SCIENCE AND TECHNOLOGY CENTERS

Rutgers University – New Brunswick; Andras P Hajnal; ***Science and Technology Center for Discrete Mathematics and Theoretical Computer Science*****; (CCR-9119999 A007, A008); $4,470,240; 36 months. (Joint support with the Software Engineering Program, the Numeric, Symbolic & Geometric Computation Program, the Theory of Computing Program, and the Algebra & Number Theory Program)**

Rutgers University, in cooperation with Princeton University, AT&T Bell Laboratories (Bell Labs), and Bell Communications Research (Bellcore) has established a Science and Technology Center for Discrete Mathematics and Theoretical Computer Science. The Center in Discrete Mathematics and Theoretical Computer Science strengthens the development of these two overlapping areas by focussing research activity in a continuing series of year-long research programs, workshops and conferences. Approximately one hundred researchers from the four collaborating institutions provide the background coherence and direction for this activity. The core of the research activity is carried out by a vigorous program of visitors (both senior and junior) from other institutions (academic, industrial, government laboratory). Postdoctoral fellows and graduate students are affiliated with the Center for varying lengths of time. Each year, the Center designates specific areas for special attention, inviting leading experts in the designated fields to organize a research program in those areas of concentration. These areas are chosen to take advantage of the expertise of the participating personnel from the collaborating institutions while addressing questions of demonstrable interest to researchers in both the discrete mathematics and theoretical computer science communities. Within these general guidelines, there are several avenues of potential emphasis that involve both serious theoretical inquiry and relevant application. For example, our modern "information society" depends on clear, efficiently designed and reliable telecommunications and communications systems. These are easily described by network theory and can be modeled using linear programming techniques. Transportation problems require similar techniques; and optimization and linear programming, possibly enhanced by parallel computations, are critical in VLSI design and manufacture. Discrete and computational geometry are foundational disciplines for computer graphics and robotics. As the geometries required for the applications become increasingly more complex, research in computational geometry becomes ever more important. Yet there are fundamental questions in discrete and computational geometry that must be addressed before the applications can be realized.

Rice University; Ken W Kennedy; ***Science and Technology Center for Research on Parallel Computation*****; (CCR-9120008 A006); $5,050,000; 12 months.**

Rice University, in collaboration with the California Institute of Technology, Syracuse University, the University of Tennessee, Argonne National Laboratory and Los Alamos National Laboratory, established the Center for Research on Parallel Computation in 1989. The goal of the Center is to make parallel computing systems truly usable. As high performance computing systems become progressively more parallel in their logical organization, ease of use comparable to conventional supercomputers becomes essential to high performance computing. The objectives of the Center cover a broad range of issues. Theory and algorithms that will be needed to parallelize important scientific applications are developed. These algorithms are embedded in scalable libraries that can be implemented on different parallel computer architectures. The utility of these software systems, algorithms and libraries in real science and engineering applications is demonstrated. Knowledge and other by-products of this research is transferred to the science and engineering community and to industry.

Rice University; Ken W Kennedy; ***Science and Technology Center for Research on Parallel Computation*****; (CCR-9120008 A007); $75,052; 36 months. (Joint support with the Programming Languages and Compilers Program, the New Technologies Program, and the ARPA-HIGH PERFORMANCE FORTRAN FORUM Program)**

The High Performance Fortran (HPF) defines extensions to Fortran 90 for the purpose of providing access to high-performance architecture features while maintaining portability across platforms. HPF primarily provides support for data parallel programs and control of data distribution. HPF has become a de-facto standard language for parallel computing systems, providing Fortran programmers with a familiar portable language. Both computing systems vendors and independent software vendors have written compilers that translate HPF commands into machine instructions that distribute computation across processors, memory, and networks. The HPF Forum is a coalition of government, high performance computing systems vendors and academic groups that us coordinated by the Center

for Research on Parallel Computation (CRPC). It was inspired by the Fortran D work at Rice University. The HPF language definition was completed in 1994.