

BERTHOLLET AND PASTEUR.

Notes on Two Famous French Scientists for Whom 1922 Marks a Centenary.

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FROM December 9th, 1748, when Claude Louis, Comte de Berthollet, was born at Talloire, Savery, France, to September 28th, 1895, when Louis Pasteur died at Villeneuve l'Etong, Seine-et-Oise, is more than a century and a half. That century and a half comprise a period more fruitful for the science of France and of the world than any other, perhaps, in the history of this earth.

On November 7th, 1822, Berthollet died at Paris; and less than three weeks later, on December 27th, Pasteur was born at Dôle, Jura. The life-work of these two men, who missed contemporaneity by but a few days, marked the difference between two epochs of science. Both turned from the commercial and practical aspects of chemistry to profounder and more far-reaching researches and discoveries; but Berthollet was a pioneer of the static eighteenth century, Pasteur of the dynamic nineteenth.

At one time a trusted envoy of Napoleon, for whose dethronement he afterwards voted, Berthollet's life was nevertheless almost as entirely devoted to scientific study and achievement as was that of the untitled and obscurely born Pasteur. Think what it must have meant to a young and aspiring chemist, fresh from his studies in Turin, to become associated in Paris with the great Lavoisier! No wonder Berthollet so applied himself, under this inspiration, that by the age of thirty-two he was a member of the Academy of Sciences. Meanwhile he was discovering processes which were to establish industries:—the charring of vessels to preserve water on shipboard; the stiffening and glazing of linen, parent of the modern collar and the happily extinct hard-boiled shirt; the artificial production of nitre; most important of all, bleaching by

means of chlorine. He was the first to analyze ammonia; he was the discoverer of potassium chloride and of fulminating silver. But his chief contribution to chemistry did not come until 1803, when he published his *Essai de Statique Chimique*, which definitely treated chemical phenomena as operating under mechanical laws, and introduced the principle of chemical equilibrium, without which modern chemistry in all its branches would be impossible. Very largely his work, also, is the modern system of chemical nomenclature.

Berthollet served as professor in the Normal School at Paris, where later Pasteur was to complete the education begun at the Royal College of Besançon. But a glance at the academic positions held by the later scientist makes one wonder when and how he found time for original work. Professor of the Lyçee at Dijon; professor of chemistry at the University of Strassburg; dean of the science faculty, which he organized, at the University of Lille; director of scientific studies at the Paris Normal School; director of the chemico-physical laboratory of the Ecole des Hautes Etudes in Paris; permanent secretary of the Academy of Sciences:—small marvel that in 1889, when presumably he was financially able to do so, he resigned all of these duties and honors which still clung to him, to give his undivided attention to the child of his old age, the Pasteur Institute.

And there he who had been at first practically a physicist, had actually founded the science of stero-chemistry, which, treating as it does of the relation of the atoms in molecules, borders so closely on physics, brought to its fruition his great work in bacteriology. Accounting for fermentation by the presence of a micro-organism in the fermenting body, Pasteur's researches were of the greatest value to the brewers and wine-makers of France; and then gained national fame for him as they explained and cured the silkworm disease which was threatening one of the country's most important industries. But he could not stop here; Jenner's earlier discovery that each kind of fermentation was due to a specific ferment, and each disease (apparently) to a specific microbe, led Pasteur to further and further applications of the theory, based also on the researches of Robert Koch.

Fowl cholera; anthrax in sheep and cattle; and then at last, ten years before his death, the specific microbe a culture of which would act as an anti-toxin for rabies in the lower animals and man. When the layman speaks of the "Pasteur cure" it is this treatment

for rabies that he means; but of how much greater significance to the scientific world was the principle on which this particular cure was founded! Sir William Osler, in "The Evolution of Modern Medicine", says of Pasteur: "At the middle of the last century we did not know much more of the actual causes of the great scourges of the race, the plagues, than did the Greeks. Here comes Pasteur's great work. Before him Egyptian darkness; with his advent a light that brightens more and more, as the years give us ever fuller knowledge." From the work of Pasteur, and secondarily of Jenner before him, has grown the whole of serumtherapy, one of the very greatest of all medical accomplishments.

A curious coincidence may be noted here; Edward Jenner, too, died in 1822, the year Pasteur was born.

It is in science and in art that a nation's truest glory lies; let France forget the days and attitude of Napoleon, and turn her eyes back instead to a century ago, when the very year that lost her one great scientist brought her an even greater to spread her fame with his throughout the globe.