

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. □

DECISION DELAYED

Anticlimax at CERN

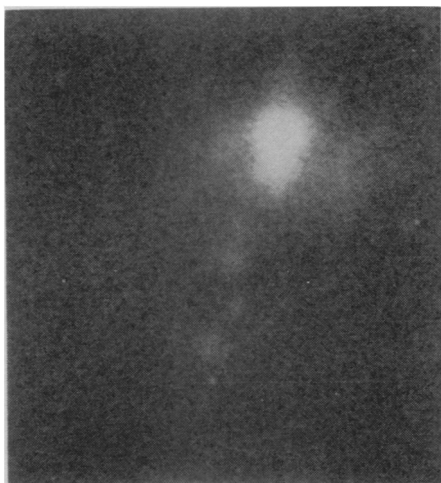
A few weeks ago, when the British Government announced its intention of rejoining the project to build an international proton accelerator of 300 billion electron-volts energy in Western Europe, observers believed that the last obstacle to beginning construction had fallen away and that the December 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. □

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