From our reporters in New York at the American Association for the Advancement of Science annual meeting

Slow start in plastic-engine race

The first public test of a racing car engine containing primarily plastic parts was postponed on Memorial Day when the car had starter problems. The difficulties were not related to the engine, says a spokesman for Amoco Chemical Corp. of Chicago, the company that provided many of the plastic parts. The car is now scheduled for a July 8 debut in a race in Watkins Glen, N.Y.

The innovative engine, which weighs 200 pounds less than conventional all-metal engines of comparable size, still has 68 pounds of metal, but it includes 60 pounds of plastic resins reinforced with 40 pounds of carbon fibers. The engine is being developed by Polimotor Research of Fair Lawn, N.J.

The engine was described by George W. Parshall of E. I. duPont de Nemours and Company of Wilmington, Del., in a discussion of the chemical development of new materials expected to advance technology. Parshall foresees novel materials producing "revolutionary changes" in many fields. For example, in optical communications and data handling, a new process for obtaining deposits of chemical vapor is now producing silica fibers of increased optical purity. Parshall also envisions hybrid electronic-optical elements, relying perhaps on new organic materials for nonlinear optical effects.

For structural materials, in addition to reinforced plastic resins, Parshall expects to see more ceramic-metal composites. One, an aluminum with a chemically modified surface to allow bonding, is already being used by Toyota for automobile connecting rods. Another new material, expected to be valuable for aircraft interiors, is an alumina-bonded polyethylene coating that is light, strong and flame-resistant. In addition, Parshall expects new ceramics to replace metals in many applications, including chemical sensors and heat engines. "In each area new materials are critical to the overall progress of technology," he says. "This chemistry has an enormous social payoff."

Biotechnology export controls

Fears that the Soviet Union may be using supplies and knowledge bought or stolen from the United States to produce and spread germ weapons have prompted U.S. government officials to look more closely at controlling the export of equipment used in biotechnology research. At issue are "dual-use" technologies that not only contribute to medical care, food production and chemical manufacture but also can have military applications, especially in chemical and biological warfare. The Department of Defense (DOD) already lists equipment for manufacturing biological materials including toxins on its Militarily Critical Technologies List. "The list is long," says John H. Birkner of the Defense Intelligence Agency. "The expectation is that it will grow longer and could eventually include any technology where the United States has something innovative that others would like to have by borrowing, buying or stealing."

Birkner called on the U.S. biotechnology industrial and academic communities to help DOD identify technologies that may be useful to DOD. He also asked them to suggest steps to keep them away from potential adversaries. "That is a prudent contribution you can make to protect the future security of this nation," says Birkner. If such cooperation is not forthcoming, he warns, the government would take whatever action is necessary to protect the country's security. "Eventually, in such a contest, [the U.S.] Government would probably prevail," he says, "as it has in the microprocessor situation."

Meanwhile, the Department of Commerce, responsible for administering the Export Administration Regulations, has proposed the formation of a Biotechnology Technical Advisory Committee to assist the department in reviewing export controls on products of biotechnology processes. "Until recently the main thrust of the department's efforts in export control areas has been to prevent the flow of U.S. technology to the Soviet and eastern bloc countries," says Henry D. Mitman of the Office of Export Administration. "Currently, other options are being considered in the implementation of the overall policy, for example, controlling *all* transfers of biotechnology."

Many scientists are concerned about stricter export controls, especially when they are combined with recent increases in the proportion of research funded by DOD. Biologist Eric Holtzman of Columbia University in New York says, "There already have been some nasty plans and actions aimed at restricting communication in cryptography, nuclear energy and other fields [SN: 2/25/84, p. 117; 3/31/84, p. 199]. As the intensification of militarily related biological research continues, such pressures probably will spread into biology." Moreover, Holtzman says, "Military concerns have already been used to press for secrecy about research in certain fields. Similar developments could easily coalesce in biotechnology, on commercial grounds, in as much as the United States thinks of its now-threatened economic supremacy as highly dependent upon its advanced technology in agriculture, pharmaceuticals and so forth."

Ironically and uncharacteristically, a Soviet scientist recently released scientific information that added to concerns about the dangers of the use of genetic engineering in biological warfare. The June ENVIRONMENTAL ACTION reports that a Soviet researcher has developed a mathematical model — three sophisticated groups of algorithms — for predicting the incidence of a worldwide pandemic of influenza. Leonid A. Rvachev, chief of a prestigious laboratory for epidemiological cybernetics in Moscow, is reportedly now fearful that his model, developed for peaceful purposes, could be used to target the dispersal of genetically engineered biological weapons. He sent 96-page descriptions of his model to several Western scientists, and he called for an international body to monitor epidemiological models.

Early prenatal diagnosis: How safe?

Chorionic villi biopsy, an experimental method first developed in China for assessing genes of 7- to 8-week-old fetuses (SN: 8/20/83, p. 116), answers an important demand of parents-to-be. When there is a question of serious disease and the potential parents may consider abortion, they want to know whether the fetus is affected as early as possible in the pregnancy. Preliminary tests indicate that chorionic villi biopsy is as accurate as amniocentesis, the current prenatal diagnostic procedure, which doesn't give results until halfway through the pregnancy.

"The burning question is how safe is the technique," says Maurice J. Mahoney of the Yale-New Haven (Conn.) Medical Center. There is little risk to the mother, but early studies indicate miscarriages occur in 3 to 9 percent of the cases assessed with the new technique. Evaluating this risk is difficult because physicians do not know how many fetuses of this age would have been miscarried spontaneously. After amniocentesis, miscarriages occur in about 0.3 percent of the cases, but the numbers aren't strictly comparable because spontaneous miscarriage rates become lower as pregnancies progress. Mahoney says the National Institutes of Health has just requested proposals for a prospective study to examine chorionic villi biopsy risk. In the United States the first babies to have experienced this technique prenatally are now just a few months old. "No baby seems to have suffered in growth defects or development," Mahoney says.

Metabolic setpoint altered in obese

Dieters who lose 100 pounds but can't keep the weight off may be struggling against more than simply the temptation to eat. They may be battling an especially efficient metabolism that requires fewer calories per push-up. The end result: A diet that is low in

calories for the average person rebuilds the fat layers of at least some of the formerly obese.

"It's looking as though obesity may turn out to be a chronic illness for some people," says Rudolph Leibel, a researcher at Rockefeller University in New York City. "It's probably wishful thinking for these people to believe that if they can just get the weight off they can go back to a 'normal' diet."

Leibel studied 12 men and 14 women before and after they lost an average of 100 pounds each. By feeding each volunteer a liquid diet of known quantity and composition, and precisely adjusting the amounts given, Leibel and co-workers were able to determine exactly the caloric intake each person needed to maintain a stable weight. They then induced a weight loss by reducing consumption to roughly 600 calories per day, and compared the now-slimmer subjects with persons of the same size who had never been overweight.

"The results were striking," Leibel says. The number of calories an average person needed to maintain his or her weight was quite similar to the number an obese person used *when obese*. After weight reduction, the formerly obese needed 28 percent fewer calories. From an energy metabolism perspective, obese subjects were more "normal" in obesity than after weight loss.

After their weight loss, Leibel told SCIENCE NEWS, the formerly obese patients in his study often complained of persistent feelings of fatigue, mental depression, intolerance of cold and irregular menstrual periods — many of the same symptoms suffered by women with the eating disorder anorexia nervosa. The similar symptoms were found to persist as long as patients maintained their weight at the reduced level. This situation might reflect a similarly deranged metabolic setpoint in the two conditions, Leibel says.

It's still not clear whether the weight loss induced the metabolic change, or simply unmasked an underlying condition. Leibel and colleagues are currently searching for biochemical markers that might help them detect persons with an artifically high metabolic setpoint before they become obese.

Whose ape is it, anyway?

One sometimes wonders whether orangutans, chimps and gorillas ever sit around the tree, contemplating which is the closest relative of man. (And, would they want to be?) Maybe they even chuckle at human scientists' machinations as they race to draw the definitive map of evolution on earth. If placed on top of one another, all these competing versions of our evolutionary highways would make the Los Angeles freeway system look like County Road 41 in Elkhart, Ind.

As was inevitable, a number of these anthropological architects met head-on at the AAAS intersection. And the results either opened up some new lanes or added some new road blocks, depending on one's perspective. Jeffrey H. Schwartz, associate professor of physical anthropology at the University of Pittsburgh concludes — after analyzing data on numerous fossils — that humans are closest, evolutionarily, to the orangutan, rather than to gorillas or chimps. Schwartz's theory appears to mesh with a previously reported finding that *Ramapithecus*, once widely viewed as the earliest known hominid (member of the human family), is actually an ancient ancestor of the orangutan (SN: 2/6/82, p. 84).

Disputing Schwartz's findings, however, was a report by Yale University scientists that genetic comparisons of humans and a number of primates demonstrate that chimpanzees are humans' closest relatives. Other groups have argued that gorillas indeed evolved on the closest track to humans.

Schwartz says that "a simple solution" to the question of why hominids, orangutans and *Ramapithecus* are so similar to one another is that all three "inherited these features from a common ancestor not shared with any African ape."

Biology

Gardiner Morse reports from Beltsville, Md., at a USDA symposium on biomembranes

Kinky membranes

When people get cold, they put on warmer clothes. When cells get cold, they often change their membrane structure. Cells have a variety of ways to do this. Researchers studying these processes hope to find new ways to protect plants against low temperature and other stresses, reports Guy A. Thompson Jr. of the University of Texas in Austin.

All biological membranes share a common basic structure: They are sandwiches of phospholipid molecules with their hydrophilic (water-loving) heads on the outside and hydrophobic (water-fearing) tails pointing inward. The tail's structure helps determine the membrane's fluidity. One common way membranes stay fluid in the cold is by increasing the number of lipid tails that are unsaturated (kinked with double bonds) Thompson explains. This prevents the tails from locking as easily with one another into a frozen lattice.

Many chilled cells depend in part on a "desaturase" enzyme to keep their membranes fluid. This enzyme converts single to double bonds in the lipid molecule tails. Thompson and others would like to know how this enzyme is regulated. One explanation Thompson favors derives from the tendency of enzymes to lose activity as they are cooled. There is evidence that desaturase enzymes embedded in the membrane slow down *less* when the cell is cooled than do enzymes which supply new saturated lipids to the membrane, he says. The result is that the ratio of unsaturated to saturated lipids in the membrane increases — that is, more tails are kinked by double bonds — and the chilled membrane stays fluid.

Anti-aluminum plant acids

Aluminum is toxic to many crops. One way it does its damage is by binding with calmodulin, a protein in plant cell membranes that plays a key role in regulating a variety of enzymes, says Alfred Haug of Michigan State University in East Lansing. "Aluminum puts specific lesions on calmodulin," Haug explains, and these can cause the malfunction of enzymes under its direction.

Some plants are more tolerant of aluminum-tainted soil than others, says Haug, and their high concentration of organic acids may be what protects them. He has shown that organic acids such as citrate shield calmodulin from aluminum by combining with the metal. One obvious strategy for making plants resistant to aluminum damage is to breed them for high organic acid content, Haug suggests.

Stop that sperm

Sperm may look determined swarming toward an egg, but once they get there, hours can pass before one of them finally fertilizes it. This is because sperm can't penetrate an egg until they've been "capacitated" — given the chemical go-ahead to release enzymes that breach the egg's membrane. Brian Davis of the Research Foundation of Southern California in La Jolla reports that microscopic membrane vesicles in the seminal plasma of various mammals can keep rabbit sperm on hold by apparently donating cholesterol to the sperm's membrane. This maintains the membrane in a state that prevents the release of its egg-piercing enzymes. Inactivated sperm have "tough outer skins," Davis explains.

Once the sperm are on their way to the egg, the inhibiting vesicles, which have accompanied them so far, are stopped in the cervical canal. The sperm swim unescorted into the uterus where uterine fluid depletes the sperm's membrane cholesterol and capacitates it over a period often lasting hours, Davis says.

Why such an elaborate system? One reason is that "the male is producing cells which are like little time-bombs," Davis told SCIENCE NEWS. "If those reactions go off prematurely, the male tract just undergoes autolysis" — self-destruction by the sperm's powerful hydrolytic enzymes.