present climate, I would not accept funds from the NSA," he says. He worries about what terms the NSA might exact and points out that he applied to the NSF, not the NSA, and that he does not want any part of an implicit commitment to the NSA. He wonders what would happen if the NSA wanted to classify his work and he refused. Would his funds be cut off? If so, he believes he would have no due process. He is concerned about the NSF's agreement with the NSA. "It's a very frightening collusion between agencies," he says.

Adleman is a theoretical computer scientist. His research, says Rivest, "has to do with a fundamental understanding of what it means for a computation to be hard or easy." Rivest is gravely concerned that the NSA wants to fund such research. "I'm shocked," he remarks. "What worries me is that the line [between what is and what is not cryptography] is being pushed in a way that affects our ability to do basic computer science research."

What would happen if the NSA were to fund Adleman's work and to decide it should be classified for national security reasons? "We would not automatically classify the work. We would want to discuss with him the possibility of classifying it," Inman says, but he concedes that in such a case NSA would try to persuade Adleman that classification was necessary.

George Davida of the University of Wisconsin in Milwaukee had his own run-in with the NSA when the agency tried to slap a secrecy order on his invention of a cryptologic device. Since then, he has been extremely concerned about the agency's encroachment in academic research. "I really don't think Inman understands how the university and academic community works," he says. "Adleman is not tenured at MIT. If he begins to have trouble getting funded or publishing his research it could literally ruin his career."

Inman, however, thinks the agency is being entirely reasonable and that the NSA's funding of cryptographic research will work. "We just need two or three people who aren't scared to death of us. I really am dealing with sociological problems on both sides," he says.

In contrast to Inman, who seems quite clear about what his agency wants, the NSF appears unable to make up its mind. "We're still trying to work out a policy [on cryptography research]," says Langenberg. But if the NSF continues to delay, its policy may end up being worked out for it, and academic scientists may find that, without any public discussions, there are prior restraints on their research.—GINA BARI KOLATA

Navy Lab Concludes the Vela Saw a Bomb

Unlike the White House, the federal laboratories prefer the sinister explanation of the 22 September flash

Despite its best efforts to lead the choir, the President's science office has been unable to get the government's technical community to agree on whether or not someone secretly exploded a nuclear bomb on 22 September 1979 in the Southern Hemisphere. Discordant voices continue to rise above the White House mood music, whose theme is that probably nothing happened, and if something did, it cannot be proved (see *Science*, 1 August, p. 572).

The latest dissent comes from Alan Berman, director of research for the Naval Research Laboratory (NRL) and coordinator of a 300-page study sent to the White House on 30 June. Berman says that his report, the only comprehensive and original analysis commissioned by the government, concludes that there was a "nuclear event" on 22 September. The location—somewhere near Prince Edward Island, South Africa, or Antarctica.

When a signal was first received from a Vela surveillance satellite in 1979, it was accepted as evidence that a nuclear blast had occurred. South Africa was suspected of being the perpetrator because the flash was sighted near its borders. Then two journalists who were writing a book on Israel's nuclear program claimed to have learned that Israel and South Africa were cooperating to build a small nuclear device. Israel became a second suspect. Some saw the Soviets' hand in the plot. All these countries denied involvement.

The Vela's message proved impossible to corroborate. Lacking any clear physical proof that a blast had occurred, the White House assembled a panel of independent scientists to review all the data that had been collected. The group, chaired by Jack Ruina of the Massachusetts Institute of Technology, concluded in April that there was not enough evidence to support the original reading of Vela's signal. It was judged to have been caused by a natural event.

Berman's split with the Administration is notable because he is one of the few dissenters to speak publicly. Others may have been dazzled by the stellar cast of the White House panel, which was loaded with Nobel laureates, or silenced by a healthy respect for security regulations. One national laboratory executive who disagrees with the White House said, "I am keenly aware as a result of such things as the litigation that resulted from the *Progressive* case [in which U.S. prosecutors alleged that scientists leaked secret data to a free-lance writer] that our security laws are pretty effective for people who work in the industry as I do. . . . There may be folks who can talk a lot about such things that support the White House hypothesis. I can't talk that much about the things that support our hypothesis because I've got a different set of ground rules."

Scientists and intelligence analysts who have worked on the puzzle for the last year have divided into two camps, as one at the Los Alamos Laboratory in New Mexico put it: the believers and nonbelievers. The former think that the light sensors on the Vela surveillance satellite actually did "see" a bomb blast, and the latter take sides with the panel of distinguished experts convened by the White House, who think that some other natural event caused the satellite to make a false report. The believers in the Vela's signal tend to think that the White House is impelled by a political motive to ignore uncomfortable facts. "The crux of the matter," one said, "is that the White House is afraid that if this [Vela report] is true, its nuclear nonproliferation policy would be shot to hell. So they said, let's convene a panel

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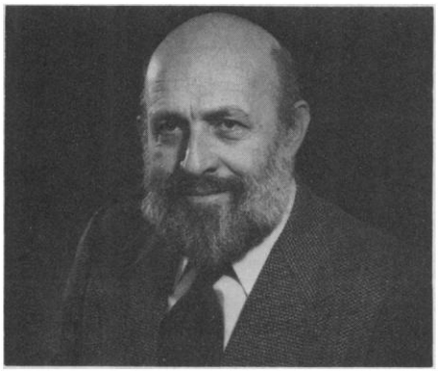
and ask them to find a technically feasible explanation other than this, because we don't want to have to face it."

From the White House perspective, the dissent seems to come from technicians with a proprietary interest in defending the Vela gadgetry, or from those who simply think the Administration is naïve about the behavior of other nations. A staffer in the President's Office of Science and Technology Policy who has worked on this problem says that the technical people often fail to appreciate the political realities. This is frustrating to him. Technical data are really of no use unless they add up to an airtight case that will stand up to criticism in a public forum like the United Nations General Assembly. Precisely because so little can be proved about the Vela's message, there is room for lots of opinion.

Berman was irritated because the White House report on the Vela, issued on 15 July, dismissed the NRL's work in a few lines as being "incomplete" and "ambiguous." He points out that the White House scientists drafted that conclusion in April, before the NRL had finished its work. Furthermore, he says, "that panel undertook no study of its own. They listened to presentations. They heard various opinions and came to their own." In contrast, the NRL assigned 75 people to work on the project for months. They concluded that the preponderance of the evidence suggested that there was a nuclear blast.

The strongest evidence, in Berman's view, comes from a hydroacoustic signal received at the right time and from the right direction to have been linked with the event seen by Vela. The NRL searched the log for "every minute of every day" for 30 days before the event and 30 days afterward to see if there were any comparable signals possibly caused by natural phenomena. There were none. Berman says it was the strongest hydroacoustic pulse he has ever seen, comparable in its "signature" only to those that followed recent overt nuclear tests in the Pacific.

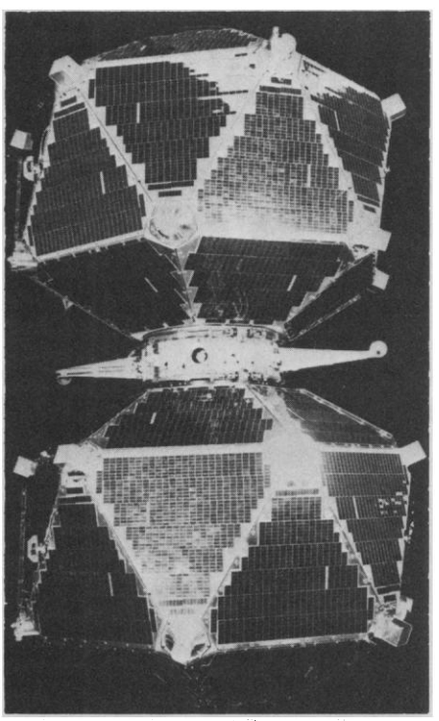
A member of the White House staff, calling the issue a "dead horse," enumerated several flaws in the NRL conclusions. None could be verified because the entire report is classified. The NRL study is fraught with ambiguity, he says, because two signals were detected: a weak one, which came first, and then a strong one. If one assumes that they came from the same source, the first had to be a direct signal, and the second, reflected. But most of the mathematical analysis was based on the second signal. No matter how sophisticated the mathematics, this staffer says, one cannot determine with confidence the origin of a reflected signal.



Dr. Alan Berman

Then there is the problem that the Navy has not been able to resolve—an internal difference of opinion about the source of the signal. One group maintains that it probably came from Prince Edward Island, and another, that it came from Antarctica. If it came from Prince Edward Island, and if it was produced by a nuclear blast, it should have been seen by another satellite. It wasn't. (Those who believe there was a blast argue that the second satellite may not have been working properly.) Somehow the Navy people "got themselves going down this garden path," the White House official says, trying to buttress the hypothesis that the blast may have occurred on Prince Edward Island.

The other technical point that believers in the Vela like to discuss involves the light sensors, or "bhangmeters." The Vela has two of these, one more sensitive than the other. The White House scientific panel made much of the fact that in recording the 22 September flash, one bhangmeter recorded more light—in relative terms—than the other did. This had not happened during previously recorded nuclear blasts. The discrepancy suggested to the White House group that the bhangmeters saw an event close at hand, perhaps sunlight reflected off a bit of debris which bounced against the satellite, not an event on the earth's surface.



Two Vela satellites mounted for launching. In the early 1960's, the United States put up five pairs of Velas to monitor atmospheric nuclear tests.

Many scientists who have worked on this case at the Los Alamos and Sandia Laboratories find it hard to believe the reflected-sunlight theory. One expert at Sandia said there was a plausible explanation for the discrepant bhangmeter readings, but he would not discuss it for fear of violating security regulations. Another said the discrepancy might have been caused by a difference between the alignment of the meters relative to the earth's axis. "If you were looking for some explanation other than this," he said, the White House theory is "the only other one that could possibly be it." How likely is it that a small meteoroid bouncing off the satellite produced the near-perfect image of a nuclear bomb flash? "It strains credibility," he said.

This Vela expert agreed with the White House that the pattern of the 22 September signal was unusual. However, he was annoyed that it had been judged so quickly a "zoo event." The term is used for signals whose cause is not understood; the Vela has produced about 70 such oddities in the last decade. This expert, who helped design the satellite, thought he should have been consulted sooner about some of the odd signals that had been noticed before the event of 22 September. He was not. Suddenly last year when an explanation was needed, he said, "The zoo animals came marching out of the woodwork."

While the specialists continue to ponder their meter readings and acoustic signals, the White House staff is trying to isolate the geographic area where a blast possibly could have taken place. Prince Edward Island may soon be eliminated. If it was over Antarctica, the White House aide says, geophysical data from observation posts in the area might be able to confirm that there was a disturbance on 22 September. Negative reports will be welcome, for they will help reduce the suspect zone. "The area is shrinking," he says with satisfaction, "and soon we may get it down to zero."

—ELIOT MARSHALL