CHARLOTTE MANGUM (1938–1998)

Many of us will remember Charlotte Preston Mangum in our own special ways as a teacher, a scientist, a colleague and a friend. In the last two years of her life, as she struggled in her illness, she continued to focus on her true passion, her science. This passion made her the complete person that she was. She lived this passion in her students at the College of William and Mary, where she spent her entire career. A philosophy major at Vassar College, she went on to earn advanced degrees in zoology. She encouraged this kind of intellectual breadth in her students. At last count there are more than 70, many of us starting out as undergraduate students working in her laboratory. She made her mark as a scientist in more than 135 publications. She also made her mark on her students and her friends as seen in the comments below. The comments begin with a very special remembrance from Larry Wiseman, Charlotte's fellow faculty member in the Department of Biology at the College of William and Mary.

Charlotte was the epitome of a comparative physiologist. Her scientific questions often included different animal species as a variable. Her intelligence and her vast knowledge of different kinds of organisms inspired her students to ask the 'right' questions. Our knowledge of respiratory pigments, their evolution and how they function in organisms in different conditions has greatly increased because of Charlotte's contributions.

I am lucky to have been one of her students. I am also lucky to have called her a colleague and a close friend. I will miss her.
Lou Burnett, W&M B.S. 1973, Grice Marine Laboratory, College of Charleston

'Probably not a day goes by that I don't think of my friend Charlotte. She picked me up at the airport for my job interview and seminar at William and Mary. It was 1971 and I was just 26. She was barely 30. The ride to campus was brisk. We would share many more. Ten years later, when I became Chair, she told me, "Larry, this will kill your scientific career". Charlotte could be direct, but she was right. Wherever I went, they didn't know me of course, but invariably someone would come up to say, "Give my best to Charlotte". William and Mary Biology and Charlotte Mangum were a perfect fit.

I valued her directness. Whenever I bothered her with bureaucratic requests, she responded either immediately or not at all. If it was important, she responded, sometimes at length and in writing. If it was unimportant, she filed it quickly in the file of no return. But maybe she saved it, for she saved everything. Her house, her basement, was a jigsaw puzzle of things old and new. She knew where every item was stored. "The wall toward the road, half way down, third shelf up, behind the orange box, in the metal tray". With those directions she would send me down to retrieve something she needed, something small but necessary for the current project.

Charlotte's final gift to me was entrusting her life to my care. She had, more than a year before she died, given me "medical power of attorney", a humbling responsibility. In the final three weeks, I stayed at her house and we fed the birds outside her windows, checked the pier partially destroyed by strong winds, cooked dinner together, watched movies or sports on television, swapped stories of science and academic politics, of ballet and books, fondly recalled our friends and their

exploits, and sat in silence happy to be together, unhappy for the reason of our final closeness. Mostly, silence.

My friend Charlotte was strong and she taught me through her stoic courage and strength something about myself that no one else had ever taught me. Something I cannot put in words, but something that changed me permanently. The last night, back in the hospital emergency room, we said little. We held hands. She had given me her trust and one last brisk ride. She changed my life. I miss her.

Larry Wiseman, Department of Biology, College of William and Mary

'Charlotte never forgot her roots as a classically trained zoologist, and her command of a vast body of knowledge about invertebrate biology made it clear to her students that there was no excuse for a physiologist not to know the natural history, embryology, anatomy, evolutionary affinities, etc., of one's research animals. Indeed, what stands out in her writings is her ability to tie together diverse facts about an animal's biology in order to understand its physiology in an evolutionary and ecological context.'

Chuck Booth, W&M M.A. 1977, Eastern Connecticut State University

'Charlotte and I first crossed paths in Aarhus, Denmark, where she had a firm friend in Kjell Johansen. It was a daunting experience for me as a young Postdoc to meet such a name out of the literature. However, all my fears were dispelled after the first 'Elephant Beer' together; from then on, Charlotte was a good friend and an exceptional colleague. I remember a wonderful New Year's Eve we all spent together after the Baltimore American Society of Zoologists meeting with friends from the United States and France where champagne was mixed with good wine from the Pfalz. In the months before Charlotte died, I decided to write to her and express my thanks and respect for her over all the years. She has given many of us support, advice and inspiration over the years, not only as a scientist, editor and reviewer, but also as a person. Charlotte's reply to me was, as usual, happy and cheerful, and one can only admire a person who has the strength of character to clean up her desk and get all those student papers published before as she said "that's it". We shall all miss her wisdom, knowledge and helpful "suggestions" in the years to come not only over our e-mails and paper reviews, but as a champion of invertebrate comparative physiology.'

Chris Bridges, University of Düsseldorf

'The greatest compliment that has been given me was to be called one of Charlotte's students. As a scientist she was outstanding, as a mentor she conveyed the enthusiasm and skills to make learning a lifelong process, and as an individual she was a true friend.'

Ken Callicott, W&M B.S. 1991, Stanford University

'I am sure that I echo many of her former students when I say that Charlotte played an instrumental role in shaping my career as a scientist. As an undergraduate in Charlotte's laboratory, I learned what "doing science" was all about. In recent years, I have come to realize that this was true for many others. I am proud to have my name included among those for whom Charlotte Mangum was a mentor and role model.'

Mary Alice Coffroth, W&M B.S. 1975, State University of New York at Buffalo

'Charlotte was instrumental in showing me the world of experimental invertebrate physiology. Her guidance and insistence on experimental rigor laid the foundation for a delightful experience on the intracellular signaling mechanisms of invertebrate vision in the horseshoe crab.'

D. Wesley Corson, W&M B.S. 1971, Medical University of South Carolina

'Near the end of my undergraduate years at William and Mary, Charlotte "suggested" she'd like to accompany me on the York River when next I went out in the boat – just to see the different sites where mussels dwelt. This being in the vicinity of her house, she knew the waters, so when a squall blew in while we were across the river, she could point the way along the shoreline. I will forever recall the two of us huddled in her small boat (the *Diopatra*) making that run in 2-foot waves across the York River.'

Peter L. deFur, W&M B.S. 1972, M.A. 1977, Virginia Commonwealth University

'Most of all I remember her energy. I will never forget a field trip where we chased a blue crab through a freshwater swamp in stifling heat with Charlotte leading the hunt. We finally trapped it to Charlotte's cries of delight, for this would enable her to study its osmoregulation under extreme conditions. Nothing dampened her enthusiasm for biology. She inspired us all.'

Helena M. Galvão, W&M B.S. 1979, M.A. 1984, Universidade do Algarve, Portugal

'Charlotte's lasting contributions to science are there for all to see in her published papers and in the professional activities of her numerous students. Many former students presented summaries of their recent work at a day-long symposium in Williamsburg in February 1997, an occasion marked by personal warmth, professionalism and a lack of false sentiment. The students honored Charlotte in a style that epitomized her own career. We remember Charlotte as a dear friend with whom we shared many early experiences, both foolish and serious, as we made our independent ways into science.'

Judy and Fred Grassle, Rutgers University

'There are two things I remember most about conversations with Charlotte. The first is what I consider to have been her signature statement when talking about science and formulating hypotheses. "You have to do the experiment". It speaks to the fact that above everything else, Charlotte's work was solidly grounded in rigorous experimentation. The second

thing I remember is her famous retort, "But, what about ....?" This indicated another of Charlotte's remarkable strengths, her broad and seemingly encyclopedic knowledge of biological and physiological diversity, especially among the invertebrates. If ever there were someone who took the word "comparative" seriously, it was Charlotte Mangum.'
Ray Henry, W&M B.S. 1974, M.A. 1978, Auburn University

'To individuals like myself, who overlapped with Charlotte in our graduate student and/or postdoctoral years at Duke University, what most impressed us, from very early on and throughout her career, was the unutterable uniqueness of her knowledge. It was a special blending of two main streams. First, deep knowledge of phylogeny, especially invertebrate phylogeny (I have seen her discuss evidence for major phylogenetic bifurcations with systematists for hours on end; what other physiologist could do that?) and, second, an equally good understanding of comparative biochemistry and physiology, with emphasis on integrative physiology. I could never quite figure out the origin of this, but I have always suspected that its fountainhead was a profound interest and sound training in invertebrate zoology early in her career, followed by curiosity and enquiry into how things worked. Whatever the source of her knowledge, many of us have always believed there was no one else anywhere else who knew the things she knew. I always viewed this as her precious gift to our field. This is what I will always think of when I think of Charlotte Mangum.'
Peter W. Hochachka, University of British Columbia

'I entered the College of William and Mary in 1965 intending to become a biologist. Little did I know then what those aspirations would mean. My research career began, literally, when Charlotte wrote at the bottom of an invertebrate zoology project report, "See me about continuing this work". For me, this was a fundamentally important invitation. I doubt I would have become an academic researcher had it not been for Charlotte's encouragement, friendship and leadership by example. There are many who followed us early members of her group who illustrate her talent for encouraging the development of the abilities of others.'
Richard Hoffmann, W&M B.S. 1969, State University of New York at Albany

'Charlotte and I were almost exact contemporaries and were friends and colleagues for about 28 years. I'm not sure where we met, most likely at an ASZ meeting. For many years, she and I and Ann Kammer were the only women present at the DCPB divisional meeting; she helped give me the courage to start speaking up. As a junior faculty member at City College, I was responsible early on for running the seminar program, and of course I invited all my friends, and Charlotte was near the top of the list. Afterwards, the students stayed in our apartment until almost midnight talking with her, and not only about the polychaetes that had been the subject of her seminar.

I considered Charlotte a repository for all kinds of knowledge and was never surprised by the diversity of topics she would bring up and discuss in depth. As we all know, she was direct and blunt at times and did not suffer fools gladly. Her high standards for science were legendary – a compliment from Charlotte was worth two from anyone else. However, her sense of humor and ability to enjoy science and life were extraordinary – she was the one who closed the bar at night during the ASZ meetings. And I will never forget the night in Hachioji, Japan, where Charlotte, Nora Terwilliger, Nancy Sanders and I sat around in our kimonos laughing and drinking scotchy-water. Her passing has left a large hole in the fabric of comparative physiology, but her legacy of students and colleagues will help to begin the mending.'
Linda H. Mantel, Willamette University

'Charlotte was always been, and continues to be, an inspiration to me. When I think of Charlotte, I always recall a feeling of endless opportunity. When discussing with her my rather naive ideas on what was my fascination at the time (anaerobic energy metabolism), Charlotte always said, "Do the experiment". There were no "buts" "ands" or "ifs". Every idea was an opportunity, and every experiment an adventure. For this, I shall always be grateful.'
Christopher Nicchitta, W&M B.S. 1981, Duke University Medical Center

'I entered William and Mary with what I thought was a very specific career focus to become a marine biologist and help save the Chesapeake Bay. I had no idea what academic science was and how close I was to being able to do original work. That was Charlotte's greatest gift to me, that there were any number of fascinating questions out there that could be answered with an experiment that I might be able to conceive and carry out with rigor and discipline and eventually publish. What a revelation for a naive 19-year-old! What a discovery; indeed, what a gift!'
Ken Paynter, W&M B.S. 1980, University of Maryland

'It always seemed that science and pleasure were synonymous with Charlotte. Having a beer with Charlotte usually led to some type of scientific enlightenment. Her wonderful work speaks most eloquently of her dedication, integrity and caring.'
David Scholnick, W&M M.A. 1989, Eckerd College

'Some of us arrived at the College of William and Mary over 30 years ago as undergraduates interested in biology but really did not know where this would lead us. What it took was an assistant professor who, by her example and direct involvement, showed us the possibilities of a career in research and teaching. Others among us arrived at the College as first-year graduate students already committed to such a career, attracted by the opportunity to work with a distinguished professor of truly international repute. What we all got was a lasting respect and affection for a remarkable mentor and friend

who impacted our scientific and personal lives in so many ways.'
Malcolm Shick, W&M B.S. 1969, M.A. 1971, University of Maine

'Charlotte was a close friend for many years. We taught together in the Invertebrate Zoology course at Woods Hole, we roomed together at annual meetings of the American Society of Zoologists, and we visited each other at our homes in Virginia, Tennessee and Massachusetts. Her knowledge of invertebrates and invertebrate physiology in particular is legendary. Charlotte was a person whose extraordinary intelligence combined with level-headedness gave her clear insights into issues and their resolution. The excellence of her science is too well recognized to require further comment, and it was no surprise when she was elected President of the Society for Integrative and Comparative Biology. She and my husband served together on the U.S. National Committee for Physiological Sciences and he also was a great admirer of her sensible thinking. On top of everything, she was fun to be with. What a pleasure it has been to have had as a friend someone whose intelligence, good sense and good humor reaffirm what is best about having friends. Comfortable, reliable friends. I will grieve her loss for years to come.'
Dorothy Skinner, Oak Ridge National Laboratory (ret.)

'One of my favorite images of Charlotte is that of raconteur. Good biologists are storytellers, and she was one of the best. She specialized in mystery stories, not so much who-done-its as how. She collected her data and questioned her colleagues for details. She would easily resume a conversation after a two year hiatus as though she'd never laid the topic aside, or suddenly call and ask, fully expecting an immediate answer, "What was the P_{50} of that chiton blood you looked at fifteen years ago?" Her extraordinary memory allowed her to keep the threads of multiple intertwined plots, dealing with topics such as hypersalinity, hypoxia and hemocyanin, moving forward over the years while the plot evolved until she had woven together a reasonable conclusion.'
Nora Terwilliger, University of Oregon

'Although I was not a student of Charlotte's in the conventional sense, I always considered her to be a mentor as well as a collaborator and friend. Frequent visits between Williamsburg and Richmond affirmed common interests, including the design of T-shirts that poked fun at our own work on ion regulation. A couple of weeks before she died, she sent me one of those T-shirts with a note that she hoped that I would wear it. Of course I will, complete with stains that might be blue crab hemolymph. Even after I moved to the midwest, less frequent conversations continued, picking up where we had left off months previously. Charlotte was always searching for connections, intently interested in and supportive of the work of others. Thanks, Charlotte! You are missed greatly.'
David Towle, Lake Forest College

'I am lucky to have been one of Charlotte's graduate students. She taught me about academic research and teaching through her example of professionalism and dedication to science. My fascination with environmental physiology and marine biology was nurtured by her intelligence, insights and remarkable enthusiasm for studying animals in their environmental settings. Perhaps more importantly, I learned what a good time I could have with friends who were also doing science! I will always be grateful to Charlotte for her mentoring.
William E. Zamer, W&M M.A. 1978, Lake Forest College