

"Leave them in peace; we can always shoot them all later."

The important lesson is that science is universal, and when it is viewed as Soviet science or Aryan science, disaster can often be the outcome. The science of eugenics, literally 'good birth', assumed that all human characteristics, intellectual and moral as well as physical, were inherited, and hence people of 'inferior' races or those with hereditary diseases should be controlled.

The concept of Aryan science started long before Hitler came to power and was based on the principle that the Aryans were a superior race. The Nazi government first applied these ideas to its own people, and some 300,000 people considered physically or mentally inferior were sterilized between 1933 and 1939. After 1936, killings by doctors in hospitals and asylums began. In 1939 euthanasia was legalized to replace sterilization, and finally, no fewer than 70,000 patients in institutions were secretly killed. Later, this belief in racial superiority led to the killing of millions of Jews, Poles, gypsies and others in concentration camps.

Eugenics started in Britain in 1869 and quickly spread to the United States, where eugenic measures such as marriage laws preventing unsuitable unions were introduced. Compulsory sterilization followed in many states, starting with Indiana in 1907 and lasting well into the sixties. Other countries followed suit. In Sweden, compulsory sterilization became legal in 1934, and over the next 30 years about 1% of the population — 63,000 Swedes — were sterilized for reasons of race or social undesirability. Eugenics is now almost dead, but racial discrimination is alive, although usually bearing other names, such as 'ethnic cleansing'. The fight against eugenics continues.

Gratzer writes as a historian, and so his book lacks the charm of personal involvement found in Langmuir's contributions — Langmuir played the part of Robert Wood by demonstrating to experimental physicists Bergen Davis and Arthur Barnes that they were counting imaginary scintillations. Gratzer could have discussed cold fusion in more depth, as this controversy continues today. In fact, the true believers held a meeting in Italy last May which was sponsored by the three main Italian official research organizations.

For a wrong result to be believed and for the idea to spread, the reputation of the people involved is very important. Bob Park, the author of a somewhat similar book, *Voodoo Science*, says that, no matter how crazy the claim, it is always possible to find a physicist with a PhD to support it. Reading Gratzer's book, one is tempted to say that there is a 50% chance that a Nobel laureate will support the claim.

Interestingly, Gratzer shows that scientists who make bad errors tend to be treated

kindly by their colleagues. This is probably because the profession believes in self-regulation, and possibly also because there is a feeling of 'there but for the grace of God, go I'.

What will be the next example of pathological science, for there are surely many more still to come? Possibly it will be something we all desire — a new energy source, life on Mars. I would recommend Gratzer's book as a tool to help us recognize it sooner and fight it effectively. ■

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Funny, I thought this was science

Laughter: A Scientific Investigation

by Robert R. Provine
*Viking/Faber & Faber: 2000. 256 pp.
 \$24.95, £12.99*

Steve Blinkhorn

If a lion were laughing, how could we tell? Or is the very idea nonsense? It is easy enough to suppose that early hominids felt fear, despair, elation, sorrow — but what would count as a simian snigger, and does joviality depend on a joke? Laughter has an awkward place in any account of emotion, perhaps because of the suspicion that it is inextricably linked with self-conscious cognitive processes and so is the preserve of our own species.

There is a craft of humour, whose aim is to provoke laughter. But just as the study of pathos is not exhausted by an examination of tragic literature, there is more to laughter than the creation of comedy. This "scientific investigation" of laughter strives to remain on the subject and to avoid being sidetracked into the theory and practice of humour, but

in the process makes some exceedingly bad jokes and some very dubious claims. On the other hand, it has the conspicuous merit of at least tackling its subject from many points of view, however unpersuasively. Journalistic in style, it starts "with the 'who', 'what', 'when', and 'where', of laughter". The fact that the 'how' and the 'why' are missing is the clue to the essentially ethological, tractarian nature of the enterprise. "Laughter, like speech, is a vocal signal that we seldom send unless there is an audience." But how can you *know* that? Is this not just one author's perception? It may be a sign of serious mental weakness, but let me confess to laughing out loud at books, and broadcast comedy, and — yes — even the works of Daedalus in the pages of *Nature*, when no one else is present.

Are these vicariously social situations? Very likely, but then the notion of an audience becomes vacuous. Provine had volunteers record in diaries their solitary behaviour, and not surprisingly they laughed more in company than alone. Most people drink more alcohol in company than alone, and while that surely tells us something about the prominence of social drinking in Western society, it tells us nothing about the chemistry and metabolism of ethanol.

Worse still, so far as solitary vice is concerned, in the days when I wrote comedy for performance, I knew that if it didn't make me laugh out loud as I wrote it, it would leave an audience cold. Of course, that is to fall into the trap of equating laughter and comedy, and whereas comedy is culturally conditioned, ticklishness isn't. Unfortunately, because a great deal of consensual tickling and concomitant laughter takes place in circumstances beyond the ethologist's gaze, a comprehensive account based on frequency, rhythm, intensity, location and mutuality must await some future Masters and Johnson (of titillation in the literal sense). Provine notes, somewhat sadly, that opportunities for engaging in this often highly ambiguous-



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ly enjoyable activity decline with advancing years, as does recorded pleasure in the experience when it does occur. But perhaps willingness to participate enthusiastically in the business of rating, on a 10-point scale, the pleasure experienced by being tickled also declines markedly with age.

The irritating thing about what is, in principle, an attractive scholarly enterprise, is the sheer unevenness of the treatment. One might almost think it an unhappy collaborative effort. After some truly dire attempts at humour (“premature ejaculation”, “laftus interruptus”), the reader is pleasantly surprised by stretches of good, pacy exposition of plausible science and intriguing insights from primatology and the study of autism. But then Chapter 9, “Laughing Your Way to Health”, feels like an editorial imposition, and comes to no worthwhile conclusions at all. The following chapter, “Ten Tips for Increasing Laughter”, solemnly advises the reader to “stage social events” and “provide humorous materials”. We need a neurobiologist for this kind of advice?

What bothers me most is that a professor who, presumably, has spent many hours on his feet engaging the attention of eager youth on matters scientific feels it worth proposing that, as a public speaker evokes laughter from an audience, “*the brains of speaker and audience are locked into a dual-processing mode*” (author’s italics). Classical manuals of rhetoric have more insight to offer. “Laughter is about relationships” — but only in the sense that Life Is About Relationships, a sense that does little to inform and nothing to explain.

Humour can be very culture-specific: recognition laughter is comprehensible only in terms of a set of expectations and experiences, the humour of incongruity only in terms of what would count as congruent, and neither yields much to this analysis. As for irony, well, that is perhaps in any case a peculiarly British taste, and possibly one of the great barriers to shared laughter between nations. I came to wonder eventually just

how much the author’s sense of humour has been sidetracked by his professional interest in laughter. One is left with the feeling that, in his view, laughter is funny peculiar rather than funny ha-ha, and that putting this book together was rather less fun than he would like us to believe. ■

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The gene is dead; long live the gene

The Century of the Gene

by Evelyn Fox Keller
Harvard University Press: 2000.192 pp.
\$22.95, £15.95

Jerry A. Coyne

Gregor Mendel’s work was rediscovered in 1900 and Wilhelm Johannsen coined the word ‘gene’ in 1909. Since then, genetics has progressed from T. H. Morgan’s work on the fruitfly *Drosophila* to the genome projects of today. In retrospect, it seems appropriate to dub the twentieth century, at least in scientific terms, ‘the century of the gene’. But despite the title of her book, Evelyn Fox Keller disagrees.

The Century of the Gene is, in fact, a jihad against our notion of the gene. Keller insists that the gene is neither the stable, self-replicating entity we thought it was, nor a repository of information about development. To Keller, ‘gene’ is simply an outmoded term, a semantic straitjacket signifying something that can’t be defined. Were she less constrained by publishing convention, I suspect her book would have been called *The Century of that Nebulous, Ill-Defined Entity Formerly Known as ‘The Gene’*.

Keller, a philosopher and historian of science, is best known for *A Feeling for the Organism* (W. H. Freeman, 1983), her biog-

raphy of the geneticist Barbara McClintock, which was written for a general audience. Given the high technical level of discussion, *The Century of the Gene* is, however, clearly aimed at professional biologists.

Unfortunately, the book is long on complaint and short on substance, and ultimately fails to make its case against the primacy of the gene. Despite her repeated claims that the recent history of genetics is replete with “major reversals”, “serious provocations” and “radical modifications”, the gene emerges unscathed. Many of the alleged problems highlighted by Keller turn out to be semantic issues likely to be of little interest to either working biologists or serious philosophers of science. Moreover, the level of analysis is disturbingly superficial: Keller seems more interested in forcing genetics into the Procrustean bed of her thesis than in presenting a balanced argument.

She claims, for example, that the idea of the gene as a unit of structure or function is outmoded because some bits of DNA do not produce proteins, but instead regulate genes, because some genes can be spliced or read in alternative ways, and because the products of some genes perform several functions. Although it is true that genes are often complex, the word gene is still a perfectly good working term for biologists, especially when defined as a piece of DNA that is translated into messenger RNA. Farmers are still called farmers even though their job is far more complex than that of their predecessors.

Keller asserts that DNA is not a ‘self-replicating’ molecule because enzymes are needed for replication. She also claims that genes do not direct development because gene activation depends on many different factors (such as chromatin structure, egg cytoplasm and local differences in the cellular environment which turn on different genes in different tissues). Again, these are pseudo-problems: replication enzymes and many inducers of development are themselves products of genes. One might as well argue that political candidates are not self-promoting because they hire others to do that job for them. Certainly, non-genetic factors influence development, but ultimately we differ from chimpanzees because of our genes, not our environments.

The supposed non-autonomy and complexity of genes lead Keller to suggest that we should replace a reductionist approach to genetics with a more holistic programme that incorporates trendy concepts such as developmental networks and self-organization. But she does not specify how this approach would work. In fact, history shows clearly that the greatest triumphs of genetics have been born of reductionism: progress nearly always comes by first studying single genes and then examining their interactions with others. The remarkable advances in understanding the developmental genetics

