Prof. Merja Penttilä

Synthetic biology lecture course, spring 2022

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

**Form groups of 3 persons (three groups with 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. For each article other persons not belonging to the presenting group are assigned to ask questions, and you can choose the time point for your turn as well.

(All presentations will be included in the common study material.)

Please, send your presentations to [merja.penttila@vtt.fi](mailto: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  2.5 | Galanie, S. et al. (2015). **Complete biosynthesis of opiods in yeast.** Science 349, 1095-1100. | Paola Argumedo,  Renate de Vreede,  Kassian Armbruster,  Gábor Kovacs | Lauri Honkanen  Martina Huusela  Elisa Raiskio |
| 2  2.5 | Jensen,… M.C. Jewett & Michael Köpke. **Carbon-negative production of acetone and isopropanol by gas fermentation at industrial pilot scale**. Nature Biotechnology | VOL 40 | March 2022 | 335–344. https://doi.org/10.1038/s41587-021-01195-w | Petteri Hämäläinen  Leevi Lamminjoki,  Bibi Hannikainen,  Eveliina Lainio | Paola Argumedo,  Renate de Vreede,  Kassian Armbruster,  Gábor Kovacs |
| 3  2.5 | Pezhman Mohammadi et al. **Bioinspired Functionally Graded Composite Assembled Using Cellulose Nanocrystals and Genetically Engineered Proteins with Controlled Biomineralization**. Adv.Mater.2021, 33, 2102658 | Nea Virta  Olli Lohilahti  Artturi Linna | Ronja Haikarainen,  Heidi Leppänen,  Saana Rekinen |
| 4  9.5 | 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. | Sami Valkamaa  Emilia Leppäkangas  Julia Wierzchowiecka | Eero Gustafsson  Olli Lohilahti  Artturi Linna |
| 5  9.5 | [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) | Eero Gustafsson  Martina Huusela  Lauri Honkanen | Fred Sammalisto  Aarni Aspi,  Guillaume Fulconis |
| 6  9.5 | [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 | Ronja Haikarainen,  Heidi Leppänen,  Saana Rekinen | Sami Valkamaa,  Emilia Leppäkangas  Kaisu Hiltunen |
| 7  16.5 | [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 | Saku Mattila,  Katri Oksa,  Kaisu Hiltunen,  Elisa Raiskio | Petteri Hämäläinen  Leevi Lamminjoki,  Bibi Hannikainen,  Eveliina Lainio |
| 8  16.5 | 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.) | Arthur Aspelin  Cedric Ehrnrooth,  Challe Livman | Julia Wierzchowiecka  Saku Mattila  Nea Virta  Katri Oksa |
| 9  16.5 | 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> | Fred Sammalisto  Aarni Aspi,  Guillaume Fulconis | Arthur Aspelin  Cedric Ehrnrooth,  Challe Livman |