

Round Table Talk: Peter Goddard with Hitoshi Murayama and Hirosi Ooguri

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How the Newton Institute Got Off the Ground

Ooguri: Thank you for joining us for this conversation today.

Goddard: It's my pleasure.

Ooguri: You were the Deputy Director of the Newton Institute which is now one of the leading institutes in mathematical science in the world and you have been responsible in starting that institute, including the designing and the construction of the building.

Goddard: With other people, yes.

Ooguri: You were also the Director of the Institute for Advanced Study and led the expansion of programs. You guided the institute through

financially turbulent periods. So, I think we have a lot to learn from your experience. The areas you have worked on are also quite relevant for this institute. In fact, tomorrow, you're going to give a colloquium about the interdisciplinary research between mathematics and physics—that would be another subject that we would like to talk about today.

Murayama: I'd love to hear about the story of how the Newton Institute got off the ground—how you actually had a vision for the institute and how you tried to bring people in.

Goddard: Well, I think that in the middle of 1980s, I and many of my colleagues in the UK, and particularly

in Cambridge, realized that the country didn't have such institutes. We realized that there was a growth in such institutes because the Institute for Advanced Study had been playing a particular role worldwide for many years and that had inspired various people to start other institutes. For example, Hirzebruch's Institute in Bonn is one famous example, and the IHES (Institut des Hautes Études Scientifiques) near Paris is another that was inspired by the IAS.

Ooguri: And there is RIMS (Research Institute for Mathematical Sciences in Kyoto).

Goddard: So, often people who had been at the IAS had seen there were

things that they could emulate in their own countries—they didn't usually make replicas. In the United States the MSRI (Mathematical Sciences Research Institute) in Berkeley and ITP (Institute for Theoretical Physics), now the Kavli ITP, in Santa Barbara were started. I think many of us found that we were spending our sabbaticals and our vacations in these institutes because they were very good places to go to intersect with lots of people and to be in a research intensive environment. But there really wasn't any such institute in the United Kingdom. We thought that it was excellent that we should go and help run a program in Santa Barbara or take part in the workshop in Oberwolfach (The Mathematisches Forschungsinstitut Oberwolfach), or what have you, but it's important to have a two-way flow and to be able to bring people to the UK and, of course, to Cambridge. Some people had already started thinking about this in London. Michael Green was involved, but they hadn't managed to get off the ground. And we saw an opportunity in Cambridge because, at that particular moment, we could see that there might be resources available in the colleges rather than in the university, in Trinity College and Saint John's College, and that it might be possible then to convince the UK research councils to match the resources that Cambridge was finding for itself, to make an international institute there. Then we had to decide what the appropriate scope of the institute, and what the appropriate model of operation of the institute should be. We felt that the scope should be very broad and this would help get broad support, but also many of us thought that the interesting areas were perhaps

preferentially where there were crossovers between disciplines or between sub-disciplines. Then you had a greater added value from an institute because you could bring together people, who would not normally have the time to get together in universities, from different disciplines. I think one of the reasons that institutes have grown in importance—and it was one of the founding principles of the institute in Princeton even back in the 1930s, is that the modern university, and I think this is true all over the world, is now a busy place. It's a place in which the academics are expected to be entrepreneurial, not a place in which they're expected to sit in their offices and have the detachment to think about fundamental questions. They don't, in general, have the time to interact with their colleagues in the next department. They're more likely to interact with colleagues from other disciplines when they're in other places, when they don't have to go to meetings—I think that has been one of the reasons for the growth of institutes like ours worldwide. We saw all those reasons as good reasons. The idea was that if we had a broad institute, it would gain perhaps more support from a wider range of colleagues and, secondly, that it would have the opportunity then to operate in cross disciplinary areas: not that the things that happened in the Newton Institute had to be cross disciplinary, but in each program, in comparing one with another, one looks at what is the added value of having this happen in this institution.

Murayama: Who initiated this discussion? Was it Michael Atiyah or you or...?

Goddard: Well, there were a number

of people who initiated it. Peter Landshoff, Martin Rees, and others.

Murayama: Oh, Martin Rees?

Goddard: Yes, Martin Rees was involved all the way through, and Peter Landshoff played an important role along with me. We did most of the donkeywork, as they say. Then there were very skilled mathematicians, John Coates and...

Ooguri: Is that because of the British tradition that theoretical physicists are regarded as part of the mathematics department?

Goddard: It was partly that, because the initial push for this came from the Faculty of Mathematics which included the Department of Applied Mathematics and Theoretical Physics.

Ooguri: It included many of the leading theoretical physicists like yourself and Martin Rees.

Goddard: Yes. Then we got support from other Faculties as well. The dominant push came from inside the Faculty of Mathematics. I was a professor of theoretical physics in the Faculty of Mathematics.

Ooguri: I have a question regarding the scope of the institute. You mentioned several mathematics institutions existed before your institute. But there are different kinds. For example, places such as IAS and IHES have their own strength in the faculty. They have leading scholars in the area, and they are the attractions. On the other hand, the places like MSRI have only a very lean faculty, basically just the director, and the strength of their program attracts people. You chose the MSRI mode.

Goddard: Yes.

Ooguri: What has led to that kind of choice?

Goddard: There was a discussion among those people who were forming the institute—and this is at

the end of the 1980s. [We started thinking in about '88.] There were a number of points if you look at the taxonomy, if you like, of these institutes, their various structural aspects. And this is an important one. Do you have a permanent faculty or do you not have a permanent faculty? There are arguments each way. One of the issues for an institute in particular is, "how do you gain a body of support for it?" How do you have a group of people who care about it? One way, of course, is to have leading academics be faculty members. I think this is true of ITP in Santa Barbara, and so on. The other issue you have there if you have a permanent faculty is that you could make some wrong appointments. Now, in fact, if you take something like the Institute for Advanced Study, I think it has a remarkable record of not making wrong appointments.

Ooguri: You can't afford to make mistake at places like this.

Taking Risks to Do Things That Change How People Think

Goddard: Well, I think the problem is—the way I would say is and when I was director at the institute I would try to explain to trustees is the following. Even if we make a mistake, we're making them extremely rarely, and it is more important that people do groundbreaking work. What one has to try to get across is that we are not trying to do quality control here. We're not trying to be in a risk-free environment. What is important is that we do things that change how people think, that we change the nature of the subject, that we make breakthroughs, if the choice is between doing that and doing very good research that doesn't really change anything.

Ooguri: That's a difficult decision, right? You have to take risks to do that.

Goddard: Yes, you have to explain to people that that is the whole point. That it is much preferable to have an institution in which there might be one or two people who are not as great as you might like, though I don't think this is true of the institute, but even if it were true, that would be better, because alongside that there are people like Edward Witten, Pierre Deligne, and so on, who are completely reconfiguring how we understand whole areas of intellectual activity. You should be more concerned about that than you have nobody who falls below a certain standard. The analogy I used to take, it probably works in Japan as well, is—if you want to take the driving test, you go to the driving school, presumably.

Murayama: In Japan, yes.

Goddard: Then all you're concerned with is passing the test.

Murayama: Right. There is a minimum threshold. Other than that, you don't care.

Goddard: There's a very precise thing that you want. You don't care...

Murayama: You don't care whether you take 100—yes, that's right.

Goddard: You don't want to get a perfect score. That's not really relevant.

Murayama: That's not necessary.

Goddard: You don't go home and boast to your spouse or your parents that you have a perfect score. You don't go there to have your life changed. You might expect when you go to a university, perhaps at 18, that your life will be changed and that it will be a formative experience. But that's not the purpose of the driving school. The purpose of the

driving school is to have a very quality controlled result and if you looked at choosing between driving schools, you'd just select the one that had the highest passed rates, whereas—this is the complete antithesis of this—we're not trying to produce people who can drive cars. We're trying to change the way people think, and so it doesn't matter if there are one or two bad results.

Ooguri: I recognize that. "I shouldn't make a mistake" alone is not a good way to approach this recruitment.

Goddard: You shouldn't if you got very few appointments. Then if you make a mistake, that's a real problem. But I don't think it's possible to have an attitude that you're trying to avoid risks and still really, really do dramatic things.

Ooguri: But in the case of the Newton Institute, you decided not to go that way, but rather...

Goddard: Yes. There were a number of reasons but I think the fundamental one was really related to the sort of model of programmatic activity that we decided on, which was based on, let's say, particularly Santa Barbara. We decided that a permanent faculty wasn't necessary for this model of operation. It would be quite expensive. It would also arouse jealousy in the sense that in Cambridge, by and large, nearly everybody is teaching. If we were to try to create positions in the university, which were completely free of teaching like this, or even if ones which would in some sense be seen as privileged in this institution, this would arouse some opposition. I think one of the considerations we have to have—I don't know whether this applies very much in Japan; it applies much less in the United States I think than in the UK—is that

there is a danger when you try to make such an institute other people, outside Cambridge, would be jealous because it's in Cambridge, and inside Cambridge people might be jealous because it was being given such special terms.

Ooguri: I think, you can argue in both ways. In the case of Santa Barbara, there could be people who are jealous, but most of the faculty members who are not at ITP would recognize that this is an excellent tool to recruit people like Joe Polchinski and Lars Bildsten.

Goddard: Of course, they had some good people like Jim Hartle, John Cardy and Bob Sugar and so on, before, but I think it must be true that the standing of Santa Barbara as a graduate school in physics has changed enormously.

Ooguri: For the university as a whole, they benefited by having this, so probably most of the people recognize the value there.

Goddard: Yes. But, at Cambridge, it is more difficult to get that to be recognized, I think, because there are already so many good things happening.

Ooguri: So they might argue, "We don't need that because we are at Cambridge and we are already excellent."

Goddard: Some people would argue that.

Ooguri: So it sounds like it was a political decision.

Goddard: It was partly a political decision, yes, and it was partly financial. But it was a challenge to get the resources together anyway. And to get these resources as well, and with these political considerations, we decided at least to put the issue off.

Ooguri: It is functioning very well because it's located right next to the

math department and within this mathematics complex.

The Institute Constructed outside the Traditional Univ. Area: The Faculty of Math Moved There

Goddard: It is now, yes. We had to make a decision at some point as to whether we would try to get a building in the middle of Cambridge. In that case it would be a preexisting building. We already thought that it was very important to design this building so as to encourage interaction, and if we had the existing building, it would almost certainly be impossible to do that very well, because it's very expensive to rip apart an existing building and to reconfigure it inside.

Ooguri: Was it why you decided to move outside of this traditional Cambridge University area?

Goddard: That was probably the major consideration. The second one was that the buildings of the faculty of the two departments (theoretical physics and applied mathematics, and pure mathematics) were overcrowded, so that we were inhibited in doing new things or even having very many visitors in comfort because every space was already over-occupied.

Ooguri: I remember your previous location at Silver Street.

Goddard: Yes.

Ooguri: That was some kind of a factory or something like that.

Goddard: You're very discerning. It was a book factory! It was the building in which the University Press actually printed the books.

Ooguri: So then, it's interesting that the institute was constructed outside and the math department followed it and moved to that location.

Goddard: What we perceived was

that if we put it in the center, the departments might have to move anyway, at some point, and that probably we should force the issue. Then fortuitously, my college, St. John's College, had a field of seven acres available. It had been reserved for the expansion of one of the colleges that was further out, Girton College, to come more into Cambridge. It had been kept empty for a few decades actually when it might have been developed. It was earmarked for college or university purposes so that when we talked inside the college about whether the college had any land that might help with this process, the Bursar of the college, Chris Johnson, mentioned this particular site. We saw that actually the whole of the faculty would fit in this site.

Ooguri: So, you already had the vision of eventually building this mathematics complex there.

Goddard: We thought it would probably take more years. But as soon as the institute was opened and I was there running it day to day for Michael Atiyah, we felt that one mile from the old faculty buildings was a real disadvantage. People would not just pop over to go to the talks, and then they wouldn't feel so supportive or get so much value from it. In some sense actually a mile is a very bad distance because somebody will make a special effort to go to London but they don't necessarily make a special effort to go a mile. So we decided that, very soon after we opened the Newton Institute, that we should seek to move the faculty next to the...

Ooguri: And you succeeded in doing that.

Goddard: Yes. Then we had to raise money. So, Peter Landshoff and I,

with help from people like Martin Rees, set about raising the money funding those buildings.

Murayama: It's a doubly expensive proposal to do that, right? You started a new institute and at the same time were working to move the mathematics faculty.



Goddard: But we had already started the institute. So the fundraising then was for these new buildings.

Murayama: I see.

The Institute's Building Designed to Promote Highly Interactive Activities

Ooguri: Now, since we are talking about buildings, I want to ask you this. When I first went to the institute, I immediately fell in love with the building. It really worked like a dream. You have the central interaction area and you come out and you're in the middle of discussion. But if you want to focus on your research, you can just retire to your office. It's very well thought out, and it works very well.



Goddard: Thank you.

Ooguri: It has been subsequently emulated by many institutions, including this one. What was the process of coming up with this kind of design?

Goddard: We wrote a brief for architects. We listed all the things we felt we needed, what were important to try to achieve. And, in particular, we explained that we needed to encourage interaction. I should say there was one prior aspect to this. You said that there are different

sorts of institutes in which different things happen and you distinguished whether there was faculty or not, but along with that also goes whether you're bringing people there to interact or whether you're bringing people there to do their own thing. At the institute in Princeton, basically people do their own thing though some schools are more interactive than others. Natural Sciences is more interactive perhaps than, say, Historical Studies, and Social Science is a bit more interactive perhaps than Historical Studies. It just depends on the style of the particular school, but the institute can accommodate those differences of style. If you go into IHES, it's more like IAS, in terms of people sitting in their offices. But we decided—so it was a choice—that we should have activities going on at the Newton Institute that would be highly interactive. There would be programs and we would specifically tell people that you're not meant to come here and write your book or your paper. You're coming here to discuss. As you say, you must have the opportunity to go to your private room and work out your calculations if you want, but there will be a tendency to interact. We put all of these into the brief...

Ooguri: So, that probably also has to do with the focus on interdisciplinarity that was already there from the beginning of the idea of the institute.

Goddard: Yes, exactly, to bring together people who weren't normally talking to one another. We wrote down a whole series of considerations about this and then we selected with the help of the central university authorities, a number of architectural firms—maybe four. We got these firms

together for a day and we showed them the existing departments. We talked about what was happening there that we wanted to happen in a new place, what was not happening well there, and we spent the whole day talking to them about the issues. We gave them a formal document as well. Then we asked them to come back in a month, and each to make a presentation for an hour or two to us about how they would tackle what we were after. The firm that won came with a model and the model was conceptually very like the institute that you came to. It had a central mezzanine floor and it emphasized the fact that you would know what was going on in the building. One way I think about this is that people's experience of buildings has a characteristic timescale that depends on what you're doing there. If you come to be a student in the mathematics complex in Cambridge, your experience there is on a timescale of 2, 3, and 4 years. If you're a faculty member, it's ten years. Now, if you're coming to this institute, the timescale is 2 to 3 months. And that effects how your experience of the building should be. For example, if you're coming somewhere for 2 or 3 years, you can spend time learning how to get around the building.

Ooguri: It should be more intuitive if you only have a short time.

Goddard: Yes, exactly. It should be immediate. If somebody takes you on ten-minute tour of the building, you will already know it. That goes along with the interactivity because you can see everything that's happening in that building once somebody shows you around and takes you to your office. You've already seen where the coffee is, you can see into the two seminar rooms, you can see where

the library is. Now, the mathematics faculty buildings are built next door—they're built more on a three-year timescale, and you'll take some time to learn all the nooks and crannies. It's not so transparent. It's also the case that at Newton Institute, if you go to your office, there's basically only one way you can do that, and that way involves going through the central area, whereas in the faculty buildings, you can get to your office in one of a number of ways.

Ooguri: Sometimes you may want to do that.

Goddard: You can either walk through the main concourse and advertise your presence ... you



know, like in Italy, they have this practice in the evening in the cities of walking through the streets, families walk through the streets in Florence or in Siena, and advertise their presence to see people and so the Newton Institute makes you do that. I don't know if I already told you the story about Vladimir Arnold. He was a very lively character. He was a member of the first program and after a while, he stopped me and he said, "You know this building is terrible for my health." I said "What's wrong? Nobody is complaining." He said, "Well, you see, I come in here, I have a cup of coffee and then after an hour, I need to go to the men's room. So I go out of my door, I go to the men's room, and immediately somebody stops me and then I manage to get past them and then somebody else talks to me and eventually there is going to be some terrible problem."

Ooguri: Yes. My experience was like that, and it was very intuitive

and so it would naturally be in the middle of a discussion when I go out of the office. Also, I like some of the playful elements of the building such as having a small blackboard in the elevator. I remember when I was there, somebody wrote, "I found a remarkable proof of the Fermat's Last Theorem, but the elevator ride is too short to write it." And, of course, it was soon afterwards that the proof was actually announced at the Newton Institute.

Goddard: Only one year afterward. Somebody wrote that very early.

Ooguri: So the remarkable proof was almost there.

Goddard: Yes.

One Should Have an Idea of Timescale for an Academic Institute

Ooguri: You were the deputy director of the institute. For how many years?

Goddard: For three years, formally. For one year before that I was doing it in practice. So, I was really looking after it for two years before it opened and then two years after. I decided after a year of its operating, it would actually be good to leave after two years and let somebody else continue. If you start something like that, your experience may be different, but mine was that it's probably good for the person who starts it not to continue too long because it's like you have a parental relationship and it's good to let go.

Ooguri: At some point, you have to let go of your kids.

Goddard: Yes, I think so. Since I had been dealing with all the practicalities, many of the things started as a file on my desk in my academic office, and now there was the whole building, and so on, and I just felt it would actually be good to step away. I actually planned then to

go on sabbatical to IHES.

Ooguri: Just to be intentionally away from the institute.

Goddard: Yes, for the next year. But then my colleagues in my college elected me master of the college so that thwarted my ambition to get away.

Ooguri: So, what's your view of the institute now? Has it turned out in exactly the way you anticipated it would be, or were there any surprises?

Goddard: I went back there for the 20th anniversary. We had a short meeting and they asked me to give a talk, so I surveyed what had happened, and I felt very content about the model. At the start, I thought that you should have an idea of timescale for the institute—at least that particular institute, and Peter Landshoff and I and the others felt confident that what this model of the Santa Barbara and MSRI type of interactions, which had really become much more prevalent in the previous 20 years, I would say, would be a very good model for the next 20 years—50 years, perhaps, who knows? But at least 20 years. Let's think that this place would exist for 20 years and it should function well for that period, and after that one could revise one's view, and so you acquire permanent fixtures, etc., thinking about that timescale. And so, after 20 years was a good point to review it since it had reached that point and I think now they still think a 20 years' horizon is a good horizon and are striving to get more endowment. I think it's approaching £10 million. It really needs at least £20 million together with grant income, too. But I think it's made valuable contributions. So, I'm pleased that it worked.

(to be continued)