exists of why we cannot develop a satisfactory understanding of ourselves through selfish gene theory alone. We are far too complex to be comprehended through a reductive dissection of our parts.

We have a tendency to use ideas such as selfish gene theory to justify our own selfish and socially destructive practices. It's significant, I think, that Dawkins' book received wide acclaim on the eve of the 1980s—the era when greed was seen as good, and when the free market was worshipped. As our experience with social Darwinism illustrates, we need to be eternally on guard against the siren song of self-interest if we wish to live in a fair and equitable society.

Genes and ideas share at least one similarity: both reproduce, and the occasional error in reproduction provides variation. Thus, both are potentially subject to evolution by natural selection. Recognition that genes (or at least the physically inherited traits they give rise to) and ideas are similar is at least a century old. The German biologist Richard Semon wrote two books on the subject: *Die Mneme* (1904, published in English as *The Mneme* in 1921) and *Die Mnemischen Empfindungen* (1909, published in English as *Mnemic Psychology* in 1923).[17] He coined the word mneme (pronounced 'mnee-m', and which is derived from the Greek word for memory) to denote a grand unifying theory of reproduction—both physical and mental. He believed that memory had a physical reality, that it must leave an impression upon the brain. In describing his theory Semon wrote that:

> Instead of speaking of a factor of *memory*, a factor of *habit*, or a factor of *heredity*...I have preferred to consider these as manifestations of a common principle, which I shall call the *mnemic principle*.[18]

Semon's work catalogues a fascinating if all but forgotten episode in twentieth-century biology which sought to prove that experience

could be inherited. He drew heavily on the work of Paul Kammerer, a brilliant young Viennese biologist whose experiments with what he called the fire-newt (*Salamandra maculosa*) were considered sensational at the time. Pregnant females were kept from water, thereby inducing them to give birth to fewer, more advanced young. This characteristic, it was claimed, was passed on to the next generation, despite their having free access to water. Other experiments, conducted by Marie von Chauvin on axolotls, resulted in the creatures developing lungs. Their offspring, she observed, frequently surfaced to gulp air, something normal axolotls will do 'only at an advanced age and in water deficient in air'.[19] But there was always the possibility that genetics, rather than Semon's 'mnemic principle', influenced the result.

Irrefutable proof, Semon felt, was at last obtained by the indefatigable Herr Kammerer. His triumph with the 'obstetric toad' (*Alytes obstetricans*) consisted of persuading the warty creatures to forgo having sex on land by keeping them 'in a room at high temperature...until they were induced...to cool themselves in the water-trough...Here the male and female found each other'. Forced to mate in water rather than on land, the toads coupled in a manner not usually favoured by the species.[20] This Semon interpreted as the creatures 'remembering' the ancestral method of copulation, which, it was claimed, persisted in subsequent generations.

Some of the experiments supposedly demonstrating the mnemic principle were truly bizarre. Dr Walter Finkler devoted himself to transplanting the heads of male insects onto females. The victims showed signs of life for several days but, perhaps unsurprisingly, exhibited disturbed sexual behaviour. Dr Hans Spemann made the 'Bombinator' frog grow eye lenses on the back of its head—a feat surpassed by Dr Gunnar Ekman, who induced green tree frogs (*Hyla arborea*) to grow eye lenses anywhere 'with the possible

exception of the ear and nose primordia'.[21] This, Semon was convinced, demonstrated that frog skin 'remembered' how to grow eyes if appropriately stimulated.

By the 1920s the body of work Semon drew upon was under assault. The geneticists, championed by William Bateson (the originator of the term genetics itself), launched attacks that seem to have been vitriolic and obsessive. It has been suggested that Bateson had personal reasons for wishing to see Kammerer's work discredited, and when, in 1926, it was discovered that one of Kammerer's toads had been tampered with, this was held up as evidence that his entire body of work was suspect. With his reputation in tatters, Kammerer shot himself.[22]

Semon's all-encompassing theory did indeed have a fatal flaw: it necessitated a Lamarckian element in physical evolution. One of the iron-clad rules of physical evolution is that individuals cannot pass on to their offspring any favourable traits acquired during their lifetimes. Lamarck believed that giraffes could stretch their necks by continually reaching up for leaves, and that such stretched necks could be passed on to their offspring. Today we know that neck length among giraffes is coded in their genes, and that, with some rare exceptions (such as lengths of DNA inserted into genomes by viruses), physical traits acquired during an individual's lifetime cannot be passed on. Cultural evolution, in contrast, is purely Lamarckian. It is fuelled by the spread of ideas, and technologies that flow from such ideas, and those acquired by one generation are passed on to the next. Cultural evolution is far faster than physical evolution: it took the sabre-toothed cats millions of years to evolve their great stabbing canines, but it took humans only a few thousand years to develop metal daggers that are far more potent weapons.

For all its flaws, Semon's pioneering work held a seed of genius

that is built upon in Richard Dawkins' book *The Selfish Gene*. Dawkins proposes the term 'meme' for transmitted ideas or beliefs. He says of them that, 'if memes in brains are analogous to genes they must be self-replicating brain structures, actual patterns of neuronal wiring-up that reconstitute themselves in one brain after another', adding that 'memes should be regarded as living structures, not just metaphorically but technically'.

In summary, Dawkins' memes are ideas that have a physical reality in our brains. They are transferrable just as genes are, and he suggests that they may be similarly selfish. Just how closely analogous mnemes (I prefer Semon's spelling) and genes are is an open question, but I do not believe that mnemes are necessarily selfish in the way that genes are. Some mnemes, for example, can see individuals act against their strict self-interest. Philanthropists often donate their wealth to causes that benefit humanity or the environment, and sometimes they do so anonymously, thereby ensuring that they accrue no social benefit. Perhaps they give to such causes simply because they believe it's the right thing to do. Whatever the case, such philanthropy is not in the interest of their selfish genes, which would benefit maximally if all was given to their children or near relatives.

Some mnemes, however, do prompt people to act selfishly, but such mnemes are decried in all societies. Indeed our strongest moral and religious precepts are aimed squarely at destroying them. As we've seen, such mnemes thrive at times, not least when given credibility by social Darwinism or Neo-Darwinian theory. Viewed in this light, the conflict between religion and evolutionary theory looks somewhat different. The challenge to religious belief that Darwinism presented in Victorian Britain acted as a kind of 'secret weapon' for the cause of selfish mnemes. By eroding religious authority it diminished, for some at least, a belief in the need for