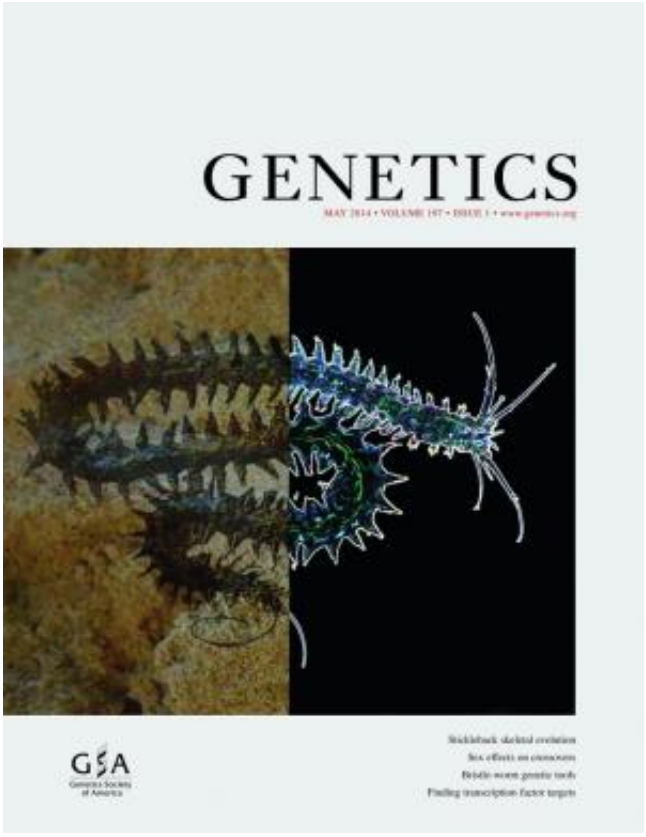
# Platynereis functional advancements

May 8 2014




The cover image of the *Genetics* May issue presents motifs of the "living fossil" *Platynereis dumerilii* and its transition to a functional laboratory model. Credit: Artwork courtesy of Florian Raible. (Copyright: *Genetics*)

Researchers at the Max F. Perutz Laboratories (MFPL) of the University of Vienna and the Medical University of Vienna made a breakthrough for the *Platynereis* model system, as they describe the first method for generating specific and inheritable mutations in the species. The method,

in combination with other tools, now places this marine bristle worm in an excellent position to advance research at the frontiers of neurobiology, chronobiology, evolutionary developmental biology and marine biology. The study and a review on *Platynereis dumerilii* genetic methods were chosen by the renowned journal *Genetics* as one of the May 2014 Highlights and also got the cover image.

Many fascinating biological phenomena, of which we currently have little to no molecular understanding, can be observed in the tiny marine bristle worm *Platynereis dumerilii*. It displays a slow rate of evolution, which permits analyses of ancestral genes and cell types, possesses a vertebrate-type hormonal system, as well as the ability to regenerate large pieces of its body. Furthermore, its reproductive timing is controlled by multiple timers – a feature likely to be common to many other organisms. These characteristics make it an ideal model for evolutionary studies as well as for chronobiology, amongst other research fields. However, dissecting *Platynereis* gene function in vivo had remained challenging due to a lack of available tools.

**TALENs as a new tool to engineer targeted modifications in *Platynereis* genes**

To address this need, scientists from the Max F. Perutz Laboratories (MFPL) and the Research Platform "Marine Rhythms of Life" of the University of Vienna and supported by the VIPS (Vienna International Postdoctoral program) have now established customized transcriptional activator-like effector nucleases (TALENs) as a tool to engineer targeted modifications in *Platynereis* genes. These tailored enzymes bind specific DNA sequences and "cut" the genome at these locations. The repair mechanisms of the cell promptly repair the damage, however small errors in the form of insertions and deletions can be introduced during the repair process. The result is the generation of small mutations that render the protein product of the gene non-functional – allowing the

generation of the first-ever *Platynereis* mutants.

## Future directions

The researchers found out that the induced mutations are heritable, demonstrating that TALENs can be used for generating mutant lines in this bristle worm. "This new tool opens the door for detailed in vivo functional analyses in *Platynereis* and can also facilitate further technical developments. For example, we hope to use TALENs to insert fluorescent reporter genes into the genome. In this way we can study how gene expression is regulated across the entire lifecycle", explains first author Stephanie Bannister, VIPS Postdoc in Florian Raible's group at the Department of Microbiology, Immunobiology and Genetics at the University of Vienna. She spearheaded the establishment of the technique. "In addition, we have provided a streamlined workflow that can serve as a template for the establishment of TALEN technology in other non-conventional and emerging model organisms", Stephanie Bannister adds.

**More information:** Stephanie Bannister, Olga Antonova, Alessandra Polo, Claudia Lohs, Natalia Hallay, Agne Valinciute, Florian Raible, Kristin Tessmar-Raible: TALENs mediate efficient and heritable mutation of endogenous genes in the marine annelid Platynereis dumerilii. In: *Genetics* (March 2014). DOI: dx.doi.org/10.1534/genetics.113.161091

Juliane Zantke, Stephanie Bannister, Vinoth Babu Veedin Rajan, Florian Raible, Kristin Tessmar-Raible: Genetic and genomic tools for the marine annelid Platynereis dumerilii. In: *Genetics* (May 2014) DOI: dx.doi.org/10.1534/genetics.112.148254

PHYS.ORG

Provided by University of Vienna

Citation: Platynereis functional advancements (2014, May 8) retrieved 19 April 2024 from https://phys.org/news/2014-05-platynereis-functional-advancements.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.