letters

hard time getting his beautiful work published at all. Roger Elliott from Oxford constructed the axial next-nearest-neighbor Ising model in 1961 to describe magnetic properties of erbium. Michael Fisher of Cornell University and I have achieved a real breakthrough (judging from the numerous citations) in the analysis of the ANNNI model: We established the stability of a multitude of phases springing directly from the multiphase point. The increasing complexity of the phase diagram (Bak calls it "the most spectacular phase diagram of any model studied so far") at higher temperatures stems from *systematic* branching processes found by Phillip Duxbury from Kensington, Australia, and myself.

For details on this exciting topic of spatially modulated structures in systems with competing interactions, I recommend a recent review by Julia Yeomans from Oxford, to be published soon in the series *Solid State Physics* (Academic, New York).

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BAK REPLIES: The phase diagram of the ANNNI model that was presented in my PHYSICS TODAY article, including multiphase points, branching processes and incommensurate phases, was taken from an article by Juhani von Boehm and myself (*Physical Review B* **21**, 5297, 1980), which was published well before the papers by Walter Selke, Michael Fisher and Phillip Duxbury.

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Supercomputer restrictions

What contrast we found in the July 1986 issue of PHYSICS TODAY! I refer to the Reference Frame column by Leo Kadanoff (page 7) and the letter to the editor by Congressman Terry L. Bruce (page 11). It was refreshing to read Kadanoff's lucid and balanced discussion of computational physics and the openness of academic research. It was only a predictable litany that emanated from Bruce's words, which attempted to convince us that our supercomputers must be protected at any cost. The imposition of restrictions is the short-term solution that denotes long-term blindness, the usual mark of a politician. Openness of communication channels is a broader approach, characteristic of better minds, that can only help in the long run.

One of Kadanoff's ideas was that the Soviet Union can hardly be expected to achieve any kind of weapons development with supercomputers located in the United States. Bruce has obviously made few international telephone calls if he expects anyone to simply call up a supercomputer from abroad. The flaws in Bruce's reasoning shine through in his remarks concerning Enrico Fermi. The example he gave is more than wrong; it seems to be a straw man that Bruce set up to distract us from the unsavory measures he proposes. Bruce said that a blanket prohibition against Eastern-bloc scholars would not work, because scientists from "unfriendly nations" have often assisted the US. As an example he gave Fermi. I am not familiar with the wording of the blanket prohibition, but I suspect it could not be so inane as to address birthplace as opposed to citizenship. Obviously, the former is irrelevant!

The restrictions Bruce proposes are appropriate for wartime, but no war is on or planned. Maintaining a war mentality is a short-term approach that can only hurt us in the long run. I think Fermi would have been appalled by such ideas.

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Medical imaging mistake

I enjoyed the unintentional brain teaser on medical imaging in *Physics News in 1986* (page S44, figure 3) in your January 1987 issue. It has been a useful educational tool for my class in medical physics.

For your readers' information, I believe the "answers" should be: Photograph (a) goes with caption (c), "bone"; photograph (b) goes with (a), "soft tissue—lung window"; photograph (c) goes with caption (b), "soft tissue—mediastinum window." Photograph (d) is labeled correctly, though it, like the others, is best viewed by turning the page upside down.

I hope that many of your readers were stimulated by the article and the figure in question. The medical physics community appreciates the exposure of our profession to the broad readership of PHYSICS TODAY.

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Superluminal communication

David Mermin, in "Is the moon there when nobody looks? Reality and the quantum theory" (April 1985, page 38), quotes a letter from an unnamed "executive director of a California think tank" as follows: "If in fact we can control the faster-than-light nonlocal effect, it would be possible . . . to make an untappable and unjammable command–control–communication system at very high bit rates for use in the submarine fleet." The idea was proposed by me; the letter, dated 12 March 1982, was from A. Lawrence Chickering of the Institute for Contemporary Studies to Under Secretary of Defense for Research and Engineering Richard DeLauer.

Mermin, like most physicists today, disagrees with me: "What is clear is that if there is spooky action at a distance, then, like other spooks, it is absolutely useless."

While I agree that Alain Aspect's experiment and all experiments so far demonstrate no controllable nonlocality—that is, no quantum action at a distance that can be used for command, control or communication—one must ask whether or not Nature forbids such an effect. Fred Hoyle[1] provides empirical evidence for "loops in time" that suggests that Nature uses faster-than-light control to create the universe by intelligent design. However, some cosmologists think that "inflation" weakens Hoyle's argument. Nevertheless, I am trying to invent testable, controllable nonlocal quantum mechanisms to check Hoyle's revolutionary conjecture and possibly to render nuclear weapons "impotent and obsolete" as part of the Strategic Defense Initiative.[2]

My first point is that the Lorentz invariance of special relativity, confirmed by experimental tests of the equivalence of mass to energy and time dilation, does not forbid faster-than-light "tachyon" propagation of energy. It is the additional logically independent postulate of relativistic causality that forbids faster-than-light phenomena. However, causality, in the sense of causes preceding effects and compatibility of spacelike separated correlated quantum measurements, may be compared to Euclid's fifth axiom of parallels, which unduly restricted geometry to zero curvature. Furthermore, the tests of causality by dispersion relations are, in my opinion, far from convincing. I suspect that atomic parity violation by the weak force may be one way of producing photon pair states that violate relativistic causality.

My second point is that some interpretations of quantum mechanics, such as John Wheeler's "delayed choice"[3] and John G. Cramer's "transactional interpretation,"[4] suggest the sort of retroactive loop in time that Hoyle is talking about.