SCIENCE & SOCIETY

Rewriting the economics of history

"Cliometrics"—the application of modern statistical methods to the study of economic developments in the past—has begun to overturn some long-held assumptions of historians. A summary of recent research appears in the January/February MOSAIC magazine, published by the National Science Foundation.

The only best seller cliometricians have produced so far is *Time on the Cross* (SN: 5/11/74, p. 303), which portrays slavery in the Antebellum South—despite any moral judgments—as a more efficient and profitable venture than historians had previously believed. Though these conclusions are still hotly contested, subsequent studies have tended to confirm them.

Another dearly held historical premise is that the Civil War accelerated U.S. industrialization, rocketing the country into international prominence despite economic stagnation immediately following the conflict. Cliometricians now challenge all three aspects of this theory: As early as 1834, they say, America had already become one of the world's great economic powers, with a gross national product only slightly smaller than Britain's and France's. Rather than stimulating industrialization, the Civil War apparently diverted resources away from growing industries, and when the postwar period is examined from the point of view of per capita income, its rate of growth is the greatest of any decade until World War II.

The impact of technology on national growth is a particularly tricky variable to assess, because so many other factors are involved. The railroad is usually credited with "opening the West," but some cliometricians now say that 95 percent of the prairie land brought under commercial cultivation would have been utilized without it. Between 1600 and 1850, the cost of ocean transportation dropped 50 percent, but though some technological advances were made during this time, most of the price drop can be traced to the disappearance of piracy and reduction of time a ship had to idle in port waiting to be loaded. Some technological innovations apparently still deserve their revolutionary reputations, however. In 1910, the average farm worker could raise three times more wheat than his counterpart in 1840— fully 60 percent of this increase was due to mechanization (especially introduction of the reaper and thresher).

Chou saved Chinese science?

Of the many plaudits Chou En-lai received following his death recently, one of the most interesting is the assertion that he rescued prominent Chinese scientists and their projects from the onslaughts of the Red Guards, during the so-called Cultural Revolution. Tam Dalyell, a British Member of Parliament writing in the Jan. 22 NEW SCIENTIST, tells of conversations with scientists in China who told him Chou made very sure vital research was moved out of areas controlled by the Red Guards. Specifically, by protecting the work of advanced physicists, he apparently can be credited with ensuring China's development as a nuclear power.

Scientists' declining salaries

The price-adjusted starting salaries of new Ph.D.'s in science and engineering fell between 13 and 23 percent from 1969 to 1973, according to University of Wisconsin economist John Bishop, writing in the January/February SOCIETY. Whether subsidies for graduate education will be adequate to ensure a future supply of such Ph.D.'s depends, in part, on the effect of such declines. Direct support of specific research fields generally seems a more efficient way of ensuring sufficient personnel than supporting specific training programs. But more research will be needed to be sure.

SPACE SCIENCES

A found friend for *a* Puppis

Astronomical photographs taken from Skylab in 1973 have revealed the presence of a hot, subdwarf star, invisible from earth, as the unusual companion to an already known yellow-giant star named *a* Puppis. The discovery was made when the supposed photos of *a* Puppis alone, taken at far-ultraviolet wavelengths that do not penetrate earth's atmosphere, yielded spectra of a faint, blue star much hotter than the 10,000 degrees F of a yellow giant.

It has been known that the spectral lines of *a* Puppis shift back and forth slightly in a cycle of barely more than seven years, says Sid Parsons of the University of Texas, who is part of a team analyzing the Skylab photos with principal investigator Karl Henize. "This indicated that the star had a companion which was probably even more massive than the sun." Such a companion ought to have been clearly visible from the ground, yet it was not. Its faintness by visible light implies that it no longer derives its energy from hydrogen fusion, but it is too bright to be a highly collapsed white dwarf. "This means that the companion to *a* Puppis is a hot subdwarf," Parsons says. "Perhaps it is in the process of contracting to the white dwarf state, in which electrons are packed together as tightly as possible without being forced into the nuclei."

The presence of a yellow giant and a hot subdwarf in partnership (which suggests that they are of the same age) is valuable for studies of stellar evolution. "The companion," says Parsons, "must have originally been brighter and more massive than the present yellow giant because it is further along in its evolution, and the more massive a star, the faster it evolves." A report is in the Jan. 15 ASTROPHYSICAL JOURNAL. □

Sunwatch by slingshot

Although the two Helios spacecraft are providing the closest solar studies to date, their observations, like those from earth, are centered on the sun's middle latitudes. To look "down" on the sun requires sending a spacecraft out of the plane of the ecliptic, which in turn would necessitate the use of a huge—and expensive—rocket if it were to be done by a direct launch from earth. David F. Bender of the Jet Propulsion Laboratory in Pasadena proposes that the task could be done with a much smaller initial push—a Delta-class rocket or a small booster carried aloft in the space shuttle—by using the gravity of the earth itself for assistance.

Pioneer 11 used the gravity of Jupiter to bend its path around toward Saturn. Mariner 10 used Venus to get to Mercury, and was then aimed so that Mercury's gravity would put the spacecraft into an orbit exactly twice as long as Mercury's; every time the spacecraft completed one revolution, the planet would have completed two, and was there waiting to permit additional scientific studies. Similar techniques would allow an out-of-the-ecliptic solar mission using the gravity of Jupiter for redirection, but, points out Bender, the huge resulting orbit would cross the sun only about every five years.

The earth-assist method, Bender told the aerospace sciences meeting in Washington of the American Institute of Aeronautics and Astronautics, would yield a solar crossing about once a year. The trade-off is that it would take a long time, with repeated flybys of the earth, to shift the spacecraft's orbit to a high inclination. The earth-assisted mission giving the highest-latitude view of the sun, for example, would need nine flybys and 13 years to reach an inclination slightly above 54 degrees. A 38-degree tilt could be achieved in eight years. The initial flybys would be used to give the spacecraft the same orbital period as the earth, so that the resulting repeat encounters could be aimed at increasing the orbit's inclination. □