it shape memory, carbon nanotubes by themselves do not perform well enough to be used as a synthetic biomaterial, said the research team. However, the researchers are combining carbon nanotubes with different polymers to create a material they anticipate will perform as well as soft tissue. The team is also using results from this study to develop mechanically compliant electrical probes and interconnects.

Zinc Compounds Tuned to Model Other Materials

P. Canfield, S. Bud'ko, S. Jia, and G. Samolyuk of Ames Laboratory and Iowa State University have discovered a family of zinc compounds that can be tuned, or manipulated, to exert some of the physical properties and behavior of other materials, ranging from copper to elements like palladium, to more complex electronic and magnetic compounds. Their versatility makes the zinc compounds ideal for basic research efforts to observe and learn more about the origins of phenomena such as magnetism. The compounds, based upon the RT_2Zn_{20} family (where R represents a rare-earth atom and T represents a transition metal atom), are mostly zinc and are "tuned" by substituting the R and T atoms.

Canfield said, "We can make compounds for up to 10 transition metals, and for each of those we can include between seven and 14 rare earths. So that's between 70 and 140 compounds."

As reported in the May issue of *Nature Physics* (p. 334; DOI:10.1038/nphys568), one of the compounds the researchers made, YFe_2Zn_{20}, turned out to be even closer to being ferromagnetic than palladium, a nearly ferromagnetic material that scientists have traditionally studied to better understand magnetism.

Canfield describes palladium as a "runner-up" in terms of band magnetism—the magnetism of the common metals like iron, cobalt, or nickel. These metals become ferromagnetic at such high temperatures that it is difficult to study them in detail, so palladium is the next-best option.

"The problem is that as an element, palladium is a little hard to tune," said Canfield. "There is one palladium site, and it's not that versatile. For basic research as well as possible applied materials, you want compounds that allow for the manipulation of their properties. We can tune the rare earth-iron(2)-zinc(20) so we're able to push these compounds even closer to ferromagnetism and try to understand the consequences of this," he said.

The tunability of the new family of zinc(20) compounds is allowing the researchers to approach the ferromagnetic transition point from where they hope to achieve another ambition—pushing the material to become ferromagnetic at very low temperatures by tweaking and tuning.

"If we could do that," said Canfield, "then we could actually witness the birth of this type of small moment ferromagnetism—instead of just before and after pictures, we could watch the whole film."

News of MRS Members/Materials Researchers

Pierre-Gilles de Gennes

Pierre-Gilles de Gennes, 1991 Nobel laureate who made seminal contributions to solid-state, soft-matter, and polymer physics, died in Orsay at age 74 on May 18, 2007. A home-schooled graduate of Ecole Normale Supérieure, de Gennes pursued a doctorate in neutron scattering and magnetism at the Saclay CEA Center. In 1961 following a postdoctoral year at Berkeley and a two-year stint in the navy, de Gennes assumed an assistant professorship at the University of Paris, Orsay. His first book, *Superconductivity of Metals and Alloys* (translated by his long-time colleague, P. Pincus), was derived from lecture notes designed to give both experimentalists and theoreticians access to the topic. The stimulating interplay between theory and experiment was one signature of de Gennes' creative oeuvre and in the late 1960s he infused concepts from Landau theory into liquid crystal phase transitions. This catalyzed an international pursuit of the physics underlying this delicate state of matter at the core of the ubiquitous LCD. In France his highly-collaborative discoveries were so prodigious that the resulting multi-authored papers were published under the inclusive by-line, "The Orsay Liquid Crystal Group." Their findings are summarized in de Gennes's 1974 text, *The Physics of Liquid Crystals*.

In 1971 at age 39, de Gennes was awarded a prestigious chair at the Collège de France and turned his attention to condensed phases of soft matter. His provocative view of macromolecular statics and dynamics (see his *Scaling Concepts in Polymer Physics*, 1979) inspired new experiments using carefully tailored macromolecules and launched a corresponding escalation of theory. Unique rationalizations of phenomena in entangled polymer melts, for example, "reptation"—the snake-like oscillatory motion of a chain confined to a "tube" circumscribed by neighboring chains—started a renaissance in polymer physics and chemistry. Moreover, influenced by the attention that de Gennes incited by working in these technologically important fields, the traditional "hard science" disciplines in U.S. academe acquiesced and admitted soft matter physicists and polymer chemists to their ranks, a decision that ultimately engendered a refreshing receptivity in those disciplines toward the exciting advances taking place in the life and soft-material sciences.

Following the award of the Nobel Prize in physics, de Gennes endeavored to introduce young students to the excitement of science, visiting some 200 high schools within three years (see his *Les Objets Fragiles*, 1994). An inspirational pedagogical style permeated both his scientific and public lectures: "A lot of people were surprised that a Nobel laureate, who lives and thrives in the convoluted language of intense scientific discourse, could have people laughing within five minutes into his lecture and keep them chuckling the whole way through," recalls my son about hearing, at the age of 14, de Gennes's 1999 lecture "Bubbles, Foams and Other Fragile Objects."

Between 1975 and 2002 de Gennes was director of the École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI) where he expanded the traditional engineering disciplines in physics and chemistry to include biology. A recipient of numerous awards (Holweck Prize, Ampère Prize, CNRS Gold Medal, Matteuci Medal, Harvey Prize, Wolf Prize, Lorntz Medal, and ACS and APC awards), and member of the French, Dutch, American, and National Academies, and the Royal Society, he concluded his career at Institut Curie working on an array of diverse topics—dynamics of wetting, granular materials, cellular adhesion and brain function. In a commemorative ceremony on June 5 in Paris, the newly-elected Président de la République Nicolas Sarkozy presided over the dedication of "Espace Pierre-Gilles de Gennes," at the ESPCI Museum.

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