engineered the reform of the Gregorian calendar, wrote in his copy beside a faulty trigonometric theorem, "Here Copernicus is dreaming!" Several score of the books reveal detailed technical critiques by astronomers. The marginal notes of Erasmus Reinhold, the foremost astronomer in the mid-16th century Lutheran world, ignored the heliocentric cosmology but devoted great attention to questions such as the motion of the moon and the slow precession of the stars. And contrary to the conventional wisdom, Gingerich has shown that Copernicus was quickly taught at the graduate level in many of the great Lutheran universities.

Do notes appear in all the books? "It's hard to say," Gingerich told the History of Science Society. "It's difficult to find a copy that is totally clean, that doesn't have at least a little bit of underlining. Then there were the people who wrote index notes in the margin, sometimes losing interest after about 20 pages. About 10 percent of the books contain really interesting comments."

A book's provenance can also illuminate the sheer sweep of history. A copy now in a private collection in Oxfordshire was previously owned by William Jones, an English mathematician in the circle of Newton and Halley. Earlier, it was owned by Richard Bently, a classical scholar and master of Trinity College. Still earlier, it was in the possession of John Greaves, a 17th century astronomer at Oxford who apparently bought the book in Italy on the way to the Middle East. On the endpapers and flyleaves, Greaves took notes on Ur and Lahore, and noted that someone had sighted two unicorns in India.

So far Gingerich's survey has yielded two major discoveries. Not only was technical comprehension of the epic treatise widespread, but a network of shared notes often formed between master and apprentice, sometimes stretching over generations. This path of learning took place outside the tradition of the universities, and is therefore a major find. Some of Reinhold's comments over the course of the 16th and 17th centuries found their way into more than a dozen books. Another scholar's notes appear in six different volumes. As Gingerich has written in an article entitled "The great Copernicus chase": "Astronomy professors scrutinized the text and their protégés carefully copied out their remarks, setting the notes onto the margins of fresh copies of the book with a precision impossible by aural transmission alone. Clearly the students sat with the master book before them as they transcribed

Los Alamos Alumnus Touted as NSF Chief

Announcement of a new director of the National Science Foundation (NSF) is said to be imminent. The leading contender is said to be the foundation's current assistant director for mathematical and physical sciences, Edward A. Knapp, who joined NSF in September after 24 years as a scientist and administrator at Los Alamos National Laboratory.

Knapp has been active in scientific organizations in his discipline and to some extent in international scientific affairs, but is not well known in the science establishment. What is important is that he is apparently well known to President's science adviser George A. Keyworth II, who also came up through the Los Alamos hierarchy and is consulted in Administration appointments in the science sector.

Departing NSF director John B. Slaughter has accelerated his exit from the foundation in order to take up his new post as chancellor of the University of Maryland's College Park campus on 1 November. Slaughter announced in June that he would leave NSF for the university job. He said then that he would delay his departure from NSF to give President Reagan time to appoint a successor.

NSF deputy director Donald N. Langenberg will serve as acting director of the foundation until a new director takes over. Langenberg will be undertaking his second stint as acting director. He was acting director from July to December 1980 in the interval between terms of Slaughter and his predecessor, Richard C. Atkinson, now chancellor of the University of California, San Diego.

Knapp, 50, whose name has been mentioned increasingly on Capitol Hill and elsewhere as the probable White House choice to lead NSF, was head of the Accelerator Technology Division at Los Alamos when he was named to the NSF assistant director post. He earned a Ph.D. in high energy physics from the University of California, Berkeley, in 1958 and joined Los Alamos that year. Knapp's career at the laboratory included participation in the planning of the lab's Los Alamos Meson Physics Facility; he organized the accelerator technology division in 1978.

Slaughter's timing in leaving NSF was something of a surprise to the NSF staff. Slaughter was unavailable for comment, but sources in the foundation indicated that his decision was influenced by considerations that he had completed his role in NSF budget activities and that a longer absence from the university post could cause difficulties. Slaughter, 48, who was provost of Washington State University before becoming NSF director, will head Maryland's 37,500-student main campus outside Washington.

In actions that affected the policy sphere at NSF, President Reagan announced three more nominees to the National Science Board, the policy-making body for the foundation. The nominees are Robert F. Gilkeson, chairman of the board of the Philadelphia Electric Company; William F. Miller, president and chief executive of SRI, International; and William A. Nierenberg, director of Scripps Institution of Oceanography at the University of California, San Diego. If confirmed by the Senate, the appointments would bring NSB membership to within one of its full statutory membership of 24. The Administration for some months appeared to ignore a number of vacancies on the board.

—JOHN WALSH

Nuclear Regulation Run Amok, DOE Reports

Perhaps as early as next January, according to the White House, the Administration will propose new legislation designed to simplify nuclear plant licensing. One of the Administration's oft-repeated promises is that it will do something to shorten the time needed to get a nuclear project approved by the government. President Reagan's appointees have been looking for ways to simplify and centralize the running of the Nuclear Regulatory Commission (NRC), which is charged with protecting public safety. The first substantive indication of what they may propose appears in a paper issued by the Department of Energy (DOE) in October. It was one of several parting shots fired by James Ed-

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wards, who is leaving DOE to head the Medical University of South Carolina.

The 45-page report, sharply critical of current NRC practices, is full of suggestions for administrative and legal reform. Noting that plant construction time lengthened by 70 percent between 1974 and 1980, the paper places much of the blame on "increased NRC review time." The 20 percent inflation rate for capital costs, the paper says, is "due in part to a regulatory emphasis on the analytical understanding of low probability events in an unduly legalistic licensing forum." Because of this, builders have dealt with safety concerns in ways that make sense in a legal, but not always in an engineering, context.

The DOE paper gives an example: in order to survive "low probability earthquakes," nuclear plant piping must now meet very fine tolerances, the kind one might expect to find in a machine shop but not in a large heating plant. Plumbing a nuclear plant has become more costly than it need be, DOE argues, and this has increased expenses.

In summary, the DOE report finds regulators to be "unpredictable," which is to say that DOE believes they have not established a consistent safety policy. They have shifted ground from year to year, making the rules complex, even chaotic. To improve the situation, the DOE recommends the following changes.

- The NRC should define what it considers to be an acceptable level of risk and should not require any plant operating within this acceptable range to install new safety devices by "backfitting." All backfitting requirements should be approved by a central committee.
- Public hearings on applications for a nuclear plant license should be more tightly constrained to avoid procedural delay. The NRC should take several steps to weed out irrelevant petitions, such as those involving "previously resolved issues." Cross-examination of witnesses should occur only when material facts are contested.
- Applicants should be allowed to get a construction and operating license in one step, not made to go through two independent hearings as at present.
- Rather than ask the independent Advisory Committee on Reactor Safeguards (ACRS) to look at all license applications, the government should let the ACRS review only those it deems most important.
- The NRC should review and give 10-year clearances for nuclear plant construction in certain areas so that future builders will have quick access to sites.
- The NRC should clear certain generic reactor designs in advance so that builders will be able to buy approved plans off the shelf.

The nuclear industry welcomes these proposals. The antinuclear critics are not particularly aroused, for they do not think Congress is ready to approve broad licensing changes. "It's another get-well card for the industry," says Robert Pollard of the Union of Concerned Scientists. Noting that domestic nuclear plant orders stopped in 1979, he says, "This may make the industry feel better, but it won't cure its illness."

—ELIOT MARSHALL

President Vetoes EPA R & D Bill

Just before the election, President Reagan took the extraordinary step of vetoing a bill that authorizes funds for research and development by the Environmental Protection Agency (EPA) in the current fiscal year. In his announcement, the President cited—of all things—a point of scientific principle. He noted that a heretofore obscure provision of the bill required representation from "states, industry, labor, academia, consumers, and the general public" on EPA's Science Advisory Board, a group that settles scientific disputes and helps to set research priorities.

The requirement is repugnant, he said, to the tradition of disinterested scientific advice. "To undermine this tradition by requiring that scientists . . . wear the label of 'industry' or 'labor' or 'consumer' is a modern-day version of Lysenkoism to which I must strongly object."

Reagan's careful attention to a detail that other Presidents would surely have ignored is said to be the handiwork of John Hernandez, the deputy administrator of EPA. In an unusual eleventh-hour effort, Hernandez successfully persuaded both the Office of Management and Budget and the Office of Science and Technology Policy that the issue was of sufficient importance for Reagan to risk a further blackening of his image on the environment from skeptics who would disbelieve his motive.

Representative James Scheuer (D-N.Y.), for example, claimed that the stated reason for the veto was a cover for Reagan's opposition to provisions in the bill that required research on such problems as indoor air pollution and the health effects of energy production. Scheuer, who chairs a House subcommittee on the environment, is responsible for the language that Reagan found offensive.

Scheuer's complaints were undercut, however, when the leaders of two scientific organizations rose to the President's defense. Frank Press, president of the National Academy of Sciences, and William Carey, executive director of the AAAS, both wrote to presidential science adviser George Keyworth after the President's decision to state that they too objected to the advisory board requirement. Press said that "such a provision could mean that political ideologies and institutional affiliations replace professional and technical competence in the selection of the Board's membership." Carey said it was "inimical" to advisory board duties.

Scheuer's argument was also undercut by the fact that EPA's research and development funds are ultimately determined by an appropriations bill, which the President has already approved. That bill contains some extra money for acid rain and indoor air pollution, although not as much as Scheuer wanted. It also gives the agency the option of spending less than Scheuer sought for water quality and hazardous air pollutant research.

Reagan's veto message acknowledged his opposition to several provisions in the authorization bill, but it emphasized the science board requirement. Strangely, no one in the Administration took the trouble to voice a strong objection to the requirement until after the bill was passed, according to congressional staff aides. EPA and OMB officials said it was merely an oversight.

—R. JEFFREY SMITH