Prof. Merja Penttilä

Synthetic biology lecture course, spring 2021

**HOMEWORK: Presentation based on a scientific article**

Form groups of 3-4 persons and select one article from the list below (that is not selected yet by somebody else). Please, read the article carefully to understand the main points of it well. Google also since short “layman” descriptions have been published on some of the articles. You may also see if any new publications exist that have referred to this article; these may bring interesting additions to the topic. Small details are not important, but the general concept is and some methods in order to understand what was achieved and how.

Provide a clear presentation; it should also contain enough explanations so that it is understandable as a stand-alone story. Use pictures and illustrations. Some articles may be demanding but discuss, find more information, and try to capture the essential. The presentation **should not exceed 20 min**. We will have 9 presentations total, 3 presentations each lecture time, with time for discussion. (All presentations will be included in the common study material.

Please, send your presentations to merja.penttila@vtt.fi on the **previous Friday by noon**. You may be asked to alter the presentation in case there are errors.

It would be useful for everybody to familiarize themselves to the topic a bit before the lecture, not only the presenters!

Include the following to the presentation:

- Brief introduction to the topic

- Main aim, why was this done

- Methods and approaches

- What was achieved, were they successful, what did not work (if presented)

- Why and how is this important and path forward

- You can also list if there were major points you did not understand

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|  | Article | Persons in the group | Askers of questions  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1  26.4 | Galanie, S. et al. (2015). **Complete biosynthesis of opiods in yeast.** Science 349, 1095-1100. | Maria Pajumo  Vilma Jäämuru  Rosaliina Turunen  Mirjami Wallin | Linda van den Berg  Eskild Fisker Angen  Matti Ahokas  Inka Mattila |
| 2  26.4 | [Ann E Donnelly](https://www.nature.com/articles/nchembio.2550#auth-1), [Grant S Murphy](https://www.nature.com/articles/nchembio.2550#auth-2), [Katherine M Digianantonio](https://www.nature.com/articles/nchembio.2550#auth-3) & [Michael H Hecht](https://www.nature.com/articles/nchembio.2550#auth-4)**. A *de novo* enzyme catalyzes a life-sustaining reaction in *Escherichia coli.*** *Nature Chemical Biology* volume 14, pages 253–255 (2018). doi:10.1038/nchembio.2550 | Eevi Hyttinen  Jonna Hurme  Ida Uotila  Senni Lehtonen | Karoliina Laine  Kamila Tastenova  Tuuli Virkkala  Anniina Savolainen |
| 3  26.4 | Seth L. Shipman,, Jeff Nivala, Jeffrey D. Macklis, George M. Church. **Crispr-Cas9 encoding a digital movie into the genomes of a population of living bacteria.** Add videos to your presentation**.** Nature July 2017, Vol 547, 345-. doi:10.1038/nature23017 | Linh Tong  Filip Lewicki  Lotta Laihotie | Julia Manninen  Krista Karttunen  Sanni Haahti  Sharon Saarinen |
| 4  10.5 | Segall-Shapiro T.H., Sontag E.D., & Voigt C.A. (2018). [**Engineered promoters enable constant gene expression at any copy number in bacteria.**](https://www.nature.com/articles/nbt.4111) *Nature Biotechnology,* DOI: 10.1038/nbt.4111. | Karoliina Laine  Kamila Tastenova  Tuuli Virkkala  Anniina Savolainen | Maria Pajumo  Vilma Jäämuru  Rosaliina Turunen  Mirjami Wallin |
| 5  10.5 | [Daniel Solis-Escalante](https://www.ncbi.nlm.nih.gov/pubmed/?term=Solis-Escalante%20D%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), [Niels G. A. Kuijpers](https://www.ncbi.nlm.nih.gov/pubmed/?term=Kuijpers%20NG%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), [Nuria Barrajon-Simancas](https://www.ncbi.nlm.nih.gov/pubmed/?term=Barrajon-Simancas%20N%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), [Marcel van den Broek](https://www.ncbi.nlm.nih.gov/pubmed/?term=van%20den%20Broek%20M%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), [Jack T. Pronk](https://www.ncbi.nlm.nih.gov/pubmed/?term=Pronk%20JT%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), [Jean-Marc Daran](https://www.ncbi.nlm.nih.gov/pubmed/?term=Daran%20JM%5BAuthor%5D&cauthor=true&cauthor_uid=26071034), and [Pascale Daran-Lapujade](https://www.ncbi.nlm.nih.gov/pubmed/?term=Daran-Lapujade%20P%5BAuthor%5D&cauthor=true&cauthor_uid=26071034). **A Minimal Set of Glycolytic Genes Reveals Strong Redundancies in *Saccharomyces cerevisiae* Central Metabolism.**[Eukaryot Cell](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4519752/). 2015 Aug; 14(8): 804–816. doi: [10.1128/EC.00064-15](https://dx.doi.org/10.1128%2FEC.00064-15).  Kuipers et al. Pathway swapping: **Toward modular engineering of essential cellular processes.**[Proc Natl Acad Sci U S A](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206561/). 2016 Dec 27; 113(52): 15060–15065. doi: [10.1073/pnas.1606701113](https://dx.doi.org/10.1073%2Fpnas.1606701113) | Linnea Niskanen  Larissa Risku | Linh Tong  Filip Lewicki  Lotta Laihotie |
| 6  10.5 | [Katarzyna P. Adamala](https://www.nature.com/articles/nchem.2644#auth-1), [Daniel A. Martin-Alarcon](https://www.nature.com/articles/nchem.2644#auth-2), [Katriona R. Guthrie-Honea](https://www.nature.com/articles/nchem.2644#auth-3) & [Edward S. Boyden](https://www.nature.com/articles/nchem.2644#auth-4). **Engineering genetic circuit interactions within and between synthetic minimal cells.** *Nature Chemistry* volume 9, pages 431–439 (2017). doi:10.1038/nchem.2644 | Borbála Gergics  Alice Klein  Fiona Småros  Alexandra Granqvist | Maria Heikkilä  Kim Kutvonen  Henri Moisanen  Sami Seppänen |
| 7  17.5 | [Drew S. Tack](https://www.nature.com/articles/s41598-018-21549-w#auth-1), [Austin C. Cole](https://www.nature.com/articles/s41598-018-21549-w#auth-2), [Raghav Shroff](https://www.nature.com/articles/s41598-018-21549-w#auth-3), [Barrett R. Morrow](https://www.nature.com/articles/s41598-018-21549-w#auth-4) & [Andrew D. Ellington](https://www.nature.com/articles/s41598-018-21549-w#auth-5). **Evolving Bacterial Fitness with an Expanded Genetic Code.** *Scientific Reports,* **volume 8**, Article number: 3288(2018). doi:10.1038/s41598-018-21549-w | Linda van den Berg  Eskild Fisker Angen  Matti Ahokas  Inka Mattila | Borbála Gergics  Alice Klein  Fiona Småros  Alexandra Granqvist |
| 8  17.5 | Ryu et al. **Control of nitrogen fixation in bacteria that associate with cereals**[Nature Microbiology](https://www.nature.com/nmicrobiol) volume 5, pages 314–330 (2020).  (Temme, K., Zhao, D., & C.A. Voigt (2012). [Refactoring the nitrogen fixation gene cluster from *Klebsiella oxytoca*.](http://www.pnas.org/content/109/18/7085.short) *Proc. Natl. Acad. Sci.*, 109(18): 7085-7090.) | Julia Manninen  Krista Karttunen  Sanni Haahti  Sharon Saarinen | Linnea Niskanen  Larissa Risku |
| 9  17.5 | Terrell et al. **Bioelectronic control of a microbial community using surface-assembled electrogenetic cells to route signals.** Nature Nanotechnol. (2021). https://doi.org/10.1038/s41565-021-00878-4 | Maria Heikkilä  Kim Kutvonen  Henri Moisanen  Sami Seppänen | Eevi Hyttinen  Jonna Hurme  Ida Uotila  Senni Lehtonen |