which are the letters of the genetic code, can be identified. But a nanopore in graphene is the first nanopore short enough to distinguish between two closely neighboring nucleobases.

Several challenges still remain to be overcome before a nanopore can do such reading, including controlling the speed with which DNA threads through the nanopore.

Other co-authors are W. Hubbard of Harvard, and A. Reina and J. Kong of MIT.

Nano Focus

Ultracompact self-wound nanomembranes exhibit exceptional supercapacitance

Designing ultracompact supercapacitors is a critical challenge for the development of next-generation compact electronic gadgets such as implantable biomedical devices. Currently available supercapacitors are too bulky for use in such small gadgets. Using nanoscale self-assembly techniques, C.C. Bof Bufon and O.G. Schmidt from Chemnitz University of Technology and IFW Dresden in Germany, and their colleagues have developed a method to fabricate self-wound ultracompact hybrid nanomembranes that are two orders of magnitude smaller than their flat counterparts with exceptionally high capacitance per footprint area.

As reported in the July 14th issue of *Nano Letters* (DOI: 10.1021/nl1010367; p. 2506), the research team deposited strained multilayered nanomembranes by sequential depositions of metal and dielectric thin films on a sacrificial layer. Selective etching of the sacrificial layer initiated self-rolling of the nanomembranes into cylinders. The compactness of the cylinders was reproducibly tuned by careful control of the processing parameters. Hundreds of self-rolled cylinders can be prepared in parallel on a single chip which can be reused repeatedly. Furthermore, the research team demonstrated that organic monolayers may be introduced in the inorganic films of the nanomembranes to reduce leakage currents. In addition, these organic monolayers could be potentially leveraged for biological and chemical functionalization of these electronic elements with organic molecules. This self-rolling process can occur in aqueous media at physiological pH and is thus compatible for incorporation of biomolecules.

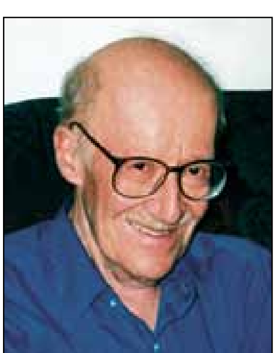
Self-rolled nanomembrane supercapacitor showing the hybrid layer sequence of self-assembled monolayer–oxide–metal. Reproduced with permission from *Nano Lett.* **10** (7) (2010) DOI: 10.1021/nl1010367; p. 2506. © 2010 American Chemical Society.

The researchers believe that these ultracompact capacitors could be used to reduce size of energy storage elements, filters and signal converters in a variety of applications such as implantable biomedical devices and novel devices for energy harvesting.

Kaushik Chatterjee

In Memoriam:

Arthur Stanley Nowick



Arthur Stanley Nowick died on July 20 at age 86 of heart arrhythmia while swimming near his home in Newport Beach, Calif. He was a pioneer in the field of internal friction, anelasticity, and crystal defects.

He is the author of more than 200 publications in a wide range of fields in materials science and solid-state physics. His 1972 book *Anelastic Relaxation in Crystalline Solids* (Academic Press), co-authored with Brian S. Berry, is widely recognized as the definitive treatise on internal friction and anelasticity. He is author of the 1995 book *Crystal Properties via Group Theory* (Cambridge University Press). He is co-editor of two additional books on diffusion in solids. He was also an advisor to nearly 30 PhD students.

Nowick was the 1994 recipient of the David Turnbull Lectureship, bestowed by the Materials Research Society in recognition of career contributions to the fundamental understanding of the science of materials. The award cited his "pioneering work in anelastic and dielectric behavior in fast ion conductors, and in amorphous alloys," his "profound contributions to the understanding of grain boundary motion, morphological stability, the structure of surfaces and interfaces, and flow and diffusion as stochastic phenomena," and "his excellence in teaching and writing." His Turnbull Award Lecture, titled, "The Golden Age of Crystal Defects," elucidated the emergence of an understanding of crystal defects and explained his seminal contributions and those of his collaborators.

Nowick also received the Achievement Award from the American Society for Metals (1963), the A. Frank Golick Lectureship from the University of Missouri, Rolla (1970), and the Gold Medal from the 9th International Conference on Internal Friction and Ultrasonic Attenuation in Solids (1989). He was a fellow of the American Physical Society and of the Metallurgical Society of AIME. In

1987 he received the Great Teacher Award from Columbia University.

Nowick received his bachelor's degree in physics from Brooklyn College in 1943 and his master's and PhD degrees from Columbia University in 1948 and 1950, respectively. From 1949 to 1951 he was a postdoctoral fellow with Clarence Zener at the University of Chicago.

He began his professional career in 1951 as an Assistant, and then Associate, Professor of Metallurgy at Yale University. In 1957, he moved to head the metallurgy group at the new IBM T.J. Watson Research Center. In 1966, Nowick accepted a position at Columbia University and spent the main part of his career as a Professor of Metallurgy and Materials Science at Columbia University in the Henry Krumb School of Mines, which ultimately became part of the School of Engineering and Applied Science. At the time of his retirement to emeritus status in 1993, he held the Henry Marion Howe Professorship. In 2001, he moved to California, where he held a position of Visiting Researcher in the Department of Chemical Engineering and Materials Science at the University of California, Irvine, until the time of his death.

Nowick was esteemed by his former students, colleagues, and members of the scientific community. Harry L. Tuller, of the Department of Materials Science and Engineering at the Massachusetts Institute of Technology, said, "I was one of Art's doctoral students at Columbia graduating in 1973 and until today, nearly 40 years later, I still appreciate his influence on my academic training, my research, and my teaching. He was a wonderful role model. What is more, I can honestly say that my present career path, as faculty member at MIT, was directly due to his advice and support."

Irving P. Herman, chair of the Department of Applied Physics and Applied Mathematics, and director of the Materials Research Science and Engineering Center, at Columbia University, recalls his interactions, "When I arrived at Columbia in 1986, Art Nowick was one of the clear leaders in the materials science effort. He also led the Committee on Solid State Science and Engineering, which bound together the efforts in several departments on campus. Since then, solid state and materials physics has been flourishing at Columbia, in part to Art's interdepartmental leadership. I interacted with him many times in this effort, and always found him to be a wise and very kind person." Richard M. Osgood, Jr., Higgins Professor of Electrical Engineering and Applied Physics at Columbia University, adds, "When I joined Columbia, he was carrying out beautiful experiments showing the physics of ion-mediated conductivity in glass. He also managed to hold together the vision of Columbia's commitment to high-quality, physics-based materials science. He was a real standout in the materials community—a great scientist and a terrific person."

Martin E. Glicksman, Florida 21st Century Scholar in the Department of Materials Science and Engineering at the University of Florida and member of the National Academy of Engineering, said, "I've known him for almost 50 years, and admired greatly his works at Columbia University. The world has lost a truly great human being." Theodore Moustakas, of the Departments of Electrical and Computer Engineering and Physics and director of the Wide Bandgap Semiconductor Laboratory at Boston University, said, "Art's care and guidance has truly shaped my professional career. I wish I had the chance to tell him this before he departed."

In addition to being an outstanding materials scientist, Nowick was also an accomplished pianist, with wide-ranging interests in classical music and jazz. His friends, colleagues, and students often enjoyed his in-home concerts.

Nowick is survived by his wife of 60 years Joan; their sons Jon, Steve, Alan, and James; his sons' respective spouses Pauline, Martha, Irene, and John; and his grandson Jordan.

James S. Nowick
University of California, Irvine
Steven M. Nowick
Columbia University