Interspecies interactions in Baltic Sea sediments

Microorganisms do not live alone in the environment - they rather compete (-/- interaction), share food as commensals (+/0 interaction), or collaborate (+/+ interaction) in order to gain energy for life. Sometimes microorganisms from distinct domains of life (Bacteria and Archaea) cooperate in order to survive under energy-limiting conditions. Generally, such cooperative interactions are based on the Bacteria oxidizing a substrate in the absence of an electron acceptor. This Bacteria will be positively affected by the interaction because it will release its excess electrons as hydrogen gas, which will feed a partner Archaea-microorganism. The Archaea will be positively affected by gaining a food source - hydrogen gas - which they will convert to methane.
Recently, we discovered a new type of interactions between Bacteria and Archaea which does not involve hydrogen gas but instead, it requires electrical connections between cells.

Such electrical connections could be established either by conductive molecules on cellular surfaces or by conductive particles from the environment.

Conductive particles can accelerate 5-10 fold the electric interactions between the bacterium Geobacter and the archaeon Methanosarcina. A type of conductive particle is magnetite -an iron oxide, which is abundant in marine environments including the Baltic Sea.
Your Master thesis will involve hunting for such electric-interspecies associations. You will investigate the community from Baltic Sea sediments, which are rich in conductive particles. For this, you will use quantitative PCR, and 16S amplicon sequencing. The community data will be correlated to available geochemical profiles (especially iron-oxide content) from these sediments.

Your research findings will have an impact on our understanding of the iron and manganese cycles but also on the global carbon cycle, including methane. Methane is circa 30 times more potent as a greenhouse gas than carbon dioxide. Therefore understanding what controls the methane cycle is imminent in order to prevent global warming.

Supervision by Amelia-Elena Rotaru and Carolin Loscher