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COVER: This piece of mathematical folklore illustrates the contortions and transformations shapes endure in the study of topology, which looks at properties of geometrical figures that persist after the figures are deformed. Recently, mathematicians have made progress in classifying the myriad forms that surfaces and volumes can take in two, three or more dimensions. See p. 42. (Cover illustration courtesy of Mathematics Magazine, the Mathematical Society of America)

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LETTERS

Alternative radwaste disposal

In "Radwaste solutions pivot on politics" (SN: 5/1/82, p. 296), the conclusion is reached that high-level wastes can safely be disposed of in granite at depths of 1,000 to 3,000 meters. Such deep holes large enough to contain the existing accumulation of such wastes would be needlessly(?) expensive.

Have the alternatives of disposal in subduction trenches been considered? Two such possibilities seem plausible. First, where oceanic plates subduct continental plates. If putting wastes in glasseous or ceramic form packaged in stainless steel would be safe for a decade or two, the packages dumped into such trenches would be carried under the continent at a depth of 6 miles or more.

The second possibility would seem to be subduction trenches where two oceanic plates collide. Collision of two continental plates, e.g., India and Asia, produced the Himalayas. Presumably collision between two oceanic plates would carry dumped, packaged nuclear wastes down into the earth's mantle to be completely safe forever.

Either appears to be at least as effective and far cheaper than excavating cavities large enough to hold all the wastes at a depth of 1,000 to 3,000 meters in solid granite.

Billy E. Goetz
Santa Fe, N.M.

The mutagenicity of urethane

Dr. W. Generosa of the Oak Ridge Laboratory is quoted (SN: 5/1/82, p. 295) in comments on my study, reported in the April 8 NATURE, showing an increase in heritable tumors in mice following parental treatment with radiation and urethane. I am very glad to know that my study is attracting interest in the United States and that the Oak Ridge Laboratory is beginning confirmatory studies.

Generosa argues that "while the mutagenicity of radiation has been proved, the same is not true of urethane." However, I have demonstrated the matagenicity of urethane in *Drosophila*, the maximum frequency of X-linked lethal mutations being equal to that produced by 2000 R of X-rays (CANCER RESEARCH 39: 4224-7, 1979). Furthermore, urethane-induced somatic mutations have been demonstrated in the mouse by the spot test (3rd ICEM, Tokyo, 1981). So the mutagenicity of urethane is well established.

One advantage of urethane is that, since in *Drosophila* it produces recessive lethal mutations but does not produce chromosome rearrangements, it might be more suggestive than radiation as to the cellular events leading to heritable cancer. We need information on other strains of mice. Since urethane has been widely used in medicine and industry, it is important that it be studied further.

Taisei Nomura
Osaka, Japan

Scientific literacy concerns

The concerns raised by Dr. Paul Hurd and his colleagues at a recent National Academy of Sciences convocation (SN: 5/22/82, p. 341) are both on-target and extremely disturbing. Actually, it should come as no great surprise that a majority of America's youth is graduating from high school with little or no understanding of science, mathematics and basic technology.

Science is an inescapable reality in modern society. As such, it should receive an unparalleled emphasis in our educational system. The halls of academia hold the key to tomorrow. Without a perpetuation and continued analysis of accumulated knowledge, however, people are destined to live in ignorance. And the consequences of ignorance tend to be highly detrimental, especially in a world which seems to move closer toward Armageddon with each passing day.

It is simply becoming too easy to attain a formalized "education" today. As a culture, we appear to be losing our sense of priority. If everyone can achieve a high school education or a college degree, then the entire process is a meaningless endeavor. We should constantly raise our scholastic standards (and rewards) in order to ensure the development of superior intellects.

Educators are far too preoccupied with making sure that everybody succeeds and nobody fails. This philosophy can be traced to personality theories that stress the negative consequences of "perceived" failure. But in order for the educational structure to remain progressive and vital, it must precipitate substantial effort and perseverance. Those who are not willing to do the required work should not advance academically.

Let us hope that our leaders will wake up to the realization that education, especially science-related education, is in dire need of a revitalization. Cutting federal aid is a very near-sighted approach to a problem that has far-reaching implications. The future of all humankind is intrinsically linked to what we do, or fail to do, in the present.

Aaron Wilson Hughey
Bowling Green, Ky.

Paul Hurd is concerned that declining literacy in the sciences is "harmful" in that it will hamper people's ability to cope successfully in an increasingly technological world. I see two parallel dangers: 1) the increasing interest in cults and "the occult" is certainly a direct result of the declining adequacy of general science education, and 2) within science, knowledge has become so specialized and compartmentalized that the sharing of information across disciplines is incomplete and very little that is comprehensible to the lay person trickles down; a result is scientific illiteracy at both levels. A Ph.D. in engineering, for example, becomes an acceptable credential for criticizing evolution and propounding "creation science."

Phillips Stevens Jr.
State University of New York at Buffalo
Buffalo, N.Y.

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