

GUEST EDITORIAL

The 2014 FUN Achievement Award

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The JUNE edition of the FUN 2014 Workshop Proceedings at Ithaca College in 2014 is dedicated to Carol Ann Paul, who died in October 2014. The following provides background on her career achievements as a neuroscience educator, and is based on our letter for her winning nomination for the 2014 FUN Lifetime Achievement Award. Carol Ann was Emeritus Instructor in Neuroscience Laboratories at Wellesley College. As colleagues who have worked directly with her, we understand the major contributions she has made not only at Wellesley, but also to the broader neuroscience education community through her work with FUN, the Journal of Neuroscience Education (*JUNE*), Project Kaleidoscope, The Teagle Foundation, and the publication of *Discovering Neurons: The Experimental Basis of Neuroscience*. Carol Ann received the *FUN Neuroscience Educator Award* in 2002 and the *JUNE Editor's Choice Award* in 2004, and served as a counselor (2002-04) and Secretary (2009) for FUN. These and other contributions are described in more detail below. Because of the significant impact Carol Ann has had on undergraduate education in neuroscience, we nominated her with admiration and enthusiasm for a FUN Lifetime Achievement Award.

Carol Ann served on the faculty at three undergraduate institutions: Williams College (1973-1980), Harvard University (1980-1983) and Wellesley College (1983-2010). In all of these positions, Carol Ann specialized in laboratory training of undergraduates in biology, with a particular emphasis on physiology and neuroscience. At Wellesley, Carol Ann was a founding member in 2007 of the independent Neuroscience Program, which evolved from the interdepartmental Psychobiology (1968-1997) and Neuroscience (1997-2007) Programs. As a result, faculty are appointed directly to Neuroscience Program and do not share appointments with other departments, which has allowed the design and implementation of a new core curriculum in the neuroscience major. Carol Ann played an integral role in planning this curriculum, which is composed of introductory (NEUR 100), intermediate (NEUR 200) and advanced (NEUR 300) courses; NEUR 100 and 200 both include state-of-the-art laboratory experiences that have been widely applauded by students and faculty alike. In many cases, Carol Ann conceived of the laboratories, planned these and carried the projects through to completion. In other cases, a faculty member had a concept that Carol Ann pursued, to create an experience that incorporated the stated learning goals. While faculty in



Carol Ann Paul
1948-2014

the Neuroscience Program at Wellesley work as a team to create and maintain the curriculum, Carol Ann was *the* driving force behind the laboratory experiences in the core sequence. However, only three years after the establishment of the new Neuroscience Program, Carol Ann suffered a devastating stroke as a result of a familial heart condition, cutting short her career.

Prior to her illness, Carol Ann was involved in a wide breadth of academic endeavors, all centered on her love of neuroscience. She published many peer-reviewed papers, most of which were focused on neuroscience education, and particularly enjoyed interviewing prominent neuroscientists, which were the basis for several articles published in *JUNE*. She also was a Principle Investigator on a long list of grants for development of curricular tools in neuroscience from the National Science Foundation, as well as many intramural awards through Wellesley's HHMI funding. She also participated in workshops for Project Kaleidoscope and FUN, presenting her latest laboratory curriculum ideas.

Carol Ann was a true scholar, committed to the idea that research endeavors go hand-in-hand with educational excellence. Not to be undone by her failing health, she decided to pursue a master's degree at the Boston University of School of Public Health. Her master's research project resulted in a prominent publication on the effects of alcohol consumption on brain size in humans, published in the *Archives of Neurology* (a JAMA journal). In an interview at that time, Carol Ann explained her interest in this topic: *"Is there a beneficial effect of consuming small amounts of alcohol on normal decline in brain volume, as is found in the cardio-vascular system? It is known that, on average, brain volume declines at about 1.9% each decade. I wanted to know if consuming small amounts of alcohol reduced this normal decline with aging.... To my surprise, after adjusting the data for variables such as age, sex, body mass index and other cardiovascular variables, there was a significant negative linear relationship between alcohol consumption and brain volume. Thus it can be concluded that there is no beneficial effect of low alcohol consumption in reducing normal decline in brain volume."* (<http://web.wellesley.edu/PublicAffairs/Releases/2008/101408a.html>) Perhaps not surprisingly, the *Archives of Neurology* publication received national coverage, including exposure on NPR and other major news outlets, with attention-grabbing headlines such as *"Drinking Shrinks the Brain."*

At Wellesley, a generation of students benefited from Carol Ann's enthusiasm for laboratory teaching and her curricular innovations. Among these, she created a magnetic resonance imaging laboratory with faculty in the Chemistry Department that was incorporated into an advanced neuroscience course in the spring of 2010. She also organized a laboratory experience with Computer Science faculty for the intermediate core course, in which students use a tabletop computer interface to explore bioinformatics relevant to a specific genetic mutation in mice that is the topic of the first few weeks of labs in this course. It is very clear that over a long history at Wellesley College, Carol Ann never tired of change, of encouraging a rapid evolution in the curriculum, of finding the most tantalizing questions in neuroscience and creating effective laboratory experiences for our students. She always found a way to bring together the right people and tools to "make it happen." Passionate about constantly bringing new ideas into the laboratory curriculum, Carol Ann taught by "doing."

Carol Ann always brought tremendous strength to her role as a teacher in the classroom, as evidenced by student comments and the popularity of her lab sections over an extensive career at Wellesley. However, perhaps her most significant legacy is her contribution to curricular reforms, such as those mentioned above, in the teaching of neuroscience to undergraduates. While Wellesley students have been primary beneficiaries of her efforts, the impact of Carol Ann's work in developing and disseminating ideas for exciting learning experiences reaches far beyond the Wellesley community. Evidence of these contributions is clear in *Discovering Neurons: The Experimental Basis of Neuroscience*, a book that was

conceived and compiled by Carol Ann. Several of the chapters describe experiments that she devised and "tested" on our Wellesley students. The content of other chapters was contributed by colleagues at other institutions who supported this project. Carol Ann reworked contributions into a consistent, readable style, and wrote several chapters that related to laboratory innovations at Wellesley. Leafing through *Discovering Neurons*, Carol Ann's commitment to pedagogy in experimental neuroscience is obvious. Her goal was to share effective approaches for teaching undergraduates in the neuroscience laboratory, and to provide the simplest and most direct experimental tests of fundamental questions about the nervous system. She made efforts to include experimental options that did not require sophisticated instrumentation or expensive reagents, so that less well-endowed institutions could launch an experimental neuroscience curriculum. Parts of each chapter are directed to the instructor, and other parts to the undergraduate. And, although this book was published many years ago, it has become a classic and maintains its popularity --- to the extent that Cold Spring Harbor Laboratory Press has made selected chapters from this book accessible as individual monographs with electronic access via PubMed and Medline. As a result of her contributions to neuroscience pedagogy, she was invited, along with other national leaders in neuroscience education, to serve on site visits and in training workshops (1995, 1998, 2001, 2005) for Project Kaleidoscope (PKAL).

Carol Ann's tireless advocacy for undergraduate neuroscience education led to her involvement in a variety of organizations cited. Among these was a faculty workshop that she organized in July 2006, sponsored by FUN and financed by funds from an NSF award she had at that time. Its success inspired Wes Colgan, one of us (BRJ), Ron Hoy and Bob Wyttenbach to restart yearly CrawDad faculty workshops in 2011 and to develop with Stefan Pulver, the CrawFly workshops starting in 2012. Short faculty teaching workshops in 2013 at Tillotson College in Austin and at Pomona College came from the same inspiration. These national faculty workshops were directly inspired by Carol Ann's vision to give educators new tools in student neuroscience laboratories, as she did with the original Bowdoin workshop.

Although Carol Ann had not been in the classroom teaching formally since 2010, she was nevertheless ever-present. For example, one of us (MCW), who came to neuroscience with only a degree in physics, is grateful to have learned neuroanatomy directly and systematically from Carol Ann. He will continue to pass that knowledge on to lab and lecture students indefinitely, and still uses her video demonstration of a "3d sheep brain dissection" in the introductory labs (<http://academics.wellesley.edu/Biology/Concepts/Html/sheepbrain.html>). Because her curricular work was so effective and so well documented, others have been able to step in and teach in her place (although never quite filling her shoes). And, because of the excellence and durability of the laboratory experiences Carol Ann created, the impact of her work will be felt well into the future by students and teachers who will never

know her personally. Indeed, at the time when illness took her away from Wellesley, she was working on a new project, *The Neuron Connection* (<http://www.wellesley.edu/Biology/Concepts/Html/theneuronconnection.html>), with one of us (BRJ) and Julio Ramirez from Davidson College, to create and disseminate the next generation of neuroscience laboratory experiences for undergraduates.

In spite of her physical limitations due to the stroke, Carol Ann continued as a learner and a teacher. She returned to our introductory Neuroscience course to tell our students about the neuroscience behind stroke and what it's like to be a stroke survivor. Through her local senior center, she launched a stroke support group and was active in writing workshops and book clubs. Forever the neuroscientist, she hoped to attend the 2014 Society for Neuroscience meeting in order to learn about research progress related to stroke. And, for all of us in the Neuroscience program, Carol Ann was an advisor-friend who combined direct honesty with her wonderful Irish wit and charm. She was the kind of mentor that each of us needs in our lives, pushing each of us to be the best we can be.

Carol Ann dedicated her book *Discovering Neurons* to her sister Hilary, who suffered from the same heart condition as Carol Ann, and who had a similarly optimistic

approach to life. Carol Ann stated, "*Part of my wish in editing this manual is that some students who 'discover neurons' may uncover more information about the relationship between the brain and health and lead to a greater understanding of how a positive attitude can ameliorate physical deterioration.*" In nominating Carol Ann for the Faculty for Undergraduate Neuroscience Lifetime Achievement Award, it was our hope that her many contributions to the training of undergraduates in neuroscience will be formally recognized. Further, we hope that those who have benefited from her teachings and example will continue to promote neuroscience education, and that one day, these efforts to train generations of neuroscientists will lead to critical advances in our understanding of neurological diseases, including stroke and its relationship to heart disease. Carol Ann learned that she had won the 2014 FUN Lifetime Achievement Award just before she died.

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