A Genome Sampler

PAGE 663

All genomes share critical features of composition, replication, and information management. However, despite these commonalities unifying plants, animals, and microbes, genomic information is also key to the incredible diversity that exists on this planet. This special section presents a sampling of progress in the genome analysis of a variety of organisms.

Although the flowering plant *Arabidopsis thaliana* averages less than 20 centimeters in height, it has become of prime importance in plant biology as a model representative of higher plants. (See the foldout chart summarizing the state of the *Arabidopsis* genome project and the Review by Meinke *et al.*) Knowledge generated by this project already shows promise in improving agronomic features such as yield and drought resistance in important agricultural crops and is leading toward development of "plant factories" that can produce new products such as biodegradable plastics. Realization of the potential of plant model systems depends on how far comparative genomics can be stretched, and Gale and Devos discuss its strengths and limitations. Whether we will reach the full potential of what one researcher has called the golden age of plant biology will also depend on budgets; see the News story by Pennisi about the recent infusion of funds into plant genomic research and the projects that are being planned.

Funding for generating genomic information on some other model systems (*Escherichia coli*, yeast, *Caenorhabditis elegans*, *Drosophila*, and mouse) and humans has primarily been coordinated under the Human Genome Project. Representatives of the National Institutes of Health and the Department of Energy present the second 5-year plan (Collins *et al.*) for the project. The focus of this endeavor has evolved from mapping to an all-out push on sequencing, and doing it better, cheaper, and faster. This latest plan also contains a clearer view of the next stages, with an emphasis on providing tools and resources that will enable researchers to ask more far-reaching questions.

Even with all the progress made, uncertainties remain. The ramifications of ramping up the sequencing effort remain unclear. Assembly and finishing of the sequence present unique challenges. And once we have this "book of life," will we be able to read it? As Gelbart points out, we are still functional illiterates when it comes to interpreting what the genome has to tell us. How we organize the flood of data that is being generated is a key component of beginning to decipher it.

However, excitement about the future is undeniably building. Chu *et al.* (p. 699) present a functional genomics study that is an example of the shape of future analyses. The availability of the complete sequence of the yeast genome allowed them to increase by an order of magnitude the number of genes known to be associated with spore formation. See also the Report by Deloukas *et al.* (p. 744) on the newest version of the physical map of human gene–based markers and the Report (Stephens *et al.*, p. 754) and Perspective (Hatch, p. 638) on the complete sequence of *Chlamydia trachomatis*.

The social and ethical ramifications of generating these quanta of genomic information are complex. How do we decide what kinds of research are appropriate and what kinds of research products to release into the environment? How will genomic information change our understanding of concepts such as race and ethnicity? (See the News story by Marshall.) In his Editorial (p. 625), Greely makes a point that should never be lost in the excitement of finding more and more sequence and looking for the genes associated with human diseases and traits: Respect for the people and cultures taking part in these studies should be of prime importance. An appropriate combination of scientific advances and consideration of social and ethical issues will allow us to achieve the full potential of plant biotechnology to feed and supply the world's population and of the Human Genome Project to give new dimensions to medicine and our picture of ourselves.

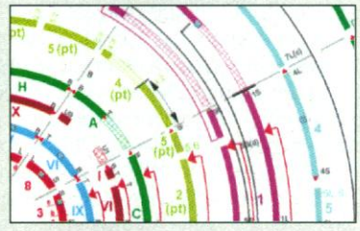
–BARBARA R. JASNY AND PAMELA J. HINES

CONTENTS

NEWS

PAGE 655

VIEWPOINTS



PAGE 656

REVIEWS

See also the News story on p. 608, Editorial on p. 625, Perspective on p. 638, Research Article on p. 699, and Reports on pp. 744 and 754.

Science