Sergio Focardi—Esiste la "Fusione Fredda" (1994)

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[00:14] [...] before the start of this conference, Professor Focardi for the availability he has given to intervene in this topic, which is a topic of great relevance and highly interesting unknown future prospects. We must thank Professor Focardi for other things too: for the important works he is carrying out in Italy with two fellow researchers always on the topic of cold fusion, and above all because he is the head of the Computer Science faculty of Cesena, who we talked about indeed, it is the second science faculty of the University of Bologna in terms of number of frequencies.

[01:18] This certainly goes to the honor of Professor Focardi, for his work within the University and above all for the rigorous scientific method that leads to it, also having a great personal consideration. I congratulate Professor Focardi and I thank him further for the availability he had at the invitation of the Cassa di Risparmio Foundation to entertain citizenship on this issue.

[Applause]

[02:02] [Focardi] It is I, President, who I have to thank you and the Cassa di Risparmio foundation for the sensitivity that has always been shown towards university institutions and also on this occasion for giving me the invitation that I have gladly accepted because it will be quite a difficult challenge. Being an open invitation to citizenship - even if I see many students I know, but they are certainly not the exclusive participants - I had to prepare it at a level that maintains scientific rigor but that is possibly widely understood, therefore a level that is quite difficult to be continued.

[02:52] I say this not to justify myself, but just to thank you for offering me this challenge since I have not liked easy jobs for many years and if they are not sufficiently difficult I cannot get involved. This is it, and let's see how today I will manage to cope with these difficulties.

[...]

[03:45] I will begin with a speech taken a little far away about energy. But with this I will not want to show that what we are seeing is definitely a certain form of energy - so I would ask you not to want to make a kind of short circuit between the initial and the final speech and to make me say things that I do not have in mind. say - but I think the discussion on energy is quite important because perhaps it will also allow us to understand the psychological situation in which the whole story has taken place in recent years.

[04:28] On the blackboard you can now see a graph projected in which the primary sources of energy are reported some years ago, worldwide. Things have certainly not changed - this situation is still true today - and you can see it immediately, looking at this graph, where I have neglected the less important sources, which also exist (I have put only the most important ones), that if hydroelectric power is excluded , which represents 7% of the total, all other energy sources are sources that have to do with transformations of matter from the initial state into the final states in which it is transformed through processes or combustion or breaking of elementary structures.

[05:24] So, let's say, this is a bit the situation from which for example you can immediately see that if - I repeat - we exclude hydroelectric power, energy can be obtained essentially in two different ways, energy which we then normally use, electricity typically and all other forms: either starting from oil, coal and gas and burning them, or starting from compounds - typically uranium - and causing nuclear reactions to take place. There are two types of transformation that still pass through the path of combustion: there is a thermal step in between.

[06:12] And all these forms of energy have their drawbacks, in the sense that every time one transforms these primary products into the final forms there are the residues of the transformation that somehow create problems — then I will run a few examples , possibly — for which producing energy by transforming the initial material is a process which in any case can always cause immediate risks or inconveniences. Example: if one burns oil - the result of combustion, which is a chemical reaction in which electrical forces intervene that transform coal for example into carbon dioxide - the result of the reaction that occurs is the production of carbon dioxide, which is released into the atmosphere is responsible for what is feared by everyone today, which is the greenhouse effect, that is, a risk of changes in the temperature of the planet with all possible consequences.

[07:21] So if one uses uranium in reactors the problem is that uranium disintegration products are radioactive products which also have a long average life and of course you have to place them somewhere where they are not dangerous, hoping that in the hundreds of years to come, do not create events that put these waste back into circulation.

[07:45] So all these forms of energy are forms that have a strong dose of danger. And there is no difference between one and the other: to date there is no form of energy that is absolutely clean and harmless. On the other hand, we need energy, because if we ... maybe we don't realize it, and we don't realize it because normally we have so many things to think about - I am now convinced that to be aware of things one must at least for a few minutes concentrate on these, think about things. We are a company today that is heavily dependent on energy. Maybe we don't realize it. So how do we know that? Well, you could do some little numbers, little calculations — but of course I had made a commitment to never try to use numbers, never formulas, not to be immediately unpleasant at the Auditorium — and then I tried to [..] present the thing in a different way.

[08:47] Suppose that by magic, rather better by curse rather than magic, suddenly all these sources disappeared, someone made us disappear. We would suddenly find ourselves without energy. So what to do? Well one solution one can immediately think of. If we lack the energy produced by the combustion of all these objects, we use human energy or animal energy, as was done in the Middle Ages. Well, if one does the calculation for example in human energy, that is, thinks of the slaves - obviously do not think that I am a slave driver, I am making a paradox - and he says: oh well, how many slaves [it would take] each of us to maintain the level of current life?

[09:35] If for an average Italian citizen - which means then there are those who need it most, and others less - they would like ... I read because I don't remember exactly, 125 slaves each. That is, each of us should have 125 slaves on average who work exclusively for the master. But it would be crazy. Citizenship would go from 60 million to 700 million. Slaves should be real slaves, that is, do not in turn demand our standard of living which would require 100 slaves for each of them, otherwise things would not work. So a dramatic thing, because the energy we consume is not only that of our meter, but it is the energy to make clothes, shoes, food, cars, to send cars, everything, to watch television ...

[10:27] So in reality we are a company heavily dependent on energy, and if energy runs out, things get serious. I would not now like to enter into the talk [of] when it will end, if it will end, if this will ever happen, but clearly those stocks are not unlimited. I think that thinking about consuming all the consumable today we have reserves of that type there for 120–150 years, but don't take this number very seriously because I haven't done recent calculations. And perhaps a responsible company should start thinking about what will happen in 150 years and put in place everything it can do today to think about our successors. That is, we cannot use the famous phrase "après moi le déluge", can we? This does not seem responsible to me.

[11:23] Now, I would like to point out one thing: that between the energies of chemical origin, fuels, and the energy of nuclear origin there is a big difference that surely also meant at the level of environmental impact, and it is this: that for the same energy produced, to obtain the same result, it is necessary to consume one million more material - if the chemical form of combustion is used - compared to nuclear power. I mean that the same energy can be obtained with a gram of uranium or with a ton of coal or oil. This implies problems of transport, implies problems of disposal, implies problems of slag, but there is this great difference of a factor of one million which is in my opinion also important for the purposes of environmental impact. Now I don't want to take the defenses of one form or another of energy here: I said that all of them have their risks and dangers, and the energy discourse is really very complicated because in addition to these scientific considerations there are the economic ones that they also matter and must be evaluated. I believe that there is no person in the world who is able to treat the whole energy problem from start to finish.

[12:46] Well, I believe that many of these things I said are known to people, of course. But it seems important to me to reiterate this. I am convinced that energy should not be wasted, because wasting energy - keeping a lamp lit in a room where there is nobody - is like taking one of those famous imaginary slaves and making it work unnecessarily because it is useless . So there is a big responsibility for our society from this point of view, because every energy that is wasted is useless pollution that we pour onto the planet.

[13:23] But now I'm going to nuclear power, because the talk of this conference will eventually end up somehow on possible forms of energy of nuclear origin. In the nuclear field there are two ways to get energy from matter, which is the way of fission - fission is perhaps a technical word, I think, I am now used to using it: it means to break - which means to take heavy nuclei, typically l uranium or plutonium or thorium, splitting them, building intermediate nuclei and extracting energy in this process. Nuclei which are then radioactive and pose problems. And this energy is now used: that slice that we see in the graph comes from fission reactors. Fission reactors have a certain intrinsic danger: unfortunately all of them remember the recent accident in Chernobyl. And then the fission is linked to tragic episodes in the history of humanity: the bombs thrown on Hiroshima, on Nagasaki. And this is an original vice that this form of energy retains. But there are objectively the risks of the slag, above all, in my opinion

[14:41] And then the other possibility is energy by fusion: that is, taking the light nuclei, hydrogen - then I will also show another image where I will try in a simple way to try to represent what we mean by hydrogen. I apologize to those who know exactly what I'm talking about - where light nuclei are taken, merge together and energy is produced once again. Well, this second operation can make the sun, the stars can do it - then I'll try to explain why these sun and stars can do this - sun and stars start from hydrogen and then, like complicated machines, they build helium, then they build oxygen, then they build carbon, they build all the elements of which we are made by successive fusions. We, our skin, our flesh, are made of carbon, oxygen, phosphorus, zol ... nitrogen — sulfur no, there will be little — calcium: all elements that have been manufactured in a remote star that is not our sun, it is a star that existed before, and that probably, when it became supernova, exploding and producing the elements beyond the iron, in my opinion it was in the area where then the nebula was formed from which then the solar system was reformed, therefore ours remote origin, our roots are in the stars, and are in nuclear fusion reactions, from which all matter was made.

[16:13] The stars succeed. What about men? Can we do artificial fusion? Because doing artificial fusion would mean having hydrogen and its similar elements as fuel, which I will discuss in a moment. It would mean having unlimited fuel available, and here I am back to the previous discussion of how long the current fuels will last. Well, we are ... "we", in short, the scientific community is working on this. At this moment the most advanced machine is an English, European machine, the JET, which is made in England. The ITER project has started now - I don't know the meaning of the acronym - but ITER is a worldwide machine, in collaboration between Europe, the United States, Japan and Russia. It has not yet been decided where the machine will be made; it is clear that there will be terrible fights between states for this.

[17:12] In [...] the first phase will end. I think that in 2002-2003 the project, then construction in 2010, perhaps the machine will become functional in 2020-2030, but at that point will we have fusion, fusion energy? Today the experts say in 40–50 years, so I am referring to the experts. But the central problem in my opinion is this: fusion will certainly be achieved, I believe, feasibility will be demonstrated. But when it comes to building the reactor by fusion it will be very serious problems: because the radioactivity of the processes will damage the walls of the reactor in a month. So one has the problem of building a machine - a machine from a power plant, of course - and after a month ago? Disassemble the reactor. This is madness, I think. But let's admit that madness has the upper hand: who is going to dismantle the reactor? The men? Of course not: they would die. Robots? Robots would also die from the radioactivity of the walls. So in reality the problem - surely scientifically soluble - will have great technological difficulties. So if I had to bet today - I can also lose the bet because in the end, when the answer is known, I would obviously not pay: in 2040 the problem for me will no longer arise - I would bet that we will never have the energy for fusion, never. Unless the scientific results make us open new paths - and with this I am not saying that we must not do these researches: these researches are very important - from which we will have new ideas.

[18:53] And then fusion machines are not as quiet and harmless as they often say, it is not true. Because there will be radioactivity of the fusion products and above all there is another big problem. One of the fuels of these machines in current designs is tritium, which is a heavy hydrogen, and tritium is radioactive. And if tritium escapes from the plant, it goes around the world and replaces hydrogen everywhere, and therefore also in food, and people eat it. So, a control panel is not a very ... so quiet object. It has its risks, which does not mean that we must not take risks, because risks are everywhere: there is nothing without risk in life.

[19:39] Now this is a bit of an overview of today's situation, but it was also 4–5 years ago. 4–5 years ago when on the eve of Easter 1989 — I remember the date, the period very well, I think it was Wednesday… Holy Thursday or the day before — two American scientists, Fleischmann and Pons, with a sudden press conference , without having previously published the work or made scientific conferences - this is a mistake they made - announced that they had produced nuclear fusion in a metal at normal temperature. This is an incredible result for the knowledge we have and now I will try to explain why: why and what it means to merge, and why such a result is incredible; then I will return to the story of Fleischmann and Pons.

[20:44] Everyone knows that the atom is a system that more or less looks like a solar system, only very small: it takes 100 million atoms lined up to make an inch, this gives an idea of the size. If one could now enlarge an atom and make it as big as a football field, he would see that the nucleus, which is the central part, is the size of a pinhead and is, say, in the center of the field, and the electrons even more little ones wander along the edges, the baseline, the lateral phallus, there in the area. So in reality the atom is an empty object, where emptiness predominates over matter and where spaces are immense.

[21:29] And the electrons and nucleus are together because the nucleus is positive, the electrons are negative; charges of opposite sign attract and stay together. I apologize if every now and then a little elementary physics is forced to introduce it into the speech. Now suppose that another atom, an invader, arrives on this: another soccer field that arrives on the soccer field. Then interactions arise between the electrons and the electrons, between the invading nucleus and the invaded electrons, and these also occur at a distance: they are real clashes in which the electrons have the worst, because the electrons are 2000 times lighter than the nuclei . It is as if there was a clash between a passerby and a chick: the mass ratio is the same; the chick is blown away, the passerby does not notice.

[22:19] Then the invading nuclei sweep away the electrons, send them away; these, poor people, only attend the show, if there will be a show, and travel in a straight line.

[jump]

I apologize to the many present who know these things, but to be fair to those who may not know I have to say it - it is the simplest nucleus: a proton and an electron, nothing simpler than hydrogen. Deuterium is a kind of older, fatter brother: it has the same nucleus, except that there is an extra neutron; the same charge but double mass. Tritium is the older brother of the family. But from the chemical point of view all three behave like hydrogens, because the chemistry depends on the external electrons. Other characters in this story - and then many others I will not mention any more - are helium. Helium is the next element of Mendeleev's table, because it has two protons and charges two — therefore two electrons to neutralize the charge — and there are two heliums: helium with mass 4 and helium with mass 3.

[23:29] So when in the next few minutes I will speak of hydrogen, deuterium, tritium, I speak of very simple elements and objects: they are the famous "football fields" once enlarged, made in this way, with a nucleus like this . Obviously I have to represent things with simple models.

[23:47] Well, what did Fleischmann and Pons do? They used deuterium and palladium. They did electrolysis with a palladium electrode using deuterated materials, and they saw energy appear, but this energy came, came, was not stable, they could not reproduce it, they always have in their ... in their 5 years — because they continued to work ; among other things, today they have big Japanese funding: they work in France, financed by Japan, because Japan has made big investments on this line - when they got a lot of energy they got 1 watt, which means turning on a Christmas tree bulb. But it's not like they get 1 fixed watt. 1 watt that goes, that comes, that you don't know when and when it comes.

[24:31] And then the famous researchers, those "hit and run", doing these experiments, who found the neutrons, who didn't find the neutrons ... because if there are nuclear reactions then combinations of all those elements of the product occur the final. And this certainly confused ideas to many: there are those who find something, those who do not find it, those who then deny it ... because many have come from other lines of research; in a few months they thought of doing something, of getting something serious, and this cannot be done. This has meant that this group of researchers is a kind of group of "outcasts" compared to the international scientific community. They are almost on the index, they are ill-considered, halfway between the sorcerer and the charlatan, and this is the reality. For the international scientific community, one cannot speak of cold fusion.

[25:26] With the friends of Cesena, having to be in a city, I said "let's put the word cold fusion very well, we can't use the complicated words that we use". To be clear, it's fine, but not on a scientific level. So this was the line of Fleischmann and Pons, and now I'm going to jump 10 months and go to October 1989: we are in Trento, the scientific congress. I am in a corridor where there were the congress works that I was talking to Roberto Habel, a professor in Cagliari — with whom we are linked by a long friendship - a mutual friend of ours, Francesco Piantelli of Siena, approaches us and says: “there I have to talk"

[26:49] Then he linked this phenomenon he had seen to what Fleischmann and Pons said, what they said. He said: "it's probably an effect similar to Fleischmann and Pons." I immediately said "look, I don't believe it Francesco: it is useless to talk about it". I expressed my disbelief. Habel was also not a believer in these things. But in short, Piantelli says "let's go to dinner together, let's discuss" and he wouldn't let go. And by dint of talking he convinced us. He convinced us to repeat his experiment to try to see what actually happened.

[27:25] I have to say that I accepted the game as a joke. I liked only one thing: that Piantelli having this thing - it could have been important - had chosen me and Habel: it meant that he had faith in us on two levels which I consider extremely important; the second more than the first. One who trusted that we could be people who could help him in what he wanted to do, but the other who trusted people who would never have stolen the idea, because it is "dangerous" to tell others about their own idea. I will always be grateful to Piantelli and grateful for this esteem for me - which I also reciprocate.

[28:05] And the game begins, a hobby, a strange game in which we gather but not very frequently, we begin to analyze Piantelli's experiment; what was there? But there were the gangliosides, there was the nickel on which the gangliosides were supported, there was deuterium. What can it be? We begin to argue in the long run and eventually say "probably the ones responsible are nickel and deuterium", taking into account what Fleischmann and Pons said. To repeat the Piantelli experiment, what should we do? We need to re-prepare a nickel sample by putting deuterium inside it, to review the effect, and then to go to 100 degrees below zero and repeat the experiment.

[28:47] Then let's design an apparatus. Everything takes place with maximum economy: the experiment is not official, it does not exist ... nobody knows about this experiment. In Siena actually, Piantelli's colleagues know. But Siena is a small department, because there is no degree in Physics. Piantelli is a person of great intelligence, of great imagination, but he has always lived in a somewhat isolated location and perhaps his ideas never completed them as he wanted, so he has no credit with his colleagues. Piantelli is a "crazy" according to his colleagues, and the fact that Habel and I begin to appear in Siena is only reevaluating Piantelli, he gives two "crazy" people added to the restaurant: these are three "crazy" people who work on this problem; so for many months I made the figure of the "crazy" and I was aware of it.

[29:36] But this was our salvation, because nobody believed what we were doing, we were "crazy". In fact, now that the University of Siena, having recognized Piantelli's work, has given it the right space, where has it given it? To the former mental hospital, which no longer exists. Where, it seems to me, that he can be placed rightly [laughs]. Obviously we always joke among ourselves, because the work is also heavy.

[30:00] Well, together with Pianelli we begin this operation: load the hydrogen, the deuterium into the nickel. We build a small ... a box, we put the nickel, we begin to make tests, very empirical tests. And we find that when the nickel is around 300-400 degrees, it absorbs hydrogen considerably. This is something unknown in scientific literature, as we later discovered — but we started with empiricists in this work-we found out later, talking to the experts of the national cold fusion who said "but this does not appear to anyone what happens", yet it happens. Eh, but he says "the books don't say it" and Roberto Habel rightly said "but we hadn't read them". Fortunately for us, even nickel had not read the books and things worked; because the scientific literature is difficult to find and sometimes it is not complete.

[31:00] And by dint of doing these operations, load the nickel, with what? Well, we should have used deuterium, but since deuterium costs too much and is the "brother" of hydrogen, we said "let's put hydro[31:45] I pick up the phone and hear a voice saying "I'm Francesco Piantelli, an incredible thing happened". My answer is "but how do you know I'm here?". He says "I already called your house", so he woke us all up. 5:30 in the morning. And he says "last night, putting on hydrogen, the nickel temperature suddenly rose by 30, 40, 50 degrees" - he didn't even know it anymore: he was still scared at 5:30 in the morning - I got scared , then I say "well, what did you do?" and says "I made the void and the system has returned to peace". So I said "be careful, don't do it again: because if there are neutrons, if there is a nuclear reaction there are neutrons, you are ruined. Wait, we'll put the neutron counters. "

[32:27] So, this date is suddenly a turning point in our work because at this point Piantelli's experiment [of] returning to 100 degrees below zero with deuterium no longer makes sense, because we find that hydrogen at 400 degrees in nickel does these things. And it is much more convenient to work at 400 degrees than at −100 degrees, because at 400 degrees if there is energy it can be extracted; at -100 degrees it's just a game. And hydrogen is much easier than deuterium - moreover, hydrogen contains a little deuterium and this in our opinion is the cause of what we have seen.

[33:04] So at this point our experiment has completely changed and we are now studying what hydrogen does in nickel. But all this continues to happen in a kind of "carboneria", because we do not ask for research funds. Before we couldn't ask them why it was a game; now we can no longer ask them why there is the problem of patents and if one wants the funds for research he has to say what he wants to do, and then it is obvious that everyone knows it. So the experiment continues in absolute secrecy apart from the figure of the three "fools" we did with the friends of Siena.

[33:41] I would now like to show the schematic of the apparatus. Obviously I can't go into much detail, but this is very simple. This is the figure that we later published in the scientific journal; you see the room, that rectangle; in the center there is the nickel and around the nickel there is the spiral that warms it, because to warm the nickel we have to put a heater, a kind of electric stove. Then in this chamber we can put hydrogen or deuterium — but from a certain point onwards we only work hydrogen — and we put hydrogen inside and at some point after a certain number of loads, the temperature of the nickel suddenly jumps up, 40 degrees the first time, then another 40 degrees and so on.

[34:31] And so we find ourselves in a condition in which, for the same energy put in, the temperature suddenly increases for these effects, and this means that someone else puts energy, otherwise it is not understandable how this growth occurs. In essence, the idea is this: if we have a container and in this container we heat the internal part, as it heats up increases the energy output to the outside. When the energy that comes out is the same as that entered, the temperature stabilizes. So our measurements are extremely simple measurements, because we measure the electric current, an electric voltage and a couple of temperatures, a pressure. That is, all stuff level ... so, in short. In short, any person.

[35:26] Okay, we built the device in a certain way, but then the measurements are trivial. Then in the end there is a calculator that records, that does everything, and so on. And this whole operation lasted the whole 1993 with multiple chambers, with multiple samples, repeating the experiment, finding the same results and arriving in certain situations where the difference in energy between what we put in and what came out came about fifty watts. We also reached 57 watts, which is the energy of an electric lamp. So we went from the bulb of the Fleischmann and Pons Christmas tree to the electric lamp.

[37:00] So what is it? Is it perhaps the cold fusion of Fleischmann and Pons? But "cold fusion" has become a dirty word in physics: it cannot be pronounced. Rightly so, because science cannot march by exclusion: it must demonstrate things and we are people who must keep scientific rigor. But now we have the result, we can no longer keep it; we are now at the end of 1993: we decide to write a quick letter in scientific work, running - of which this is one of the figures - we present it to an international journal of Italian physics, which prints in Italy, the New Cimento, which tends to does not accept such works because the scientific community considers these characters on the sidelines.

[37:44] We suddenly entered the margin, that is to say, from people who were valued by many, suddenly we become people to be wary of - but it is a risk that we had to take - but the magazine suddenly accepts it, the job. And the job goes to print. But in the meantime another phenomenon happens: the serious scientific journals do not publish the work on the basis of who presented it, but they show it to others to criticize the opinions. So this job went around by someone, and someone of these passed it to the friend, and the friend to the friend, and something like this happens: that we realize that the Italian insiders know it. They know it because they begin to call Piantelli, Siene, and ask for strange information: "can I come and see what you are doing?", "Can I do ...?".

[38:37] And Piantelli, who can't say no to people, but has a certain dose of cold humor, what does he do? He says yes. Among other things Piantelli worked in a small room that would have been slightly larger than this table, put in a different way; now he has the "madhouse" and space has it, but before he did not have it. In this small little room Piantelli introduces strange things, for example a high frequency pulse, deliberately, in a corner. And these visitors observe them that out of the corner of their eyes they look at this object and do not have the courage to ask them, perhaps. And then they call me or Habel and he says "but what is that strange impulse I saw ...?" And we say to him "but it doesn't help", but they don't believe it: "in a room so small because never does one hold an impulse? ”.

[39:28] Then at some point we needed a compressor and he deliberately leaves the compressor. At one point I said to him "put a black cat with a bakelite rod in it, at least someone will think that we are superstitious or not superstitious and that we use electrostatics for rubbing, because ...". So these strange games are born, but we know that by now everyone knows, why they talk to each other, why they try to understand. And then at some point we become aware that we need to take the next step. We have already done the first important one: the scientific journal, but that's not enough: it takes a scientific presentation to the experts

[40:04] So let's have a restricted invitation conference on February 14th in Siena. And they all come: the email, the e-mail, the fax, everything, and quickly in a few days all the Italian experts arrive in Siena, and we tell them what we have done, but they largely know it because they have seen the work, even if they don't know certain things. My friends appoint me as an official speaker, probably because I can cope with them more than certain possible questions, I don't know. In short, in the end I wanted Piantelli to speak; Piantelli didn't feel like it and in the end I spoke. So I became the official speaker of the group. But first we agree on everything.

[40:46] And here the meeting is very interesting, because cross-cutting discussions arise between those present, among them; they even give us advice, not criticism — we expected criticism — they tell us “but why don't you put an external thermometer on and go and see what the external temperature does?”, because there someone can say that things can happen on thermometers, and we said: "we are already preparing it".

[41:10] And others tell us: "but why don't you take the gas, analyze it and go to see if there is helium-3?". Because if there is nuclear reaction, in our hypothesis there is helium-3. Among other things, I must say, that during these processes, we checked the radioactivity around, if there was radioactivity around the chamber, and there is no radioactivity neither of neutrons, nor of gamma. Obviously, for our safety. Piantelli would surely have died if there had been radioactivity with all the tests he had done.

[41:43] And then I learned at the press conference that the Rector, who lived downstairs, was also happy with this. Maybe that's also why he sent the dangerous tenant away [laughs]. And then there is the problem of colleagues, of the people of the Institute in short ... it was necessary ... therefore we did things seriously, even if as "illegal immigrants". So there is no radioactivity, perhaps because the reaction is helium-3 plus electromagnetic energy, and therefore there are no neutrons - because if the neutrons are there they come out.

[42:13] So from these friends, colleagues, we collect suggestions but we can say "we are already doing it". These on February 14th. On February 15th there is a conference in Rome made by an Italian theorist: Giuliano Preparata from Milan, a theorist of cold fusion. A very nice person who, however, faces problems as if he were going to the crusades: if he finds an opponent who does not believe in cold fusion, he defeats him, attacks him. When I said at the conference that I didn't believe in cold fusion she looked at me like that and said "how? Didn't he believe in cold fusion? ”, And I didn't believe it, have patience.

[42:52] But he treated me like ... there was little left to insult me about my mistake, "original sin". He goes to Rome to do a seminar on the same topic and of course he tells everyone about our results, that he learned them 24 hours earlier in Siena. In Rome there is a journalist from the Republic, who warns Prazzico, who is the scientific editorialist, of the news. Prazzico begins to go around Rome, Frascati, La Casaccia, because he believes that we are doing something in Rome, I don't know: he suspected that we are doing research on the Roman centers.

[43:27] We know that Prazzicus does this; we try to stop him, trying to offer him something in return. But we already know that nobody stops him: the only journalist in Italy who has the news nobody stops him, we know that Repubblica will come out. So at this point we convene for the following Saturday, February 19th, a press conference in Siena. The press conference, however, comes after the Repubblica article that comes out titling "the Siena bomb" and practically telling everything we had said the day before and what was written about things.

[44:00] At this point the discussion goes on a general level. But at this point we have done things in order, because we first have the communication to the scientific journal, then the conference restricted to professionals, then we talk to the press, and at this point we can also tell the press that it is not able to go into the technical details [...]

[jump]

[44:24] [...] I collected this in another graphic that I entitled "Siena 4" —it is not the name of a taxi, it is the fourth chamber of Siena — which is completely different from the previous ones. I don't want to go into details now but there is always nickel - that green object with hydrogen - but this time the thermometer is outside. There is an external heater, but the thermometer is outside. And then, here at the bottom right maybe you see [...], there is an external thermometer that measures the external temperature of the system.

[45:02] Well, this external thermometer, when the effect in this chamber was re-verified - which so far has not been very high and we have not yet understood why - it went up to a temperature of 1.6 ° C the first once, 2 ° C the second time. This is a thermometer in the air: he does not know that we are trafficking with hydrogen, with nickel; he ignores what we do, he measures the outside temperature. And if the outside temperature increases, it means that there is more energy coming out from inside. This is a novelty that we have put together in the meantime, in my opinion very important, because ... because it eliminates certain suspicions of people who thought that they could be effects of thermometers and things like that; so today we can say "there is energy that comes from within", this we can say.

[45:54] We can say that this energy is not chemical because chemistry is not enough to explain the quantities of energy we see. And then it is an energy of another form. What other form? Well, if one has to think about the known forms, there is only the possibility that it is nuclear, even if one does not understand how it happens, where ... who is it that gives hydrogen or deuterium this enormous energy that they need to melt, which they find easily in the stars, because there is temperature, but there is not here.

[46:27] But here it is clear that we do not know these things. However, if there is energy production there must be something, there is no doubt about this; we do not feel like saying that the principle of energy conservation is no longer valid. This is unthinkable. So now we are left with the problem of proving that there is nuclear energy, if nuclear. There is no doubt that if it is nuclear, we will test it, because we just need to find helium-3 - which is the product we expect - to have evidence, because helium-3 is a very rare gas: it is a million times rarer than helium-4 which in turn is rare. Helium-3 costs one million [lire] per liter — among other things, this would be a machine to make helium-3 if this worked.

[47:10] So we have the strategy to do these tests, which we will do. What has happened in the meantime? Well, this is Siena 4 which comes after the press conferences. A room has already been put into operation in Cagliari, which we now call Cagliari 1, otherwise we no longer understand anything at the end. In Bologna, we are starting the construction of a room, also in Bologna; in Siena, in the “asylum”, another 3 or 4 will leave soon; therefore we are expanding the structures in such a way as to experiment on many apparatuses, because these measures are long measures: they take time.

[47:49] And then it is clear that if one has multiple apparatuses he can make many measurements, if one has few, he can make few. You have to try everything: you have to prove if things work or not with deuterium, with mixtures of hydrogen and deuterium, other metals - we suspect other metals - and then try to increase the power. Will we be able to increase the power? And I don't know this right now. We are already preparing - in Siena always, our strength - a machine similar to this one that if it goes, should produce a kilowatt, so we are now at the level of a good stove. But we don't know yet, because we know too little about this system.

[48:33] A few days ago a journalist — I don't even remember which newspaper — talking about and asking about these things at one point he said to me: “But what do you say about this thing then? What do you think? "And I say" Look, here we have to put "if". If the energy is nuclear, and we don't have the evidence — and [if] we don't have the evidence, we can't call it cold fusion, otherwise we will kill our colleagues — if it can be produced on a larger scale then it will be a great result for physics and applications ".

[49:10] Then he said to me "But professor, this then perhaps is the discovery of the century." Certainly, lacking modesty, I said to him "say also the discovery of Humanity. Because here no radiation comes out and because there is absolutely no pollution and because the source is unlimited, so if all this should happen we will certainly have achieved a result that remains in the history of humanity "

[49:37] So this reporter asked me a question that I had never asked myself and said "but you say, how did you feel the next day?". I thought about how I felt the next day. I said "I felt exactly like the day before". And he says "but how? He says, you make the discovery of Humanity and feel exactly the next day as the day before or two days before. "

[49:58] Eh, the reporter was right. And I said to him "but look, maybe here we have to understand each other. I am not working for the good of humanity. I work because I enjoy it. If I didn't have fun, I wouldn't work; I'm basically an egoist, don't take me for a benefactor. " I thank you for your kind attention.

[Applause]