



# Baruj Benacerraf

## 1920–2011

Kenneth L Rock

The scientific community mourns the loss of Baruj Benacerraf, who died recently at the age of 90. He had a long and storied career, to which we owe much as a field.

Baruj Benacerraf was born in Venezuela to Spanish Moroccan and Algerian parents. When he was 5 years of age, his family moved to Paris, France, where he received most of his primary education. The original plan was that Baruj would go into law and assist the family business in Venezuela, but then Hitler intervened. His family heard the distant drumbeat of war, and as they were Jews in Paris, his father had the foresight to move the family back to Venezuela in advance of *Fall Rot*, the Nazi invasion of France. As his schooling had been unexpectedly interrupted, Baruj was sent to the United States to complete his education. It was after his transfer to Columbia University that his interest in science was kindled and he decided to apply to medical school, rather than pursuing law. However, he had not appreciated how difficult a goal this would be for someone of his ethnic background at that point in history. Rejected from all the medical schools to which he had applied, he gained last-minute admission to the Medical College of Virginia only through the intervention of a friend's father.

The war again intervened when all medical students were drafted into the army; as part of this process, he became a naturalized US citizen. He was allowed to complete school and an internship at Queens General Hospital in New York City, then was called into active service late in the war and was stationed in France. Discharged at the age of 27, he had to decide what he would do next. He had a personal interest in immunology, having suffered asthma as a child, and he had experienced a taste of experimental science in medical school; these experiences persuaded him to try his hand at research. He applied to and was accepted into Elvin Kabat's laboratory for a postdoctoral fellowship and subsequently trained with Bernard Halpern in France. Once at the bench and making discoveries, he said "I was hooked for life as surely as if I had become addicted to heroin."

Fresh out of his training, he was recruited by Lewis Thomas to New York University. At this juncture in his life, illness in his family required him to not only run his own laboratory but also look after the family business, including running a bank in New York in his spare time. He was very successful at both. He remained in academics ever after, serving 10 years at New York University, 2 years at the US National Institutes of Health and then 26 years at Harvard Medical School.

Baruj's contributions to immunology were enormous. Early in his career, Baruj and his colleagues observed that when they immunized outbred guinea pigs with simple antigens, not all of the animals responded. Rather than dismissing this result as a technical problem, Baruj recognized its potential importance and sought to determine whether there was an underlying genetic basis. Together with his associates, Baruj showed that there is a single genetic locus, functioning in a Mendelian autosomal dominant manner, that encodes molecules

that control immune responses to many polypeptide antigens. In the end, it turned out that these immune-response genes were the major histocompatibility complex (MHC) class II genes. This discovery proved to be at the heart of many critical immunological processes, including MHC restriction, alloreactivity and autoimmunity. In recognition of this seminal discovery, he was awarded the 1980 Nobel Prize in Physiology or Medicine together with George Snell and Jean Dausset. When asked by a reporter how he had made this brilliant discovery, he replied "I was lucky," and indeed he believed that chance observation together with the prepared mind was critical to the advancement of science. However, those who knew him appreciated that his mind was more prepared than most.

Over the ensuing decades, Baruj continued to elucidate the roles and mechanisms of the products of MHC immune-response genes, including MHC-restricted T cell interactions and alloreactivity as a cross-reaction of antigen-specific T cells, to name just a few. He also predicted that MHC molecules bind antigens specifically and provided some of the initial experimental support for this concept. He was of course proved right. His was one of those rare discoveries that has a profound effect on the direction of research in the field over subsequent decades, and it is still being worked on to this day. Baruj made many additional contributions to the field beyond immune-response genes, including the discovery of Fc (cystallizable fragment) receptors.

Over the course of his career, Baruj trained over 80 students and fellows, and he often said that he felt this was his most important legacy. He knew how to identify talented people, school them in the rigors of the scientific method, stimulate creativity and encourage their independence. He viewed the training relationship as an intimate collaboration and deeply enjoyed this experience. The record shows that in this endeavor, as in his science, he was very successful. Among his trainees were William Paul, Lloyd Old, Victor Nussenzweig, Ronald Germain, Steve Burakoff and Robert Finberg, to name just a few.

Throughout his career, Baruj assumed major leadership positions. He was elected president of the American Association of Immunologists, the Federation of American Societies for Experimental Biology and the International Union of Immunological Societies. He was director of the Laboratory of Immunology at the US National Institutes of Health, chairman of the Department of Immunology at Harvard Medical School and president of the Dana-Farber Cancer Institute. Wherever he went, immunology flourished. He was a skilled administrator, and his background in business and banking served him well—for example, he turned the fortunes of the Dana-Farber Institute around from an institution with a paltry endowment of US\$1.5 million to a clinical and scientific powerhouse with an endowment of hundreds of millions of dollars.

The field says goodbye to one of its giants. Our condolences go to his daughter Beryl and the rest of his family.

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