ACCELERATORS IN OUR FUTURE?*

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It has been a rewarding experience for me, personally, to attend this Particle Accelerator Conference, and I appreciate the opportunity you have given me to say a few words to you this evening. It is truly an honor to speak on the same program as Ed McMillan, whose contributions to accelerator art and to science are known and respected by all of us here. If I were to identify the single most important element of the AEC's Physical Research Program -- after the people participating, and many of you here tonight stand high on that list -- I would have to single out your field of interest and your product -- the particle accelerator.

Before commenting briefly on the topic announced for this talk, I must tell you a story about what happened to me on the way here. It has been only two months since I signed in at the Atomic Energy Commission in this, my first public service job. Prior to formally joining the AEC, however, I was able to visit a number of the major national laboratories and obtain a snapshot view of what goes on there currently, as well as to renew some old acquaintances and establish some new personal relationships with the people involved. On each of these visits I found the particle accelerator capabilities - or in some cases, their limitations - the factor pacing the scientific programs within these laboratories. When I announced my intent to come to this Conference a few weeks ago, one of my new associates asked my why the hell was I going off to a technical meeting when I should be at my desk minding my administrative business. (I think in retrospect that it was just his way of reminding me that travel funds are in very short supply in AEC these days.) But I rose to his challenge and tried to explain that I felt a real need to learn what present and future developments could be expected in accelerator technology. I said that I sensed that there would be a need to initiate some new accelerator projects during my tenure, and I wanted to be as knowledgeable as possible on this subject. He looked up at me and said, "Hell, John, you're up to your ass in accelerators right now!"

I thought that remark was somewhat provocative and that it might provide a good title for the talk I wanted to deliver here -- but I "chickened out" when Dick Neal asked me for one. Instead I chose to entitle this talk: "Accelerators in Our Future?" That question mark is important - but you should subtitle it: "Or - Up to My Ass in Accelerators." Perhaps I should apologize to two groups here tonight for my use of such language. To the first group - those who may be offended by certain terms - I can only say I am sorry and offer as explanation the fact (as some of you know) that I have spent the last year working with high school kids - which freed up my speech somewhat. To the second group - those for whom the American idiom may not be native - I can only suggest that you turn to a nearby colleague for a simultaneous translation.

However, before actually delivering the deep, probing analysis which I prepared on this subject -- sort of an attempt to make a proctological examination of our future -- I cannot resist one more diversion, to share with you some quite personal reminiscences that my associate's words also invoked.

Ed tells me he is going to address us in a few minutes on some memories of innovative and creative accelerator builders of the past. Even though I am going to look at the present and future in my address, with your permission, Ed, I would like to overlap your domain first. I would like to remember some not so innovative or so effective accelerator work of the past -- to share some memories with you -- of my own work in this field.

While I am a newcomer to government service, this is not my first association with the AEC. Some fifteen to twenty years ago, I was engaged in AEC-supported research in the laboratory as many of you here today are. I shall never forget coming as a fresh young post-doc to Caltech to assist in converting the CIT Electron Synchrotron from 500 Mev to 1,200 Mev operation. Bob Walker assigned me the job of instrumenting and carrying out the beam diagnostics. He suggested that I might find it useful to look at the beam probes that were used for the 500 Mev operation, in designing those for the upcoming conversion. Many of you will remember that the CIT Synchrotron started out its life as the quarter scale model of the Bevatron. It was a weak focusing machine, and the vacuum tank enclosed an aperture of something like 30" x 12 x 14"; thus one could crawl inside.

So, to follow Bob's suggestion, that's just what I did. When the occasion arose to let the system down to air, I removed my shoes, shirt and tie and crawled into a quadrant tank up to about here. I then wormed my way into into the vacuum chamber to examine the probes. My education completed, I had only to get out. That turned out to be more difficult than getting in. On the way out a significant number of epidermal cells of my backside were removed, and I left not only some sweat and tears, but also a little blood inside that accelerator. It took somewhat longer to pump down, but the synchrotron recovered faster than I did. So I really do feel confident to face the future remembering that I have been here before. This is not the first occasion I have been up to my rear end in accelerators.

If I can be more serious, however, the AEC's Physical Research Program involves in large measure the design, construction, operation and carrying out of research on particle accelerators as Bill Wallenmeyer demonstrated yesterday. The Division of Physical Research at this time is supporting fifty-four particle accelerators and the research programs using them. I am sure I need not convince this audience of the important role which particle accelerators have served for the advancement of science and the benefit of mankind. Nor, I believe, will it be a surprise to you that the number of accelerators involved in the AEC research program is smaller now

*Dinner address, March 6, 1973

than it used to be. In 1967, for example, this number was sixty-eight. During the intervening period twelve new accelerators have come into operation, so that we have shut down or transferred programmatically about twenty-six accelerators (roughly 50% of the number now operating) in the last six years. These statistics cause me to observe that my predecessor a man of greater stature, but somewhat less height than I, is seated at this table tonight. If I am up to my ass, he must certainly have been at least up to his armpits in both accelerators and science and he survived. But to return to our question: Will there be more accelerators in our future? I, for one, believe there must be.

It is particularly gratifying to assume charge of a program under which the construction of the two largest accelerator projects in the United States, are going well. The National Accelerator Laboratory, which includes the highest energy accelerator currently operating, and the Clinton P. Anderson Meson Physics Facility, or LAMPF, bring high honor to the field of accelerator technology. Undoubtedly, we can look forward to many years to productive research with these two new facilities which certainly will move back research frontiers. The directors of these projects and their staffs are deserving of high praise for the successful execution of these large and complex projects.

Now that the 200 Gev accelerator at NAL has become a 400 Gev accelerator and is in regular operation at 300 Gev, I know that many of you are thinking about various ways to get to even higher energies and I believe that this quest for higher energies will be with us for the foreseeable future. For the moment, at least, the cost of a very large synchrotron is prohibitive. However, the instantaneous success of the e^+e^- storage rings at SLAC, the outstanding results on the ISR at CERN and the interesting prospects of the large variety of colliding beam systems at Novosibirsk, all of which we heard about today, hold great promise for the future of such colliding beam devices. I am sure that we will all be most interested to hear tomorrow of the progress on the ISABELLE and PEP design studies.

However, we must not be too assumptive, we must now look not only at whether these large potential projects are good for the advancement of basic knowledge but also at many other factors. We must be cost conscious, we must be inventive, we must indentify and pursue those efforts most crucial to the advancement of our science, we must strive for more immediate applicability of research results to the benefit of mankind. Finally, we must convince the country as a whole that they have a stake in these scientific enterprises and will share in the reward. These are all topics addressed at this Conference.

As one example, of the diverse factors affecting our future the need for enriched uranium for power reactors during the 1980's will significantly exeeed that available from current plants. If industry does not step up to the opportunity to fulfill this need and make the requisite investment in new production facilities, the government -- and I refer to the AEC here -- is faced with a significant responsibility. The capital investments in new plants of the gaseous diffusion type which may be required are truly large. New accelerators will have to compete for funds in this arena.

In trying to be brief, I cannot possibly comment on the many other accelerator projects recently completed, under construction, under design or being proposed. My silence neither endorses nor criticizes either the performance or the goals of these other projects. I am sure that for the AEC projects among these, there will be opportunities for detailed evaluation. While we would like to strive for one hundred percent success in our accelerator projects, we must recognize that there will be times when we will miss our mark. We then will have to evaluate the options available and hopefully reach the best management decisions. We will all gain by that. But I do believe that there will be accelerators in our future -- in the AEC's and in yours.