

## Was Galileo Saved by Plea Bargain?

*Controversy surrounds a novel claim that Galileo's trial was a plea-bargaining process, designed to protect him against charges of heresy for promoting the atomic theory of matter*

**T**HE trial and condemnation of Galileo Galilei in 1633 for having supported Copernicus' heliocentric model of the universe is widely acknowledged as one of the key events in the history of modern science. Indeed, the Catholic Church has recently been sufficiently embarrassed by its earlier insistence on the primacy of religious faith over scientific experiment to have taken the unusual step of awarding Galileo a full pardon.

But was the trial all that it appeared to be? An Italian historian of science, Pietro Redondi, has come up with a new thesis which, if proved correct, suggests the need for a fundamental reappraisal both of the real causes of the conflict between Galileo and his critics and of the broader historical significance of the trial itself for the relationship between science and religion.

In a book just published in France\* (and due to appear in the United States next year) Redondi claims that the real crime for which Galileo was denounced was not his support for the Copernican theory that the earth revolves around the sun, an idea to which the Church had previously given its blessing. Rather it was his suggestion that matter is made up of immutable atoms. This was a much more serious affair, since it contradicted the Church's fundamental dogma that bread and wine blessed during the communion service are physically transformed into the body and blood of Christ.

Redondi, who is assistant director of the Alexandre Koyre Center for the history of science here, goes on to claim that the trial itself was not motivated by personal animosity toward Galileo but was the result of a power struggle within the Church between the relatively liberal Pope Urban VIII and the more conservative Society of Jesus. He also suggests that the Pope, worried about his previous open support for Galileo, persuaded the Florentine physicist to plead

guilty to the lesser charge of Copernicanism in order to shield both of them from suspicions of heresy launched by the Jesuits. Had Galileo been convicted of heresy, he might well have been burned at the stake.

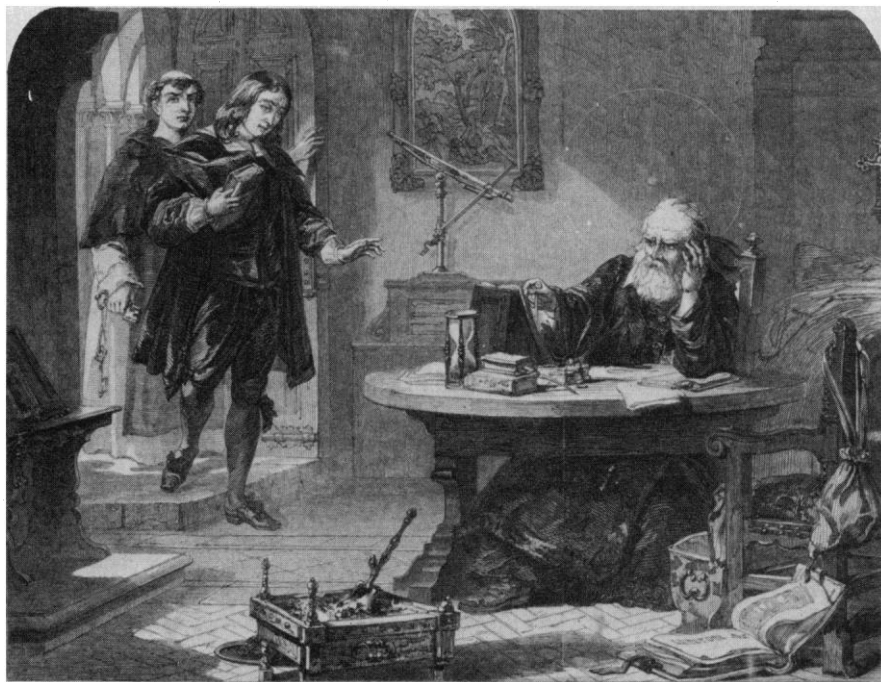
Redondi's thesis, based on research in the Vatican archives and a wide reading of the contemporary literature, and written up in a racy style, has already generated strong controversy among historians of science since it was first published in Italy 3 years ago. Oxford historian Alistair Crombie, for example, describes Redondi's suggestions as "absurd" and claims that they are based on an "untenable interpretation" of the available evidence.

Others are less dismissive. While acknowledging the need for firmer data to support the hypothesis, they have been less hostile to the new perspective which Redondi claims to open up on one of the best known dramas in modern science. Galileo scholar William Wallace, for example, of Catholic University in Washington, D.C., describes the

book in a review as "one of the most exciting additions to the recent literature" on Galileo, and adds that "many people do not recognize the vast pluralism that existed within the unified appearance of the Catholic Church at the time."

Central to the controversy is a hitherto unknown document which Redondi came across virtually by chance in the Vatican archives. Written in 1624, the anonymous document seeks advice on whether a passage in Galileo's just published *Il Saggiatore*, implying that all matter is made up of indivisible atoms, is compatible with the theological doctrine of the Eucharist recently confirmed by the Council of Trent as the central element of Catholic dogma.

Redondi uses a combination of textual and circumstantial evidence to argue that the document was written by the prominent Jesuit mathematician and architect Orazio Grassi, with whom Galileo had already crossed swords over the interpretation of comets and who was reported to have



**John Milton visiting Galileo.** Milton, who was in Italy in 1638 paid a visit to Galileo, who was then a prisoner of the Inquisition.

\**Galilée Héritique* by Pietro Redondi, translated from the Italian by Monique Aymard (Editions Gallimard, Paris, 1985). First published in Italy under the title *Galileo Eretico* by Giulio Einaudi in 1983. To be published next year in the United States by Princeton University Press.

vowed an instant reply to *Il Saggiatore* when it appeared in Rome. He goes on to suggest that, although the questions in the document were phrased in a way that clearly implied they were meant to be a denunciation, nothing was done at the time, partly because the Jesuits were in a relatively weak position in the Church. But the charges were resurrected in the early 1630's, during the height of Europe's Thirty Years War, when Urban VIII was coming under pressure to shift his allegiance from France (which had sided with Protestant Germany and Sweden) to Spain, and the Jesuits were using this to try to return to power.

In line with this interpretation, Redondi then raises the possibility that a special commission set up by the Pope under Cardinal Francesco Barberini to examine complaints made with the support of the Jesuits against Galileo's newly published *Il Dialogo* had been instructed to frame the charges of heresy in a way that would do the least overall damage. He also says that this tactic was accepted by Galileo during a famous closed-door meeting with Barberini, after which Galileo dropped his initial defiant stand and agreed to plead guilty to the lesser charge of defending Copernicus' ideas.

This novel interpretation of a thoroughly studied event has encountered many critics. Some have focused their attacks on the newly discovered document. The Society of Jesus in Rome, for example, has produced a letter written by Grassi in the same year, but in a very different handwriting, to dispute that he was the author of the charges (Redondi now says that the document could be a copy made by an assistant). Others argue that the document, which is unsigned apart from the initial "G," could have been a standard inquiry with little legal significance.

Redondi himself argues that, even if his data are weak, his interpretation of the events surrounding the trial remains new and significant. "Galileo's trial was a political process, like all the great affairs of state," he said in a recent interview. "The movement [towards liberalization] was suddenly stopped by political and military dangers at the top of the Church; this crisis was the external key to the personal issue faced by Galileo."

William Shea of McGill University agrees that Redondi's approach to understanding Galileo in the context of his period remains important. "Redondi writes about this is the way that people produce new theories about the Kennedy assassination," he says. "Many scholars feel that some of his ideas are far-fetched; but the book does for the first time compel us to ask certain questions about Galileo that we have not asked before." ■ **DAVID DICKSON**

# The Buried Cost of the Savannah River Plant

*Once-secret documents reveal a history of problems at the South Carolina plant where 33 million gallons of military nuclear waste sit in steel tanks*

**F**EDERAL officials are beginning to cope with the pollution left behind by the 40-year-old nuclear weapons program, but they are not wildly enthusiastic about the work that lies ahead.

It will cost over \$1 billion to repackaging liquid defense wastes alone. The first major effort, which began 3 years ago at the Savannah River Plant (SRP) near Aiken, South Carolina—producer of most of the nation's bomb material—will take until the next century to complete. Other cleanup campaigns are getting started at the defense nuclear complex in Hanford, Washington, the re-

jects that would control ongoing thermal and chemical pollution at DOE's nuclear weapons plants, preferring to spend the money on real defense programs, such as new weapons R&D. The cuts may be restored when the DOE appropriation reaches the floor of Congress, but the committee vote shows that the senators, like others, are reluctant to spend defense money on something as unmilitary as the environment.

However, there are dangers in hesitating, as a new report on the Savannah River Plant points out. A 110-page paper (see box), released on 23 July by the Environmental



**Savannah River tank farm.** The plant holds 70% of U.S. high-level defense waste.

tired Y-12 enrichment plant in Oak Ridge, Tennessee, and sites in California, Colorado, and Ohio.

These and other remedial programs will crowd the budget at the parent agency, the Department of Energy (DOE), pushing aside regular defense projects. They will spark regional fights over where to store the waste canisters. And they have caused worries about the new pollution that will arise when tanks and seepage basins are disturbed. The agenda is so unappealing that even national leaders seem ready to cut and run.

For example, the Senate Armed Services Committee recently proposed a retreat. It cut more than \$81 million from DOE proj-

Policy Institute (EPI), criticizes the managers of this plant for their neglect of health and safety in the past. EPI claims that the government is allowing a 300-square-mile corner of South Carolina to become a "national sacrifice area" for the weapons program, a zone whose soil and water will remain toxic for longer than humans have kept records.

The authors, EPI staffer Robert Alvarez and consultant Arjun Mahkijani, reviewed a data bank of 14,000 incidents recorded between 1953 and 1982 by employees of the E. I. du Pont de Nemours & Company, the manager of the Savannah River Plant. EPI and others filed legal actions and Freedom of Information appeals over the last 5 years