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The Confusion Profusion

The exciting prospect of cold fusion seems to be diminishing from a hurricane to an April shower. The results are certainly not all in yet, but the early promise of untold energy is disappearing amid the relentless detail of careful electrochemical experiments and heat balances. The cold fusion incident has been unfortunate in many respects, but it has yielded some valuable lessons that suggest that the dark cloud may have a palladium lining.

The first lesson is that the merit in the established scientific procedure of exposing one's findings to peer review before publicizing results is reaffirmed. Peer review has merit for authors, who get good feedback; it has merit for other scientists, who get a screening of the research most likely to be valuable to them; and it has merit for the press and the public, who cannot be expected to have complex scientific expertise. The volumes of newsprint devoted to the cold fusion incident and the wasted effort of scientists who tried to duplicate experiments for which there were no details demonstrate why scientists are skeptical of results that first appear in the general press rather than in scholarly journals.

Before scientists become too critical about press coverage, however, it is important to recognize that discoveries with major implications for societal change are difficult to suppress. The open atmosphere of academia inevitably means that graduate students, postdoctoral fellows, colleagues, and visitors will learn of experiments in progress, and if these have important implications, the gossip circuit and the computer network will spread news of the work that the scientists might well prefer to confine temporarily to the laboratory. This does not excuse premature press releases or incomplete experiments, because the more important the conclusion the more careful should be the experiment. But it does explain that leaks occur and that once the genie gets out of the bottle the bottle openers will lose control.

Another lesson from the cold fusion flap should give insight to those embroiled in the controversy between scientists and legislators about scientific fraud. No question of fraud has arisen in the fusion experiments, but the rush of other scientists to duplicate them is illustrative of what happens in any major discovery—correct, incorrect, cutting edge, premature, or fraudulent. The argument of most scientists, that fraud is not widespread in science, represents faith in a law that is illustrated by the fusion confusion. The law might be stated simply as, "The bigger the result the more quickly it is going to be checked." The process of science itself ensures that every major discovery, or claim to a discovery, will be checked in a very short period of time. When scientists oppose the advocacy of large bureaucracies to investigate fraud, they do so not because they are indifferent to fraud or want to suppress bad publicity, but because their experience has engendered trust that there is a correlation between the importance of a finding and the rapidity of its verification or falsification. Some minor incorrect results may escape detection for a time, but major ones will not. The reality of that process is illustrated by the rush to challenge the cold fusion results. The "establishment" cannot suppress a revolutionary concept, and the revolutionaries cannot escape the detailed scrutiny of their colleagues.

Authors have a responsibility to be their own devil's advocates and do appropriate control experiments. Peer review is a screening system to prevent the wasted effort and exaggerated expectations that can be generated by poor scholarship on a seductively important problem. When these procedures are bypassed they lead to delays and wasted effort, but inevitably scientists by instinct and obligation will do the experiments to challenge any new or unexpected finding. And if it turns out that there was great sloppiness and premature publicity, the fallout will and should be severe for those responsible for the unfulfilled expectations.

The high visibility of this event may perhaps enhance public understanding that the procedures of science are designed to hasten arrival at the truth. That truth will eventually emerge from the profusion of stories and opinion on cold fusion in the standard scientific way: it will not come through an edict by an august figure such as the President's science adviser or the presidents of the American Physical Society or of the American Chemical Society. It will not be produced by interminable legal actions leading to the Supreme Court. It will be manifested by scientists all over the world, devising increasingly clever experiments to check the propositions that have been advanced. It is the quality of those experiments that will finally determine whether cold fusion is a reality.—DANIEL E. KOSHLAND, JR.