

Leading scientists still reject God

Sir—The question of religious belief among US scientists has been debated since early in the century. Our latest survey finds that, among the top natural scientists, disbelief is greater than ever — almost total.

Research on this topic began with the eminent US psychologist James H. Leuba and his landmark survey of 1914. He found that 58% of 1,000 randomly selected US scientists expressed disbelief or doubt in the existence of God, and that this figure rose to near 70% among the 400 “greater” scientists within his sample¹. Leuba repeated his survey in somewhat different form 20 years later, and found that these percentages had increased to 67 and 85, respectively².

In 1996, we repeated Leuba’s 1914 survey and reported our results in *Nature*³. We found little change from 1914 for American scientists generally, with 60.7% expressing disbelief or doubt. This year, we closely imitated the second phase of Leuba’s 1914 survey to gauge belief among “greater” scientists, and find the rate of belief lower than ever — a mere 7% of respondents.

Leuba attributed the higher level of disbelief and doubt among “greater” scientists to their “superior knowledge, understanding, and experience”². Similarly, Oxford University scientist Peter Atkins commented on our 1996 survey, “You clearly can be a scientist and have religious beliefs. But I don’t think you can be a real scientist in the deepest sense of the word because they are such alien categories of knowledge.”⁴ Such comments led us to repeat the second phase of Leuba’s study for an up-to-date comparison of the religious beliefs of “greater” and “lesser” scientists.

Our chosen group of “greater” scientists were members of the National Academy of Sciences (NAS). Our survey found near universal rejection of the transcendent by NAS natural scientists. Disbelief in God and immortality among NAS biological scientists was 65.2% and 69.0%, respectively, and among NAS physical

Table 1 Comparison of survey answers among “greater” scientists

Belief in personal God	1914	1933	1998
Personal belief	27.7	15	7.0
Personal disbelief	52.7	68	72.2
Doubt or agnosticism	20.9	17	20.8

Belief in human immortality	1914	1933	1998
Personal belief	35.2	18	7.9
Personal disbelief	25.4	53	76.7
Doubt or agnosticism	43.7	29	23.3

Figures are percentages.

scientists it was 79.0% and 76.3%. Most of the rest were agnostics on both issues, with few believers. We found the highest percentage of belief among NAS mathematicians (14.3% in God, 15.0% in immortality). Biological scientists had the lowest rate of belief (5.5% in God, 7.1% in immortality), with physicists and astronomers slightly higher (7.5% in God, 7.5% in immortality). Overall comparison figures for the 1914, 1933 and 1998 surveys appear in Table 1.

Repeating Leuba’s methods presented challenges. For his general surveys, he randomly polled scientists listed in the standard reference work, *American Men of Science* (AMS). We used the current edition. In Leuba’s day, AMS editors designated the “great scientists” among their entries, and Leuba used these to identify his “greater” scientists^{1,2}. The AMS no longer makes these designations, so we chose as our “greater” scientists members of the NAS, a status that once assured designation as “great scientists” in the early AMS. Our method surely generated a more elite sample than Leuba’s method, which (if the quoted comments by Leuba and Atkins are correct) may explain the extremely low level of belief among our respondents.

For the 1914 survey, Leuba mailed his brief questionnaire to a random sample of 400 AMS “great scientists”. It asked about the respondent’s belief in “a God in

intellectual and affective communication with humankind” and in “personal immortality”. Respondents had the options of affirming belief, disbelief or agnosticism on each question¹. Our survey contained precisely the same questions and also asked for anonymous responses.

Leuba sent the 1914 survey to 400 “biological and physical scientists”, with the latter group including mathematicians as well as physicists and astronomers¹. Because of the relatively small size of NAS membership, we sent our survey to all 517 NAS members in those core disciplines. Leuba obtained a return rate of about 70% in 1914 and more than 75% in 1933 whereas our returns stood at about 60% for the 1996 survey and slightly over 50% from NAS members^{1,2}.

As we compiled our findings, the NAS issued a booklet encouraging the teaching of evolution in public schools, an ongoing source of friction between the scientific community and some conservative Christians in the United States. The booklet assures readers, “Whether God exists or not is a question about which science is neutral”⁵. NAS president Bruce Alberts said: “There are many very outstanding members of this academy who are very religious people, people who believe in evolution, many of them biologists.” Our survey suggests otherwise.

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Dilemma over genetics and population in China

Sir—As you write in a recent editorial, the forthcoming 18th International Congress on Genetics in Beijing will provide a rare opportunity to continue discourse on the ethics and science of eugenics¹. But a number of fundamental problems facing geneticists in China deserve mention. Without a thorough understanding and awareness of these problems and their cultural and psychological roots — as

eloquently expounded recently by Chen-Lu Tsou² — the discourse may not produce significant tangible results.

We acknowledge that the Chinese Maternal and Infant Health Law, which has been the focus of much recent debate, represents a well-intentioned step towards reducing the burden of debilitating diseases perceived to be hereditary. By sheer scale, the enormous social and economic cost to the most populous nation has no equal in the world, and would surely prompt any sensible society to react. Indeed, given the urgency of the population problem

confronting the nation, it may appear logical to concentrate on the segments of its society considered the least productive and least able to contribute to the future, if a major effort is launched to reduce its population size³.

But the good intention of the law is seriously undermined by its shaky scientific foundations. For example, where is the evidence that 20 million people are handicapped by hereditary diseases? In a nation where more than half the adult male population smoke, and environmental pollution is rampant in some areas, could a

significant proportion of those presumed hereditary handicaps be prevented by a reduction in smoking, a cleaner environment, and improved pre-, peri- and postnatal care? Should one take the current search for genetic mechanisms underlying many complex diseases or disorders, such as schizophrenia, as the *fait accompli* that these diseases are preventable through sterilization? How strong is the evidence that enforcement of the law alone will prevent many or all of the handicaps? Without solid documentation, any claims about the law and its intended effects are merely opinions, without scientific validation.

The fact, as pointed out by the sponsor of the law, that births of "inferior quality" are relatively more common among "the old revolutionary base, ethnic minorities, the frontier, and economically poor areas"⁴ suggests that many so-called "inferior births" may in fact be of environmental origin, and so preventable through improved living standards and better pre-, peri- and postnatal care (for example, taking folic acid, reducing perinatal trauma, and eliminating iodine deficiency).

The law was drafted with input from geneticists in China, but it is questionable whether the scientific part of the law was based on the best knowledge available. Judging from Chinese human genetics textbooks and scant publications in international journals, it is evident that basic research in genetic epidemiology is still in its infancy in China. This situation is undeniably the result of political turmoil and the chronic shortage of government funds for this type of research.

The lack of a rigorous grant review system allows scope for excessive importance to be given to popular acclaim and to the political goals of scientific research in allocating funding. In a country where political loyalty is often considered more important than scientific talent and integrity, this can be an effective strategy for attracting government funds.

Indeed, the recent substantial increase in funding for genetic research in China⁵ was largely the result of a letter to the Chinese president from a prominent geneticist urging protection of China's human genetic resources, because of the fear of losing the resources to foreign organizations.

As for issues relating to international collaboration, the importance given to popular acclaim and political goals can easily lead to narrow-minded nationalism, which can be generated by provoking painful memories of imperialist aggression and humiliation in the past. This type of

nationalism, coupled with the lack of 'checks and balances' in the system, provides a recipe for abuse. Ironically, efforts to protect China's human genetic resources are seriously compromised by inadequate research in basic genetic epidemiology.

The best protection against over-politicization and ignorance may be an overhaul of China's research evaluation and grant review systems. For example, experts from other countries should be invited to participate in evaluating large scientific grant applications and research institutions. For a poor country such as China, this is also the best way to ensure that scarce and meagre resources are well spent. The science part of the eugenics law — which unfortunately has no quick fix — requires years of basic genetic research which will ultimately benefit not only the Chinese people, but all humankind.

The opinions expressed here are the authors' own and should not be taken to represent those of their institutions.

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Science in the firing line in Argentina

Sir — I am appalled by your editorial of 16 April, asserting that Argentina's national research council (CONICET) spends nearly all its money on 3,000 staff scientists but has now set up a new agency, in collaboration with industry, to produce sound science (*Nature* **392**, 635; 1998).

I would like to mention a few facts and events that influenced the careers of those 3,000 researchers. In 1961, a secretary of state who did not tolerate Jews fired the director of the Malbran Institute of Immunology, Ignacio Pirofsky, provoking

the resignation and exile of most of the research personnel. In 1966, the military destroyed the School of Exact and Natural Sciences of the University of Buenos Aires ("Exactas"), beating and incarcerating researchers, and had the laboratories exorcised by a priest. Luis Botet was appointed president of the university by the military: he fired all scientists who expressed solidarity with their Exactas colleagues. Hence, 1,315 scientists left the country.

In 1976, Raul Matera, undersecretary of science and technology, bought 40 crucifixes for CONICET's offices, despite the small amount of money available for research. The Argentinian government passed a law of amnesty to pardon all the military involved in torturing and murdering tens of thousands of people, as well as a law of *punto final* (no more questions asked), but refused to compensate researchers who had been fired and deprived of their labs. In 1990, finance minister Domingo Cavallo said that he would prefer scientists "to wash dishes". Accordingly, those 3,000 researchers referred to in your editorial are paid meagre salaries, and have almost no money to run their labs. Argentina has a far larger and more productive community of researchers in exile abroad than it has at home.

To appreciate the quality of Argentinian researchers, one has only to note that they publish in the best international journals, they frequently work in first-rate universities in Britain, France and the United States, and are awarded all types of distinctions, including the Nobel prize. Argentina has some poorly financed research, but no science, because while the first depends on the ability of a few thousand, science is a way of interpreting reality that Argentina has never developed. Thus, not a single workers' union or society of entrepreneurs complained when the universities were destroyed. Consequently, today masses of unemployed people beg San Cayetano (the patron saint of workers) for work.

Argentina is not willing to accept that, in order to develop science, an ethical transformation is required, not just of its scientific infrastructure but of its society in general. Its ideal seems to be to combine technology with theology. For local governments, science is something that comes only after countries become rich. So they appoint managers to decide scientific matters.

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