Hans Bethe started visiting the Kellogg Radiation Laboratory, accompanied by Gerry Brown, every winter starting in the late eighties. My first visit to Kellogg was in 1991 as a final year graduate student. I returned in January of 1992, while a postdoc with Gerry Brown at SUNY Stony Brook, and this would be my first of many winter months spent in the company of both Hans and Gerry. The following notes are literally “mental downloads” that I wrote down every evening after leaving dinner with Hans, Gerry, and sometimes other invited guests that year. I indiscriminately wrote down everything that I could remember from that day, whether it seemed important or not, hoping to edit it later. In the end, I decided to keep the editing very minimal in order to preserve the original text’s immediacy and spontaneity. Besides grammar and punctuation, a few facts that I remembered incorrectly were restored. I also added references and footnotes that add explanations where necessary. The following is a transcript of the conversations that took place between 20 January and 20 February, 1992.

First Week

Monday, January 20th

I meet him for the first time in the afternoon. Gerry comes up to my office to tell me that there will be a discussion session with Grant Matthews from Los Alamos on problems of the early universe. I know that by that time, Hans has returned from Santa Barbara, and will be waiting in his and Gerry’s joint office on the first floor of the Kellogg Radiation Laboratory.
I am, while walking down the stairs, slightly nervous, because of all the anticipation of meeting him. When I enter the office with Gerry there is only him, Matthews hasn’t arrived yet. Gerry introduces me to Hans, who sits on a chair. His handshake is weak. I mumble that it’s a pleasure to meet him. What impression do I have? He is old, but I knew what he would look like. His hands aren’t trembling. He only has a little hair left around the back of his head, white, and almost no eyebrows. Yet his face, while wrinkled, is still somehow strong, probably because he’s a good eater. When he leaves to get himself a coffee, he walks upright. He munches on raisins. Gerry notes that Matthews hasn’t arrived and says that he’ll come and get me once he does. I go back upstairs to my office. Five minutes later Gerry is back, to tell me that everything is set. Grant Matthews talks about inhomogenous nucleosynthesis. Hans listens attentively. Somehow, I can’t really believe that Hans understands all this, him being 86. And every time he starts to make a comment, or ask a question, I expect to see that he cannot follow. However, that never happens. When he talks, he talks slowly, but surely. After maybe an hour of discussion this feeling slowly fades away. Hans knows what he is talking about. Nevertheless, he is very tired from the drive from Santa Barbara to Pasadena (he drove a rental car, all by himself), and around five they leave for the apartment. I join them at 6:30 for dinner. When I come in, Gerry tells me that dinner will take a bit longer (he is making a roast beef) and I sit down, across from Hans. Almost immediately, Hans addresses me:

“I have a request!,” he says. I look very subservient, not knowing what will follow, and answer — “Yes?”

“Please,” he continues, “can you speak at half the speed, and twice the volume? I am hard of hearing and I have this hearing aid.” I am slightly embarrassed, as during the discussion in the afternoon I talked, as I always do discussing physics, admittedly very fast. I even remember worrying about it slightly, but then got swept up in the subject again. I apologize for that, Gerry makes the usual remarks about my fast-talking, and I try to speak slowly, and loudly. The conversation is not easy, I don’t dare to ask questions, and so I only answer his, about where in Germany I’m from. I tell him about Brussels (where I was born) and about Bonn University, where I studied physics. He asks me about who is still on the Bonn faculty. I start with mentioning Rollnik, my advisor, but that name doesn’t seem to ring a bell. I mention that he’s on many committees, and now heads the one responsible for restructuring the East German physics departments. We discuss this a bit, then I mention Konrad Bleuler, knowing full well that
he must remember him. They must be roughly the same age. Indeed he does remember, his face lighting up slightly when I mention him. Then I mention more names from the Nuclear Theory group in Bonn, but none are familiar to him. Then he asks me if Wolfgang Paul is still there. Yes, of course, I answer, and tell him the anecdote about how they relegated him to a little office close to the janitor’s closet in the cellar after his retirement, only to reverse this move after he won the Nobel prize. Hans laughs, and goes on to tell me that the first met Wolfgang Paul when he visited Werner Heisenberg in Göttingen, in 1948. I go on to tell the story of how Wolfgang Paul received the money from the German government to build the 500 MeV electron synchrotron in Bonn, the first of its kind in Europe. Namely, he simply asked Heisenberg, who was then in charge of distributing research funds in Germany, for the money personally, and a week later it arrived on Wolfgang Paul’s private account, just like that. Hans is amused, and says what a fine experimenter, and a nice person, Wolfgang Paul is. We all agree. I now remember another story about Wolfgang Paul, just as an aside, that I learned during my time in Bonn. Indeed, Wolfgang Pauli visited the institute, and under some circumstance Paul whispers to Pauli: “Finally I meet my imaginary part!”

We talk about more things, discuss the reunification of Germany, and he asks me how the East is doing economically. I talk about unemployment, salaries, etc. He seems genuinely pleased to hear that I expect that the Eastern part is slowly recovering. I tell him that the German government poured over a hundred billion marks into the East, which leaves him very astonished. Yet, the conversation is still difficult, as I mostly answer his questions. There are periods of silence in between, where I don’t quite know where to look. Finally, dinner is ready. During dinner we don’t talk much. Hans eats slowly, but he eats a lot. After dinner, Hans retires as he is tired from travelling. Gerry walks a piece of the way back with me as he wants to do some grocery shopping, and says that Hans and I still have to get to know each other; that today the discussion was somewhat superficial, but that he likes to talk about Germany.

**Tuesday, January 21st**

At around 11 a.m., Gerry calls me for discussion, now with George Fuller from San Diego; later Grant Matthews joins in. Hans is a lot livelier. I’m observing him all the time. He gets up to write on the blackboard, he interrupts George Fuller: “I love the r-process, really, but I think we don’t have to worry about this here.” Fuller is slightly embarrassed, he won’t mention the
This session is about neutrino physics, specifically neutrino oscillation and transformation. I am not an expert on this, but it is very interesting. I learn that Hans has in his mind a pretty well-rounded picture of what the masses of the three neutrino species should be. Considering that the rest of the world is still wondering, or assuming that they probably all vanish, I find this quite remarkable. For the record: he estimates the electron neutrino to be basically massless, the muon neutrino to have a couple of milli electron volt, and the tau neutrino to have between 35 and 70 electron volt. Fuller and Hans agree that this should be enough to close the universe. Hans says: “I don’t know much about inflation, but Alan Guth tells me that you need $\Omega = 1$, and here we give him $\Omega = 1$; he should be satisfied!” The subject turns to experiments to detect the $\mu - \tau$ neutrino oscillations, and Hans gets emphatic: “The only experiments they do are at Fermilab, but they are doing the wrong experiment! The conversion length is a few meters” (he and Fuller just estimated it on the board with Hans’s formula), “but they are looking for kilometers! They will never find it that way!” He sits down again, and calms down. “I will have to write them a letter.” With that he goes to lunch with Fuller and Matthews. Gerry and I go to the Kellogg “Journal Club,” to listen to a talk about solar neutrino detection.

Later in the afternoon, Gerry calls me again, for more discussion with Fuller. This time, it is nucleosynthesis again. We are having a very lively discussion, but when I speak I’m always concerned about whether I’m not too fast for Hans. I try to talk slowly — have to slow down many times — but it’s very hard to control. We talk about the QCD phase transition, and I tell them that I still suspect a first-order transition involving the electric gluon condensate. Fuller is very interested, Hans is a bit skeptical, but asks the right question: “At what temperature?” I answer that I suspect at the chiral restoration temperature, Gerry objects, I concede that it’s speculation, and Hans nods. I try to give an argument why chiral restoration temperature is possible, but Hans interjects that we won’t solve that problem today. He wants to go home. Dinner is at 6:30.

I arrive on time. Hans already sits at the table, with food on his plate. He makes no compromises in matters of food. During dinner we try to find the Italian word for “vegetables,” as Gerry cooked chicken with vegetables in an Italian way, and tries to say something like “polio al vegetabile.” Hans suggests “verdura,” but concedes that that might mean “salads.” He goes on to say that he can guess the Italian equivalent of English words most of the time, and tells the story where, when he was in Italy, he wanted to
buy some laxative, and asked for “purgatorio.” The pharmacist smiled, but understood, and told him it’s “purga.” We talk about southern Italy, and how Pierre\textsuperscript{a} always maintains that he is tall for an Italian, yeah, maybe with respect to those in the South! Hans mentions that many Italians that he has known were quite tall. Fermi, he concedes, was considerably shorter than he, adding that at the time though he (Hans) was several inches taller than he is now, and that Fermi had an assistant (Rasetti) who was taller than he was then. We also discuss a little bit of physics, specifically Hans wants to hear about the talk Gerry and I went to that afternoon, about solar neutrino detection. I tell him that the girl who gave the talk, a first year graduate student, reported that they see too few neutrinos, just like in the chlorine experiment, but that these are low energy neutrinos from the $pp$ fusion reaction in the sun. Hans of course obtained the Nobel prize for his theory of energy production in the sun, which predicts many more neutrinos then observed on the ground. Gerry says that Hans is pleased with this result (too few neutrinos) because of his new theory of neutrino transformation and oscillation that predicts just that, and goes on to joke that Hans always tries to grab at any straw that would prove that he didn’t get the Nobel prize for a wrong theory. Furthermore he says that the SNO experiment will really decide about that, and Hans agrees.

After dinner, Gerry goes to lie down on the couch to have a short nap, while Hans is still finishing his chocolate cake and chocolate ice cream dessert. It is his third helping. I ask Hans about different solar neutrino experiments, and eventually we get to talk about the SNO experiment, in northern Canada. He explains the process, the technology, the difficulties, the one thousand tons of heavy water that are needed for that, at $200$ per liter of heavy water (loaned from the Canadian government) and marvels at the neutrino detection efficiency. We discuss its applicability to supernova neutrino detection, and again he is enthusiastic.

Somehow, the topic returns to Germany. Hans says he grew up in Frankfurt, and still likes that city. He asks if my parents still go to Germany, and I answer: of course, since many of our relatives still live there. I tell him that my father’s family lives in the “Pfalz” (Palatinate), and he mentions that he also has some relatives there. I also mention that my mother’s family lives in Ludwigshafen, and talk about where my parents come from originally. Then, as I realize that he likes to hear the names of German towns, I tell him that my father’s family lives close to Germersheim. At that moment, his whole face lights up, and he exclaims:

\textsuperscript{a}Pierre Pizzochero, Gerry’s former graduate student at Stony Brook.
“Germersheim! One of my earliest childhood memories is associated with Germersheim.” After a slight pause he goes on: “I was born in Strassburg, and when I was six, my father obtained a call to a professorship at the University of Kiel. So, we took the train to Kiel. It was a night train, with sleeping compartments, and I was very excited. In the middle of the night, I looked out of the window, and saw the train station sign announcing Germersheim go by. This is all I remember, I don’t know why this has remained. I was very excited, a little boy travelling in a sleeping compartment.”

“When I was eight,” he continues, “I moved to Frankfurt.” I ask him whether he had ever returned to Frankfurt, after the war.

“Of course,” he smiles, “the planes land there. Also, I returned after the war to visit my father, who still lived there. Also when I visit my sister in Neuwied, it’s easiest to go by Frankfurt.”

We talk a bit more, in a fairly relaxed way, about Brussels. He mentions that he went there a couple of times; for example for the 1961 Solvay conference, and we both marvel about the Grand’ Place. He tells me how he always thought it unreal that people actually lived in the houses around the Grand’ Place (Brussels’ central square), and I’m surprised, as this is what always goes through my mind when I walk over there. I tell him that, and we seem to have a genuine understanding. I relay to him similar impressions that I got from Regensburg in Germany, from little streets with the facades of houses that seem to lean inwards. I tell of cobblestones, and of the marks that the axles of horse-drawn carriages have left at the corners of the streets, hundreds of years ago, and that, on a silent night, one can mistake this century for another, earlier one. He listens to this in genuine delight. We talk about the history of Regensburg, and how it became to be a “Freie Reichsstadt.” I add that its decline later was probably due to its losing this status, and he interjects that this was probably due to Napoleon. We talk a bit more about Germany, and a bit of physics. I see that he’s somewhat tired, and say that I should go back to work. On the way out I see that he picks up the more interesting parts of the newspapers lying around on the couch table. Gerry told me earlier that Hans likes to read sometimes several hours a day. Before going out of the door I raise my hand and say loudly: “See you tomorrow.” He smiles and waves his hand.

**Wednesday, January 22nd**

A quiet day. We meet at 11 a.m. for discussions. This time around we have Edward Shuryak from Stony Brook. It’s an interesting discussion but nothing really stands out. Hans seems somewhat unconvinced about what