Ray Lankester was Jodrell Professor of Zoology at UCL from 1874 to 1890 while he also lectured at the associated teaching hospital across Gower Street, University College Hospital. He must have wondered whether, if Darwin were to have a clear successor, this was where he was going to be found. And, if anyone of his own generation were to deserve a funeral like Darwin’s, would it be Galton or Stephen, or even Strachey? Would he and his friends be gathering to hear eulogies about one of these men in thirty years’ time? And what about himself? How many people would be at his funeral? What had he achieved so far? What had he discovered? And had he changed hearts and minds of the public and the scientific community in the way Darwin had?

Lankester had been born into a different kind of family to those of the gentlemen who had attended Darwin’s funeral. His father, Edwin Lankester, was a self-made man who had been a doctor with an interest in microscopy and biology. He was an intellectual who had been one of the first professional medical-scientists. He had worked as both a general practitioner and an amateur zoologist, had led the biology section of the British Association for the Advancement of Science for many years and had edited the *Quarterly Journal of Microscopical Science*. The Lankesters’ home in Savile Row was not far from the rooms of many of science’s learned societies, and Ray often used to call in to the Linnean Society on his way home from school. His parents had named all three boys after famous English biologists – John Ray, Sir Richard Owen and Edward Forbes – and they encouraged their sons to pursue the same interests as their namesakes. Edwin was well known for his campaigns to improve public health in big cities, but, in the 1860s, he got into debt and
faced public humiliation, an unfortunate legacy for his three ambitious and clever sons.

Ray showed considerable academic promise and was closely overseen by his enthusiastic father. All the same, the young man’s first two years studying science at Cambridge were not happy. His parents thought it was because he was not challenged enough, so they moved him to Oxford. There, he was offered a wider range of subjects and a chance to stay on to specialise in marine biology, but he began to feel the same disappointment as he did in Cambridge. Ray had learnt to dislike the elitism of both Cambridge and Oxford. He was shocked by the lack of interest in science shown by most staff and students, and he became more depressed at Oxford, contrasting it to the challenges he had grown used to at home in London. He was contemptuous of those he called the ‘flunkeys, snobs, spendthrifts and social bullies’, the students who wanted only to have a good time in their three years there.¹

However, there was another side to Ray, one that drove him to take advantage of this comparison between Oxford and London and to promote his own beliefs wherever he was. Two good chances, unrelated to his time at Oxford, came his way when he returned home to London. One was from his role model, T. H. Huxley, who taught at the Normal School of Science in Prince Consort Road. In 1870, Lankester was asked to help with the teaching in the new laboratories there. He did this very well and gained high praise from his colleagues and the students. The relationship between Lankester and Huxley flourished. Ray could see something of his own father in Huxley. Both were self-made men who had lived through hard times as well as good ones. It meant they understood one another and shared views about religion, politics and the importance of educational opportunities. Most of all, they had the same confidence in how science was improving the living standards of ordinary people and reducing a lot of the poverty.

Then came the second chance. Anton Dohrn, a wealthy sugar importer interested in promoting Darwin’s ideas, was so impressed by the work Lankester and Huxley were doing that he asked them to help set up the world’s first real marine biology station in Naples. Nowadays, aspiring scientists register as Ph.D. students, and in Lankester’s time they also tended to devote several years to a single major project. The aim of such an experience was to build knowledge and confidence and to demonstrate to the scientific community what the individual was capable of achieving. Often it also led to the publication of papers or a book, and thereby the making of a scientific reputation. As Darwin had worked on barnacles for four years, Lankester chose marine invertebrates and,
in particular, the molluscs that grew profusely off the coast of Naples. He worked at Dohrn’s laboratory in Naples and became an expert on *Amphioxus*, cuttlefish and several exotic worms. He was also fascinated by the physiology of the electric eel.

While he was writing up this work, Lankester won a resident fellowship back at Oxford. He took a cynical view of the role: ‘Expenses much greater than anywhere else, society stale, old broken-down, one-sided pedagogues or pedants, dwelling rooms wretched, stuffy, sickening. No liberty of action, a tyrannical majority which shows its opinion of you, even if you stay away from church.’ With such strong views, it is unsurprising that university reform became an important cause for Lankester.

As well as wanting to do away with the stuffy Victorian traditions that many people at the university expected, such as ignoring science and science students, Lankester also had a positive agenda. He wanted to create more opportunities for working men and women to get into university, to develop more practical and open ways of teaching and to apply the study of biology to real social problems. In addition, he wanted universities to be independent of the church and the state and for the colleges to have their own government. This reforming zeal made him unpopular in some parts of the establishment, especially at Oxford, where there were still many conservative, inward-looking clerics. Lankester wanted to replace these clerics with external appointees. He also wanted to have open entrance exams for student places, to establish a student budget for travel and research, to relax the rules of residence in colleges, to prohibit donations of university money to religious institutions and to abolish religious tests. He argued in particular against five of the things the clerics taught the students:

1. The dread of the Unseen God, who will punish us, if not now, then after death.
2. The idea that all physical enjoyment is degrading and will bring out vengeance from the Creator.
3. The judgement that copulation is wrong.
4. The opinion of women as inferior creatures, used by the Devil to bring men to misery.
5. The view that there is a God who can be ‘got round’.

Despite being open about their beliefs, Stephen, Huxley, Strachey and Lankester retained their own peculiar brand of dogmatism throughout their lives. It was a dogmatism that was deeply ingrained within
contemporary Victorian culture; it was what remained once the Holy Spirit had evaporated.

For some years Lankester had looked for patterns in animal morphology that might show how species were related. Darwin had written to encourage him: ‘What ground work you did at Naples! I can clearly see that you will some day become our first star in Natural History.’ Huxley added his approval, and, when Robert Grant (the first Lamarckian professor of zoology at UCL and early mentor of Darwin) died in August 1874, Huxley strongly supported Lankester’s application to the professorship, though there was no doubt by then that he would get the job.

UCL was just the right place for Ray Lankester’s style, his charismatic teaching, his free thinking and his faith in science and a new style of living. The Godless Institution of Gower Street had become well known for attracting liberals rebelling at the social deprivation in the urban slums. They wanted to extend education and culture to the general public. Ever critical of what he had experienced at Oxford, Bloomsbury was the ideal place from which to mount his campaign to propagate and develop Darwin’s new model for biology and the ascent of humanity. Not only did that model need more evidence to gain universal acceptance by the scientific community but it also needed responsible representation in the many religious and social organisations that were influenced by its message. Lankester was an obvious spokesperson to take up these challenges. Above all, it was scientific knowledge and method that guided Lankester’s professional thinking, and it influenced his management style. The other pleasures of life came second, and he suffered for that, as a lonely bachelor.

Throughout the last decades of the nineteenth century, Bloomsbury was a dirty place, and not many middle-class people wanted to live or work there. The smoke from the new railway stations along Euston Road spread dirt and smells, and unsavoury travellers from the north filled the surrounding hotels. Although there were at least a dozen leafy squares and many streets of grand houses, the Bedford Estate also had a large stock of smaller properties that were leased as flats or boarding houses. There was a workhouse at Mount Pleasant and several slums scattered among the beautiful Georgian architecture. Bloomsbury was known not as a residential area but for its hospitals, the British Museum, a few shops and offices and UCL.

Lankester continued to hold up the traditions of descriptive biology and gave special attention to using well-labelled careful drawings of the specimens. For that substantial record, and for his innovations in marine biology, in 1874, just before his appointment to the chair at UCL, he
was elected to the Royal Society. With these early successes, Lankester’s destiny was clear. The 27-year-old did not hesitate to promote science as the new requisite for modern society. He had proved to himself and others that he was credible, and he soon became one of the most popular speakers in London. He was attractive to his students and the general public because he was not the member of an elite but one of the growing number of middle-class men who were succeeding on account of their talent and drive rather than their status and connections. They admired his honesty and his refusal to exploit his Oxford connections.

Over the next few years, he built the department in Bloomsbury into what was said by his university to be by far the most active school of zoology in Britain, Cambridge being the only possible competitor. Lankester trained a great series of zoologists who filled very many of the chairs in that subject both at home and in the dominions, and he thus influenced the whole course of zoology in the British Empire. Innovations included starting a museum, organising practical classes with microscope work and dissections, making drawings on large canvasses and even using coloured chalks for blackboard diagrams.

Lankester was one of the best descriptive biologists of his generation. His critical temperament forced him to observe closely and thoughtfully, and he took trouble to see the same feature from as many perspectives as possible. He was also a fastidious man and enjoyed public arguments about science, the nature of truth and the rights of man. Befriending characters as different as Marx and Darwin was very much his style, and he enjoyed playing the social rogue. He went much further than most other biologists in promoting and extending Darwin’s scientific and social legacy. Inevitably, this meant that some people were going to disagree with him, and he faced up to this with dignity and humour. However, he did not make the kind of discoveries or other achievements that would be remembered by future generations. Some of his friends, rather than scientists, thought that this was because he was living between two major periods of thought in biology and didn’t fit easily into either. The African novelist and political activist, Olive Schreiner, said he was ‘the most powerful human being I ever came into contact with; he is like those winged beasts from Nineveh at the British Museum. What you feel is just immense force.’ She admired him for challenging many of the doctrines that their own mentors accepted without question, such as traditional gender roles and the growing divide between the rich and the poor.

Ray Lankester may have been a colourful individualist, but he was also an autocratic Victorian professor who was revered and respected by
the numerous colleagues and assistants who surrounded him. That kind of relationship set the tone for the many Bloomsbury scientists who had been students of other UCL professors. At the time of Ray Lankester, these included the botanist Daniel Oliver, the physiologist Sir John Sanderson, the chemist Sir William Ramsay and the statistician Karl Pearson.

These men were among the first professional scientists and were authoritarian leaders in their disciplines, selected for that talent, and for their fitting background. Inevitably they were strong personalities though they did have a variety of political and religious affiliations. They were determined to cling to power and expected loyalty from their subordinates. In return, the professors were expected to teach and to ‘make new knowledge’ in their field, and many of them became strong academic leaders. They were assisted in the teaching by teams of demonstrators, new graduates who helped with the practical classes and gave tutorials. There were also attendants in ginger-coloured coats who displayed apparatus, specimens and blackboard drawings in the lecture theatres. These assistants echoed the professors’ interpretations of the subject matter and pressed each student with explanations and details. From them all, rigour and hard work were expected to lead the students in critical and original thinking so that they could understand and make new discoveries by the end of the course. This same approach was as relevant in the arts as it was in science. Very similar procedures were followed in the Slade School of Art, in the medical faculty and in the science faculty. Most of the students were just as original and holistic as one another, and the similarities were to continue for another generation. Indeed, for many of the scientists, writers and artists of Bloomsbury, there was little methodological difference and their similar way of thinking gave them a special unity.

Lankester’s strength of personality and broad interests enabled him to be accepted as a scientist just before mainstream academia had acknowledged the existence of biology as a distinct discipline. By 1882 he had achieved much to ensure that his holistic approach was recognised. In Germany he was well known as an English thinker: a leading marine biologist, a firm supporter of Darwin’s theories and a talented observer of the structures and lifestyles of invertebrates. He had published a great deal about these species, had offered new explanations of what we now call parallel evolution and had developed new methods for examination by the microscope, enabling observations that were sharp and critical. No wonder he had been admired by none other than Darwin himself.

There were not many professional biologists of Lankester’s generation, and most had been nurtured, like him, by the encouragement of
their enthusiastic parents. There were also not that many young people who wanted to become biologists because most had been brought up to believe in the literal truth of Genesis and moved well outside Darwin’s small circle. Biology had not long been established as a university or school subject, even in those institutions where the physical sciences were on the syllabus. The small number of schools and colleges that did teach biology did it to train doctors in anatomy and how to observe, but things were about to change.

In 1881, Lankester arranged for two new graduate students, Raphael Weldon, a Cambridge zoologist, and Karl Pearson, a mathematician, to go to the Marine Biology Station in Naples to begin a collaborative project. In addition to the usual observations and descriptions, they began to use measurements to distinguish species. One of their projects was to compare the size of eleven different organs from hundreds of specimens of shore crabs. The variations within these measurements gave a normal bell-curve variation, except for those from one feature: the frontal breadth of the carapaces. They used this unusual variation to distinguishing between races of a single species, *Carcinus moenas*. Weldon ended their joint article, ‘It cannot be too strongly urged that the problem of animal evolution is essentially a statistical one.’ Lankester was furious to hear such a one-sided and opposing view of his own strong beliefs that biology should be seen from as many perspectives as possible. Accurate observations and interpretations of anatomy and life history were the established methods of zoology. Here were two young upstarts giving all their trust in the completely different discipline of mathematics to solve the familiar problems of evolutionary biology. It was an early sign that a split was occurring in how to understand evolution, a split between progressive scientists and those reluctant or too frightened to change.

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These young scientists, Weldon and Pearson, had fought their way through home, school and college to become professional biologists. Quantification was the new currency, examinations were the new tool in education, and the many big unanswered questions in biology gave plenty of opportunity for prizes. Due to the continuing lack of any new evidence to prove Darwin’s theory beyond doubt, enthusiasm for his ideas was declining in popularity through the two decades after his death. That meant many scientists looked around for some breakthrough in the many alternative explanations of life. And, try as he did to make breakthroughts of his own, Lankester became frustrated with his failure to find useful evidence from his classical observations of new species. He
often lost his temper with others who were equally unsuccessful in their own work in other spheres. Still, he was determined to find the elusive agents of heredity, which would uphold the theories advanced by Charles Darwin and Alfred Wallace, and there were still plenty of places to seek them out. Lankester was attracting a lot of attention with his studies in embryology, and there were many other biologists investigating new aspects of biology. Consequently, he remained optimistic that clues for the agents of heredity would be found soon.

One reason for this optimism was the sudden birth of many new disciplines of closely related knowledge. At UCL these were greeted with the appointment of budding specialists in the new fields. There was psychology, statistics, biochemistry and physiology, and most of these merged into the programmes of research and teaching that already existed. Lankester excelled in spotting bright young students who were interested in these new subjects, and he encouraged them in the hope of unlocking new clues about the mechanisms of evolution. This was Lankester’s expectation in appointing his two Naples students, Karl Pearson and Raphael Weldon, to jobs at UCL, in 1883 and 1889 respectively, and both pioneered statistical methods to analyse the data that Lankester had accumulated. However, there were others who feared the impact of these numerical trends, not knowing where science was taking their ethical values and beliefs.

Some of these cautious observers, such as a young journalist from Ireland called George Bernard Shaw, even shifted their interest back to Lamarck’s earlier theory that adaptation to new environments was fixed rather than competitive. One of the biggest embarrassments that continued to haunt scientists was that they could not say whether inheritance was a result of biology or learning. The knowledge vacuum encouraged alternative ways of understanding biological complexity, but Lankester and many others were frustrated. More of the people who had initially hoped that On the Origin of Species might at last shift rigid social conventions were becoming frustrated by the lack of direct evidence for the cause of inheritance and found it difficult to continue their support for Darwin. Instead, for them, the work that Lamarck had published back in 1809 gave an adequate solution. His explanation of evolution also allowed them to keep their faith in God, but religious attitudes to science were changing, and there was no going back to the explanations of life that were popular at the beginning of the nineteenth century.

One of the strongest spokespersons for this progress in thinking about evolution had been Lankester’s first boss at the Normal School of Science, Thomas Huxley. Huxley’s own father had taught mathematics
at Ealing School. In 1835, the school was forced to close, and in the absence of an affordable alternative he began to educate his children at home. Among the works that he set the ten-year-old Thomas to read were Thomas Carlyle’s defence of slavery, James Hutton’s work on geology and even the original Aristotle. When Thomas was just sixteen years old he moved to Bloomsbury and attended Sydenham College of Anatomy in Sussex Street, just behind University College London Hospital. It was very unusual for an unqualified boy to be admitted to such a college to study, but at that time Sydenham College was opening up to new ideas from Jeremy Bentham and the open-minded Scottish poet Thomas Campbell. Huxley did well and was sent to attend advanced courses at Charing Cross Hospital. Through these years his lowly social status meant he had a difficult time as a student, having to fight harder than all the young gentlemen from Oxbridge to secure a place in the London hierarchy of scientists. Perhaps because of this, he was not content to follow the normal medical career pathway. Instead of opting for more expensive training, he applied to the Royal Navy to become a surgeon’s mate. In 1846, he was posted to HMS Rattlesnake for its exploration of Australasia. Just ten years later he had made the big leap to become professor of natural history at the Normal School of Science, in South Kensington.

Figure 2.1  Thomas Henry Huxley
With such a background, Huxley was all too aware of the traditions that English society required in order to be accepted as a ‘gentleman’, such as ownership of land or industry, or an Oxbridge education. Many such privileged young men went to work for the civil service or the church. Business was becoming acceptable if it was in the family. Banking or the Stock Exchange would do if you had money. Science did not fit into the picture. For this reason, Huxley found himself on the edge of respectability, a position that made his relationships with an investor such as Charles Darwin and a landed gentleman like Charles Lyell important. Huxley’s leadership role at the Royal School of Mines was important to Darwin and Lyell because it meant their work was being taught to future generations. In 1870, one of Huxley’s teaching assistants there was Ray Lankester.

In 1882, a few months after Darwin’s funeral, the professor of poetry at Cambridge, Matthew Arnold, was invited to give the annual Rede Lecture at the Senate House of Cambridge University. ‘Literature and Science’ was the name Arnold gave to his talk. Aware of the schism that Huxley and Lankester were trying to bridge, Arnold presented a strategy for healing. He did this simply by changing a few definitions. He proposed that ‘literature’ should include work by scientists. He argued that Darwin’s *On the Origin of Species* and Newton’s *The Principia* were just as valuable as literary works as the novels by Eliot or Dickens, while ‘science’ was just as much a part of systematic knowledge, or *Wissenschaft*, as the study of history or languages.

But Weldon and Pearson’s attempt to use measurements to help study evolution continued to be seen as a split from Lankester’s structural approach and also opposed Arnold’s observation that literature and science worked together. Already the row between Lankester’s value on subjective observation, and Galton’s attention to objectivity and measurement, was encouraging other divisions to show up. The split that worried the three professors, Arnold, Huxley and Lankester, had hardly appeared in the early 1880s, but it was one that was going to separate western culture later in the next century. Science was becoming associated with the new lower middle class while literature largely remained as the preserve of the Oxbridge-educated elite.

During these years there were many changes across the whole of English society, and no one could say they were not just a little afraid of letting go of the reliable old props in their lives. In such times of stress, many animal populations come together as shoals or herds, better to protect one another and to warn off the enemy. In 1890s England, with its extreme social diversity, many like-minded people also came together in groups.
There were the gentry, the social reformers, and there was this new unit of scientists and artists around UCL, gently influencing one another. They would argue internally but support one another when threatened from outside, and they would be defensive against the unknown. Through the new technology, and their plans to explore beyond boundaries, they were working out the meaning of this outlook on the world.

In England such theories had to face up to a social hierarchy and an associated snobbery, and it showed up in the attitudes of the players on this Bloomsbury stage. The insiders were the Kensington families with allegiance to Oxbridge and who were appointed by patrony. They were about to be challenged by enthusiastic young professional outsiders, men and women who were selected competitively on their own merit. The new theatre was in Bloomsbury, and the director was Ray Lankester.

However, there was to be more to these differences than gentle or even serious rivalry between the gentry and the ordinary people. It was the gentry who were being threatened. So, also, were most of the public, who were threatened and confused by the scientifically inspired changes to their way of life. It was appropriate that biological theory was to offer a way through the idea of planning human populations, using the new knowledge from biology to control human breeding at sustainable levels. Arnold had made his objection to the class system very plain in his lecture. So had Huxley in a speech two years earlier. At the opening of Mason College in Birmingham in 1880, he had stressed the importance of science education for commerce and manufacturing, and argued that physics and chemistry were ‘handicrafts’ to be learnt by people from all social classes. Significantly, hardly any science was taught then at Oxford or Cambridge, and only a small amount of history and classics at Mason College.

Lankester was one of the few people in a position to understand the relationship between science, population growth and the kind of education available. In 1890, most people could only see the tip of this complex iceberg: the content and extent of science education, how it related to knowledge about religion, wealth, health and sexuality. If humans really were able to control the breeding within their populations, how would they control their attitude to race and mental health? Performances of this production, the use of biological knowledge to control the breeding of different kinds of humans, were only just beginning.

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A couple of years before Huxley’s visit to Birmingham, another very different, but equally disturbing, disagreement took place between Lankester and another group: people who called into question the
impact of science on the meaning of life. The group had rooms in Bloomsbury at 8 Upper Bedford Place where they practised spirit-writing on a slate at a guinea a séance. The group’s leader was an American called Henry Slade, and Lankester’s public argument with the group was to make him famous.

It began with a remarkable address given to the British Association in 1876 and ‘sponsored’ by Alfred Wallace who, seventeen years earlier, had proposed evolution by natural selection at the same time as Darwin. Now, in front of an audience of leading biologists, Wallace spoke in support of spiritualism as a scientifically valid process. That evening, Lankester wrote a letter to The Times complaining that the lecture had brought the association and science into disrepute.

There was much that angered Lankester about spiritualism, a pursuit that became popular in Britain and North America during the 1870s and 1880s, one of the many reactions to Darwin’s challenges about the origin of life. The idea of contacting the dead and communicating with them presented scientists with an interesting challenge. In their sessions, transparent observation was forbidden and so tests with technology were not to be taken seriously. However, it was a serious activity for millions of people, who sat at cloth-covered tables, in heavily curtained drawing rooms and listened to every sound in the room with suspicion and hope. Lankester set out to falsify any hypotheses that such occasions presented.

The dispute between Lankester and the spiritualists gained much media attention and culminated in Lankester prosecuting one of Wallace’s spiritualist friends for fraud. The hearing at Bow Street Magistrate’s Court lasted several weeks and attracted huge public interest. Wallace spoke in the defendant’s favour, as did the writer Arthur Conan Doyle. The prosecutors called on a professional illusionist to show how the trick could have been performed. Wallace’s friend Henry Slade was found guilty under the Vagrancy Act. After an appeal, he was let off on a technicality but had already gone back to the United States. The affair made séances less fashionable, while Lankester became the most famous professor in the country. It did not do Alfred Wallace any good at all.

Wallace spoke at his best to defend his beliefs directly to Lankester. In the process, he quoted Lankester’s own friend Ernst Haeckel: ‘In the long run, the man with the most perfect understanding, not the man with the best revolver, would triumph. He would bequeath to his offspring the properties of brain that had promoted his victory.’ This argument seemed more acceptable to observers like Lankester than the more exotic argument about spirits, and he satisfied himself with the knowledge that
the human mind was just as capable of evolving as any other part of our bodies.

Despite such attempts to reconcile their differences, Wallace was unable to regain any scientific respect from these particular biologists. They were unconcerned that he was not a gentleman, or that he had written about natural selection independently of Darwin the gentleman. Rather, it was because at the British Association meeting he had tried to test the untestable in the name of science. Wallace’s new critics thought it was blasphemy for such an eminent biologist to give serious attention to the spiritualist cause at a scientific forum. It was an admission of doubt about explaining life’s meaning.

By the 1890s, Lankester had developed a focused view about science and, for some, he typified the popular image of a Victorian Englishman who liked to have a sense of purpose, an aim, something tangible to strive for. However, beneath this, there was also something of the romantic about him, and many people who were alienated by his science found a brave openness that was honest and kind. Like the fictional Faust, he had searched for the mysterious power that bound nature into a whole. On the other hand, Faust saw life on earth as some vast transcendental process that changed under its own force.

These complex interests in Lankester’s outlook led him to find his own particular perspective of evolution, one that he refined during his frequent visits to Germany and his friend in the zoology department at the University of Jena, Ernst Haeckel. Although both men saw that Catholics were finding it increasingly hard to argue against evolutionary biologists, they continued to be inspired by Goethe’s way of looking at biology. He emphasised the importance of analogy and the fact that similar features were often found in different structures. They had often talked of a particular process in embryology that they called recapitulation. They had noticed that a growing embryo appeared to pass through a series of stages corresponding to the evolutionary history of species.

Lankester and many other late Victorian biologists were excited about what they saw when they examined the stages of early development in the embryo. They saw that at a particular stage in development the embryos of creatures as diverse as lizards, birds and elephants look the same. Although the youngest embryos in a related group usually started off by looking different, they grew to look similar, then became different again. It was during the middle phase of similarity that the body plan was laid down; it was a moment of minimal anatomical divergence. Therefore, Lankester and others thought there was some relationship between the way an embryo developed and the way the species evolved;
they began to think (wrongly) that the stages of a developing embryo followed the same path as its evolutionary history.

On some of his trips to Germany, Lankester and Haeckel worked on a group of salamanders whose development remained at the juvenile stage yet were able to breed quite easily. They suggested that these so-called ‘axolotls’ were degenerate species, that is, forms that could only have evolved from mechanisms within the organism. They proposed that the evolutionary process at work here was different to anything that might come from one of Lamarck’s straight pathways. Degeneration took place within the organism, while the processes that Lamarck advanced were stimulated from the outside environment. In Lamarck’s scheme, it was unclear how an early embryonic phase might be inherited, let alone how it might evolve by natural selection.

There was pressure on Lankester from all of his colleagues to find evidence for inheritance and to devise experiments to prove how inheritance might enable evolution by natural selection. However, the units of inheritance and the mechanism of their passing from one generation to another were to remain elusive for several more generations. Even when some good evidence for inheritance did appear, for example, from Gregor Mendel’s early experiments on plant breeding, it was difficult to put it in any meaningful context. Although Mendel had published his work in his local scientific journal back in 1866, he had never publicised. As we shall see, its importance was not discovered until 1900. The long-anticipated particles of inheritance remained a mystery, hidden in the library of the monastery garden in Brno.

Degeneration: A Chapter in Darwinism was the title of Lankester’s 1879 presidential address to the zoology section of the British Association for the Advancement of Science. In this address, which he later turned into a book, Lankester described scores of species with unused organs, domestic ducks with smaller wings, blind cave animals and even rare families of humans with extraordinary musical talents.

Lankester was a man of contradictions. He was not one to be taken in by oversimplifications of the complex systems of biology. Yet he strongly believed that arguments were a necessary part of the way the human intellect worked things out. So, although he disagreed with much of the new criticism of natural selection, he did admire some of those who were attacking him simply because they were speaking their mind.

Lankester was asking himself whether humans could degenerate to a simpler form of society. Evolution was normally assumed to turn the primitive into the advanced and civilised. Instead of seeing evolution as progress, he was arguing the opposite. Could species sometimes return to
the form of an earlier generation? Could this explain different racial and environmental characteristics? As well as bringing about progress and reform, maybe evolution could also bring about regression and decline? This idea was pounced upon by those who saw it as a possible explanation of new tendencies in the arts, such as dandyism, naturalism and mysticism. Others used it to explain how they thought some races had evolved 'less' than European ones. They returned to Darwin’s *The Descent of Man* and saw different ways of interpreting the relationships between different races.

Lankester joked that he saw ‘degeneration’ at work in men who inherited a fortune, but his idea backfired when it was taken up by conservatives in order to argue that God had put humans at the apex of complexity. That position implied that humans were in charge of everything below and could control it all. The argument had first been made in 1809, when the French botanist Jean-Baptiste Pierre Antoine de Monet, Chevalier de la Marck, published his theory of evolution by acquired characters. This earlier theory was now used to explain how strong or dominant humans could control lower forms. In the conservatives’ scheme, there was no need for anything complicated like competition. The idea of degeneration allowed them to twist Darwin’s theories to their own ends.

One reader who enjoyed *Degeneration: A Chapter in Darwinism* was Karl Marx. Marx especially liked Lankester’s suggestion that degeneration could apply to humans as well as to other species. In an appendix to Lankester’s work, which Marx arranged to be translated into Russian, Marx added:

> in the case of human societies, it is to be supposed that ultimately a degenerate society would be beaten, repressed, and eventually annihilated by other species… The struggle is so close among civilised men that the possibility of a degeneration and permanent rest does not suggest itself. It is exceedingly probable that a community which aimed at degeneration would end in annihilation.7

For Lankester, evolution followed Darwin’s branched tree-shaped vision of evolution and not that of Lamarck which saw a lot of long and straight ladders. For Darwin, extinction was a very necessary part of the process of evolution.

The unexpected friendship between Marx and Lankester grew out of one of the latter’s lectures in the 1870s, in which he asked whether evolutionary features such as degeneration and extinctions occurred at the level of an individual or a whole population. An American archaeologist
called Charles Waldstein was in the audience and stayed on to talk to Lankester about the values of socialism. Waldstein was concerned that socialism conflicted with individual liberty. After their discussion, Waldstein introduced Lankester to Karl Marx in order that they could talk about evolution. Both believed, however, that God did not have a hand in these processes; there was not going to be a fixed end or goal. Lankester regarded this as a satisfactory beginning.

Lankester decided to stay on as a poorly paid Bloomsbury professor, and Marx continued to offer him theoretical advice. Eleanor (nicknamed Tussy) often joined in their conversations, and Lankester advised her on the difficulties created by ageing parents with no money. Eventually Lankester arranged for his friend Dr Bryan Donkin to attend Eleanor’s ailing parents. The doctor had a practice near Portman Square and also worked to diagnose neurological disorders in prisoners. After Karl Marx’s death in 1883, Lankester comforted Eleanor through her own grief and loneliness.

Dr Donkin shared Lankester’s belief that science constituted a search for truth. The two friends had been brought up to trust in God; now, however, they only had faith in science. They believed that they owed society a priestly responsibility to test scientifically any mystery they encountered, and they became dogmatic as a result. Their conviction that this view was correct sometimes produced intense antagonism among their colleagues, and especially among the many quacks who worked in late-nineteenth-century medicine. While Lankester was trying to take superstition out of the public understanding of evolution, Donkin was trying to help improve health care in prisons and workhouses. Both men soon realised that their missions upset the establishment and lacked the support of most political organisations.

Lankester was also interested in the idea that an organism’s adaptation to its environment might be driven by a natural energy, what became known as l’élan vitale. According to this idea from French philosophy, nature was a single complex system. Lankester was aware that just as Darwin had studied the diversity of barnacles during his voyage on the Beagle, so Marx had seen political unrest in Germany and had studied the Epicurian will against pessimism as part of his PhD thesis. They had all reached a similar conclusion from their very different studies that large systems change within themselves.

Not all of Lankester’s judgements were sound, not least his early support for one of his zoology acquaintances, Edward Aveling, a man who said he was fanatical about Marx’s political ideas. There was nothing that Lankester liked more than a good argument and talking frankly about
politics, and Darwin’s ideas was part of the topical diet in these intellectual circles. Aveling was two years Lankester’s junior and had been born into a well-off family in Stoke Newington. Through Lankester’s influence at UCL, he switched from the medical school to study zoology. He graduated in 1870. As a bright and promising biologist, he was highly recommended to a lectureship at King’s College, but his atheism did not endear him to the authorities there, and he was soon asked to leave. Not one to give in, he wrote a popular account of evolution by natural selection that became an important primer for budding biologists. _The Student’s Darwin_ was published in 1881 and formed the basis of several meetings that Aveling arranged with Darwin about evolution and religion. He based another book, _God Dies, Nature Remains_ on these meetings, in which he claimed that Darwin was an atheist. The controversy the book caused meant that Aveling lost those supporters he had left in academic circles. Aveling thus turned to politics and became a leading member of the Secular Society. He soon gained a reputation in the society for claiming excessive expenses and embezzling funds, and in his social circles he became known for borrowing money and not repaying it. That was when Eleanor Marx fell in love with him, beginning a relationship that ended in tragedy.

**Figure 2.2** Edward Aveling (1880)
Aware of the difficult challenges facing those who inherited Darwin’s legacy, Lankester maintained his belief that science, more than anything else, could help improve humanity. Only through a better understanding of biology would humans tackle the problems of poverty and war. As Ray Lankester matured he could understand just how vast was the challenge ahead for biology. It was not just the supreme majesty connected with the meaning of life, its origin, maintenance and adaptation. For him, there were also the topical problems of poverty, education and corruption. He was asking himself whether the gentlemen scientists could survive, how the new professional scientists could be managed and funded, and how their work could be applied to help humankind in its struggle to survive within the limits of the planet earth. Fortunately for Lankester, the work was interesting and exciting. He was having fun within this group of Bloomsbury scientists.