

Benjamin P. Flower (1962–2012)

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Benjamin P. Flower, a gifted paleoceanographer and marine geologist, supportive colleague, and dedicated educator at the University of South Florida (USF) College of Marine Science (CMS) passed away on 1 July 2012 from complications related to a rare genetic immune dysfunction, Common Variable Immunodeficiency. He was 49 years old. During his brief illness, Ben's love of life and boundless high spirits were an inspiration to his family, friends, and colleagues. He exhibited remarkable courage and kept his sense of humor in face of adversity. Ben's intellectualism and enduring love of science remained intact, even in his last hours.

Ben's paleoceanographic and paleoclimatic research focused on the role of ocean circulation in past global climate change on decadal through orbital timescales. He employed oxygen and carbon isotopes and trace metals in foraminifera extracted from ocean sediments to understand Earth's changing climatic environment and biota. He was a pioneer in recognizing the value of pairing foraminiferal magnesium/calcium-based paleotemperature and oxygen isotope data to determine the past oxygen isotopic composition of seawater. His multiproxy approach provided insights into the phasing of Late Quaternary climatic and hydrologic change. Despite his propensity for seasickness, Ben participated in eight oceanographic research cruises, including two Ocean Drilling Program expeditions on the *JOIDES Resolution*.

Ben was first inspired by the problems and challenges of understanding past climate change and paleoceanography as an undergraduate geology major at Brown University, in Rhode Island. In 1985 he completed a senior thesis on the Neogene paleoceanography of the North Pacific under the supervision of Brown geology faculty R. K. Mathews and W. L. Prell. After teaching high school and coaching soccer for 2 years, Ben moved west to begin his Ph.D. research with Earth science faculty member Jim Kennett at the University of California, Santa Barbara (UCSB). As a graduate student, Ben tackled several important research questions that remained central to his lifelong paleoceanographic research program: meltwater forcing of abrupt Late Quaternary climate change and the Cenozoic evolution of the Antarctic and global climate system.

Upon arrival at UCSB, Ben began to investigate the influence of North American continental plumbing changes on the latest Pleistocene climate development using sediment records from Orca Basin in the

Gulf of Mexico. He was a key contributor to the pivotal paper published in *Nature* in 1989 (W. S. Broecker et al., 341, 318–321, doi:10.1038/341318a0), positing major changes in the oceanic conveyor system related to continental-scale meltwater diversions. These studies continued throughout his career, leading to a better understanding of the mechanisms of abrupt oceanic and climate change, including those of the last deglaciation.

During his Ph.D. studies, Ben documented major changes in deep ocean circulation and recognized its importance in the development of the modern ocean-climate system. He was among the first to recognize how changes in intermediate waters acted as both trigger and feedback in global climate change, including the expansion of the East Antarctic Ice Sheet. He discovered the existence of sensitive relations between global carbon reservoirs and the climate-ocean system during the Middle Miocene climate transition (16–12 millions of years ago). He was also the first to produce stable isotopic records from the Miocene-age Monterey Formation in California. The isotope data supported the hypothesis that episodic increases in organic carbon burial, together with large-scale changes in ocean circulation, may have contributed to Middle Miocene global cooling. In 1993, Ben completed his Ph.D. dissertation, entitled "East Antarctic Ice Sheet development, global carbon cycling, and deep water evolution in the southwest Pacific during the Middle Miocene climatic transition from 16 to 12 Ma." His classic 1994 synthesis of Middle Miocene terrestrial and marine data published with Kennett is one of the most highly cited papers about this major Cenozoic climate transition, which is when Antarctica's ice sheets expanded and the oceans became colder at a time of relatively low atmospheric carbon dioxide.

From 1995 to 1997, Ben was a postdoctoral researcher at the University of California, Santa Cruz (UCSC). Ben, UCSC professor Jim Zachos, and others used stable isotopes of benthic foraminifera preserved in deep-sea sediments to identify Milankovitch-scale climate oscillations across the Oligocene-Miocene boundary, another significant period of Antarctic ice growth.

In 1998, Ben joined CMS at USF as an assistant professor in geological oceanography. He was awarded tenure in 2004, and he was promoted to full professor in 2012. While Ben's research primarily focused on paleoceanographic questions, he recently had began working in close collaboration with scientists at USF and Eckerd College,



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in Florida, to assess the impact of the 2010 BP Deepwater Horizon oil spill on the sediments and deepwater communities of the west Florida shelf and slope.

During his USF career, Ben mentored 14 graduate students, including 8 doctoral students. He worked closely with graduate students, training them to be future colleagues, and in 2012 he received a prestigious graduate mentoring award from USF. Ben also inspired numerous undergraduate interns working in CMS's productive and nurturing "Paleo Lab." Ben's efforts and vision helped develop the Paleo Lab into a collaborative and collegial environment where students, technical staff, and faculty members work together to answer important biogeochemical questions.

Although his scientific accomplishments were substantial, Ben was most proud of his three young children: Nora Jade, Miles Dervin, and Ramsay. Ben was a loving and involved father, and he will be dearly missed. Ben was also an accomplished athlete. He played tennis competitively at Brown, was an avid soccer player, and was a member of the national champion Santa Barbara Condors ultimate frisbee team. In ultimate frisbee, players are responsible for playing fairly, refereeing themselves, and upholding the "spirit of the game." Ultimate players believe strongly in honest and respectful play. Ben was a special person: kind; caring; hardworking; honest; and dedicated to his family, friends, and colleagues. In Ben's personal and professional life, he truly embodied the "spirit of the game." Indeed, he embodied AGU's core value of "unselfish cooperation in research."

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