White House Science Units Formed

More than three years after President Nixon disbanded the White House science advising apparatus, two congressionally mandated new advisory units have been put into operation. Last week H. Guyford Stever was confirmed by the Senate and sworn in as the director of the Office of Science and Technology Policy (OSTP), making him in effect the presidential science adviser. And Simon Ramo was appointed to head the President's Committee on Science and Technology (PCST), a long-range planning group.

Stever moves to the White House post from his position as director of the National Science Foundation, where he has been the focus of attention during NSF's recent battles with conservative congressmen. The debate started when some parents began to complain about the content of pre-college science courses developed under the auspices of the Foundation (SN: 4/19/75, p. 253). The NSF also bore the brunt of criticism leveled against several agencies for sponsoring "frivolous" research. Most of the charges were eventually put to rest to the satisfaction of a congressional majority (SN: 8/9/75, p. 87; 4/3/76, p. 215), but four Republican senators nevertheless tried to block Stever's nomination to the White House post, calling it "an affront to Congress" (SN: 7/3/76, p. 7).

By the time of the Senate confirmation hearing, however, criticism had begun to fade, and the resulting debate was almost anticlimactic. None of the opposing senators came to question Stever, and conservative Sen. Barry Goldwater (R-Ariz.) said he felt "there is no question about Dr. Stever's qualifications" for the post. Most of the hearing involved asking about the appointee's views on various issues.

Sen. Edward Kennedy (D-Mass.) summed up a widely held feeling in Congress when he said that "science for most of our citizens is a mysterious code that can only be deciphered by specialists," and expressed the hope that OSTP would help clarify these matters. Stever said the scientific community is increasingly responsive to practical needs and, "I hope to be part of that shift."

Stever's appointment was confirmed by the Senate by a vote of 78 to 6, and he was sworn in as OSTP director on Aug. 12. The NSF deputy director, Richard C. Atkinson, will serve as acting director of the Foundation until at least January.

The new science advisory office will have its hands full from the beginning, despite the distractions of an election year. Stever told SCIENCE NEWS that under him OSTP will effectively set science budget priorities for the next fiscal year, even if the present administration should be replaced. The office will also begin immediately to deal with a list of 65 policy questions prepared by two ad hoc committees formed for that purpose earlier this year (SN: 1/17/76, p. 39).

One committee, under Simon Ramo, was to determine the "contribution of technology to economic strength." The other, under Bell Labs president William O. Baker, was to look into "anticipated advances in science and technology." Among the 65 policy areas mentioned, the following eight were selected for special urgency: food production and distribution, improvement of nutrition, impact of government regulation, choice of alternative energy sources, raw materials production from the oceans, industrial productivity, priorities in basic research, and how OSTP itself should conduct policy analysis.

During the confirmation hearings, Stever was questioned particularly about how OSTP will approach military research matters and the administration's law of the sea policy. While remaining vague on the details, Stever replied that he had already begun talks with the head of the National Security Agency on how the two groups can cooperate, but cautioned that the limited size of OSTP would preclude many in-depth studies of particular weapons systems. He said that the law of the sea conference might provide his first opportunity to influence administration policy.

As head of PCST, Ramo will be in charge of conducting a two-year survey of federal science, engineering and technology. Among other things, the group is to look into organizational reform, improvement in existing systems for handling scientific and technical information, reduction and simplification of federal regulations, possibilities for forming a broader base for supporting basic research, and planning for ways in which science and technology can address major national problems.

An initial report is to be submitted to the President within one year, with a final report to follow a year later. Each report must, in turn, be sent to Congress. Afterwards, the committee can either be continued or disbanded at the President's wish. A change in administration in January, however, would probably not affect the makeup of PCST, though a new director of OSTP might be appointed. □

Charmed baryon: New particle family

When theoretical physicists added charm to the list of properties subatomic particles might possess, they opened the way for the possible existence of entire new families of particles. Over the last two years experimenters have begun to find them. Two new families of the class called mesons are now represented among the experimental data, and this week's news from the Fermi National Accelerator Laboratory is the finding of a member of a third, a new family of the class called baryons.

Charm has this widespread effect because it adds a new quark and a new antiquark to the existing theory of the structure of mesons and baryons. Quarks are the hypothetical constituents out of which theory builds the observed particles. In the older version three quarks and three antiquarks sufficed. Out of the various permutations of these, the properties of the known particles could be explained and new ones predicted. By adding another quark and antiquark, charm provided a whole new series of hypothetical permutations.

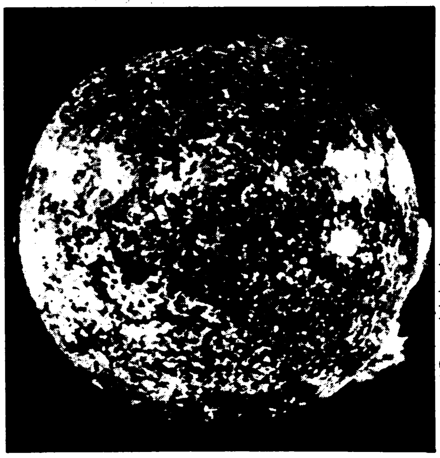
Theory tells us that a meson should be made of a quark and an antiquark, and a baryon of three quarks (or three antiquarks for an antibaryon). The first new family that experiment found was a group of mesons called psi particles. These are seen by theorists as combinations of a charmed quark and an anticharmed antiquark. Since charm and anticharm act like positive and negative, the psi's have neutral charm over all and do not display it "nakedly," but it does play a role in their behavior. These discoveries made experimenters search for nakedly charmed mesons, and this spring they began to find them. Presumably these are made of a charmed quark and a charmless antiquark. In fact, in the Aug. 16 PHYSICAL REVIEW LETTERS, the theorists who worked out the properties of a set of such nakedly charmed mesons, A. De Rújula, Howard Georgi and S. L. Glashow of Harvard University, comment on the first of these particles recently found in an experiment at the Stanford Linear Accelerator Center. They conclude in effect that what was found looks like what they had earlier predicted.

Now we come to the charmed baryons. In their structure, hypothetically a charmed quark should replace one of the three uncharmed quarks that make up an ordinary baryon (correspondingly an anticharmed or negatively charmed antiquark in an antibaryon). The particular particle found at Fermilab appears to be negatively charmed antibaryon. It has a mass of about 2.26 billion electron-volts. It was found by a collaboration of physicists from Columbia University, Fermilab, the University of Hawaii and the University of Illinois. The experiment is of a type called photoproduction, in which high-energy photons (gamma rays) are struck against a metal target. The interaction between the photons and the atomic nuclei in the target causes the photon's energy to materialize itself into any and all kinds of particles. Among them are 50 events that have the characteristics of the new antibaryon, and the phenomenon is so sharply defined the experimenters are sure it's a particle and not some amorphous bump in the data.

In principle such an antibaryon should be produced as part of a pair that includes its counterpart, a charmed baryon. Presumably these are also being made, although for technical reasons the experiment is unable to record them. Most likely they will be looked for soon. □

Mammoth quakes jostle the sun

Oscillations of the sun have once again been observed (SN: 8/2/75, p. 68), but this time with a new twist. Using NASA's Orbiting Solar Observatory 8, a team of French scientists have measured monstrous oscillations of the sun's atmosphere occurring every 14 minutes. The high-resolution ultraviolet sensors aboard the spacecraft detected pulses with amplitudes of 1,300 kilometers. This is in stark contrast to previous measurements, by Henry A. Hill of the University of Arizona, which have recorded solar oscillations with amplitudes one ten-thousandth as great. "This is definitely a new phenomenon," says Hill, and probably represents a pulsation characteristic of the solar corona (the outermost aura of the sun). The corona is millions of degrees hot and is that portion whose visible light remains during a total eclipse. Sound travels at a speed that increases as the square root of the temperature. Acoustic waves, which are most likely responsible for the observed pulsations, therefore travel through the sun with ease. Thus far theories for generally explaining the solar corona have not been successfully formulated. As such, this new phenomenon, which seems to involve that portion of the sun, is completely unexpected and currently lacks an adequate explanation. The principal investigator responsible for the French instrument on board OSO-8 is Roger Bonnet of Centre National de la Recherche Scientifique in Paris. The OSO-8 craft was launched last year equipped with instruments to study the sun and cosmic X-rays from the background radiation. □


NASA/Naval Research Laboratory

The sun (this photo taken by the Skylab ultraviolet spectroheliograph) has been seen to oscillate, changing its effective radius by 2 arc-seconds every 14 minutes.

Solar neutrinos: The inside story

Yet another hypothesis attempting to explain the absence of expected solar neutrinos has been added to the growing stockpile. It depends on the accretion of interstellar material onto the surface of the sun via gravitational attraction. This mechanism (which is not new) has the net effect, the authors argue, of enhancing the heavy element abundances (HEA) of the sun's surface compared with its interior. Since all the known relevant observations measure only the surface qualities, inferences made about the interior HEA may well be overestimates. Previous calculations by John N. Bahcall of the Institute for Advanced Study and others indicate that decreasing the solar interior's HEA would cause it (via a lengthy progression of interactions) to cool by a fraction of a million degrees. The neutrino production mechanism is highly sensitive to temperature, so this cooling would cause a suppression of the sun's neutrino output.

Based on these calculations and their reasoning, Michael J. Newman of the California Institute of Technology and Raymond J. Talbot Jr. of Rice University conclude that much of the theoretical discrepancy with observation may be due to misguided extrapolations of observed surface abundances to the interior.

Reporting in the Aug. 12 NATURE, the researchers discuss the evolution of HEA in the interstellar medium due simply to the ongoing process of nucleosynthesis. Theoretical solar models, they claim, predict that over the lifetime of the sun, the HEA may have as much as doubled (by mass). In that case, they continue, qualities of the solar interior, which reflect the conditions at birth, will differ markedly from those of the surface, which has been contaminated over the years with accreted material of varying composition. Their calculations indicate that the expected neutrino counting rate decreases by a factor roughly equal to the ratio of the HEA then (about 4.5 billion years ago) and now.

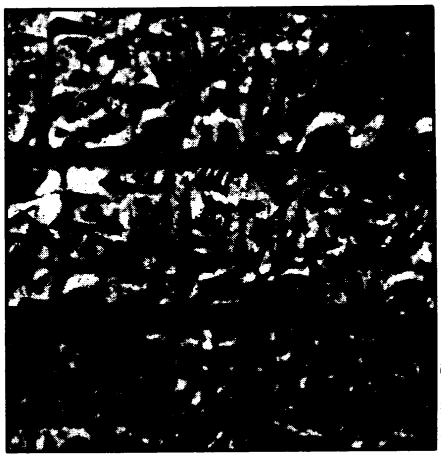
If, as mentioned, one assumes that the HEA have doubled, one predicts a neutrino rate of about 2.6 solar neutrino units (SNU). (Standard theory predicts a production rate of about 6 SNU.)

Six years ago, Raymond Davis Jr. of Brookhaven National Laboratory began looking for neutrinos emitted by the sun using a 105,000-gallon tank of perchloroethylene buried under the Black Hills in South Dakota. An average of all the accumulated data indicates an observed neutrino production rate of only 1.4 ± .4 SNU. If one regards this not as a definite measurement but as a constraint, as Davis prefers to do, the experimental statistics yield an upper limit on the rate of 1.8 SNU. Although the new prediction is still in excess of that actually observed, it certainly is a step in the right direction. □

Cuneiform tablets tell of ancient empire

King Naram-Sin of Akkad, the great Mesopotamian state, conquered Ebla in 2550 B.C., looted the palace and set it afire. Little has been heard of Ebla since, but excavations made by Italian archaeologists in Syria last year are now revealing that Ebla may have been a vast and civilized empire, rivaling Mesopotamia and Egypt in the history of civilization. The most important evidence for this comes in the form of 15,000 clay tablets covered in cuneiform script. David Noel Freedman of the University of Michigan worked with the Italian team. He says of the find: "It is as if we had ignored that Rome existed and suddenly find out about it and the Roman empire."

The language of the tablets, unknown until now, has been named Ebalite by the researchers. It is related to the Biblical


Wide World Photos

Cuneiform script tells of Eblan empire.