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This book is dedicated
to the memory of my father, W. A. Johnson,
artist, educator and enthusiast

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'Thou shalt break them with a rod of iron;
thou shalt dash them in pieces like a potter's vessel.
Be wise now therefore, O ye kings:
be instructed, ye judges of the earth'

Psalms, 2: 9–10

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A Relativistic World

The modern world began on 29 May 1919 when photographs of a solar eclipse, taken on the island of Principe off West Africa and at Sobral in Brazil, confirmed the truth of a new theory of the universe. It had been apparent for half a century that the Newtonian cosmology, based upon the straight lines of Euclidean geometry and Galileo's notions of absolute time, was in need of serious modification. It had stood for more than two hundred years. It was the framework within which the European Enlightenment, the Industrial Revolution, and the vast expansion of human knowledge, freedom and prosperity which characterized the nineteenth century, had taken place. But increasingly powerful telescopes were revealing anomalies. In particular, the motions of the planet Mercury deviated by forty-three seconds of arc a century from its predictable behaviour under Newtonian laws of physics. Why?

In 1905, a twenty-six-year-old German Jew, Albert Einstein, then working in the Swiss patent office in Berne, had published a paper, 'On the electrodynamics of moving bodies', which became known as the Special Theory of Relativity.[1] Einstein's observations on the way in which, in certain circumstances, lengths appeared to contract and clocks to slow down, are analogous to the effects of perspective in painting. In fact the discovery that space and time are relative rather than absolute terms of measurement is comparable, in its effect on our perception of the world, to the first use of perspective in art, which occurred in Greece in the two decades *c.* 500–480 BC.[2]

The originality of Einstein, amounting to a form of genius, and the curious elegance of his lines of argument, which colleagues compared to a kind of art, aroused growing, world-wide interest. In 1907 he published a demonstration that all mass has energy, encapsulated in the equation $E = mc^2$, which a later age saw as the starting point in the race for the A-bomb.[3] Not even the onset of the European war prevented scientists from following his quest for an all-embracing

General Theory of Relativity which would cover gravitational fields and provide a comprehensive revision of Newtonian physics. In 1915 news reached London that he had done it. The following spring, as the British were preparing their vast and catastrophic offensive on the Somme, the key paper was smuggled through the Netherlands and reached Cambridge, where it was received by Arthur Eddington, Professor of Astronomy and Secretary of the Royal Astronomical Society.

Eddington publicized Einstein's achievement in a 1918 paper for the Physical Society called 'Gravitation and the Principle of Relativity'. But it was of the essence of Einstein's methodology that he insisted his equations must be verified by empirical observation and he himself devised three specific tests for this purpose. The key one was that a ray of light just grazing the surface of the sun must be bent by 1.745 seconds of arc – twice the amount of gravitational deflection provided for by classical Newtonian theory. The experiment involved photographing a solar eclipse. The next was due on 29 May 1919. Before the end of the war, the Astronomer Royal, Sir Frank Dyson, had secured from a harassed government the promise of £1,000 to finance an expedition to take observations from Principe and Sobral.

Early in March 1919, the evening before the expedition sailed, the astronomers talked late into the night in Dyson's study at the Royal Observatory, Greenwich, designed by Wren in 1675–6, while Newton was still working on his general theory of gravitation. E.T. Cottingham, Eddington's assistant, who was to accompany him, asked the awful question: what would happen if measurement of the eclipse photographs showed not Newton's, nor Einstein's, but *twice* Einstein's deflection? Dyson said, 'Then Eddington will go mad and you will have to come home alone.' Eddington's notebook records that on the morning of 29 May there was a tremendous thunderstorm in Principe. The clouds cleared just in time for the eclipse at 1.30 pm. Eddington had only eight minutes in which to operate. 'I did not see the eclipse, being too busy changing plates . . . We took sixteen photographs.' Thereafter, for six nights he developed the plates at the rate of two a night. On the evening of 3 June, having spent the whole day measuring the developed prints, he turned to his colleague, 'Cottingham, you won't have to go home alone.' Einstein had been right.[4]

The expedition satisfied two of Einstein's tests, which were reconfirmed by W.W. Campbell during the September 1922 eclipse. It was a measure of Einstein's scientific rigour that he refused to accept that his own theory was valid until the third test (the 'red shift') was met. 'If it were proved that this effect does not exist in

nature', he wrote to Eddington on 15 December 1919, 'then the whole theory would have to be abandoned'. In fact the 'red shift' was confirmed by the Mount Wilson observatory in 1923, and thereafter empirical proof of relativity theory accumulated steadily, one of the most striking instances being the gravitational lensing system of quasars, identified in 1979–80.[5] At the time, Einstein's professional heroism did not go unappreciated. To the young philosopher Karl Popper and his friends at Vienna University, 'it was a great experience for us, and one which had a lasting influence on my intellectual development'. 'What impressed me most', Popper wrote later, 'was Einstein's own clear statement that he would regard his theory as untenable if it should fail in certain tests . . . . Here was an attitude utterly different from the dogmatism of Marx, Freud, Adler and even more so that of their followers. Einstein was looking for crucial experiments whose agreement with his predictions would by no means establish his theory; while a disagreement, as he was the first to stress, would show his theory to be untenable. This, I felt, was the true scientific attitude.'[6]

Einstein's theory, and Eddington's much publicized expedition to test it, aroused enormous interest throughout the world in 1919. No exercise in scientific verification, before or since, has ever attracted so many headlines or become a topic of universal conversation. The tension mounted steadily between June and the actual announcement at a packed meeting of the Royal Society in London in September that the theory had been confirmed. To A.N.Whitehead, who was present, it was like a Greek drama:

> We were the chorus commenting on the decree of destiny as disclosed in the development of a supreme incident. There was dramatic quality in the very staging: the traditional ceremonial, and in the background the picture of Newton to remind us that the greatest of scientific generalizations was now, after more than two centuries, to receive its first modification . . . a great adventure in thought had at last come home to shore.[7]

From that point onward, Einstein was a global hero, in demand at every great university in the world, mobbed wherever he went, his wistful features familiar to hundreds of millions, the archetype of the abstracted natural philosopher. The impact of his theory was immediate, and cumulatively immeasurable. But it was to illustrate what Karl Popper was later to term 'the law of unintended consequence'. Innumerable books sought to explain clearly how the General Theory had altered the Newtonian concepts which, for ordinary men and women, formed their understanding of the world about them, and how it worked. Einstein himself summed it up thus: 'The "Principle of Relativity" in its widest sense is contained in the

statement: The totality of physical phenomena is of such a character that it gives no basis for the introduction of the concept of "absolute motion"; or, shorter but less precise: There is no absolute motion.'[8] Years later, R. Buckminster Fuller was to send a famous cable to the Japanese artist Isamu Noguchi explaining Einstein's key equation in exactly 249 words, a masterpiece of compression.

But for most people, to whom Newtonian physics, with their straight lines and right angles, were perfectly comprehensible, relativity never became more than a vague source of unease. It was grasped that absolute time and absolute length had been dethroned; that motion was curvilinear. All at once, nothing seemed certain in the movements of the spheres. 'The world is out of joint', as Hamlet sadly observed. It was as though the spinning globe had been taken off its axis and cast adrift in a universe which no longer conformed to accustomed standards of measurement. At the beginning of the 1920s the belief began to circulate, for the first time at a popular level, that there were no longer any absolutes: of time and space, of good and evil, of knowledge, above all of value. Mistakenly but perhaps inevitably, relativity became confused with relativism.

No one was more distressed than Einstein by this public misapprehension. He was bewildered by the relentless publicity and error which his work seemed to promote. He wrote to his colleague Max Born on 9 September 1920: 'Like the man in the fairy-tale who turned everything he touched into gold, so with me everything turns into a fuss in the newspapers.'[9] Einstein was not a practising Jew, but he acknowledged a God. He believed passionately in absolute standards of right and wrong. His professional life was devoted to the quest not only for truth but for certitude. He insisted the world could be divided into subjective and objective spheres, and that one must be able to make precise statements about the objective portion. In the scientific (not the philosophical) sense he was a determinist. In the 1920s he found the indeterminacy principle of quantum mechanics not only unacceptable but abhorrent. For the rest of his life until his death in 1955 he sought to refute it by trying to anchor physics in a unified field theory. He wrote to Born: 'You believe in a God who plays dice, and I in complete law and order in a world which objectively exists and which I, in a wildly speculative way, am trying to capture. I firmly *believe*, but I hope that someone will discover a more realistic way or rather a more tangible basis than it has been my lot to find.'[10] But Einstein failed to produce a unified theory, either in the 1920s or thereafter. He lived to see moral relativism, to him a disease, become a social pandemic, just as he lived to see his fatal equation bring into existence nuclear warfare. There were times, he said at the end of his life, when he wished he had been a simple watchmaker.

The emergence of Einstein as a world figure in 1919 is a striking illustration of the dual impact of great scientific innovators on mankind. They change our perception of the physical world and increase our mastery of it. But they also change our ideas. The second effect is often more radical than the first. The scientific genius impinges on humanity, for good or ill, far more than any statesman or warlord. Galileo's empiricism created the ferment of natural philosophy in the seventeenth century which adumbrated the scientific and industrial revolutions. Newtonian physics formed the framework of the eighteenth-century Enlightenment, and so helped to bring modern nationalism and revolutionary politics to birth. Darwin's notion of the survival of the fittest was a key element both in the Marxist concept of class warfare and of the racial philosophies which shaped Hitlerism. Indeed the political and social consequences of Darwinian ideas have yet to work themselves out, as we shall see throughout this book. So, too, the public response to relativity was one of the principal formative influences on the course of twentieth-century history. It formed a knife, inadvertently wielded by its author, to help cut society adrift from its traditional moorings in the faith and morals of Judeo-Christian culture.

The impact of relativity was especially powerful because it virtually coincided with the public reception of Freudianism. By the time Eddington verified Einstein's General Theory, Sigmund Freud was already in his mid-fifties. Most of his really original work had been done by the turn of the century. *The Interpretation of Dreams* had been published as long ago as 1900. He was a well-known and controversial figure in specialized medical and psychiatric circles, had already founded his own school and enacted a spectacular theological dispute with his leading disciple, Carl Jung, before the Great War broke out. But it was only at the end of the war that his ideas began to circulate as common currency.

The reason for this was the attention the prolonged trench-fighting focused on cases of mental disturbance caused by stress: 'shell-shock' was the popular term. Well-born scions of military families, who had volunteered for service, fought with conspicuous gallantry and been repeatedly decorated, suddenly broke. They could not be cowards, they were not madmen. Freud had long offered, in psychoanalysis, what seemed to be a sophisticated alternative to the 'heroic' methods of curing mental illness, such as drugs, bullying, or electric-shock treatment. Such methods had been abundantly used, in ever-growing doses, as the war dragged on, and as 'cures' became progressively short-lived. When the electric current was increased, men died under treatment, or committed suicide rather than face more, like victims of the Inquisition. The post-war fury of relatives at the cruelties

inflicted in military hospitals, especially the psychiatric division of the Vienna General Hospital, led the Austrian government in 1920 to set up a commission of inquiry, which called in Freud.[11] The resulting controversy, though inconclusive, gave Freud the world-wide publicity he needed. Professionally, 1920 was the year of breakthrough for him, when the first psychiatric polyclinic was opened in Berlin, and his pupil and future biographer, Ernest Jones, launched the *International Journal of Psycho-Analysis.*

But even more spectacular, and in the long run far more important, was the sudden discovery of Freud's works and ideas by intellectuals and artists. As Havelock Ellis said at the time, to the Master's indignation, Freud was not a scientist but a great artist.[12] After eighty years' experience, his methods of therapy have proved, on the whole, costly failures, more suited to cosset the unhappy than cure the sick.[13] We now know that many of the central ideas of psychoanalysis have no basis in biology. They were, indeed, formulated by Freud before the discovery of Mendel's Laws, the chromosomal theory of inheritance, the recognition of inborn metabolic errors, the existence of hormones and the mechanism of the nervous impulse, which collectively invalidate them. As Sir Peter Medawar has put it, psychoanalysis is akin to Mesmerism and phrenology: it contains isolated nuggets of truth, but the general theory is false.[14] Moreover, as the young Karl Popper correctly noted at the time, Freud's attitude to scientific proof was very different to Einstein's and more akin to Marx's. Far from formulating his theories with a high degree of specific content which invited empirical testing and refutation, Freud made them all-embracing and difficult to test at all. And, like Marx's followers, when evidence did turn up which appeared to refute them, he modified the theories to accommodate it. Thus the Freudian corpus of belief was subject to continual expansion and osmosis, like a religious system in its formative period. As one would expect, internal critics, like Jung, were treated as heretics; external ones, like Havelock Ellis, as infidels. Freud betrayed signs, in fact, of the twentieth-century messianic ideologue at his worst – namely, a persistent tendency to regard those who diverged from him as themselves unstable and in need of treatment. Thus Ellis's disparagement of his scientific status was dismissed as 'a highly sublimated form of resistance'.[15] 'My inclination', he wrote to Jung just before their break, 'is to treat those colleagues who offer resistance exactly as we treat patients in the same situation'.[16] Two decades later, the notion of regarding dissent as a form of mental sickness, suitable for compulsory hospitalization, was to blossom in the Soviet Union into a new form of political repression.

But if Freud's work had little true scientific content, it had literary

and imaginative qualities of a high order. His style in German was magnetic and won him the nation's highest literary award, the Goethe Prize of the City of Frankfurt. He translated well. The anglicization of the existing Freudian texts became an industry in the Twenties. But the new literary output expanded too, as Freud allowed his ideas to embrace an ever-widening field of human activity and experience. Freud was a gnostic. He believed in the existence of a hidden structure of knowledge which, by using the techniques he was devising, could be discerned beneath the surface of things. The dream was his starting-point. It was not, he wrote, 'differently constructed from the neurotic symptom. Like the latter, it may seem strange and senseless, but when it is examined by means of a technique which differs slightly from the free association method used in psychoanalysis, one gets from its *manifest content* to its *hidden meaning*, or to its latent thoughts.'[17]

Gnosticism has always appealed to intellectuals. Freud offered a particularly succulent variety. He had a brilliant gift for classical allusion and imagery at a time when all educated people prided themselves on their knowledge of Greek and Latin. He was quick to seize on the importance attached to myth by the new generation of social anthropologists such as Sir James Frazer, whose *The Golden Bough* began to appear in 1890. The meaning of dreams, the function of myth – into this potent brew Freud stirred an all-pervading potion of sex, which he found at the root of almost all forms of human behaviour. The war had loosened tongues over sex; the immediate post-war period saw the habit of sexual discussion carried into print. Freud's time had come. He had, in addition to his literary gifts, some of the skills of a sensational journalist. He was an adept neologian. He could mint a striking slogan. Almost as often as his younger contemporary Rudyard Kipling, he added words and phrases to the language: 'the unconscious', 'infantile sexuality', the 'Oedipus complex', 'inferiority complex', 'guilt complex', the ego, the id and the super-ego, 'sublimation', 'depth-psychology'. Some of his salient ideas, such as the sexual interpretation of dreams or what became known as the 'Freudian slip', had the appeal of new intellectual parlour-games. Freud knew the value of topicality. In 1920, in the aftermath of the suicide of Europe, he published *Beyond the Pleasure Principle*, which introduced the idea of the 'death instinct', soon vulgarized into the 'death-wish'. For much of the Twenties, which saw a further abrupt decline in religious belief, especially among the educated, Freud was preoccupied with anatomizing religion, which he saw as a purely human construct. In *The Future of an Illusion* (1927) he dealt with man's unconscious attempts to mitigate unhappiness. 'The attempt to procure', he wrote, 'a protec-

tion against suffering through a delusional remoulding of reality is made by a considerable number of people in common. The religions of mankind must be classed among the mass-delusions of this kind. No one, needless to say, who shares a delusion ever recognizes it as such.'[18]

This seemed the voice of the new age. Not for the first time, a prophet in his fifties, long in the wilderness, had suddenly found a rapt audience of gilded youth. What was so remarkable about Freudianism was its protean quality and its ubiquity. It seemed to have a new and exciting explanation for everything. And, by virtue of Freud's skill in encapsulating emergent trends over a wide range of academic disciplines, it appeared to be presenting, with brilliant panache and masterful confidence, ideas which had already been half-formulated in the minds of the élite. 'That is what I have always thought!' noted an admiring André Gide in his diary. In the early 1920s, many intellectuals discovered that they had been Freudians for years without knowing it. The appeal was especially strong among novelists, ranging from the young Aldous Huxley, whose dazzling *Crome Yellow* was written in 1921, to the sombrely conservative Thomas Mann, to whom Freud was 'an oracle'.

The impact of Einstein and Freud upon intellectuals and creative artists was all the greater in that the coming of peace had made them aware that a fundamental revolution had been and was still taking place in the whole world of culture, of which the concepts of relativity and Freudianism seemed both portents and echoes. This revolution had deep pre-war roots. It had already begun in 1905, when it was trumpeted in a public speech, made appropriately enough by the impresario Sergei Diaghilev of the *Ballets Russes*:

> We are witnesses of the greatest moment of summing-up in history, in the name of a new and unknown culture, which will be created by us, and which will also sweep us away. That is why, without fear or misgiving, I raise my glass to the ruined walls of the beautiful palaces, as well as to the new commandments of a new aesthetic. The only wish that I, an incorrigible sensualist, can express, is that the forthcoming struggle should not damage the amenities of life, and that the death should be as beautiful and as illuminating as the resurrection.[19]

As Diaghilev spoke, the first exhibition of the Fauves was to be seen in Paris. In 1913 he staged there Stravinsky's *Sacre du Printemps*; by then Schoenberg had published the atonal *Drei Klavierstücke* and Alban Berg his String Quartet (Opus 3); and Matisse had invented the term 'Cubism'. It was in 1909 that the Futurists published their manifesto and Kurt Hiller founded his Neue Club in Berlin, the nest of the artistic movement which, in 1911, was first termed Expressionism.[20] Nearly all the major creative figures of the 1920s had already been published, exhibited or performed before 1914, and in that sense the Modern

Movement was a pre-war phenomenon. But it needed the desperate convulsions of the great struggle, and the crashing of regimes it precipitated, to give modernism the radical political dimension it had hitherto lacked, and the sense of a ruined world on which it would construct a new one. The elegiac, even apprehensive, note Diaghilev struck in 1905 was thus remarkably perceptive. The cultural and political strands of change could not be separated, any more than during the turbulence of revolution and romanticism of 1790–1830. It has been noted that James Joyce, Tristan Tzara and Lenin were all resident-exiles in Zurich in 1916, waiting for their time to come.[21]

With the end of the war, modernism sprang onto what seemed an empty stage in a blaze of publicity. On the evening of 9 November 1918 an Expressionist Council of Intellectuals met in the Reichstag building in Berlin, demanding the nationalization of the theatres, the state subsidization of the artistic professions and the demolition of all academies. Surrealism, which might have been designed to give visual expression to Freudian ideas – though its origins were quite independent – had its own programme of action, as did Futurism and Dada. But this was surface froth. Deeper down, it was the disorientation in space and time induced by relativity, and the sexual gnosticism of Freud, which seemed to be characterized in the new creative models. On 23 June 1919 Marcel Proust published *A l'Ombre des jeunes filles*, the beginning of a vast experiment in disjointed time and subterranean sexual emotions which epitomized the new preoccupations. Six months later, on 10 December, he was awarded the Prix Goncourt, and the centre of gravity of French letters had made a decisive shift away from the great survivors of the nineteenth century.[22] Of course as yet such works circulated only among the influential few. Proust had to publish his first volume at his own expense and sell it at one-third the cost of production (even as late as 1956, the complete *A la Récherche du temps perdu* was still selling less than 10,000 sets a year).[23] James Joyce, also working in Paris, could not be published at all in the British Isles. His *Ulysses*, completed in 1922, had to be issued by a private press and smuggled across frontiers. But its significance was not missed. No novel illustrated more clearly the extent to which Freud's concepts had passed into the language of literature. That same year, 1922, the poet T.S.Eliot, himself a newly identified prophet of the age, wrote that it had 'destroyed the whole of the nineteenth century'.[24] Proust and Joyce, the two great harbingers and centre-of-gravity-shifters, had no place for each other in the *Weltanschauung* they inadvertently shared. They met in Paris on 18 May 1922, after the first night of Stravinsky's *Rénard*, at a party for Diaghilev and the cast, attended by the composer and his designer, Pablo Picasso. Proust, who had