# Face to face talk on common features and differences of magnetic reconnection in space and fusion plasmas

with

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Magnetic reconnection is a common instability in both space and laboratory plasmas. How many times have we heard this phrase at the beginning of a presentation on magnetic reconnection? And how many times have we used it ourselves? Based on this observation, we have chosen to open this 2nd European Conference on Magnetic Reconnection in Plasmas in a somewhat unconventional way. We will start with a dialogue between two leading experts in the field: Prof. Philippa Browning, representing the space plasma community, and Prof. François Waelbroeck, representing fusion research. They will respond to a series of questions covering fundamental aspects of magnetic reconnection, each from the perspective of their respective domains. The discussion will be moderated by Prof. Francescp Pegoraro, with all questions agreed upon in advance.

The questions are as follows:

1. Magnetic reconnection involves two features:
   - a topology change: non-magnetic free energy that was already available is released because a topological constraint is broken
   - an energy source: the energy that is transferred to the plasma in the form of heat and/or non thermal particle acceleration is generally attributed to the “burning” of the magnetic energy only

   What definition best fits your field and how to blend these two points of view?

2. On which charateristic spatial and temporal scales does MR occur in your field?
3. On MR as a particle energy source:

   - How MR affects enetrgetic particlesin your field?
   - Which is the trademark of MR respect to other acceleration mechanisms in space plasmas
   - How fusion devices can cope with runaways electron beams?

4. On MR as a particle energy source:

- How large must the (local, global) magnetic energy reservoir be in order to account
    - ✓ for the maximum energy of the accelerated particles that are observed?
    - ✓ for the observed disruptions?

5. 2D or not 2D? Most of the analytical and numerical investigations even in space and in relativistic astrophysical contexts involve 2D configurations (or geometries that are effectively two dimensional) even in the absence of a guide field.
   To which extent in your field you can rely on a 2D picture?

6. MR and turbulence:
   Recent numerical investigations have analyzed the role on magnetic reconnection in the turbulent spectrum of weakly dissipative plasmas. On the other hand, the interaction of MR and turbulence is relevant for transport processes.
   Is there corresponding observational evidence from space plasmas? From the solar wind? From fusion?
   How MR influences turbulence and viceversa in your field?