crushed some people, Lafforgue said, and his mathematical prowess inspired envy. As a result, many were relieved when Grothendieck started behaving in a radical fashion and thereby furnished a reason for them to turn away from him. But perhaps the crucial factor was Grothendieck's rejection of scientism, the belief that science is above everything else. "Here was one of the greatest scientists of the century appearing to want to question the value of science," Lafforgue wrote in an email message. "This is probably the thing that was the most scandalous for the whole scientific community (not only in France but the world over) and that provoked in this community a reaction of rejection towards him."

Six months to the day before the start of the IHES anniversary celebration, Grothendieck wrote to the institute with a request for books. The IHES sent him the books as quickly as it could. But the exchange of letters between Grothendieck and the IHES administration culminated in his writing a furious "open letter" recounting his view of the exchange, which he took as deeply insulting towards him. He requested that copies of the open letter be sent to all members of the IHES Scientific Council and explicitly states that this letter is public (though he also says he will make no efforts on his own to publicize it). Having seen the open letter, I can say that it conveys an extreme outrage that indicates how difficult it would be to conduct reasonable communication with him.

At the same time, the open letter reveals the vivid personal tie that Grothendieck clearly still feels to the IHES. The letter also reveals an isolated individual who is reaching out in the only way he is able. In one place he speaks of his open letter as being a letter of farewell ("adieu") to a world with which he no longer has anything in common. He ends on a note of apocalyptic foreboding, saying "that the time is near when…this letter, this *cry* will be known *by all*. In a world of the *living*." This cry does not seem to concern a misunderstanding over his original request for books. Rather, it speaks of anguish in the heart of one of the great mathematicians of modern times.

Grothendieck in the News

Grothendieck's eightieth birthday inspired several articles in the popular media, including the following:

"In höheren Dimensionen (In higher Dimensions)", by Winfried Scharlau, *Die Zeit*, March 27, 2008.

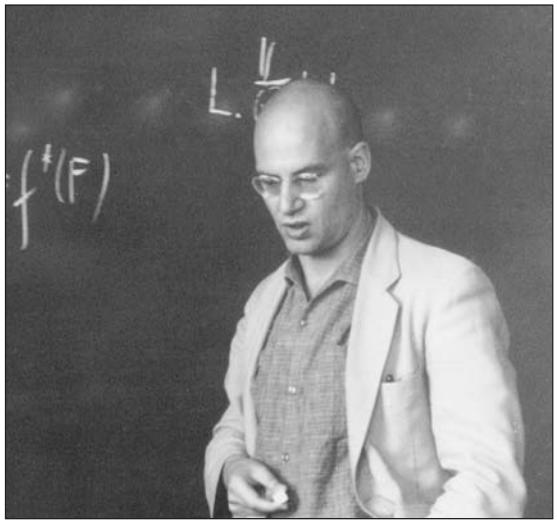
"Verschollenes Genie (Missing Genius)", *Neues Zürcher Zeitung*, by George Szpiro, April 27, 2008.

"Sensitivity to the Harmony of Things", by Julie Rehmeyer, *Science News Online*, May 9, 2008.

"Autour d'Alexandre Grothendieck" (Around Alexander Grothendieck), a broadcast on Radio France featuring Denis Guedj, Michel Demazure, and Laurent Lafforgue, June 2, 2008.

Memories of Shourik

Valentin Poénaru



Photograph courtesy of Friedrich Hirzebruch.

Alexander Grothendieck, around 1965.

I knew Alexander Grothendieck during the period 1962–1969, a time when we were very close. I arrived in Paris in mid-September 1962, after a fantastic departure from Romania (but that's another story)—or, more precisely, I arrived in Bures-sur-Yvette. My friend Barry Mazur and his very young wife Gretchen, who was 17 at the time, lived in the Residence Gratien of the Institut des Hautes Etudes Scientifiques (IHES). Barry was visiting the institute for the 1962–63 year, and right at the start of my adventure I stayed with him and his wife. This was how I quickly came to know Léon Motchane (IHES director), Annie Rolland (IHES secretary and later Motchane's wife), and of course Grothendieck. The IHES quickly decided to support me, and I have since that time remained more or less associated with the institute.

The Grothendieck I knew at this time was a very impressive person, and when I say this I am not thinking only of mathematics. Shourik, as I called him, was one of the strongest and most charismatic people I have ever met. I think of him as a character straight out of Dostoyevsky. He was also a person of great kindness and generosity. He seemed always to be in good spirits, with great mental equilibrium and also, in his own way, a certain *joie de vivre*.

At the time, he had the capacity to be able to sleep when he wanted to, and for the number of hours he wanted to, in order to take up his work all the better afterward. In fact, his capacity for work was to me something miraculous. His long workday was divided, in a very systematic and organized manner, between the redaction of *Eléments de Géométrie Algébrique* (one page of Grothendieck for four pages finalized by the pen of Dieudonné, who, with great technical virtuosity and little profundity, did not always understand what he was writing; I am quoting Grothendieck here, because one can be generous and nevertheless render severe judgments…), redaction of the *Séminaire de Géométrie Algébrique*, and the exploration of new directions, such as forming the outlines of étale and crystalline cohomology.

I learned from Shourik how to pursue several mathematical projects at the same time, in order to avoid turning in circles around a difficulty; one must pass on to something else in order to forget and then come back later with a fresh viewpoint. In fact, Grothendieck spent a lot of time on various problems that were quite different from what the world knows of his work: the Hauptvermutung and triangulability for topological varieties, division of distributions by a real analytic function (where he reached the theorem of gluing and the inequality of Lojasiewicz, without however succeeding in proving them), etc.

Although his culture suffered from certain lacunas, especially in the sciences outside of mathematics, he was very well informed about all

Valentin Poénaru is professor emeritus at the University of Paris, Orsay. His email address is valpoe@hotmail.com.

kinds of things. At the end of 1962 he was practically my only Parisian colleague who understood exactly what was happening in Eastern Europe at that time without letting himself become a prisoner of Communist propaganda, which was still very strong then. For a fresh refugee like myself, this was very important. I was often at the table of Shourik and his wife Mireille, who always received me royally; I had the impression of returning to my family house.

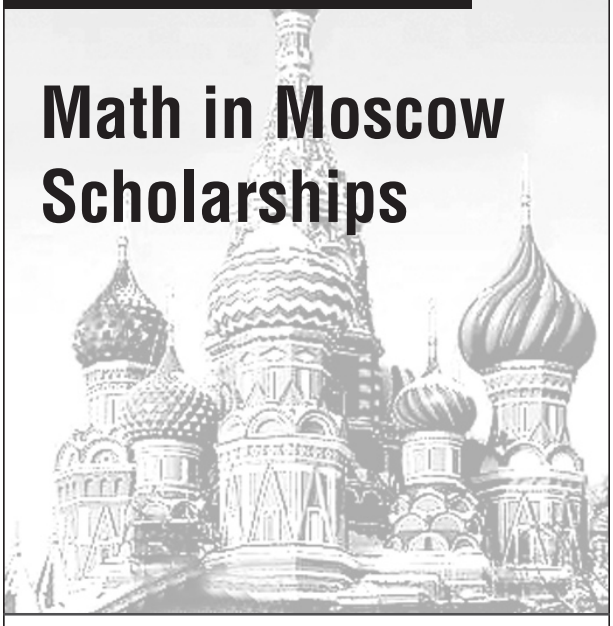
Around 1967 I sensed in Grothendieck some changes, as if a great crisis, personal and global, had commenced. The good spirits and the *joie de vivre*, which I mentioned earlier, started to disappear. His marriage started to break down; his affair with another woman certainly did not help matters.

But I think that above all, he started to tire of the style of doing mathematics that he had imposed on himself. In my opinion, this style deprived him of the elementary pleasures that mathematical activity can provide. Where we others would be exploring footpaths, he was building highways. Note in addition the contrast between the Grothdieck of the period of topological vector spaces, EGA, and SGA, and that of the period of *Esquisse d'un Programme*, the Grothdieck of *dessins d'enfants*, of motives, or of anabelian geometry. (I am thinking here not only of mathematics.)

Then came 1968. I still remember very well how the Shourik that I had "always" known entered the tumultuous gatherings on the Orsay campus, in order to defend mathematics before the students and assistants who were in revolt. And there he was received with an enormous wave of rejection and hatred, which profoundly shocked him. The crisis that had been smoldering had already bifurcated in a brutal turning point, out of which emerged another Grothendieck, very different from the one I had known.

Our close relations continued for about two years more. During this time, Shourik sought another path. The group "Survivre" came into being, as did the absolute requirement to follow the new Messiah in all his tribulations. And, from that moment forward, we saw much less of him.

AMERICAN MATHEMATICAL SOCIETY



Math in Moscow Scholarships

The AMS invites undergraduate mathematics and computer science majors in the U.S. to apply for a special scholarship to attend a Math in Moscow semester at the Independent University of Moscow. Funding is provided by the National Science Foundation and is administered by the AMS.

The Math in Moscow program offers a unique opportunity for intensive mathematical study and research, as well as a chance for students to experience life in Moscow. Instruction during the semester emphasizes in-depth understanding of carefully selected material: students explore significant connections with contemporary research topics under the guidance of internationally recognized research mathematicians, all of whom have considerable teaching experience in English.

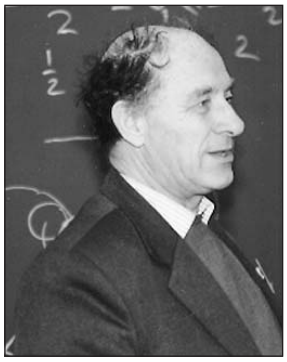
The application deadline for spring semesters is September 30, and for fall semesters is April 15.

For more information, see www.ams.org/employment/mimoscow.html.

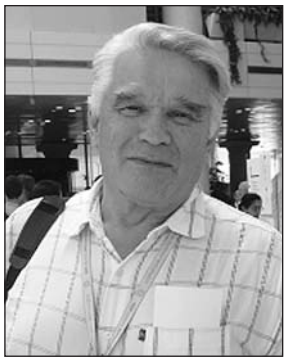
Contact: Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294, USA; telephone: 800-321-4267, ext. 4170; email: student-serv@ams.org.

AMS
American Mathematical Society
www.ams.org

Arnold and Faddeev Receive 2008 Shaw Prize



Vladimir Arnold



Ludwig Faddeev

On June 10, 2008, the Shaw Foundation announced it would award its annual Shaw Prize in Mathematical Sciences to VLADIMIR ARNOLD and LUDWIG FADDEEV "for their widespread and influential contributions to Mathematical Physics". The prize carries a cash award of US$1 million.

The Shaw Prize in Mathematical Sciences committee made the following statement:

"Vladimir Arnold, together with Andrei Kolmogorov and Jürgen Moser, made fundamental contributions to the study of stability in dynamical systems, exemplified by the motion of the planets round the sun. This work laid the foundation for all subsequent developments right up to the present time.

"Arnold also produced extremely fruitful ideas, relating classical mechanics to questions of topology. This includes the famous Arnold Conjecture, which was only recently solved.

"In classical hydrodynamics the basic equations of an ideal fluid were derived by Euler in 1757, and major steps towards understanding them were taken by Helmholtz in 1858 and Kelvin in 1869. The next significant breakthrough was made by Arnold a century later, and this has provided the basis for more recent work.

"Ludwig Faddeev has made many important contributions to quantum physics. Together with Boris Popov he showed the right way to quantize the famous non-Abelian theory which underlies all contemporary work on sub-atomic physics. This led in particular to the work of 't Hooft and Veltman, which was recognized by the Nobel Prize for Physics of 1999.

"Faddeev also developed (jointly with Valentin Pavlov) the quantum version of the beautiful theory of integrable systems in two dimensions, which has important applications in solid state physics as well as in recent models of string theory.

"In another application of the scattering theory of differential operators, Faddeev discovered a surprising link with number theory and the famous Riemann Hypothesis."

Vladimir Arnold, born in 1937 in Odessa, Ukrainian SSR, is presently the chief scientist at the Steklov Mathematical Institute in Moscow and a professor at the Université de Paris Dauphine. He obtained his first degree in 1959 at Moscow State University, was awarded a candidate's degree (equivalent to a Ph.D.) in 1961, and became a professor in 1965. He is a member of the Russian Academy of Sciences.

Ludwig Faddeev, born in 1934 in Leningrad (now St. Petersburg), Russia, is a director of the Euler International Mathematical Institute, Petersburg Department of the Steklov Institute of Mathematics. He graduated from Leningrad State University in 1956 and received his Doctor of Physical and Mathematical Sciences degree in 1963. He has been a professor at Leningrad State University since 1967. During 1986–1990, he served as president of the International Mathematical Union. He is a member of the Russian Academy of Sciences, the U.S. National Academy of Sciences, and the French Academy of Sciences.

The Shaw Prize is an international award to honor individuals who are currently active in their respective fields and have achieved distinguished and significant advances, who have made outstanding contributions in culture and the arts, or who in other domains have achieved excellence. The award is dedicated to furthering societal progress, enhancing quality of life, and enriching humanity's spiritual civilization. Preference is given to individuals whose significant work was recently achieved.

The Shaw Prize consists of three annual awards: the Prize in Astronomy, the Prize in Life Science and Medicine, and the Prize in Mathematical Sciences. Each prize carries a monetary award of US$1 million. Established under the auspices of Run Run Shaw in November 2002, the prize is managed and administered by the Shaw Prize Foundation, based in Hong Kong.

Previous recipients of the Shaw Prize in Mathematical Sciences are Robert Langlands and Richard Taylor (2007), David Mumford and Wen-Tsun Wu (2006), Andrew Wiles (2005), and Shiing-Shen Chern (2004).

—From Shaw Foundation Announcements