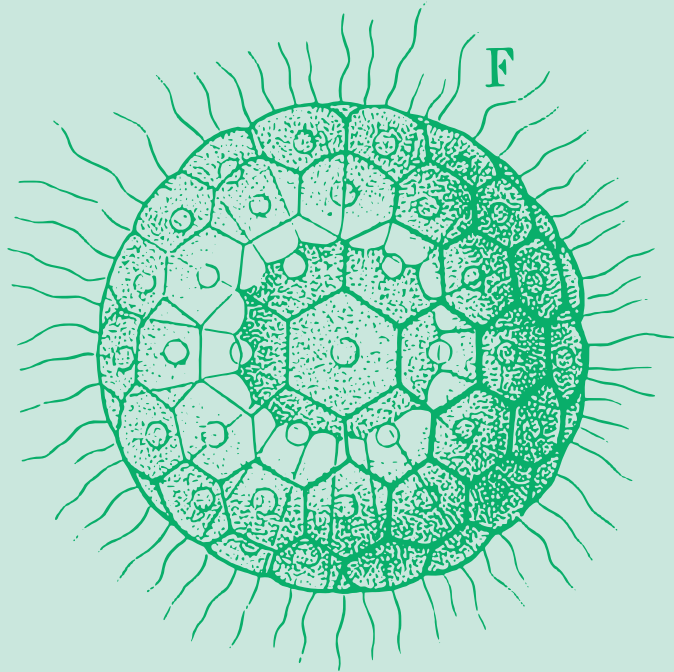


# PREFACE BY THE AUTHOR



*“The progress of science is based not only on research but also on tradition.”*

— Ernst Georg Pringsheim<sup>1</sup>

THE YEAR 2023 MARKS the 200<sup>th</sup> anniversary of the birth of the eminent botanist Nathanael Pringsheim, a contemporary of Charles Darwin. This anniversary motivated me to write the present book. Pringsheim’s impressive work and exciting life deserve to be brought out of the shadows of the past into the light of the present and made known to a wider public.

Pringsheim was a member of that group of 19<sup>th</sup> century German botanists who brought about a paradigm shift in their science. Instead of focusing only on the collection and cataloging of plants, they turned their attention to the process of plant development. As such, Pringsheim was among the modernizers of botany. The movement he helped to shape created a new understanding of the unity of all plants and even between plants and animals. The new findings were closely linked to the study of previously neglected organisms. Until then, **higher plants**, in particular flowering plants, had been the main focus of observation. With the progress of microscopy technology, however, it became now also possible to study so-called **lower plants** down to the cellular level. These include algae, and mosses.

Nathanael Pringsheim was finally able to observe in an inconspicuous alga how male gametes swam specifically toward female “egg cells” and united with them. This discovery, made in 1855, was a scientific sensation. It was the first direct observation of the **fertilization** process in a living organism. Until then, algae had been considered as sexless organisms. Pringsheim’s discovery, however, showed that sexuality is a universal principle of life. This made him famous overnight and, even as a young man, a member of the prestigious Prussian Academy of Sciences.

- **HIGHER AND LOWER PLANTS** Vascular plants possessing specialized “vascular tissues” that help transport water and nutrients, are to be distinguished as “higher plants” from “lower plants” such as algae or mosses, which are considered less complex in structure.
- **FERTILIZATION** Fusion of male and female gametes (“sex cells”) during sexual reproduction.

Pringsheim, a leading botanist of the 19<sup>th</sup> century, was not only an excellent scientist, but also a skilled and successful strategist. As a member of the widely branched Jewish Pringsheim family, which later produced many other renowned natural scientists, he represented a prime example of a German professor in his day. He was liberal, but at the same time patriotic, and as an outstanding specialist, he enjoyed a great international reputation.

His name is closely associated with Berlin, Jena, and Helgoland: in Berlin, he brought botany to blossom; in Jena, he established one of the world's first plant physiology institutes; and on Helgoland, he successfully initiated the first German marine research station.

This book aims to do justice to Nathanael Pringsheim's multifaceted life and work. To classify his work, I begin with an account of the upheavals in the scientific worldview of the 19<sup>th</sup> century. In addition, I illuminate the scientific theories that shaped Pringsheim's work. In the next step I dedicate myself to his scientific career. His family and his founding activities are also discussed. Then I highlight the pioneering scientific achievements of Nathanael Pringsheim. Special attention is given to his research on the sexuality of **algae**. Finally, I describe his role as the driving force behind the first marine biological research institute on Helgoland.

In such a project, the use of technical terms cannot be completely avoided. These will usually be explained the first time they occur and will also be through the book index.

Rudolf Ladenburg, one of the fathers of quantum mechanics, was a grandson of Nathanael Pringsheim. My uncle, the chemist Nils Jaeger, was Rudolf Ladenburg's nephew. Since I have studied the fascinating life and work of Nathanael Pringsheim more intensively, I have been captivated by it. I hope that with this book I will succeed in allowing readers to share some facets of this remarkable life.

— **ALGAE** Organism that uses sunlight through photosynthesis to produce food. Algae have a nucleus and live in water or moist land environments. Despite their similar characteristics, they are not descended from a common ancestor.

This book could only be written with the active support of many friends and colleagues as well as my family.

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*Dresden, February 2024*

*Andreas Deutsch*

#### ANNOTATION

- 1 Quoted from Mollenhauer 2003, 157.