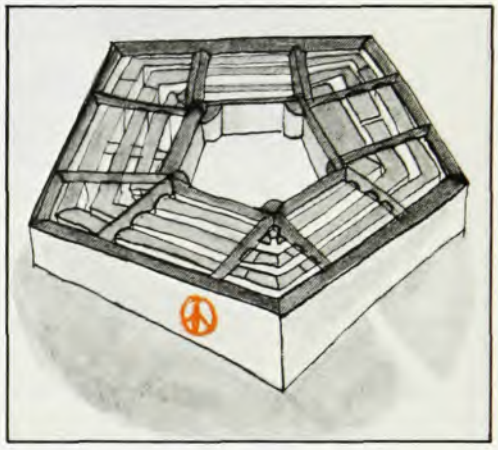
A vote for Mansfield

I am disturbed by the editorial position PHYSICS TODAY has taken to Senator Mansfield and his amendment, Sec. 203, to the Fiscal 1970 Military Procurement Authorization Act, which requires that all DOD-supported research projects must "have a direct and apparent relationship to a specific military function." Your editorial entitled "Hold That Meat Axe" in the February issue presents none of the arguments that can be made in support of this action by Congress, and it suggests that Senator Mansfield is guilty of "a meat-axe treatment of DOD-supported research." I feel PHYSICS TODAY is obligated to present the other side of this crucial debate in a fair way and that such presentation could best be done by means of guest editorials or solicited feature articles. To do the subject justice one should present the arguments in their proper historical, political and social context; this is not really possible in short letters to the editor. But I shall try anyway, and plead with the reader to think of this unusually long letter as an article rather than a letter.

Let me start with some brief historical background. Over the past few years there has been a strong and successful movement in the universities to abolish all university-sponsored classified research. More recently this movement has spread in scope to include general moral implications of certain kinds of research—whether classified or not. For example, in February 1968, the Federation of American Scientists issued a guideline on morally objectionable research patterned after a University of Michigan faculty statement. It read in part: "the university . . . should not directly or indirectly take part in military operations or participate in the collection of military intelligence. The university should not enter into any contract supporting research the specific purpose of which is the development of weapons or devices designed to destroy human life or to incapacitate human beings, nor should it provide administrative services for government weapons laboratories." It then named Los Alamos and Livermore as examples of the latter.

The case against secrecy in the university is easier to make than that of morally objectionable research or the misuse of science. The question of science and ethics is a deep and difficult one to which PHYSICS TODAY and the American Institute of Physics should devote some effort. In this limited space I cannot do the subject justice, so I will just give a brief outline of how some moral arguments might go. In a recent Senate speech Senator Fulbright referred to the universities as "the last citadels of moral and intellectual integrity." I believe the moral integrity Fulbright is talking about is connected with the university's role of safeguarding human values and human rights. History contains many examples, such as the resistance of Charles University, first under Nazi occupation, and now under Soviet occupation. Universities should be working toward the improvement of man and society—not its possible destruction. For these reasons, it is inappropriate for universities to be developing new weapons or new ways of killing people, or even to be training their students in how to kill people. We see that even the anti-ROTC campaign is connected with all this. Whether we like it or not this kind of moral stigma hangs over military-sponsored research, whether it is directly related to specific military functions or not. It is even worse now that the law requires that all DOD supported university projects must "have a direct and apparent relationship to a specific military function."

One can raise the further question that, even if weapons research is contrary to the proper role of the university, is it really morally objectionable? Has the military overstepped its role of the defense of our country? What about the "adventures" in Guatemala, the Dominican Republic, the Bay of Pigs, the illegal bombing of North Vietnam, the illegal use of herbicides on Vietnamese rice crops (this atrocity is still going on!), the continued use of antipersonnel chemical weapons in Vietnam, the Song My and other massacres, the provocative overproduction of overkill, the establishment and support of corrupt military governments, the enormous waste of our national resources, opposition to the test-ban treaty, etc. Many in the academic community (and even in the US Senate) have begun to fear the enormous size of the military and the expanding influence it has over national and international affairs. This view is reinforced by the recent governmental acceptance of new, open-ended weapons systems such as ABM, MIRV, the C-5A, the B-1A supersonic manned bomber, Poseidon, the T-111, and so on.



So one of the strong motivations in the movement to get the DOD out of the universities is the desire to reduce the enormous influence the military has gained in this country. However, in addition to this motivation and the moral-stigma question, one can give several other reasons why the DOD should not be sponsoring university research. One such reason has to do with academic integrity and intellectual honesty. Very little DOD or ARPA sponsored university research has any more relevance to the military than NSF or AEC sponsored research. But the fact remains that much of the public, and now the law itself, considers DOD-sponsored university research as military research. Is it consistent with academic integrity for us to take money from the public under

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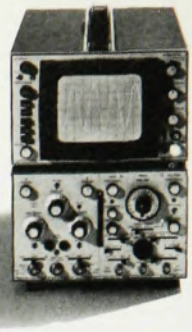

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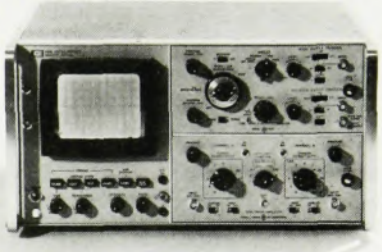

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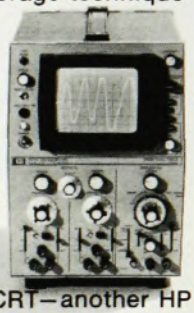

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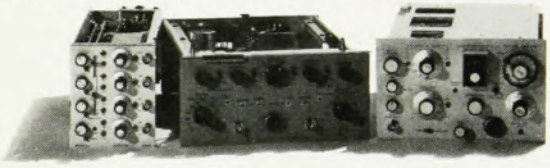

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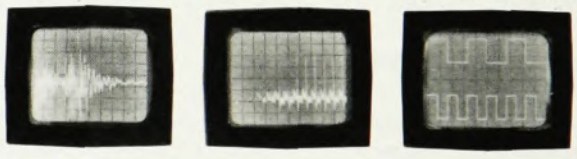

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such kind of misrepresentation? Recently the DOD asked various university presidents to justify, in writing, the direct connection between DOD-sponsored projects on their campuses and specific military functions. Most of the presidents replied that they are unable to show such a connection.

Another argument for shifting support of all university research to civilian agencies is that continued DOD support means continued weakening of these civilian agencies just at a time when they most need strengthening. Also, for an agency like the NSF, support of basic science is its primary mission, whereas, for the DOD, national defense is the primary mission, and support of university basic research is secondary. Under fiscal pressure an agency would tend to give less priority to its secondary mission.

If all university DOD contracts were suddenly terminated there would be a serious transient effect that would affect all members of the academic community, including those of us who advocate a rapid transfer of funds from DOD to civilian agencies. But even such a short-term sacrifice might be worth the long-term gain. It is argued that Congress in its desire to maintain US scientific, academic and technological leadership would quickly raise the budgets of the civilian agencies to achieve the same total level of university support. It would be as if the DOD university research funds were transferred to civilian agencies.

Actually Senator Mansfield is not advocating such a "meat-axe" approach. In a recent Senate speech he said: "Our joint emphasis will be the orderly transfer to other agencies of projects that do not meet the criteria of sec. 203." In the same speech he suggested 20 months as a possible time scale for transferring about three quarters of the funds involved. The amount of DOD support of university research in fiscal year 1970 is $223 million. According to the 6 February issue of *Science*, the Administration is asking $220 million for fiscal year 1971. So it appears that the Administration does not at all agree with Congress on this issue. The Administration did on the other hand ask for a $73-million increase for NSF and did not reduce the total amount budgeted for university research. Assuming Congress reverses its pattern of cutting the NSF budget, the universities should be able to survive this transition period.

It is my opinion that Senator Mansfield is advocating a much needed improvement in the funding of civilian research and that we of the scientific community should be complimenting him and Congress for the timely action they are taking on this matter. Rather than criticizing Senator Mansfield, PHYSICS TODAY should instead be criticizing the Administration for defying him in their 1971 budget and continuing to violate what now appears to be the law regarding DOD support of basic research. Furthermore, I suspect (or at least hope) that the editorial position taken by PHYSICS TODAY may actually misrepresent the position taken by most of our younger physicists in this debate. After all, the majority of physicists in this country are under 40.

In spite of PHYSICS TODAY and the establishment-controlled Council of the American Physical Society, there is a strong protest movement within the physics community whose goals and tactics have been rapidly evolving over the last few years. I predict that this movement is here to stay and that it will continue working for the goal of complete separation of the university from the military whether or not the Vietnam War is ended. I also predict that this goal will be achieved and that our scientific meetings and activities will deal more and more with social and political issues. We may even see, eventually, a Hippocratic oath for APS members pledging us not to misuse our science.

JAY OREAR
Cornell University

THE EDITOR COMMENTS: Our editorial took no stand on the important question of whether the DOD should or should not support basic research. This is a question that deserves thorough debate. It is not clear, for instance, if you are concerned about the military having too much influence, that the best course of action is to ban DOD research by universities. Some fear that the academic community would then lose touch with the detailed understanding it needs to engage in intelligent public debate with DOD experts. But, even if one grants that DOD support of basic research should in principle be cut as far as Senator Mansfield advocates, our edi-

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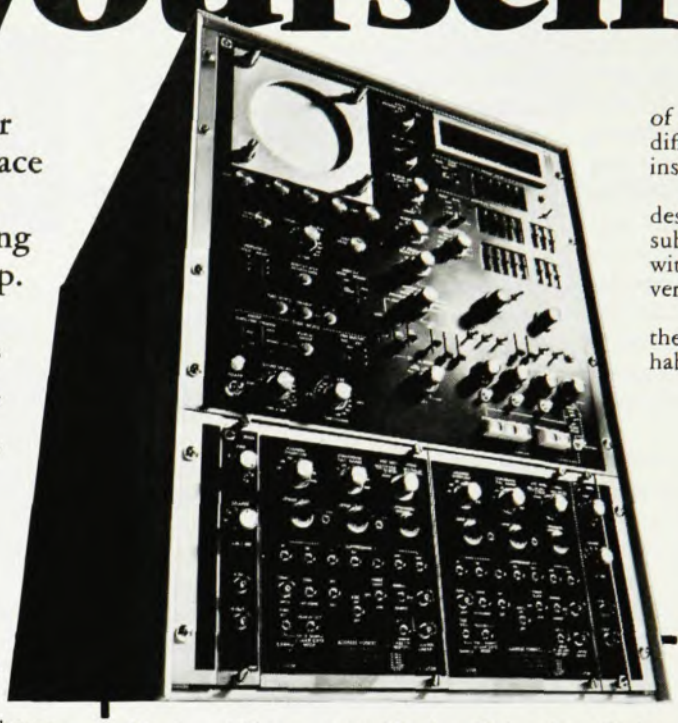

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torial attempted only to point out that the schedule he proposed for the cuts and his statements about an "orderly transfer" are contradictory. The Senator has created even further concern among scientists with his comment that, if Congress chose to eliminate rather than transfer the funds in question, it "would not be a national calamity."

More on tachyons

In connection with the article "Beyond the Light Barrier" by O-M. Bilaniuk and G. Sudarshan in the May, 1969 issue, readers of PHYSICS TODAY might be interested to know of a further tachyonic domain within relativity theory.

For decades many physicists have believed that a relativistic Newtonian-like particle dynamics, in the old and simple instantaneous-action-at-a-distance sense, is out of the question. It is, however, well within possibility, and it affords scope for many things, superlight velocities included.

A few years ago[1] the conditions were worked out for the "forces" F_i in order that a completely Newtonian-looking particle dynamics $\ddot{x}_i = F_i$ (functions of coordinates and velocities) be Lorentz-covariant. The covariance certainly can not leap to the eye when you have once figured out some suitable F's; but it is equally certainly there, when the forces are tooled up right.

The simplest known example[2] (for two particles in one dimension) is

$$\frac{\ddot{x}_1}{\ddot{x}_2} = \mp \frac{1}{2} \frac{(\dot{x}_1 - \dot{x}_2)^2}{(x_1 - x_2)}$$

Besides the somewhat hidden Lorentz-covariance, this dynamics also has self-evident Galilean covariance. The number c is absent entirely. Relativity's ubiquitous $(1 - v^2/c^2)^{1/2}$ factors are after all non-unique. There is no adjustability whatever of "masses" or "interaction strengths"—the numerical factors $\pm\,{}^1/_2$ cannot be touched without totally harming Lorentz covariance. Additionally, there is invariance to space and to time reflections and to scale changes in coordinate and in time. There is so much symmetry that the dynamics nearly fails to exist.

It is easy to see that, simply because c is not around for velocities to compare themselves with, not only are superlight velocities possible, but they are mandatory, and the transition from the sub- to superlight velocities and back again is not marvelous. The motion is in fact just (using a principal value integration through $x_1 = x_2$)

$$\begin{matrix} x_1 \\ x_2 \end{matrix} = a + bt \pm |\alpha t + \beta|^{1/2}$$

being parabolas in the x,t plane. The figure shows a plot of $t \pm |t|^{1/2}$. Around the "collision point" $t = 0$ the motion is arbitrarily fast. The Lorentz covariance stands out sharply now: Parabolas go into parabolas under any nonsingular linear transformation in x and t: the general linear group, including the Lorentz group merely as a special case, is the invariance group of the dynamics.

Given a basically Newtonian structure of dynamics, be it Lorentz-covariant or otherwise, the question of causality comes out to be an empty one. Simply, the motion unfolds, either forwards or backwards in time, from initial data on positions and velocities. The old Newtonian world view does have relativistic survival. The sending and receiving of "signals" is not in the picture. They are not needed. Observability is something else. In the relativistic Newtonian dynamics, unlike the Galilean, forces are not superposable (the sum of two relativistic forces is not a relativistic force). So when observation apparatus (this could be one particle) is brought in, the total dynamics of particle world-lines and apparatus world-lines (the latter not necessarily simple or gently coupled to the former), has to be surveyed somehow all the way down to what is recorded in the apparatus.

Well, concerning the example, isn't that just a toy? No doubt. But the machinery that could produce it would seem to bear study.[3] Perhaps, in the machinery's close concentration directly on ensembles of world-lines and their rules of construction, some wider view of relativistic nature is possible. On this view, for instance, preoccupation with momentum-energy four-vectors of the usual type is fruitless. The generalization to *system* momentum-energy, which has the interaction wound up in it, becomes more central.

There is of course a specially pointed reason for attempting the Newtonian view besides mind-broad-