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### Cover illustration

*A representation of the metastable "atomcule" consisting of an antiproton  $\bar{p}$ , an electron  $e^-$ , and an alpha particle  $\alpha$ . The antiproton circular trajectory is drawn in perspective and is to a very good approximation classical, with a frequency much lower than that of the electron, which is in the ground state. The electron's motion is shown as a density distribution, polarized by the presence of the  $\bar{p}$ . The  $\bar{p}$  velocity is so low that the electron cloud follows the antiproton around the atom. (See J. Eades, p. 172.)*

## POWELL MEMORIAL LECTURE Create the Right Atmosphere

The responsibility of scientists to the public has been discussed so much that it is difficult to add something new. Nevertheless, I shall present some thoughts as certain problems need to be taken up again and again to have them present in our daily lives.

We all see and regret the gap between scientists and the public. People have learnt that progress has two faces, for the power which allows us to improve our lives also perfects machinery for our destruction. However, systems have become so complex that we cannot understand them well enough to foresee the consequences. This creates anxiety which is aggravated by the media's tendency for negative sensationalism. It is our responsibility to recognize the danger that research could become curtailed, and to prevent this happening.

The basic problem is that one cannot hope to explain science at a level which allows an untrained person to evaluate risks; simplifications are inevitable. Unfortunately, many are suspicious that simplifications by experts are designed to solicit the right reaction. So we have to be careful, recognizing that our society is based on confidence which can be easily undermined.

Driven by curiosity, humans seek insight. I feel we often neglect this cultural aspect in concentrating on applications and utility in justifying our requests for support. Such an

emphasis is essentially correct, but it confirms the wrong impression that science has to be useful in an obvious way. We need to open a new dimension in interest by showing that science is a human adventure: people must become emotionally involved. It would help to describe how results are found, especially when teaching physics to young people. I give two examples from my own field of low-temperature physics.

Kamerlingh Onnes was held up for two years in his efforts to liquefy helium by a timid citizen who feared the consequences of Onnes's gas cylinders exploding. It was only when Van der Waals calculated the stored energy — equivalent to a few kilogrammes of gunpowder — that Onnes was allowed to continue. The other story concerns his pioneering liquefaction experiment: Onnes thought it had failed until a colleague naively asked if he knew what liquid helium looked like. This prompted Onnes to change the illumination and to tap the apparatus — at which point surface waves were seen: the liquid helium had been there all along.

Another thing we can do is by our personal behaviour to try to gain back the trust that has been lost. I refer here specifically to our rôle as experts. I remember the aftermath of the Tschernobyl disaster when we heard conflicting opinions from different groups of scientific sympathizers. And yet nobody was

lying: one can misinform by omitting facts — a form of untruth we must denounce. Scientists should perhaps try to create an atmosphere which encourages the search for genuine opinions, even those which bring scientists in conflict with funding agencies.

Let me now turn to responsibility. A scientist clearly cannot be legally responsible for consequences which he or she cannot influence. However, there must be some sort of responsibility as this is the only way to regain the public's confidence. I think we have a responsibility to prevent as much as possible bad consequences, which may mean doing things we do not like. One is reminded here of Otto Hahn, the atomic physicist, who suffered terribly from the fact that his discoveries had such unfortunate results.

Scientists all too often keep silent in the face of negative trends concerning applications. Instead, we ought to follow developments stemming from our work and publicly express misgivings, if necessary. We need a general atmosphere which encourages this kind of responsibility, for science and its applications influence our lives in such a tremendous way that we cannot ignore the consequences. As we are often blamed for not differentiating between what is said as scientists and as citizens, I shall not ask you to agree with these thoughts in the same way as I would for a statement in physics.

**A summary of the Cecil Powell Memorial Lecture on the responsibility of scientists to the public given by Werner Buckel, a former President of EPS, at the General Conference in Florence last month.**