Sir J. J. Thomson was an English physicist who helped revolutionize the knowledge of atomic structure by his discovery of the electron (1897). He received the Nobel Prize for Physics in 1906 and was knighted in 1908.

**Education and early career**

J. J. Thomson was the son of a bookseller in a suburb of Manchester. When he was only 14, he entered Owens College, now the Victoria University of Manchester. He was fortunate in that, in contrast with most colleges at the time, Owens provided some courses in experimental physics. In 1876 he obtained a scholarship at Trinity College, Cambridge, where he remained for the rest of his life. After taking his B.A. degree in mathematics in 1880, the opportunity of doing experimental research drew him to the Cavendish Laboratory. He began also to develop the theory of
electromagnetism. As set forth by James Clerk Maxwell, electricity and magnetism were interrelated; quantitative changes in one produced corresponding changes in the other.

Prompt recognition of Thomson's achievement by the scientific community came in 1884, with his election as a fellow of the Royal Society of London and appointment to the chair of physics at the Cavendish Laboratory. Thomson entered physics at a critical point in its history. Following the great discoveries of the 19th century in electricity, magnetism, and thermodynamics, many physicists in the 1880s were saying that their science was coming to an end like an exhausted mine. By 1900, however, only elderly conservatives held this view, and by 1914 a new physics was in existence, which raised, indeed, more questions than it could answer. The new physics was wildly exciting to those who, lucky enough to be engaged in it, saw its boundless possibilities. Probably no more than a half dozen great physicists were associated with this change. Although not everyone would have listed the same names, the majority of those qualified to judge would have included Thomson.

Discovery of the electron

Thomson's most important line of work, interrupted only for lectures at Princeton University in 1896, was that which led him, in 1897, to the conclusion that all matter, whatever its source, contains particles of the same kind that are much less massive than the atoms of which they form a part. They are now called electrons, although he originally called them corpuscles. His discovery was the result of an attempt to solve a long-standing controversy regarding the nature of cathode rays, which occur when an electric current is driven through a vessel from which most of the air or other gas has been pumped out. Nearly all German physicists of the time held that these visible rays were produced by occurrence in the ether—a weightless substance then thought to pervade all space—but that they were neither ordinary light nor the recently discovered X rays. British and French physicists, on the other hand, believed that these rays were electrified particles. By applying an improved vacuum technique, Thomson was able to put forward a convincing argument that these rays were composed of particles. Furthermore, these rays seemed to be composed of the same particles, or corpuscles, regardless of what kind of gas carried the electric discharge or what kinds of metals were used as conductors. Thomson's conclusion that the corpuscles were present in all kinds of matter was strengthened during the next three years, when he found that corpuscles with the same properties could be
produced in other ways--e.g., from hot metals. Thomson may be described as "the man who split the atom" for the first time, although "chipped" might be a better word, in view of the size and number of electrons. Although some atoms contain many electrons their total mass is never so much as 1/1000 that of the atom.

By the turn of the century most of the scientific world had fully accepted Thomson's far-reaching discovery. In 1903 he had the opportunity to amplify his views on the behavior of subatomic particles in natural phenomena when, in his Silliman Lectures at Yale, he suggested a discontinuous theory of light; his hypothesis foreshadowed Einstein's later theory of photons. In 1906 he received the Nobel Prize for Physics for his researches into the electrical conductivity of gases; in 1908 he was knighted; in 1909 he was made president of the British Association for the Advancement of Science; and in 1912 he received the Order of Merit.

Thomson was, however, by no means a scientific recluse. During his most fruitful years as a scientist, he was administrative head of the highly successful Cavendish Laboratory. (It was there that he met Rose Elizabeth Paget, whom he married in 1890.) He not only administered the research projects but also financed two additions to the laboratory buildings primarily from students' fees, with little support from the university and colleges. Except for its share of a small government grant to the Royal Society to aid all British universities and all branches of science, the Cavendish Laboratory received no other government subsidy, nor were there contributions from charitable corporations or industry. A gift from a devoted staff member made possible the purchase of a small liquid-air machine essential for Thomson's research on positive rays, which greatly increased knowledge of the recently discovered atomic nuclei.

Thomson was, moreover, an outstanding teacher; his importance in physics depended almost as much on the work he inspired in others as on that which he did himself. The group of men he gathered around him between 1895 and 1914 came from all over the world, and after working under him many accepted professorships abroad. Seven Nobel Prizes were awarded to those who worked under him. It was while working with Thomson at the Cavendish Laboratory in 1910, for example, that Ernest Rutherford performed the research that led to the modern understanding of the internal structure of the atom. In the process, the Rutherford atomic model supplanted the so-called plum-pudding model of atomic structure; the latter is
known as the Thomson atomic model because of the strong support Thomson gave it for a few years.

J. J. Thomson’s "plum-pudding" model of atomic structure

Thomson took his teaching duties very seriously: he lectured regularly to elementary classes in the morning and to postgraduates in the afternoon. He considered teaching to be helpful for a researcher, since it required him to reconsider basic ideas that otherwise might have been taken for granted. He never advised a man entering a new research field to begin by reading the work already done. Rather, Thomson thought it wise that he first clarify his own ideas. Then he could safely read the reports of others without having his own views influenced by assumptions that he might find difficult to throw off.

Thomson demonstrated his wide range of interests outside science by his interest in politics, current fiction, drama, university sports, and the nontechnical aspects of science. Although he was not athletic, he was an enthusiastic fan of the Cambridge cricket and rugby teams. But his greatest interest outside physics was in plants. He enjoyed long walks in the countryside, especially in hilly regions near Cambridge, where he searched for rare botanical specimens for his elaborate garden. In 1918 Thomson was made master of Trinity College. This position, in which he remained until his death, gave him the opportunity to meet many young men whose interests lay outside the field of science. He enjoyed these meetings and made many new friends.
Assessment

To a large extent, it was Thomson who made atomic physics a modern science. The studies of nuclear organization that continue even to this day and the further identification of elementary particles all followed his most outstanding accomplishment, his discovery of the electron in 1897. Although this new physics has continued to raise more theoretical questions than can be answered at present, from the start it rapidly gave rise to practical applications in technology and industry.