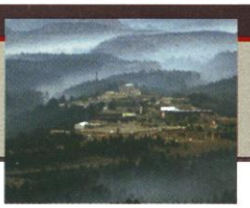

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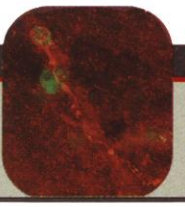
Stoking the fires at Los Alamos



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Replacing neurons in a mouse's brain

SCIENTIFIC MISCONDUCT

Panel Finds Scores of Suspect Papers in German Fraud Probe

A new report paints a darker picture of what may be the highest profile case of scientific fraud in postwar Germany. After a 2-year investigation of all 347 scientific articles co-authored by former hematologist and cancer researcher Friedhelm Herrmann, a task force jointly sponsored by Germany's main granting agency, the DFG, and the country's largest cancer charity released a report on 19 June indicating that the scope of the fraud—first uncovered 3 years ago—is far more extensive than previously thought. Although Herrmann and a co-author have left their academic posts, the new revelations could place other careers in jeopardy.

A well-known and decorated member of the German research establishment, Herrmann studied various leukemias and how they respond to cytokines, signaling messengers of the immune system. The task force, headed by cell biologist Ulf Rapp of the University of Würzburg, concluded that 52 of Herrmann's papers "contain falsifications," including data that were manipulated, while another 42 include data suspected of having been manipulated. The task force also found evidence of manipulation in three habilitations, the uniquely German post-Ph.D. qualification for aspiring professors, and "inconsistencies"—but no firm evidence of data falsification—in a randomly selected publication co-authored by clinician Roland Mertelsmann, chief of Herrmann's former hematology and oncology department at the University of Freiburg Medical Center. Any sanctions stemming from the report would come from the universities involved, the granting agencies that funded the fraudulent work, state and federal science ministries, and public prosecutors. "This is not the time yet to heave a sigh of relief and consider the matter closed," says DFG Secretary-General Reinhard Grunwald.

Initial allegations emerged in late January 1997, when Eberhardt Hildt, a postdoc in Herrmann's lab, claimed to his former Ph.D. supervisor that Herrmann, then at the University of Ulm, and Marion Brach, who had just left Ulm to start a lab at the University of Lübeck, had fabricated data in as many as four research papers appearing in 1994 and 1995. The two universities—as well as the University of Freiburg and the Max Delbrück Center for Molecular Medicine in Berlin, where Herrmann and Brach had worked previously—then set up panels to probe the allegations.

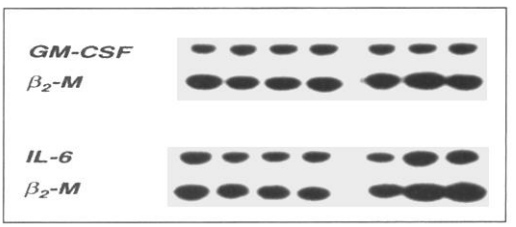
When questioned by the Lübeck panel, Brach said she was pressured by Herrmann to manipulate data on a few occasions in 1993 and 1994. Herrmann has steadfastly denied knowledge of or involvement in any manipulation. Meanwhile, the Berlin investigations zeroed in on autoradiograms—dark bands, resembling bar codes, whose patterns reflect protein and RNA production in cells under various experimental conditions. The panels found that individual bands and entire assemblies had been recycled to pose as results from other experiments in the same article or in later publications.

Journal	No. of articles
Blood	11
European Journal of Immunology	6
Journal of Immunology	6
Leukemia	5
Cancer Research	4
FEBS Letters	4
Journal of Clinical Investigation	4
Molecular Pharmacology	4

Paper trail. Journals with the most articles, co-authored by Friedhelm Herrmann, that were identified by a German task force as containing examples of clear or suspected data manipulation.

The local committees fed their findings to a national panel, chaired by Wolfgang Gerok, a retired professor of internal medicine. In a summary report issued in August 1997, Gerok's panel detailed alleged falsification and data manipulation in 37 publications. In the wake of the report, Herrmann and Brach resigned their positions.

The findings were "definitely a wake-up call for the German scientific community," says Rapp. After much soul-searching, the DFG and the Max Planck Society, Germany's premier research institution, issued guidelines to guard against fraud that were subsequently adopted by most universities (*Science*, 19 December 1997, p. 2049). But the magnitude of the alleged misconduct prompted the panel to recommend, Gerok says, that all of Herrmann's publications "as well as his scientific environment be scrutinized."



Suspiciously alike. As one example of manipulated data, the task force concluded that bands from these autoradiograms are too similar to have been the product of different experiments as portrayed in a 1995 article in the *Journal of Experimental Medicine* (vol. 181, p. 793).

Beginning in April 1998, Rapp's four-member team located all of Herrmann's publications from the MEDLINE database. Because the three co-authors (besides Brach) with whom Herrmann published most frequently were all affiliated with Mertelsmann's hematology department, first at the University of Mainz and then at Freiburg, Rapp's team focused on work generated during Herrmann's years at both institutions, from 1988 to 1992.

The panel also sampled the work of other department researchers. "We wanted to determine … whether [fraudulent behavior] was restricted to Herrmann's group or typical for the entire department," says Rapp. The task force examined more than 600 publications by Herrmann, Brach, Mertelsmann, and two colleagues—Albrecht Lindemann and Wolfgang Oster, who had defended their habilitations under Mertelsmann. Taking up where Gerok's investigation left off, Rapp's team examined the papers' figures. "We sent out questionnaires and asked the authors to disclose who was responsible for each," says Rapp, whose group also requested raw data. He says they mostly received scant cooperation.

Still, the task force ferreted out cooked

CREDITS: [LEFT TO RIGHT] TASK FORCE F. H.; TASK FORCE F. H. [M. KIEHNTOPF *ET AL.*, *JOURNAL OF EXPERIMENTAL MEDICINE* 181, 793 (1995)]

figures. They scanned every single autoradiogram and compared them with each other using image-processing software to alter orientation, intensity, and contrast. All told, Rapp says, his team found 357 apparent manipulations and fabrications of autoradiograms in the articles Herrmann co-authored. For instance, in one paper on an oncogene's activity, the same assemblage of bands was used to illustrate cellular responses to different chemicals. In other figures, bands were copied, flipped, or otherwise reused elsewhere. The 94 papers with clear or suspected manipulation could be "a lower estimate," says Gerok, as the task force members were unable to check the veracity of the raw data in most papers. Herrmann, now in private medical practice, did not respond to several requests from the task force, nor did he return calls from *Science*. Brach could not be located.

The task force investigators also found evidence of fudged figures in the habilitations of Brach, Lindemann, and Oster. The latter two contained allegedly manipulated figures appearing exclusively in the habilitations. "Since a habilitation is a single-author publication, the author is ultimately responsible for its entire content, and this makes an active participation [in the manipulations] very likely," says Rapp. During the initial investigations 3 years ago, Lindemann, who has denied involvement in data manipulation, retracted his habilitation and replaced it with a new version. Rapp's task force intended to examine it, but Lindemann failed to respond to a request for raw data, Rapp says. Instead, Mertelsmann informed the task force that Lindemann had decided to leave academic research. A University of Freiburg spokesperson, however, told *Science* that Lindemann is still with the university and has asked for a 1-year leave of absence starting 1 August. According to Rapp, Oster, who has since left the University of Freiburg, declined to respond to the task force other than with a written statement claiming he had nothing to do with the alleged misconduct. Neither Lindemann nor Oster could be reached for comment.

The task force report criticized Mertelsmann for failing to monitor the department's research closely enough to pick up on the fraud, "especially for publications in which he is the senior author," says Gerok. During its investigation, Rapp says, Mertelsmann told the task force that as a clinician he lacked a deep understanding of the molecular biology research, and thus left it to Herrmann to oversee. That did not impress the panel—or Gerok, who says that "such a notion of authorship is lethal for science." The task force also randomly selected five of Mertelsmann's 245 papers that do not include Herrmann as an author. After analyzing one in detail, the task force in its report states that it found "no conclusive proof of conscious falsifications," although "data may have been manipulated." Rapp's group plans to analyze the other four papers in the coming months. When contacted by *Science*, Mertelsmann declined to comment.

All the researchers implicated in data manipulation could face demands from the DFG and the cancer charity, the Deutsche Krebshilfe, to repay grant money used to fund tainted work. The DFG, Grunwald says, is considering legal action to recover part of the $440,000 it spent on Herrmann's work. In the meantime, Gerok says, the authors should retract all 52 clearly tainted papers.

On 19 June, University of Freiburg president Wolfgang Jäger resurrected the university's own fraud panel in order to probe for irregularities in Mertelsmann's department. "You can expect this process to drag on for a long time," says Rapp. Indeed, it may take years more for the German scientific community to put this affair behind it.

–MICHAEL HAGMANN

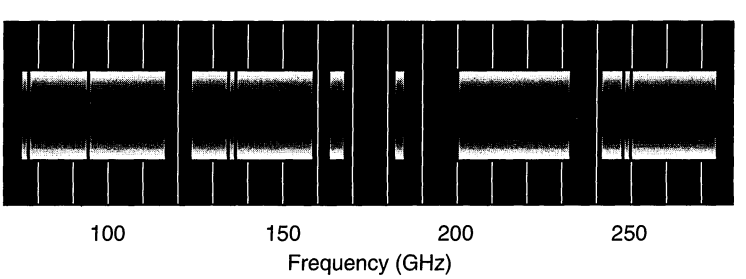
ASTRONOMY

Researchers Get Spectrum Bands

Technology has a way of opening windows of opportunity and promptly closing them again. In radio astronomy, a surge of technological advances has opened such a window over the past decade by allowing astronomers to see the electromagnetic spectrum at millimeter wavelengths. But scientists have been in danger of losing this precious band to another burgeoning technology—telecommunications—as millimeter wavelengths look promising for transmitting high-bandwidth wireless information over relatively short distances. Earlier this month, however, astronomers won an international agreement to keep their window open.

For astronomers, this band in the spectrum, which falls between long-wavelength radio waves and short-wavelength infrared light, is a gold mine. The bulk of the energy in the universe is emitted at these wavelengths; it comes from molecules in the interstellar medium, from the cosmic microwave background, and from cool material forming stars, planets, and galaxies. Studying these emissions promises insight into subjects as diverse as the origins of life and the birth of stars. But commercial technologies are already being developed to broadcast and receive at frequencies above 50 gigahertz, which corresponds to wavelengths below 6 millimeters. That's uncomfortably close to the frequencies of interest to radio astronomers, which fall between 71 and 275 GHz. "If you wanted, for instance, to broadcast the Internet from satellites in orbit—and God forbid this will ever happen—you have to go to much lower wavelengths than any employed now," says astronomer Al Wooten of the University of Virginia and the National Radio Astronomy Observatory in Charlottesville.

Now critical wavelengths have been guaranteed safe for radio astronomers. Although radiation in much of the millimeter band is blocked by Earth's atmosphere, three frequency bands can pass through relatively unscathed. The 2500 delegates to the World Radio Communication Conference, known as WRC-00, which met from 8 May to 2 June in Istanbul, Turkey, agreed to allocate all three to radio astronomers, reserving frequency bands with no scientific importance for military uses, such as satellites that require downlinks at millimeter frequency. "This is a preventive measure to assure that the future of millimeter-wave astronomy will be as free of interference as possible," says Tomas Gergely, electromagnetic spectrum manager for the



Astronomy reserve. Regions of the electromagnetic spectrum within three frequency bands not blocked by the atmosphere have been allocated to radio astronomers.

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