

get. Nevertheless, the state recognizes that it gets a good deal from the university: "for every state dollar that we get, we bring in about three times that", says Baker.

As for a solution, there is no shortage of ideas — but no simple answers, of course. A state tax for higher education is being considered, although this would be "politically full of sharks" concedes Baker. More seriously, Jack Peltason, president of the University of California, has announced a series of 'strategic initiatives', one of which is a formalization of the way UC keeps track of its patent royalties (see below, and *Nature* 360, 701; 1992). Another is the California Business-Higher Education Forum, an organization of up to 60 business and education leaders. It decided at its first meeting in February to study how the Master Plan can remain viable with current constraints.

Even the idea that the university could occupy one of the two national laboratories within the state that it runs under contract from the Department of Energy has been considered (the third is at Los Alamos, in New Mexico). Faculty and buildings are already in place, and the need to house students is now more pressing than the need to make atomic

Technology transfer

GENENTECH and Chiron face each other across San Francisco Bay. Whether measured by research output or citation impact, they are clearly in the biotechnology superleague. Their combined citations are more than half again as many as those of the other eight top ten US biotechnology companies put together: and they have made a truckload of money. Yet their success stems from the research that their founders, respectively Herb Boyer and Bill Rutter, did at the University of California. "Those are models that people always point to and say 'boy, you need to do more of those'", says Ronald Brady, senior vice president of the University of California (UC), who seeks to corral more of the money generated by UC research back into UC's now threadbare pockets.

But Brady is not just a patent policeman. By fostering stronger links between academic institutions and business, UC could use its royalties as seed-money that could by 2001, inject \$9.5 billion into California's economy — a sum greater than five times UC's total annual budget.

As part of UC president Jack Peltason's latest round of initiatives to fix UC's health, the university will set up two corporations to foster technology transfer, in what has been called the Enhanced Technology Transfer Program. One of these, the nonprofit UC Technology Development Foundation (UCTDF) will retain UC patents as an agent of the university's Board of Regents, and offer inventors legal, technical and financial services.

The other, the for-profit UC Technology Development Company (UCTDC), will evaluate an invention or discovery that may be close enough to the marketplace to be licensable and, if it is, nurture it with seed-money as a start-up company until it can be sold on to private sponsors: licence agreements from such a start-up would be managed by UCTDF, or UCTDC may wish to retain an equity.

Both companies would be financed by UC's royalty income, which stood at \$28 million in fiscal year 1992-93. By 2000, they plan to foster more than 20 start-up companies, and to award "gap funding" to help 100 inventions a year to the marketplace. The enhanced royalty income generated by these activities is expected to exceed \$222 million by 2001. But one thing leads to another, and jobs created by the ventures could result in an accumulated bonus to the state economy of \$9.5 billion by that date.

At present, the state receives 25 per

cent from UC's patent income, but in the budget proposals for fiscal year 1992-93, Governor Pete Wilson welcomes Peltason's request to waive this tax, in favour of additional funds for the technology transfer programme.

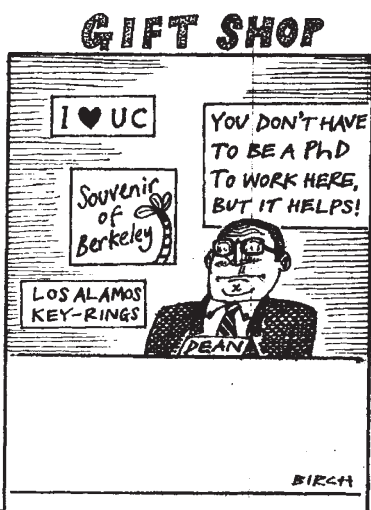
It is heady stuff, but built on the underlying philosophy that the entire stance of university research must adapt to straitened circumstances or perish. "Everybody agrees that we have put together a very powerful educational apparatus in this country. But we have not done well in terms of transferring that knowledge to the wealth-making part of society", says Kumar Patel, the new vice chancellor for research at UCLA. "The linear idea of transferring technology from researcher, to engineering, to manufacturing, to marketplace somehow just does not work. It takes too long, and if you cannot increase the velocity of what I call 'technology insertion', then we are dead."

The linear regime also creates an intellectual pecking-order that can be detrimental to economic health, in which research is regarded as more 'honourable' than engineering, engineering and more honourable than marketing, with salesmen at the bottom. But research that produces more people with PhDs will have little immediate impact on the economy.

The answer is to discuss ideas with industry while they are still at the bench-top stage. This is clearly an aim of the enhanced technology transfer initiative. Brady says: "The business community feels very strongly that there needs to be an increased interaction between the university community in its research capacity and their activities, directly".

The whole package is more than a couple of new initiatives. What it amounts to is a gross phase-change in the way academics see themselves and their activities. "A substantial number of faculty members are genuinely scared", says Patel: "then there is a small group of faculty members who are genuinely excited about the change, because they see that this is the vindication of what they had believed for many, many years, namely that university research must also be relevant research."

If even one of the 20 or so companies that UC hopes to engender by the year 2000 is another Genentech or Chiron, then everyone can go home and open the champagne. But Boyer and Rutter managed quite well without UC's initiatives. May not technology transfer be better managed at the bar-room-chat level, than from an office 22 floors above Oakland? Time will tell, but UC finances are in poor shape for a long haul.



bombs. Could the tenth campus be UC Livermore, rather than UC Fresno?

The university is nevertheless convinced that, in the long run, it will solve its problems. Its worries concern the immediate future. "In ten years time we'll be jammed to the rafters with students", says Baker. But in 20 years, he thinks, the problem may well have solved itself: more remote education by computer could be a feasible option by then. Kumar Patel is also confident that the university will rise to the challenge, just as Californians have always done. His favourite philosopher is a cartoon character called Pogo, who reminds us that "we are surrounded by insurmountable opportunities". □