

**Project No: 239193**

**Project Acronym: ComParIn**  
**Project Full Name: Computability with Partial Information**  
**ERG Periodic Report**  
**Summary**

The objective of the project ComParIn was to reintegrate the fellow, Mariya. I. Soskova in her home institution within a scientifically advanced research project. The scientific goal was to employ a new methodological approach to the study of an extension of the Turing information content model. This approach arises from a notion of uniform reducibility, introduced and studied by researchers in the host institution and was expected to provide the fellow with a novel powerful tool for attacking longstanding problems regarding definability, theory strength and the automorphism properties of the structure of the Turing degrees and its extensions. The fellowship was meant to aid the researcher in establishing herself as an independent researcher and she was expected to reach the level of associate professor towards the end of the three-year reintegration period.

The scientific results that were obtained within this project comprise six published articles in renowned scientific journals and one final manuscript in preparation. The anticipated objectives of the proposal have been achieved. A particularly fruitful collaboration between her and a faculty member at the host institution - Hristo Ganchev, has been established. This resulted in the development of a new coding method, coding with K-pairs, which lead to the solution to a longstanding open problem in the field - the characterization of the first order theory of the local structure of the enumeration degrees. Further significant results of the researcher in collaboration with the group at the host institution are the definability of the local structure of the enumeration degrees in the local structure of the omega-enumeration degrees, the definability of every jump class of the high/low hierarchy in the local structure of the omega-enumeration degrees. The expected final result, the final manuscript in preparation, is the definability of the total degrees and low degrees in the local structure of the enumeration degrees, which gives a partial solution to the most central open problem in the study of the structure of the enumeration degrees, set by Rogers in his earliest work in this field.

The scientific results obtained during this project have been recognized by the scientific community. The researcher has been invited to present lectures at 6 international conferences and workshops. She was invited for short-term research visits at the following research institutions: University of Leeds, University of Siena, Cornell University, University of Notre Dame, University of San Francisco, University of Chicago, Kurt Gödel Research Center for Mathematical Logic, Vienna, City University New York. The researcher was also invited to participate as a visiting fellow at the Isaac Newton Institute for Mathematical Sciences Semantics and Syntax: A Legacy of Alan Turing, a six month research programme, bringing more than 120 distinguished researchers to work together

on computability-related topics. Finally, the researcher has been invited to give a plenary talk at the Logic Colloquium 2012, under the auspices of the Association for Symbolic Logic, which will be hosted by the University of Manchester and will incorporate the 2012 meeting of the British Logic Colloquium.

The reintegration of the researcher in her home institution has been successful not only scientifically. During her three year experience at the host institution she has been promoted twice and now holds the highest level of Assistant Professor, Chief Assistant Professor. She is currently in the process of being promoted to Associate Professor, which is expected to be finalized in July 2012.

The researcher has been actively participating the educational process at Sofia University. She has improved her teaching skill and gained a lot of experience, lecturing in five different courses on the undergraduate level. She has furthermore written a textbook, entitled “Lecture Notes on Discrete Mathematics and Algorithms” to aid her students, which is published online and available at <http://www.fmi.uni-sofia.bg/fmi/logic/msoskova/>. The researcher developed and taught two further courses at graduate level, but also attended by faculty members, transferring the knowledge gained at the previous institution. The researcher has also co-supervised a master student, who completed a masters degree in 2011.

The researcher has exhibited leadership qualities, which have evolved during the past three years from participation in organizing committees of major conferences, to participation in a programme committee, steering committee and finally co-chairing one of the major workshops in the up-coming celebration of Turing’s centenary. The researcher is the co-ordinator of the annual workshop “Women in Computability” and the mentorship programme as part of the CiE 2011 and CiE 2012 conferences, which is sponsored by Elsevier and aims to bring together women in computing and mathematical research to present and exchange their academic and scientific experience with young researchers.

The researcher has sustained her international collaborations, with the previous host institution and members of the computability group in Siena. However, with the support of this project, the fellow was able to form many new collaborations, during her research visits at US universities. As a result the Sofia group has been included in an NSF-funded project, entitled “Collaboration in Computability”, and aimed building a network of researchers in computability from a number of institutions in the U.S., Bulgaria, Russia, and Kazakhstan.

Finally the researcher has initiated a collaboration with Prof. Theodore Slaman at the University of California, Berkeley. Together with the host institution, they have been successful in an application for a Marie Curie International Outgoing fellowship, which will enable the researcher to be further trained at one of the top universities in the world for two years, starting August 2012, after which she will return to the host institution and transfer the obtained knowledge.