Norway spruce has largest genome ever sequenced — but it contains barely more functional genes than human beings have — an interesting article in the journal Nature

Published:
24 May 2013 – 09:35

Author:
By BrainiYak

Categories:
- Biology
- Genetics
- Science

Comments:
- None
- Comments RSS Feed
- Post a comment
- Trackback URL

Citation — to study

> Björn Nystedt, Nathaniel R. Street, Anna Wetterbom, Andrea Zuccolo, Yao-Cheng Lin, Douglas G. Scofield, Francesco Vezzi, Nicolas Delhomme, Stefania Giacomello, Andrey Alexeyenko, Riccardo Vicedomini, Kristoffer Sahlin, Ellen Sherwood, Malin Elfstrand, Lydia Gramzow, Kristina Holmberg, Jimmie Hällman, Olivier Keech, Lisa Klasson, Maxim Koriabine, Melis Kucukoglu, Max Käller, Johannes Luthman, Fredrik Lysholm, and Totte Niittylä, *The Norway spruce genome sequence and conifer genome evolution*, Nature, doi:10.1038/nature12211 (early online publication, 22 May 2013)

Citation — to press release

> Umeå Universitet, *Norway spruce genome sequenced: Largest ever to be mapped*, ScienceDaily (22 May 2013)

Findings

From the press release:

> Swedish scientists have mapped the gene sequence of Norway spruce (the Christmas tree) . . . and that is the largest genome to have ever been mapped. The genome is complex and seven times larger than that of humans.
>
> [T]he question arises: why is the spruce genome still seven times larger than ours?
>
> According to the study an explanation is "genome obesity" caused by extensive repetitive DNA sequences, which have accumulated for several hundred million years of evolutionary history.
>
> Other plant and animal species have efficient mechanisms to eliminate such repetitive DNA, but these do not seem to operate so well in conifers.
>
> "It is remarkable that the spruce is doing so well despite this unnecessary genetic load," says Professor Pär Ingvarsson at UPSC [Umeå Plant Science Centre].
>
> "Of course, some of this DNA has a function but it seems strange that it would be beneficial to have so very much. This appears to be something special for conifers."
>
>

Good science writing

One of the elements that I harp on in these BrainiYak postings is the importance of genuinely communicative science writing. The Norway spruce paper is an example of excellence in that regard.

The following sample paragraph reviews the evolutionary history and importance of conifers. The overview serves as memory refresher and puts the study into meaningful perspective:

> Gymnosperms are a group of land plants comprising the extant taxa, cycads, *Ginkgo*, gnetophytes and conifers.
>
> Gymnosperms first appeared more than 300 million years ago (Myr ago)[1], well before the angiosperm lineage separated from the stem group of extant gymnosperms[2].
>
> The major radiation of conifer families occurred 250–65 Myr ago[3], and during their evolution the morphology of conifers has changed relatively little. There are approximately 630 conifer species, representing about 70 currently recognized genera, which dominate many terrestrial ecosystems, especially in the Northern Hemisphere.
>
> Conifers also dominated both before and after the major mass extinction events at the end of the Permian and Cretaceous periods, around 250 and 65 Myr ago, respectively.
>
> Conifers are of immense ecological and economic value; coniferous forests cover enormous areas in the Northern Hemisphere, and conifers are keystone species in many other ecosystems.
>
> Conifers contribute a large fraction of terrestrial photosynthesis and biomass, and the cultural and economic values of conifers are also paramount; early civilizations used conifers for firewood, tools and artefacts and today several national economies depend on commodities produced from conifers.
>
> However, despite their abundance and importance, our understanding of conifer genomes is limited.
>
> Most conifers have 12 ($2n = 24$) chromosomes, probably reflecting the ancestral karyotype[4], which are typically of similar size, each being roughly comparable to the size of the human genome, and containing high proportions of repetitive elements[5, 6].
>
>

The moral? — Interesting genetic biology and excellent science communication

Well done, indeed.