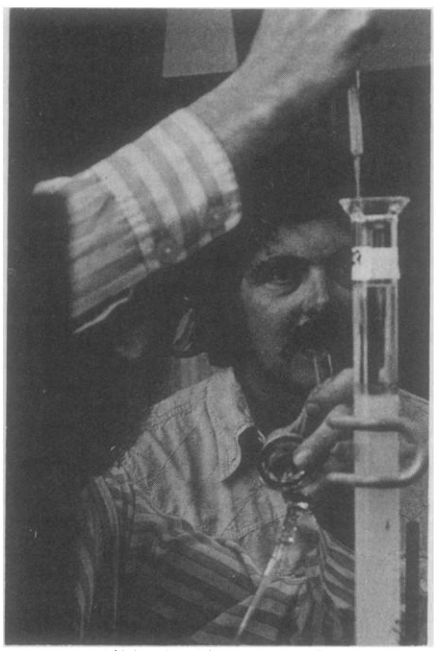
Gene Splicing Company Wows Wall Street

Investors' frenzy to buy into the new genetic technology caused a historic day on the market

In January 1976 Robert Swanson and Herbert Boyer each put up $500 to found a partnership, which later became the company Genentech, for exploring the commercial possibilities of gene splicing. At around 10:45 a.m. on 14 October 1980, the value of each man's holding stood at slightly more than $82 million.



University of California, San Francisco Photo

Herbert W. Boyer

Designer gene doyen

At that moment, some 20 minutes after trading had started in the company's first public offering of its stock, the price per share had soared from an initial $35 to the giddy height of $89. Genentech was expected to be the hottest issue to hit Wall Street in some time, but the explosion in its price was the most striking that many brokers had ever seen.

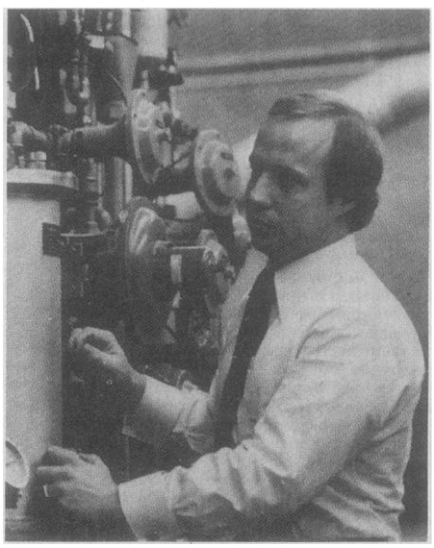
When the day closed, with the price at $71.25 a share, the first gene splicing company to go public had established for itself a market valuation of $529 million, or some 8 percent of the value of Du Pont. Yet the enterprise which Swanson and Boyer founded less than 5 years ago has so far accumulated a loss of nearly $700,000. It has no product on the market. The uncertainties of clinical trials and FDA approval could delay by 3 years or so the marketing of Genentech's leading products, human insulin, growth hormone, and interferon; and the interferon project is clouded by a claim from the University of California (*Science*, 26 September 1980).

How did Genentech come to win so eminent a spot in the public eye? Its cofounder, Robert Swanson, is a mere 32-year-old with degrees in chemistry and management from MIT. After working briefly for the venture capital firm of Kleiner & Perkins, he approached Herbert Boyer, a biologist at the University of California, San Francisco, who with Stanley Cohen of Stanford invented the recombinant DNA technique in 1973.

Genentech, located in San Francisco, was incorporated on 6 April 1976 and started hiring scientists who could help advance the still theoretical promise of recombinant DNA to commercial reality. A major competitor, Cetus, was already established in Berkeley, across the bay, and one of the company's earliest backers, Daniel Adams of Inco, was soon to set up a second rival in the form of Biogen.

Once set up, Genentech produced a slow but steady stream of technical successes that put it well ahead of the field. It announced bacterial processes for production of the brain hormone somatostatin in 1977, for human insulin in 1978, for human growth hormone in 1979, and, in June this year, for interferon. The progress with interferon, a substance of high interest to Wall Street, prepared the ground for offering stock to the public. As of August 1980, Genentech had grown to be a company of 112 people, 40 of whom have Ph.D.'s.

Investor interest in Genentech's fortunes has always been so buoyant that the company has been able to raise large amounts of capital by selling off comparatively small amounts of equity. This month's offering of 1.1 million shares raised $38.5 million, but the public has bought only 14 percent of the equity. Swanson and Boyer still own 925,000 each of the almost 7,500,000 shares outstanding, giving them together 25 percent ownership in their company. Other large shareholders are Lubrizol Enterprises (21 percent) and Kleiner & Perkins (13 percent).



AP Photo

Robert A. Swanson

MIT chemist makes good

The company's long-term strategy is to produce and market its own products. For the moment, however, its tactic is to find partners among the established pharmaceutical houses. Its insulin process was developed under contract to Eli Lilly, which pays on a royalty basis. Genentech's earnings depend on the extent to which Eli Lilly switches from animal glands to bacterially made insulin as its source of supply. In the case of growth hormone, Genentech's arrangement with Kabi of Sweden gives it the right to supply a percentage of Kabi's needs. A similar agreement exists with Roche, for which Genentech developed the interferon process.

The market for human growth hormone is small. The big money spinners are insulin and interferon, but factors beyond Genentech's control may limit its profits. The insulin market seems about to enter a highly turbulent phase, with purified pork insulin competing with human and standard insulin, and all three facing future competition from insulin pumps. Interferon, however great its potential, faces several uncertainties, the first being that of whether it works.

Genentech has other projects in hand, such as a vaccine for foot and mouth disease, and has evidently developed a firm grasp of the new technology. Yet its suc-

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cess in translating its technical mastery into hard cash is still far from assured. Its prime asset, a corps of able researchers and technicians, may count for less than marketing skills or fermentation technology when the art of gene splicing becomes more generally available.

On the other hand, the skills shown by Genentech's scientists and managers so far may enable it to stay atop the crest of the wave and continue to dominate the growing industry. In which case the Street's first reaction to Genentech's stock may not have been totally off the wall.—NICHOLAS WADE

Iraqi Nuclear Program Halted by Bombing

The air attack missed Iraq's reactors, but raised a specter of conventional war with radioactive fallout

The battered French program to build a nuclear research center for Iraq was hit with a new setback this fall just after radioactive fuel had been delivered for installation. Bombs, presumably delivered by Iranian pilots, hit the research site about 10 miles from the center of Baghdad on 30 September. They damaged an auxiliary building and forced the French technicians working on the project to leave. The attack did not damage the reactors, but it did shut down the program indefinitely.

The incident provoked speculation of two kinds: on the specific effects of this air raid and on the general risks that war presents to operators of nuclear plants.

The Iraqi center, called Tuwaitha, included a small Soviet research reactor (5 megawatts in thermal power) built in the 1960's, a new French reactor known as Osirak (about 50 megawatts), and a full-scale mock-up of the Osirak called Isis (only about 800 kilowatts). The French reactors are duplicates of a reactor in Saclay, France, incorporating the latest research technology. France has also offered to build a large (900-megawatt) power reactor for Iraq sometime in the future. Bids are now being entertained.

Coming on the heels of two other acts of sabotage, the attack on Tuwaitha seemed to some observers part of a larger plot. In 1979 part of the Osirak core was damaged by a bomb while being shipped from the factory in Toulon, France. Then in June of this year, the Egyptian physicist serving as the chief liaison between France and Iraq was murdered in a hotel room in Paris (*Science*, 29 August). The French press did not hesitate to report the widespread suspicion that these were the acts of Israeli saboteurs.

Thus, the weekly journal *L'Express* asked in a major article on 11 October, "Qui a Bombardé Osirak?" Its answer: western specialists confirm that it could be no one but Israel. The only evidence the journal cited was the word of "one of the most qualified sources" that this was the conclusion of several European intelligence agencies.

Israel denied that it had had any part in the business. It is true, however, that the chief of Israeli military intelligence appeared on television 2 days before the attack, wondering aloud why the Iranians had neglected to bomb the Iraqi atomic site.

The Israelis have protested France's decision to supply nuclear technology to Iraq ever since the announcement of a contract in 1976. From a legal point of view, they have little to work with, for the Iraqis and the French have followed to the letter all the safety and nonproliferation requirements of the International Atomic Energy Agency. Likewise, Iraq has signed the Nuclear Nonproliferation Treaty. Israel and France have not.

Israel fears that Iraq will use its newly acquired machinery to build the first Arab bomb, or—nearly as objectionable—to train a generation of nuclear physicists who will later build weapons for the Arab world. Israel has a motive for destroying Osirak, but no one has found Israelis at the scene of any of the crimes.

The French authorities prefer to say as little as possible about the work in Iraq, on the grounds that the documents are strictly confidential. The French are embarrassed by the furor that surrounds the project, and, as one official of the Commisariat à l'Energie Atomique (CEA) explained, giving out further information would only revive the campaign against Osirak which has been "all over the press." Thus it is impossible to learn from an official source what happened to the Iraqi reactor. But the CEA does not contradict reports which have appeared in the French press, saying the damage was negligible, and that some fuel is already at the site.

The mock-up reactor, Isis, was apparently due to receive its first charge of fuel (93 percent enriched uranium) in the week before the Iraqi-Iranian war broke out. Twelve to 13 kilograms of uranium fuel have been delivered, according to French accounts. Loading was postponed and then abandoned following the air raid. Some French workers are still at the site, but they remain only to help with maintenance and protection of the site. The program, which counted on starting the reactors in 1981, has been delayed by a year or two. A new furor is brewing in France over the fact that the highly enriched uranium has now been left in Iraqi hands without proper French supervision. The French government is divided on how to proceed with the plan.

If the attackers had scored a direct hit on a loaded Osirak, would they have created a radioactive disaster in Iraq? The CEA spokesman, Jean Pellerin, would not discuss the plant's design, but said it was a copy of a reactor at Saclay which is protected by a concrete containment structure. The containment on large power reactors—in France as in the United States and Germany—is made of steel-reinforced concrete, several feet thick. It is intended to prevent the release of radioactive debris from an accident, but is also made to withstand the impact of a large commercial jetliner. Osirak, a rather large research reactor, does not have as massive a shield as a power reactor. But according to one expert at the American Department of Energy (DOE), it contains a concrete "biological shield" at least a meter thick.

In order to do serious damage, a bomb would have to penetrate the building that houses Osirak, Osirak's concrete shield (or, if from the right angle, a deep pool of water), and finally the metal vessel which holds the fuel. Most conventional weapons could not do this, although a large electronically guided "smart" bomb of the kind used by the U.S. Air

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