Sequencing the world

WASHINGTON, DC

An ambitious effort to map, store and disseminate genetic information about much of life on Earth gets under way

IN NOVEMBER 2015, 23 of biology’s bigwigs met up at the Smithsonian Institution, in Washington, DC, to plot a grandiose scheme. It had been 12 years since the publication of the complete genetic sequence of Homo sapiens. Other organisms’ genomes had been deciphered in the intervening period but the projects doing so had a piecemeal feel to them. Some were predictable one-offs, such as chickens, honey bees and rice. Some were more ambitious, such as attempts to sample vertebrate, insect and arachnid biodiversity by looking at representatives of several thousand genera within these groups, but were advancing only slowly. What was needed, the committee concluded, was a project with the scale and sweep of the original Human Genome Project. Its goal, they decided, should be to gather DNA sequences from specimens of all complex life on Earth. They decided to call it the Earth Bio-Genome Project (EBP).

At around the same time as this meeting, a Peruvian entrepreneur living in São Paulo, Brazil, was formulating an audacious plan of his own. Juan Carlos Castilla Rubio wanted to shift the economy of the Amazon basin away from industries such as mining, logging and ranching, and towards one based on exploiting the region’s living organisms and the biological information they embody. At least twice in the past—with the businesses of rubber-tree plantations, and of blood-pressure drugs called ACE inhibitors, which are derived from snake venom—Amazonian organisms have helped create industries worth billions of dollars. Today’s explosion of biological knowledge, Mr Castilla felt, tended many more such opportunities.

For the shift he had in mind to happen, though, he reasoned that both those who live in the Amazon basin and those who govern it would have to share in the profits of this putative new economy. And one part of ensuring this happened would be to devise a way to stop a repetition of what occurred with rubber and ACE inhibitors—namely, their appropriation by foreign firms, without royalties or tax revenues accruing to the locals.

Such thinking is not unique to Mr Castilla. An international agreement called the Nagoya protocol already gives legal rights to the country of origin of exploited biological material. What is unique, or at least unusual, about Mr Castilla’s approach, though, is that he also understands how regulations intended to enforce such rights can get in the way of the research needed to turn knowledge into profit. To that end he has been putting his mind to the question of how to create an open library of the Amazon’s biological data (particularly DNA sequences) in a way that can also track who does what with those data, and automatically distribute part of any commercial value that results from such activities to the country of origin. He calls his idea the Amazon Bank of Codes.

Now, under the auspices of the World Economic Forum’s annual meeting at Davos, a Swiss ski resort, these two ideas have come together. On January 23rd it was announced that the EBP will help collect the data to be stored in the code bank. The forum, for its part, will drum up support for the venture among the world’s panjandrum—and with luck some dosh as well.

Branching out
The EBP’s stated goal is to sequence, within a decade, the genomes of all 1.5m known species of eukaryotes. These are organisms that have proper nuclei in their cells—namely plants, animals, fungi and a range of single-celled organisms called protists. (It will leave it to others to sequence bacteria and archaea, the groups of organisms without proper nuclei.) The plan is to use the first three years to decipher, in detail, the DNA of a member of each eukaryotic family. Families are the taxonomic group above the genus level (foxes, for example, belong to the genus Vulpes in the family Canidae) and the eukaryotes comprise roughly 9,300 of them. The subsequent three years would be devoted to creating rougher sequences of one species from each of the 500,000 or so eukaryotic genera. The remaining species would be sequenced, in less detail still, over the final four years of the project.

That is an ambitious timetable. The first part would require deciphering more than eight genomes a day; the second almost 240; the third, about1,000. For comparison, the number of eukaryotic genomes se-
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Ethnomusicology

Beyond Babel

Music may be the food of love, but oddly, is not the language of it

“WHERE words fail, music speaks.” Though these words, from the pen of Hans Christian Andersen, are an appealing notion, the idea that there might be universals in music which transcend cultural boundaries has generally been met with scepticism by scholars working in the field. That scepticism may, however, be unwarranted, for research published in Current Biology this week by Samuel Mehr and Manvir Singh of Harvard University provides evidence that music does indeed permit the communication of simple ideas between people even when they have no language in common.

To ascertain this, the two researchers recruited 750 online volunteers from 60 countries. They played these volunteers 36 musical excerpts, each 14 seconds long, and each drawn at random from one of 18 songs in a collection of the music of small-scale societies around the world. Given the broad range of cultures and languages represented in the collection, and the ethnic diversity of the volunteers, Dr Mehr and Mr Singh could be reasonably certain that those listening were both unfamiliar with the music and unable to understand the lyrics in question.

After each excerpt had been played, volunteers were asked what they thought the song’s function was, and how sure they were of that on a scale of one to six. The possibilities offered were: “for dance-