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Human chromosome 22 and the virtues of collaboration

Two rival approaches to gene sequencing have demonstrated their complementarity with the fruitfly. For similar progress with the human genome, hostilities over data release policies should be re-examined.

Geneticists and many others have cause to celebrate this week. The consortium behind the publicly funded international Human Genome Project has just put the one-billionth base pair of sequence into the public databases, and today is publishing the first sequence of a human chromosome, number 22 (see pages 447, 467 and 489). Given the scale and complexity of the task, the sequence is a great achievement.

The consortium's major rival, Celera Genomics, has itself also just completed the 180 million base-pair genome of *Drosophila melanogaster* (see *Nature* **401,** 729; 1999). It did this in collaboration with an academic team headed by Gerry Rubin at the University of California at Berkeley, funded by the US National Institutes of Health (NIH). Participants in the collaboration saw it as a precursor for similar cooperation on the human genome. Their agreement stated that it was "also a test of whether a public/private collaboration can expedite and lower the cost of the generation and use of genomic information".

"Yes" seems to be the answer. Rubin's group provided Celera with maps of the fly genome, for example, and Celera quickly produced additional high-quality sequence data. It has been a win–win affair.

Tensions have so far blocked public/private collaboration on the human genome. Talks between Celera and the US Department of Energy foundered late last year on the thorny question of data access (see *Nature* **397,** 93; 1999). The NIH and Britain's Wellcome Trust opposed the deal as conflicting with the so-called 'Bermuda agreement' under which sequence data obtained through the Human Genome Project are released into public databases within 24 hours (see http://www.sanger.ac.uk/HGP/policy-forum.shtml#ref1, which includes a concisely readable description of the sequencing process).

Craig Venter, Celera's president, has promised to release human sequence data quarterly — his subscribers have immediate access. The company argues that the Bermuda agreement is less relevant than it was. What Celera is seeking to patent — as indeed are many scientists at NIH and elsewhere — are genes of demonstrable utility, rather than raw sequence data and genes of unknown function, whose patenting the Bermuda agreement was indirectly designed to pre-empt.

Rubin and Celera managed to strike a pragmatic compromise that included Celera depositing data in GenBank on completion of sequencing. But the value of the cooperation rested less on simply seeing data, and more on the fact that scientists from both sides worked together on the strategy for assembling the sequence data and identifying the genes they contain. The result has been faster and better for it.

It is increasingly clear that the different approaches being taken by Celera and the Human Genome Project are complementary. Collaboration could provide increased coverage and accuracy of the human genome and a higher rate of discoveries important for human health; importantly, a comparison of the two sequences would also yield many single-nucleotide polymorphisms, the major form of DNA variation involved in human traits and diseases.

More substantial collaboration would certainly accelerate completion of the human genome. One question is: at what price in future licensing requirements that would impede research? No progress has been achieved in bridging the public and private genome projects, mainly because the current policies on data release are still far apart. Venter's commitments to his investors are his affair; if he and the Human Genome Project participants can find a mutually acceptable moral and expedient policy on data release, the significant benefits of closer cooperation between Celera and the publicly funded project would be realized. That possibility should be pursued. ■

In pursuit of broadband visions

Ambitious research agendas should stimulate vigorous demand for investment in broadband networks.

As hardware prices continue to tumble, Internet use in countries with low-cost access to the Internet, particularly Scandinavia, Canada and the United States, has penetrated as many as 50 per cent of households. But it is still the science research community that sets the technical challenges, with research centres in neuro-imaging and particle physics, for example, expecting to generate 10^{15} bytes of data every year, and with the anticipated development of petaflop (10^{15} floating-point operations per second) computing power distributed over networks.

The US research community has already set the infrastructure agenda by promoting the idea of 'grids', in which reliable processing power and data are distributed among relevant communities by means of 'middleware' (see, for example, www.gridforum.org). Commendably, the Academia Europaea and the European Science Foundation are also pushing for urgent development along these lines, and are preparing a joint report that urges European action at every level.

So who needs to do what in Europe? A strong report — well documented and vivid in depicting the opportunities — needs to be published as soon as possible, and circulated to all capable of actively supporting the idea, whether in or beyond the research community. A proposal for investment needs to be considered by the council of research ministers next May, and the European Commission should approve funding as part of its fifth Framework programme.

Because such development will also benefit people beyond the research community, the case is intrinsically strong at these elevated levels of decision-making. But researchers must make a case for such investment locally if their institutions are to exploit the grids. The Academia Europaea/European Science Foundation have identified the cost of periodic upgrades that institutions need to provide for: about 10 per cent of their annual budget every seven years or so. That represents a tough challenge for a university. Researchers in the United States, Europe and elsewhere should lobby their rectors accordingly. ■