accelerated reaction." At the same time, he says, this mechanism could also provide spatial control: with both A and B hooked firmly onto different points of an appropriate catalyst molecule, there would be only one way they could reach across, touch each other, and merge to form a product.

The trick was to find a catalyst molecule with the right properties. A search through what Corey calls "a very confusing literature" on chiral synthesis, together with a few years of laboratory study, eventually led his group to a certain organic compound containing the element boron. It had been investigated several years earlier in the laboratory of Japanese chemist Shinichi Itsuno. But what they found was that a slight modification caused it to have a dramatic catalytic effect, with one chiral form of the product molecule being enhanced over the other by factors averaging 20 to 1.

Dubbed the "CBS" catalyst after the initials of the three authors on the 1987 paper—Corey, Raman K. Bakshi, and Saizo Shibata—it was the first of the chemzymes. Since then it has grown into a family of about 20 different catalysts, each with a slight modification to the basic molecule designed to enhance its usefulness to a particular reaction. At the same time, moreover, Corey and his co-workers have developed several other chemzyme families, one of which works beautifully for that original prostaglandin synthesis.

Looking to the future, Corey is particularly excited by the possibility of designing chemzymes that incorporate atoms of a transition metal such as nickel, molybdenum, or rhodium. Not only are metals very good at making molecules more reactive, he says, but because they are so big and have so many electrons in their outer layers, they can also coordinate as many as seven or eight groups at once. "And that gives you tremendous potential for much more sophisticated, information-rich catalysts," he says.

Meanwhile, Corey likes to think that the chemzyme work is important for another reason as well: it exemplifies a movement in modern chemistry known as "rational" molecular design.

"CBS was unique in that it was not found by trial and error," he says. "We started out by understanding the reaction and the chemical mechanisms involved. And then we looked for a system with the right 3-D control and reactivity enhancement, sorting through what we knew about molecular structure and reaction pathways."

"This is a brand new thing in chemistry," he says, "a rational design of molecules that work in a known way. I like to think that CBS was a first step in that direction."

■ M. MITCHELL WALDROP

DNA Typing Is Called Flawed

One month after a group of scientists made legal history in a Bronx courtroom, the case which brought them together is about to come to a verdict.

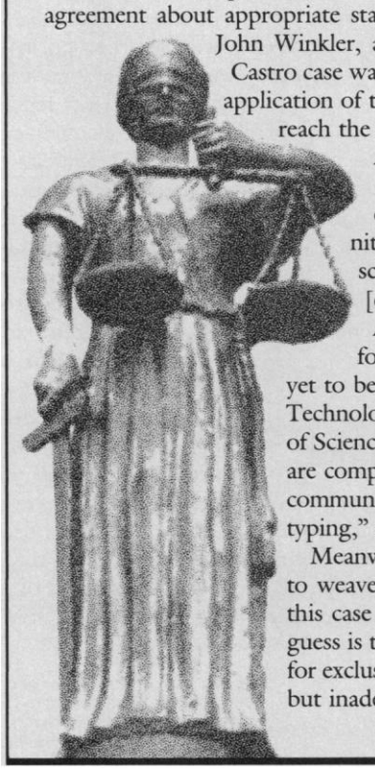
In June, four scientists called as expert witnesses for both the prosecution and the defense rewrote judicial practice when they banded together and declared that the scientific evidence—DNA typing—in the pre-trial hearing of this double murder case was no good and should be dumped (*Science*, 2 June, p. 1033). The unusually long hearing is now at an end, and just last week, in the final briefing to the judge, prosecution counsel made a dramatic concession: the DNA results that were supposed to link the accused murderer to his alleged victims are so flawed as to be inadmissible. And yet, proposed the prosecuting attorney, the judge should make a ruling on the admissibility of such evidence in general.

"Bizarre," says defense counsel Peter Neufeld. "How can the prosecution argue that the technique is acceptable, when the only example of it the court has seen has been described as grossly inadequate by scientists on both sides?"

The Castro case, as this trial has come to be called in the national press, was by no means the first in which the relatively novel technique of DNA typing has been used to try to tie an accused to his victim: since it was introduced a couple of years ago, the method has been on the witness stand more than 200 times. But Castro became a cause célèbre when defense counsel decided to launch the first serious challenge to the reliability of the technique. "The Castro hearing put DNA typing as a whole on trial," says Neufeld. "And from the evidence we've seen, you'd have to say it fails."

Done properly, DNA typing compares the genetic material from two sources and, if they match, gives an estimate of the probability of such a match occurring by pure chance: it is a combination of modern molecular biology and standard population genetics, and holds the promise of being extremely powerful. The evidence in *People v. Castro*, which was produced by Lifecodes Corporation, New York, a major player in forensic DNA typing, was said to demonstrate that a spot of blood on Joseph Castro's watch genetically matched the blood of one of the victims, the likelihood of a match by chance being one in 189,200,000.

"In the Castro case both parts of the technique—the molecular biology and the population genetics—were scientifically unacceptable," says the Whitehead Institute's Eric Lander, a witness for the defense. The joint statement from all expert witnesses was blunt on this point this, and added: "There is a need to reach general scientific agreement about appropriate standards for the practice of forensic DNA typing."



John Winkler, a spokesman for Lifecodes, told *Science* that "The Castro case wasn't our best work—it was early days in the forensic application of the technique." Nevertheless, he added: "Would we reach the same conclusion today? Yes, we would."

Although legal standards vary from state to state, acceptability of scientific evidence includes some element of consensus among the scientific community. "The record in this case makes it plain that the scientific community has not resolved these questions [of standard practice]," argues the defense counsel.

As further evidence to the current immaturity of forensic DNA typing, defense counsel also points to a yet to be completed study of the technique by the Office of Technology, and a soon to be announced National Academy of Sciences' panel on the subject. "Until these various studies are complete, it is surely premature to say that the scientific community has come to a consensus on forensic DNA typing," says Neufeld.

Meanwhile, the judge—Gerald Sheindlin—whose task it is to weave science and the law into some compatible mix in this case is expected to deliver his decision next week. One guess is that, as currently practiced, DNA typing is adequate for exclusions (saying that two DNA samples do not match), but inadequate for inclusions (saying two samples match).

■ ROGER LEWIN