7,549,101. Add these digits, $7 + 5 + 4 + 9 + 1 + 0 + 1 = 27$, and $2 + 7 = 9$.

But we have extended already this article to a greater length than we intended, simply wishing to give the origin and history of the decimal notation as far as it can be traced, and will close by stating that this notation is every way adapted to the practical operations of business, as well as the most abstruse mathematical investigations. In whatever light it is viewed, the decimal notation must be regarded as one of the most striking monuments of human ingenuity, and its beneficial influence on the progress of science and the arts, on commerce and civilization, must win for its unknown author the everlasting admiration and gratitude of mankind.

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THE SCIENTIFIC LABORS OF WILLIAM CROOKES.

Among the active and successful scientific workers of England, at the present time, the gentleman whose portrait we give this month is one of the foremost. Though only in the meridian of his manhood, he has made two discoveries—those of the metal thallium and of the radiometer—which will immortalize his name; while his minor labors in the field of science, both in the laboratory and in the editorial office, are in an unusual degree important and valuable.

William Crookes was born in London, in 1832. His scientific career commenced in 1848, when he entered the Royal College of Chemistry as a pupil of the distinguished chemist Dr. Hoffmann, now of the University of Berlin. He had gained the Ashburton scholarship at the age of seventeen. After two years of study, Dr. Hoffmann appointed him, first, his junior, and then his senior assistant, which post he held until 1854, when he went to Oxford to superintend the meteorological department of the Radcliffe Observatory. In 1855 he was appointed Teacher of Chemistry at the Science College, Chester. In 1859 he founded the Chemical News, and in 1864 he became editor of the Quarterly Journal of Science.

Mr. Crookes's researches were begun while at the Royal College of Chemistry, his first paper, "On the Seleno-Cyanides," being published in the Quarterly Journal of the Chemical Society, in 1851. Since then he has been almost uninterruptedly engaged in private research on subjects connected with chemistry and physics.

In 1861 Mr. Crookes discovered, by means of spectral observations and chemical reactions, the metal thallium; and in June, 1862, and February, 1873, he laid before the Royal Society an account of
its occurrence, distribution, and the method of extraction from the ore, together with its physical characteristics and chemical properties. He also discussed the position of thallium among elementary bodies, and gave a series of analytical notes on the new metal. In the Journal of the Chemical Society for April, 1864, he collated all the information then extant, both from his own researches and from those of others, introducing qualitative and quantitative descriptions of an extended series of the salts of the metal. In June, 1872, he laid before the Royal Society the details and results of experiments which had occupied much of his time during the previous eight years, and which consisted of laborious researches on the atomic weight of thallium.

In 1863 Mr. Crookes was elected a Fellow of the Royal Society. In 1865 he discovered the sodium amalgamation process for separating gold and silver from their ores. (This process was discovered independently, and at about the same time, by Prof. Henry Wurtz, of New York.) In 1866 he was appointed by the English Government to inquire into and report upon the application of disinfectants in arresting the spread of the cattle-plague then prevalent in England. In 1871 he was selected as a member of the English expedition to Oran for observing the total phase of the solar eclipse which occurred in December of that year.

Mr. Crookes commenced his research on "Repulsion resulting from Radiation" in 1872. These experiments were suggested by some observations made when weighing heavy pieces of glass apparatus in a vacuum balance during his researches on the atomic weight of thallium. His first paper on the subject was read before the Royal Society on December 11, 1873, and during the last three years Mr. Crookes has sent six other communications to the society on the same subject. The construction of the radiometer is one result of his investigation. At first it was thought that the movement of the vanes in the exhausted bulb was due to radiation, for no movement took place until the vacuum was so good as to be almost beyond the powers of an ordinary air-pump to produce, and as the vacuum got more and more absolute, so the force increased in power; but Mr. Crookes soon found that at a rarefaction so high that the residual gas was a non-conductor of an induction-current, there was enough matter present to produce motion, and therefore to offer resistance to motion. That this residual gas was not a mere accidental accompaniment of the phenomena was rendered probable both by the experiments of Dr. Schuster and by that of Mr. Crookes, on the movement of the floating glass case of a radiometer when the arms are fixed by a magnet, which was demonstrated to the Royal Society on March 30, 1876. Mr. Crookes has since constructed a special apparatus for measuring the vacuum. A vertical plate, instead of continuously ro-
tating in one direction, as in the ordinary radiometer, is suspended by a glass fibre, which it twists in opposite directions alternately. The movement is started by rotating the whole apparatus through a small angle, and the observation consists in noting the successive amplitudes of vibration when the instrument is left to itself, a mirror and spot of light being employed for this purpose. The results of these experiments leave no reasonable doubt that the repulsion is due to the internal movement of the molecules of the residual gas.

In 1875 Mr. Crookes received the award of a Royal medal from the Royal Society for his various chemical and physical researches; and in 1876 he was elected a Vice-President of the Chemical Society.

Previous to his researches on “Repulsion,” Mr. Crookes began to investigate so-called spiritualism. As far as it extended, his inquiry into the subject convinced him that certain phenomena obtained under test conditions in his own house were due neither to tricks, mechanical arrangements, nor to legerdemain. He inclined to the opinion that the “medium” possessed what Mr. Sergeant Cox calls psychic force, but he had arrived at no definite conclusions as to the cause of the phenomena when he decided to discontinue their investigation.


It is claimed that Mr. Crookes was the first to apply photography to the investigation of the solar spectrum, but his earlier researches were so numerous that it is impossible to refer to them all. We may, however, mention his papers “On the Opacity of the Yellow-Soda Flame to Light of its own Color,” “On the Measurement of the Luminous Intensity of Light,” “On a New Binocular Spectrum Microscope,” and “On the Optical Phenomena of Opals.”