R, Schultz – Research Summary

My research deals with problems in geometric topology and transformation groups. Geometric topology is the study of such properties for well – behaved geometrical objects (or spaces) such that small pieces resemble standard models like regions in ordinary Euclidean geometry (which are called manifolds), and transformation groups is the study of geometrical and topological symmetries. The ordinary sphere is a basic example of a manifold, and manifolds arise in numerous mathematical contexts, including the analysis of solutions to systems of equations and the theory of differential equations; they also arise in many areas of physics ranging from classical mechanics to relativity and string theory. During the twentieth century, and particularly its second half, there were many important advances in our understanding of manifolds and the development of techniques for studying them systematically. My research applies many of these tools, often in combination with techniques and results from algebraic topology, to study a variety of questions in geometric topology. Many (and probably most) of these problems involve the symmetry properties of manifolds.

***Elaboration on the specific content of the research:*** Suggested new text is in red.

In the period in review, Professor Schultz has ~~four~~ two submitted papers on the applications of geometric topology to the study of manifolds which have certain types of positively curved geometrical structures (the standard round sphere is the most basic example of such an object). The topological structure of such objects is given by result due to J. Cheeger and D. Gromoll called the Soul Theorem, and earlier work of I. Belegradek and others gave examples of manifolds which have large families of different positively curved structures; the results of the two papers use additional techniques from geometric topology and differential geometry to describe systematic new classes of examples and to prove that some of these examples are as small as possible. O~~f these, o~~ne paper has been submitted to the Annals of Mathematics and the other to the Journal of Differential Geometry. Both journals are of very high quality and the peer review process is very rigorous and time consuming. Professor Schultz continues his long collaboration with S. Kwasik and, now in some cases also with I. Belgadrek, and three ~~joint~~ papers on other topics (two of which are joint) are in preparation. Professor Schultz has given talks on these results at various conferences and lecture notes of these talks are available on his website. In a fourth paper which is also under preparation, Professor Schultz and his collaborators use a variety of technique in algebraic and geometric topology to classifying certain kinds of structures on manifolds which are similar to some key phenomena in the submitted papers. Professor Schultz has also been able to go beyond th~~is~~e joint work with Belegradek and Kwasik, and aspects of this work may be found in the lecture notes of the talk he gave in Muenster.