

HEINRICH ANTON DE BARY: NACH EINHUNDERTFÜNFZIG JAHREN

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We began to scribble this tribute to De Bary in January 1981, an even hundred and fifty years after he was born on January 26, 1831 in Frankfurt am Main in Germany. This was seven years less than 100 years after he died in Strasbourg on January 19, 1888.

We feel humbled in the presence of this great scientist who looks out at us from the portrait shown here. In our imagination we can transport ourselves to Strasbourg and become two of his ninety students instead of scientific sons of the fourth and fifth generation of descent. Being imaginary students, we can almost see the twinkle in those china-blue eyes as he straightens us out on a point of science.

In this chapter we will pay tribute chiefly to the man, and not so much to his giant contributions to science.

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A. De Bary

THE SCIENTIFIC BASE OF THE GREAT MAN

One needn't go far in expressing profound admiration of his advances in science. While still in medical school, he researched the smut and rust diseases of cereals. He published these in his classic book *Die Brandpilze*. We like his statement that he was addressing the book to farmers as well as to botanists. He published this book when he was only 22 years old, an age when most pathologists are still clinging to alma mater's skirts. In this book he took out after the dogma of spontaneous generation. Standing on the shoulders of earlier plant pathologists like Tillet and Prévost, he succeeded in squelching the myth. In Paris Pasteur was doing the same for human disease.

For 200 years farmers had been telling the intellectuals that wheat rust comes from barberries. The yokels were laughed out of court. Everybody who knew anything knew that wheat rust is an excrescence pushed out of

a sick plant. De Bary, being a nonconformist, thought it worthwhile to check the farmers out. They were right.

He decided on a valuable innovation. He would follow the fungus around its life cycle from spore to spore. He started with the spore on the barberry, inoculated wheat, followed the mycelium to the summer spore, then to the winter spore, and sporidia. These he inoculated onto barberry and followed the mycelium back to the original spore. He had to have a few new terms: heteroecious, aecidiospore, uredospore, teleutospore, and sporidium.

He helped to settle the role of the cell in living things by showing that protoplasm of slime molds could exist without cell walls. He made important contributions to the knowledge of sex in fungi. This would eventuate in B. O. Dodge's demonstration that *Neurospora* could be bred like corn and fruit flies but had the distinct advantage that each product of meiosis could be isolated separately. Using this, Tatum and Beadle got a Nobel prize.

Some have labeled De Bary as a mycologist. He was really as much a physiologist and plant anatomist. He examined the concepts of parasites and saprophytes and straightened them out. He even studied the substance from *Sclerotinia* that causes decay in carrot tissue, many years before the classic experiments of L. R. Jones in this field.

During De Bary's childhood the potato blight was ravishing the potatoes in Ireland and producing panic and famine. It was occurring in Germany, too, but not so destructively. Being a physician, his father seems to have been intensely interested in this dreadful episode.

In his research days De Bary remembered the dining table discussions of his father. He set out to study the disease. Using the same kind of inoculation techniques that had been so successful on barberries, he showed that the fungus, then called *Peronospora infestans*, causes potato blight and is not caused by it as the spontaneous generation crowd proclaimed. He was the first to discover zoospores in the fungus and renamed it *Phytophthora infestans*. The Tulasnes had always looked for the perfect stage of their fungi. De Bary asked himself, "Where is the perfect stage of *Phytophthora infestans*?" He searched through thousands of smears and sections of diseased potato tissues but never found it. This caused him trouble with the proponents of spontaneous generation. They jeered at him, saying, in effect, "You say that like begets like, but you can't find the eggs of the potato fungus. Your theory must be wrong." De Bary, with remarkable prescience, was sure that the oospores would be found, and they were found, about 50 years after he died, by G. P. Clinton, a scientific grandson via W. G. Farlow.

THE PERSONAL BASIS OF HIS DISTINGUISHED CAREER

His Antecedents

We broke with tradition by discussing his science before discussing his family, but now we must deal with his family. One wonders how the French name, De Bary, got to Frankfurt am Main in Germany. The answer is that his family were formerly of the Walloon aristocracy in the French-speaking part of Belgium. His ancestors had left Belgium in the latter part of the 17th century for religious reasons.

Anton's mother was Emilie von Meyer, whose family included at least two scientists of note. She produced five sons. Anton, himself, married Antonie Einert, daughter of Dr. Wilhelm Einert, a lawyer of Leipzig. One wonders if their similar names, Anton and Antonie, did not bring them together. They produced four children, Wilhelm, August, Marie, and Hermann. Farlow [see Sparrow (5)] writes of a jolly Christmas with the family.

Anton's father, Heinrich De Bary, was a well-to-do physician. In the elder De Bary's day, physicians were often botanists because they depended so heavily on herbs and simples to treat disease. De Bary's father was clearly interested in plants. He leased from the city an island in the river, Main, where he set up what might be called a private botanical garden. We know that he grew fruit trees, and we suspect that he grew medicinal herbs as well, perhaps foxglove, belladonna, and the like. Here in this garden the elder De Bary taught his son what he knew about botany.

The father very much wanted his son to be a physician and sent him through medical school to prepare him. The old man's botanical schooling eventually overrode the medical one, however, and Anton became a botanist. Plant pathologists were called botanists in those days. He practiced medicine for only two months before going off to Tübingen to become a full time botanist.

The Outflowing Chemotactic Current

As we figuratively labor in his laboratory, we marvel at the chemotactic current flowing out from the great mind of De Bary over thousands of miles of dry land and wet water to attract such men as Woronin from Russia, Farlow from Boston, and Schimoyama presumably from Japan. Our fellow students have tried to describe the source of this current in the tributes they wrote when he died.

We think it both tragic and ironic that De Bary died of cancer of the mouth. This was the mouth that had spoken so brilliantly to so many people, students, townspeople, and farmers. His voice has been stilled for nearly a century but his words live on in his writings.

What His Students Have Said

What did those say who moved upstream in that chemotactic current toward its source in our man, Heinrich Anton De Bary? We obtained much data from Sparrow (5), who penned a beautiful tribute to De Bary only a few weeks before he died. Sparrow lists 10 students from De Bary's days at Freiburg, Germany (1855–1866), 15 more from his days at Halle (1866–1872), and 65 more while he was at Strasbourg (1872–1888). If you assign these students to the midpoint of his sojourn at each place, accumulate them, and plot a graph, you have an elegant semilog plot which reveals that his students increased logarithmically with time. He died in 1888. If you extrapolate the curve eight more years to a normal retirement at age 65, you find that he might have had as many as 240 students altogether. Of course, he could not fit that many into his laboratory and would have had to turn some away.

Some of his students that we know best in plant pathology are Woronin, Millardet, Brefeld, Beijerinck (of virus fame), Farlow, Alfred Fischer (who fought the polemic about bacteria with E. F. Smith), Klebs, Koch, Wakker (the Dutchman of bacterial fame), Marshall Ward, and Winogradsky. American plant pathology almost wholly descends from Farlow and Marshall Ward.

Marshall Ward (6) wrote of De Bary's book, *Morphologie und Physiologie der Pilze, Flechten, und Myxomyceten*:

He gave definiteness to the scattered knowledge (of these organisms) and enabled the scientific world to see clearly the remarkable power of the man. His unflinching honesty and rigorous self criticism and modesty had already attracted the attention of all who came into contact with him or his work. Now, however, was seen the marvelous grasp of details, and the power of logical generalization which he possessed, and thenceforward the name of De Bary was associated with the leadership of the modern school of biologists, he was himself creating.

Ward refers further to

... his keen appreciation of all good work ... his humorous and never malicious disposition; of his sharp, but always just criticism of anything pretentious. ... Quaint, he often was, in speech and manner, but the impressive truthfulness of his nature, the earnestness of his teaching, and the absence of any striving after effect gave to his very quaintness, a charm and dignity, the influence of which will never be forgotten so long as his pupils live.

An anonymous writer (1) had this to say:

His simple frank manner attracted all who came into his laboratory: he was especially kind to young workers, and had a pleasant way of leading them through the intricacies of a difficult investigation. The enthusiasm of those who have worked in his laboratory is always evident; they speak with one accord of his modesty, sterling justice, sympathetic criticism, and total absence of littleness.

What His Later Admirers Have Said

The American Phytopathological Society demonstrated its appreciation by asking its most distinguished member, Erwin F. Smith (4), to write a tribute for page 1, number 1, volume 1 of its new journal. Smith wrote:

Of all the personalities contributing to the advancement of plant pathology from its crude beginnings to the present time, none has been more interesting than that of De Bary, none more productive of important results. De Bary cleared the way for all that has followed in plant pathology and we must ever think of him with that reverence due a great master.

Rodgers (3), in his biography of Erwin F. Smith, spoke glowingly of De Bary: "Gifted with brilliance and the instincts of a cautious experimental scientist, one who refused to admit or advance any truth as fact until proved by strict technical procedures. . . ."

Sparrow (5) writes: "With his students De Bary was good company and popular, for they speak of his affability, sparkling humor, and ready wit . . . [he] would regale [them] with fascinating and charmingly told anecdotes of botany and botanists. . . ." Sparrow quotes Reess (2) who said that if a student thought he was further advanced than he really was, De Bary could open his eyes with strong criticism.

Sparrow says that he could not express his feelings any better than in the words of De Bary's student, Reess (2), who wrote: "De Bary's scientific fame will survive in the immortal glory of his works, but whoever was fortunate enough to know him personally, will remember him as a man in whom were united in a rare and harmonious manner scientific greatness and earned success, with modesty, nobility, and true integrity."

We wouldn't even attempt to say it better.

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