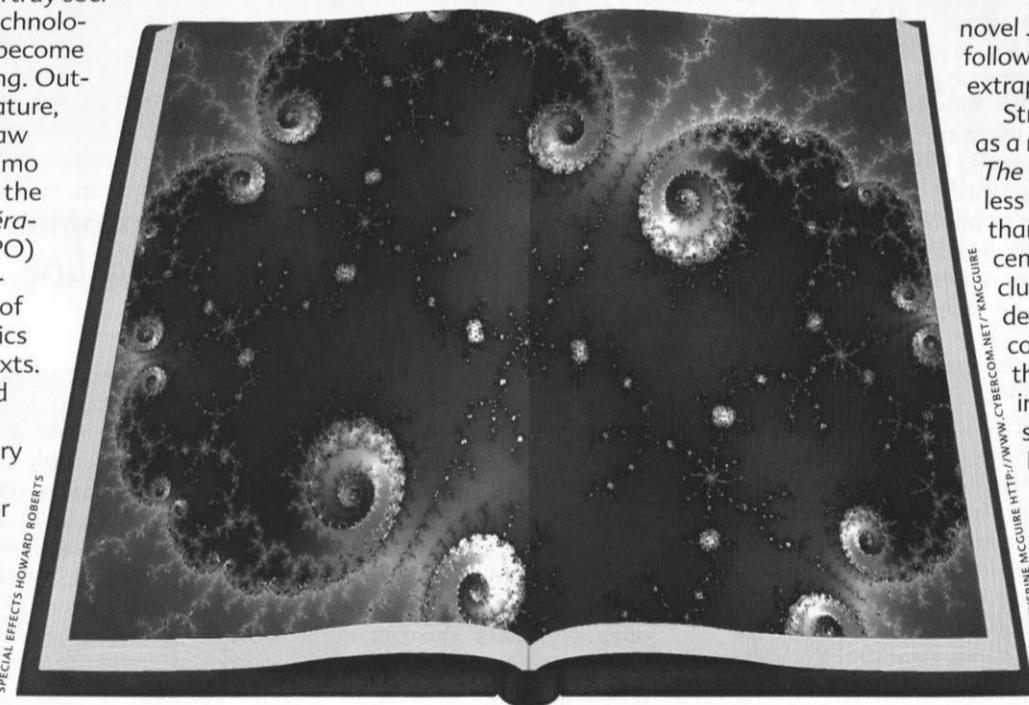


In spite of the Cold War and global warming, however, the relation between literature and science has changed. Science generally makes less sweeping claims about its understanding of reality than it did in the last century (whether this be due to a "legitimation crisis," increasing specialization, or the nature of recent discoveries), thereby diminishing the incentive for other cultural forces to articulate counterclaims. Literature, too, has become more ambivalent about its role, and the consequent blurring of the boundaries between "high" and "popular" literature has allowed themes previously confined to certain popular genres, such as science fiction, to spread to a broader spectrum of literary works. With computers transforming the work of visual artists, film makers, and poets as well as physicists and statisticians, a sense of separation between science and art grows harder to sustain.

As a consequence, postmodern literature, so far from associating technology only with apocalypse, also celebrates science's potential to transform human bodies, minds, and cultures—even to effect transformations that might have inspired earlier writers with horror. From John Cage's techno-utopian poetry of the 1960s and '70s to the fascination of cyberpunk novelists with global computer networks and alterations of the human body, science has inspired postmodern writers with scenarios of fantastic possibility. Deserts and moons transformed into livable habitats, hunger crises solved through the cultivation of artificial protein, humans with implanted sensory devices or neuroelectronic interfaces, biological and psychological gender transformations accomplished in less than a week—all these form part of exhilarating new worlds, crucially enabled by science and technology. Bruce Sterling's "Shapers," genetically engineered and psychologically reconditioned family clans, would have been an object of horror in a Huxleyan world but are by no means terrifying in Sterling's universe; William Gibson's "vat-grown ninjas" may appear vaguely unpleasant but do not call up visions of monstrosity or totalitarian control of human reproduction. The liberation of an artificial intelligence from its creators' control in Gibson's *Neuromancer* is the kind of plot that would have led to catastrophe in earlier novels: the creation breaking free and wreaking havoc all around it. In Gibson, nothing of the sort occurs; on the contrary, the independence of the AI "Wintermute" from its human controllers heralds positive change.

Far from appearing as mechanistic, deterministic, and inhuman, science in these works frees humans from biological and physical as well as social and cultural constraints. This is not to say that such novels celebrate technological progress wholesale: Samuel Delany's *Triton* describes a world where people change gender with little effort, but where interplanetary wars also wipe out millions within minutes; and for all the thrill of excursions into cyberspace, Gibson's crime-ridden and decayed city sprawls are hardly desirable places to live. A similar ambiguity often attaches to more high-literary attempts to deploy not only technological procedures and artifacts but scientific theories.

American authors Thomas Pynchon and Don DeLillo, for example, some of whose works are structured around concepts of thermodynamics and information theory, portray societies saturated with technologies that can by turns become liberatory or threatening. Outside Anglo-Saxon literature, writers such as Stanislaw Lem, Arno Schmidt, Primo Levi, Italo Calvino, and the French *Ouvroir de Littérature Potentielle* (OULIPO) group have also experimented with elements of science and mathematics to structure fictional texts. And in the late '80s and early '90s, non-linear dynamics or chaos theory has become a major source of inspiration for writers such as Tom Stoppard, whose play "Arcadia" is explicitly based on chaos theory, and Bruce Sterling, whose cyberpunk



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Quantifying antiquity

ROGER S. BAGNALL

"But we became classicists so we wouldn't have to deal with numbers," protested a colleague. The use of statistical analysis in historical study has had its partisans and its enemies, no matter what period we look at. But the ancient world is in a class by itself, with what one historian called "the total absence of statistics."¹ Many are happy to have it that way, perhaps feeling that without quantitative methods, there is no threat of history's turning into a (social) science.

The ancient authors give many numbers, of course, but even where these are free from corruption or distortion they are often no more than guesses. Surviving documents, like those on papyrus, might seem to be more promising, but even there scholarly hostility has been strong: "In my opinion, the data furnished by the papyri scarcely lend themselves to statistical investigations," said one scholar—attacking an article of mine, it should be said.²

To be fair, there are reasons for such skepticism. For example, numismatists have often used the number of attested coin dies and the amount of duplication of dies in the surviving coins to estimate how many dies were originally used. Such estimates give a sense of the relative intensity of coinage. But some scholars have gone beyond this to try to calculate the absolute number of coins originally produced and on this estimate to base elaborate historical reconstructions. Such views have now come under heavy fire and seem indefensible: The number of coins produced from a single die can vary by a factor of 10 to 15. Many elaborate studies of ancient demography have depended on ages at death reported on tombstones, but critical analysis has shown that simply counting these ages results in age distributions never found in any known population.³ It seems that some people, particularly young children, simply didn't get tombstones and are thus missing from any population described simply on the basis of gravestones with ages.

In the face of such difficulties, one could just give up trying to meld scientific precision with historical inquiry. There are lots of other ways to write ancient history, some of them familiar since antiquity—political and military narrative, for example—some the product of the Renaissance and the Enlightenment—descriptive antiquarian cataloguing of offices, taxes, trades, and the like. More recent fashions borrow from literary criticism or anthropology, looking at ideologies and mentalities, or picking up the taste for "microhistory" developed in the study of more recent periods, where numbers do not matter because one is looking at a particular case in great depth.⁴

Or do they? Microhistory is very much concerned with how individuals shaped their lives in the face of the conditions and constraints that faced them, and many of those constraints demand quantitative description, whether of

novel *Schismatrix* narrates the future history of mankind following the model of Ilya Prigogine's philosophical extrapolations from his work in chemistry.

Strikingly, many of these texts employ scientific theory as a model for explaining historical processes. Pynchon's *The Crying of Lot 49* and *Gravity's Rainbow* are arguably less concerned with order and entropy in themselves than as tools that might reveal secret patterns of 20th century history, even though this search remains inconclusive. The same is true of Stoppard and Sterling's deployments of chaos theory. Inevitably, these texts conceive history less as the outcome of human agency than of the operation of forces above or below the individual's threshold of perception and comprehension—a predicament that British novelist Christine Brooke-Rose has brilliantly fictionalized in *Out*.

The weakening or even demise of individual intention as a central motor force of history and society is described with fear and despair in some novels, with hope and even euphoria in others. This ambivalence as to whether the human being as conventionally understood should be at the center of literary endeavor links the works that use scientific theories with the more technology-oriented texts that prominently feature robots,

cyborgs, and surgically or genetically altered characters. This postmodernist move away from the anthropocentric focus of realist and high-modernist narrative has opened up new avenues for the integration of science into literary texts—not necessarily making literature less human but allowing it to envision the human in a broader range of contexts and histories.

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demographic realities or economic possibilities. If we do not know how young most people died, or how much land they farmed, how can we even begin to understand the choices that faced them?

The data available for antiquity will never approach the richness of our information for early modern Europe, but that does not mean that there is no hope of learning some important things. Demography is a prime example. Studying the census declarations of Roman Egypt, for example, has allowed us to get a fairly good notion of life expectancy for women, a slightly less precise idea of the life span of men, and usable figures for such demographic basics as household size, the percentage of slaves, the number of children the average woman had, and rates of marriage and remarriage.⁵ Most of these figures stand up respectably to standard statistical tests. Because they are based on a scattering of individual census returns, however, they tell us nothing about the aggregate population. Hellenistic Egypt (323-30 BCE), by contrast, has few individual census returns but plenty of lists of households and their members. From these, a forthcoming study is able to establish good figures for the overall population of one important region of Egypt in the third century BCE and for the breakdown between urban and rural areas; it also yields much more precise figures for the male-female ratio than we have for the Roman period.⁶ But the lists lack ages, and life expectancy is thus impossible to compute.

Neither of these bodies of evidence thus tells us everything we would like to know. And it would be rash to combine them without careful analysis, because Roman rule brought profound changes to the society of Egypt. But together they establish a fair number of the main lines of Egypt's population over a long period. What is striking from a methodological point of view is that these studies are totally different in approach. The Roman material is not inherently statistical in character; these declarations become quantitative information only as the result of our counting and analysis of them. The Hellenistic lists, by contrast, were compiled precisely in order to allow the government to produce numbers—numbers of people subject to particular taxes, as it happens—and some of them include totals. Some even draw total figures from various other documents in order to get an overall picture. The bureaucrats of Egypt were the statisticians.



THE PAST seen through a glass, brightly

It would be idle to pretend that quantifying the ancient world is easy. The two studies of demography required an enormous investment of time and expertise in reading, correcting, and tabulating the texts in Greek and Egyptian. Models based on information from other times and places can help greatly, as they have in these demographic investigations, but one still needs the raw information. The data are not just lying there for anyone to use; most of the time they must be extracted with great pains, then subjected to analysis and statistical tests, including careful thought about their representativeness. Not all numbers are significant: If the number of texts of Homer doubles from one century to another, it matters whether the total number of known papyri doubles at the same time. It is easier to pretend that this analysis cannot be done—and of course not everything can be studied quantitatively. But a refusal to use statistics and models eventually comes down to a refusal to look at some of the

most important characteristics of a society, and the study of antiquity cannot afford that kind of evasion. History may never be a pure science, but science has much to offer history.

1 Jones, A.H.M. *The Later Roman Empire 284-602* (Oxford 1964) 1: viii.

2 Wipszycka, Ewa. "La christianisation de l'Égypte aux IVe-VIe siècles: Aspects sociaux et ethniques," *Aegyptus* 68 (1988): 165.

3 See Parkin, T.G. *Demography and Roman Society* (Baltimore 1992) for a detailed discussion of these studies.

4 E.g., Keenan, J.G. "A Constantinople Loan, AD 541," *BASP* 29 (1992): 175-82; on microhistory generally, see Levi, G. in Burke, P., ed., *New Perspectives on Historical Writing* (Cambridge/Oxford 1991): 93-110.

5 Bagnall, R.S. and B.W. Frier. *The Demography of Roman Egypt* (Cambridge 1994).

6 Clarysse, W. and D.J. Thompson. *Counting the People* (Leuven, forthcoming).

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Science Studies: Beyond the *Social Text* hoax

JANET ATKINSON-GROSJEAN

In 1994, molecular biologist Paul Gross and mathematician Norm Levitt published a blistering polemic against "progressivist" academic views of science. *Higher Superstition: The Academic Left and its Quarrels with Science* provoked a firestorm of debate. Two years later, a special "Science Wars" issue of the cultural studies journal *Social Text* assembled leading figures in science studies (also termed Science and Technology Studies, or STS) to rebut Gross, Levitt, and all who stood with them.

Among the contributors was quantum-field physicist Alan Sokal. His essay¹ appeared to draw postmodern philosophical, cultural, and political conclusions from mathematical and physical theories. Many critiques of science adopt similar strategies and reach similar conclusions, but Sokal's essay struck some readers as particularly significant. Sokal is, after all, a leading physicist—someone from "the other side."

Shortly after the "Science Wars" issue hit the streets, Sokal revealed in *Lingua Franca* that his *Social Text* essay

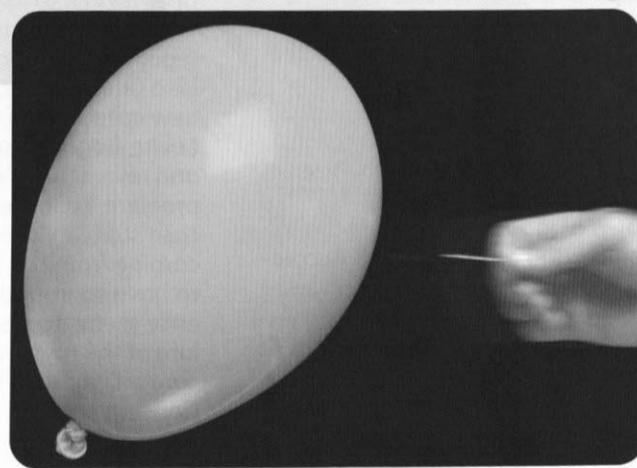


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was a put-on, a parody of anti-science rhetoric. "I intentionally wrote the article so that any competent physicist or mathematician (or undergraduate physics or math major) would realize that it is a spoof. Evidently the editors of *Social Text* felt comfortable publishing an article on quantum physics without bothering to consult anyone knowledgeable in the subject." *Social Text* had indeed published the essay without external review. As Norm Levitt says, "They invited disgrace and it descended on them in spades."

