Cold fusion generators possible in five years

Physicists Frederick Mayer and John Reitz have a new idea about what makes the controversial "cold fusion" experiments work. Their concept could revolutionize the world economy in 20 years.

Since the announcement of "cold fusion" on March 23, 1989 by Drs. Martin Fleischmann and Stanley Pons, the major media as well as the scientific establishment have insisted that there is no such thing, that the results reported were merely an appearance resulting from poor diagnostics, or even fraud. But on April 25, 1991, two plasma physicists, Frederick J. Mayer and John R. Reitz, held a press conference in Boston, at which they asserted that with modest financing from private industry, they believe that they could build a working demonstration nuclear reactor in five years, based upon the Fleischmann-Pons experiment.

Scientists in Japan, India, Eastern Europe, and Italy, as well as in leading laboratories in the United States, have confirmed the experimental work of Fleischmann and Pons. While the results have been in some measure anomalous and the experiments do not always agree quantitatively, there has been a consensus by nuclear scientists that something important and new is happening.

Now Mayer and Reitz claim that they have developed a theory, which has major commercial as well as theoretical implications, which can explain these experiments. They conclude that what is really occurring is the creation of a new kind of very short-lived particle which is able to penetrate the nuclei of heavy metals to produce results very like what occurs in hot fusion. In other words, they confirm the experimental results achieved by Fleischmann and Pons, and the other scientists who have successfully repeated their work, but they disagree about the theoretical conclusions.

Rather than the fusion of two deuterium nuclei or a deuterium and a tritium nucleus taking place at room temperature, they believe that the deuterium or tritium is compressed in a palladium lattice so that a virtual neutron, which they name a hydron, is formed by the condensation of electrons on a proton. The hydron then is capable of entering the nucleus of a heavy element such as palladium, or perhaps some of the contaminants typically found in palladium samples.

The April 25 press conference by Drs. Mayer and Reitz followed a scientific seminar given by them at the Massachusetts Institute of Technology. They have published a technical paper on this which appeared in the May issue of the journal Fusion Technology.

Mayer has more than 20 years of experience in magnetic and inertial confinement fusion research and now heads a consulting and research firm in Ann Arbor, Michigan, called Mayer Applied Research, Inc. Reitz, a theoretical physicist, is his principal collaborator. The MARI company has applied for several patents on practical nuclear reactor systems and processes that make use of the new research discovery. MARI is also looking for industrial partners for joint R&D projects.

A series of experiments proposed by Mayer and Reitz should confirm or disprove their theory. Most exciting, if they are proven correct, they say that they can build a demonstration reactor within five years. According to their expectations, the "cold" fusion reactions will optimally occur at higher temperatures, in the 7,000° to 8,000° Celsius range. This is well within the range of existing materials technologies, in contrast to the problem of developing a workable reactor with more traditional "hot fusion" temperatures in

Dr. Frederick Mayer (center) and associates announce their new theory of cold fusion at a Boston press conference.

the range of 100 million degrees. Mayer expects that after a successful proof of principle within five years, fusion power can have a global impact on the world economy within an additional 15 years.

Excerpts from their press conference follow. The transcript was made available to EIR *by* 21st Century Science & Technology *magazine.*

A new theory for a new particle

Mayer: We have invited you here because we think we have made an important advance in the understanding of some of the very anomalous observations that have been made in different areas, cold fusion being one of them. We did some work which finally resulted in a publication yesterday.[1] Since a few of our colleagues had heard about the publication, we were invited by Prof. [Peter] Hagelstein and Prof. [Lawrence] Lidsky, at MIT, to deliver a technical seminar about thid since we thought there was interest beyond this particular locale, we decided that it was appropriate to invite the media to come and talk about it and hear about what we have done.

Let me give you a brief history. I am a plasma physicist by training. And John [Reitz] has been involved in both solid state physics and nuclear physics. I spent a number of years working in laser-induced fusion and in some smaller sense in magnetic fusion as well. I have been involved in trying to control fusion for most of my professional life. When the cold fusion experiments first came out two years ago, it was impossible not to take a look at it and try to find out what we thought was going on. John and I got involved in trying to figure out how you could make some neutrons from deuterated metals. In fact, we published a paper given at the Santa Fe meeting in 1989 [a Department of Energy conference on cold fusion] having to do with cracks generating accelerated deuterons, therefore yielding neutrons in some reactions. We concluded, very skeptically, that this was very interesting from a scientific point of view, but certainly wasn't going to go anywhere with respect to large-scale energy production.

At that meeting, however, I was bowled over by certain of the data which were not as clearly brought to me in some of the earlier publications. So, when we got back, we started thinking more broadly about all the issues. And as the data started rolling in, it became more and more apparent that something very important was happening here; so it was hard not to continue working on it.

Our paper is the first in a series of papers on the implications of this new energy source. What we have done is put together a new theory for what we believe are a new set of nuclear reactions mediated by a new particle—actually a new series of particles. This theory provides a framework within which you can attempt to understand all of these anomalous phenomena, not just cold fusion. In fact, the theory gains its strength, as far as we are concerned, from the fact that it applies equally as well, and more quantitatively, if you will, to the area called cluster impact fusion [experimental work with ion-beam fusion conducted at Brookhaven National Laboratory].[2] It also goes some distance, we believe, to understand some of the other anomalies; for example, thermochemical fusion as the Soviets have described certain experiments. Also it produces an explanation for other anomalies, such as bursts of tritium coming out of volcanoes, which has been pointed to by Steve Jones [at Brigham Young University in Utah] and others. It explains, as well, finding high levels of helium-3 inside metals, and other things. Let me get to just a very brief outline of what we think is going on, and why we think it provides the framework for understanding some of these anomalous characteristics.

Of course, everyone knows that the big technical problem and the big conflict in cold fusion has been, how do you ever breach the Coulomb barrier [at which charged particles collide and their initial paths are deflected]. We have found, from assembling other people's ideas and our own ideas, That we believe the way this happens is by the creation inside metals and inside plasmas of a new particle that is compact, very small, and short-lived.

The new particle occurs by making a charge-neutral compact of a proton and an electron, or a deuteron and an electron, or a triton and an electron. Those three particles we have called *hydrons,* because they are formed with hydrogen nuclei and electrons. These objects are nuclear size, not atomic size. They last only for short periods, but during their lifetimes they are charge-neutral. Therefore, they don't experience repulsion in a Coulomb potential.

Transfer reactions

That's the Coulomb barrier part of the story. The other part of the story is that there are reactions that are allowed by these particles or that these particles provide an ability to begin. These particles now can have a new set of reactions with very high Z nuclei [heavy elements, Z being the atomic number], such as palladium or titanium. So it is no longer the case that the easiest reaction to have happen is the deuteron-deuteron reaction, the classic fusion reaction. These reactions are called *direct nuclear reactions,* or simpler, just *transfer reactions.* The transfer is of a neutron from either a deuteron or triton to a heavy nucleus; or a deuteron receiving a neutron from a heavy nucleus. The transfer can go in either direction.

In that transfer, there are no neutrons released, but there is nuclear energy released. However, it comes out in the form of charged particles of low energy. That obviates the biggest difficulty—or resolves the biggest conflict in cold fusion: what we jokingly call the "dead graduate student" problem. That is, if all of this heat is coming from the deuteron-deuteron reaction (D-D), you would have had to have created so many neutrons that you would have irradiated everybody to death. And you know you didn't do that.

The answer is, you don't do that, because those neutrons at that level are not there. There are still D-D neutrons being produced but in small numbers. And those are seen by experimenters as well. Let me summarize: The new physics here, as you might guess, is not in just one piece. It requires two rather interesting and rather spectacular events that have hitherto not been seen: One is the formation of these little compact objects, called hydrons; and the other is this class of reactions, which, when the Coulomb barrier is not there, have a very high probability of occurring—much higher than a D-D fusion.

Now, the other part of this is that to create these [hydrons], you have to have a certain amount of heat; you have to heat up materials because they have to be ionized. They have to have a lot of hydrogen isotope in them and they have to be ionized. And if you are doing it in metals, you also have to have the right metals. If you are creating the hydrons in a plasma, that is another way to have free electrons; then you can get ordinary D-D neutrons. That is what is happening in cluster impact fusion, and it is the reason that those results are also anomalously large (that is, the rates at which these are created is anomalously large).

Again, the theory offers conclusions about why nuclear physics can take place in these relatively heated regions in two places: inside of metals, in particular heated metals; and also inside of heated, high-density plasmas. If the density of the plasma is too low, you also don't create enough of them. These things, therefore, are happening all over, in a variety of anomalous experimental circumstances. In particular, there is a very good chance that these reactions are going on inside the Earth, as had been suggested already by a number of people, but could not be squared with the standard nuclear reactions, the standard D-D nuclear reactions.

One of those, an exciting one, is the recently reported Soviet experiment, where they took little pellets of lithium deuteride and dropped them into a container of heavy water

The Fleischmann-Pons original experiment

In the original experiment conducted by Martin Fleischmann and Stanley Pons, announced in March 1989, the basic apparatus consists of palladium and platinum electrodes placed in a glass tube with heavy water. A voltage applied across the electrodes splits the water into oxygen and deuterium, and the deuterium is then absorbed by the palladium. Excess heat at room temperature was measured, which Fleischmann and Pons attributed to a nuclear process—the fusing of deuterium atoms. The experiment occurs at room temperature, hence the name, cold fusion.

that was inside a neutron detector, and they made neutrons. That is a spectacular result, because it is created at temperatures of only a few thousand degrees. But it also tells you you don't need anything special like a palladium lattice to make fusion at very low temperatures. The point here is not to say there is not something special about palladium, because there is. There is a reaction that we list in our paper that operates on a tau hydron—that is, a hydron created from a triton—inside of metals, which reacts with the palladium to release nuclear energy. So, the palladium is, in fact, important in that set of nuclear reactions and is probably creating the heat, or at least some part of the heat in those experiments.

Similarly, with titanium, there is a certain reaction with one of the hydrons that creates nuclear reactions in titanium as well.

The right conditions

There is an important point that I should bring up, and that is that the reactions we have identified so far in so-called cold fusion, we believe, are operating on contaminant-level materials. That is to say, we have not used the right materials yet to get large amounts of energy release. Furthermore, we have not used the right conditions; that is, we don't want it to be cold. We want it to be heated, because that form helps to form the hydrons, and hydrons are the particles that allow the nuclear reactions to occur in larger numbers.

I should mention that there is evidence for the fact that these particles, these little compact particles, form—evidence that is separate from any nuclear observations, just standard observations on the interactions of hydrogen with metals. A well-known but little understood phenomenon is the hydrogen embrittlement of metals and the very high diffusion rates of hydrogen in metals. It is almost certainly the case that that also is a solid state physics observation of the existence of these compact objects, because it is these small objects that then can go through metals sort of unimpeded, compared to hydrogen itself, atomic hydrogen. The point is, though, that there are observations that now span a very large number of areas in physics that can be simple results of the fact that these compact objects formed. Only one of those observations is the observation of strange nuclear events. There is a broader set of implications for that.

Reactor systems possible

There are a few things we should now get to. One of the most important is that if these ideas turn out to be true, then it is clear that raising the level of contaminants in the right way could yield very large energies coming out. If those energies and those power levels can be sustained, still maintaining a very low level of penetrating nuclear radiations, then it seems that reactor systems would then become possible, probably with very small amounts of shielding, which would be very important.

It also appears, if these things are correct, that these reactions, and therefore the ability to do something with them, should be easily accessible. It is not complex, like many other systems trying to release energy from the nuclear domain, which become either very large or very costly.

From the technical point of view, our company is doing a few things. One, we, of course, have applied for certain patents to take advantage of what looks like a clear path to an energy developing system. And we are actively seeking strategic partnerships with large companies. We are really not interested in small investments, because we think this will quickly go from where we are now, to where we want to be in a very short time. And, therefore, we are looking for partnerships where people have more than money—where they have a distribution network, a production network, and a capability, if this path is really clear, of getting there fast.

We also believe that the government should be interested in these things, but may not be. They may not be able to help out quickly enough, because I think if these things are correct, that we may be able to quickly get to a place where industry is the primary player. We hope that is true.

Those are the main points that I wanted to make. The topic is broad. The ramifications, of course, are very extensive. And, of course, you understand that at this point, this still is theory, but we have high confidence it is correct, because it is supported by many otherwise very strange observations.

From the discussion with the press

Q: To what degree does what you have found, or what you believe you have found, validate the findings of Fleischmann and Pons . . . to vindicate the position that they have taken on cold fusion?

Mayer: . . . I am not trying to vindicate anything. I would say that I believe they were mistreated in many ways by what has transpired. That's more a statement, really, about our country, than anything else. I am sorry to say that that is the case. . . . I believe . . . I am making a sociological statement. The fact is that science proceeds by allowing information to flow out, to be criticized, and then, if it's not right to go away—not to try and make the people go away. The idea, if it is okay, will survive. If it is not all right, it should disappear. But the fact is that more than that has transpired in this issue. And that is something I am sorry to have seen happen in this country.

Reitz: We believe that the experiments that Pons and Fleischmann did were good experiments. They did see new effects that had not been observed before. . . . There are other experiments throughout the world that indicate the same type of thing going on, or at least nuclear reactions going on at moderate or low energies. But the Pons and Fleischmann experiments were striking. And clearly they are the ones that got us interested in it in the first place. We think their interpretations of the specific reactions that they identified as cold fusion were probably not correct, although at higher temperatures they probably would be. They said they thought they were the D-D reactions. I think they did say something about there may be other nuclear reactions going on, and that is basically what we are saying now: that experiments that have been done so far primarily are working on the contaminants. And they are a different class of nuclear reactions than the conventional fusion reaction.

Mayer: What is certainly being observed at these very low temperatures are these transfer reactions. And it really isn't a fusion reaction. A fusion reaction in general means you form a compound nucleus, which then comes apart. This is a reaction where a light particle comes in and a neutron jumps across the remaining gap. You don't have to fuse the whole objects. It sort of tears the neutron out of one nucleus and puts it in the other. But it is still the case that the Pons and Fleischmann experiments led us to try and understand what was going on, plus all of the other strange observations.

We bring up cluster impact fusion because it also can be explained on the same basis of physics. There is no necessity to make up anything different for all of these anomalous observations, including the tritium coming out of the earth. All of these things fall under this larger blanket of the formation of this new class of nuclear reactions and hydron formation.

Q: To what degree can you empirically verify the existence of these particles? And to what degree does it rely on circumstantial evidence and computer modeling?

Mayer: There is no direct observation, yet, of those particles. Actually, it may be very hard to make a direct observation. But this is the same phenomenon that is observed in many other areas of physics where a couple of particles get together, run around together for a little while, and come apart. That is a standard type of phenomenon. It is well known, for example, with positron-electron pairs. It is well known in elementary particle physics, as well. These are called continuum bound-state resonances, the more technical term. Usually in such resonances they are given names, and we decided that since this is the only one that we know of that is more like an atom, to give it a special name—a hydron.

Q: How long have you been persuaded that this phenomenon does in fact exist?

Mayer: Of course, when you don't understand something, you have fluctuations in belief. And we certainly had fluctuations in belief, too; but, when I came back from the Santa Fe meeting [in 1989], there were a number of things that I just could not say were errors. One of those was the observation of all of this excess heat. That's the biggest signal, if you will, in all of these experiments. There is heat that is unaccounted for by other processes that are known. The second was the generation of MeV particles, for example, in a sense out of nowhere.

Reitz: Let me mention one other thing. There are two experiments mentioned in our paper that give evidence of a nuclear transformation of the type that Fred has described, that is, direct neutron transfer. And actually there is quantitative evidence. One has a change in the isotopic content of palladium. And the other one involves a charged particle coming out of titanium after being subjected to this low-temperature environment to produce cold fusion. These are exactly what we predict. These reactions could not occur without some kind of neutral particle, of the hydron type, mediating this type of effect. So, we do have some experimental evidence. It is indirect, but it is supportive.

Mayer: It is quantitative. And it could not occur, so far as we know, by other nuclear processes. And since it also, as John said, could not occur without the formation of these hydrons, it is very suggestive that that is what is happening. Of course, by itself, it is not a direct confirmation. All of this evidence is suggestive. The important point is that the evidence is suggestive in a broad class of reactions. And . . . we are pleased by the fact that it is testable. It is not a general theory; it is very specific. It says: If this happens, then this is what you would see. So, it is testable, and with the tests, if it's proven wrong, then it is just wrong. You have to go out and try again. . . .

Q: You said you expect it to mature, in your words, fast, and I gather go commercial. What does fast mean?

Mayer: You are going to put me on the spot. I would say five years. We have put down here five years to get things to the prototype stage. And I think it would take another 10, typical of technology in fusion and to the society, another 10 to 15 years to grow it to the point that it impacted the society, say, as a computer did. . . . There is a lot of experimental work to be done. But we know what to do.

Q: You also indicated you are looking for big money.

Mayer: . . .The point is that we it will take us a certain amount of money. The big money is not big money on the scale of other enterprises, on the scale of what this could mean. It is big money for our company, but it is not big money on the scale of say, big companies.

Q: Is there danger of a meltdown?

Mayer: If the material gets too hot, from generating its own nuclear energy, the reaction rate goes down. So, there is an optimal temperature at which this will operate, which is something like, nominally, 7,000° or 8,000° C—which, by the way, is also the temperature, approximately, at the center of the Earth. That may not be just coincidence, by the way, and that is a statement about geophysics. But . . . there should be no problem with runaway; and meltdown is self-extinguishing, because, in fact, if it does melt and puddle, then it will cool to the point that it goes out.

So, the nice thing is, that we think it will not be dangerous nuclear energy. It will be very forgiving.

The reason I am so emotional about this, is because many of us have experienced this negative, nasty, hostile position that has been taken in the face of something which is potentially very, very important. It is a bad statement about the state of science in the United States.

Q: What would the fuel and the catalysts be if you were using it on a commercial scale?

Mayer: We are not sure yet. As John mentioned, we have a lot of experiments to do yet. We have outlined the broad theory. Finding an optimal set of circumstances and materials and operating conditions and the things you are talking about, starting and stopping and everything else, is in fact the thing we need some larger assistance with. Those are non-trivial things. But the broad outline of how to get there, we have made clear. So, the point now is to get on with all of those issues, trying, first of all, to do two things. We would like to see those things being done simultaneously: optimizing materials, dealing with the engineering aspects, starting and stopping, the accelerator and the brake; and finally, harnessing this in a way to make it very easily.

Reitz: Some suggested materials which we think are operating at the contaminant level are listed in the paper. These may not be the final ones.

Mayer: Nor the only ones.

Reitz: On page 2 there is a list of at least some of them. But they still might have to use palladium or titanium metal, as a background metal.

Q: There might be something you don't even know about?

Mayer: That's right. In fact, let me just say, there are probably more things that we don't know about, then we do know about.

We have a broad outline. What we have done is that in some sense we have all been in a dark room, we turned on the lights a little bit. Now we can look around. So, in that sense we have provide a way to sort of steer experiments, maybe. And the other thing is, if these things are incorrect, we will know that fast. And that's the whole point in research. If you have a new idea, you do want to get to the place where it is testable, quickly, so, again, you don't waste your time. And that's another reason for bringing the information to the public at large.

A number of people have said: "Why don't you just be quiet and run to this person or that person?" The answer is, it will take too long that way. This way will be much faster. The major thing we want to do is make it work. We want this to be an energy source. If there is an energy source here, which we think there is, let's get it to work. And let's make it happen quickly. And that's what we are going to do. . . . In fact the research focus, if this is correct now, is going to switch. It is going to switch. . . . Well, there will continue to be a lot of this optimizing of reactions, but some of the focus now is going to be going to understanding hydron physics, because that's the base of this, at some level.

By the way, I have to acknowledge another set of people who have influenced our thinking about these things. One group is James Vary and his group at Iowa State University. And we also have been strongly influenced in our thinking by a number of the experimental groups. One of those groups is the group at Naval Research Laboratory. Another one is the group at Texas A&M. And a variety of the other experiments that have come along, that have been very, very powerful results.

Q: To contrast your perception of the evidence of cold fusion, which you feel so strongly about, with the perceptions which seem to be running wild on the negative side, how did you come to the conclusion that cold fusion is a solid phenomenon?

Mayer: Well, I am primarily an experimentalist, so, when I had looked at the data, I decided there was no way that all of these things could have been either hoaxes, which some people have suggested, or incorrect, which some people have suggested. Finally, you have to believe that the data are telling you that nature is offering up something to be understood. So you have to either understand it or find yourself, if you are of such a mind, saying this is all impossible, as some people are saying.

Reitz: And of course, the data wasn't all from one laboratory, though it is true that the initial work came from the two Utah laboratories, but there are now more than 60 laboratories worldwide that have seen these things. They just can't be artifacts, anymore.

Mayer: There is the larger picture, and that is, there are anomalies in other areas which are very similar. And these have been pointed out as well by researchers who are in this field. The anomalies in geophysics are substantial. They can't be explained in some simple way. And so, therefore, the fact that one set of ideas can bring some coherence to this whole picture to us is a very important point. It is well known, for example, that the Earth's heat, when you look at it from the point of view of resulting from standard, long-lived radioactivity—you have uranium and thorium—those alpha particles from that decay produce helium, which diffuses out of the Earth. The amount of helium that is coming out of the Earth is very inconsistent with the amount of heat coming out of the Earth. So, if you are a geophysicist, then you say, well, what's going on here?

You have to conjure up some other mechanism. But that you see—connected with other funny phenomena, like having a lot of helium-3 and tritium coming out of volcanoes—says there looks like there are nuclear transformations going on in the Earth. But you know that the Earth can't be at the temperatures required to produce ordinary nuclear reactions, the standard, high-temperature nuclear reactions. So, I think at some level, you are forced to conclude that there are some other types of nuclear reactions going on. And we think those are all relatively thermal nuclear reactions taking place at only a few thousand degrees.

There are a lot of these things that I think, once this set of ideas becomes clear, will come out. And there are more of these anomalies that are around, and we presented a few in our lecture. There are the observations of a lot of helium-3 in technical metals, metals that have been processed in laboratories. And this has also been pointed to by other researchers in cold fusion. It is not just we who noticed that.

Q: You seem to be suggesting, if this isn't an oxymoron, common scientific sense supports the notion of cold fusion?
Mayer: Let's be careful of the words now. The reaction that is dominating some of these results is not a fusion reaction. And when it works best, it is not cold. So, I am trying to make sure we understand the distinction. The point is these are nuclear reactions at moderately lukewarm temperature. It is not cold, but the point is also, it is not fusion in the standard sense that you would think about it. But, what you are saying is that common sense would dictate that something like this must happen, that's because we have tried to put this into a context which did explain a lot of the anomalies and in a way that spanned those different anomalies. And it's again that, which we think gives a lot of strength to these arguments.

Q: Recognizing that science is not a democracy, you don't win because you get the most votes, you win because you are right, nonetheless, how do you account for the fact that so many people have so summarily rejected Pons-Fleischmann?
Mayer: I would say the following: As I think I mentioned before, I think that is rather more a statement right now about our society, and about a certain closed-mindedness which occurs; I am not sure why, or where that happens, whether it is in our science education, or what. It seems to me you can't close your mind to the data, and I think a lot of people have. I would say that's where I see a major problem. . . .

Q: Given the history of cold fusion and criticisms of people holding press conferences, I am just wondering, why not in your case simply wait for experimental data supporting it and proceed with your business plan? Why hold a press conference now? I am a little uncertain.
Mayer: I want it to happen fast. If I am wrong I want that to occur; I want it proven. Just let me say, the other way takes a long time. We have tried to interest certain large institutions by logic, and it has not worked out real well. So, what I am saying is, I want to go in a direction in which something will happen.

Q: The press has been so hostile, especially the *New York Times*. Do you see this reflected in academic circles?
Mayer: I think academic circles have been carried right along with the whole stance. In fact, to be honest, I am a little bit ashamed of some people, who I felt would be more open-minded and really more discerning about how they made decisions.

Q: At least "the jury is still out" would be a good attitude?
Mayer: Right. It would have been good to say at least, "the jury is still out." I was very skeptical in the beginning, too. But then when the data started pointing up, and it didn't matter what other people said, the fact was that the only argument that people had was that you can't get past the Coulomb barrier. But that is just a calculation.

Q: Arithmetic?
Mayer: It is just arithmetic. And the answer, "arithmetic," is important after you know what physics is going on. Not before. If it is something you don't understand, you can conclude something from the arithmetic, but the chances are, it's going to be wrong. . . . The reason I am so emotional about this, is because many of us have experienced, with our colleagues, this negative, nasty, hostile position that has been taken in the face of something which is potentially very, very important. It is a bad statement about the state of science in the United States.

A fellow over here at MIT failed to get his tenure, because he expressed some sympathy. These are very important phenomena, and they don't come along that often. A lot of ones come along that are suggestive, that don't turn out. I think people kind of cut their teeth on shooting those down. When something really big and really important comes along, I think a lot of people keep that reflex going. And it takes the kind of discipline and kind of care to check these things out. Most of them don't turn out. This one did.

Notes

1. The paper authored by Mayer and Reitz, "Nuclear Energy Release in Metals," was published in the May 1991 issue of *Fusion Technology*, a journal of the American Nuclear Society, p. 552. The paper was received by the journal Oct. 16, 1990.

2. See R.J. Buehler, G. Friedlander, and L. Friedman, "Cluster-Impact Fusion," *Physical Review Letters*, Sept. 18, 1989, p. 1292.