

on, but are we safer with or without SDI? The answer demands a thoughtful and mature examination of the intertwined political, economic, technical and strategic issues. Unduly simplifying the problem by seeing distinctions where none exist can have grave, perhaps fatal, consequences.

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3/87

Physics Takes the Witness Stand

Certain objectives of the article "Forensic Physics of Vehicle Accidents," by Arthur C. Damask (March 1987, page 36), are very valuable. However, as one who has spent 40 years performing basic research on collision of solids and human impact trauma, I strongly disagree with certain of his views and also would like to elaborate on some additional important topics:

▷ Credibility is the principal attribute of an expert in any court, particularly in litigation involving vehicular impact and resultant trauma. I agree that attendance in brief courses is not a suitable qualification, but neither is a PhD, even one in the general area of expertise and granted by a respected university, unless competence has been demonstrated.

▷ The most crucial qualification of an expert is experience and judgment. It takes a seasoned scientist to evaluate the weight of frequently conflicting physical evidence.

▷ The best credential of an expert is a continuous successful research effort in collision dynamics and trauma, documented by peer-reviewed archival publications. Many consultants have published no research papers, while others exhibit publications that were subjected to either scant review or none at all. Some recent papers are based on invalid representations of a system or on totally arbitrary assignments of physical parameters that change results by many orders of magnitude; some also fail to account for crucial phenomenological processes or boundary conditions.

▷ Damask suggests that more physicists should enter the area of collision litigation, which he claims to now be dominated by "a few good engineers." I strongly disagree with this position. Accident reconstruction demands an intimate knowledge of the mechanics of rigid and deformable bodies and material behavior under dynamic loading. Physicists abandoned this domain as a research area many decades ago and turned it over to the

engineering profession, which has advanced it substantially. There is currently no coherent effort by the physics community to reclaim this field, and research efforts in collision and trauma analysis are published in engineering rather than physical journals. Due to this discrepancy in exposure and development, I believe that engineers are in a much better position to be qualified as experts in accident litigation.

▷ The huge fees accruing to an expert representing one side in such litigation present an additional obstacle to developing a completely detached representation of the most probable accident scenario. In many cases, opposing experts draw contradictory conclusions from the same facts. This confuses the jury, discredits the profession and detracts from the value of such testimony. Ideally, experts should be hired by the court, as often occurs in Europe.

▷ Damask takes pride in the court acceptance of computer programs in accident litigation. There may be substantial legal grounds on which to question the propriety of this procedure. One cannot cross-examine programs, only their originators. Since expert consultants are generally not familiar with the total software development and often only input the code used, only the group that created the program can properly say whether the code itself should be questioned. Because code development often takes many years and involves many contributors, it is impractical or impossible to document accuracy and applicability. Programs such as CRASH and various others detailing occupant motion under collision conditions specifically warn the user that the results represent only a state-of-the-art effort; furthermore, utmost care is required in their employment.

▷ Investigations of collision trauma and its mitigation are best accomplished by a team of medical specialists and engineers; the foundation of experimental head injury investigation in the US was laid by the combined efforts of Elihu S. Gurdjian, an MD, and Herbert Lissner, an engineer. However, there is currently considerable disagreement concerning the mechanical dosage that the living human can tolerate, both for the whole body and for individual parts. These values are constantly being revised, indicating doubts concerning their accuracy and validity. This uncertainty and other disagreements about biomechanical approaches make it necessary that one use the utmost caution in developing conclusions and virtually obviate the

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use of categorical pronouncements even in civil litigation. In criminal cases, where much higher standards of proof are required, I believe that biomechanics can play a useful role in very few cases, and in none where tolerance levels are critical except by virtually unanimous agreement of qualified and experienced members of the biomechanical community.

WERNER GOLDSMITH
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DAMASK REPLIES: Werner Goldsmith and I agree on many areas. In the area of disagreement I stand by the statements in my article.

ARTHUR C. DAMASK
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Multiple Submissions: An Abstract Solution

The Council of The American Physical Society has recently issued a statement, "Integrity in Physics" (June 1987, page 81), which lists the following six sins: plagiarism; data fabrication and manipulation; submission of the same paper or trivial variations of it to more than one publication channel; fictitious coauthorship; a reviewer's lack of impartiality; and slow response of a referee in order to suppress publication.

I wonder, does it occur to the authors of this document that their third commandment is not on good terms with their fifth and sixth commandments? Under the existing refereeing system the author of any innovative idea or experiment remains a virtually helpless hostage of the anonymous referee for an unspecified time. If after several months the paper is rejected (often practically without comments) the author has no means to claim priority—submission to another journal is a brand-new deal with, of course, a new submission date.

Simultaneous publication of the same paper in two or more journals is quite embarrassing for the authors. Nobody really wants this trouble. Yet most would agree that simultaneous submission of "trivial variations" of the same study to more than one journal is often the only practical means to reduce the risk of being victimized by the unfair refereeing system. This is especially so for the novice trying to enter a "hot" and highly competitive area.

A solution that I hope many will find reasonable is the following: Major journals should promptly publish authors' abstracts of all submitted

papers (unless the authors themselves instruct otherwise), leaving the acceptance of the full text to the usual refereeing process. Length restrictions (such as a camera-ready 12×12-cm abstract, or less than 100 words if typeset) and, possibly, an optional small charge could be applied. It would be up to the authors to assure that their priority claims are properly expressed in the available space. I stress that the proposed system is not the same as the publication of abstracts in the APS *Bulletin* (which are not peer reviewed) since journals will publish only abstracts accompanied by the full texts of the papers.

If this system is adopted, editorial boards should not be afraid of a sudden, uncontrolled flood of low-quality papers—in the long run most authors will find it quite embarrassing to have published many abstracts without the full papers following. Besides alleviating many faults of the existing refereeing system, the abstract publishing method would be useful in itself as a new tool for spreading scientific awareness extremely rapidly.

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Cosmic Strings and Superstrings

Paul Ginsparg and Sheldon Glashow's Reference Frame column concerning the mass pilgrimage of theoreticians, "Desperately Seeking Superstrings" (May 1986, page 7), prompts me modestly to suggest a clue that will help them find a "yellow brick path" that leads to their much sought after "Blizzard of Gauze": Look in the works of the "4-B's"—Beltrami, Birkeland, Buneman and de Broglie!

Eugenio Beltrami and Kristian Birkeland have laid the groundwork for understanding the macroscopic vortex strings of the cosmos and the laboratory. In self-magnetizing plasmas, Beltrami vortex strings provide the macroscopic paradigm for type II superconductivity. The three-dimensional, fully electromagnetic, particle-in-cell, vorticity-handling simulation codes of Oscar Buneman and his protégés in this latter part of the 20th century are providing computer-simulation corroboration of observational results on cosmic strings in both the laboratory and the cosmos. The evangelical effect of this imprimatur is precipitating an avalanche of conversions from the red-herring denominations into the community of