engineering or science because of the salary level, which does not yet compare favorably with that of other professions and trades attained after a comparable number of years of experience. It is also widely felt that the engineering shortage is a temporary one created by large federal armament spending. It would be wisest and in the best interests of the country to increase the salary level of all research and development engineers and scientists, including biological and medical scientists, to a level which is at least commensurate with the training required and which will at least offer a sufficient return on the investment to induce those promising students of a practical nature to enter research.

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I enjoyed your editorial "Feedback" in the recent issue of *Science* until I ran against the last sentence in which you wish to "find some way to apply the brakes without discriminating against the governmental employee," with regard to increases in salaries for scientists in government and industry. Obviously, there should be some limit to the ceiling on salaries, but I do not see why we need any brakes applied yet. If we are to attract young men into science in our present society, the only feasible method is to make science financially attractive to them. This, in my opinion, has not yet happened. They can do better in medicine and far better in business administration. Until the scientist receives a salary comparable to what he might get in these two and other fields, we have not solved the problem. Hence, I feel that no effort should be made to "apply brakes" yet.

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Scientists on Politicians, and the Obverse

J. Bronowski said: ". . . the decisions of state cannot be taken out of the context of science. . . .

"The fate of a nation may hang on an error of judgment here. Let me give you a slightly mischievous example. In 1945, the British Government published . . . a White Paper on the wartime development of atomic energy. Among the documents in this White Paper is the directive by which Mr. Winston Churchill . . . set up the project to make an atomic bomb. This directive begins with the words: 'Although personally I am quite content with the existing explosives. . . .'

"This bland phrase is a monument to a nonscientific education. . . . I do not much care for atomic bombs myself, but still less do I care to have them judged in phrases like Mr. Churchill's. In 1941, they might have weighed life and death between this country and Germany; and what brought down the scales was not the wisdom of statesmen, but the democratic tradition which caused Mr. Churchill to waive his own unwisdom.

"This example shows us succinctly what voters and statesmen do not know. I have called Mr. Churchill's astonishing phrase a monument to a nonscientific education. For it could have been written only by a man, an intelligent man, who simply does not understand how big a million is."

This remarkable series of statements was published once in Great Britain [*Advancement of Sci.* **12**, 301 (1955)] and once in *Science*, [**123**, 70 1956)] and was recently quoted in *Science* [**125**, 179 (1957)] by Dael Wolfle, who apparently takes them at face value

It is astonishing, and it is a prime example, but not of what the authors intended. Churchill's statement was obviously a bitter jest and nothing more. Doubtless, his knowledge of the devilish uses to which explosives can be put and his good judgment, rather than merely the "democratic tradition," "brought

down the scales" and permitted work on atomic energy to go ahead.

If Bronowski had any information concerning the former Prime Minister's opposition to the atomic studies other than his own peculiar interpretation of the White Paper, he should have stated it. If he did not have such information, his remarks are an example of drubbing a straw man, and their influence may not be merely "mischievous" but baleful, unless perchance they alert politicians to the need for educating scientists in politics, government, and similar matters.

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Causes and Effects

A comment may perhaps be in order on one point in the argument of Robert B. MacLeod, in his article on "Teleology and theory of human behavior [*Science* **125**, 477 (15 Mar. 1957)]. MacLeod is discussing the possibility of reintroducing the idea of teleology into science and suggests that the theory of relativity may permit us to relax the ideas of cause and effect that have prevailed since the Newtonian revolution. He says:

"If, however, we question the absoluteness of time and play with the idea that, in different frames of reference, the relationship between antecedent and consequent may be reversed, we may be left free to think that something that has not yet happened may be an essential condition of something that is about to happen. If the temporal relationship is relationally, rather than absolutely, determined, we might conceivably reincorporate purpose as a natural fact into the stream of natural causation."

It is here suggested that the theory of relatively cannot be strained to permit such a thought. Even though the "absolute" idea of time may have been overthrown, it is still not true that effects can, in any conceivable frame of reference, precede their causes. It is true that the time-order of two events may be reversed for two different observers, but it must be noted that this can happen *only if* the two events are in each other's "absolute elsewhere." The two events must be so far in space and so close in time that no signal from either event could possibly have arrived at the other in time to cause it. If two events are related in this manner for one observer, they are related in this manner for all observers. Such a pair of events could be described as "not possibly causal." But if two events are related so that a signal from *A* could have got through in time to cause *B*, then they are "possibly causal," and they have this "possibly causal" relationship, and in the same sense, *A* to *B*, for *all* observers.

It may be true to say, as MacLeod