This way of thinking is likely to stimulate project proposals with a very different look and feel. In Heidelberg, one group of scientists is discussing ideas for an Institute of Genome Research that would bring together basic studies of genes with disease models and clinical work, especially in neurology, oncology, and cell biology. The Max Delbruck Center in Berlin is also planning a proposal focusing on medical questions, according to bioinformaticist Jens Reich, but with an epidemiological slant—collecting and analyzing family material for common multigene diseases and studying the diversity of the relevant genes.

**Mapping the right path**

Another hard decision for Germany's genome program will be how heavily to invest in human mapping and sequencing. Many of the researchers who spoke with *Science* feared that this could eat up the money fast and reduce the chances for Germany to find a special niche internationally. Others worried that it is not realistic—or worthwhile—to jump in now, with human genome work so advanced elsewhere in the world.

But it may be hard to stay out. One reason could be pressure to contribute from countries now carrying most of the cost and effort. "Mapping and sequencing the human genome shouldn't be left to any one country or individual," says Cambridge's Goodfellow. "The project is so large and so important, it should be shared. It's a moral issue. ... Germany can't say, we're not interested in this; we'll exploit what others have done and do the fun bits ourselves."

And in fact, the time is now especially good for newcomers. In the early years, genome researchers pursued a whole battery of approaches. But there is now a "major change in strategy," says David Bentley of the Sanger Center in Cambridge, U.K., with sequencing likely to begin much earlier than originally planned (*Science*, 2 June, p. 1270). That, in turn, helps researchers zero in on the essential tasks: making sequence-ready maps for 99% of the genome, plus the entire job of sequencing—still "a gigantic amount of work," he says. What's more, there is still only a handful of labs that can churn out megabases. So the bottom line is, says Bentley, "the more people on board, the better."

What's more, despite Germany's reputation as a desert for genome work, it has at least some groups already involved in mapping and sequencing. An emerging international consortium of labs to map and sequence the X chromosome includes both Poustka and André Rosenthal at the Institute for Molecular Biotechnology in Jena, while other German groups are involved in European Union–sponsored genome projects on yeast, fruit fly, and *Arabidopsis*.

Another argument for investing in large-scale sequencing is that the technology is crucial to many questions about function and can therefore help Germany find its special niche in genome research. Munich's Pääbo hopes to use comparative sequence analysis across species to look at key events in evolution, such as how animals adapted to living on land, the origin of the vertebrate body plan, and the evolution of the human brain. Rosenthal's lab is involved in sequencing the puffer fish genome, which is emerging as an important model, particularly in pointing researchers to control regions in the human genome, he says. Then there's the issue of genetic diversity, which Rosenthal calls "the future of the genome project."

So perhaps, after all its past agonies, Germany's genome project will end up with the best of all problems—having to make a choice among lots of good ideas. Says one German scientist, a longtime observer of genome research: "The future is bright, but the road is tortuous."

**–Patricia Kahn**

GENETIC ENGINEERING

# Russia Readies Its First Gene Law

MOSCOW—Brandishing a transgenic potato before the Duma, the lower house of Russia's parliament, Viktor Shevelukha, deputy chair of the Duma's committee on culture, education, and science, persuaded deputies to pass the country's first law governing genetic engineering at the end of last month. The legislation, which sets up a regulatory system similar to those in place in the West, has come as a relief to some scientists, because early drafts of the law would have imposed much tighter controls.

"We wanted to adopt an internationally compatible law which at the same time would take into consideration the present situation in Russia," says geneticist Konstantin Skryabin, who heads the Council for Biotechnology of the Russian Academy of Sciences and chaired a committee that drew up the new law. The committee—which included leading scientists involved in genetic engineering, representatives of the relevant government ministries, and a strong contingent of environmental scientists—had to tread a fine line between the needs of a rapidly developing biotech industry and demands from the general public for tough environmental regulation.

The committee completed a draft late last year and asked UNESCO to assess it. It didn't get a good reception. UNESCO asked a panel of 15 scientific, legal, and ethical experts to review the draft, and some of them judged it far too restrictive. "The draft law was awful," says biochemist Julian Kinderlerer of the Institute for Biotechnological Law and Ethics at the University of Sheffield in the United Kingdom. "It required the government to register all researchers considered competent to carry out biotechnological research and to carry out an annual examination to ensure they are keeping up standards. No one else requires this." The draft also required researchers to obtain a license from the government for any genetic manipulation experiments, even completely harmless ones.

**"We wanted to adopt an internationally compatible law ... [consistent with] the situation in Russia."**
**—Konstantin Skryabin**

Four of the panel members, including Kinderlerer, visited Moscow in March for further discussions with the drafting committee. "We strongly recommended that they follow either the European Union or the U.S. line," Kinderlerer says. The committee took heed: The version presented to the Duma last month bears striking similarities to European genetic-research legislation.

All experiments are graded in risk from 1 to 4, with grade 1 experiments deemed harmless and grade 4 having the greatest potential risk. All experiments that involve deliberate release into the environment are graded 3 or 4. For grades 1 and 2, researchers will have to obtain permission from a special commission within their own institution. For experiments graded 3 and 4, they must apply to a new Interdepartmental Committee, which will then apply to the relevant ministries for licenses on their behalf. "The aim of such a pattern," says Skryabin, "is to free scientists from as much bureaucratic formalities as possible, as the researchers will have to deal with only one federal body."

The Russian government hopes to obtain half of the $1.6 million cost of setting up the system from industry. Running the system will cost about $200,000 a year, but importantly for cash-strapped Russia, the drafting committee expects that income from licenses will make the system profitable in just over 2 years.

**–Andrey Allakhverdov**

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