the O VI absorption lines, Cox told us.

The stellar-bubble hypothesis is supported by experimental evidence that goes back to 1968, when George Herbig (University of California, Santa Cruz) inferred from optical studies the existence of a sheet in front of the early-type star ζ Oph that is less than about 0.15 pc thick and of density greater than about 500 cm^{-3}. In 1973 results from *Copernicus* on many more OB stars began to come in. They showed a great number of rotational excitation lines for H_2, with J up to 6, their non-thermal distribution indicating that the high levels were being pumped. Since such a strong pumping source would also rapidly destroy these excited rotational states, it must be assumed that the molecular cloud is close to the source of excitation—the star—and furthermore, dense and thin. These interpretations of the data in terms of thin dense sheets in front of such stars are due to John Black and Alexander Dalgarno (Harvard University) and Michael Jura (University of California at Los Angeles). The unexpected observation of O VI in almost all stars observed—but only the uv-emitting early-type stars can be observed—has already been mentioned; this and other highly ionized atoms observed with *Copernicus* were also studied by Donald York of Princeton.

In the theory of Castor, McCray and Weaver, the bubble around a hot massive star is made up of either four or five regions, the number depending on the age of the system and the ambient density. In region 1, the innermost around the star, a hypersonic wind of cool (roughly 10^4 K) gas blasts freely from the star at about 2000 km/sec. At a radius of about 10 pc it encounters a shock wave in plowing up interstellar gas. Immediately beyond this shock is region 2, which consists of shocked stellar wind. In this zone the gas has a velocity of about 20–30 km/sec and heats up to 10^6 K. Most of the mass of the bubble is contained in region 3, which contains the swept-up interstellar gas. It is here that most of the ionization due to the uv radiation emitted by the central star occurs. However, region 3 is relatively cool (about 10^4 K), so that heat conducts into it from region 2—and this in turn causes mass diffusion back from 3 into 2. Finally, if the ionization front (where all of the star's photons have been used up in ionization processes) is within the bubble, there will be a region 4, which is a cold (about 10^2 K), dense, neutral shell only about 0.1 pc thick.

Region 4 (when it exists) will be mainly composed of neutral hydrogen atoms and H_2 while region 3 contains mainly H II (H^+) ions. The O VI is predicted to be mainly concentrated in the transition region between 2 and 3. McCray told PHYSICS TODAY that the amount of O VI predicted by the model agrees very well with the O VI column densities observed by Jenkins and Meloy.

The conclusion that the observed H II is often concentrated in circumstellar regions rather than widely distributed between stars was reached earlier by Gary Steigman (Yale University) and Peter Strittmatter and Robert Williams of the University of Arizona's Steward Observatory.[6]

Can further analysis of observations distinguish whether the absorbing ions are part of the general interstellar medium or in compact regions around stars? Jenkins says that it is difficult to separate the two models, partly because the column densities predicted by Castor, McCray and Weaver are rather insensitive to the spectral type of the star. Regional correlations are also problematic, but it may help to look for other ions because of their characteristic temperature dependences. In particular, the fact that we almost never see N V (N^{4+}) or S IV (S^{3+}) is consistent with the temperatures in the Cox–Smith model, Jenkins says. On the other hand, the column densities of these ions predicted by Castor, McCray and Weaver are just about at the upper limits of the observations. This, says Jenkins, is making it "a bit uncomfortable" for the Castor–McCray–Weaver model. Jenkins is completing a new survey of the O VI data, hoping to be able to distinguish the two theories.

—HRL

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Sandia to build largest solar-energy test plant

A five-megawatt thermal solar test facility, said to be the largest solar test plant in the world, will be built at Sandia Laboratories in Albuquerque, New Mexico. The Energy Research and Development Administration's Division of Solar Energy will manage the new plant, and Sandia Laboratories will operate it.

The new facility will test prototype solar receivers and other components that are being developed for a planned ten-megawatt electric solar pilot plant. The Albuquerque facility will also be used for more general research in solar energy and other areas. The five-megawatt plant will consist of three subsystems: a field of radiation collectors, a solar receiver-boiler and a thermal storage system.

ERDA has awarded \$325 000 to Black and Veatch Consulting Engineers of Kansas City, Missouri for the preparation of a conceptual design of the facility. The plant is expected to be operating at a one-megawatt level within fifteen months and to be fully operational in about thirty months.

Three-meter infrared telescope for Hawaii

The world's largest infrared telescope will soon sit atop 13 800 foot Mauna Kea in Hawaii. The National Aeronautics and Space Administration has awarded a \$5.5 million contract to the University of Hawaii for construction of the three-meter device, which is scheduled for completion in mid-1977. It will be an open facility operated for NASA by the university.

The telescope will be used primarily to provide supporting and complementary data for NASA's planetary exploration programs, particularly the 1977 Mariner mission to Jupiter and Saturn. It will also serve to provide ground-based observations of such objects as interstellar dust, exploding galaxies and galactic nuclei in the middle and far infrared.

ERDA and NASA sign management agreement

The Energy Research and Development Administration and the National Aeronautics and Space Administration have signed an interagency agreement in which ERDA and NASA management will identify specific program tasks that can be undertaken by the NASA centers in support of ERDA programs. ERDA will use the NASA centers in three broad areas:

- Research in specified fields such as solar systems, gas turbines, fuel cells, hydrogen technology and ground-propulsion technology;
- Proposals for specific technology developments, including testing, evaluation and demonstration of projects or hardware;
- ERDA may call upon NASA for technical and administrative expertise in ERDA's management arrangements with private high-technology institutions.

An ERDA/NASA program coordination committee will be formed to provide a continuing mechanism for reviewing the scope of NASA support for ERDA projects. □