Nanotubes: Metallic by a twist of fate

When a tailor mismatches the stripes in a fabric while sewing a shirt, the garment merely looks funny. However, when a single atomic layer of graphite rolls up into the minuscule cylinder known as a nanotube, the angle at which the edges join can have a dramatic effect on the tube's electric conductivity.

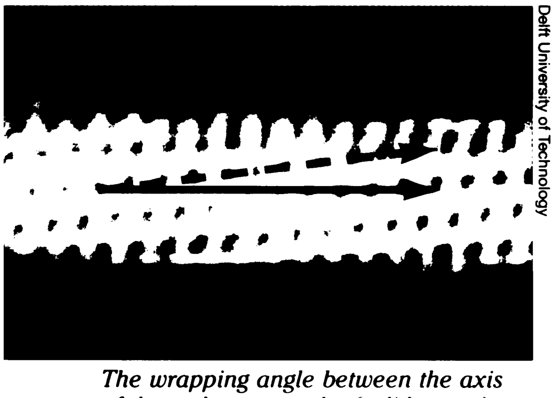
Even though they are made of exactly the same material, some carbon nanotubes conduct electricity as easily as a metal does, while others act as semiconductors, blocking the passage of low-voltage current. This variation, first predicted by three research groups in 1992, has now been observed by two teams of scientists, one from Harvard University and the other from Rice University in Houston and Delft University of Technology in the Netherlands. Their findings appear in the Jan. 1 NATURE.

Both teams used a scanning tunneling microscope to determine the diameter and spiral angle of a nanotube. They then measured the tube's conductivity with a miniature probe.

"It's remarkable how one small change in a nanotube's structure can make a tremendous difference in its electrical behavior," says Andrew G. Rinzler of Rice.

In graphite, each carbon atom links to three others, forming a hexagonal lattice that resembles a slice through an atomic-scale honeycomb. The regularity of this pattern allows the edges of a sheet of graphite, when rolled into a cylinder, to match seamlessly at several different angles.

"This landmark work goes a long way toward telling us that the basic theory is correct," says Mildred S. Dresselhaus, a physicist at the Massachusetts Institute of Technology. However, she adds, additional experimental and theoretical work needs to be done to link some of the teams' observations to the details of the theory. —*S. Perkins*



Delft University of Technology

The wrapping angle between the axis of the carbon nanotube (solid arrow) and the row of holes in the graphite's hexagonal atomic lattice (dotted arrow) affects the nanotube's electric conductivity.

Chimp brains show humanlike tilt to left

Human language abilities depend on tissue located mostly on the left side of the brain, or left hemisphere. A new study finds that the common chimpanzee, despite its inability to speak, shares with people one feature of this anatomical pattern—a structure called the planum temporale is larger on the left side of the brain than on the right.

In humans, a swath of neural tissue, known as Wernicke's area, encompasses the entire planum temporale and helps to orchestrate language comprehension.

A larger planum temporale in the left hemisphere also characterized the common ancestor of chimps and humans, a creature that lived around 8 million years ago, contends a scientific team headed by neurobiologist Patrick J. Gannon of Mount Sinai School of Medicine in New York. Whether the planum temporale fostered species-specific forms of communication or assumed other responsibilities during the course of evolution remains unclear, the group notes.

"This is a great contribution to the field [of comparative brain studies]," says neuroscientist Katerina Semendeferi of the University of California, San Diego. "Now we need to look more closely at brain organization in all apes."

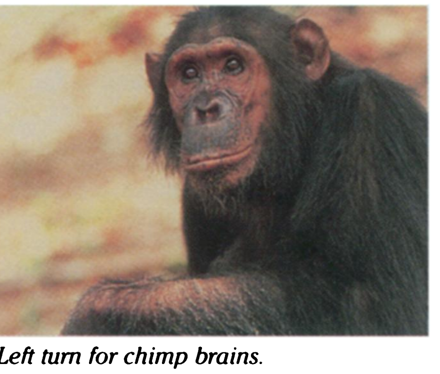
Semendeferi suspects that the larger left-brain planum temporale exists in gorillas and orangutans, as well as in chimps. She directed a related study, published in the April 1997 JOURNAL OF HUMAN EVOLUTION, indicating that the brain's frontal lobe—often assumed to have expanded greatly in humans to support complex thought—is actually about the same size, relative to overall brain volume, in all apes.

Gannon's team conducted a microscopic analysis of the surface of 18 preserved chimp brains. The group identified anatomical landmarks delineating the planum temporale and then calculated its surface area in each hemisphere. A pronounced left-side size advantage appeared in 17 of the brains, the researchers report in the Jan. 9 SCIENCE.

An investigation reported 20 years ago found few signs of the planum temporale in chimps. As a result, some scientists thought this brain area was poorly developed in nonhuman primates.

"If Gannon's group is able to see planum temporale landmarks in chimps, they're to be congratulated," comments anthropologist Dean Falk of the State University of New York at Albany. "Their finding fits with some previous research on asymmetry in chimp brains."

The greatest left-right asymmetry of the planum temporale has been reported in people with perfect pitch, Falk notes. In chimps, a similar left-hemisphere emphasis may help in processing melodic aspects of their vocal communication, she theorizes. —*B. Bower*



Hugo Van Lawick/Discovery Channel

Left turn for chimp brains.

Ebola virus vaccine protects guinea pigs

Few diseases have as fearsome a reputation as Ebola fever. Just to handle the Ebola virus, scientists must wear space suits and employ the strictest biohazard precautions. This rare illness is transmitted by close contact and most often kills humans swiftly. There is no effective treatment for Ebola fever and, so far, no way to prevent it.

In their efforts to make an Ebola vaccine, scientists have tried traditional methods—such as using an inactivated virus or a slightly modified version of a live Ebola virus—with some success in laboratory animals. These approaches can make researchers uneasy, however.

"I don't know that I'd be willing to take an injection of a purified, inactivated strain" of Ebola, says Anthony Sanchez, a virologist at the federal Centers for Disease Control and Prevention (CDC) in Atlanta. "And we can't predict what an attenuated live virus would do in a person."

Instead, Sanchez and other researchers are exploring the nascent field of gene vaccination in hopes of producing a riskfree inoculation that will protect against the Ebola virus. By injecting the genes that normally encode some of the virus' proteins, researchers at the University of Michigan Medical Center in Ann Arbor and the CDC have rendered 15 of 16 guinea pigs impervious to the Ebola virus when exposed to it less than 2 months later. Six unvaccinated guinea pigs died.

Of 10 guinea pigs exposed to the live virus 4 months after inoculation, 7 survived; all of the unvaccinated animals died. The team's findings appear in the January NATURE MEDICINE.

Although the intact Ebola virus seems to thwart the body's immune and inflammatory mechanisms when it infects a person, the treated guinea pigs pro-