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The Vernov Radiation Belt (Almost)

Nearly 30 years ago the Soviet Union startled and frightened us by launching Sputnik 1, the world's first artificial satellite. Less than a month later they launched Sputnik 2, which contained, in addition to a dog, some instrumentation built by S. N. Vernov and his staff at Moscow State University. The purpose of the instrumentation was to make measurements of cosmic rays above the earth's atmosphere. The first American satellite, Explorer 1, carrying similar cosmic-ray instrumentation, would not be launched for nearly 3 months. The Soviet spacecraft passed well into the intense zone of radiation that would shortly be called the Van Allen radiation belt. Why, then, was the radiation belt discovered by the American rather than the earlier Russian satellite?

The Russian radiation detector faithfully responded to the radiation belt while within it. However, Vernov and his colleagues had no immediate knowledge of these detector responses because Sputnik 2 was launched into an orbit that precluded direct detection within the Soviet Union. When the satellite was over Moscow and the Russian tracking stations, it was at a low altitude and therefore beneath the radiation belt. When the satellite was at higher altitudes and its radiation detectors were signaling the presence of the belt, Sputnik 2 was over the horizon and could not be heard by the Russian tracking stations.

Although radio signals from Sputnik were picked up all over the world as the satellite proceeded in its orbit, no one else knew what the signals meant. For reasons of secrecy, the Russians had not made arrangements to have anyone else receive data from the satellite and pass the data along to them. The first the Russians knew of the radiation belt was when they learned that James Van Allen had presented Explorer 1 data to support his announcement of the discovery. The announcement was made at the National Academy of Sciences some 6 months after the launching of Sputnik 2.

Retrospective analyses of records received in Australia and South America, for example, showed that Sputnik 2 had indeed signaled the presence of the radiation belt well in advance of Explorer 1. But, because of their perceived need for secrecy, the Russians missed making one of the most dramatic discoveries in space science. If theirs had been the open program of space exploration that the American program was (and is), credit for the discovery would have gone to Vernov, irrespective of who received the satellite radio signals and decoded them. The radiation belt would today be called the Vernov radiation belt.

Secrecy in scientific matters, although undoubtedly serving to keep competitors unaware of intentions, progress, and techniques, has the obvious disadvantages of hindering the two-way flow of information and diminishing the inspirational effects provided by open communication. It also appears that blocking or hindering external communications has an unintended adverse effect on internal communications. The institutional procedures and the mind-set that accompany the deliberate suppression of the open exchange of information in one arena spill over into others where they are unnecessary or even unwanted. Some observers believe that the poor internal communications in Soviet science is a direct consequence of their penchant for secrecy.

The United States has been able to stay ahead in most areas of research by moving so fast that the competition has not been able to keep up; the flow of knowledge that is a natural consequence of the openness of our programs has been one of our strengths. Because the freedom we enjoy in scientific communications is one of the causes of our excellence in research, we should guard this freedom jealously.—A. J. DESSLER, *Director, Space Science Laboratory, Marshall Space Flight Center, Huntsville, Alabama 35812*