

J.E.: So your purpose is: you would like to write some kind of general biography [of Peter Bergmann]?

D.S.: Well I have a couple of objectives. One of them is of a more scientific nature. I am actually been looking up a couple of years on a more detailed history of constrained Hamiltonian dynamics.

J.E.: Oh Yes.

D.S.: And in fact I started with Peter's work in 1948 and then discovered that I needed to go back further in history to Leon Rosenfeld. So I have been concentrating recently on his early work in 1930 to 1932.

J.E.: It starts that early?

D.S.: Yes it starts that early. It is very surprising. Perhaps later we can talk a little bit more about that. But then I discovered in researching Peter's life that his father was a very important biochemist, a founder of modern biochemistry. I didn't know that. And I discovered in talking to many of his friends and collaborators that they also did not know that. And then I learned more about his aunt and his mother who were instrumental in founding the Montessori movement here in Germany. So, many things and I so finally decided that I would also attempt to do a longer term project, to do some scientific social intellectual history that would center on the Bergmann family. So I am beginning at the end of the 19<sup>th</sup> century. So it has turned out to be a very exciting project.

J.E.: Very many sided

D.S.: But that's going to be a longer term. But I do want to do genuine scientific history.

J.E. Ok, then I have some picture.

D.S.: So how can we get started, I guess perhaps we could begin if you could tell me how you first came into contact with Peter Bergmann, anything you can tell me about the nature of your association with him.

J.E.: I have to start with the fact that I studied in Hamburg with Pascual Jordan. And Jordan had a seminar on general relativity in which I was quite active and Jordan managed to convince one of the rich German industrialists Wilhelm Flick to provide some money to organize an exchange between young U.S. people. Today one would say a postdoctoral exchange program, something like that. And Flick however said that yes he would be willing to do that but it should be a relatively small and concrete problem. There should be a specific group in the United States and Jordan's group in Hamburg between which this should take place and now Jordan apparently already knew Peter Bergmann from somewhere.

D.S.: What year, roughly?

J.E.: That was between 1957–59, around that time. And then I was asked as a kind of emissary as a student. I had just done my Ph.D. in 1958 and I was asked to visit the United States, visit Peter Bergmann and to kind of establish a personal contact how one should, how one could proceed.

D.S.: And you had completed your Ph.D.?

J.E.: I had just completed my Ph.D. And for me it was a big thing. It was the first time in my life that I flew in an airplane from Hamburg from the Flughafen there. And I remember that I was very surprised that then I got into the 35th floor of the Hotel New Yorker in Manhattan. And the next day Peter Bergmann kindly visited/came to this place and we talked to each other. And there was one little story which I remember: we went downstairs, I wanted to buy something simple. And as usual in Germany I took my purse, put it onto the counter and Peter said: Oh No. you never do this here[laughing]. So this was my first instruction on how to be careful. Well and Peter then took me to a Stevens meeting in Hoboken, New Jersey. And so I listened to the various talks and I had to practice my school English – you see I had never been outside of Germany at the time and then, after a number of talks had been given, Peter wrote a little piece of paper and gave it to me and he wrote: I should also make a little speech and tell what is being done in Jordan's group and I was first quite taken and then I pulled myself together and tried my school English and said something on what was done at Jordan's group and Peter was very happy and [?] . He was always very encouraging. This was always one of the very nice features of Peter's. So.

D.S.: I think that Jim Anderson was already at Stevens?

J.E.: Jim Anderson was there too, Ja. And I think Art Komar was also there. And Ralph Schiller was there also.

D.S.: I spoke to both, Ralph Schiller and Jim Anderson this summer during a visit in their summer cottage in the Cape Cod region.

J.E.: Oh yeah and also I think Josh Goldberg was also there. Ted Newman, I strangely enough do not remember.

D.S.: But this was at Stevens, Josh was there?

J.E.: Yes. They had these, rather regularly they had these seminar meetings at Stevens. And well then I was there just for a week or so. Then we more or less came to, we agreed that if Jordan would agree that that we should try to have an exchange between students from Jordan's group and from [his case?]. And I was then in fact the first student from Jordan's group, and that I should go to Peter's group and that was at the end of '62, I think it was.

D.S.: Was it four years that had passed?

J.E.: It was... no, the first thing was for one-and-a-half year.

D.S.: No. There were four years between the time you first met ...

J.E.: Yeah, or three years? I don't know precisely when, I would have to look it up if I find any notes about that. But it's about that time.

D.S. : Did you happen to visit Peters apartment at that time.

J.E.: Not at that time. No. We always met only at Syracuse. And it was the rule at that time that over the weekend Peter would fly to New York and we students, we had to agree who would always bring Peter to the airport. That was one of the... . And I remember that I think the closest discussion partner for politics as well as for science was Art Komar. He was clearly the major established collaborators of Peter's. And what impressed me among others was that Peter had a wide range of interests . In physics for example he was working mainly on the relation between quantum theory and general relativity but besides that he had a serious interest in statistical mechanics in particular. He had been working, I think, with Lebowitz who recently got the Max Planck Medal by the German Physical Society. And he had interests in the foundations of quantum mechanics for example during my time there, there was a seminar on the theory of measurement in quantum mechanics and I remember I also wanted to participate and so I learned something and gave a talk and that was one of the things that I always kept in my memory that this wide range of interest and Peter was always very serious in these things. He was always asking questions, making comments and so on. So that was an interesting time, although the work which interested him in research, that was something for which I was not prepared, so in that respect there was very little interaction.

D.S.: What were you working on at the time?

J.E.: On... well ... special types of exact solutions in General Relativity – stationary axisymmetric solutions, and also I started, I became interested in how does one describe matter in General Relativity. Relativistic Hydrodynamics and such things. And sometimes when Peter was travelling he asked me to substitute for him in his lectures and that was a nice challenge for me and I was very happy that I learned from Peter then afterwards that the students had told him that I did it as good as he had done and I was very proud of that remark (J.E. laughing).

D.S.: Very nice ... Those were graduate courses

J.E.: Yes these were graduate courses. In fact it was a course on General Relativity.

D.S.: So you said you had not so much interaction concerning the study of exact solutions with Peter. Did you have with other members of the physics department?

J.E.: Not really, no. I think I worked mostly on my own, of course I would be talking to Artie Komar and to the others but they all had their own interests and there was not really a serious direct interaction on a project. But I liked to teach. I gave a graduate course on classical electrodynamics and I was very ambitious. I really wanted to establish also the relation between

the microscopic description of electrons, Lorentz's electron theory together with the more classical Maxwell theory, and so on.

D.S. You must have had extensive interactions with Fritz Rohrlich?

J.E. Yes. And among the other people there, I found it interesting to talk to ... I think Hart was his name or somebody who was ... ?.

D.S.: Eric Harth.

J.E.: Yes. Eric Harth. He became interested in Biology. He was one of the interesting persons there.

D.S. Can you perhaps say a little bit about what the daily schedule was like when you were there In Syracuse?

J.E.: Well. We would usually meet in the morning around 11 or so and have some coffee and that was then general talk.

D.S.: That was the Relativity group?

J.E.: That was the Relativity group. Yes, and apart from that we met at seminar time in the afternoon usually. But otherwise there was not a more regular kind of social meeting. But every day we had some time together.

D.S.: Later on – I think this happened in the relativity group – there were reading groups of some sort where people reported on research?. Did that occur while you were there?

J.E.: I don't remember that. No. Not that we reported on research papers which we read. No. Maybe later on.

D.S.: Let's see socialization, say around 11 o'clock. Luncheon interactions?

J.E.: Ah...Yes, we usually ... yes .. lunch we usually also went together.

D.S.: I imagine conversations then were wide-ranging.

J.E. yes what impressed me – you see, at that time I had not been following politics very much – and I found it very remarkable how carefully Peter and Art Komar, these two people, how they read nearly every article in the New York Times and were discussing heatedly the political situation. So I just listened to that and hardly made any remarks about that. But it really impressed me that these people knew so much. So I tried to pull myself together and also get a little bit into that content.

D.S.: I guess that concerned both domestic and international politics?

J.E.: Yes. Yes. That. Mainly really domestic. And also, of course, they had ... Since they were both Jews also the situation, the relation between the US and Israel, that was also a big part of the discussion, I think.

D.S.: Can you remember enough to be able to characterize to any extent what their positions were with regard to the relations between the US and Israel?

J.E.: No not really. I must say that I have a very good memory even for technical details in physics but my attention was usually focused on these things because that was what mainly concerned myself and with what I was concerned. And therefore I only, so to speak, in an external way, I listened to the other things but didn't have much of that in my memory

D.S.: One other thing that is of interest to me in regard to international relations is what I see as Peter's serious attempts to improve understanding, particularly with ... well, not so much understanding but at least scientific interchange with scientists behind the Iron Curtain. You recall anything of that nature?

J.E.: No. I only knew that he sometimes had connections with the Jena group of professor Schmutzer. But I wasn't involved directly in that.

D.S.: That was at that time, in the early 1960s.

J.E.: When was it already?... Again I don't know. Something else comes to my mind. I was wrong when I said I came in connection with Peter first in connection with this visit in the US. Actually I met Peter already at the Bern Conference on General Relativity in 1955. Jordan had taken me along to that conference and there I talked for a while with Peter and also we had a little bit of a train ride together there we talked.

D.S.: So Jordan also was acquainted with Peter?

J.E.: Yes. But I don't know where this came from. But they were both at this Bern Conference for example. Whether this was the place where they first met or not I don't know.

D.S.: Were you involved in any way with the creation of the General Relativity Society?

J.E.: Uhm...well, I was not really one of the founding members but I was very early – I knew about this – and I became, I was one of the first members I think. And I sometimes tried to help organizing things. Mercier was I think the first person to get this going. I knew André Mercier fairly well, I sometimes travelled to Bern to discuss matters with him about the Society, so in that sense I was associated early on with the ...

D.S.: Good. That is something I would like to at some stage to investigate in more detail ,the creation of this society, Peter's role,....

J.E.: It seems to me that Peter must have been quite important in the founding of the society.

D.S.: That's my impression. And there is in fact, we now have – I helped with Engelbert Schucking and Josh Goldberg to actually save and document Peter's papers at the Syracuse University Library. There's a substantial amount of material on the creation of the Society.

J.E.: I wonder whether this Bern-Conference had something to do with the founding?

D.S.: I suspect it did.

J.E.: Yeah. I would also think so. Because several of the established people interested Relativity, they were all there.

D.S.: Yeah. Actually I would be very much interested in hearing of any memories that you have from that conference, because that is significant.

J.E.: Yes, I do have. One is, for example, at the first evening – I think it was a Monday – there was a party at the home of Professor Mercier and I was somewhat reluctant approaching this because all these famous people, I knew some of the names, and when I approached the home I noticed that there was a very well -looking elderly gentlemen walking in front of me and then we had entered the home he wrote of course his name into the book and I noticed: Max von Laue? [laughing] This was one of the episodes and another one was that I was very impressed by Pauli who was the president of that. And he was clearly the person who was looked upon with awe by all the others... and afraid also of Pauli I think and Papapetrou gave a talk there on how one can construct, within General Relativity, models of clocks and one had then to decide what are the conditions in order that such a clock model really shows proper time and he had talked about ... it was quite a good talk. Unfortunatley, he mentioned as one type of clock that would not in generally function very well, a pendulum clock. And I remember that always remained in my memory after that talk of Papapetrou's, Max von Laue raised his finger and said, "I should like..." I say this in German: „Wenn ich mir die Bemerkung erlauben darf, so ist es diese, das Gerät, was man in einem Laden kaufen kann unter der Bezeichnung Pendeluhr ist eine Uhr erst in Verbindung mit einem festen Gravitationsfeld [both laughing]" It was a very nice remark. And once, I was taken along to have lunch with Jordan and Heckmann and Pauli and I noticed that Jordan and Pauli they seemed to like each other and they liked to make jokes and laugh very loudly and so on. Then at one stage. And Heckmann was a very serious person. He would never really laugh very easy and so on. And at one stage during this conversation, Pauli looked at Jordan, who was at that time a rather fat man, he looked at Jordan and then he bent to Heckmann and said: „Do you know, Heckmann, why Jordan has propogandized a theory in which there is creation of matter out of nothing?" And Heckmann said „No, I have no idea.“ „Well this is pure anthropomorphism.“ [both laughing]"

D.S.: I may have my dates wrong here but is that the meeting which Feynman came? He came to one...

J.E.: No. He came the next. No, not even the next one. The next after next. Feynman came to the Jablona Conference near Warsaw and there he made these very cynical remarks.

D.S.: Did you go to that one?

J.E.: Yes, I was there too. It seems to me that these remarks were particularly inappropriate because that was one of the meetings were one for the first time tried to bring General Relativity again into contact with other parts of physics and there were talks on Gravitational Radiation

and relation to Quantum Theory and so on . So I think this was really not proper, the way in which Feynman talked about that.

D.S.: I read... I don't recall where I saw this, that he resolved never again to attend a relativity meeting that ...

J.E.: Yes, it's bad for my blood pressure, all this people crawling around talking ...

J.E.: Concerning 55, I think, as far as the scientific aspects are concerned. Peter gave one of the principle reports at that meeting. It was on the status of ... relation of ... well how did he call it. Ah I know it. The title was "Über die Quantisierung allgemein kovarianter Feldtheorien". That was really one of the major talks there and Pauli commented on that. And Pauli for example said – I don't know whether he said it immediately afterwards or in his later summary – he was very impressed that somebody who knew so very well all the techniques of quantization like Peter Bergmann that such a person still had not come to a good conclusion.

D.S.: The Pauli relation to quantization of gravity is something that particularly interests me because it turns out that he was collaborating with Léon Rosenfeld in the 1930s.

J.E.: Yes. Very early.

D.S.: And Rosenfeld apparently also with Pauli's assistance made - what for me is - incredible process in the development of constrained Hamiltonian dynamics. And then subsequently Pauli very much encouraging him to include gravity in his thoughts, which he did with astounding success. But then both Pauli and Rosenfeld abandoned this effort of quantizing general relativity by 1932. Anything that you can recall further about Pauli's comments at that meeting would be particularly interesting.

J.E.: What I do remember is that in his summarizing speech Pauli said that he was very interested in what Lischnerowicz had reported about the initial value problems in General Relativity because he Pauli felt that the structural insights which one gains in that they should also be very important for quantizing gravity. And that was very foresighted. I think most people at that time would not pay much attention to initial value problems. That is the one thing that I remember. Another thing was that Pauli made some remarks that he was very sceptical about ... attempted changes and generalizations of General Relativity. He said that he felt that Einstein's theory was still better than the competitors which had been proposed and he mentioned Fock. He said he had talked to Fock about the matter and he agreed with Fock –now I have to say this again in German - because it was this typical way in which Pauli used to talk. He said "Es mögen wohl alle diejenigen, die die alte Einsteinsche Theorie für besser halten als ihre Nachfolger, eine gute Chance haben Recht zu behalten" [both laughing]

D.S.: Very good. Yeah it's the context in which Pauli and Rosenfeld had begun to look at the canonical formalism with gauge symmetry was electromagnetism. That is a very important step in the development of quantum field theory.

J.E.: Yes.

D.S.: But the surprising thing is that Pauli had suggested to Rosenfeld that he should incorporate that into quantum [undecipherable] To me that somewhat resembles the Apollo moon shoot - the enormous progress that was made in 1930 in constrained dynamics.

J.E.: Well in this context Pauli and quantization I learned from Norbert Straumann that Pauli very early only I think in the beginning 30s when the first ideas had come up about that there should be vacuum fluctuations in quantum field theory. Pauli asked himself whether the quantum fluctuations, the vacuum fluctuations, would contribute to the stress-energy-momentum-tensor on the right-hand-side of Einsteins field equations and he had made what seemed to him a reasonable cut off in energy at the time and then he found out that ... if one would take into account that contribution then that was such a large contribution to the energy-density that the radius of the universe would be not quite the distance from the earth to the moon and so he abandoned that and said: No

D.S.: Did he publish anything?

J.E.: I don't know that Pauli published that. But Straumann has published this and he talked about it and he gave ... I think he even gave a reference where he learned this from Pauli. That was ... there is an article by Straumann where this is mentioned and quoted ... Ah one place where this is also given is Straumann's latest textbook on General Relativity that appeared with Springer 2005. I think.

D.S.: I've heard this from several and think you already told me this, that Peter never told much about his family?

J.E.: No.

D.S.: Can you recall him telling you anything what so ever about his family?

J.E.: No. Not really. Well I learned a little about his background only indirect later on when I talked to others or read something. No, he never talked about his family

D.S.: He never talked ... it would seem natural given that you were German to have at least mention something about his own German background.

J.E.: No, not really ... By the way is there anything perhaps ... of course Peter took his Ph.D. in Prague. Are there any job comments?

D.S.: I don't know what exists in Prague. I am actually intending in the near future to go to Prague and to see what I can find.



J.E.: Then you should try to contact if possible a little in advance Jiri Bičák because he is very much interested in history and he knows everything what was available in Prague.

D.S.: Oh that is wonderful. How do you spell his name?

J.E.: B I C A K. And there is an accent on the C.

D.S.: I see.

J.E.: And his first name is written J I R I. and he is in the physics department there and.

D.S.: Oh he is there in Prague then I'll definitely follow up.

J. E.: He is very much interested in history and particularly everything that is connected to physics and Prague.

D.S.: Wonderful. If I can find anything there in the archives that will be very useful. I have been to archives in Freiburg, where Peter went to the Gymnasium. And just two weeks ago I was in Dresden where he actually studied chemistry for a year.

J.E.: Oh I didn't know that.

D.S.: And I first learned that he had studied chemistry from a short autobiography that appears in his Nachlass. But his father was then an Honorarprofessor at the Technische Universität. but I don't know what courses he took. Then he also studied for a year at university of Freiburg. I don't know what courses he took there either. So nothing whatsoever about his German background?

J.E.: No. No. ... It may be that my wife who pays much more attention to such personal affairs that she might remember something ... I'll ask her.

D.S.: That be wonderful If you would. I actually have a copy of an email that she wrote to Ernie Bergmann where she did some research on Peter's family. But she may have discovered something new since she wrote that letter to Ernie. I think that she might have something ... Can you ... Hopefully we speak once again once I have more focused questions to ask you.

J.E.: When will you be here again?

D.S.: I am here until the end of August.

J.E.: Ah yeah you told me.

D.S.: If you could may be say something of a general character about Peters personality, about his mode of interaction. Anything concerning his character, that would be very useful.

J.E.: One ... I mentioned this I think before, I was impressed about his warmth in human affairs and his ... his helpfulness in every respect then whenever we were there as young people with my wife and we needed some ... some advice how to arrange this or that he would always be very helpful and he would never turn you down and say. "I have something more important to do." And the other thing which is I think really highly non-trivial is that he never let us know that there was a difficulty for him to talk to somebody who was German. One could have anticipated

there might have been a difficulty because of what has happened to his family but never - no. ... This is one of the things ...

D.S.: Were your interactions with him always in German?

J.E.: Yes. We would usually talk in German and ... well ... this is not that serious. When I first had come to Syracuse and we were there in the morning having coffee together I was surprised that even first year students who had just started working with him would say: "Good morning, Peter [overly cheery tone]" [both laughing] How could one address a professor with Peter?

D.S.: It struck me also as a graduate student. You - I guess – having listened into these conversations regarding ... politics and such. He must have given an impression he had social concerns ...

J.E.: Yes.

D.S.: issues of human justice.

J.E.: Although I do not know whether he was involved in any so to speak organizational things in this respect. He certainly was very interested and he had a very ... what ever he said was to me a very plausible and was very human and so on but I am not aware that he was in one of these organizations. I mean, I think much later on there was this society of concerned scientists in the US. That was later I think.

D.S.: That was in the seventies I think.

J.E.: But there must have been similar organizations already at an earlier stage I think also in connection with atomic energy or so. But I don't know whether he was concerned with any one of those things. He was certainly very much impressed by Einstein. Whenever Einstein's name was mentioned it was clear that he felt very close to Einstein's thinking not just in physics but also Einstein's role as a kind of social and political figure. But I don't recall any details on that.

D.S.: You recall anything else that he might have told you regarding his interaction with Einstein?

- Pause -

J.E.: No. Not really. He was ...

D.S.: That's one of my regrets also that I never pursued that angle ...

J.E.: Yes. Yes. I often I also think that I would like to talk to Jordan now and I ask him a lot of questions.

D.S.: Yeah. It could say that too. I think perhaps ...

J.E.: Yes I think we can meet again if I remember something.

D.S.: Yeah let me turn this thing off.