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COVER: It's still, unhappily, a blueprint. A number of physicists would like to launch the new science of gravity-wave astronomy, but first they have to confirm the existence of the waves. When they do, theoreticians may be able to begin telling us what information the waves convey. See p. 169 (Photo: Hughes Research Laboratories)

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LETTERS

BOTEC vs. bathtub

Michael Guillen's marvelous article on dimensional analysis (SN: 2/4/78, p. 78) defends Eddington's contention that laws of nature can be deduced through *a priori* considerations. Guillen's recipe, however, contains a powerful first step: "Decide which factors in the problem are likely to influence the unknown quantity." As a post-Archimedian, Guillen obtained a correct analysis of the *Queen Mary* problem. A pre-Archimedian might not have had it so easy. Suppose the factors thought to influence the volume of water displaced (in cm^3) are the volume of the ship (cm^3), the ratio of the density of the ship to that of the water, and the ratio of the height of the ship to the depth of the water. Multiplying the three factors, we have $(\text{cm}^3)(\text{g}/\text{cm}^3)(\text{cm}^3/\text{g})(\text{cm}/\text{cm})$. Although the dimensions work out, the answer doesn't describe what happens in the ocean. My point is that dimensional analysis can tell you when a proposed "law" is inconsistent with other measurement structures, but it does not diagnose which of several consistent possibilities is empirically correct.

An envelope by the tub can help one rule out certain possibilities. Had Archimedes been so prepared, perhaps he would not have run naked through the streets, and the world would have been deprived of a good story.

Michael H. Birnbaum
Champaign, Ill.

I thoroughly enjoyed the article on dimensional analysis, being a practitioner myself. However, I don't think Michael Guillen illustrated the true elegance of it. By careful choosing of the units, the BOTEC method can often be completely bypassed and the calculations done in one's head.

For example, the *Queen Mary* weighs about 80 million tons. By happenstance, a pint of water weighs about a pound. This still leaves the answer in uncommon units, so another conversion is needed.

Now the elegance! I simply do a biblical trick and convert pints of water to pints of beer and raise one to the British. Who really cares about salt water anyhow?

Robert Lipp
Los Gatos, Calif.

What price utility?

The final two paragraphs of Joe Harrison's comments (SN: 2/4/78, p. 67) on your article about specialization of colleges (SN: 12/31/77, p. 422) must have set Jacob Bronowski spinning in his grave. Evidently Harrison does not consider art to be "progress." Who is to say that space travel or polio vaccines constitute more "progress" than a symphony or a painting? Such verdicts will be handed down, if ever, far in the

future, not now. Indeed, it is equally true that Beethoven and Mozart needed no aerospace engineers to turn out their beautiful music; Giotto and Raphael scarcely needed Jonas Salk to paint their enduring masterpieces. The ultimate *useful man* — a narrow-minded, problem-solving technocrat — is no better adapted to serve humanity than is the broadly cultured "total man" to whom Harrison so strongly objects. The answer is, of course, that both perspectives and all points of view in between are essential for the survival of mankind. To advocate one over the other is to invite disaster to our civilization.

Richard J. Pike
Menlo Park, Calif.

As a student of both the sciences and the humanities, I feel compelled to respond to Joe Harrison's letter.

While I have no illusions about being a Renaissance man, I can solve a differential equation, program a computer, sketch a portrait, fix an automobile, build a house, play the guitar, cook a meal, write a story, design a circuit and quote the classics. Mr. Harrison would undoubtedly consider me useless, but to my family and friends I am a very handy fellow.

There is no reason why scientists and artists cannot investigate fields other than their own, for the trained mind can and will expand to contain all that you put into it. Indeed, it is the natural tendency of the untainted human spirit to embrace the whole of experience.

True, we did not need Beethoven and Mozart to get us to the moon, but they helped give us a reason to go there. Surely the few kilos of rocks we brought back cannot justify such an effort by themselves. No, I think Apollo has done more to uplift the spirit of mankind than to increase our science. And artists may never have saved a human life, but they have helped give millions a reason to live. As a NASA official stated in a recent "Nova" program, space flight will not be fully justified until we can orbit a sixty-year-old poet.

Thomas B. Albrecht
Kingman, Kan.

Destructible fuel tanks

Your article on the testing of the space shuttle fuel tank (SN: 1/21/78, p. 40) contains an error when it states that the tank will parachute into the ocean. The external tank will fall into a remote area of the Indian or South Pacific Ocean shortly after a space shuttle launch and will be destroyed. It is the solid rocket boosters that will parachute into the water about 300 kilometers down range for reuse.

James Greer
Milwaukee, Wis.

... It is a shame that the used tank could not be boosted into a stable orbit, to be used in space manufacturing.

John M. Zupko
Trenton, N.J.

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