

# Photosynthesis: “Plug and play”?

15 -18 August 2016 @Oort

## Motivation and goal of the workshop

Sustainable development of our society requires a dramatic increase in the contribution of photosynthesis to the production of energy carriers and commodity materials, to remedy excessive current CO<sub>2</sub> emission. To facilitate this transition it is necessary to engineer photosynthesis into a form in which relevant products are formed directly from CO<sub>2</sub> and water. Such ‘direct conversion’ can be approached from opposite directions: (i) Engineering existing phototrophs and transforming them into efficient product-forming organisms, accompanied by genome reduction, and (ii) transferring the capacity to photosynthesize to chemotrophic cell factories, with the option to also engineer them to autotrophy. This latter way to tackle the problem is also referred to as a ‘plug-and-play’ approach.

All this requires a thorough knowledge about the minimal requirements for photosynthesis, with the complication that this process comes in at least 3 different forms: oxygenic photosynthesis, various forms of anoxygenic photosynthesis and retinal-based photosynthesis. Significantly, the most recent literature on increasing the efficiency of (oxygenic) photosynthesis proposes to mix the different types of photosynthesis, as well as CO<sub>2</sub>.

## Participants and organization of the workshop

In total 48 participants from 12 different countries took part in the workshop, several of whom also participated in the Maastricht meeting on Photosynthesis, which was held in the week preceding this workshop. This participation ranged from the very junior master- and PhD students to (emeritus) professors, most from academia, but also with significant participation from industry. Amongst these were 11 plenary speakers, 10 invited speakers and participants. From the latter group 8 introduced their research project in a short talk in one of the plenary afternoon sessions and 6 presented a poster. Also one of the sponsoring companies gave a brief presentation of its field of activities.

The meeting was organized with two plenary- and one invited lecture in the morning session and one plenary-, one/two invited lectures, and on average three short presentations in the afternoons. All lectures were scheduled with ample time for discussions (which were led by the organizers and some of the invited speakers). Generally the lectures were of high quality and they were followed by lively discussions, with participants from all echelons. Many of the discussions spilled over into the coffee-, tea- and lunch-breaks. Accordingly, all types of photosynthesis, various forms of autotrophy, synthetic biology and metabolic modelling, and the plug & play approach versus genome reduction were all presented and explained at a high level and discussed with very broad participation. The organizers therefore consider this workshop as a success, even more because several new initiatives for collaboration (particularly inter-European) emerged among the younger participants. Several of the younger participants, after the meeting, expressed to me explicitly that they had learned a lot of this very interesting and stimulating scientific gathering.

## Organizationally

The facilities for science, the social program, and the logistics for coffee-, tea-, lunch- and evening-breaks were organized in a very efficient and helpful way by the Lorentz staff. This has helped significantly to create the open and interactive atmosphere during the meeting. If I can mention one small minus point, it is the uncertainty about the financial support from the Lorentz center: Had this been clearer from the beginning, it would have been possible to also invite one or two Asian colleagues, while the choice now was largely limited to plenary- and invited speakers from Europe and the US. Because of the generous support of the sponsors (particularly the universities of Turku and Amsterdam) in hindsight this broader geographical coverage would have been possible.

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