Scientific report for ESF short visit grant 6396

1. Purpose of the visit

The purpose of the visit was to work on several open problems concerning random graphs chosen uniformly at random from all graphs that are embeddable on a given surface.

2. Description of the work carried out during the visit

During the visit we worked on three related research questions.
The first was to generalize the existing results for random labeled graphs on a given surface to the unlabeled case.
Another aim of the visit was to attack an attractive conjecture of Chapuy et al. (2011) stating that the chromatic number of the random graph will equal four with high probability (independent of the choice of surface).
A third, related question that we studied arose in recent work of the PI. It states that every graph property that can be written as a sentence in Monadic Second Order logic will either hold with probability close to zero or with probability close to one. This conjecture, if true, will for instance imply that the chromatic number is a constant with high probability -- which is currently not known.

3. Description of the main results obtained

During the visit we made some progress on the questions mentioned in part 2. Our findings are promising and we intend to develop them further in the hope of solving completely our target questions.

4. Future collaboration with host institution

Future collaboration between the PI and host is planned, both on the line of research in this project as well as on other lines of research.

5. Projected publications

At this point in time it is to early to predict what, if any, publications will result from the research as we are still in the early stages.