Interview: Martin Fleischmann

'When benefits are great, experiment'

by Ralf Schauerhammer

Dr. Martin Fleischmann gave the following interview to EIR *on April 22, 1989. The interviewer is the managing editor of* Fusion, *the publication of the Fusion Energy Forum in West Germany.*

EIR: I will not ask you if the experimental results you obtained are correct. I think we can start from the fact that what you did was a great breakthrough. So I wanted to ask you more about the ideas behind your work. For example, when did you get the idea that it might be possible to realize nuclear fusion in this way?

Fleischmann: I have had the idea since about 1970, but there were many reasons for thinking it would not work. I accept that absolutely. Physicists find it extremely difficult to accept. There are many, many reasons for thinking it would not work, and there are just one or two reasons which make you think it might possibly work. I think it is totally impossible, by theory, to predict whether it will work or not work, so you do the experiment. Low probability of success times high benefit means you do the experiment! Right?

EIR: Exactly. I fully agree.

Fleischmann: But, of course, for many years I did not think it would work. We actually started working on it five years ago.

EIR: Could you describe your thinking? In your paper you say that you observed certain anomalies, which are not further specified.

Fleischmann: Anomalies, well, there are many anomalies. There are many things which are not understood about it. Actually that is not true. Professor Pons and I understand it much better, but we cannot actually talk about it, at the moment. You understand that [laughing].

EIR: I understand. But you did it.

Fleischmann: We have much more evidence than is disclosed in this paper.

EIR: I am sure.

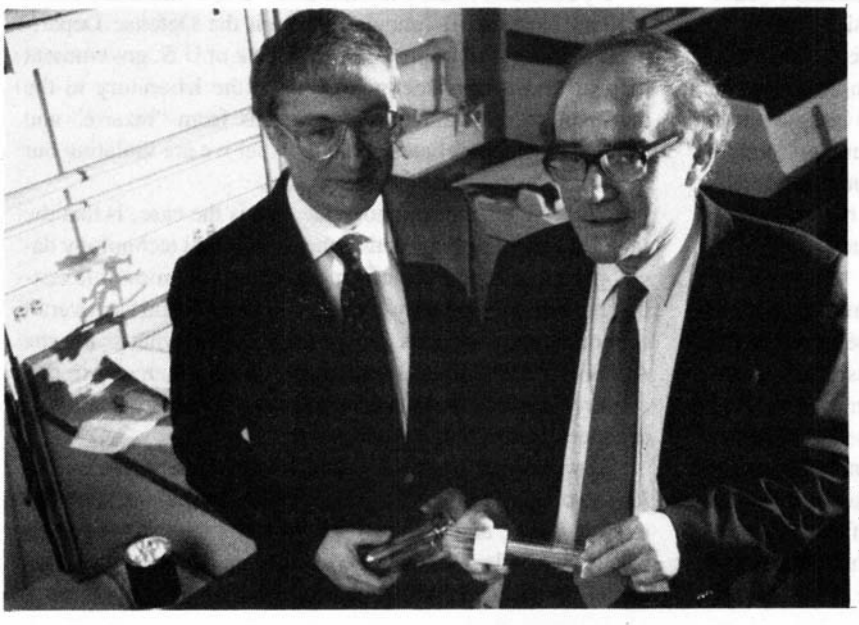
Fleischmann: Which people are very curious about, they want us to tell them the whole story immediately, but—no!

EIR: Do you think that palladium is very important, because of its general catalytical role in chemistry? Did this lead you to some of your ideas?

Fleischmann: I think we can think of other systems which are worth investigating—many. We do have a theory. Our own theory is such, that it would lead us to investigate certain types of metals and alloys.

EIR: Do you see a relation to the muon-catalyzed fusion, which is usually called "cold fusion"?

Fleischmann: Only in the sense, that we think heavy fer-



University of Utah

Drs. B. Stanley Pons (left) and Martin Fleischmann hold the electrochemical cells with which they have created a sustained nuclear fusion reaction at room temperature.

mions are important.

EIR: You say you have a theory. This theory, I imagine, must at the least, attack two taboos of today's physics. One of them is that processes in the electron-volt range and the mega-electron-volt range are totally separated. Your approach indicates that you do not believe too much in this.
Fleischmann: I don't think the separation is quite as sharp as the physicists would want to make you believe. I think the core question is the screening of the Coulomb potential. The Coulomb barrier is effectively screened. And the other point is, that the physicists are wrong about where that barrier is penetrated. It is penetrated higher up than people think.

EIR: That is exactly one thing I wanted to ask you about later. So let me ask it now. I see your results in connection with other discoveries in solid-state physics. We saw the discovery of so-called "quasi-crystals," refuting ideas which had been held for a very long time. We had the high-temperature superconductors. And now your results. Aren't we experiencing a revolution, which might force us to turn the so-called "many-body problems" on their head?
Fleischmann: Of course, if you want to have it in a nutshell, you have to use a quantum formalism which is consistent with the grand co-momental ensembles, so that must be a many-body approach. That is phenomenally difficult to do. You see, the problem is, in theory you need a relativistic treatment of a many-body problem, and that is extremely difficult. But I have no doubt, one will attempt it. If nobody does it, then we will have to do it ourselves. But we are better occupied looking at the experimental side, in my opinion.

EIR: Do you agree that it might lead to a very basic reformulation of fundamental theory?
Fleischmann: No, I think one knows what one has to put in. It will lead to a reevaluation of what is important. I don't think, that this, for instance, in any sense would affect unified field theory. I think what one knows would be adequate for the interpretation. One can dream, that there might be some very peculiar phenomena, which I won't even tell. I think there are at least two very strange phenomena, one could envisage what could possibly take place; but before speculating about that, I think one has to explore how far one can get with existing concepts, and I think one can probably find adequate explanations of the phenomena in terms of existing concepts. That would in turn predict new experiments which have to be tested.

EIR: Do you have ideas of those experiments?
Fleischmann: Oh, yes, we have done some of them already.

EIR: But you probably don't want to talk about it.
Fleischmann: Not just yet. . . . I am going to America on Monday and I will be there until about May 20. Professor Pons and I are going to the Electrochemical Society meeting in Los Angeles on May 8. We may release some more information there.

EIR: There is another interesting factor which I think I picked up in your work, and which I consider to be very important. You express the idea that more than two nuclei might be involved in a nuclear reaction. This implies that you do not approach this from random processes but that you think more of a fusion process which is coherent, like a laser.
Fleischmann: Could be. . . . I think a boson condensation, condensation is a little bit far-fetched, but one has to bear it in mind. Something like a boson condensation—don't call it a boson condensation—but something akin to that could lead to a lowering of the Coulomb potential certainly. I think that it is not too impossible that you have a collective phenomenon of deuterons in the octahedral spaces in the lattice, a sort of nucleation, not nuclear fusion, but nucleation of what is in fact metallic deuterium, a nucleus of metallic deuterium bound by heavy fermions. That is not too impossible to imagine. But, I'm telling you much more than I should. . . . I don't know what you are going to make of my theorizing. Do you want to ask some other questions?

EIR: It is of great interest what the economical and political implications of your work are. You probably know that

The basic experiment

Electrochemists Martin Fleischmann and Stanley Pons achieved fusion at room temperature using a simple electrochemical cell. They placed a platinum anode and palladium cathode in a 99.5% pure heavy water bath and connected them to a low-power DC current source. Heavy hydrogen was generated and slowly absorbed by the palladium metal.

They report energy generation exceeding 10 watts per cubic centimeter of the palladium electrode in which deuterium-deuterium fusion is taking place. They carried out experimental runs with this level of fusion output for more than 120 hours, measuring a total energy output over this time period in excess of 4 million joules per cubic centimeter of the palladium electrode.

The experiment is generating upwards of 10 times the energy input used to keep the cell in operation. That is, the experiment is 10 times beyond breakeven energy generation. As the researchers noted, "It is inconceivable that this could be due to anything but nuclear processes."

greenies like Jeremy Rifkin are up in arms. Did you hear that Rifkin said that this is the worst thing that could have happen to our planet?
Fleischmann: Why do they say that?

EIR: Because they are crazy, I think. Paul Ehrlich said that the prospect of cheap power is like "giving a machine gun to an idiot child." That's what they are saying. I think that is a crazy reflection of something quite real.
Fleischmann: First we have to see if this thing can be got to work. I say to everybody: The approach to this thing so far has been most irrational and nobody has been more irrational than the scientists. It is an experimental observation, which has to be confirmed or denied. If the experimental observation is correct, then there is the question of the theoretical interpretation. If our interpretation is correct—it's either right or wrong—then comes the technology. If we are right, and in fact, we are getting thermal effects without any appreciable radiation, with only the generation of helium-4 or predominantly helium-4, why should anybody complain? It's insane!

EIR: Sure, that's true. They complain, because they are committed malthusians, because they want to reduce—
Fleischmann: Well, I agree with that, too. I think the future of the world demands a restriction on the increasing standard of living, a reduction of the world's population, and alternative sources of energy. It requires all of those things—not one, all! And, of course, because I am committed to that, we do the work. I don't only do that thing, I do other things as well along the same line. But—

EIR: On the reduction of population I would not agree with you—
Fleischmann: Well, I think somewhere along there must be a limitation.

EIR: Perhaps somewhere along, but the carrying capacity of the world is not—
Fleischmann: It's bigger, it's not reached, thank goodness! I thought the green people were, on the whole, initially in favor of the notion. But they are not, you say? They are against it? Well, if it is developed into a technology, then the short-term situation is destabilizing.

EIR: There are some military implications also.
Fleischmann: I don't want to talk about that. I can't say there are no military implications, but they seem less than with many other things.

EIR: But from an economical point of view it would be just what we would like to have. Nuclear energy with no radiation.
Fleischmann: The short-term situation is destabilizing. Therefore it has to be approached from the point of view of an international development, absolutely! I think the political implications have to be grasped early on.

EIR: Do you see this in connection with the ongoing political process since Reykjavik? Does this lead to common research between the United States and the Soviet Union?
Fleischmann: I think this is so large that there will be a thousand different laboratories developing it. I think there will be some international cooperation. But I think, in the end, there might have to be international control and license to exploit it. That is my view. I think, if I would forecast the likely development, that if it is successful, there will be international control and licenses for it.

EIR: One can imagine technologies that are relatively easy to produce, which would not need licenses and even make it difficult to—
Fleischmann: Most projects fail at that stage. Lets face it. Four hundred ninety-nine out of 500, or 999 out of 1,000 projects fail because of some technological barrier which you simply cannot cross. One has to be aware of that.

EIR: I was surprised about the debate among the scientists, which seemed not fully to be carried on by joy of contributing to the progress of mankind, but much more by selfish concerns. I think that reflects a general cultural problem. Do you have some ideas how to improve the scientific debate?
Fleischmann: Well, I went to Erice, [Italy], you know, to Professor [Antonino] Zichichi's conference, and the debate there struck me as irrational as anything I have ever heard. It seems to me the whole thing is being conducted at a very irrational level, which dismays me. I told you what my attitude to this is. An experimental observation requires experimental verification or denial, before you start to theorize. But the attitude to it is: It is against the currently accepted theory, therefore, the experiment is wrong. That strikes me as—well, one thing that this is not, it's not science—that's hysteria. There are many reasons. I almost feel that some people feel themselves threatened by such experiments.

EIR: By the way, are you talking a lot to the tokamak people?
Fleischmann: No, I don't really talk to the tokamak people. I have a high regard for that research. I would like, if you write something about it, to put me on record, that I do like independent small-scale reseach, but that I also see the merit of large-scale projects such as magnetic or inertial confinement projects. It would be a disaster if those were affected by the possibility of some other route. All those projects need to be investigated. They are based on sound scientific principles and should be investigated in a sound scientific manner, just like our project should be. I don't have much to say, to contribute to them really. I'm not a specialist in this area. They would have a lot to contribute to this project.

EIR: What is the most important point one should make on

For zero growth fanatics, nothing could be worse

The following excerpts are from the Los Angeles Times, *April 19, 1989, p. V-1 ("View") section, "Fear of Fusion: What If It Works?" by Paul Ciotti,* Times *Staff Writer. They exhibit how obsessive the irrational element in our society is about refusing to give up technological pessimism. Paul Ehrlich is the author of* The Population Bomb, *and Rifkin wrote* Entropy, *pseudo-scientific works which have been debunked by this review's editors.*

"It was," one Berkeley physicist said, "like seeing your car suddenly jump on the roof. It was that unexpected and stunning."

. . . Even if it [works], given society's dismal record in managing technology, the prospect of cheap, inexhaustible power from fusion is "like giving a machine gun to an idiot child," Stanford biologist Paul Ehrlich says.

Laments Washington-based author-activist Jeremy Rifkin, "It's the worst thing that could happen to our planet."

Inexhaustible power, he argues, only gives man an infinite ability to exhaust the planet's resources, to destroy its fragile balance and create unimaginable human and industrial waste.

Stanford's Paul Ehrlich says he has no problem with the notion of cheap, clean, inexhaustible power per se, which could be a tremendous boon to mankind.

The problem: Industrialized societies, so far, have not used power wisely. The world's limited supply of fossil fuels is rapidly vanishing up smokestacks and out tail pipes. Rifkin cites a 1985 University of New Hampshire study showing that 88% of the Earth's oil and gas reserves will be depleted by 2025.

And even if fusion turns out as well as it has been promoted, Ehrlich says, it won't be a panacea. most problems in the Third World, for example, are social, political, or economic, not technological, he says. "The idea that you can solve the human dilemma with a single technological breakthrough is incorrect."

The current unqualified euphoria for fusion also concerns Barry Commoner, director of the Center for the Biology of Natural Systems at Queens College in New York.

He argues that fusion power could prove to be a dangerous distraction from existing energy sources. It does not make sense, he says, to jump on an unproven, possibly dangerous technology like fusion when a safe, proven, and decentralized technology like solar power is there for the asking.

Since fusion "does not yet exist," Commoner says, "it would be foolish to design a transition based on the assumption that it will exist. It's like starting to build a bridge over a river without knowing where the other side is."

To those people old enough to have been present for the original debates on nuclear fission, the unbridled enthusiasm for fusion power sounds strangely familiar.

In 1946, Holdren says, a famous physicist named Arnold Sommerfeld predicted that with the development of nuclear energy, "electricity would be too cheap to meter" and nuclear energy would abolish poverty from the face of the Earth by 1960. "They always oversell," Laura Nader says. It is only much later that you hear about the downside.

Quick-fix hopes

To Rifkin and Ehrlich, this is the real danger of fusion power—it gives people the false hope that a technological quick fix to the world's problems is just over the horizon. "Fusion power is an expedient short-lived diversion to the real problem," Rifkin says. "It gives some people the false hope that there are no limits to growth and no environmental price to be paid by having unlimited sources of energy.

But in thermodynamics, which is to say in real life, there's no such thing as a free lunch. "Even if one component is cheap," Rifkin says, "you pay the price somewhere else.' "

the matter as it stands now?

Fleischmann: I think people should try to verify the main point which we made, namely that there is an anomalous release of heat. I think they should not be going around looking for neutrons, which I think are a side issue, and for which we have ourselves got theories, you know. But I think it is a side issue. They should attack the main problem, which is the energy release. And I have nothing to say to people, who say they cannot find neutrons. Under many situations we cannot find neutrons either. Just as well, as [otherwise] we would be dead! [Laughter.]

EIR: So you are quite alive and happy, and looking forward to developing some new ideas?

Fleischmann: I'm fit and ready to attack the problem anew.

EIR: I wish you good luck.

Fleischmann: Thank you for your interest.