1001/2 H. G. WELLS: A SURVEY AND TRIBUTE

By SIR RICHARD GREGORY, BART., F.R.S.

CREATIVE ideas, and the influence of their expression, constitute a measure of material and intellectual advance displayed in the works of science and literature. Science is now commonly understood to be systematic and formulated natural philosophy; but with achievements in these fields of human understanding are also associated moral and social forces which, though not of a physical kind, are observable in their effects and admit of rational analysis and judgment.

This is the domain of what Wells defined as human ecology; and all his works—novels, fantastic and imaginative romances and books upon social, religious and political questions—are concerned, directly and indirectly, with individual and social factors involved in the biological whole. As a philosophy of matter, life and mind and their relationships to one another, he may be said to have expressed independently much the same evolutionary principles in diverse ways as those presented by General Smuts in his "Holism and Evolution", published in 1926. Moral as well as material values enter into this new humanism, and the adaptation of them to worthy conditions of life must continually create new problems for civilized societies to face and to solve, the tendency always being towards integrations of increased complexity and therefore of increasing difficulty of adjustment.

This was consistently the attitude taken by Wells towards human thought and action. In a Friday Evening Discourse at the Royal Institution in 1902, on the "Discovery of the Future", his thesis was "that mankind was at the dawn of a great change-over from life regarded as a system of consequences to life regarded as a system of constructive effort. . . . We should be less and less bound by the engagements of the past and more and more ruled by a realization of the creative effect of our acts". He did not say that the future could be foretold, but he held that its conditions could be foretold.

Thirty-four years later, in another Discourse at the Royal Institution, Wells again expressed what was always dominant in his mind—to relate effects to causes and arrive at generalizations and syntheses. His temperament and endeavour were those of a scientific inquirer into individual experiences and their collective relationships, with the same independence of customary authority as that of the Horatian motto *Nullius in verba* of the Royal Society, but with much greater perplexities to study than those of the concrete natural sciences. The subject of the Discourse at the Royal Institution was "The Idea of a World Encyclopedia", and the object was the collation of all published knowledge in the world by, with and for the world.

The conspectus of such a vast undertaking can be found in Wells's "Outline of History", "The Science of Life", with his eldest son, G. P. Wells, and Julian Huxley as joint authors, and "The Work, Wealth and Happiness of Mankind", successively published from 1920 to 1932. The "Outline" is a story of the earth as the abode of man from his earliest appearance on the planet to the Peace of Versailles; the "Life" deals with biology and social structures; and "Work" with ways in which humanity earns its living. As

contributions to the history of man and his activities, these three works constitute a supreme achievement which could not have been conceived and constructed by any historian without his scientific credentials. He was as aware as anyone of certain weaknesses and deficiencies; but he welcomed suggestions to remedy them as well as to include new discoveries relating to human evolution and history, particularly in revised editions of the "Outline".

To have mastered such a vast body of human thought and action, and to have kept abreast, as Wells did, of current knowledge and opinion on many technical subjects, was an intellectual feat which no other modern man of letters could possibly have achieved. Referring to these historical surveys and attempts to bring economic, financial and social life into rational relationship, he said at the Royal Institution ten years ago that he had been engaged in the "still more desperate struggle to estimate the possible consequences of this or that set of operating causes upon the future of mankind". His imaginative romances, as well as his works on social, religious and political questions, reflect his reactions to historical or visionary influences upon modes of human existence. On the magic carpet of his mind he could travel backward or forward in time and space and live in ideals so vividly that they became convincing realities in narrative.

The first scientific fantasy of this kind was "The Time Machine", a rough draft of which appeared in the *Science Schools Journal* when Wells was a young man of twenty-one years. He had acquired a sound knowledge of the fundamental facts of astronomy and was able, therefore, to describe accurately the rapidly changing celestial scenes presented to the time traveller. The moon passed in an instant through all its phases, the sun became a band of fire and swayed up and down, from solstice to solstice again in a minute or less, with spring and winter merging into one another in the picture. Wells knew, better than any other man of letters, what such natural events and processes had been and that they were due to forces acting continually and uniformly. It was this scientific knowledge, combined with brilliant powers of expression, that made him unique in his own particular field.

After "The Time Machine" came "The War of the Worlds" as the second of a series of a dozen imaginative romances in which physical and biological factors were cleverly used. Lowell's work on the planet Mars, and his conclusions that the so-called canals had been artificially constructed by intelligent beings, had been published three years earlier, so Wells had a good basis for his story. The Martians he conceived to invade the earth brought novel heat-rays and a heavy gas with them as devastating means of conquest, but after a short time they themselves became masses of corruption due to insidious germs of disease which they had eliminated in their own planet and to which their bodies were, therefore, not immune. This end of the Martian invaders is a characteristic example of the application of scientific knowledge to forms and conditions of life woven into a story having also strong emotional appeal.

"The First Men in the Moon", published in 1901, again revealed his genius for producing a story rich in human interest without disturbing the sensibilities of critical scientific minds. In this respect, Wells's novel was far in advance of Jules Verne's "Journey to the Moon", which had many scientific blunders and inconsistencies. Moreover, Verne's travellers did

not reach the moon, whereas Wells's landed upon our satellite and found beings living inside it with thoughts and feelings which made contacts with human hearts.

So it was with the story "In the Days of the Comet", published in 1906. Several years earlier a remarkable new star appeared, visible to the naked eye, and expanding at such a rate that it was thought by many people to be a minor planet approaching the earth. Wells had a much better basis for his fancy when he made a comet cross the earth's orbit at a point near enough for us to pass through its tail, as actually happened in 1861. He let his imagination play with the idea that human nature might be changed by the introduction of a new spiritual element in the earth's atmosphere, represented by a peculiar greenish radiation from his comet's tail. After passing through the tail, the whole race was transfigured. Jealousy and hatred vanished, and with it war and poverty, in the vision of a world lifted out of acquisitive greed into a condition of celestial harmony. This poetic dream of what mankind might become by following paths of truth and righteousness and suppressing animal instincts is displayed in a number of Wells's works, often with hope but always conscious of the prevalence of evil tendencies in human nature.

In "The World Set Free", the transformation from old to new and better conditions of life and government was reached not through the swish of a comet's tail but as the result of a world war. The book was published early in 1914, but in substance and outlook it describes the Second World War even more closely than the First. The book was dedicated to Prof. Soddy's "Interpretation of Radium", published in 1909; and the theme is that of the disintegration of the atom and the use of atomic bombs and thousands of aeroplanes in modern warfare. As a story of the discovery and use of natural power to supplement man's animal strength, the first chapter of the book, entitled "The Sun Snarers", states these developments with crystal clearness. It outlines the conquest of external power in the industrial applications of fire, steam, electricity, and new chemical elements, leading up to radium and the release of the energy locked up in atoms, for use first with devastating effects in what was called "The Last War" and then, in 1956, to liberate the race from obsessions and entanglements which impede moral and material growth.

"Already before the release of atomic energy the tensions between the old way of living and the new were intense" are words used in the last chapter to introduce the assembly summoned to place social organisation upon a new and nobler footing. This council was constituted in the spirit of the United Nations Organisation, and it eventually led to the planning of a new common social order for the entire population of the earth. How close the realities will approach to Wells's ideals remains to be seen.

Other works in which the possible future of the human race was forecast are "The Sleeper Awakes" (1899), "Anticipations" (1901), "Mankind in the Making" (1903), "The Food of the Gods" (1904), and "A Modern Utopia" (1905). Of "Anticipations" Sir Ray Lankester said, in a five-column review in *Nature* of March 13, 1902:

"This is a profoundly interesting and suggestive book by a very remarkable man. Mr. Wells was educated at the Royal College of Science; he has a thorough knowledge of, and considerable training in,

the great branches of science—physics, chemistry, astronomy, geology and biology. This course of study operated, in the case of Mr. Wells, upon a mind naturally gifted with an extraordinarily vivid imagination and the aptitude for true literary art."

This kind of encouragement from scientific friends was highly appreciated by Wells from the very beginning of his literary career to the end of his life. He was trained to become a science teacher, and during this formative period, as well as for several years later, his closest contacts were with workers in scientific fields. He knew that when he entered the world of letters, in which he afterwards attained international fame, he lost his place on the ladder on which he had been moving upward; but the fact that he continued to be regarded as a great scientific educator by leaders of his own generation, and an inspiration to the new, kept him continually in touch with advancing knowledge and contributed in no small measure to the remarkable responses represented in his works.

"Anticipations" projected the present into the future from the outlook tower of modern science. It was an indictment of many existing customs and structures and a prophecy of what changes might be expected in the near future. On the mechanical or inventive side, the predictions made in the book revealed an insight which was truly marvellous. Motor-cars and motor-roads were largely to replace railway traffic. Land ironclads, armoured trains, armoured tortoises or tanks and flying machines with folded parachutes for escape were to be used in warfare. Forty years after this forecast all these machines were in action, but their development has not been accompanied by the changes of heart and social structures which Wells hoped for but had not the same scientific reasons to expect to be fulfilled.

In "A Modern Utopia" (1905), faith in the principles of a rational social biology is expressed in practical terms with hope as well as ingenuity. The system presented resembles that of the Platonic Republic, save that insistence is given to the preciousness of individual freedom and to toleration. Family allowances were to be made to women, but criminals and certain other groups were not to be allowed to reproduce their kind, though they were free to follow their own proclivities in their own separate communities. The main idea was to keep learning and the applications of it progressive instead of fixed and pedantic, the spirit being, therefore, that of "The Discovery of the Future". This kind of idealistic Utopia is found again in "Men Like Gods" (1923). It makes man the master of his own house and conceives the birth of a new race with noble qualities of mind and great physical strength, devoted to the understanding of Nature in all its aspects and its control for the progressive welfare of humanity.

Such projections as these into the future of man and society are not satires like Swift's "Gulliver's Travels" and Samuel Butler's "Erewhon", or parodies of science found in novels of our own times. They rank with Plato's "Republic", Thomas More's "Utopia" and William Morris's "News from Nowhere" in their social philosophy and as vivid literature. The world of science has every reason to be proud that its spirit and service should have been translated so genuinely and loyally into "Thoughts that breathe and words that burn" with such unsurpassing power and influence as those possessed by Wells. He presented scientific workers to his readers as human beings and not as the travesties in which

they figure in novels and romances written without his intimate knowledge of them and their impulses. That is why homage has always been gratefully paid to him in these columns and in other scientific periodicals.

"By science," Wells once said, "is meant a process of human intellectual energy which is exhaustively and reverently criticized, leading, it is hoped, to action exhaustively criticized before it is exhaustively planned." In these words he expressed the whole of his faith, the whole of his belief in human life. How and why he acquired this faith and proclaimed it is comprehensively stated in the two volumes of his "Experiment in Autography" (1934), the sub-title of which reads "Discoveries and Conclusions of a Very Ordinary Man". He looked at people and their actions against a background of knowledge never used before to paint pictures of aspects of individual and social life; and his insight as well as the breadth of his experiences made all the scenes and figures stand out with convincing reality, even when they were fanciful.

From first to last the characters in all Wells's works represent growing experiences and the responses of thought to them. Following scientific methods, he observed ways and means of life independently, described faithfully what he saw and deduced principles from this evidence. "Love and Mr. Lewisham", "Kipps", "Mr. Polly", and "The Wheels of Chance" are stories in which he himself lived and struggled and thought. So it was with most of his other novels. When he left this field for that of scientific romances, literary critics deplored the change of front and his re-entry into a field in which he became the supreme interpreter.

Mention has already been made of the lines of these perspectives of space and time, and of some other adventures into the domain of human ecology. It is sufficient here to refer, in addition, to "The World of William Clissold", three volumes (1926), "The Way the World is Going" (1928), "The Open Conspiracy" (1930), "After Democracy" (1933), "The Anatomy of Frustration" (1936), "Star Begotten" (1937), in which the idea is used that cosmic rays directed towards the earth might induce mutation of genes in human nuclei, "The Fate of Homo Sapiens" (1939), "The New World Order" (1940), "The Outlook for Homo Sapiens", and "The Conquest of Time" and "Phoenix" (both in 1942), "'42, '43, '44: The Happy Turning", which is a supplement to the "Autobiography", and "Mind at the End of its Tether" (1945).

These, with other books already noted, comprise only a selected list of Wells's contributions to the study of social biology. They state the essential ideas of his life and draw the perspective of a world liberated from sectionalism, with men and women of goodwill and wide outlook co-operating in the task of constructing and maintaining conditions and ways of life worthy of human powers and the availability of the natural resources of the universe.

In "Ann Veronica" (1909)—a novel which provoked a storm of indignation from a group of critics, because of its frank discussion of sex relationships—Wells makes one of the characters say: "Find the thing you want to do intensely, make sure that's it, and do it with all your might. If you live, well and good: if you die, well and good. Your purpose is done." Before he wrote these words, Wells had had several reminders that his physical system was weak in several parts and liable to breakdowns. It was his

indomitable spirit that urged him on to carry out his purpose for a much longer period than anyone who knew him when he began his literary career would have expected. This was maintained to the day of his death on August 13. A few weeks before his heart ceased to beat, he had planned to work hard at the scenario of a film to be "The Shape of Things to Come" brought up to date with the new ideas and curiosities due to the popularization of the principles of the nuclear disintegration of the atom and the manufacture of the atomic bomb.

To have had such an intention at seventy-nine years of age and after producing about a hundred notable volumes is an impressive example of the mental alertness and perseverance of purpose of Wells's life, the spirit of which remains in his works to enlighten the world for many generations. From his early days he was eager to learn and to master his circumstances. His father was a small tradesman at Bromley, Kent, where Herbert George Wells (familiarily known as "H.G.") was born on September 21, 1866. His mother was a typical representative of the lower middle class of Victorian times, with fixed regard for the established order and its conventions. This led to Wells being sent to a local 'academy' as a child instead of going to a national school.

With the same maternal desire that Wells should occupy a 'respectable' place in the social order, he was twice placed in drapery establishments, from both of which he came away with resentment at the life imposed upon him. Between these two experiences he was sent for a month's trial as an apprentice to a pharmaceutical chemist at Midhurst, Sussex; but this new start in life was abandoned for financial reasons. He began there, however, the study of Latin with lessons from the headmaster of the small grammar school, at which he became a boarder for a couple of months in the interim between the two drapery adventures. After breaking away from the second of these trials, he wrote to this headmaster, who, as the result, offered him a post as an usher in the Preparatory Department of Midhurst Grammar School.

It was at this place and under this influence that Wells made his first systematic acquaintance with modern science. There he attended evening classes under the Science and Art Department, and was so successful in gaining grant-earning certificates in a number of subjects that in 1884 he was accepted as a science teacher in training at the Normal School of Science, South Kensington, which later became the Royal College of Science.

After three years at the College, Wells left without being awarded the associateship, having failed in the examination in advanced geology. Even without this qualification he was able to obtain a post in a small private school in Wales, where he had his left kidney crushed during a football game and was wrongly pronounced to be consumptive, but later to be diabetic, which proved to be true. In 1889 he became an assistant master in a private school at Kilburn, where Alfred Harmsworth (Lord Northcliffe) had been a pupil, and Wells taught mathematics and science to a class which included A. A. Milne, the novelist and playwright, son of the headmaster of the school.

While at this Henley House School, Wells passed the London Intermediate B.Sc. examination with honours in zoology and was awarded the licentiate-ship of the College of Preceptors with the three prizes in theory and practice of education, mathematics and

natural science. These successes led to the offer of a post on the staff of the University Tutorial College, where he went to teach biology and also geology to students at Red Lion Square working for the University of London examinations. While there he took his B.Sc. degree in 1890 with first-class honours in zoology and was first in the second class in honours in geology. He also obtained the fellowship diploma of the College of Preceptors with honours in two subjects and gained the Doreck Scholarship for theory and practice of education, thus getting in front of university teachers in their own examination.

His career as a professional teacher came to an end in 1893 with another breakdown of health. It was then that he began to earn his living by writing articles for the periodical press on common subjects in his own whimsical vein of reactions to them. His "Select Conversations with an Uncle" (1895) is a collection of such contributions from scores of other unsigned articles and tales. He also contributed a number of reviews to *Nature*, including one on Podmore's "Apparitions and Thought Transference". His first book was, however, Part I of a "Text-book of Zoology" (1893), with an introduction by G. B. Howes, assistant professor of zoology at the Royal College of Science, followed two years later by Part II, and Gregory and Wells's "Honours Physiography". In the same year (1895) "The Time Machine" was published, and Wells found himself recognized, at twenty-nine years of age, as a bright star rising above the horizon of the world of letters to radiate a new penetrating light before men.

The honorary degree of D.Lit. was conferred upon Wells by the University of London in 1936; and in 1943 he was awarded the D.Sc. degree for a thesis on "The Quality of Illusion in the Continuity of the Individual Life in the Higher Metazoa, with Particular Reference to *Homo sapiens*". He was president of the Educational Science Section of the British Association at the Nottingham meeting in 1937, when he gave an address on "The Informative Content of Education", which led to the publication of two reports upon the subject by a research committee of the Association. He was elected an honorary fellow of the Imperial College of Science and Technology in 1943, just fifty years after the publication of "The Time Machine", the first of the imposing series of works by which Wells became the greatest international scientific educator of his times.

SEVENTY-FIFTH ANNIVERSARY OF THE CORDOBA OBSERVATORY

By DR. E. GAVIOLA
Director

THE Cordoba Observatory owes its creation to the happy and trustful collaboration between a great Argentine statesman, President Sarmiento, and a great American astronomer, Director Gould.

During the nineteenth century, astronomy endeavoured to take possession of the sky by making an inventory of its stars. Bessel demanded already in 1822 to know the precise position and brilliance of all stars down to the ninth magnitude. He himself measured the positions of 62,380 stars between 45° north and 15° south. Argelander extended the limits to 80° north and 31° south, adding 50,000 stars. The

English astronomer Carrington filled the gap at the north pole. In the south, the American naval officer Gilliss had made many observations at Santiago de Chile (1849–52) between –65° and the south pole, but he died in 1865 and it was uncertain if and when the positions would be reduced and published. (They were in 1895, adding 16,748 stars to the inventory.)

Gould felt it was his mission to fill the great southern gap. He wrote in 1865 to Sarmiento, then Argentine envoy in Washington, asking for permission and protection for leading an astronomical expedition to Cordoba, supported by the friends of science in Boston. Sarmiento offered more than was asked. But the expedition had to be delayed: Gould could not obtain sufficient private funds; the Argentine Government regretted not to be able to help much at that time, on account of having all its energies devoted to the Paraguay War (1866).

Sarmiento became President in 1868 and in the following year Gould was invited to organise an Argentine National Observatory. Gould accepted promptly, ordered a fine 5-in. meridian circle from Repsold in Hamburg, and sailed for Cordoba in 1870. On his arrival he heard that the Franco-Prussian War was delaying his instrument in Hamburg. When it finally arrived in Rosario, it was held up again by a quarantine due to an epidemic of yellow fever. The "Uranometria Argentina", a census of all the naked-eye stars from 10° north to the southern pole, owes its existence to these delays. It contains 7,756 stars down to the seventh magnitude.

Seventy-five years ago, on October 24, 1871, the Cordoba Observatory was solemnly and officially inaugurated with speeches by President Sarmiento, Secretary Avellaneda and Director Gould.

The planned observations with the meridian circle were begun in September 1873 and continued by Gould until 1885, when he considered his mission in Cordoba fulfilled and returned to the United States. The main fruits of this period were the "Zone Catalogue", published in 1884, containing 73,161 stars between 23° and 80° south and the "Argentine General Catalogue" (1886) of 33,500 southern stars measured repeatedly with the utmost precision. The gap in the southern skies had been closed and the Cordoba Observatory had won a place of honour in the annals of world astronomy.

Under the direction of John M. Thome, the meridian observations continued and led to new catalogues, but the main work of this period (1885–1908) is undoubtedly the monumental "Cordoba Durchmusterung". It contains 613,718 stars between –22° and the southern pole. Thome himself could not finish it. The first three parts were published by him; the fourth was completed by his successor, Charles D. Perrine, in 1914. The fifth was observed and reduced by José Tretter, appearing in print in 1932, twenty-four years after Thome's death.

The Cordoba Durchmusterung contains all the stars down to the tenth magnitude, and many even fainter (to mag. 11.5) observed with a 5-in. equatorial refractor. It is still to-day the basis for the identification of southern stars.

Thome undertook in 1890 to continue the series of catalogues known as the zones of the "Astronomische Gesellschaft" from –22° south. He measured with the meridian circle the positions of 44,000 stars (–22° to –37°) between 1891 and 1900, but did not live to see the catalogues published. They appeared in 1913, 1914 and 1925. The La Plata Observatory has measured and published the zones –47° to –72°.