GENOME INITIATIVE

WATSON'S GREAT HUMAN CHROMOSOME AUCTION

WASHINGTON, D.C.—The mammoth project of mapping and sequencing the human genome (*Bio/Technology* 7:223, Mar. '89) might best be managed by "auctioning off the chromosomes"—perhaps country by country, suggests James Watson, director of the Cold Spring Harbor Laboratory (Cold Spring Harbor, NY) and Associate Director for Human Genome Research at the National Institutes of Health (NIH, Bethesda, MD). The undertaking represents a "perfect opportunity for international cooperation," except perhaps for the ongoing "jungle" of competition to study human chromosome 21, where several important genetic disease markers already have been identified, he says. Watson and other genome enthusiasts aired their views during a two-day conference in April, "Unlocking Potential: The Promise of the Human Genome Initiative," co-sponsored by the American Medical Association and the Alliance for Aging Research, and supported by a grant from DuPont (Wilmington, DE).

"Dividing up the effort internationally is desirable and achievable," says Ralph Christoffersen, vice president, discovery research, of The Upjohn Company (Kalamazoo, MI), agreeing with Watson. "Let's avoid redundancy." Jack McConnell, corporate director of advanced technology at Johnson & Johnson (Raritan, NJ), recommends establishing "public-private management consortia to oversee the genome project"—at least within the U.S. However, international coordination currently is in "a mess," notes Robert Cook-Deegan, acting executive director of the Congressional Biomedical Ethics Board and former congressional Office of Technology Assessment (OTA) staff member, who directed the OTA study of the project.

Although management strategies are developing slowly, the pace of new technology development is rapid. With it, scientists now can do "genetics on anything," says Sydney Brenner, director of the Medical Research Council Molecular Genetics Unit (Cambridge, U.K.). Thus, instead of "looking through little cracks in the fence" at the formidable challenges of molecular genetics, "big doors have opened." Adds Walter Gilbert of Harvard University (Cambridge, MA), "Working out the sequence will change the nature of the science we're doing, [moving it] to be more theoretically based." The ad-

vanced understanding of genetics will lead to "individually tailored" medicines, Gilbert says.

Moreover, it will enhance progress toward human gene therapy, according to Thomas Caskey, chairman of the institute for molecular genetics at Baylor College of Medicine (Houston, TX). With use of a retrovirus to restore missing gene functions, he and his colleagues recently "cured" adenosine deaminase deficiency—a genetic disorder that leads to severe immunodeficiencies—in cells from a human patient that are being grown *in vitro*. If similarly engineered cells could be reintroduced successfully into such patients, the otherwise usually fatal disease may become treatable.

Although the focus of the genome initiative is on human genetics and medicine, the program is expected to have a far broader impact. For example, NIH officials promise that the genomes of several model organisms of ascending genetic complexity will be scrutinized on the way to analyzing the human genome. More recently, the U.S. Department of Agriculture

(USDA) announced preliminary plans to study the genomes of agriculturally important organisms, mainly plants.

Agricultural biotechnology companies already are exploiting some fruits of advanced gene-mapping technologies, points out David Evans, vice president of DNA Plant Technology (Cinnaminson, NJ). For instance, restriction fragment length polymorphism (RFLP) mapping, a technology fundamental to the genome initiative, is becoming a standard means recognized by courts to define patentable plant varieties, he says. And, researchers and more traditional plant breeders are trying to correlate RFLP patterns with valuable physiological traits in plants, hoping someday to select promising new plant varieties as seedlings rather than at later stages of development. The "major limitation" on this approach is "the absence of detailed knowledge of the genetic basis of plant traits," notes Robert Goodman, executive vice president of Calgene (Davis, CA). "A modest investment in genome [research] will pay big dividends." —Jeffrey L. Fox

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