

The emergence of space and time in string theory
Faculty Research Grant Closing Report
Rolf Schimmrigk

1. *Description of grant-supported activity.*

I spent the summer of 2006 doing research at IUSB and for several weeks in Europe. I continued to work with Monika Lynker on a project on arithmetic methods in the context of special Fano varieties, constructing arithmetic geometric modular forms that we were able to identify with modular forms constructed from the string worldsheet via Hecke indefinite modular forms. This project also involves IUSB student Savan Kharel. Monika and I also started a new project in which we aim to use new methods to extend our results to families of varieties. We spent a lot of time understanding the mathematics involved and started work on programming the necessary machine computations. I also went to Europe, as planned, visiting in particular Klaus Hulek and his group at the Institute for Algebraic Geometry in Hannover, Germany. I gave a talk at the Institute and had extended discussions with some of the members of the group.

2. *Were you able to complete the project? Describe any difficulty you had.*

The projects I'm working on are part of an extended multi-year long program. As such they will not be finished in a short period of time. We were, however, able to come near the completion of our project concerning the arithmetic of special Fano varieties. Furthermore I made good progress on a project concerned with arithmetic mirror symmetry in the context of elliptic curves.

The p -adic program to consider families of string compactifications turned out to be more difficult and time-consuming than expected. However, we made good use of the time in the summer and we continued this project while we were in Europe.

3. *Did, or will, the project result in a specific product - a manuscript, etc? If so, describe and indicate the state of development.*

The results of our projects will be reported in either refereed journals or refereed book contributions. I have three papers in preparation, of which the first one will be submitted shortly:

1. *A modularity test for elliptic arithmetic mirror symmetry*
R. Schimmrigk, imminent submission
2. *Galois representations and string theoretic modular motives*
R. Schimmrigk, in preparation, to be submitted in 2007
3. *Arithmetic aspects of mirrors of rigid Calabi-Yau manifolds,*
S. Kharel, M. Lynker and R. Schimmrigk, in preparation, to be submitted in 2007

The project that Monika and I started in the summer will be continued and will eventually result in a publication.