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creased more than threefold since 1965; the *Directory of American Philosophers* for 1992–93 lists more than 10,000 academic philosophers in the United States and Canada.

What is most striking about American philosophy, Rescher maintains, is its fragmentation: "Every doctrine, every theory, every approach finds its devotees somewhere within the overall community. On most of the larger issues there are no significant majorities." Indeed, there is not even a consensus on what the urgent problems in philosophy are.

"Specialization and division of labor run rampant, and cottage industries are the order of the day," Rescher says. One cottage industry, for example, has to do with ethical questions in the professions; another, with the epistemology of information processing. Issues that once would have been considered merely bizarre (e.g., "Is Polygamy Good Feminism?") now are solemnly discussed at professional meetings and in the pages of journals. Entire professional societies are devoted to subjects that no one a generation ago would have deemed philosophical (e.g., the Society for the Study of Ethics and Animals).

While American philosophers were once inspired by religion, then took natural science as their guide early in the 20th century, today they draw from a wide variety of sources, ranging from French philosopher Jacques Derrida to mathematician John von Neumann.

"Philosophy—which ought by mission to be and is by tradition an integration of knowledge—has itself become increasingly disintegrated," Rescher laments. Yet American philosophy's "pluralistic character" is just "a realistic and effective accommodation" to the American environment. "One must," Rescher says, "accept the inevitable."

## Bishops' Move

"The Politics of the American Catholic Hierarchy" by Timothy A. Byrnes, in *Political Science Quarterly* (Fall 1993), Academy of Political Science, 475 Riverside Dr., Ste. 1274, New York, N.Y. 10115-1274.

The American hierarchy of the Roman Catholic Church became very active in national politics during the 1970s and '80s, as the bishops

jumped into the right-to-life movement and published lengthy pastoral letters on U.S. defense and economic issues. As early as 1976, some got involved in national elections. Byrnes, a political scientist at Colgate University, contends that the bishops' new prominence in politics was not entirely their own doing.

Earlier in this century, when many Americans still looked upon "papists" with great suspicion, the bishops spoke out mainly in defense of the patriotism of American Catholics. In some cities, bishops came to have clout with local political leaders. By the 1960s, however, this "parochial" era was essentially over. Prosperous and well-educated, American Catholics no longer needed clerical apologists to provide political leadership. John F. Kennedy's election symbolized the movement of Catholics into the mainstream. But the bishops, encouraged by Pope John XXIII's Second Vatican Council (1962–65), strengthened the National Conference of Catholic Bishops (NCCB) and began to apply Catholic social teaching to national issues.

At the same time, Byrnes points out, the breakdown of the long-dominant Democratic New Deal coalition led some politicians in both parties to appeal to voters on religious grounds. Roman Catholics make up nearly a quarter of the U.S. population (57 million in 1990). The bishops do not control Catholic voters, Byrnes observes, but many politicians "believe, or perhaps fear, that the bishops can still exert a substantial influence" on them. Hence, many candidates have sought to play up their areas of agreement with the bishops and to minimize differences.

Thus, in 1976, three years after *Roe v. Wade*, Democratic presidential candidate Jimmy Carter, a Southern Baptist, met with the NCCB executive committee and tried, unsuccessfully, to paper over his differences with the bishops on abortion. Republican president Gerald Ford, meanwhile, proclaimed his support of an antiabortion constitutional amendment and had the NCCB executive committee to the White House.

By 1984, the bishops had expanded their public agenda to include opposition to nuclear arms and were divided over whether or not

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abortion alone should serve, in effect, as a political litmus test. Cardinal Joseph Bernardin of Chicago urged that the church's "pro-life position . . . be developed in terms of a comprehensive and consistent ethic of life." This, Byrnes observes, provided "a kind of moral cover" for "pro-choice" Catholic Democrats. The partisan implications of the bishops' conflicting positions, and the fact that a pro-choice Catholic,

Geraldine Ferraro, was the Democratic candidate for vice president, gave the bishops a larger role in the 1984 campaigns than they otherwise would have played. Four years later, with different candidates and different circumstances, the bishops had a much lower profile. How big a role they play in national politics in the future, Byrnes concludes, will be determined, in considerable part, by the parties and candidates themselves.

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## SCIENCE, TECHNOLOGY & ENVIRONMENT

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### Computerized Q.E.D.'s

"The Death of Proof" by John Horgan, in *Scientific American* (Oct. 1993), 415 Madison Ave., New York, N.Y. 10017-1111.

When Princeton's Andrew J. Wiles announced last June that he had solved Fermat's last theorem, his fellow mathematicians gasped in astonishment. More than 350 years ago, Pierre de Fermat claimed that he had found a proof of the proposition that for the equation  $X^n + Y^n = Z^n$ , there are no integral solutions for any value of  $N$  greater than two. Fermat did not disclose his proof, however. Now, Wiles claimed to have found one. And largely on the basis of his reputation, other mathematicians accepted his claim. But his proof ran to 200 pages (and could have been five times longer, if he had spelled everything out), and only one mathematician in 1,000 was qualified to evaluate it.

Unsettled situations such as this are not uncommon these days. Mathematical proofs often run hundreds of pages and can take years to be confirmed. In one case, a demonstration that was completed in the early 1980s consisted of some 500 articles totaling nearly 15,000 pages and written by more than 100 workers; only one person is said to have grasped the proof in its entirety, and he died in 1992.

The increasing complexity of mathematics, together with the rise of the computer, is bringing about profound changes in the ancient discipline, *Scientific American* senior writer Horgan reports. "For millennia, mathematicians have measured progress in terms of what they can

demonstrate through proofs—that is, a series of logical steps leading from a set of axioms to an irrefutable conclusion. Now the doubts riddling modern human thought have finally infected mathematics. Mathematicians may at last be forced to accept what many scientists and philosophers already have admitted: Their assertions are, at best, only provisionally true, true until proved false."

The computer, Horgan says, is forcing mathematicians "to reconsider the very nature of proof." Some proofs have required enormous calculations by computers, and cannot be verified by mere humans. Two years ago, Laszlo Babai of the University of Chicago and several colleagues developed a technique for "computer proofs" that offer the probability—but not the certainty—of truth. Still other investigators have been using computer graphics to produce "video proofs," which they hope will be more persuasive than traditional, formal proofs.

But computational experiments, whether involving graphics or numerical calculations, can be deceptive, Horgan notes. All the calculations that computers make are based on the manipulation of discrete, whole numbers (namely, ones and zeros). As a result, computers can only approximate numbers such as  $\pi$  or the square root of two, and that can result in errors. Even most of the mathematicians taking advantage of computer graphics and other experimental techniques agree that seeing by computer should not be believing. David A. Hoffman of the University of Massachusetts at Amherst, one of those mathematicians, worries about the decreased