to question the argument that information production and dissemination hinges on information users paying directly for what they use (*1*, p. 335).

Commercial journal publishers evidently are another matter. Charles O. Reville, president of the Williams & Wilkins Company, reports that the average income from the firm's 30 specialty journals breaks down as follows: 65 percent from subscription sale, 21 percent from advertising, 7.5 percent from the sale of author reprints, 4 percent from back volume sales, 1 percent from the sale of commercial reprints, and 1 percent from the sale of mail lists, rights, and microfilm. See C. O. Reville, Jr., *Economics of Scientific Publications* (Council of Biology Editors, Washington, D.C., 1973), p. 7.


40. R. P. Henderson, quoted in *EDP (Electronic Data Processing) Wkly.* **11**, 1 (8 March 1971).
41. S. Beer, in *The Management of Information and Knowledge* (Government Printing Office, Washington, D.C., 1970), No. 15, pp. 60–61.
42. J. McDermott, *N.Y. Rev. Books* (31 July 1969), pp. 25–35.
43. The modifications are listed in detail in Henry (*8*, p. 391).


**NEWS AND COMMENT**

# Cliometrics: Book on Slavery Stirs up a Scholarly Storm

Scholarly wrangles help stave off boredom among the inhabitants of academe's groves; occasionally the scuffling in the shrubbery becomes so animated that it attracts the notice of the passerby.

Such has been the case over a two-volume work called *Time on the Cross*, a book about American slavery published last spring by two University of Rochester economists, Robert W. Fogel and Stanley R. Engerman.

The book is a product of a relatively new methodological approach to economic history, heavily reliant on the use of computers, that has come to be known as cliometrics (after Clio, muse of history). *Time on the Cross* has aroused an enormous amount of attention both within and outside the academic community. The reasons are several. First, it challenges many entrenched assumptions about what may be the most emotionally freighted chapter in America's history. Second, it represents the most flamboyant and extensive application yet to appear of the methods of cliometricians (otherwise known as econometric historians). Finally, or so many critics aver, the authors themselves have inflated and inflamed the controversy by vigorously promoting the book not only within their profession but by arguing their case on television shows and granting interviews to all who seek them. Fogel says, "Stan and I felt we had stumbled on something very important and it should be brought to the public attention." Their more conservative colleagues call it academic hucksterism.

What Stan and Bob stumbled upon was evidence that, in Fogel's words, "the claim that slavery crippled blacks intellectually and culturally is a myth." The authors list ten "common beliefs," relating to the efficiency of the system and the extent to which slaves were "exploited," which they claim their methods of truth seeking have either debunked or at least called into question.

While the authors believe the furor over the book has been occasioned mainly by its conclusions, its critics claim to be more concerned about their use, or misuse, of a fledgling methodology which hitherto has been applied to narrow economic questions.

Econometrics is defined by one writer as "the utilization of mathematics, economics, and statistics in an effort to evaluate economic models empirically with the help of concrete data and to investigate the empirical support of certain economic theories." The post–World War II development of econometrics has been made possible by advancements in computer technology. This quantitative approach is parallel to the efforts of branches of other disciplines such as sociology (as in sociometrics), psychology, and political science to establish a scientific base.

As defined by Fogel, cliometrics is the "systematic application of the behavioral models of the social sciences, and of their related mathematical and statistical methods, to the study of history."

The application of econometrics to history has been part of attempts by economists to broaden the discipline from application to immediate questions to attempts to analyze the larger questions of economic growth and development and the Industrial Revolution in the United States. And, as it happens, the phenomenon of slavery, which Fogel calls "the leading question in American historiography," has become the chief proving ground for the new methodology. Cliometricians have reached some new conclusions that are considerably at variance with traditional historical interpretations—two scholars, for example, have determined that the construction of railroads was not as crucial as previously believed to the economic development of the West. The growth of the methodology has generated a scholarly debate of some years' standing between what might be called the "quantifiers" and the "humanists." The former strive for objectivity by taking masses of data, reducing them to computer fodder, and making what they claim to be logical inferences and deductions from the resulting calculations. The latter also strive for objectivity—but their assumptions are less formally stated (and perhaps, they claim, more complex).

The "cliometric revolution," as some have called it, began officially in the late 1950's with the publication of a paper by two young Harvard graduate students in economics, Alfred H. Conrad and John R. Meyer, on the economics of slavery. The paper was written for Alexander Gerschenkron, who, along with Nobel prizewinner Simon Kuznets, was one of the progenitors of the new methodology. In it, Conrad and Meyer sought to discover whether slavery was a profitable institution or whether it was a racist-colonialist phenomenon that existed for primarily noneconomic reasons and that was therefore on the wane before the Civil War. The latter assumption was popular at the time, but the Conrad and Meyer paper offered firm evidence, in the minds of many scholars, that slavery was indeed a profitable and flourishing, if morally unsupportable, institution for Southern slave owners. The excitement generated over the paper encouraged a flow of similar efforts, many dealing with various aspects of the Southern slave economy.

The current crop of cliometricians is chiefly made up of persons who were graduate students in economics in the late 1950's and early 1960's, so they

are relatively youthful as a group. Broadly speaking, there are several hundred of them, since economic historians for the past 15 years have been routinely trained in econometrics. However, according to Peter Temin of the Massachusetts Institute of Technology, there are probably only 35 to 50 individuals who would identify themselves primarily as cliometricians, partly because most don't care for the term and partly because cliometrics is a branch of economics rather than a separate discipline.

Cliometricians emphasize that theirs is a methodology, not a school of thought. It is an interdisciplinary approach combining history, economics, and statistics. Cliometricians don't intend to start a professional association or launch a journal. They do, however, hold annual meetings. These started at Purdue University (where the term was half-facetiously coined) in the early 1960's, and have now been moved to the University of Wisconsin. They write articles that are published in economic and history journals, but few books have as yet been undertaken in the genre.

Now *Time on the Cross* has appeared on the scene. The work is described by some as the most important, by others as the most unfortunate, and by still others as both an important and unfortunate attempt to apply cliometrics to American history. It has combined audacious use of the methodology with an interpretation of slavery that is in tune with current trends in thinking about the topic, but carries the new theories to such extremes that it has left some scholars gasping with disbelief.

Reinterpretation of American slavery has undergone several basic shifts since World War II. In the postwar effort to reconstruct for black Americans what historian David Brion Davis calls a "usable past," the image of the Southern slave has shifted from the infantile, emasculated "Sambo" projected by Stanley Elkins, to the sullen, angry, oppressed, but withal spirited individual depicted by historian Kenneth Stampp—to the point where historians are now saying that slaves, despite their hard lot and psychological degradation, managed to create and sustain their own sense of group identity, culture, and coherence as families. Fogel and Engerman have carried this image even further. With the aid of computers they were able to reduce to usable form massive amounts of hitherto unmanageable data from such sources as probate records, census figures, records from individual plantations, manifests posted by ships engaged in interregional slave trade, and records of slave sales. From all this material they concluded that slaves were adequately fed; that they were given incentives to be more productive than the average Northern agricultural worker; that many slaves had positions as overseers on plantations or were skilled as artisans; that very few slave families were broken up by the interregional slave trade; that whippings were not as frequent as was supposed; that sexual exploitation of slaves by masters "was not so great as to preclude the development of a family norm"; and that the picture of slaves being constantly at odds with their masters is not accurate.

### Authors Are Themselves Surprised

Fogel told *Science* that he would have been very skeptical if someone had come up with these suggestions a few years ago, but he feels his and Engerman's conclusions, arrived at with the aid of some 30 graduate students and approximately 40 hours of computer time, provide, if not the last word on the subject, at least an opening to a whole new discussion about slavery. Their research also has brought the quantitative approach to history very much into the public eye, and has raised many questions about the limitations of the methodology. While most good historians regard the conflict between humanistic and quantitative approaches to history as a "non-issue"—since the approaches can be complementary—cliometricians have come under attack for being too hemmed in by their own techniques. Harry Scheiber, economic historian at the University of California in San Diego and one of the original "Young Turks" of the cliometric revolution, now calls them "cliomagicians," and one of the conventional jibes against the group, according to Marxist historian Eugene Genovese of the University of Rochester, is that "if you asked them to do a study of the crucifixion they'd start by counting the nails." In any event, since the value of quantitative analysis is not in dispute, the sharpest strife is among cliometricians themselves. The Fogel and Engerman book has not only intensified the differences but has laid bare many new areas of conflict.

This was apparent at an unusual 3-day conference held in October at the University of Rochester which was attended by some 100 American historians, economists, and sociologists, plus a few interested foreigners. (Cliometrics is basically an expensive American sport, but a few foreigners, notably in France and England, have taken an interest.) The purpose of the conference, which was conceived by Genovese and underwritten by the Social Sciences Research Council of New York City, was to bring Fogel and Engerman together with their critics, who have become increasingly vociferous and numerous since the first, somewhat awestruck, reviews appeared. (*Newsweek* called the book "dynamite"; the *New York Times* reviewer said, ". . . if a more important book about American history has been published in the last decade, I don't know about it"; and even famed Southern historian C. Vann Woodward wrote in the *New York Review of Books* that, although he was mystified by the methodology, the book marked "a new period of slavery scholarship."

The Rochester conference gave the critics a chance to get their licks in, and they did. Accounts of the conference indicate that it was a tumultuous affair, with scholars retreating to their hotels to compute devastating critiques for presentation the next day.

Here is one small illustration of the debates the book has aroused: the authors believe it is possible slaves were whipped much less commonly than has been supposed. They base this on the whippings recorded by one slave owner. A critic points out that a plantation owner who kept such orderly and detailed records would be more likely to have been a rational individual who perceived it as not in his best interests to be overly punitive. Fogel says this particular slave owner had a reputation for beating his slaves a lot. This argument doesn't take into account that the master might not have recorded all the whippings he administered, or explain why one would systematically record whippings in a diary.

This is a simple case compared to the chains of inferences that must be made to conclude, from census figures on mulattoes and the computed average age (21) of a slave woman when she had her first child, that slaves were not sexually exploited by whites to the extent originally believed, and that sexual morality tended more toward prudishness than promiscuity. Such inductive leaps have created many

# Briefing

## Ford Budget Axe Cuts Research

President Ford on 26 November proposed to reduce federal spending by $4.6 billion in ways that would put a special squeeze on the research community. The President wants to take $300 million out of the current fiscal year, 1975, civilian R & D budget as part of his program of fiscal restraint.

Significantly, the $300 million represents approximately 6 percent of the total cuts proposed, whereas civilian R & D makes up only 3 percent of the total federal budget. No reductions were proposed in the $8.6 billion military R & D budget.

It is too soon to tell whether the Democratic Congress, reinforced by the election results, will go along with the President's proposed package of cuts and expenditure deferrals. If it should, however, the National Institutes of Health would be hardest hit, losing $112.1 million or 25 percent of new grants and 5 percent of ongoing grants in the remainder of the fiscal year. Also reduced would be funds for the Center for Disease Control in Atlanta, Georgia, for special project grants in the health manpower field, and for the budget of the Alcohol, Drug Abuse, and Mental Health Administration.

The Ford Administration is on record backing development of alternative energy sources, but the new budget proposal would take $80 million away from reactor development, including work on the liquid metal fast breeder reactor, the molten salt-breeder reactor, and the high temperature gas-cooled reactor. Controlled thermonuclear and laser fusion programs would also be partially deferred.

The President also proposed deferring $72 million of the current budget of the National Aeronautics and Space Administration, including part of the joint U.S.-U.S.S.R. docking mission, the NIMBUS G pollution monitoring satellite, the Pioneer-Venus probes, the TIROS N weather satellite, and other research and technology programs. The National Science Foundation would have $20 million deferred, including funds for solar and geothermal energy research, institutional support, and for the RANN (Research Applied to National Needs) program. The National Oceanic and Atmospheric Administration's budget for facilities and construction, as well as a fisheries survey in the Gulf of Mexico, Atlantic, and Pacific would be deferred. The budget of the National Bureau of Standards would be reduced by $3.7 million.

These and other research cuts are part of no less than 135 separate actions Ford requested. There is enough confusion in the affected agencies as to how to implement them; at NIH, for example, grant and contract awards are being temporarily held up until the situation is clarified. In Congress too, there is some dispute as to whether the usual committees should respond to the Ford initiatives or whether they should be reviewed by the new budget committees. But even if these proposals are blocked by the Congress, the Administration could try to implement them again when it submits its proposed fiscal 1976 budget in January.—D.S.

## Son of Deep Throat Foils Physicists

Fearful that *Physical Review Letters* might refuse to publish word about their discovery of two extraordinary new particles if newspapers heard about it first, physicists at Stanford, Berkeley, Brookhaven, and MIT tried their very best to keep the story secret for 3 weeks in November. Their plan was to hold it up for the *PRL*'s 2 December issue, but an intrepid student journalist on the Berkeley campus put the plan awry.

William Link, a science writer for the *Daily Californian*, isn't telling who leaked it to him, but he says he heard the story after one of the discreet seminars exultant physicists were holding on the two Bay Area campuses. Link verified the story and broke it on 15 November in the campus paper. Students, Link observes, "are notorious blabbermouths."

But it all ended happily. Somewhat coyly, a *PRL* official said the journal decided in this case to bend its rules against prepublication.

—R.G. and W.D.M.

new questions and have opened gaps into which fellow scholars have rushed headlong. If it is assumed that the statistics are not only correct but representative of the population, the critics ask, aren't there other ways to explain the surprisingly advanced age of primiparous women? One theory explored at the Rochester conference was that slave women experienced late menarche. This idea is implausible if the authors' theories about the slave diet hold true, because female fertility is dependent on adequate nutrition. (The possibility that abortion might have been widely practiced was not even discussed.)

These isolated examples illustrate the pitfalls of trying to reconstruct an "objective" account of an historical phenomenon, especially when most of the variables relate to human nature. Value judgments masquerade as logical inferences, and one small logical inconsistency can skew results as badly as a misplaced decimal point. The more one attempts to deal in pure rationality, it seems, the more room there is for emotional judgments to slither in, not only unquantified but unrecognized.

While many cliometricians call *Time on the Cross* an important book, many also express surprise and dismay that two such respected scholars could engage in what they see as flagrant abuse of their methodology.

Paul David of Stanford, one of the original "Young Turks," calls it a "sloppy, shoddy" piece of work. He finds himself appalled by the "intimidating" presentation by the authors, the "mystification" of the scientific approach, and the "dreadful" model for scholarship the book supplies for tender graduate students who might make the mistake of liking it. He says these qualities have forced scholardom to give the book much more attention than it deserves. In fact, David and four colleagues are actually putting together a book-length critique just to show how bad *Time on the Cross* is.

Anyone untrained in statistics is helpless when it comes to judging the validity of the book's conclusions, and Fogel claims that even many econometricians don't seem to understand the reasoning. Because the findings are so surprising, he says, critics automatically suspect the methods, and "every time we don't give a procedure it is assumed we did the wrong procedure."

Fogel and Engerman originally

planned to publish the first book, which presents the findings in simple narrative form, alone. They planned to follow up later with a "closely reasoned monograph" on the methods. But amazed reactions from colleagues to whom they circulated 200 drafts of volume 1 persuaded them to put out both volumes simultaneously. Fogel acknowledges that volume 2, subtitled "Evidence and methods," was done in haste and does not in every case explain how they reached their conclusions. "Our biggest error," he says, "is we underestimated how much evidence would be demanded of us." Not everyone thinks the book is awful. Meyer, for one, says it is "still a great book despite its limitations," and predicts that it will inspire at least 50 doctoral theses. Certainly it has inspired the spirited debate Fogel and Engerman say they hoped to engender, and certainly it has put cliometrics on the map.

As Berkeley historian Winthrop Jordan has indicated, not everyone is happy about that. Some scholars who went to the Rochester conference say they are dismayed by the whole episode—they fear the book will give cliometrics a bad name and turn traditional historians off the idea of applying quantitative methods in interpreting the past. Douglass North of the University of Washington, one of the original developers of econometric approach to history, admires the book, but he feels that it also highlights the limitations of the methodology. Most economists, he says, operate within the framework of neoclassical economic theory. This is based on the assumption that people in general act on a rational basis, and it is usable for a relatively small range of problems where you can deal with "perfectly competitive markets." While the cliometric methodology is in itself ideologically neutral, one's theoretical framework would determine how one programmed the computer and developed chains of inferences. North feels the theoretical framework is too narrow, but, as Temin points out, so far no other economic theory has been refined to the extent that it is serviceable. Fogel appears to believe that this concern is irrelevant, and contends that *Time on the Cross*, flawed as it may be, has shown that cliometrics can be applied to a broad range of noneconomic questions.

The book has raised issues that cut across the usual ideological lines. People concerned with giving blacks a "usable past" can't decide whether the book will give today's American blacks more to be proud of or will deprive them of conventional explanations for current problems which rest partially on the assumption that slavery destroyed Negro family structure. People concerned with giving cliometrics a usable future can't decide whether the book will make historians skeptical of the methodology or lead the way to a far broader absorption of quantitative techniques into the interpretation of history. Fogel believes the book will encourage the latter trend. He points out that training in mathematical quantitative techniques has become required at the University of Rochester for all doctoral candidates in history, and that people at Harvard, where Fogel recently won a coveted appointment as professor of economic history, are interested in setting up an econometric history program within the history department.

Fogel and Engerman can be counted on to continue supplying fuel for controversy—they plan to devote the next few years to the production of two additional volumes, which will include statistical analyses of narrations of exslaves that were collected during the 1920's and 1930's. Meanwhile, the core of the debate has receded back to academia, carried on through furious exchanges of computer tapes.

—CONSTANCE HOLDEN

# Battelle Memorial Institute: Another Reading of the Will

*Columbus, Ohio.* Battelle Memorial Institute (BMI) began operations 45 years ago on the strength of a $3.5-million endowment resulting from the will of Gordon Battelle, the heir to a medium-sized Ohio iron and steel fortune. BMI survived the Depression and flourished subsequently to the extent that, as one of the oldest of the private, nonprofit research organizations, it also became by some measures the most successful. In 1973 Battelle's Columbus Laboratories alone conducted some $57 million worth of research funded by industry and government. And the balance sheet for 1972 put the total assets of BMI and its subsidiaries at $285 million.

Although BMI has gone from strength to strength, for the last few years a cloud has hung on the Battelle horizon in the form of a legal challenge generated in BMI's hometown of Columbus. The fundamental point at issue is whether BMI and its trustees have properly carried out the terms of Battelle's will. Over the years, BMI leaders have interpreted Battelle's public service obligation to include strengthening the organization and building its research competence. The implications of the present legal imbroglio are not clear, but, although the odds seem to be against radical change, a sweeping reinterpretation of Battelle's mission as a charitable trust could lead to very different uses of its resources and even to a redistribution of its assets.

The gauntlet was thrown down in 1969 by Columbus probate court Judge Richard B. Metcalf, who said he intended to hold a hearing in which BMI would be required to explain its actions. This was reported in Columbus papers but no legal move was made. BMI then reacted by asking Ohio Attorney General Paul W. Brown to review Battelle, arguing that the attorney general, rather than the probate judge, has jurisdiction.

After investigation, the attorney general decided that the best way to handle the matter was to seek a declaratory judgment, and in July 1970 he filed such an action. This meant that the attorney general's office would study Battelle's operations and enter into negotiations with BMI officials on any matters about which the attorney general was unsatisfied. If agreement were reached, the attorney general and BMI would present that agreement to the county court, where the judge would,