

The smoking gun of eugenics.

Autores: Gould, Stephen J.

Fonte: Natural History; Dec91, Vol. 100 Issue 12, p8, 7p, 3 Cartoon or Caricatures

Seção: THIS VIEW OF LIFE

Should we-can we-take a kindly view toward a hero's faults?

Do Baptist preachers cause public drunkenness? I raise this unlikely inquiry because an old and famous tabulation clearly shows a strong positive correlation between the number of preachers and the frequency of arrests for inebriation during the second half of the nineteenth century in America.

You don't need Ph.D. in logic to spot the fallacy in my first sentence. Correlation is not causality. The undeniable association of preachers and drunks might mean that hellfire inspires imbibing, but it could also, and more reasonably, suggest that a rise in public drinking promotes the hiring of more preachers. As another possibility--almost surely correct in this particular case--preaching and drinking may have no causal relationship, and their simultaneous increase may only reflect a common link to a third, truly determining factor. The steady rise of the American population during the late nineteenth century promoted an increase in thousands of phenomena linked to total numbers but otherwise unrelated--arrests for drinking and hiring of clergy, for example. This tale has long served as the standard textbook example for illustrating the difference between correlation and causality.

But good principles can also be used to buttress bad arguments. I have often stated in this forum that only great thinkers are allowed to fail greatly--meaning that their errors, although large in scope and import, are invariably rich and instructive rather than petty and merely embarrassing. This essay treats the two greatest errors of the twentieth-century patron saint in my profession of evolutionary biology.

Most general readers may not know the name of Sir Ronald Aylmer Fisher (1890-1962), for he wrote nothing for nonprofessional consumption, and the highly mathematical character of his technical work bars access to many full-time naturalists as well. But no scientist is more important as a founder of modern evolutionary theory, particularly for his successful integration of Mendelian genetics with Darwinian natural selection. Fisher's 1930 book, *The Genetical Theory of Natural Selection*, is the keystone for the architecture of modern Darwinism. Fisher built with mathematics, and most biologists will say (although I would disagree in important respects) that the field he founded--population genetics--is the centerpiece of evolutionary theory. Fisher was also one of the world's most distinguished statisticians; he invented a technique called the analysis of variance--now about as central to statistics as the alphabet is to orthography. In short, Fisher is the Babe Ruth of statistics and evolutionary theory.

But the Babe also struck out a lot, and Fisher made some major-league errors. Most of my colleagues know about the two key mistakes that I will analyze in this essay, but they just aren't discussed in polite, professional company. One is dismissed as an inconsequential foible of Fisher's old age, while the other is bypassed in silence, although it occupies more than one-third of Fisher's most important 1930 book.

During the last half dozen years of his life, Fisher spent considerable time and several publications trying to debunk the idea that smoking causes lung cancer. Sir Ronald, who enjoyed his pipe, did not deny that a real correlation between smoking and lung cancer had been found. But following the textbook paradigm of preachers and drunkards, he disputed the claim that causation ran directly from smoke to cancer. He presented the two other logical possibilities, just as the texts always do for Baptists and boozers. First, cancer might cause smoking rather than vice versa. This inherently implausible version seems hard to defend, even as an abstract argument for the sake of conjecture, but Fisher found a way.

As a smoker, Fisher extolled the soothing effects of tobacco. He also recognized that cancers take years to develop and that future sufferers live for several years in a "precancerous state." He supposed that lungs might be chemically irritated during this precancerous phase, and that people so afflicted might increase smoking for psychological relief from an unrecognized physical ailment. A bit strained, but not illogical. Fisher wrote in 1958:

Is it possible, then, that lung cancer--that is to say the precancerous condition which must exist and is known to exist for years in those who are going to show overt lung cancer--is one of the causes of smoking cigarettes? I don't think it can be excluded. ... The precancerous condition is one involving a certain amount of slight chronic inflammation.... A slight cause of irritation--a slight disappointment, an unexpected delay, some sort of mild rebuff, a frustration--is commonly accompanied by pulling out a cigarette, and getting a little compensation for life's minor ills in that way. And so anyone suffering from chronic inflammation in part of the body (something that does not give rise to conscious pain) is not unlikely to be associated with smoking more frequently, or smoking rather than not smoking.... To take the poor chap's cigarettes away from him would be rather like taking away his white stick from a blind man.

But Fisher recognized that the second alternative explanation for the correlation of smoking and lung cancer--the association of both, independently, with a truly causal third factor--held much greater plausibility and promise. And Fisher had no doubt about the most likely common factor--genetic predisposition. He wrote: "For my part, I think it is more likely that a common cause supplies the explanation. ... The obvious common cause to think of is the genotype." In other words, genes that make people more susceptible to lung cancer might also lead to behaviors and personalities that encourage smoking. Again, the argument is undeniably logical; genes may have multiple effects, both physical and behavioral. To choose an obvious example, several forms of mental retardation have no causal relationship with correlated physical features: short stature does not produce retardation (or vice versa) in people with Down's syndrome.

With the hindsight of an additional twenty-five years, we may say conclusively that Fisher was wrong, and tragically so. Smoking is a direct and potent cause of lung cancer--the reason for hundreds of thousands of premature deaths in America each year. Yet I cannot fault Fisher on the logic of his argument: correlation is not causality, and the bare fact of correlation does permit the three causal scenarios that Fisher detailed. If Fisher had presented his objections to the indictment of smoking only as a cautionary claim in the absence of conclusive data, then we could not blame him today. (One cannot always be right in our complex world; no dishonor attends an incorrect choice among plausible outcomes drawn from a properly constructed argument.) But in Fisher's case, we have reason to question his motives and his objectivity--and some judgment for his incorrect conclusion may therefore be exacted.

Fisher did present his case with the conventional rhetoric of science. He claimed to be both objective in his weighing of evidence and agnostic about the outcome. He maintained that he had raised the issue only in a proper scientific spirit of caution and love of truth. Fisher made three explicit arguments for special and scrupulous care in treating such a socially charged issue, a potential matter of life and death.

1. Millions of people enjoy smoking. We dare not poison the source of their pleasure without conclusive evidence. Fisher pleaded for the psychic health of ordinary smokers in the elitist language of an Oxbridge don (Fisher was the Balfour Professor of Genetics at Cambridge and, at the end of his career, president of Gonville and Caius College):

After all, a large number of the smokers of the world are not very clever, perhaps not very strong-minded. The habit is an insidious one, difficult to break, and consequently in many, many cases there would be implanted what a psychologist might recognize as a grave conflict.... Before one interferes with the peace of mind and habits of others, it seems to me that the scientific evidence--the exact weight of the evidence free from emotion should be rather carefully examined.

Writing more forcefully in a letter to the British Medical Journal (July 6, 1957), Fisher compared the claims of antismoking forces with the classic case of hysteria mongering: "Surely the 'yellow peril' of modern times is not the mild and soothing weed but the organized creation of states of frantic alarm."

2. If we make a strident claim for smoking as a cause of cancer, and if we then turn out to be wrong, the entire enterprise of statistics will be discredited. In a further letter to the British Medical Journal (August 3, 1957), Fisher pleaded for caution as a protection for science:

Statistics has gained a place of modest usefulness in medical research. It can deserve and retain this only by complete impartiality... I do not relish the prospect of this science being now discredited by a catastrophic and conspicuous howler.

3. In situations of uncertainty, we need more research above all. Premature conclusions stifle further investigation. In yet another letter, this time to *Nature*, Britain's leading journal for professional scientists, Fisher wrote (August 30, 1958): "Considerable propaganda is now being developed to convince the public that cigarette smoking is

dangerous." In his letter of August 1957, Fisher had already specified the perils of such a campaign: "Excessive confidence that the solution has already been found is the main obstacle in the way of more penetrating research."

Fisher's last point backfired strongly on him--an ironic illustration of its power and truth. Fisher supported his suspicion that smoking does not cause cancer with two poorly documented sets of data--a curious claim that people who inhale show less cancer, for the same amount of smoking, than those who do not inhale; and a puzzling contention that lung cancer is increasing faster in men than in women, whereas smoking has risen more rapidly in women. The inhaling data were drawn from a very poorly constructed questionnaire. Most respondents may not even have known the meaning of the word inhale and may have checked "no" in simple confusion. Later information shows a strongly positive correlation of cancer with inhaling, when all other factors are held constant. As for men versus women, Fisher's argument was sound, but the data were wrong. The ever-accelerating incidence of lung cancer in women now ranks among the strongest points of evidence for a causal connection.

The basis for a negative judgment of Fisher in this sorry incident emerges not from the logic of his argument (which was sound, although his conclusion, based on inadequate data, was wrong) or from his proper words of caution, but from a clear inference that he did not live by his own stated strictures. Evidently, Fisher did not approach the issue of smoking and cancer with the open mind that he championed as so necessary for any good science. He maintained an obvious preference for denying that smoking causes cancer--even though he states, again and again, that the raw data of an admitted correlation offer no preference for any of the three potential interpretations. Two aspects of his writing give the game away. First, his language. Just consider the sample quoted above. He calls for argument "free from emotion" and for "complete impartiality." Yet the claim that smoking might cause cancer is labeled as "propaganda," probably a "catastrophic and conspicuous howler," and a "frantic alarm" acting as the 'yellow peril' of modern times."

Second, his treatment of limited data then available. Fisher accepted, virtually without question or criticism, the inadequate but exculpatory data, previously cited, on inhaling and incidence in men versus women--even though both sets would soon be discredited. Fisher then showcased some even more dubious data supposedly consonant with his favored view that both cancer and smoking arise independently from a common genetic predisposition. Two studies compared the smoking behaviors of identical and fraternal twin pairs. Smoking preferences were more often shared by identical than by fraternal twins. Since identicals form from one egg and therefore share the same genetic program, while fraternal twins develop from two eggs and are no closer genetically than any other pair of siblings, Fisher concluded that the greater similarity of identicals must indicate a strong genetic basis for smoking preferences.

But this inference is both potentially wrong and largely irrelevant to Fisher's argument. First of all, the greater smoking similarity of identicals could, at most, indicate a genetic predisposition in attitudes toward the weed; such data say nothing at all about genetic bases for cancer or about correlation of the two potential predispositions. Moreover, Fisher's data do not even prove his basic assertion of genetic predisposition for smoking. Fisher's explanation does represent one potential interpretation of the data, but another clearly exists, and he hardly considers it. Identical twins look alike and are frequently raised to emphasize the eerie similarity; they are often dressed alike, learn to act as surrogates one for the other, and so on. Perhaps this greater similarity in raising leads to a stronger likelihood for similar smoking habits.

In any case, Fisher should have considered all these possibilities if he were truly pursuing this issue with an open mind. We must conclude, rather, that he entered the fray with a clear preference, even a mission--the debunking of smoking as a cause, and a championing of joint genetic predisposition as an alternative explanation. We must therefore probe deeper and ask why Fisher had such an overwhelming preference. Two factors stand out: one immediate and practical; the other, longstanding and theoretical.

The immediate reason is easy to state and hard to gainsay. In 1956, Fisher became the paid scientific consultant for the Tobacco Manufacturers' Standing Committee. Fisher took great umbrage at any implication that his objectivity might be compromised thereby, arguing that he wouldn't sell his soul for the pittance they paid him. Higher powers must judge the tangled commitments wrought by such employment; I will only observe that we generally, and with good reason, require institutional impartiality as a prerequisite for genuine objectivity of mind.

The longstanding reason is more interesting intellectually and permits us to work back toward Fisher's first great error, thereby revealing an important continuity in his life and career. Fisher was a strong, lifelong supporter of eugenics, the proposition that human life and culture could be bettered by implementing strategies for genetic improvement by selective breeding--either encouraging childbearing by those judged genetically more fit (positive eugenics) or preventing procreation by the supposedly unfit (negative eugenics). I must emphasize at the start that I do not single out Fisher for any special opprobrium on this score. The great majority of geneticists advocated some form of eugenics, at least until Hitler showed so graphically how a ruthless program of negative eugenics might operate. Moreover, Fisher's idiosyncratic version was relatively benign politically and largely in the positive mode. Eugenics was a big and motley movement, including its fascists to be sure, but also its idealistic socialists and committed democrats. Fisher's strong and lifelong preference for genetic explanations of behavior, the foundation of his eugenic sympathies, surely predisposed him to the argument that both smoking and cancer might be linked to genetic variation among people. The same preference for genetic explanations inspired his much more extensive and encompassing first great error--his general theory of racial decline (and possible eugenic salvation), as presented in his magnum opus of 1930, *The Genetical Theory of Natural Selection*.

Just as most of my colleagues ignore Fisher's late and embarrassing work on smoking, they also pay little or no attention to the eugenic chapters of our profession's bible. Evolutionists may not know much about Fisher's campaign to exonerate the tobacco industry, but how can they bypass several chapters of a crucial volume present in every professional's library? One leading book on the history of population genetics says this and no more about Fisher's eugenic chapters: "In the concluding five chapters he extended his genetical ideas to human populations."

We don't like to admit flaws in our saints. Perhaps my colleagues are embarrassed that a truly great work, the abstract and theoretical foundation of our field, should include a practical view of society that most of us find both fatally flawed and politically unacceptable. Perhaps we tend to view the eugenic chapters as an unfortunate and discardable appendage to a great work of very different character. But such dismissal cannot be defended. The eugenic chapters are no ending frill; they represent more than one-third of the book. Moreover, Fisher explicitly insists that these chapters follow directly from his general theory and cannot be separated from his more abstract conclusions. He states that he only gathered these chapters together for convenience and that he might, instead, have scattered the eugenic material throughout the book. Fisher writes: "The deductions respecting man are strictly inseparable from the more general chapters."

A single, if complex, argument runs through the five eugenic chapters: advanced civilizations destroy themselves by "the social promotion of the relatively infertile," that is, people who rise into the ruling classes (the "better people" so necessary to successful government) tend, alas, to have fewer children for reasons of relative genetic infertility, not mere (and reversible) social choice. The upper classes therefore deplete themselves, and society eventually weakens and crumbles. If this assertion seems implausible a priori, then follow Fisher's rationale through six steps. Again, as with smoking, the argument is impeccably logical, in the narrow, technical sense of following its premises, but entirely wrong, almost nonsensical, based on the fallacy of those key premises.

1. All great civilizations cycle from initial prosperity to eventual decline and fall. Although conquest may terminate a depleted race, the cause of decline is internal and intrinsic. The major reason for ultimate failure must lie with a predictable weakening of the elite classes. Can this decline be stemmed and stability with greatness imparted? Fisher writes: "The fact of the decline of past civilizations is the most patent in history... The immediate cause of decay must be the degeneration or depletion of the ruling classes."

2. Fisher now notes, but misinterprets, the well-documented relationship between family size and social status in modern Western nations. Poorer families have more children, while the elite are relatively infertile because they marry later, have fewer children after marriage, and contain a higher percentage of individuals who remain bachelors or spinsters. This relative infertility of the upper classes leads to their depletion and, eventually, to a decline of civilization by failure of the most able to replenish themselves. Fisher writes: "The birth rate is much higher in the poorer than in the more prosperous classes, and this difference has been increasing in recent generations."

Interestingly, and on this basis, Fisher rejects the two most common alternative explanations for racial decay advanced by eugenicists of his time. He denies, first, that the upper classes alone are being vitiated by dangerous inbreeding. The decline in fertility is gradual and pervasive through the social hierarchy, not confined to the ruling elite. Fisher writes:

The deficiency in procreation is not especially characteristic of titled families or of the higher intellects, but is a graded quality extending by a regular declivity from the top to the bottom of the social scale.

Secondly, Fisher also rejected the common argument with the most unfortunate moral and political consequences--that superior civilizations decay by racial mixture with inferior groups. Fisher's rejection arises directly from his general evolutionary views--and this link supplies the best proof that Fisher's eugenic chapters are integrally connected with his theoretical work in evolution, and that the two parts of his book cannot be separated, with the theory exalted and the eugenics ignored in embarrassment. The book's

centerpiece is a proposition now known as Fisher's fundamental theorem of natural selection--"the rate of increase in fitness of any organism at any time is equal to its genetic variance in fitness at that time." Or roughly, the rate of evolution by natural selection is directly proportional to the amount of usable genetic variation maintained in a population. Or even more roughly, genetic variation is a good thing if you want to accelerate the rate of evolution. Therefore, since eugenic betterment requires effective evolution, anything that boosts the amount of usable variation should be strongly desirable in Fisher's view. Racial mixing represents a powerful way to increase variation, and Fisher had to acknowledge its potential benefits. (Fisher, following a common prejudice of his time, did not deny the general superiority of some races. Thus, race mixture might lower the average quality of a people. Nonetheless, the range of variation would increase, even while the mean declined, and natural selection could produce improvement by favoring rare individuals on the extended upper end.)

3. One might think that the elite have fewer children for purely social reasons (greater access to contraception, postponement of childbearing for work or education, more access to types of leisure better enjoyed without large families), but in fact, the cause of the correlation is largely genetic and the elite are less fertile for constitutional reasons. This statement is the centerpiece of Fisher's eugenics. He argues that the low fertility of modern elites is a pernicious and recent development, not a permanent state of all societies. In "primitive" social organizations, rulers generally have more children. (Fisher discreetly bypasses the major reasons for this former positive correlation--concubinage and multiple marriage by males in power-- largely, I suspect, because he rejects such practices morally and so much wishes to think well of elites in any age!) Fisher writes: "The normal destiny of accumulated wealth was to provide for a numerous posterity."

But "advanced" civilization has reversed this old and biologically healthy correlation. The elite now have fewer children, primarily for reasons of relative genetic infertility. How did the tragic reversal occur? Fisher argues that tendencies for social promotion of the less fertile predictably arise in advanced civilizations, thus flooding the upper classes with the source of their eventual depletion. But how could such a tendency originate?

4. People who rise from the lower to the upper classes (in a democracy that allows such mobility) do so by virtue of genetic superiority and the advantages thus conferred via intelligence and business acumen. But, unfortunately, these people also tend to be less fertile. Fisher's argument here exactly follows the form of his later claim for smoking. High ability does not cause infertility, nor does infertility produce brilliance. Rather, the correlation of high ability and infertility originates because both traits are independently linked to a pernicious circumstance that arises only in advanced civilizations. You have to possess strong, genetically based ability in order to rise at all. But if you also come from a large family (and therefore inherit a propensity for high fertility), your chances of rising are diminished because your family will be poorer (more mouths to feed, all other things being equal) and you will have less access to education. But if you have the same high ability and also come from a small family (with heritable low fertility), you gain a better chance to rise. By this noncausal correlation of ability and infertility, the chief reason for declining civilization emerges: the social promotion of the relatively infertile.

The situation breeds tragedy all around. The lower classes decline by loss of their most able members; the upper classes sink by the infertility of these upwardly mobile people. Society goes down the tubes. Fisher, at least, attempted to do his personal bit to stem the tide by raising a bevy of kids.

5. Fisher now faced a problem in the logic of his argument. If the upper classes are so infertile, shouldn't rising immigrants from lower levels help to replenish the dearth even if they are less fertile than their compatriots remaining at the bottom? Fisher, following a curious argument first advanced by Francis Galton, argued that men who rise by ability tend to marry particularly infertile upper-class women, thus diluting their own capacity for childbearing. Such men, knowing their advantages and being clever enough to exploit them, tend to marry heiresses should the opportunity arise (for they so desperately need a financial leg up in order to use their considerable abilities). Now an heiress tends to be particularly infertile because she is so often the only child in a family. Fisher laments: "This puts in the same class the children of comparatively infertile parents and the men of ability, and their intermarriage has the result of uniting sterility and ability."

When you dissect this preciously absurd argument for its hidden assumptions, sexist and otherwise, you get some sense of Fisher's own background and social biases. You realize how illusory must be the notion of absolute impartiality--of obedience only to the logic of argument and the dictates of empirical data. Only men do the rising from lower classes. Infertility is the burden and fault of women. In other words, men advance and women then pull the whole family line down.

6. Fisher summarized the baneful effect of the genetically based inverse correlation of childbearing and social status:

Whenever, then, the socially lower occupations are the more fertile, we must face a paradox that the biologically successful members of our society are to be found principally among its social failures, and equally that classes of persons who are prosperous and socially successful are, on the whole, the biological failures, the unfit of the struggle for existence, doomed more or less speedily, according to their social distinction, to be eradicated from the human stock.

If the social promotion of infertility is the cause of this destructive inverse correlation, then our only hope for reversal and salvation lies in legislated policies aimed at social promotion of the more fertile. Fisher advocated some form of payments for childbearing, so that lower-class people of both ability and fertility would be able to rise--as I said at the outset, a relatively benign form of eugenics.

I need hardly detail the numerous false assumptions that derail Fisher's complex argument. I only note that they represent exactly the same mistake-- uncritical acceptance of genetic conjectures--that invalidated his later case for smoking. Why should we assume that people who rise socially do so, in large part, by genetic endowment? And even if this argument is valid, why assume that the well-known negative correlation of childbearing and social status results from differential genetic fertility, especially when so many excellent and obviously nongenetic explanations cry out for attention (although Fisher mentions them only in quick derision), including, as mentioned before, longer years of schooling, delayed marriage, and greater access to contraception and abortion. The first genetic conjecture (a biological basis for social promotion) seems less implausible, although quite unproven; but the second conjecture (a genetic basis for fewer children in the upper classes) seems wildly improbable and even borders on the absurd. Yet Fisher's case absolutely requires that both genetic conjectures be valid, for if we rise genetically but then have fewer children only for social reasons, then his argument falls apart, since no "social promotion of infertility" would exist.

We may take a kindly view of Fisher's eugenics and say that his genetic conjectures did no harm, for try as he might--in press and before Parliament-- Fisher's recommendations made no practical headway. But false genetic hypotheses of human behaviors and statuses are politically potent. They represent an ultimate weapon for social conservatives who wish to "blame the victim" for any correctable social ill or inequity. Are workplaces toxic? Screen workers and fire those with genetic predispositions to react badly. Is adequate access available to members of minority races? Argue that they are inferior by nature and therefore already occupy an appropriate number of slots. The genetic fallacy is generic-and applicable almost anywhere for the common and lamentable social aim of preserving an unfair status quo.

We may excuse Fisher's eugenics as relatively harmless, but we cannot be so sanguine about his campaign against a causal link between cancer and smoking. Joan Fisher Box wrote a fine biography of her father, marred only by an understandably hagiographical approach. She depicts Fisher's smoking campaign as rousing good fun for her father, a kind of harmless little game enjoyed by a gadfly against powerful interests. But her last paragraph on this topic is chilling, unintentionally so I suspect:

In 1958 Fisher was brought into discussion of the evidence in the United States in connection with legal suits expected to be brought to trial against tobacco manufacturers for personal damage caused by their products. Early in 1960 he visited the United States at the invitation of a legal firm representing an American tobacco company, whose case was brought to trial in April that year. Other suits were either not brought or were unsuccessful, and the legal pressure on tobacco companies was relieved for a time.

And that, friends, translates into many, many deaths-as pressure to quit and to restrict advertising diminished. Fisher may have been only the tiniest cog in a great machine rolled out by the tobacco industry, but he did contribute. Charles Lamb once wrote a humorous couplet:

For thy sake, Tobacco, I
Would do anything but die.

Bad and biased arguments can have serious, even deadly, consequences.

~~~~~

By Stephen Jay Gould  
Stephen Jay Gould teaches biology, geology, and the history of science at Harvard University.