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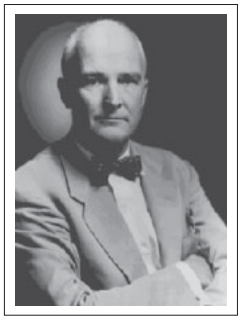
John H. Gibbon Jr., MD: A poet with an idea (1903–1973)



Few inventions dramatically revolutionize the practice of medicine; however, the creation of the heart-lung machine by John Heysham Gibbon Jr. not only succeeded in this goal but also created a whole new field of cardiovascular surgery. John H. Gibbon Jr. was born in Philadelphia on September 29th 1903 to a highly intellectual and prominent family. His mother, Marjorie Young, was a descendant of the one of the founding fathers of the United States, while his father, John H. Gibbon Sr., graduated from Jefferson Medical College in 1891 and became a Professor of Surgery [1]. John H. Gibbon Jr. (JHG Jr.) was the fifth generation of his family to enter medicine and the third surgeon; however, his contribution to the field of cardiology and surgery will be remembered forever.

The Gibbon family raised their children with great discipline and instilled in them a fondness for written expression, which became a major interest of JHG Jr. [2]. He attended Princeton University between 1919 and 1924, during which time he had a period of extensive personal growth and developed new interests in philosophy and religion. Upon graduation, JHG Jr., following in his father's footsteps, entered Jefferson Medical College. During his first year at medical school he seriously contemplated becoming a poet; however, his father convinced him to continue with medicine while pursuing his writing skills. It was his father's encouragement that allowed the world to experience his great scientific mind as well as his ease of written expression.

JHG Jr. completed medical school in 1927 and went on to Pennsylvania Hospital to pursue his two-year internship. During his training Gibbon was introduced to clinical research while studying the effects of sodium and potassium chloride in the diet of hypertensive patients [1]. He decided to expand his interest in clinical investigation by undertaking a research fellowship at Harvard University under the renowned thoracic surgeon Dr. Edward D. Churchill. This decision would change Gibbon's academic and personal life forever.

In February 1930 JHG Jr. began working in the Harvard laboratory where he met Dr. Churchill's research assistant, Mary Hopkins [3]. She was an intelligent woman who shared many of the same interests as Gibbon. Their marriage in March of 1931 began a lifelong personal and professional collaboration which would result in the development of the first heart-lung machine.

The most significant day in the academic life of JHG Jr. occurred on October 3rd 1930, which would change the history of cardiology and surgery forever. Dr. Churchill was asked to evaluate a patient complaining of chest discomfort who had been on customary bed rest for two weeks after a cholecystectomy [4]. The patient suddenly became dyspnoeic and semi-conscious prompting Dr. Churchill to make the diagnosis of a pulmonary embolism. She was to be taken to the operating room once emergently indicated for a, nearly always fatal, Tendelenberg operation, also known as a pulmonary embolectomy. JHG Jr. was assigned to monitor the patient's condition overnight, and when, in the morning, her blood pressure could not be measured she immediately went to surgery. Dr. Churchill performed a pulmonary embolectomy in only six and a half minutes; however, the patient died. This critical event prompted Gibbon to dedicate his life to constructing the heart-lung machine. He recalls: "...during the 17 hours by this patient's side, the thought constantly recurred that the patient's hazardous condition could be improved if some of the blue blood in the patient's distended veins could be continuously withdrawn into an apparatus where the blood could pick up oxygen and discharge carbon dioxide, and then pump this blood back into the patient's arteries. Such a procedure would also lend support to the patient's circulation while the embolectomy was being performed" [4].

Once back in Philadelphia in 1931, JHG Jr. began practicing surgery at Pennsylvania Hospital while also conducting preliminary research with his wife in developing the heart-lung machine. In 1934

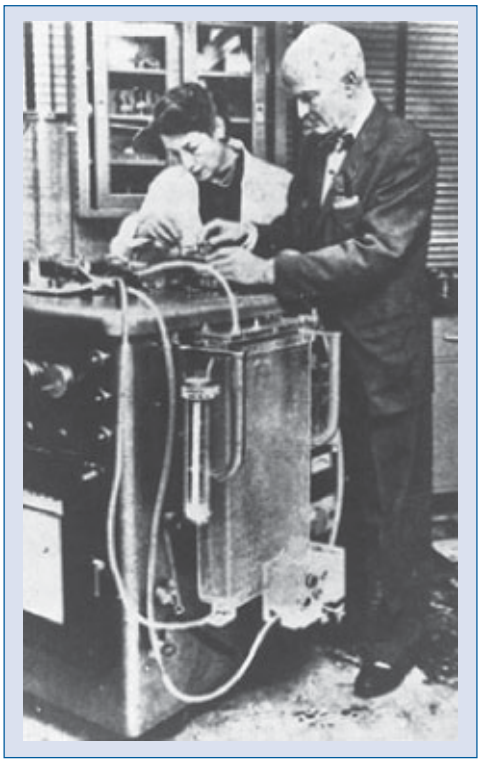


Figure 1. John and Mary Gibbon with the heart-lung machine.

he was granted another research fellowship with Dr. Churchill in Harvard to further the work on his machine — an idea which was met with a fair amount of scepticism [1]. JHG Jr. and his wife fully dedicated their time to constructing the heart-lung machine from very rudimentary materials. Their initiative proved to be a success with the first experiments allowing cats to survive 2 hours and 51 minutes with complete occlusion of the pulmonary artery [5]. After coming back to Philadelphia JHG Jr. and Mary continued their work on extracorporeal circulation, trying to solve problems encountered with the machine. The biggest obstacles were the hemolysis which occurred when blood ran through the machine and the inability to oxygenate large volumes of blood. Gibbon's work, however, was interrupted in January of 1942 when he volunteered for duty in World War II and was sent to the South Pacific until 1945 (Fig. 1).

He returned to work on the heart-lung machine at Jefferson Medical College in 1946. At this time JHG Jr. had numerous residents and students working in his research laboratory, which led to his meeting with Thomas J. Watson Sr., the chairman of IBM [3]. E.J. Clark was a medical student interested in Gibbon's research, and through his father-in-law's connections he introduced Watson to his mentor. Watson was very enthusiastic about perfecting the heart-lung machine with JHG Jr., and a great collaboration was born. Throughout this time Gibbon, along with his residents and IBM engineers, made great improvements in the existing machine including increasing the size of the oxygenator and the addition of a filter to prevent the formation of fibrin clots, among many others. Mortality rates associated with the experiments had decreased from 80% to 10% during these collaborative years.

The time had come for clinical application of the heart-lung machine, and such a day came in February 1952 [6]. A 15-month-old girl with clinical diagnosis of an atrial septal defect causing heart failure was attached to the heart-lung machine. Once her heart was opened no defect was found, and before the surgeons had time to explore further, the patient died. At autopsy the patient was found to have a patent ductus arteriosus, thus greatly emphasizing the need for diagnostic cardiac catheterization.

On May 16 1953 the first successful operation utilizing the heart-lung machine was performed in a critically ill 18-year-old female with a large atrial septal defect confirmed by cardiac catheterization [6]. She was kept on the heart-lung machine for 26 minutes while the defect was closed and subsequently recovered uneventfully living well into the 1980s. As JHG Jr. recalls, his idea "...was born and developed into a reality and finally was employed successfully in an operation on the heart of a human patient twenty-two years later, an event that I hardly dreamed of in 1931" [7]. Over the next decade JHG Jr. was approached by the Mayo Clinic to reproduce his machine and perform intracardiac procedures. He shared his knowledge, and throughout many subsequent years the Mayo Clinic performed hundreds of operations, thus significantly contributing to the new field of intracardiac surgery.

JHG Jr. fully retired in 1967 and focused on his other life passions including poetry, painting, tennis, and his family and friends. It was on February 5 1973 that he suffered a fatal myocardial infarction while playing tennis with his wife, Mary. John Heysham Gibbon Jr. dedicated his life's work to developing the first successful heart-lung machine. What stemmed from an idea to help a patient with a pulmonary embolism became the key to a new field of intracardiac procedures. He will be forever remembered as one of the founding fathers of cardiovascular surgery.

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