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### *Chinese Scholarship Council 2024*

*PhD proposal: Plastic litter biodegradation by microorganisms in the marine environment*

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**Host laboratory:** Laboratoire d'Océanographie Microbienne UMR 7621, 1 Avenue Fabre, F-66650 Banyuls sur mer (Directed by Fabien Joux)

**PhD direction:** Jean-François GHIGLIONE, Director of research CNRS

#### **Description of the research project:**

Plastic debris represent 80% of waste in marine environments, with 8 to 12 million tons ending in the Oceans every year. China is particularly active in finding solutions to this pollution, since this country together with Indonesia, Philippines, Thailand and Vietnam are spewing out as much as 60 percent of the plastic waste that enters the world's seas.

This application is based on a previous and very positive experience within the framework of the "Chinese Scholarship Council". The Chinese student (Dr. Jingguang Cheng, PhD 2017-2020) is now co-author of nine scientific papers in rank A journals. This very efficient PhD thesis helped us to decipher the colonization of plastics by microorganisms (including pathogens) and its toxicological impacts in marine fauna.

Here, the objective of the project is to evaluate the impact of biotic and abiotic factors driving plastic litter biodegradation in the marine environment. It aims to answer the following questions : What are the relative influence of concentration, size (from macro- to nanoplastics) and chemical structure of the polymers in plastic biodegradation? To what extent environmental parameters (temperature, light, nutrients) are playing key roles? Who is doing what in a complex microbial community able to biodegrade plastics ? What are the biochemical pathways involved in the marine plastic biodegradation and what is the fate of the biodegradation products? Studies will focus mainly on polyethylene (PE) biodegradation, which is the most abundant polymer type in the marine environment, but also on the biosourced and biodegradable polyhydroxyalkanoate (PHA). A large set of techniques will be made available to the PhD student (Next Generation Sequencing, DNA-Stable isotope probing, Microscopy, Respirometry, Enzymatic activities). The work will be in close collaboration with chemists (IMRCP, Toulouse & ICCF, Clermont-Ferrand) and molecular biologists (GENOSCOPE, Evry).

This work will be part of the ANR-PLASTIMAR project founded by the French National Agency (P.I. JF Ghiglione, 2023-2027) and will take advantage of many collaborations build in this field by our laboratory (co-founder of the GDR-Polymer and Oceans with 250 scientific members). The PhD student will be part of the team "Marine microbial ecotoxicology" (directed by JF Ghiglione) within the Microbial Oceanography Laboratory (LOMIC, UMR7621, directed by F Joux).

**Keywords:** microplastics and nanoplastics, pollution, biodegradation, microbial ecotoxicology

**Applicant profile:** Knowledges in microbiology, molecular biology and bioinformatics are beneficial. English or French speakers only. Selection of the applicants will be essentially based on their motivation and on the quality of their application form.