Chapter 7
Science and its critics

Many people take it for granted that science is a good thing, for obvious reasons. After all, science has given us electricity, safe drinking water, penicillin, and air travel—all of which have undoubtedly benefited humanity. But despite these impressive contributions to human welfare, science is not without its critics. Some argue that society spends too much money on science at the expense of the arts; others observe that science has given us technological capabilities we would be better off without, e.g. weapons of mass destruction. Some feminists argue that science is inherently male-biased; those of religious persuasion often feel that science threatens their faith; and anthropologists have accused Western science of arrogantly assuming its superiority over the knowledge and beliefs of indigenous cultures. This does not exhaust the list of criticisms to which science has been subject, but here we confine our attention to three that are of particular philosophical interest.

Scientism

The word 'scientific' has acquired a peculiar cachet in modern times. If someone accuses you of behaving unscientifically, they are almost certainly criticizing you. Scientific conduct is rational and praiseworthy; unscientific conduct is irrational and worthy of contempt. It is difficult to know why calling something scientific

should carry these connotations, but it probably relates to the high status which science holds in modern society. Scientists are treated as experts, their opinions regularly sought on matters of social importance. Of course, everybody recognizes that scientists sometimes get it wrong; for example, scientific advisers to the British government in the early 1990s declared that 'mad cow' disease posed no threat to humans, only to be proved tragically mistaken. But occasional hiccups of this sort tend not to shake the public faith in science, nor the esteem in which scientists are held. In many countries, scientists are viewed much as religious leaders used to be: possessors of specialized knowledge that is inaccessible to the laity.

'Scientism' is a pejorative term used by some philosophers to describe what they see as science worship, or an over-reverential attitude towards modern science. Opponents of scientism argue that science is not the only valid form of intellectual endeavour, and not the only way of understanding the world. They often stress that they are not anti-science per se; what they are opposed to is the assumption that scientific methods are necessarily applicable to every subject matter. So their aim is not to attack science but to put it in place, by rejecting the idea that scientific knowledge is all the knowledge there is.

Scientism is a rather vague doctrine, and, given that the term has a pejorative usage, few would explicitly admit to believing it. Nonetheless, something quite like science worship is a genuine feature of the intellectual landscape. This is not necessarily a bad thing—perhaps science deserves to be worshipped. But it is certainly a real phenomenon. One field which is often accused of science worship is contemporary anglophone philosophy (of which philosophy of science is just one branch). Traditionally philosophy is regarded as a humanities subject, despite its close historical links to mathematics and science, and with good reason. For philosophy asks questions about the nature of knowledge, morality, and human well-being, for example, which do not seem

soluble by scientific methods. No branch of science tells us how we should lead our lives, what knowledge is, or what human flourishing involves; these are quintessentially philosophical questions.

In the light of this, it may seem surprising that some philosophers insist that science is the only legitimate path to knowledge. Questions that cannot be resolved by scientific means are not genuine questions at all, they hold. This view was endorsed by the famous 20th-century English philosopher Bertrand Russell, who wrote: 'whatever knowledge is attainable, must be attained by scientific methods; and what science cannot discover, mankind cannot know'. The grounds for the view lie in a doctrine called 'naturalism', which stresses that we human beings are part and parcel of the natural world, not something apart from it, as was once believed. Since science studies the whole of the natural world, surely it should be capable of revealing the complete truth about the human condition, leaving nothing left for philosophy? On this view, philosophy has no distinctive subject matter of its own. Insofar as it serves a useful role at all, it involves 'clarifying scientific concepts'—clearing the brush so that scientists can get on with their work.

Not surprisingly, many philosophers reject this subordination of their discipline to science; this is one source of opposition to scientism. They argue that philosophical enquiry has its own proprietary methods, which can reveal truths of a sort that science cannot. Proponents of this view allow that philosophy should aim to be *consistent* with the sciences, in the sense of not advancing claims which conflict with what science teaches us. And they typically accept that we humans are part of the natural order, so not exempt from the scope of science. But it does not follow, they argue, that science is the only legitimate source of knowledge about the world.

What exactly are these methods of philosophical enquiry? They include logical reasoning, the use of thought experiments, and

what is called 'conceptual analysis', which tries to delimit a particular concept by relying on our intuitions about whether a particular case falls under it. For example, a classical philosophical question asks whether knowledge is identical to true belief. Most philosophers say that the answer is 'no', on the grounds that we can construct cases in which a person does truly believe a particular proposition but cannot be said to know it. (For example, suppose you believe that it is ten past six because that is what your watch says; in fact your watch is broken, but by chance the time *is* actually ten past six! Your belief is therefore true, but intuitively you did not *know* that it was ten past six as you simply 'got lucky'.) So by using conceptual analysis, we can establish that knowledge and true belief are not identical—which is a substantive philosophical truth. This is just one example; but it illustrates the idea that philosophical enquiry can yield genuine knowledge using its own non-scientific methods.

How should this debate be assessed? On the one hand, there are certainly examples of philosophical questions which appear to be genuine, to lie outside the provenance of any science, and to be answerable by the distinctive methods of philosophers. However, against this, many of the questions discussed in the history of philosophy, e.g. about perception, imagination, and memory, have turned out to be matters for the empirical sciences, in particular psychology. Indeed the pool of questions classed as 'philosophical' has shrunk over the centuries, as more and more get appropriated by science. Moreover, the idea that philosophical enquiry and scientific enquiry are autonomous, each relying on their own methods, has been criticized as wishful thinking; opponents point out that while there is certainly progress in science, progress in philosophy is rather harder to discern.

An analogous issue concerns the relation between the natural and social sciences. Just as philosophers complain of 'science worship' in their discipline, so social scientists complain of 'natural science worship' in theirs. It is often felt that natural sciences such as

physics, chemistry, and biology are in a more advanced state than social sciences such as economics, sociology, and anthropology; the former can formulate precise laws with great predictive power, while the latter usually cannot. Why should this be so? It can hardly be because natural scientists are smarter than social scientists. One possible answer is that the *methods* of the natural sciences are superior. If this is correct, then what the social sciences need to do to catch up is to ape the methods of the natural sciences. To some extent this has already happened. The increasing use of mathematics in the social sciences may be partly a result of this attitude. Physics made a great leap forward when Galileo took the step of applying mathematical language to the description of motion; so it is tempting to think that a comparable leap forward might be achievable in the social sciences if a comparable way of 'mathematicizing' their subject matter can be found.

However, some social scientists resist the suggestion that they should look up to the natural sciences in this way, arguing that the methods of natural science are not necessarily appropriate for studying social phenomena. They typically deny that the social sciences are impoverished vis-à-vis the natural sciences, pointing out that the complexity of social phenomena, and the fact that controlled experiments usually cannot be done, mean that finding precise laws with predictive power is not an appropriate benchmark of success.

An influential version of this argument derives from the 19th-century German sociologists Wilhelm Dilthey and Max Weber. They argued that social phenomena must be understood from the viewpoint of the actor(s) responsible for them. What distinguishes social from natural phenomena is that the former are the result of the intentional action of humans. Thus a special type of understanding, called *verstehen*, is needed for social scientific enquiry; this involves trying to grasp the subjective meaning that a social action has for the actor. For example, an

anthropologist studying a religious ritual needs to understand the significance that the ritual has for the participants; a purely 'objective' analysis, of the sort that could be had by applying the methods of natural science, cannot yield a genuine understanding of the ritual, since it neglects the crucial matter of the ritual's meaning. The doctrine of *verstehen* thus posits a sharp discontinuity between the natural and social sciences. The doctrine had a significant influence on the development of anthropology and sociology, in particular, in the 20th century.

Neither the scientism issue nor the parallel issue about natural and social science is easy to resolve. In part, this is because it is not fully clear what exactly the 'methods of science', or the 'methods of natural science', actually comprise—a point that is often overlooked by both sides in the debate. If we want to know whether the methods of science are applicable to every subject matter, or whether they are capable of answering every important question, we obviously need to know what exactly those methods *are*. But as we have seen, this is less straightforward a question than it seems. Certainly we know some of the main features of scientific enquiry: experimental testing, observation, theory construction, and inductive inference. But this list does not provide a precise definition of 'the scientific method'. Nor is it obvious that such a definition could be provided. Science changes rapidly over time, so the assumption that there is a fixed, unchanging 'scientific method', used by all scientific disciplines at all times, is not inevitable. But this assumption is implicit both in the claim that science is the only route to knowledge *and* in the counter-claim that some questions cannot be answered by scientific methods. This suggests that, to some extent at least, the debate about scientism may rest on a false presupposition.

Science and religion

The tension between science and religion is old. Perhaps the best-known example is Galileo's clash with the Catholic Church.

In 1633 the Inquisition forced Galileo to publicly recant his Copernican views and condemned him to spend his last years under house arrest in Florence. The Church objected to the Copernican theory because it contravened the holy Scriptures, of course. In recent years, the most prominent science/religion clash has been the bitter dispute between Darwinists and proponents of 'intelligent design' in the United States, which will be our focus here.

Theological opposition to Darwin's theory of evolution is nothing new. When *The Origin of Species* was published in 1859, it immediately attracted criticism from churchmen in England. The reason is obvious: Darwin's theory maintains that all current species, including humans, have descended from common ancestors over a long period of time. This theory clearly contradicts the Book of Genesis, which says that God created all living creatures over a period of six days. Some Darwinians have tried to reconcile their belief in evolution with their Christian faith by arguing that the Book of Genesis should not be interpreted literally—it should be regarded as allegorical, or symbolic. However, in the USA, many evangelical Protestants have been unwilling to bend their religious beliefs to fit scientific findings. They insist that the biblical account of creation is literally true, and that Darwin's theory of evolution is therefore completely wrong.

This opinion is known as 'creationism', and is accepted by some 40 per cent of the adult population in the USA. Creationism is a powerful political force, and over the years has had considerable influence on the teaching of biology in American high schools, to the dismay of scientists. Since the American constitution prohibits the teaching of religion in public schools, 'creation science' was invented—which claims that the biblical account of creation is a better scientific explanation of life on earth than Darwin's theory of evolution. So teaching biblical creation does not violate the constitutional ban, for it counts as science, not religion! In 1981 a law was passed in Arkansas calling for biology teachers to give

'equal time' to evolution and creation science. However this was overruled by a federal judge the following year, and in 1987 a Supreme Court judgment ruled that teaching creation science in public schools was unconstitutional.

Following these legal defeats, the creation science movement cleverly rebranded itself under the label 'intelligent design'. The name is an allusion to an old argument for the existence of God, known as the 'argument from design', which says that the existence of complex biological organisms can only be explained by supposing that an intelligent deity created them; this deity is usually identified with the Christian God. The argument from design was part of the intellectual mainstream in the pre-Darwinian era, but is of course rejected by contemporary biologists. Proponents of intelligent design have resuscitated the argument, claiming that biological organisms exhibit 'irreducible complexity' which could not have evolved by Darwinian means, and is thus proof of God's handiwork. An 'irreducibly complex' system is one with a number of interacting parts each of which is critical to the system's functioning—remove or alter any one of the parts and the system breaks down. It is true that biological organisms, and indeed individual cells, are complex in this sense, as their functioning depends on the coordinated activity of many biochemical components. This sort of interdependence could not have evolved by natural selection, claim the intelligent design camp.

Despite its recent prominence, this argument is old wine in new bottles. In *The Origin of Species*, Darwin himself wondered how the vertebrate eye, a highly complex organ, might have evolved by natural selection, noting that at first blush it seems 'absurd'. However, Darwin believed that the difficulty could be resolved by imagining a sequence leading from a simple eye (perhaps just a few light-sensitive cells) to modern eyes by a gradual series of incremental improvements, each of which conferred a selective advantage. In this way an organ of great complexity, with finely

tuned components, could have evolved by natural selection. Darwin himself could only guess as to what the intermediate stages of eye evolution were. But recent scientific work has offered detailed insight into the probable sequence of stages, based on studying the embryonic development of the eye, and performing detailed genetic analyses, across vertebrate species. So the suggestion that the eye could not have arisen by natural selection has been successfully rebutted. The moral generalizes: there is no evidence to support the idea that organisms exhibit any features that could not have resulted from an evolutionary process.

In addition to their emphasis on 'irreducible complexity', proponents of intelligent design have tried to undermine the Darwinian worldview in other ways. They argue that the evidence for Darwinism is inconclusive, so Darwinism should not be regarded as established fact but rather as 'just a theory'. In addition, they have focused on various internal disputes among Darwinians, and picked on a few incautious remarks by individual biologists, in an attempt to show that disagreeing with the theory of evolution is scientifically respectable. They conclude that since Darwinism is 'just a theory', students should be exposed to alternative theories too—such as the theory that an intelligent deity created all living organisms.

In a way, it is quite correct that Darwinism is 'just a theory' and not proven fact. As we saw in Chapter 2, it is never possible to *prove* that a scientific theory is true, in the strict sense of proof, for the inference from data to theory is invariably non-deductive. But this is a general point—it has nothing to do with the theory of evolution per se. By the same token, we could argue that it is 'just a theory' that the earth goes round the sun, or that water is made of H_2O, or that unsupported objects tend to fall, so students should be presented with alternatives to each of these. But proponents of intelligent design do not argue this. They are not sceptical about science as a whole, but about the theory of evolution in particular. So if their position is to be defensible, it

cannot simply turn on the point that our data doesn't guarantee the truth of Darwin's theory. For the same is true of every scientific theory, and indeed of most commonsense beliefs too.

Another intelligent design argument is that the fossil record is patchy, particularly when it comes to the supposed ancestors of *Homo sapiens*. There is some truth in this charge. Evolutionists have long puzzled over the gaps in the fossil record. One persistent puzzle is why there are so few 'transition fossils'—of creatures intermediate between two species. If later species evolved from earlier ones as Darwin's theory asserts, surely transition fossils should be common? However this is not a good argument against Darwin's theory. For fossils are not the only or even the main source of evidence for the theory of evolution. Other sources include comparative anatomy, embryology, biogeography, and genetics. Consider for example the fact that humans and chimpanzees share 98 per cent of their DNA. This and thousands of similar facts make perfect sense if the theory of evolution is true, and thus constitute excellent evidence for the theory. Of course, a proponent of intelligent design can also explain this fact, by saying that the designer chose to make humans and chimpanzees genetically similar for reasons of his (or her) own. But the possibility of giving 'explanations' of this sort simply shows that Darwin's theory is not logically entailed by the evidence, so in principle other explanations can be concocted. This methodological point is correct, but shows nothing special about Darwinism.

Though the arguments of the intelligent design camp are uniformly unsound, the controversy does raise serious questions concerning science education. How should the tension between science and faith be dealt with in a secular education system? Who should determine the content of high-school science classes? Should parents who don't want their children to be taught about evolution, or some other scientific matter, be overruled by the state? These questions normally receive little public attention,

but the clash between Darwinism and intelligent design has brought them to the fore.

Is science value-free?

Everybody would agree that scientific knowledge has sometimes been used for unethical ends—to make nuclear and chemical weapons, for example. But such cases do not show that there is something ethically objectionable about scientific knowledge itself. It is the *use* to which that knowledge is put that is unethical. Indeed many philosophers would say that it makes no sense to talk about science or scientific knowledge being ethical or unethical per se. For science is concerned with facts, and facts in themselves have no ethical significance. It is what we do with those facts that is right or wrong, moral or immoral. On this view, science is essentially a *value-free* activity—its job is just to provide information about the world. What society chooses to do with that information is another matter.

Not all philosophers accept this picture of science as neutral with respect to questions of value, nor the underlying fact/value dichotomy on which it rests. Some claim that scientific enquiry is invariably laden with value judgements. One argument for this stems from the obvious fact that scientists have to choose what to study—not everything can be examined at once. So judgements about the relative importance of different possible objects of study have to be made, and these are value judgements, in a weak sense. Another argument stems from the fact that any set of data can in principle be explained in more than one way. A scientist's choice of theory will thus never be uniquely determined by their data. Some philosophers take this to show that values are invariably involved in theory choice, and thus that science cannot be value-free. A third argument is that scientific knowledge cannot be divorced from its intended applications in the way that value-freedom would require. On this view, it is naive to picture scientists as disinterestedly doing research for its own sake, without a thought

for its practical applications. The fact that much scientific research today is funded by the private sector lends some credence to this view.

Though interesting, these arguments are all somewhat abstract—they seek to show that science could not be value-free as a matter of principle, rather than identifying actual cases of values playing a role in science. But specific allegations of value-ladenness have also been made. Here we focus on two examples, one from psychology/biology and the other from medicine.

Our first case concerns the discipline of evolutionary psychology, which tries to understand the psychological make-up of humans, and their resulting behaviour, by applying Darwinian principles. At first blush this project sounds perfectly reasonable. For humans are just another species of animal, and biologists agree that Darwinian theory can explain a lot about animal behaviour and its psychological underpinnings. For example, there is an obvious Darwinian explanation for why mice have an instinctive fear of cats. In the past, mice with this instinctive fear tended to leave more offspring than ones without, as the latter got eaten; assuming that the instinct was genetically based, and thus transmitted from parents to offspring, over many generations it would have spread through the population. Evolutionary psychologists believe that many aspects of human psychology can be given a Darwinian explanation of this sort.

To illustrate, consider human mating preferences. There is evidence that males and females systematically differ in the attributes they seek in their mating partners. (The strength of this evidence is a matter of debate.) A large cross-cultural survey by David Buss found that males on average preferred their female marriage partner to be younger than them, and to be of an age that coincides closely with peak female fertility (about 24 years). By contrast, females preferred to marry men who were older than them. Moreover, physical attractiveness mattered more to males, whereas

earning potential mattered more to females. Buss and other evolutionary psychologists argue that these preferences have a Darwinian explanation. From an evolutionary viewpoint, the best strategy for a male is to find a female mate with high reproductive potential, as this maximizes the number of offspring he can have with her. Females should prefer to find a high-status male, who controls resources and is able to provide for the offspring. (This difference in optimal mating strategy stems from the fact that females have a limited supply of eggs, while males have effectively unlimited sperm, so offspring care matters more for females.) Therefore, it is argued, the mating preferences of modern humans can be explained by Darwinian natural selection.

Though the idea that humans' psychological traits have evolved by natural selection is plausible, evolutionary psychology is a controversial field, and its practitioners have been accused of ideological bias. The controversy dates back to the 'sociobiology wars' of the 1970s and 1980s. Human sociobiology was a precursor discipline of evolutionary psychology, and shared with it a commitment to seeking Darwinian explanations of human behaviour. A series of acrimonious exchanges took place between E. O. Wilson, whose 1975 book *Sociobiology* founded the field, and his Harvard colleagues Richard Lewontin and Stephen Jay Gould. The dispute arose from Wilson's claim that many human social behaviours, including aggression, rape, and xenophobia, had a genetic basis, and were adaptations favoured by natural selection because they enhanced the reproductive success of our ancestors.

Sociobiology attracted a variety of criticisms, some of which were strictly scientific. Critics pointed out that sociobiological hypotheses were hard to test so should be regarded as conjectures not established truths, and that cultural influences on human behaviour should not be downplayed. But others objected more fundamentally, claiming that the whole sociobiological enterprise was ideologically suspect. They saw it as an attempt to excuse anti-social behaviour, usually by men, or to argue for the inevitability

of certain social arrangements. By arguing that rape, for example, has a genetic component and has arisen by Darwinian selection, sociobiologists seemed to be implying that it was 'natural' and thus that rapists were not responsible for their actions—they were obeying their genetic impulses. In short, critics charged that sociobiology was a value-laden science, and the values it was laden with were very dubious.

In many ways, modern evolutionary psychology represents an improvement over the sociobiology of the 1970s and 1980s. The best work in evolutionary psychology has a strong empirical basis and meets the strictest scientific standards. The naive genetic determinism of the early sociobiologists has given way to a more nuanced picture in which cultural factors, as well as genes, are acknowledged to affect behaviour, and in which cross-cultural diversity is not ignored. However evolutionary psychology continues to attract critics, in part because it shares with its predecessor an emphasis on the 'darker' side of human nature, a focus on matters to do with sex, mating, and marriage, and on the supposed innate psychological differences between men and women. These foci are somewhat surprising, given that human psychology encompasses much more than this. Thus the charge that evolutionary psychology is serving to reinforce existing stereotypes, if only inadvertently, is hard to completely avoid.

One possible response to this charge is to insist on the distinction between facts and values. Consider the suggestion made by some evolutionary psychologists that marital infidelity, or 'extra-pair copulation', is an evolved strategy that human females use to obtain genetic benefits for their offspring when their long-term mate is of low genetic quality. Whether this is true is presumably a question of scientific fact, though not an easy one to answer. But facts are one thing, values another. Even if extra-pair copulation is an evolutionary adaptation, that does not make it morally right. So there is nothing ideologically suspect about evolutionary psychology, despite its rather selective research foci.

Like all sciences, it is simply trying to tell us the facts about the world. Sometimes the facts are disturbing, but we must learn to live with them.

Our second example of possible value-ladenness comes from psychiatry, the branch of medicine that treats mental disorders such as depression, schizophrenia, and anorexia. There is an ongoing debate among psychiatrists and philosophers over how the concept of mental disorder (or mental illness) should be understood. One camp embraces the 'medical model', which says that it is a fully objective matter whether something is a mental disorder or not; no value judgements are involved. Mental and physical disorders are alike in this respect, it is argued. If you suffer from diabetes or emphysema, for example, then your physical body is not working properly; similarly, if you suffer from depression or schizophrenia, then your mind is not working properly. So the boundary between mental health and illness is just as objective as the boundary between physical health and illness, on the medical model.

An alternative view regards mental disorder as an inherently normative category, involving implicit or explicit value judgements. Something gets labelled a mental disorder, on this view, if it involves behaviour patterns that deviate from society's expectations, or that others regard as 'deviant'. For example, homosexuality was regarded as a mental disorder in Western countries until quite recently; it was only in 1973 that the American Psychiatric Association removed homosexuality from the DSM (*Diagnostic and Statistical Manual of Mental Disorders*), and not all of its members agreed. Moreover, medical anthropologists have documented considerable cross-cultural variation in the mental disorders that a society recognizes, something that the DSM has long struggled to handle. So the view that mental disorder is a value-laden or normative concept is certainly plausible. Proponents of this view typically argue that mental disorder is not a genuine medical category at all, but

rather an instrument of social control. A radical version of this argument was made by the American psychiatrist Thomas Szasz in a famous 1961 book entitled *The Myth of Mental Illness*.

The debate between the 'medical model' and the view of mental disorder as inherently value-laden is complex. One issue concerns the relation between mind and brain. A point in favour of the medical model is that at least some mental disorders are known to have a neural or neurochemical basis, i.e. they are brain disorders, often arising from faulty brain circuitry. This is increasingly the view of mainstream psychiatry. Since the brain is part of the physical body, this suggests that there is no sharp dichotomy between mental and physical disorders. So if the category of physical disorder is agreed to be objective rather than value-laden, surely the same must be true of mental disorder?

Though powerful, this argument is not conclusive for two reasons. First, for some mental disorders, such as the childhood illnesses autism and ADHD, there are ongoing disagreements over whether they are single, unified disorders at all. These disorders are characterized by clusters of symptoms which often but not always co-occur, with substantial variation from child to child. (This is why autism is called a 'spectrum disorder'.) Moreover, many of these symptoms are found to some degree or other in 'normal' children, who do not meet the diagnostic threshold. This suggests that there is an element of conventionality or arbitrariness in what gets counted as a mental disorder; so even allowing that mental functioning depends on brain wiring and brain chemistry, it does not follow that mental disorder is necessarily as objective a category as that of physical disorder.

Secondly, not all parties agree that physical disorder *is* an objective category. Some philosophers argue that any talk of disorder or illness, whether physical or mental, is inherently normative and value-laden. If someone suffers from a physical disorder this means that their body, or part of it, is malfunctioning—it is not working

as it should. But this 'should' indicates a normative dimension, it is argued. Who decides how the physical body 'should' be working? After all human physiology exhibits considerable variation. Some people have 20/20 vision, others slightly less, and others substantially less. Surely any attempt to draw a line and say that this is how human eyes 'should' work involves value judgements? In a society where visual acuity mattered less, for example, the line would probably be drawn somewhere else. So on this view, mental and physical disorder are both value-laden categories.

Against this, other philosophers have tried to bolster the medical model by suggesting that the normativity here is only apparent. Talk of how the body, or the mind, 'should' work can be grounded in a fully objective way, via the concept of biological function, they argue. To understand this suggestion, consider the human heart. The heart pumps blood around the body, and it also makes a regular thumping sound; however only the former is the heart's function—the thumping sound is just a side effect. According to a widely held view, this distinction between function and side effect has an objective basis in facts about evolutionary history. It is because they pump blood, not because they make a thumping sound, that hearts were favoured by natural selection, so exist today. Therefore if a person's heart does not pump blood, then in a fully objective sense it is malfunctioning. When doctors talk about 'heart disease', they are not making any value judgements but simply appealing to what the heart is meant to do, in the sense of its evolved biological function.

A similar story can be told about mental disorders, it is argued. The brain and its sub-components have biological functions; when a person's brain does not perform its function properly, this leads to mental disorder. So in classifying conditions such as schizophrenia and depression as mental disorders, we are not making value judgements but simply appealing to the fact that in patients with these conditions, some part of their brain is not

performing its evolved function properly. So the boundary between mental disorder and mental health can in principle be drawn in a fully objective way, via the notion of biological function. In this way proponents of the medical model hope to show that what counts as a mental disorder is not a reflection of prevailing social norms, but rather has an objective biological basis. However this line of argument is controversial, as it rests on assumptions about our evolutionary history that may not be true. For this and other reasons, not all psychiatrists and philosophers accept it.

Finally, note that our two examples of (alleged) value-ladenness in science are of different sorts. In the evolutionary psychology case, the suggestion was that the particular hypotheses researchers choose to investigate, and the answers to them that they propose, serve to reinforce existing stereotypes. If this is true, then in principle it could be remedied by suitably modifying the content of the science, taking care to exclude any possible biases, and applying stricter scientific standards. In the psychiatry case, the suggestion was that the category of mental disorder itself is value-laden, involving implicit value judgements. If this is true, then it is less clear how it could be remedied, if at all, for mental disorder is a fundamental notion in psychiatry. So the value-ladenness in this case is potentially more deep-seated.

To conclude, it is inevitable that the scientific enterprise should find itself subject to criticism from a variety of sources, despite the clear benefits it has brought to humanity. It is also a good thing, for uncritical acceptance of everything that scientists say and do would be unhealthy and dogmatic. Philosophical reflection on the criticisms levelled against science may not produce any final answers, but it can help to isolate the key issues and encourage a rational, balanced discussion of them.