

A time of torment for science

Scientists and even the concept of science seem to be facing increasing attacks in a troubled society



Wide World

Dr. Teller: Target of dissidents at AAAS session on generation gap in science.

For years the British novelist C. P. Snow has been propounding the theory that science forms a culture of its own, separated from the rest of society by a psychological gulf nearly impossible to overcome. For an almost equal length of time the average scientist tended to discount the warning. He might have found it impossible to discuss his work with laymen, or even with other scientists who were not specialists in his field, but the same situation holds true for those who produce a Broadway play or run a shoe factory.

But that was before the convention of relevance. It was before the scientists were made to feel uneasy, not because of what they had done—such feeling had been rampant among nuclear scientists since Hiroshima—but for what they had not done. They had ignored the important problems of society to chase off to the moon, promote an unpopular war and develop a gadget-ridden economy that threatened to make the world inhabitable in the years to come.

To the scientists who gathered in Chicago this week for the annual jamboree of the American Association for the Advancement of Science, it must have seemed that Snow's model of the

two cultures had some deep validity. Not only had the scientific community been forced to recognize its shortcomings and responsibilities; there was good evidence that the whole concept of science was under heavy attack. And there were signs that shifting to more relevant areas might not be either easy or adequate.

Viewed from almost any traditional angle, 1970 has been a disastrous year for science. The drying up of defense money continued, and the effects were deeply felt by scientists, who even in the palmy days had been the targets of suspicion by their military paymasters. The euphoria of the moon landing drifted away into indifference and then into dismay as Apollo 13 was nearly lost in space.

Military and space budget cuts were accompanied by slashes in other science fundings. Even research in biology and medicine—surely relevant sciences if there are any—was cut to the bone. The promise of heart transplants dissolved and people became more concerned with the frightening costs of having a simple appendectomy rather than with more exotic diseases.

Even more important was the growing suspicion that nothing a scientist

could do was much good for society.

Although many scientists like to think of their work as something as intellectually satisfying as a work of art—a thought Dr. Edward Teller of the Lawrence Radiation Laboratory tried to express at a raucous symposium on the Generation Gap in Science—the popular picture of science is of something rather mysterious that somehow gets things done. And many of the things that science has been doing—moon trips, nuclear power plants, to say nothing of military applications—seem to many segments of the public to be turning out wrong.

The root of the problem, as Dr. Teller pointed out, lies in the traumatic change in science brought about by World War II. In order to convert quickly the understanding of nuclear fission, discovered in 1938, into a nuclear bomb in 1945, scientists expended not only tremendous effort and money, but extraordinary theoretical foresight. The success was impressive; but, as Dr. Teller says, it led to “an absolute belief in the powers of the planner.”

There followed the era of big science, with its further examples of success, first in military weapons, then in space. Science, formerly the field of him who

followed the beat of his own drum and who gained support in the same way as writers, artists and other luxuries of society, became the scene of group action, goal-achievement and quick results. While many scientists returned to more basic research, they were supported by Government grants on the promise that eventually the returns would be great. "What scientists have gained in success," says Dr. Teller, "they have lost in modesty."

Success may be cause to forgive immodesty but science has been extraordinarily unsuccessful in recent years. Even the moon adventure has been scientifically disappointing—there were no great discoveries, only further mysteries.

And in the newly urgent area of environmental concern, each scientific advance has been not reassuring but further dismaying. As scientists have

turned to measuring pollution, they have found only more evidence that there is no quick way to clean up the world, to make it livable. Each discovery reveals how the technology science made possible is in the public eye storing up ecological disaster for generations to come, and even for those that live today.

There is every sign that scientists, who also live in the world, are enthusiastically grasping the nettle: They are reversing their thought processes and directing their attention from producing new wonders to controlling the ones that exist.

But at present, as the effort is just starting and the problems look almost insoluble, the atmosphere is depressing. And the chances are that scientists, once the mysterious gods of twentieth century power, will continue to take their lumps in the years that come. □

most others, they are not associated with clusters of galaxies; they stand alone. In fact they look like clouds of intergalactic hydrogen that have just begun to form stars.

Further study may show whether the young-star galaxies are young or cases of arrested development. Drs. Sargent and Searle would like to find out whether there are more of them. They would also like to know whether there are invisible intergalactic gas clouds that have not yet started to form stars. The latter investigation can be done only by radio and would be very difficult, says Dr. Sargent, because "no one knows at what redshifts to look." Hydrogen clouds can be identified by their characteristic radio signal, which comes at 21 centimeters wavelength if the cloud is still but is shifted toward longer wavelengths according to the speed of the cloud. No one knows what speeds to expect.

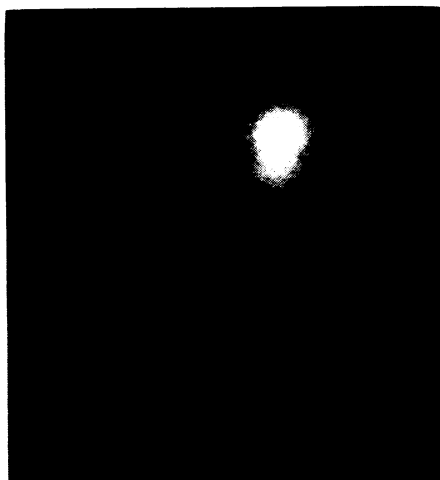
An observation of intergalactic hydrogen would also require highly sensitive equipment. Dr. Sargent cites a new installation at Westerbork in the Netherlands as one that would be capable of making a search.

If the Zw galaxies prove to be very young, they will not necessarily give a basis for decision between the rival big-bang and steady-state cosmologies. In both theories it is possible to have galaxies forming at different times after the beginning of the universe. The question is whether or not they do.

Another question is how galaxies form. The big bang starts the universe with a smooth mixture of matter and energy. For galaxies to form, turbulences must occur, but how and why they come about is uncertain. □

ZW GALAXIES

Young or just peculiar?



Hale Observatories

II Zw 0553 plus 03: It may be a baby.

One of the important questions in cosmology is whether the galaxies began all at once at a particular point near the beginning of the universe or whether new galaxies form from time to time. The discovery of an indisputably young galaxy would answer the question.

Some astronomers think that quasars may be young galaxies. A kind of taxonomic classification of galaxies can be made according to the compactness and brightness of their nuclei. The scale would range from quasars, considered under this scheme to be all nucleus, to galaxies like the Milky Way with diffuse, rather dark nuclei. Some people see these classifications as an evolutionary sequence, but there is no proof of it.

Two galaxies that appear to be young in a quite different way have now been found by Drs. Wallace L. W. Sargent

of the California Institute of Technology and Leonard Searle of the Hale Observatories. These galaxies contain only short-lived stars, a circumstance that can mean either that the galaxies are no older than their stars, 10 million years or about a thousandth of the age of the universe in most big-bang theories, or that there is something peculiar about them that prevents them from forming longer-lived stars.

The two galaxies are called I Zw 0930 plus 55 and II Zw 0553 plus 03. The Zw in their names refers to Dr. Fritz Zwicky, an emeritus professor at Caltech, who catalogued them years ago. But they were not extensively studied at that time.

In the Milky Way and other galaxies that have been studied in detail, stars of various life expectancies can be found in all stages of their development. But in the two Zw galaxies only one kind of star, short-lived large blue ones, is found. The less massive reddish stars that can live for billions of years are not seen.

If the galaxies are older than their stars, then they must produce repeatedly only the blue giant stars that live a few million years and then become white dwarfs. If that is true, something inhibits these galaxies from forming less massive longer-lived stars. Dr. Sargent thinks it may be the gas density in them. The Zw galaxies show gas densities of about 500 atoms per cubic centimeter; the Milky Way, for comparison, has one atom per cubic centimeter.

The Zw galaxies have other peculiarities. Unlike most galaxies, which have definite spherical or spiral shapes, they are irregular blobs. Again unlike

DECISION DELAYED

Anticlimax at CERN

A few weeks ago, when the British Government announced its intention of rejoining the project to build an international proton accelerator of 300 billion electron-volts energy in Western Europe, observers believed that the last obstacle to beginning construction had fallen away and that the December meeting of the council of CERN, the Western European physics consortium, would give the signal to start construction (SN: 12/12, p. 445).

That did not happen because of foot-dragging by the smaller nations. Although nations whose contributions represent 87 percent of the organization's finances have agreed to join the new project, Denmark, Greece, the Netherlands, Norway and Sweden were unable to say yes at the meeting last week.

The question has been put over to the February council meeting. □