

Excerpts from a round table listenable here  
<https://www.youtube.com/watch?v=d08IHGeIIJY>

**Alain Connes** : Yes then first, if you want, there is a specificity of mathematics compared to the other disciplines and I think that I must speak about it first : it is that, for a mathematician, by far, the most valuable thing and I'll explain why, it's time. And the way the CNRS helped me, if you will, when I was at the École Normale, in fact, I refused to pass the aggregation because I knew I wanted to do research, and I didn't want to go back at all in a spirit of cramming, which had been the spirit of preparation for entering the École Normale, etc., it was a blessed time, it was the beginning of the 70s ; so in fact, I was immediately taken on as an intern at the CNRS and I had, if you want, five extraordinary years in which I had all the time it took to reflect, to work, etc., on, precisely, the works which afterwards earned me the Fields medal.

And in 75, I went to do my cooperation in an underdeveloped country, which was in Kingston, English Canada. I had gotten some help if you want from friends, who had sent me there to a university, which was a very, very long time also profitable in terms of work and fortunately, because it was supposedly my military service, but well, it was an extraordinary way to get through. And at that time, I made a mistake, I made a mistake which was that I learned that I was offered a teaching position in Paris and I let myself be tempted, being far I said to myself : "oh, I've done enough research, etc.", I accepted this position. When I came back to France, therefore, I left the CNRS, I resigned from the CNRS all immediately, I returned to France, and when I returned to France, I started my work as a teacher, and I realized at that time what my time had become. Before, when I worked at the CNRS, my time was a time that was continuous, which was continuous, I could think all day. Of course, when we think about a math problem, we don't need..., we don't even need paper, pencil, we have..., we can go for a walk, we think about this problem. What we need to know is that for three hours, for five hours, we will not be interrupted. When I was in university, when I worked at university, I knew that I had, for example, an hour and a half to reflect. I started, I started to think, etc., my brain heated, and started to be available to the problem I was looking at, etc. And then when a quarter of an hour arrived before class, I said to myself "no, I have to interrupt, that I have to stop.". My time, if you know math, my time had turned into what we call a Cantor set, that is to say that I no longer had, if you will, long enough continuous intervals to reflect. And that is the miracle of the CNRS, the miracle that allows young researchers to fully immerse themselves in a problem, in a math problem, for example, and by this immersion, if you want, by this kind of... I don't know, me, work, if you want, of penetration which occurs... One day... Indeed, for me, it had occurred in the 70s, I came back from having accompanied my wife to her high school, I was in a car, I was driving a small car, I was stopped at a red light and at one point, I did have an enlightenment. And this illumination was such that my brain was completely certain

of the result, I didn't need to check it, I did not need paper, pencil, etc., I was fully lit knowing that was good, there was something extraordinary that was there. So when I returned to Paris after my military service, after my cooperation, in fact, I realized very quickly that I had made a terrible mistake and that in fact, it would have been better if I had become a postman or that, any job other than the job I had at that time, which made it impossible for me to have a long enough time to think; at that time, I re-applied to the CNRS, it is true, I mean, a year after accepting the position in Paris, I re-applied at the CNRS because I said to myself "but I made a huge mistake". I re-posed my candidacy for four consecutive years, to the CNRS, without being accepted, but the CNRS gave me the silver medal, and later, in 2004, CNRS gave me the Golden medal. At that time, we could see that they were not too happy not to be able to see me get in but they couldn't, well, I mean. And then finally, at early 80s, I was taken over by the CNRS and it was again a period absolutely incredible, of incomparable creativity, compared with the time I had when I was at university, for exactly that reason, exactly that reason.

In the meantime, therefore, I had nevertheless perceived that there was something, as a researcher at CNRS, something that did not stick completely : what did not stick completely was that the job of a math researcher is a job where there is no lab, where there is not generally, well it must be said that if we really want to make a breakthrough, you have to be alone, and so it's a job which, at the level of human contact, is very frustrating. That is to say that in fact, most of the time, there is no illumination, I mean, I remember the story of de Valéry who asked Einstein if Einstein had a small notebook in which he could write down his great ideas. And Einstein replied "I had two big ideas in my life". So, I mean, It's obvious that most of the time, a math researcher spends his time to be frustrated, that is to say, we do not understand something, we try to understand, in fact, for real work, we don't do math because we want to have fun doing it, no, we don't do math because we want to make money, no, we do math because we are trying to understand. So most of the time, we are trying to understand, it's difficult, in the meantime, we're spending an extraordinary time, if you want, to take examples, to search, etc. The purpose of the manipulation, well, sure, is to understand, but it's also to create concepts, because by doing that, we create concepts. So I noticed something, which was a bit of a gap, at the time, of the CNRS, and that was that a math researcher was very isolated, and in fact did not have, if you will, the given opportunity to transmit his knowledge. And what makes that when the Collège de France asked me, in 1984, to become a professor at the Collège, I found, there, at the Collège de France, if you will, a combination that was really ideal, in the sense that we gave the teachers all the time it took to search, but there was an homeopathic dose, I would say, of teaching that is to say that each year, we have a teaching to do, and I think that since, if you will, the CNRS has amended in this direction, that is to say that the transitions between the CNRS and the university, which precisely fill this void, that is to say to transmit knowledge. It's still something essential, Nicole Le Douarin talked about it, it's still

essential if you want, for a researcher, not to not remain completely isolated in his bubble, and to be able to transmit his knowledge.

What is obvious is that when we pass on our knowledge, the moment we make the effort to transmit it, we also make progress. That is to say, we realize that we had not understood something, simply because we give lectures on this. So my experience of course for the CNRS, I owe it everything, everything I have found in my scientific career, but I got there at some point blessed, which was at the beginning of the 70s, there had been this doubling of CNRS credit in the early 60s, well, I mean, unfortunately that's not the case anymore, because I saw, if you will, with the example of a lot of students that I had, the current difficulty of entering the CNRS is now much more difficult.

[...]

No, if you want, I think there is an error at least in my field, in mathematics, you can't generalize, but having copied the Anglo-Saxon system which is the system of having a Grant from the NSF and which is to make requests for projects, etc., it's disastrous for mathematics for the following reason : I think there is a comparison that is quite striking who says "mathematicians are fermions, physicists are bosons.". So for people who don't know what that means, you know, fermions is related to what reveals the periodic table of the elements, fermions have the property that they cannot occupy the same state. So what does that mean, it means that in general, mathematicians choose a small box, and they put themselves in there, and they work alone, unlike physicists who in general, well can... Of course, there are often physics modes, which make that there is a very large number of theoretical physicists of whom I know the capacities, which agglomerate on a subject. So what is the difficulty when we imitate the Anglo-Saxon system ? This is that in fact, when we make these requests for projects, etc., what will happen ? It is going to have a gregarious effect, that is to say that in fact, we are going to create feudalities. It ensues there will be a number of subjects that will develop at the expense of others, and for the reason that, ultimately, it is the people of these subjects who will be appointed in the appropriate commissions, and who will only recruit people from their own subjects. It happened in a completely obvious way in the United States, in mathematics. And in France, we escaped this defect, we really escaped this default, in Europe too, in general. And unfortunately, when we imitated, when we tried to imitate this Anglo-Saxon system with the ANR in particular, we fell in the panel, that is to say that this freedom that there was, this possibility if you want researchers to work on a topic that is truly original, and that does not correspond at all to one of these feudalities, has disappeared. And that, at the CNRS level, it's very, very disastrous for mathematics, in the sense that if you want I see what we need, for mathematics, I only talk about that subject. What we need is... I know a very large number of young and talented people, talented researchers who now spend their time writing research proposals, and

so we know very well that in fact, what they write is because when we do research, what we will find, we cannot say it before, what we will find, we will search on a subject, then we will find something, something which did not correspond at all to what we said at the start. So they write, they spend their time writing this, they spend their time looking for a job, a year, on years, etc. instead of... In my day, I was given, I don't know, five years, five quiet years at the CNRS, I was not I was not permanent, not at all, I was a Trainee, after I was in charge, so at that time, it was before the 81s, when we established researchers, but we could take researchers, for a limited period, they were contractual, they did not hold for the rest of their lives. So we didn't have this infinite difficulty in choosing them, knowing that for the rest of their lives, they would continue to find, it was impossible. But on the other hand, we gave all these people the opportunity to realize themselves. Among them, there were some who couldn't, but hey, there were some who did. But if you will, it's a system that worked wonderfully better, than the current system in which we create these feudalities and these feudalities, what do they do, they only self-reproduce themselves and often in a sterile manner, after a moment.