

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

## Chiara Ilgrande

Title of the doctoral dissertation:

*Synthetic microbial communities for urine nitrification in regenerative life support systems: bottom-up design, ground optimization and spaceflights.*

The public defence will take place on 19 of December 2018 at 16:30 in the Academieraadzaal (Hall of the Academic Board), room A 0.030 at Campus Coupure, Coupure Links 653, 9000 Ghent.

There will be a contiguous reception to which you are heartily invited.  
Please confirm your attendance before December the 10<sup>th</sup> to: chiara.ilgrande@ugent.be

### Dissertation supervisors

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### Board of examiners

**Prof. dr. ir. Mieke Uyttendaele**  
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**Dr. Christophe Lasseur**  
European Space Research and  
Technology Centre,  
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### Abstract of the doctoral research

Human life during space missions is currently enabled by a regular resupply of food and water. To sustain human space exploration missions where no resupply is possible or sustainable, the recycling of water and wastes, combined with *in-situ* production of oxygen and food is necessary.

Nitrogen is a critical nutrient for edible plant and single cell protein production and, as waste, is present primarily (~80%) in urine, in the form of urea. Although urea can be directly utilized as nitrogen source, its conversion in the more stable form of nitrate is preferred. This can be achieved through microbial conversions performed by ureolytic and nitrifying bacteria.

In this PhD research, a bottom-up selection and step-wise combination of the microorganisms necessary for ureolysis and nitrification was utilized to develop a functional microbial community. Since alteration in gravity, radiation and temperature typical of the space environment can affect the functionality of bacteria, their activity was evaluated after exposure to space conditions during two space missions.

The results obtained demonstrated the conversion of urea into nitrate with the selected strains and the preservation of functionality after space exposure, paving the way for future urine nitrification in space.

### Brief Curriculum Vitae

Chiara Ilgrande obtained her MSc degree in Industrial Biotechnology at the University of Milano Bicocca in 2012, with an experimental thesis on the development and validation of a microbial community for fuel contaminated water in lab scale bio-barrier. After a brief industrial experience as regulatory assistant, she started her PhD in 2014 at the Center for Microbial Ecology and Technology (CMET), University of Ghent.

Her research project, promoted by the European Space Agency (ESA), focused on the selection and spaceflight exposure of a microbial community for urine nitrification, to implement the circular waste management technologies for space exploration.

During her PhD, Chiara participated in numerous ESA projects as researcher or consultant, which lead to collaborations with international research centres and universities. Her work has been presented on international conferences and she co-authored multiple publications on peer-reviewed journals.

During her PhD, she mentored two master students and was lab and teaching assistant for the course of Microbial Ecology and Environmental Sanitation.