real, that they simply could not take seriously the idea that one of their own colleagues would deliberately falsify data.

In early July, Charles Martin, another A&M electrochemist doing his own cold fusion experiments, tried to convince Bockris that if anyone thought the cells had been spiked, then Bockris's responsibility was to run cells in such a way that they would be beyond suspicion. At a July meeting of the various A&M researchers studying cold fusion, Martin offered to run Bockris's cells in his—Martin's—lab. "We will lock the lab," Martin said, "have very limited access, and see how it works."

Although Bockris would later say that he even had a suspect in the early days, he did little to ensure that the ongoing tritium experiments were not being tampered with. He never took Martin up on his offer to lock the cells in Martin's own lab, nor did he lock up the cells that were running in his—Bockris's—lab. And, says Ramesh Kainthla, an Indian postdoc who was the senior member of Bockris's team at the time, no one locked the tritiated water away or got rid of it entirely.

What Bockris *did* do was twofold: First, he removed Packham from his job of sampling the cells for tritium. But not, however, because he considered Packham a suspect. Packham, who was running the tritium experiments, had become the natural focus of attention. "I tried to get Packham off," Bockris says, "because by that time all these stories were floating around. Nigel spikes the tritium. Everyone thinks Nigel spikes the tritium." Bockris replaced Packham with Kainthla and Omo Velev, a Bulgarian physicist, both of whom had been working on the heat measurements. From then on, Packham says, he made a conscious effort to stay away from the tritium work.

Secondly, Bockris offered what he considered convincing arguments for why the cells that had already come up hot could not have been "sabotaged." In Bockris's first paper on the tritium work, written in mid-summer and published in the *Journal of Electroanalytical Chemistry*, he wrote off the allegations: "Interference with the experiments is considered improbable because of positive results from the Cyclotron Institute to which entrance is prohibited except by the usual personnel at the Institute."

To those who knew the Cyclotron Institute, however, Bockris's defense was unconvincing. "Any graduate student could have gotten into that lab," says John Huizenga, cochairman of the DOE cold fusion review panel on which Bigeleisen served. "It's not a bank vault."

Moreover, when Bockris wrote his paper, only two of the positive cells had come from Wolf's lab at the Cyclotron Institute. The Institute had no guards on nights or weekends. Anyone with the necessary keys could get in unquestioned and those keys had readily been given to Bockris's researchers so they could tend to the cells when necessary.

Bockris's group also took to presenting the protocol for cell A7—the cell that produced tritium while being monitored over a 12-hour period—as proof against the spiking accusations. But they would exaggerate the details to do so.

In October, for instance, at a workshop co-sponsored by the National Science Foundation and the Electric Power Research Institute (EPRI), Wolf would report that this cell "was done at the Bockris laboratory by dedicated graduate students, four of them, standing over the cells."

In November, when Packham was asked about the spiking accusations, he would explain that the cells "were under guard for that time, 24 hours a day, 7 days a week. There was one cell [A7] . . . that shows the

Wolf: My Tritium Was an Impurity

Many scientists have considered Kevin Wolf's reports of tritium the hardest to dismiss among all the claims of cold fusion. Wolf, a Texas A&M nuclear chemist, is widely regarded as a careful and skeptical researcher, so when he said last fall that he was having difficulty explaining how tritium was appearing in electrolytic cells run in his lab and that of A&M chemist John Bockris, people listened. Now Wolf appears to have knocked perhaps the last prop out from under the shaky claims of cold fusion.

"It's pretty clear that our low-level tritium was [due to] contamination," Wolf says of the cells that turned hot in his lab. And since several other labs that saw tritium in fusion cells got their palladium from the same supplier as Wolf—Hoover & Strong Inc. from Richmond, Virginia—the contamination that Wolf found throws added doubt on much of the tritium data reported in this country.

To look for tritium contamination Wolf completely dissolved a number of palladium samples, including electrodes from cold fusion cells, electrodes run in light water blank cells, and virgin palladium. He found low levels of tritium contamination in both the virgin palladium and the blank cells. The latter result was particularly surprising since the palladium electrode from the light water blank had been vacuum annealed before use, a process believed to drive all the tritium out of the metal.

His contamination findings do not necessarily apply to the tritium results in the Bockris's lab, Wolf says, even though both labs bought palladium from the same company. Bockris's cells showed tritium levels much higher than are consistent with the amount of tritium Wolf discovered hiding in the palladium. In trying to understand where the tritium came from, however, Wolf made a second finding that raises other questions about the Bockris data.

Wolf also tested some of the electrolyte from a fusion cell run in the Bockris lab that had shown a very high level of tritium. He found that the electrolyte, which had been stored in a sealed container since last year, contained a large amount of light water. Though there are other possible explanations, this result is consistent with the hypothesis that the cell had been spiked with tritium. Tritiated water contains a large amount of normal light water, and if someone had spiked the cell with tritiated water, he would have left the telltale light water behind as well.

After hearing of Wolf's discovery of light water in one of their cells, the members of Bockris's group examined eight more of their cells, says team member Nigel Packham. All eight cells, including two that had been sealed, had large amounts of light water, between 30% and 90% of the total water content of the cells, he reports. The light water could have gotten there if the electrolyte were exposed to the open air for some time, he notes. Over time, water molecules from the atmosphere will trade places with the heavy water in the solution.

"It's just incredible, I don't understand it," Wolf said. He has checked 50 cells in his own lab and found no more than 1% light water—usually much less—in 48 of them. "The proper conclusion," Wolf said, "is that things [in the Bockris lab] were so uncontrolled and so sloppy [that] those studies don't mean anything."

Packham, although concerned with the light water contamination and Wolf's discovery of tritium in the palladium samples, says he and Bockris are not ready to abandon their tritium results. "Our feeling here is that it is unlikely that we would have produced the tritium levels that we have from latent low-level contamination."

■ ROBERT POOL