Physical Society's radical chicks come home to roost

In the winter of 1969 activist demonstrators appeared at the joint annual meeting of the American Physical Society and the American Association of Physics Teachers in New York. They appeared again last year (SN: 3/6/71, p. 169). Last week the 1972 joint meeting was held in San Francisco. Many of the same activists were present. They were still demonstrating, but some of them were also on the podium participating in symposia on the problems they have been raising.

The activists are still far short of the more or less radical goals that most of them hold, but they have brought about a significant revolution within the Physical Society. Symposia on topics such as the relationship of physics to society, the relationship of physics to the life of the physicist and how to find jobs for unemployed physicists—unheard of five years ago—are now organized by officers of the society. They have become expected, even chic, parts of the program.

In part this is a cooptation of the activists by the establishment to prevent worse trouble. In part it comes from the principles of the physics establishment itself. Falling mainly in the Democratic left range of the political spectrum, the establishmentarians are uneasy about trying to shut up dissent. Mainly the interest appears due to the crisis of falling employment, lessened support and faltering public confidence that has struck physics. Many nondemonstrating physicists have begun asking the same questions as the demonstrators.

An observer wonders whether the establishmentarians, some of whom believe in a kind of old fashioned Germanic democracy of professors, really comprehend the nature of some of the cuckoo chicks they have invited onto their platforms. "There is a rumor that I will appear nude," said Brian Schwartz of Massachusetts Institute of Technology some time before he delivered a paper entitled, "Can the counterculture save physics." He didn't, but the possibility of such a rumor indicates how Physical Society meetings have changed in the last five years.

Schwartz proposes a radical reorientation of physicists' relation to their science, what he calls making physics more sensuous. Physicists tend to abstraction by reflex. For example, Schwartz says, a physicist experiences the sun as a complex of thermonuclear reactions. Schwartz wants him to experience it poetically, erotically and biologically as well. He wants to make the experience of physics by physicists and other persons paramount. Priority would no longer matter; the prime consideration would be the quality of an individual's experience of the physical world.

While most physicists would probably not yet accept all of Schwartz's program, the insecurity and anomie spreading as a result of the crisis are leading many of them to question their relation to their science and its and their relation to society.

The nub of the latter question is power, as everyone has acknowledged for a long time. Physics is at the bottom of much modern technology, and the technology provides the means of political and economic power. Physicists are generally the discoverers, developers and advisers—seldom the wielders of power. They realize that the circumstance puts them in a tender moral position.

Attitudes on this question range widely. Some seem to think the problems can be alleviated by good scientists and good politicians working together. Kenneth S. Pitzer, formerly president of Stanford University and now a professor of chemistry at the University of California at Berkeley, actually used the traditional phrase "checks and balances." Pitzer is particularly concerned that Congress is at a grave disadvantage with respect to the Executive in matters of scientific advice. The Administration has the scientific advisers, and it uses their advice for its own purposes, tending to select the positive and suppress the negative. Pitzer wants to help Congress by removing secrecy from most of the Administration's scientific advice so that Congress can have it in unedited form.

This kind of selection and editing, says Frank von Hippel of Argonne National Laboratory, often misrepresents the scientific advisers when the Government publishes their advice. He contends that the advisers are nearly always honest and balanced—though their opinions on a question may vary widely—but editing and selection can leave them looking like whores. To the radicals the prostitution is inherent in the system, and only basic change will help. They call for noncooperation, for refusing to advise and for withholding information. There is even talk of a scientists' strike.

None of these questions was settled at the meeting and none is likely to be settled in the near future. A good indicator of the current ferment is that through the meeting the public relations people of the American Institute of Physics were doing a brisk trade in bumper stickers reading, "Physics is good for you." Ten years ago there would have been no need for such a sticker. No one would have raised the question it tries to answer. □

The universe may be half antimatter after all

The laws of particle physics require that the universe contain equal amounts of matter and antimatter. Many cosmologists who believe in the now widely accepted big bang theory doubt that this can actually be so. If it isn't, they are in a bad dilemma because it is a basic axiom of physical science that laws that apply in one domain should work in others.

The problem is that early in the history of the big bang universe, its material was extremely hot and extremely dense. If it were equally balanced between matter and antimatter, they would annihilate each other. A universe consisting of pure radiation—photons—would result, and it could never get out of that state.

Not so, says Roland Omnes of the Orsay Laboratory in France. He has made theoretical calculations that show that an evenly balanced universe could avoid this radiation catastrophe, separating matter and antimatter into different regions. He described his work last week at the American Physical Society meeting in San Francisco.

In the early stages of the big bang, says Omnes, matter and antimatter separate by a process similar to the phase transition by which a liquid and a vapor separate. Bubbles composed of one or the other begin to form and grow. Annihilation reactions occurring at the boundaries of the exclusive regions generate heat that serves both to buffer the interior of the bubble against annihilation and to increase its size. The separated regions grow until they reach a limiting mass. The amount turns out to be the mass of a galaxy within a factor of about 100.

This could mean that half the galaxies are matter and half are antimatter, but there is no way to tell whether we are seeing any antigalaxies. Light produced by antimatter looks the same as light produced by matter.

Omnes's theory also allows calculation of the total amount of material—matter and antimatter—in the universe. It also permits determination of the present-day ratio of nucleons to photons (that is, matter to radiation; electrons are so light they don't count), assuming that the universe is 10 billion years old as most cosmologists tend to think. The total is something between 10^{43} and 10^{47} grams. The ratio of nucleons to photons in the universe comes out between 10^{-4} and 10^{-11}. Experimentally at the present time the nucleon-photon ratio is between 10^{-8} and 10^{-9}.

These coincidences and agreements are gratifying, says Omnes, and they give him confidence in his theory. □