

## TECHNOLOGY TRANSFER

## UC Goes Where Harvard Feared to Tread

Call it a sign of the times. In 1980, a plan to start a company at Harvard to commercialize university inventions collapsed when faculty members claimed it would erode academic independence and raise potential conflicts of interest. Last week, the University of California (UC) announced plans to set up a similar company, but nary a protest was heard. The difference? A decade of growing university-industry links has made the idea seem less threatening—and UC, which is feeling the chill of California's recession, needs extra income.

The proposal UC officials presented to the university's Board of Regents last week calls for launching a for-profit company to help UC turn more of its patents into products—and cash. Those behind the plan believe there is a lot of untapped potential: Only about 25% of UC patents are actually licensed by companies, although at least another 25% are believed to have commercial possibilities. The proposed company, to be called the UC Technology Development Co., would try to take those undeveloped technologies a step toward commercial application either by giving UC researchers money to do additional development themselves or by spinning off a startup company to do the work. After that, it would try to attract an industrial investor.

UC Technology Development would have first refusal rights to fund further development of any promising—but not yet marketable—technology coming from the UC campuses or the three national laboratories that UC manages for the Department of Energy: Los Alamos, Lawrence Livermore, and Lawrence Berkeley. It would then get exclusive rights to form a company around the technology or to license it, while retaining a share of the company or royalties. Profits from the venture would be reinvested, rather than going back into university research. A companion nonprofit corporation known as the UC Technology Development Foundation would take care of the actual patenting and licensing work.

UC officials project that the for-profit company will directly invest more than \$65 million in an estimated 350 technologies between 1994 and 2001. Initial funding would come from the \$27 million in licensing royalties that UC is already collecting, a quarter of which it now turns over to the state. (UC has asked the governor of California to let it keep all the royalties to support the new company.) In addition, the university hopes to raise another \$370 million from venture capi-

talists and stock offerings. In return, California would eventually reap a big tax harvest if UC's projections are correct: The university claims that new companies spawned by UC patents—as many as six startups a year—could generate as much as \$9.5 billion worth of “economic activity” by 2001.

When Harvard floated a similar idea a decade ago, it was shot down in flames after the faculty worried that commercial incentives would skew university priorities toward projects most likely to make money, rather than those that are scientifically the most interesting. California has often taken a more relaxed view, however. Startup companies spun out of Stanford's computer research laboratories spawned Silicon Valley, and California's biotech revolution got its

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**—Ronald Brady**

## SMOKING AND HEALTH

## Signs of Damage by Radicals

Over the past few years, a growing band of researchers have pointed to free radicals as major culprits in health problems ranging from cancer to heart disease and even aging. And, since cigarette smoke contains a cocktail of free radicals—highly reactive chemical species with one or more unpaired electrons that oxidize many biological molecules including DNA—there's been growing speculation that the increased cancer risk faced by smokers may in large part be due to the insidious effect of these agents. A handful of in vitro experiments have lent support to this speculation by showing that tobacco smoke can oxidize isolated DNA. But there's been no hard evidence from human studies that smoking adds significantly to the oxidative assault that everyone's genetic material faces from the free radicals generated as a by-product of normal metabolism—until now.

Researchers from Copenhagen University, Århus University, and the Danish Cancer Registry report in the December issue of *Carcinogenesis* that they have found that the urine of smokers contains larger quantities of a tell-tale indicator of DNA oxidation than that of nonsmokers. From a public health standpoint, these results could be a mixed blessing: The Danish researchers who carried out the study are now trying to determine whether giving smokers large doses of antioxidants can reduce the signs of oxidative damage. But they worry that die-hard smokers may erroneously believe that such

start in academic labs. After 2 years of discussion with the UC faculty, says Ronald Brady, the university's senior vice president for administration, the concept of a technology development company no longer seems heretical. The possibility that company funding may tilt the academic playing field “is a legitimate concern,” Brady says, “but we've told them that we're going to try hard to protect what the faculty is already doing.” To help keep academic concerns at a minimum, the new company's board of directors will include one or two members of the academic council.

The proposal will face its first test when the new California budget request comes out in January. That will reveal whether the governor is willing to give up the state's share of the UC royalty income. The board of regents, which will meet again in March, will have the final say. But given the woeful state of the California economy, any proposal to wring more dollars from UC research seems likely to find a receptive audience. As one researcher involved in the ill-fated Harvard venture puts it, “The way people look at these things changes a lot with the economic situation.”

**—Christopher Anderson**

measures can make smoking safe.

The Danish group studied DNA oxidation indirectly, by recording the concentration of a compound called 8-hydroxydeoxyguanosine (8OHdG), which is released when enzymes called exonucleases repair oxidized DNA, in urine from a random sample of 83 Danish adults. They found that the 30 smokers in the sample excreted half as much 8OHdG again as did the nonsmokers, indicating that smoking greatly increases the rate at which DNA is oxidized. This could be caused directly by the free radicals present in cigarette smoke. But Copenhagen University pharmacologist Steffen Loft, a member of the Danish team, believes that the fact that smokers' metabolic rates are typically 10% to 15% higher than those of nonsmokers also plays a role. He suspects that the higher rate of cellular respiration in smokers is largely due to the enhancement of one particular metabolic pathway that results in the formation of free radicals.

In spite of the growing interest in free radicals, most researchers investigating the mechanisms by which smoking causes cancer have, until now, concentrated on the binding to DNA of the polyaromatic hydrocarbons found in tobacco smoke. More work must be done before it's possible to estimate the relative importance of the two processes in causing cancer among smokers. But Loft believes that DNA oxidation will prove “at least as important as aromatic binding.”