letters

Remembering Reagan and SDI

Peter Westwick's interesting feature article "The Strategic Offense Initiative? The Soviets and Star Wars" (PHYSICS TODAY, June 2008, page 43) stimulated a few memories that may add to the history he partially documents. I was a US senator from New Mexico in 1977–82 and thus had some direct involvement in events leading up to President Ronald Reagan's March 1983 announcement of the Strategic Defense Initiative.

In 1979 and 1980, I had become increasingly interested in the potential of providing the US with a defense against ballistic missiles to counter the known Soviet efforts to construct high-powered ground-based lasers as well as a national infrastructure that could survive in the event of a nuclear exchange. In the course of my reading on the subject, I ran across an article in a November 1979 *New Yorker* by my then colleague, the late Senator Daniel Patrick Moynihan.[1] Moynihan cited separately published arguments by Andrei Sakharov and Freeman Dyson against the existing doctrine of mutually assured destruction (MAD) and in favor of mutually assured protection. Moynihan found the Sakharov–Dyson arguments persuasive and added a few favorable ones of his own.

Having discovered our joint interest in strategic defense, Moynihan and I decided that we would sponsor a floor discussion during the Senate Morning Hour when the Democratic and Republican leadership made time available for presentations by individual senators. He agreed, and we sent our colleagues an invitation to join us at a specific time and day for that purpose. Unfortunately, no one showed up for our discussion except the two of us.

Possibly stimulated by reports of this attempt and other statements I had made on the subject and related technology matters, President-elect Reagan asked me to discuss the subject with him in December 1980. At that meeting, Reagan showed both a deep concern and a deep knowledge about the absence of any means to protect the US from an actual missile attack. He said that the continued production and deployment of weapons of mass destruction could not preserve the peace indefinitely and that we should search for defensive alternatives. He asked what I thought of the feasibility of Edward Teller's suggestion that space-based lasers could ultimately be used to destroy missiles or warheads. I said it then appeared to be technically feasible but would require a great deal of development work once ongoing research indicated which laser candidates were most attractive. In the exchange, I had the impression that Reagan and Teller had discussed the issue long before the 1982 date suggested in Westwick's article. Further archival research may confirm this.

On the question of what Reagan believed relative to defensive versus offensive use of space-based weapons, note his response to a query from Walter Mondale during a presidential debate in 1984. Mondale asked if Reagan was serious about sharing strategic defense technology with the Soviets. Reagan's answer: "Why not?" His response would seem to imply that his focus was purely on missile defense. After participating in the first SDI war game at the Pentagon in 1983, I continued to examine the potential of a shared strategic defense in more detail and concluded that Reagan's intuition on the matter was correct.[2]

With today's proliferation of missiles by rogue nations, some having a nuclear potential, this may be an even better time for the US, Japan, and Europe to discuss shared strategic defense with Russia, China, and other concerned nations.

References

1. D. P. Moynihan, *New Yorker*, 19 November 1979, p. 104.
2. H. H. Schmitt, *Ann. N. Y. Acad. Sci.* **577**, 245 (1985).

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Westwick replies: I thank Harrison Schmitt for his firsthand knowledge of events. Existing evidence suggests that by 1980 President Ronald Reagan had learned about new concepts for missile defense, including Edward Teller's, from various sources, but that Teller himself was frustrated by his lack of personal access to the president until September 1982. His July 1982 letter was an effort to provide his views. Further research may indeed clarify this chronology.

I agree that Reagan—and most others in the US—viewed the Strategic Defense Initiative as purely defensive, and furthermore that his personal offer to share SDI technology was sincere. My point is that the Soviets did not believe him.

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Scientists protest professor's dismissal

We, the undersigned plasma physicists, are familiar with magnetic mirror research, and we are concerned about the recent actions of the administration of the University of Tsukuba in Japan. Teruji Cho, a professor there, was dismissed from his position as director of the university's plasma research center on 6 March 2008, allegedly for intentionally manipulating experimental data that appeared in *Physical Review Letters*.[1] That publication, in fact, contains results that are extremely interesting and far-reaching in their significance. Cho's team definitively demonstrated that flow shear stabilization can be directly controlled using

off-axis electron cyclotron resonance heating. In addition to the dismissal, the university requested that the *PRL* editorial staff retract the paper.

The accusation against Cho, and against three other senior staff members, was initiated by graduate students who filed a complaint to an administrative oversight committee that was headed by Hiroshi Mizubayashi. After an investigation, the committee demanded of Cho that the *PRL* paper be retracted. An additional university investigatory committee headed by Kazuhiko Shimizu supported that demand. However, Cho and his senior collaborators refused to make such a retraction because they are convinced of the integrity of their data. They submitted to the university committee a report addressing the controversial issues, and they submitted to the journal *Physics of Plasmas* (*PoP*) a more detailed paper for publication. The university committees rejected Cho's report without substantive scientific comments.

Meanwhile, Cho's manuscript was judged to be scientifically sound and to merit publication in *PoP*[2] on the basis of favorable standard refereeing and reports from two additional experts who were consulted when the *PoP* editorial staff became aware of the scientific controversy associated with Cho's work. We believe that the *PoP* editors acted correctly; the second paper convincingly confirms the correctness and reliability of the results published in the *PRL* paper. However, the university administration apparently did not accept the opinion of the *PoP* editorial board. Instead, they terminated Cho's professorial position on 29 August 2008, an action that was announced in the worldwide press.

Many scientists who are familiar with magnetic mirror research, especially that conducted at Tsukuba's plasma research center, are deeply concerned about the accusations against Cho and his colleagues. At least four letters have been sent to Yoichi Iwasaki, president of the university, to inform the administration of support for the scientific integrity of Cho's claims. None of those letters were acknowledged. We find it troubling that the university appears to be uninterested in the opinions of experts in the field.

It is clear to us that neither Cho nor his close colleagues on the GAMMA-10 team intentionally misrepresented data. We cannot understand why the University of Tsukuba administration has taken the extreme action of dismissing a distinguished investigator. Cho has been open about his experimental and analytical techniques and has shared his data and methodology with his research team and with foreign collaborators from Russia and the US. We are concerned that the university's actions against Cho constitute a form of scientific censorship. We believe that an appropriate international scientific panel should investigate the university's behavior in this matter.

References

1. T. Cho et al., *Phys. Rev. Lett.* **97**, 055001 (2006).
2. T. Cho et al., *Phys. Plasmas* **15**, 056120 (2008).

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Stellarator pro and con

The cancellation of the National Compact Stellarator Experiment (PHYSICS TODAY, July 2008, page 25) leaves a hole in the US and world fusion programs that are focused on ITER. Two physics points define the importance of the hole that NCSX filled. First, the shape of the plasma is the primary design freedom of magnetically confined fusion plasmas. The other determinants of plasma equilibria, which are the pressure and current profiles, are largely self-determined. Second, the excellent confinement of tokamaks, such as ITER, does not require axisymmetry. Only quasi-axisymmetry is required, which greatly increases the freedom of plasma shaping.

In quasi-symmetry the magnetic field lines lie on nested toroidal surfaces, and the magnetic field strength on those surfaces has a symmetry—even when the shape of the surfaces does not. Particle trajectories are determined by the magnetic field strength, independent of the shape of the magnetic surfaces, and quasi-symmetry ensures the preservation of the constant of the motion that gives good confinement in axisymmetry. The deviation from axisymmetry can have any magnitude as long as it is constrained by quasi-axisymmetry. Axisymmetric shaping—aspect ratio, ellipticity, triangularity, and squareness—is considered essential to achieving the ITER mission, but most of the shaping freedom of toroidal plasmas requires the breaking of axisymmetry.

The NCSX stellarator was the only experiment in the world designed to study quasi-axisymmetric shaping other than in the axisymmetric limit. Although the project is canceled, its costs do establish a required financial scale. The highest cost estimates for NCSX construction and research were about 15% of the annual US non-ITER construction budget for fusion, or about 1% of the envisioned world ITER budget. Expertise on quasi-axisymmetric shaping would give the US unique capabilities in exploiting the information from ITER to make fusion a reality, if that expertise were developed by the time the ITER information becomes available.

As the primary design freedom, quasi-axisymmetric shaping is clearly important. It is the only type of non-axisymmetric shaping that can be applied to ITER-like plasmas when the fusion program moves to the design of a demonstration power plant. Non-axisymmetric shaping provides the only known solutions to a number of issues that must be addressed before magnetic fusion energy can be a reality.[1]

Management problems led to the cancellation of NCSX. Such problems cannot be allowed to undermine the fundamental strategic objectives of US fusion research: to develop the knowledge base for fusion energy, to have a world-leading fusion program, and to ensure the success of the ITER mission.

Reference

1. For a discussion of issues facing magnetic fusion, see *Priorities, Gaps, and Opportunities: Towards a Long-Range Strategic Plan for*