Two grants of 2.5 million to study microorganisms

Liesje Mommer and Thijs Ettema have both secured ERC Advanced Grants for innovative research. In both cases, the research centres on microorganisms. Mommer studies mycorrhizal fungi, and Ettema archaea. Text Roelof Kleis

Protective fungi

Professor of Belowground Ecology Liesje Mommer studies the relationship between biodiversity and pathogens in the soil. Biodiversity offers protection against pathogens; this has been known for more than 50 years. But this rule of thumb doesn't always apply. 'Sometimes biodiversity has no effect on outbreaks of a disease, or more biodiversity is associated with *greater* pressure of disease,' says Mommer. She will use the ERC grant to look for an explanation for these outcomes.
One possible explanation is found underground in mycorrhizal fungi, which live in symbiosis with plant roots. 'We know the fungi exchange minerals with the plant in return for sugars. Now some evidence has been found that they protect plants from disease. How widespread is that? Are plant communities with better mycorrhiza networks also more resistant to pathogenic fungi? And what properties does such a plant community have?'
Another aspect Mommer will be studying is the interaction between different fungi. 'Certain plants in a community boost one pathogen at the expense of another. We can use knowledge about this mechanism in agriculture, for example to make strip cropping more robust in the face of outbreaks of disease. My mission is to use biodiversity to make agricultural systems more resilient and thereby reduce the need for pesticides.'
Mommer will be working on the new project for the next five years along with three PhD candidates, two postdocs and one analyst.

Complex life

How did complex life on Earth start? That is the question professor of Microbiology Thijs Ettema has been pondering his entire career. The quest already led to his discovery of the Asgard archaea, a group of microorganisms that is closest in evolutionary terms to complex life forms such as humans. In this case, complexity means eukaryotic, having cells that consist of a nucleus and cell organs.
Archaea don't have a nucleus, but they do have certain eukaryotic features. Ettema has already demonstrated that. 'They have certain genes that eukaryotes also have and that are involved in the formation of compartments. These are vesicles enclosed by a membrane that exchange substances with one another. What do the eukaryotic genes do in archaea? My hypothesis is they have a function here too that points to complexity.'
But he first needs to be able to cultivate archaea and study them. The pointers to complexity are currently based purely on genetic studies. 'We want to find out what the archaea look like and what the proteins do that we see in the genetic code. We will use advanced techniques to try and cultivate archaea so we can study them under the microscope. I hope this grant will let us do that within the next five years.'
The ERC grant covers a period of five years. Ettema will be able to take on two PhD candidates and two postdocs, as well as buy new equipment for cultivating archaea.