

## Chapter 7. Professor at the Collège de France and Orsay, 1970-1973

After Grothendieck gave up his position at the IHES, the question arose as to where he would work in the future. Presumably he did not give the matter too much attention at first, as it seemed self-evident that a scientist of his caliber would be welcome everywhere, although there is no doubt that many of his colleagues felt antagonized by the radical manner in which he championed *Survivre*, and by his criticism of academic activities and the scientific establishment. In any case, at Serre's instigation, a post as invited professor was hastily created, the first of its kind at the Collège de France. Starting in the fall of 1970, he held this position for two years.

The Collège de France is an unusual institution, more comparable to an academy than a university. Only first-rate scientists are appointed, and the greatest freedom is accorded to them in conjunction with minor teaching obligations. Mathematicians are expected to lecture a minimum of eighteen hours per semester. There is no curriculum, and the professors are free to choose the subjects of their courses. Consequently there are no limits on admission for auditors. Everyone who is interested may attend. This system ensures that leading scientists such as Serre have the opportunity to lecture every year on contemporary developments and the newest research - often their own.

A position at the Collège de France was in some respects ideal for Grothendieck, because it left him time for his non-mathematical activities. The author is unaware of the subject of his course for the winter semester of 1970/71, but in the summer semester of 1971 he gave a course on Barsotti-Tate groups, in which Luc Illusie participated, among others. He also held a seminar in which Illusie gave some talks on the cotangent complex.

At this point we will make a small digression for the benefit of readers interested in algebraic geometry. In the years 1969-1972 Grothendieck's main interests were the above-mentioned Barsotti-Tate groups and the associated Dieudonné crystals. This theory deals with infinitesimal deformations of Abel group schemes and the associated  $p$ -divisible groups. As early as December 1969, Grothendieck had sketched the fundamental principles of this theory in a long letter to Illusie. The course at the Collège de France contained complete proofs, which were partly based on the theory of obstructions to infinitesimal deformations, also inspired by Grothendieck, dealt with in Illusie's thesis. According to Illusie the entire theory still remains very dynamic, and has

continued to gain in relevance even in the last decade.<sup>1</sup>

At that time, apart from Illusie, William Messing also earned his doctoral degree under Grothendieck, with a thesis treating the same range of subjects. His work was based on a lecture Grothendieck gave in Montreal, which contained, according to Messing, a strategy for proving a conjecture (or unpublished theorem) by Serre and Tate. Messing worked out the strategy and thus gave the first published proof of this theorem. He did most of the work alone, and later gave a seminar on the subject in Princeton, which was attended by Nicholas Katz. Crucial to the proof was his use of one of the main results of Illusie's thesis.

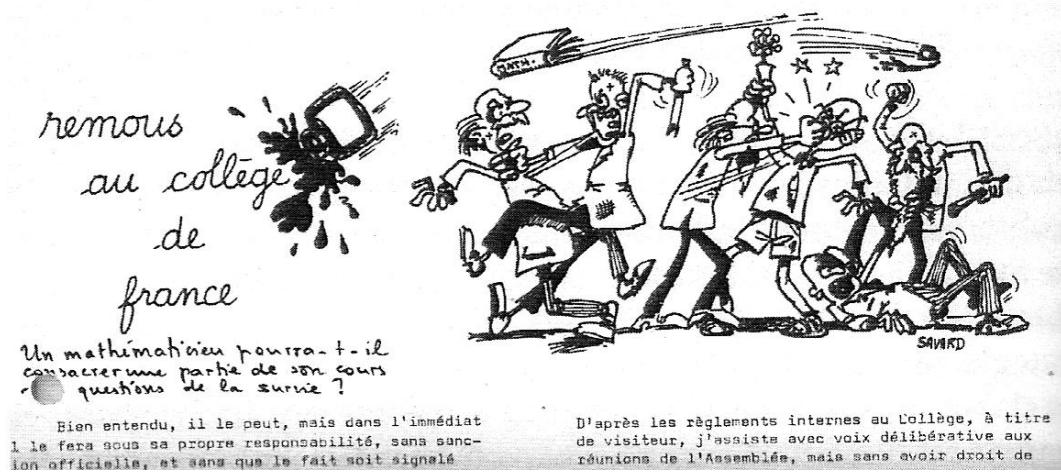
Messing obtained his Ph.D. at Princeton in 1971. The title of his thesis is "The crystals associated to Barsotti-Tate groups: With applications to abelian schemes." The jury members were Grothendieck and Nicholas Katz. Messing wrote to the author: "Concerning Grothendieck as a thesis advisor, for me he was terrific." Grothendieck himself did not mention Bill Messing in a list of his students and thesis students in *Récoltes et Semailles*.

In May 1971, Luc Illusie also received his doctorate under Grothendieck. He had already been collaborating for several years on editing the *Séminaire de Géométrie Algébrique* (SGA). The title of his thesis was: "*Complexe cotangent; application à la théorie des déformations*." About Grothendieck he wrote: "Certainly he was the most fantastic advisor one could dream of."

After this digression, let us return to Grothendieck's lectures at the Collège de France. For him it was self-evident that here, too, he would speak about the subjects that were important to him. This led to violent disputes with the administration of the Collège in the summer semester of 1971. On June 27, 1971, a large public discussion on his winter course and the extension of his contract at the Collège de France took place. Grothendieck no doubt provoked this discussion himself.

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<sup>1</sup> Grothendieck goes into this subject in a letter to David Mumford dated 5 January 1970. The Grothendieck/Mumford correspondence will be published shortly.



In Bulletin No. 9 of *Survivre*, there is a detailed account of this discussion by Grothendieck himself, under the title "*Remous [Turmoil] au Collège de France.*" According to this, he had proposed a course with the title "Théorie de Dieudonné des Groupes de Barsotti-Tate," which was to begin on November 3rd. The first hours, however, open to the participation of any interested auditors, were to be dedicated to the theme "*Science et technologie dans la crise évolutionniste actuelle: Allons nous continuer la recherche scientifique?*" [Science and technology in the present evolutionist crisis: are we going to continue with scientific research?] He explains:

It must be specified that the Collège de France is open to all auditors, independently of their nationality, sex, religion, age, exams, haircut or other distinguishing characteristics. There are no admission requirements[...]. Every interested person is invited to participate in the discussions, whether they be mathematical or not [...]

Traditionally a professor chooses the subject of his course for the coming year with complete freedom. In principle his choice must be approved at a professors' meeting. But that is a matter of routine; there is always a unanimous vote. As far as I know it has never happened that a suggestion was even questioned, let alone refused. This routine has now, on June 27, been perturbed, and the cause is my very own course. I should specify that I am not a regular professor at the Collège de France, but that I was appointed for two years to the newly created *chair de professeur*, which was created especially for invited professorships and is the first of its kind at the Collège de France.

Grothendieck then describes in detail the discussion and the reactions of his colleagues.

J.-P. Serre, the mathematician who made the suggestion to nominate me for this invited professorship and requested its extension for a second year, was visibly annoyed and unpleasantly affected vis-à-vis his colleagues, because he felt himself to

be partly responsible for the complications caused by my presence at the Collège de France; as an excuse he explained that at the time that he had made these proposals, he could not have been able to foresee my future development (which he avowedly regretted).

After extensive discussion it came to a vote; The theme "*crise évolutionniste*" was rejected by a large majority, the theme "*Groupes de Barsotti-Tate*" was accepted with a considerable number of nays and abstentions. Grothendieck did in fact give this course, and in spite of all, he even organized a series of events around *Survivre*. Apparently the course was not particularly well attended, as Ch. L., a mathematics student who spent the year 1971/72 in Paris and occasionally participated in *Survivre* discussions, noted that on January 26, 1972 there were only three people attending Grothendieck's lecture.

Grothendieck spent the following year, 1972/73, at the University of Orsay. There is a certain discrepancy here, since in his curriculum vitae Grothendieck wrote that he held a position in Orsay beginning in 1971. Perhaps his activities at the Collège and Orsay overlapped.

He taught a standard course called "*Préparation à l'agrégation*," The *agrégation de mathématiques* is a special feature of the French educational system, which does not exist in this form in other countries. It is a national competition, where those with the best results are guaranteed a well-paid position in secondary education, if they do not wish to go on to a university career.

Grothendieck's course served as a preparation for this competition. The organization was such that each three-hour session began with a lecture by a student, usually on an elementary subject, which would then be commented upon and completed by Grothendieck. Daniel Pecker recounts that fifteen or twenty students attended, and Grothendieck very much enjoyed teaching "ordinary" students, and not a selected elite. He would appear pushing his bike, extremely punctual, arrayed in bizarre Arabian trousers, always accompanied by a young lady (always the same one<sup>2</sup>), and his remarks and comments were clear as crystal. He did not prepare, but improvised; he used neither books nor pencil nor chalk. He elucidated the motivation behind mathematical concepts, and to the amazement of the students, there was not a single calculation and not a single "trick."

Pecker himself spoke during this course about the fundamental concepts of group theory, and in his comments Grothendieck clarified the description of a group through the use of generators and relations. When Pecker did not fully understand something and asked a question (something quite unusual in the French tradition of lecturing), Grothendieck at first reacted with some surprise, but then was both affable and very patient.

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<sup>2</sup> This can be no other than Justine Skalba (see the following chapters).

He rarely commented on the history of mathematics and almost never on other mathematicians, but he tried to convey the inner “philosophical” goals of mathematics. He often mentioned with a certain pride that he had never studied at one of the elite institutions, and that he didn’t belong to the group of *normaliens* [former students of the Ecole Normale Supérieure] who dominated French academic life. It is also remarkable that Grothendieck did not say a single word about his ecological activities; he concentrated entirely on teaching his students as well as possible.

When Szolem Mandelbrojt (1899-1983) retired, his position at the Collège de France came free, and Grothendieck applied for it, sending a letter to the professors of the Collège dated January 20, 1973. Or more precisely, he announced his decision to apply:

I have learned that a position for mathematics will be created at the Collège and that its precise function will be decided at the next professors' meeting. The suggestions that have been made up to now concern the creation of a chair either for group theory or applied mathematics. With this letter, I take the liberty of informing you that I intend to apply for the next available position in mathematics, independently of the specific description. I do not in any way claim that I could pass for a specialist either in group theory or in applied mathematics. In fact, I am not a "specialist" in any area of mathematics, which has not, however, prevented me from making various contributions to a large number of mathematical topics that are considered important, and from having influenced others in various ways (including some which touch on group theory and applied mathematics!)

Together with this letter, of which he sent copies to his “competitors” Tits and Lions, Grothendieck included a “research statement” which revealed that he did not intend to concern himself primarily with mathematics, but rather wished to apply himself to the more urgent question of a stable and humane society. And so his application was rejected. Indeed, in 1973 two positions in mathematics were created. The chair for group theory went to Jacques Tits (born 1930) and the chair for control theory (“*analyse mathématiques des systèmes et de leur contrôle*”) went to Jacques-Louis Lions (1928-2001).

In retrospect, it is not clear what Grothendieck’s motives really were in submitting this “application”. At the beginning of 1973, as will be shown in the following chapters, his withdrawal from bourgeois society was almost complete. He had left his family and was living together with his partner in the chaotic commune of Châtenay-Malabry, his involvement with *Survivre* was almost over, and within a short time he left for his second trip to Buffalo, never to return to Paris again. On top of this, it is probable that both positions had already been attributed. It is significant that Grothendieck sent copies of his application as information to precisely those who would actually end up holding the positions, and not to other applicants such as Pierre Cartier. Did he wish to

“show his colors” one last time - to draw attention to the fact that he was still there and that he still existed?

It is important to make one addendum concerning the period covered in this chapter. In June or July of 1971, Grothendieck was naturalized, taking French citizenship. Indeed, one must assume that this event was more than just a practical, bureaucratic matter for him. Earlier he had consistently refused to apply for French citizenship, no doubt in part for ideological reasons, and also out of reverence for his father. The cause of his change of heart is not completely clear. But presumably the fact that he could no longer be called up for military service played a role, and furthermore, a regulation passport resolved all sorts of bureaucratic difficulties related to travel.