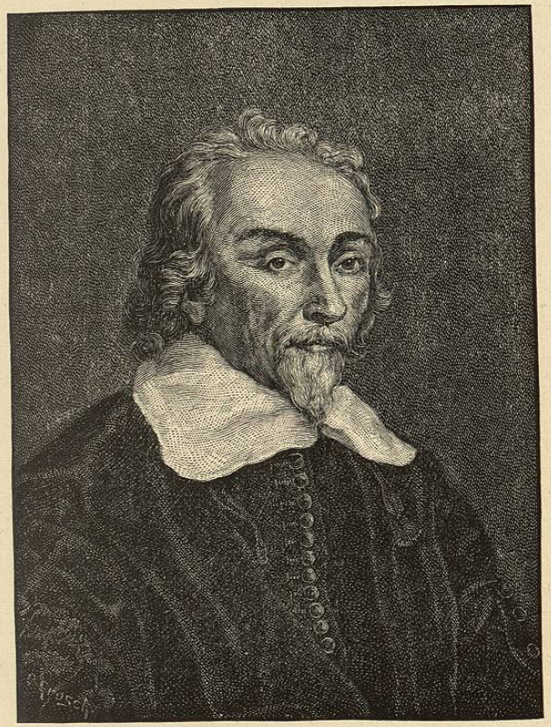
William Harvey

it be, was not even guessed at three centuries ago. We can scarcely realize, indeed, the ignorance of the world in regard to the functions of the various organs of the human body when Harvey began his investigations. For fifteen centuries, ever since the time of Galen (A. D. 130-200), the knowledge of the world in regard to such matters had been at a standstill. It was still believed and taught, as Aristotle and his followers had believed and taught eighteen centuries before, that the liver was the chief engine for the distribution of the blood throughout the animal system, and that that organ sent its fluid matter to the right ventricle of the heart, whence by a sort of suction it was conveyed to the lungs and throughout the body generally by means of the veins. The arteries were supposed to convey to the lungs and to the body generally from the left ventricle of the heart another sort of fluid, subtle and aerial in its character, which was called the "vital spirit," although Galen showed that the fluid which passed from the left side of the heart contained blood as well as vital spirit. But no "periodic circulation" of the blood fluid throughout the body was ever dreamed of, and the utmost amount of circulation that was supposed to take place was a vague sort of "diffusion." The heart was not recognized as an important organ in the blood system at all, but the veins and arteries were supposed to "suck" the blood from the heart and so convey it to various parts of the body. Such were the beliefs which even learned men of science held of the motion of the heart, and of the conveyance of the blood throughout the body, when Harvey first began to study the question.

William Harvey was born in Kent, England, April 1,



WILLIAM HARVEY.

1578, and was the son of a prosperous yeoman. Having been given a good preliminary education at the grammar school at Canterbury, he was sent to Caius college, Cambridge, where at the age of nineteen he received his B. A. degree. Then, having chosen medicine as a profession, he went to Padua, Italy, to study under the learned Fabricius there. Fabricius had discovered in the veins of the human body those little valves whose use we now know to be the prevention of the blood from flowing backward in its return passage to the heart. Fabricius, however, had not discovered the true use of the valves, and the explanation of their use that he put forward did not seem to his young student Harvey to be satisfactory. It was, indeed, Harvey's endeavor to obtain a satisfactory explanation of these valves that suggested to him the larger question of the explanation of the entire motion of the blood, and so led to his own immortal discovery. When, in 1602, Harvey returned to England with his doctor's degree, and settled in London, he brought no little reputation with him, and it was not long before he had gained an excellent practice. Among his patients was Sir Francis Bacon. Later on he was made physician extraordinary to King James, and afterward he was physician in ordinary to King Charles. In 1607 he had become a fellow of the Royal College of Physicians, and two years later physician to St. Bartholomew's hospital. In 1615 he had been made Lumleian lecturer. These were important appointments for so young a practitioner, but Harvey's professional career was continuous in its honors and successes to the end. In the year 1616, a year that may be remembered from the fact that it was the year of Shakespeare's death, he first began to

bring publicly forward in his lectures his views of the movements of the heart and blood. But it was not until twelve years later, in 1628, twenty-eight years after he first began to study the question, that he gave his conclusions to the world in printed form. But when he finally did so he had demonstrated his case so clearly there was no gainsaying it. His theory was at once acknowledged, by all those who took the trouble to examine it, as established beyond doubt. Harvey indeed had left no room for doubt. He had proved his views, not by a citation of authorities, as the wont then was, but by an examination of nature herself. To use his own words, the motion of the heart was asserted to be what he actually saw it to be in living animals. He had taken all branches of the animal kingdom into consideration in his investigation, and dogs, pigs, serpents, frogs, fishes, slugs, oysters, lobsters, insects, the transparent shrimp, and the chick in the shell, had contributed to his proof. In short, so far as an anatomical and physiological theory could be established by actual demonstrations without the use of the microscope (the microsccpe was not then invented), so far had Harvey in 1628 established that theory of the circulation of the blood which is now believed throughout the world.

Harvey's demonstration of his theory was scarcely less complete in its detail than it was in its general principle. He proved that it is the heart that by its muscular contractions squeezes the blood into the arteries, both general and pulmonary, and gives it the necessary impetus for its regular circulation by means of the arteries outward and the veins back again throughout the whole body. He proved that there is no passage between the two sides of the heart (although before his time it had always been believed that there was such a passage), but that one side of the heart is concerned with the reception of the dark blood from the body by the general veins and conveying it to the lungs by means of the pulmonary artery, and that the other side of the heart is concerned with the reception of the bright blood from the lungs by the pulmonary vein and conveying it to all parts of the body by means of the general arteries. He proved, too, that the blood in the arteries and in the veins is the same blood in different stages of its circulation (although it had formerly been believed that the blood in the arteries had been mixed with the subtle fluid called vital spirit), only that the bright blood in the arteries is blood mixed with air obtained in the lungs, while the dark blood in the veins is blood mixed with substance obtained in its passage through the tissues after it had left the arteries. He also proved that the circulation of the blood throughout the system is regular and periodic, corresponding with the beating of the heart and the throbbing of the pulse. Finally he proved that the liver, which for ages had been considered a principal engine in the diffusion of blood throughout the body, was not a factor in the circulatory system at all, the whole force for the periodic movements of the blood through both arteries and veins being obtained from the rhythmical muscular contractions or squeezings of the two sides of the heart. The only part in the whole circulatory system as now understood which he did not explain was the passage of the blood in its progress from the arteries to the veins, through the tissues, by means of the capillaries. He had no knowledge of those minute microscopic ducts that unite the visible and traceable arteries with the visible and traceable

II. WILLIAM HARVEY

1578-1657

BIOGRAPHICAL STUDY

BY WELLINGTON PROUT, M. A.

Seldom does the world think of its debts to the great men of science whose discoveries and inventions have done so much to promote its happiness. Its debt to Harvey, the discoverer of the true motions of the heart and of the circulation of the blood in the living body, it probably remembers as infrequently as any. It is now nearly three centuries since Harvey began to ponder upon the question the solution of which gave birth to the science of modern medicine. This is perhaps a reason why he is so infrequently thought of. Matters that then seemed dark and mysterious, even to the most learned and skillful, are now the common knowledge not alone of childhood but of uninstructed ignorance. It would be difficult indeed to find in any civilized community of our time any one who does not know that the action of the heart in a living body causes the blood to flow in regular periodic pulsations throughout the body. And yet this knowledge, rudimentary and elementary though