

JAMES RENNIE BEQUEST

REPORT ON EXPEDITION / PROJECT / CONFERENCE

Expedition/Project/

Conference Title: Spring Meeting of the German Physics Society (DPG) and European Physics Society (EPS)

Travel Dates: 11-03-18, 17-03-18

Location: Berlin, Germany

Group member(s): Leonardo Mancini

Aims: - Present my work in a talk; - Network with other researchers;
- Attend talks from a wide range of topics.

OUTCOME (a minimum of 300 words):-

The Spring Meeting of the German Physics Society (DPG) and European Physics Society (EPS) this year broke the record for the most largely attended physics conference with more than 6000 participants. The conference brings together researchers from a number of fields under the umbrella of condensed matter.

I was given the chance to contribute with a 15 minutes talk in the focus session: "Physics of microbial systems". The abstract of the work I presented is attached. It was a great occasion to obtain feedback on one of the topics that will be part of my thesis and to practice the presentation of my work to a technical audience, but also to showcase research carried out at the University of Edinburgh in an international setting.

Due to the size of the meeting I could observe several different approaches to research problems. The fact that most people at the conference came from a background different from mine was a great source of scientific and personal enrichment, because it let me consider different perspectives and see many applications of research tools that I had only partially explored before. More in detail, in almost all the talks, speakers were using mathematical modelling as a thinking framework to organize their research, an approach that I have now made mine and that I am implementing in the publication of our last work.

I also had the chance to talk to researchers who use techniques similar to mine enlarging and maintaining my lab's network.

Despite the cold in Berlin, it was overall a great scientific experience.

I would like to thank the James Rennie Bequest for the funding that has allowed my participation to the conference.

ABSTRACT: Dormant, dead or alive: measuring steady state free energy levels in bacterial cells — Leonardo Mancini and Teuta Pilizota — University of Edinburgh

Bacteria can survive a variety of external stresses by entering a state of suspended growth that is commonly referred to as dormancy. Such response has historically been considered a unequivocal low metabolism/low energy state and a vast array of stressors seem to be avoidable through dormancy. Antibiotics are among the most notable examples of such stressors and tolerant, dormant cells are known as persisters. However, recent experiments show that some persisters might survive antibiotic challenges through mechanisms that are, in contrast, energy consuming. The findings open the possibility of several different dormant steady states with distinct cellular free energy levels. To verify such a hypothesis, molecular sensors that can provide information on cellular energetics in vivo and at the single cell level are needed. To this end, we have successfully optimized the expression of a previously reported QUEEN ATP sensor and characterized in E. coli the newly proposed

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membrane voltage dye, Thioflavin T. Our results provided insights that can be generalized to other dyes, such as TMRM and DiSC3(5). Using the sensors, we present measurements of free energy levels during dormancy when this is induced by different conditions and signals, such as starvation, quorum sensing, and stress signalling molecules.