Professor Alain E. Bussard was among the pioneers who led the development of the immunology discipline at a time when it needed to find a niche of its own, distinct but relevant to microbiology and medicine. Today, the discipline of Immunology has its own identity and is taught as a separate subject at university level. Alain Bussard’s contributions towards this remarkable achievement at the Pasteur Institute in Paris, nationally within France and internationally within and beyond Europe were truly exemplary.

Alain Bussard was born on May 25, 1917, in Paris, France. His mother, Odette Maurel, alias Marion Gilbert, pianist, novelist, translator and journalist was highly committed to the feminist cause and his father, Leon Bussard, was an agronomist. Alain Bussard began his scientific career in 1939 when he was recruited as a technician by Paul Langevin, director of ESPCI (Ecole Superieure de Physique et Chimie Industrielles de la ville de Paris). Then came the second world war in which Alain Bussard played a very active role in the resistance movement.

In 1943, he took a position with the CNRS (Centre National de la Recherche Scientifique) in Robert Courrier’s laboratory of Endocrinology at “College de France” in Paris. Two years later, in 1945, he came to the Pasteur Institute to the laboratory of Pierre Grabar, a pioneer of immunochemistry, and worked on anti-hormone antibodies (Ab) essentially to develop an immunoassay to detect pregnancy. One of his first research publications dates back to 1947 [1]. It was during his stint in the Grabar laboratory that he met his life-time friend Jacques Oudin, a brilliant immunochemist, known for his seminal work on Ab allotypes and idio-types.

Alain Bussard defended his doctoral thesis in 1950 and was encouraged by Jacques Monod (French Nobel prize winner with François Jacob and André Lwoff in 1965) to pursue post-doctoral studies in America, funded by a grant from the Rockefeller Foundation. Although Alain was based at the University of Madison, Wisconsin, he visited many different laboratories (California Institute of Technology, Harvard University, etc.) and interacted with many pioneers in the field of immunology, such as Elvin Kabat and Joshua Lederberg with whom he retained life-long contact; Alain was very impressed by the quality and dynamism of research in the USA.

Upon his return to France in 1953, he took up the position of assistant professor in the laboratory of Jacques Monod to work on anti-enzyme Ab. At that time, knowledge about immunology was rapidly expanding and, in France, the Pasteur Institute was the only place to do fundamental, quality research in this developing field. Alain Bussard worked with Pierre Grabar and Jacques Oudin, the leaders in the characterization of Ab specificities by principally using gel immunoprecipitation and electrophoresis.

Alain Bussard, combining both these procedures, developed the novel technique, electrosyneresis (also called
Alain Bussard quickly progressed from immunochemical and molecular studies of serum Ab to the cellular studies of Ab-secreting cells. His first article dealing with Ab-secreting B cells in rabbits was published in 1960 [3]. The subsequent paper was published in Nature [4] and cellular immunology not only got the attention of the international research community, but also led to greater recognition of the Pasteur Institute. This seminal work on Ab-secreting cells led to the creation of a laboratory of Cellular Immunology in 1963 with Alain Bussard as its Director. Numerous scientific personalities of immunology visited and collaborated with the laboratory, including Joseph Inghram, Alistair Cuningham, Sir Gustave Nossal, and Cesar Milstein. These interactions contributed to precise, single cell studies that ultimately led to advances in the understanding of the mechanisms of Ab production.

These pioneering studies led to a new era that was named by some scientists as “the Bussard phenomenon,” a genuine demonstration of the famous notion of serendipity (which, interestingly, has no translation in French) thought by Alain Bussard to play a crucial role in scientific findings. He discovered that B cells from the peritoneal cavity of a non-immune mouse are highly enriched in a subpopulation that secrete autoantibodies. The characterisation and functional analysis of these cells (now called B1a cells), which are distinguishable from the majority of conventional B cells (now called B2 cells), has constituted a saga that is still ongoing. The cellular characteristics of B1a cells at the morphological, ontogenetical, functional, phenotypical and anatomical distribution levels raised new questions that ultimately resulted in the delineation of the differentiation pathways of B cells. From Alain Bussard’s first publication on mouse peritoneal B cells in 1966 [5] to his last in 1986 [6], Alain’s approach was always highly methodical and stringent and involved the development of new methodologies. For example, his laboratory was one of the first in the Pasteur Institute to use hybridoma technology to generate monoclonal Ab (published in 1978) [7]. When applied to peritoneal B cells, it allowed the sequencing of the Ab produced by hybridomas leading to the identification of novel V H genetic elements. Peritoneal B cells continue to provide new insights as highlighted by the recent description of regulatory B cells [8].

Alain Bussard’s personality, and his organized, curious, sharp, engaged and open mind to any technical or conceptual situation were matched by his desire to promote immunology at both national and international levels. Alain Bussard was an active witness to the creation of the French Society of Immunology (SFI; http://www.sfi-immunologie.com.fr) by Pierre Grabar in 1966 and Alain became the 3rd president of the SFI in 1971. Through the aegis of SFI, he contributed towards the creation of the International Union of Immunological Societies (IUIS; http://www.iuisonline.org) in 1969 and was the first president of the European Federation of Immunological Societies (EFIS; www.efis.org), which he founded in 1975. He was involved in various scientific committees at the Pasteur Institute, as well as with CNRS and INSERM (Institut National de la Santé Et de la Recherche Médicale). He held several international positions, including WHO expert in Immunology, member of EMBO, editor of the journal Immunochemistry (now Molecular Immunology) and founder of Immunology Letters, one of the two official journal of EFIS (the other being the European Journal of Immunology). He also created a databank of immunocloners (hybridomas, T-cell clones, etc.) and participated in the creation of a research and development platform specifically devoted to the production of hybridomas at the Pasteur Institute.

Being a noble spirit, both philosophically and scientifically, with literary taste from his mother and scientific talent acquired from his father, Alain Bussard remained glued to the advances in science. His last contributions were epistemologic, the Darwinian and Lamarckian aspects of immunology, and the impact of the prion story on the transmission of the molecular information (published in 2005) [9].

After his retirement from the Pasteur Institute in 1985, Alain Bussard lived with his wife Jacqueline Pages-Bussard at the French Riviera, South France, and was actively engaged in literary, cultural and scientific pursuits until the end. For us, having had the privilege of being his students, Alain Bussard was truly an exceptional scientist who created an original school of thinking in immunology that has greatly influenced our practice of science in advancing knowledge.

Alain thoughtfully engaged in advancing knowledge and always showed genuine concern for the better, in all situations and for all. French and European immunology is heavily indebted to him and his vision led to where...
imunology is today. Thank you very much Professor Bussard for who you were and what you did for ‘science’ and the community at large. The legacy of your school of thinking is rare but it lives through your students into the 21st century for all the time to come.

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