

LETTERS (continued from page 15)

Euler equation) contains all the physics needed for understanding turbulence. But we don't yet fully understand how very small fluctuations may be amplified to produce chaotic behavior. My point was that scientific computation is likely to play as big a role in solving this problem as will laboratory experiment and analytic theory. I think Schiesser would agree.

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'Entropy Engine' Fuels Discussion of PT Ad Policies

I note with disappointment a full-page advertisement in your September issue (page 77) from a company attempting to promote a so-called entropy engine that, if it worked, would grossly violate the second law of thermodynamics. Specifically, this company is promoting the notion that by means of simply rotating a cylinder and piston containing an ideal gas, useful work can be extracted from the gas, and its temperature thereby decreased. To make matters worse, the ad cites reputable works from the physics literature that, of course, contain no such nonsensical assertions.

So what is the harm of publishing such ads, you may ask? Well, despite the efforts of the physics community, most of the people in this world are not particularly well schooled in physics. According to the Web page of this particular advertiser, you can buy one of these entropy engines for \$75 000. The device supposedly converts atmospheric heat into work, and (so the Web page alleges) it operates with an efficiency that "is greater than Carnot's." To any physicist, of course, that sends up a red flag that this product is not very likely to deliver on its promises. But will the average businessperson know that?

I do not ask that PHYSICS TODAY hold its advertisers to the same standards that apply to technical articles. However, when pseudoscientific nonsense such as this appears in the magazine, even if only as an ad, such products gain credibility that they definitely do not deserve.

Refusal to carry ads for products that are obviously contrary to the goals of an organization is a recognized and appropriate practice. For

example, medical journals do not normally accept ads for tobacco products. Surely the evidence that supports the second law of thermodynamics is even more persuasive than that which links tobacco to ill health.

In the future, please refuse to run ads that are so blatantly erroneous or attempt to mislead or take advantage of those who lack a basic knowledge of physics.

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The Entropy Systems, Inc advertisement basically claims that the company's "entropy engine" is a perpetual-motion machine. Further investigations of the company's Web site show that this is exactly what it is trying to sell.

For a complete review of the company's claims, I recommend reading the discussion available on the Web from the sci.energy.hydrogen newsgroup. A summary can be found at <http://x43.deja.com/getdoc.xp?AN=525477756&search=thread&CONTEXT=93752>.

A publication that supposedly reports on physics should not print ads for pseudoscientific products that violate the laws of physics.

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BRODSKY REPLIES: On rare occasions, some members of the physics community question certain advertisements accepted by PHYSICS TODAY and other American Institute of Physics (AIP) publications. While we pride ourselves on the scientific integrity and usefulness of our editorial content, we generally have a relatively open policy on ads. Even so, we do reserve—and occasionally exercise—the right to reject ads. Several other leading scientific publications follow similar guidelines, and some of them accepted the same ad being questioned here.

Such decisions are hard to make, and clearly they fall within the purview of each publishing entity. It is worth noting that, in the case of AIP, some of the member societies have a policy that allows any member to give an oral presentation at a society meeting, along with the right to publish an abstract, no matter how questionable the thesis. Ads in AIP publications are a somewhat different matter, though, and drawing the

line on what is acceptable is a more complex and difficult proposition.

AIP and its advisory bodies are currently reviewing the institute's guidelines. As AIP's executive director, I welcome written correspondence that will help us in our deliberations. It should be sent directly to me for forwarding.

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Book on Future of Science Leads to Energetic Exchange

Although I agree with virtually all of Joel Primack's criticisms and comments regarding John Maddox's highly opinionated work, *What Remains To Be Discovered: Mapping the Secrets of the Universe, the Origins of Life, and the Future of the Human Race* (PHYSICS TODAY, August, page 64), the doctor should heal himself first. In the process of correcting what he perceives to be Maddox's false statements, Primack states that "the energy of relativistic particles is not gravitationally equivalent to mass." Well, last I heard, positive energy of every known type falls into the right-hand-side gravitating source term of the Einstein equations. It is the energy imparted to relativistic particles that is responsible for creating new particles—that is, matter (as, for example, in accelerators). Matter gravitates. End of story.

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PRIMACK REPLIES: I am sorry that the statement in my review that Harry Ringermacher questions was not sufficiently clear. What I meant was that the gravitational effects of relativistic particles are due not only to their energy, but also to the other contributions that they make to the energy-momentum tensor $T^{\mu\nu}$. For example, for a gas in its rest frame, T^{00} is the energy density ρ and the space components T^{ii} equal the pressure P . For the scale factor of the universe R , Einstein's field equations imply that the deceleration $-\ddot{R}$ is proportional to $(\rho/3 + P)$. Thus, in the case of highly relativistic particles, for which $P = \rho/3$, their pressure contributes as much as their energy density does to slowing the expansion of the early universe.

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