Maria Anna Faust
1930-2021

Dr. Maria Anna Faust (neé Spillenberg), aquatic microbiologist and research botanist emerita from the Smithsonian Institution, passed away on April 24, 2021, at the age of 91 from complications related to a stroke.

Maria Anna Spillenberg was born in Budapest, Hungary on April 21, 1930, with her twin sister Marta, to Anna Maria and George Spillenberg. Her childhood was spent in a small, close knit Hungarian village near Budapest. As a young girl, she endured the onset and duration of World War II. Her father, a medical doctor, was called into the Hungarian military and left his young family behind until after the war.

Maria received her Bachelor of Arts degree in 1951 from the Agricultural University of Budapest where she met Miklos Faust, the love of her life. They wed on July 17, 1954, and welcomed their daughter, Judit, two years later. The onset of the communist political system in Hungary provided many challenges which lead to the abrupt departure of Maria's family to Yugoslavia in 1957. They remained there in a refugee camp for 20 months awaiting asylum to the United Kingdom, Australia or the United States, whichever country would accept their petition first. Upon arrival to the United States, Maria, Miklos, Judit and Maria's parents worked toward a new life making their way from humble beginnings. The Faust and Spillenberg families valued education and felt it was a way of securing their futures. Consequently, Maria earned a master's degree in microbiology at Rutgers University in 1962, followed by a doctoral degree in aquatic microbiology at the University of Maryland at College Park in 1970.

Maria's earliest published work (Faust, 1969*) was on the effect of respiratory inhibitors and membrane-active compounds on bacterial motility followed by comparisons between bacterial and algal utilization of orthophosphate in estuaries. Her research interests lead to a postdoctoral fellowship at the Smithsonian Radiation Biology Laboratory (SRBL) in Rockville, MD in 1971 where Maria worked with Dr. Elizabeth Gantt. Maria accepted a position at the SRBL in 1973 but it was closed a few years later. Maria was reassigned and continued her work as aquatic microbiologist at the Smithsonian Environmental Research Center (SERC) in Edgewater, MD. There her focus was on a series of prescient water quality studies. These included the relationship between land use practices and fecal bacteria in soils, organic carbon release by phytoplankton, transport of bacteria in temperate marsh sediments, tidal transport of microorganisms in brackish marshes and nutrient fluxes in tributaries of the Chesapeake Bay. Maria's dedicated work set the stage for subsequent environmentally relevant efforts to inform management decisions. One of her contributions at SERC was a pontoon boat duly named, the *Queen Maria*. This barge is still afloat and functioning in the same capacity it was designed for – a stable work platform for sampling on Muddy Creek and the Rhode River.

In 1983, at a juncture in her career, Maria attended an intensive three-week workshop in Advanced Phytoplankton Taxonomy. This was the third in a series of courses which started in 1976 upon the recommendation of the SCOR Working Group of Phytoplankton Methods that was organized in Drobak, Norway by the Marine Botany Section of the

Plate1: Field photos. A. Smithsonian's Field Station at Carrie Bow Cay (CBC), Belize 2009; B. CBC May 2001; C. Smithsonian's Field Laboratory at Ft. Pierce, FL July 2009; D. CBC May 2004 (front row: Marta Nicholas, Maria Faust, Pat Tester, R.J. Chrost; back row: Sabrina Varnam, Bert Pfieffer, Steve Kibler, Mark Vandersea); E. Celebrating Maria's birthday at the Smithsonian's Field Laboratory at Ft. Pierce, FL July 2009. (front row Maria, Pat Tester; back row Steve Kibler, Chris Holland, Mark Vandersea); F. Maria at the Smithsonian's Field Station at Carrie Bow Cay (CBC), Belize; G. Maria collecting dinoflagellates at South Water Cay, Belize, May 2002; H. Maria isolating dinoflagellates at CBC May 2004; I. Morning exercise, "Give me 10 more." CBC May 2003 (Sabrina Varnam, Mark Vandersea, Steve Kibler, Wayne Litaker, Maria); J. CBC sunset

University of Oslo. There Maria and her cohorts, many of whom would become leaders in their field, spent long days and some long nights under the tutelage of outstanding instructors, Grethe Hasle (diatoms) with assistance from Eric Syvertsen, Karen Steidinger (dinoflagellates) with assistance from Karl Tangen, Jahn Throndsen (flagellates), and Berit Heimdal (coccolithophores), with lectures from Barrie Dale.

From that time forward dinoflagellate taxonomy and ecology were Maria's major foci and she never looked back. In 1987 she joined the Department of Botany at the Smithsonian National Museum of Natural History, Museum Support Center (NMNH-MSC) in Suitland, MD where she remained until her retirement in 2009.

A series of studies on *Prorocentrum* (cysts, morphology, growth, photosynthesis, descriptions of nine new species) were published from 1985-1993. Much of her material and inspiration was from exploring the mangrove islands of Twin Cays, Belize, near the Smithsonian's Carrie Bow Cay Field Station on the Meso-American Barrier Reef system located fifteen miles offshore from Dangriga. Maria would return there over thirty times in her efforts to understand the taxonomy and ecology of tropical dinoflagellates more thoroughly. Work from 1994-1998 included her overview of benthic, toxic dinoflagellates and a review their life histories, broadening her interest to include *Ostreopsis* species and mixotrophic feeding by benthic dinoflagellates.

Maria's paper on sand-dwelling dinoflagellates in 1995 described a new *Gambierdiscus* species that she named *Gambierdiscus belizeanus*. This was only the second species of what, at that time, was thought to be a monospecific genus. The only other described *Gambierdiscus* was the type species, *G. toxicus*, described in 1979 by Adachi and Fukuyo from the Gambier Islands in French Polynesia [1]. Her discovery would be followed in rapid succession by the description of three other new species found in the Pacific by Mireille Chinain in collaboration with Serge Pauillac of the Institut Louis Malardé, Tahiti [2]. One of these species, *G. polynesiensis*, would turn out to be the most toxic *Gambierdiscus* known to date. Maria's exquisite electron micrographs and

Plate 2: Professional. A. Maria Spillenberg 1953; B. Participants of the SCOR Working Group on Phytoplankton Methods organized in Drobak, Norway by the Marine Botany Section of the University of Oslo IOC Phytoplankton Course, 1983. Maria is in the front row, sixth from the right; C. Graduation from Rutgers University 1962; D. Phycological Society of America. Award of Excellence, Williamsburg, VA August 2004 (Wayne Litaker and Maria). E. Maria receiving PSA's Award of Excellence, Williamsburg, VA August. F. Smithsonian's Marine Science Symposium, Washington, DC 2007 (Maria and Wayne Litaker); G. Maria in New Caledonia 2008; H. Poster Session, SI's Marine Science Symposium 2007; I. Maria's office at the Smithsonian National Museum of Natural History, Museum Support Center in Suitland, MD, 2005 (Maria and Pat Tester); J. Maria in her lab at the Smithsonian National Museum of Natural History, Museum Support Center in Suitland, MD, 2005

her exacting organizational and record keeping skills in this study would prove most valuable a few years later.

The SEM stub containing preserved material for the GTT-91 isolate of *G. toxicus* from the 1999 study was deposited in the Type Collection of Dinoflagellates at the National Museum of Natural History, Smithsonian Institution. In 2009, when no live *G. toxicus* cells could be found, this SEM stub was used as the source for the redescription of the species and designation of an epitype [3]. This monograph described four new *Gambierdiscus* species and provided line drawings, high resolution light micrographs and SEMs of all extant *Gambierdiscus* species as well as sequence data that were deposited in GenBank. This comprehensive publication was subsequently selected for the Tyge Christensen Award for the best paper published in the International Phycological Society's journal *Phycologia* in 2009.

In her 40 year career, Maria published over 120 research papers. A notable publication, *Identifying Harmful Marine Dinoflagellates*, [4], is a taxonomic identification and reference guide of 48 harmful marine dinoflagellate species with descriptions of plate and thecal morphology and excellent scanning

Continued on page 22

research, and her teaching and supervision of technicians, Gertrud received the honorary title, "Mother of Limnology in Brazil".

In the early 1980s, she organized annual UNESCO-sponsored courses on tropical water resources for lake managers. This initiated a project on Lake Kariba, an impounded reservoir that was created on the Zambezi River. Gertrud built up a research station at the Zimbabwean lake side which has been appreciated by a large number of students and scientists.

West of Lake Kariba, the Okavango River forms the world's largest inland delta in the Kalahari desert. The hydrobiology of the delta has been explored under Gertrud's leadership. The algal flora of the Negril and Black River Morasses, Jamaica, the Namn-Guom Reservoir, Laos, and the lakes around Ho Chi Minh City in Vietnam also became parts of her field research.

Alone, or together with colleagues, Gertrud has discovered 91 species and varieties of algae and published approximately 100 scientific papers. Three algal species have been named after her; the chrysophytes *Synura cronbergiae* P.A.Siver and *Mallomonas cronbergiae* Piatek, the cyanobacterium *Chroococcus cronbergiae* Komárek & E.Novelo and the cyanobacterial genus *Cronbergia* J. Komárek, E.Zapomelová & F.Hindák, with four species.

During her expeditions around large parts of the world, Gertrud collected thousands of algal samples that were carefully studied and photographed. Gertrud was the co-author of a handbook on cyanobacteria, published by IOC-UNESCO and ISSHA in 2006, in which many of her beautiful images of cyanobacteria were presented. Her wide-ranging knowledge on harmful algae made her an important investigator when solving the cause of waterborne outbreaks.

She lived a life in wonder and curiosity with the constant passion for the diversity of life in a drop of water. Her work was characterised by professionalism, integrity and courage. Gertrud never hesitated to raise her voice against bullying or abuse of power.

Gertrud generously shared her knowledge with students and colleagues from all over the world. She was always keen to build up local skills in the countries she visited and therefore supervised a large number of master's and doctoral students from Asia, Europe and Africa. She opened her and Stig's home to them with warmth and her generous hospitality.

Gertrud is mourned by her husband Stig, seven children and families, twelve grandchildren, relatives and friends from all over the world.

We are many who will sincerely miss Gertrud and who feel a genuine and profound gratitude for what she has meant to us and to numerous others.

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Continued from page 20

electron and light micrographs. This contribution from the US National Herbarium has been widely distributed to and valued by students and researchers worldwide. It assisted in Maria's love of teaching. She freely shared her expertise and experiences with others by inviting them to visit her laboratory, sharing the research facilities at Carrie Bow Cay, Belize or spending time with them at the poster sessions at meetings. She was a strong supporter of the International Society for the Study of Harmful Algae and a member of the American Phycological Society, attending their meetings and contributing regularly. In 2004, Maria was honored by the Award of Excellence from the Phycological Society of America. Maria will be remembered for many things including her technically exquisite and artistic microscopy (SEM). But most of all she will be remembered for her old-world graciousness, her kindness, her wisdom and eagerness to share her knowledge and passion for dinoflagellates.

*See a full list of Dr. Faust's publications at *https://scholar.google.com/citations?user=VWu61XsAAAAJ&hl=en*

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