



Press Release

Moss beats Human

Simple moss plants outperform us by gene number

At the genetic level, mosses are more complex than humans: A group of German, Belgian and Japanese scientists, coordinated by Professor **Ralf Reski** from the University of Freiburg, Germany, published a new study where they describe 32,275 protein-encoding genes from the moss *Physcomitrella patens*. This is about 10,000 genes more than the human genome contains. Mosses are tiny plants with a simple body plan: They have no roots, no flowers and do not produce seeds. Therefore, they were for a long time they were considered to be simple organisms also at the genetic level.

The moss *Physcomitrella* was chosen by Reski early on as the organism of choice and is now well established as a model species for basic biology, biotechnology, and synthetic biology on a worldwide scale. Consequently, the US Department of Energy Joint Genome Institute (US DoE JGI) has ennobled the *Physcomitrella* genome as a “flagship genome”. The experts believe that flagship genomes contain information that will help us cope with major challenges occurring during global climate change. The expectations include improved crop yields, disease and insect resistance, drought tolerance, and more efficient biofuel production.

For their recent study the scientists collected all available information on the moss genome as well as transcript evidence and used this data for a completely new bioinformatic analysis. The result is freely available on the community resource www.cosmoss.org, developed and maintained by the Chair of Plant Biotechnology in Freiburg. By combining all DNA and RNA

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data, the scientists were not only able to annotate the 32,275 genes that encode proteins but also to reveal the so-called “dark matter of the genome”, i.e. those genomic regions that are transcribed into small non-coding RNAs like microRNAs.

“One of our intriguing findings is that 13 per cent of the *Physcomitrella* genes have no clear relatives in any other sequenced organism so far. Analysing these orphan genes more deeply will reveal the hidden treasures of the moss genome”, Reski says. “Although it seems annoying that mosses outperform humans greatly by gene number, it is exactly this feature that may secure our future.”

Ralf Reski heads the Freiburg Chair of Plant Biotechnology. The biologist is a member of the Cluster of Excellence BIOS – Centre for Biological Signalling Studies and Senior Fellow at FRIAS, the Freiburg Institute for Advanced Studies of the University of Freiburg. In addition, Reski is co-founder of the Trinational Institute for Plant Research TIP, and, effective from October on, Senior Fellow at USIAS, the University of Strasbourg Institute for Advanced Study, France.

The original publication is:

Andreas Zimmer, Daniel Lang et al. (2013): Reannotation and extended community resources of the non-seed plant *Physcomitrella patens* provide insights into the evolution of plant gene structures and functions. *BMC Genomics* 14, 498. It can be viewed as open access publication under <http://www.biomedcentral.com/1471-2164/14/498/abstract>.

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