company that was successful enough to, as he put it, "make a little money." Inspired by the Kremer Prize, a £50,000 award put up by British industrialist Henry Kremer for the first person to fly an aircraft under his own power around a figure eight–shaped course (the prize was claimed in 1977), Fredkin had for several years been trying to interest some institution in a similar offer for a championship computer chess program, but without success.

Fredkin told *Science* that he thinks "prizes are a wonderful thing and there should be more of them." He cited the prize that got Lindbergh to fly across the Atlantic as an example of the positive impact that prizes can have. His interest in computer chess comes from the widely accepted assertion that computer chess is a kind of benchmark for progress in artificial intelligence research.

In times past, however, the connection between brute force searching, the method used by almost all the top chess-playing programs, and intelligence has been questioned. Years ago it was thought that a chess-playing computer would have to emulate human chess masters to qualify as intelligent. Some artificial intelligence researchers are now taking a less anthropocentric view. With the rise to dominance of brute force chess programs such as Belle, investigators have accepted the concept of a knowledge-search continuum within which computers can compensate for a lack of chess knowledge by an ability to do more searching. Fredkin puts it more bluntly. "Intelligence is having a problem and solving it," he says.

The other half of the prize story is that artificial intelligence researchers were themselves considering the establishment of several prizes for the solution of certain problems, including computer chess, whose solutions would be recognized as major advances in the still young field. According to Raj Reddy of Carnegie-Mellon University, people have yet to reach a consensus on what things when achieved would truly represent progress in artificial intelligence. One approach that leading investigators have discussed is to devise a set of problems in the spirit of the Hilbert problems in mathematics that, if solved, would be recognized as such advances. Prizes would be offered for solutions to the problems as a way to direct the attention of artificial intelligence researchers to the selected areas. When Reddy announced last year at a Tokyo meeting of the International Joint Council on Artificial Intelligence that an awards committee had been formed and foundations would be approached as sponsors, a marriage between Fredkin, who had the money, and the research community, which could administer the details, was made for the establishment of a chess prize. (There is a second large prize. Volmac, a Dutch computer software company, last year offered $50,000 to anyone who can write a chess program to defeat former world champion and international grand master Max Euwe of the Netherlands by 1 January 1984.)

The interest accrued on the prize money is being used to sponsor competition between the best computer programs and comparable human players, according to Hans Berliner of Carnegie-Mellon, who is chairman of the committee administering the Fredkin Prize. For example, Chess 4.9 and Belle, the two highest scoring entries in the most recent North American championships, are being paired with humans in the expert category. The winner of each match is to receive $1500. In fact, the first match has already been held at Stanford University last August. Chess 4.9 met Paul Benjamin, a New York City chess player. Each side won one game and thereby half the prize money. Belle is scheduled to play its match next month.

Berliner's expectation is that each year, the ratings of the human opponents will rise as the programs get better. Eventually, it is hoped, FIDE will admit a computer chess team to the international championships. At that point, it is up to the chess program to survive as best it can and perhaps one day fight its way all the way to world chess championship. Fredkin hopes this process will take about 10 years ("a good prize should last about 10 years but not much longer"), but most computer chess watchers are prepared for a much longer wait.—ARTHUR L. ROBINSON

. . . computer chess programs have now advanced to the stage where the best of them can beat some 99.5 percent of human players.

Prizes That Predict Nobel Winners

Mid-October is the date of that riveting annual sweepstake, the Nobel prize awards. Jimmy the Greek does not give odds, but others who follow the competition, particularly those who hand out lesser awards, like to think that they can pick the winners. Thus when Columbia University awarded its Louisa Gross Horwitz prize on 1 October, a university press release noted, "Of the 22 scientists who have won the award since it was first given in 1967, eight have subsequently won the Nobel Prize."

The Horwitz prize ($22,000) is given each year for outstanding research in biology or biochemistry. This year's winner is César Milstein, an Argentine-born molecular biologist employed by the Medical Research Council at Cambridge University, England. Along with his associate Georges Kohler, Milstein is credited with developing a method, known as the hybridoma technique, for producing monoclonal or pure antibodies.

The chairman of the committee that selected Milstein, I. Bernard Weinstein of Columbia's Cancer Research Center, said Milstein's work on hybridomas has "really revolutionized the whole field of immunology." Milstein's discovery, first announced in 1975, has made it possible to produce nearly unlimited quantities of specific mouse antibodies in the laboratory. The new technique thus offers a quantitative as well as a qualitative improvement. The hope is that this technique will make it possible to develop new means of attacking autoimmune diseases and some types of cancer.

Weinstein added that "we have had a pretty good track record" in choosing future Nobel winners; he expected Milstein would one day be among them. He also mentioned that in September Milstein had received another award with a short but impressive history, the Wolf Foundation prize. The Wolf Foundation was created in 1975 by a wealthy Israeli—Ricardo Lobo Wolf—who put up $10 million as an initial endowment. He clearly meant it to be a complement or competitor for the Nobel Foundation.

The Wolf prize of $100,000 has been given annually since 1978 in

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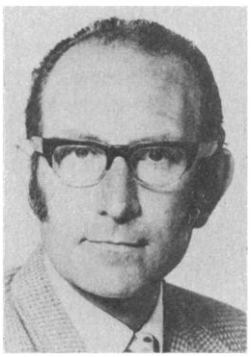
each of five areas of science. On 15 September the foundation announced this year's winners. In medicine, the prize went to Milstein and two others: Leo Sachs of the Weizmann Institute in Rehovot, Israel, and James Gowans, secretary of Britain's Medical Research Council. Like all winners



César Milstein

of the Wolf prizes, they were chosen by an unidentified panel of their peers, which cited the three for their "contributions to the knowledge of the function and disfunction of the body cells, . . . the development of specific antibodies, and the elucidation of mechanisms governing the control of and differentiation of normal and cancer cells."

The other winners of the Wolf prizes this year were Karl Maramorosh of Rutgers University, in agriculture; Henri Cartan of the Université de Paris and Andrei Kolmogorov of the Moscow State University, in mathematics; Henry Eyring of the University of Utah, in chemistry; and Michael Fisher of Cornell University, Leo Kadanoff of Brown University, and Kenneth Wilson of Cornell, in physics.

Westinghouse Feels Impact of Declining Demand

The world's largest and most successful maker of nuclear power plants, the Westinghouse Corporation, has been stung recently by the declining demand for electrical power. The company announced on 29 September that by the end of next year it would close a nuclear steam generator fabrication plant in Tampa, Florida, and dismiss 1000 employees. The cutback was decided upon, according to spokesman J. P. Daley, after Westinghouse concluded that demand for electrical power in the United States has gone into a period of stagnation.

Daley emphasized that the popular agitation against nuclear power had nothing to do with the change in the market. The problem, he said, was the oil embargo of 1973 and the OPEC price increases for oil. The cost of electricity has increased as a result, and this has driven ratepayers to consume less. The annual rate of increase in the use of electricity in this country has been halved since the embargo, from 7 percent to 3.5 percent.

Electric utilities have slowed the construction of new facilities and postponed ordering new plants. During the early 1970's, dozens of nuclear generators were ordered each year. In 1979 and 1980, utilities have failed to order even one new reactor. Despite this slowdown, the nation has on average an excess generating capacity of 35 percent. "Nobody's guessing when the domestic market will revive," Daley says.

Business is not bad for Westinghouse, however. The company is working on a backlog of orders valued at $4 billion, half of it for fuel supplies. In addition, major expansions are planned for the training and strategic operations divisions, providing safety-related services which have come into demand as a result of the accident at Three Mile Island.

Disease Center Will Fund Love Canal Research

The White House has decided, for this fiscal year at least, that the Environmental Protection Agency (EPA) will not have primary control over studies of how human health is affected by exposure to hazardous waste dumps. The EPA had asked for funding this year to pay for studies of people living near two chemical burial grounds, one at Love Canal, New York, and the other in Memphis, Tennessee. The Office of Management and Budget declined the agency's request in September, after deliberations that went on all summer. Instead, the funds will be channeled through the Department of Health and Human Services directly to the Center for Disease Control (CDC) in Atlanta.

The decision grows out of a flap which arose earlier this year over a study of chromosome breakage among the residents of Love Canal. That research was commissioned and released by the EPA. It reported a higher than average incidence of genetic damage among the people of Love Canal and thereby caused a panic. Though the much disputed study may have been accurate enough as far as it went, the protocol had a grievous defect—lack of controls—which arose from the fact that it was shaped according to the requirements of lawyers at the Department of Justice instead of according to scientific principles.

Carter Administration officials say that the recent decision on funding for studies of health effects should not be interpreted as a slap at the EPA. "It's just an accounting decision," says Denis Prager of the President's Office of Science and Technology Policy. "The EPA did a pretty reasonable job in a situation where there were no ground rules," he added. The "knee-jerk reaction" is that the EPA fouled up, but, "I would prefer to say the federal government didn't do as good a job as it might."

Negotiations are now in progress to come up with the ground rules that were so notably lacking earlier this year. The EPA Administrator Douglas Costle has met once with Health and Human Services Secretary Patricia Roberts Harris. They and their subordinates have been trying since August to draw jurisdictional lines through the toxic waste disaster. So far, an EPA official says, "they have not gotten down to the nitty gritty." In Prager's words, "there is no policy." It has been extraordinarily hard, it seems, just to get people together in one room during this campaign season. Nothing much will happen before November, one senses.

Meanwhile, a staffer in the chronic diseases division of the CDC says he is still "anxiously awaiting the word from the budget people" on the funding of research on health effects. He would like to give the go-ahead to a $5 million study at Love Canal to be sponsored jointly by CDC and the medical school of the State University of New York at Buffalo. The White House has not yet processed the request.

Eliot Marshall