

COVER SHEET FOR PROPOSALS TO THE NATIONAL SCIENCE FOUNDATION

FOR CONSIDERATION BY NSF ORGANIZATIONAL UNIT <small>(Indicate the most specific unit known, i.e. program, division, etc.)</small> Computer & Information Science & Engineering		PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE NSF 91-78/REU/October 1, 1991																
SUBMITTING INSTITUTION CODE <small>(if known)</small>	FOR RENEWAL <input type="checkbox"/> CONTINUING AWARD <input type="checkbox"/> ACCOMPLISHMENT BASED RENEWAL <input type="checkbox"/> REQUEST, LIST PREVIOUS AWARD NO.:	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)																
NAME OF SUBMITTING ORGANIZATION TO WHICH AWARD SHOULD BE MADE (INCLUDE BRANCH/CAMPUS/OTHER COMPONENTS): Hope College																		
ADDRESS OF ORGANIZATION (INCLUDE ZIP CODE) Holland, MI 49423																		
IS SUBMITTING ORGANIZATION: <input type="checkbox"/> For-Profit Organization; <input type="checkbox"/> Small Business; <input type="checkbox"/> Minority Business; <input type="checkbox"/> Woman-Owned Business																		
TITLE OF PROPOSED PROJECT REU: An Undergraduate Research Participation Program in Computer Science																		
REQUESTED AMOUNT \$104,550	PROPOSED DURATION 3 years	DESIRED STARTING DATE March 1, 1992																
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW: <table style="width: 100%; margin-top: 5px;"> <tr> <td><input type="checkbox"/> Animal Welfare</td> <td><input type="checkbox"/> National Environmental Policy Act</td> <td><input type="checkbox"/> International Cooperative Activity</td> </tr> <tr> <td><input type="checkbox"/> Endangered Species</td> <td><input type="checkbox"/> Research Involving Recombinant DNA Molecules</td> <td><input type="checkbox"/> Research Opportunity Award</td> </tr> <tr> <td><input type="checkbox"/> Human Subjects</td> <td><input type="checkbox"/> Historical Sites</td> <td><input type="checkbox"/> Facilitation Award for Handicapped</td> </tr> <tr> <td><input type="checkbox"/> Marine Mammal Protection</td> <td><input type="checkbox"/> Interdisciplinary</td> <td><input type="checkbox"/> Proprietary and Privileged Information</td> </tr> <tr> <td><input type="checkbox"/> Pollution Control</td> <td></td> <td></td> </tr> </table>				<input type="checkbox"/> Animal Welfare	<input type="checkbox"/> National Environmental Policy Act	<input type="checkbox"/> International Cooperative Activity	<input type="checkbox"/> Endangered Species	<input type="checkbox"/> Research Involving Recombinant DNA Molecules	<input type="checkbox"/> Research Opportunity Award	<input type="checkbox"/> Human Subjects	<input type="checkbox"/> Historical Sites	<input type="checkbox"/> Facilitation Award for Handicapped	<input type="checkbox"/> Marine Mammal Protection	<input type="checkbox"/> Interdisciplinary	<input type="checkbox"/> Proprietary and Privileged Information	<input type="checkbox"/> Pollution Control		
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<input type="checkbox"/> Pollution Control																		
PI/PD DEPARTMENT Computer Science	PI/PD ORGANIZATION Hope College	PI/PD PHONE NO. & ELECTRONIC MAIL 616-394-7508 dershem@cs.hope.edu																
PI/PD NAME/TITLE Herbert L. Dershem	SOCIAL SECURITY NO.* 271-40-8660	HIGHEST DEGREE & YEAR Ph.D. 1969	SIGNATURE 															
ADDITIONAL PI/PD (TYPED)																		
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For NSF Use:																		
TO BE COMPLETED BY THE AUTHORIZED ORGANIZATIONAL REPRESENTATIVE. By signing and submitting this proposal, the prospective grantee is providing the certifications set forth in (1) <i>Grants for Research and Education in Science and Engineering</i> , NSF 83-57 (rev. 11/87), and (2) Appendix C, 45CFR 620, Subpart F (Requirements for: a Drug-Free Workplace).																		
(If answering yes to either, please provide explanation.)			YES															
Is the organization delinquent on any Federal Debt?			NO															
Is the organization presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?																		
AUTHORIZED ORGANIZATIONAL REP.	SIGNATURE	DATE	TELEPHONE NO.															
NAME/TITLE (TYPED) James M. Gentile, Dean of Natural		9/25/91	616-394-7714															
OTHER ENDORSEMENT (optional)	Sciences																	
NAME/TITLE (TYPED)																		

*Submission of social security numbers is voluntary and will not affect the organization's eligibility for an award. However, they are an integral part of the NSF information system and assist in processing the proposal. SSN solicited under NSF Act of 1950, as amended.

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RESEARCH EXPERIENCES FOR UNDERGRADUATES

NATIONAL SCIENCE FOUNDATION
Project Summary Form

Type all entries. See the reverse side for instructions and codes to be used in filling out this form.

1. Major Field: Computer Science
2. Subfields: _____
3. Focus Code: B D 4. Highest Degree Code: B
5. Audience Code: W M _ _ _
6. Institution Code: P R I V
7. Name of Institution: Hope College
8. Name of Principal Investigator: Herbert L. Dershem
9. Project Title: REU: An Undergraduate Research Participation
Program in Computer Science
10. Number of Students Involved: 24 11. Scope Code: N
12. Other Institutions Involved: None, although 12 of the
students will come from institutions other than Hope
13. Type of Project: S I 14. Activity Period: S

15. Summary of Proposed Work:

The REU program at Hope College is designed to provide talented undergraduates with a meaningful research experience that will encourage them to consider a career in computer science research. Our goal is to expose the students to the techniques, attitudes and rewards of computer science research and to provide encouragement and direction in the pursuit of such a career. We will strongly recruit women and minority students to our program. Eight participants will be selected each year, four from Hope and four from other institutions. Those students will work for ten weeks during the summer in close collaboration with a Hope faculty mentor. Students will have the opportunity to use the Hope College Computer Science SUN SPARCstation network as well as the INMOS transputers. Areas of research include parallel algorithms, neural networks, data communications, concurrent processing, voice recognition, fractal growth, and graphics algorithms. The students will perform independent research, give oral presentations on their work, attend workshops on graduate school, prepare scientific papers, and present their work at seminars at their home institutions.

NARRATIVE

1. INTRODUCTION

Hope College is a four-year liberal arts college dedicated to excellence. The Science Division at Hope College is one of the strongest divisions of its kind at any four-year college. Hope College has been chosen to be the site of the next national meeting of the Council on Undergraduate Research and is the recipient of a recent major grant from the Kellogg Foundation to help improve K-8 science and mathematics education.

The faculty and administration of Hope College believe research participation by undergraduates to be a critical component in the training of future scientists. All of the science departments at Hope College offer independent study programs involving student research for which academic credit is awarded. Outstanding majors are encouraged to continue their research on a full time basis during the summer months. For the past three summers, the Hope College Computer Science Department has had students participating in summer research supported by local funds and funding from the Pew MidStates Consortium. In addition, the department has had two students participate in summer REU projects at other institutions.

Hope College has a long tradition of undergraduate research in Biology, Chemistry, and Physics. A recent study indicated that Hope was the third most productive institution in Computer Science research from among the 48 institutions in the "Oberlin group" as measured by publications in the period 1977-1987. During the 10 year period from 1981-1991, the Computer Science Department graduated 166 majors. Of those, 24 attended graduate or professional school and 151 participated in a Research/Independent Study course during the academic year.

The Hope College Computer Science Department has four components for the establishment of a successful summer undergraduate research environment: faculty expertise, equipment and facilities, student interest, and institutional support. This proposal is a request for the one remaining component: funding.

Faculty The faculty of the department are committed to undergraduate research and have active research programs. Their qualifications are described in Sections 3.1 and 6.

Equipment and Facilities The department has computer facilities available for its research that are comparable to that found at any other undergraduate institution in the country. These facilities are described further in Section 3 below.

Student Interest Hope College Computer Science students are highly motivated to performing research. This past summer, seven Hope Computer Science students applied for summer research positions, but only limited funding was available to support three students in the department. Even more would have applied if there had been more positions available or if the department had solicited applications.

Institutional Support Hope College strongly encourages faculty/student collaborative research. Undergraduate research with NSF support was carried out during the summer

of 1991 in the departments of Physics, Mathematics, Biology, and Chemistry. Institutional support for collaborative research outside of the sciences has increased by the establishment of a President's Discretionary Fund for this purpose.

2. NATURE OF STUDENT ACTIVITIES

2.1 Student Involvement

The student participants in this project will be expected to spend a minimum of 40 hours per week for 10 weeks on the research project to which they are assigned. Each student will be assigned to work with a faculty mentor, two students being assigned to each mentor. Early in the program, the students will work closely with their mentors, but as they gain experience they will be encouraged to work more independently. Each student will do library research in addition to the laboratory research so that they become familiar with techniques for searching and using research literature.

2.2 Student Orientation

The P.D. will serve as the program coordinator and will be responsible for all of the administrative details including housing arrangements, stipend payments, mentor assignments, scheduling of starting dates for students, the seminar program, organizing social activities, and submission of progress reports. It will be particularly important for the P.D. to provide an orientation to the campus and the department for the non-Hope student participants. All students will receive an orientation to the departmental laboratory facilities, both hardware and software, and the library facilities, particularly the use of various research tools.

During the orientation period, each mentor will also provide her students with the particular information needed to carry out the assigned project.

2.3 Weekly Seminars

Each week a seminar will be held which will be attended by all students and faculty. Early in the project period, each student will present one seminar describing the nature of her problem and a proposed research plan. At the end of the project, each student will present the results of the research project.

In addition to these student presentations, other seminars will include faculty presentations on research methods, technical writing, and the use of various computer resources. Also, at least two Hope alumni who are currently attending graduate school in Computer Science will present seminars and informally meet with the research students to describe the nature of graduate study in Computer Science.

2.4 Research Projects

The problems described below represent ongoing research activities for possible student involvement. Each project describes how a student could meaningfully participate and is designed to require the student to apply experience and information gained in formal classroom instruction.

Project 1: Probabilistic and Parallel Techniques applied to the construction of two-dimensional Voronoi diagrams

Herbert L. Dershem

Not until recently have studies appeared introducing parallel construction of Voronoi diagrams. Even less has been done in the applications of probabilistic techniques to the same problem. We propose the implementation of basic tools for the construction and display of Voronoi diagrams in two dimensions using the two classical approaches, Shamos' divide-and-conquer and Fortune's sweepline technique. This would be followed by the study and implementation of parallel and probabilistic approaches. We will also apply the same techniques to the solution of related problems such as Delaunay triangulation and Convex Hulls.

Implementation will be done using the SUN SPARCstations and Transputers.

Project 2: Neural Networks

Shirley V. Browne and Michael J. Jipping

Two faculty members, Shirley Browne and Mike Jipping, have research interests in the area of neural networks. Recent joint work by Browne and a student has involved using a neural network simulator to construct, train, and test a feed-forward back-propagation network for doing image analysis and classification. Further work is needed to improve the accuracy of the image classification and to reduce the time required to train the network. Students will be involved in implementing new strategies for neural network image processing found in the current research literature. Students will also run experiments using the neural network simulator and will collect and analyze the resulting data. Other possible areas for future work in neural networks are speech recognition and statistical analysis of ecological data. Preliminary investigation of each of these areas has already been started, by Jipping and Browne, respectively.

Project 3: Data Communications and Networking

Shirley V. Browne

Shirley Browne is currently working in the area of data communications and networking. Recent work includes the investigation of how to extend broadcast communication primitives and logical ordering properties to handle network partitioning. Other work is concerned with adapting process group membership protocols to real-time communication requirements.

Students will be involved in carrying out performance analyses of the proposed protocols.

Project 4: Algorithm Visualization and Animation

Shirley V. Browne

In the area of computer science education, the faculty are interested in incorporating algorithm visualization and animation into their courses. Shirley Browne recently attended an NSF-sponsored workshop on algorithm visualization/animation and has shared that experience with other faculty members. Students will be involved in investigating user interface and human-machine interaction issues and in developing visualization and animation software for use in courses.

Project 5: Concurrent Software Metrics

Michael J. Jipping

Concurrent software design differs from sequential software design in several significant respects. Little has been done to coordinate and integrate the solutions to parallel and sequential design. This project focuses on tools for the design phase of concurrent systems, specifically contextual concurrent software metrics. The project develops metrics addressing a specific issue in concurrent system design: verifying the absence of anomalies in a design. It also works at developing a measure of anomalies present in a design and implementing anomaly resolution, refining and extending the work of Taylor and Muhanna. The objectives are threefold: (1) define anomalies in a way that is meaningful at the design phase; (2) define and implement adaptations of algorithms that will address the presence of anomalies in a concurrent design; and (3) develop and implement resolution algorithms for both deadlock and resource corruption anomalies. Students have been participating in this project for the past three years.

Project 6: Voice Recognition

Michael J. Jipping

This project will develop software for a voice recognition system that is (1) inexpensive, (2) easily added to existing systems, and (3) flexible and extensible. The software will be part of a larger project to produce the "VoiceBox": a small computing unit that can be connected to a computer and uses software on the box and in the host computer to recognize and interpret voice input. This VoiceBox is based on INMOS Transputers for processing and will take one to four of them. The driving software will adapt itself to the number of units in the box. This project has several novel parts: combining neural network technology with compiler construction lexical analysis techniques to build the phoneme recognizer; providing an adaptable parallel implementation to the phoneme recognizer; and providing a "translator/interpreter toolkit" for the construction of one's own translator or interpreter.

Project 7: Using readability measures to estimate software complexity

Herbert L. Dershem

Previous student research has developed several measures of software complexity based on formulas used to estimate the readability of English text. This project would extend the work done in the following ways: (1) obtain empirical data based on comparisons of new metrics with traditional metrics on sample software; (2) experiment with changes in parameters in the readability metrics to further refinement their accuracy; and (3) implement parsers to evaluate these metrics in a variety of languages.

Project 8: Lindenmayer Systems and Fractal Growth

Gordon A. Stegink

Lindenmayer systems were originally conceived as a mathematical theory of plant development. Recent advances extend the theory into production rules for language, geometric motion, and fractal growth. In this latter application, realistic fractal plants can be created with properties derived from real-world biological phenomena. The project will involve the study of Lindenmayer systems, and the implementation of rendering algorithms for the production of the graphical images generated. Programming will be done on SUN SPARCstations using C and GKS.

Project 9: A Graphical User Interface (GUI) for Iterated Function Systems

Gordon A. Stegink

Iterated Function Systems have been popularized by the work of Michael Barnsley as a method of producing fractal images. While these techniques are interesting in themselves, this project will develop a user interface so that the user can specify the transformations involved strictly by the effect of drawing and moving an object. As the geometry is displayed on the visible screen the parameters of the transforms involved are computed for the production of the fractal image which results from the system. The work will be done on SUN SPARCstations using C, GKS, and XView.

Project 10: Parallel Algorithms in Computer Graphics

Gordon A. Stegink

Several algorithms in computer graphics are local, in the sense that the result of the algorithm in one small area is independent of what the algorithm produces in nearby areas. Such algorithms are ideal for a parallel implementation. This project will involve the implementation of ray tracing algorithms on a SUN SPARCstation using C, GKS, and the INMOS transputers.

2.5 Post-Project Activities

All REU participants will be required to submit a final written report on their research

activities, as well as an evaluation of the overall program. The P.D. and the mentor will recommend follow-up activities for each participant to carry out during the following academic year. For external students this might involve remote access to Hope College computing facilities as well as communication via electronic mail between student and mentor. For Hope students, this follow-up work will include formal continuation of the project by enrollment in the departmental Senior Project Seminar and/or the Independent Study/Research course. All participants will be encouraged to make a presentation of their work at their home institution or at a scientific meeting. When appropriate, the student's work will be included in a publication submitted to a professional journal.

3. THE RESEARCH ENVIRONMENT

3.1 Faculty

The department's four faculty members are a good mix of junior and senior faculty, with two of each. Three of the faculty hold a Ph.D. in Computer Science and all are active in Computer Science research and have experience supervising undergraduate research. All four members of the faculty have been principal investigators in National Science Foundation projects.

3.2 Facilities and Equipment

The departments of Computer Science, Mathematics, and Computer Science are housed in VanderWerf Hall. This building was constructed in 1964 and a major renovation was completed in 1990 resulting in the building being joined to Van Zoeren Hall. The complex now includes, in addition to the three laboratories that are exclusively for Computer Science research and instruction, three campus-wide computer laboratories which contain 40 IBM PC-compatible systems, 4 Macintosh computers, and 20 terminals connected to the campus-wide VAX computer network.

The Computer Science Department laboratory facilities are summarized in the table below:

Machine/Part	Peripherals (if any)
Sun 4/360	32 MB memory, 688 MB disk drive, 2400-baud US Robotics Courier modem
Sun 4/470	32 MB memory, 669 MB disk drive
(2) Sun 4/40s	12/16 MB memory, 207 MB disk drive, 3.5" floppy.
(8) Sun 4/60s	16 MB memory, 100 MB disk drive, 3.5" floppy drive, GX graphics coprocessor.
(3) Sun 4/65s	16 MB memory, 100 MB disk drive, 3.5" floppy.
(1) Sun 4/75	20 MB memory, 200 and 480 MB disk drives, 3.5" floppy drive.
(32) INMOS Transputers	These are parallel processing units housed in the Sun 4/470.

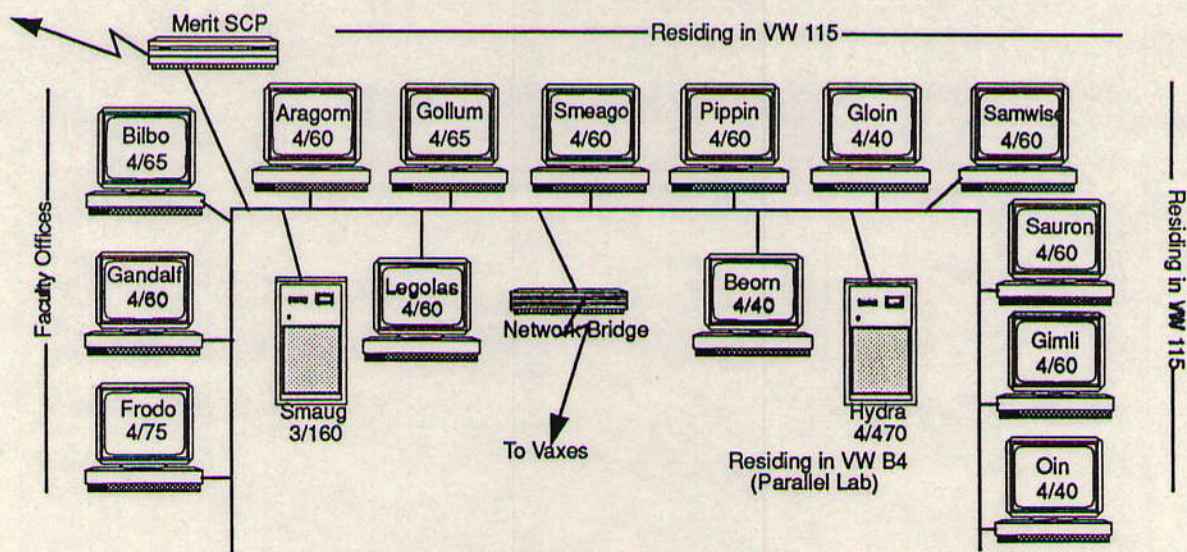
One of the 4/60 machines is a "spare parts" machine. An 8mm backup unit – an Exabyte

tape drive – is connected to the Sun 4/360, which serves as the lab's file server. The lab has one laser printer, a NEC LC890 SilentWriter, and seven Epson dot-matrix printers (various models). The lab has two modems: a 1200-baud modem and a 2400-baud US Robotics Courier connected to the Sun 4/360. The lab also has 2 microphone sets, a Sun "dials and knobs" input device, and a Chinon DS2000 digital Scanner.

Lab software includes "standard" distributed SunOS/Unix software. This includes a distribution of Sun's OpenWindows, which is a version of the X windowing system. In addition, several packages have been purchased from various vendors including FrameMaker, SunGKS, SunPHIGS, SunLink DNI DECnet support software, Saber-C, DOS Windows, and Adobe Transcript. INMOS languages and development software are available for the Transputers. The lab uses several public domain software packages including T_EX, EMACS, and DECnet utilities.

The lab's software and hardware provide access to the Internet through a college-owned Merit SCP. These facilities also provide access to campus Vaxes through an Ethernet bridge. A depiction of the Computer Science lab facilities is shown in the Figure below.

Figure 1. Depiction of Lab Facilities.



3.3 Departmental Statistics

Year	Graduating Majors	Graduates Attending Grad School	Independent Study and Research Projects	Summer Research Students
1981-82	14	2	11	0
1982-83	22	2	17	0
1983-84	16	2	22	0
1984-85	29	3	34	0
1985-86	18	2	12	0
1986-87	15	3	5	0
1987-88	16	2	17	1
1988-89	8	4	9	2
1989-90	14	3	10	2
1990-91	14	1	14	3

4. STUDENT PARTICIPANTS

4.1 Recruitment of Participants

4.1.1 Hope College Students

The summer research program in Computer Science will be announced in all upper-level Computer Science classes, in the departmental seminar, through notices on the departmental bulletin board, and through a mailing to all Computer Science majors. A packet describing the program, research areas, participant benefits and obligations, and applications procedures will be available from the departmental office. Since upper-level classes in Computer Science are typically smaller than 20 students, the professors will be able to individually encourage especially promising students to apply including women and minorities.

4.1.2 Non-Hope College Students

Fifty percent of the participants in the REU program will be from institutions other than Hope College. A special effort will be made to encourage women and minorities from other institutions to apply.

A program announcement will be sent to the Mathematics and Computer Science chairs and the Officer for Minority Affairs at all colleges and universities within an approximate 500 mile radius of Hope College. These Chairs and Officers will be sent a reply card which will ask them to send the names of women and minorities who are majoring in Computer Science. They will also be asked to post the announcement of the program. The P.D. will contact all students whose names are submitted on the reply cards to encourage them to apply to the program.

In addition, advertisements for the program will be placed in the student newspapers of 15 large universities. Publicity for the program will also appear in local newspapers.

The above process for recruiting non-Hope participants draws heavily on ideas used successfully in the past by the Hope College Biology and Chemistry Departments in the

recruitment of students for their REU programs.

All promotional materials will be distributed as soon as notification of the award is received. Applications and transcripts will be due by March 30 and notification of the awards will be made no later than April 15.

4.2 Selection Process

There will be eight student participants in the program, four from Hope College and four from other institutions. During the application process, the Hope students will be considered as one pool of applicants and the non-Hope students as another.

All applicants will be asked to submit a written statement indicating their career goals and the role of research in their future plans. Students from other institutions will also be asked to provide a transcript and a letter of reference from a faculty member. These items will be obtained directly by the P.D. for Hope student applicants.

A number of criteria will be considered in the selection of participants within each pool of applicants. These are the applicant's (1) academic record; (2) demonstrated interest in Computer Science and research; (3) potential for success in research as indicated by independence, creativity, and motivation; and (4) career plans. The four faculty participants in this program will comprise the selection committee that will make the final selection of student participants.

The overall aim of this process is to provide flexible guidelines for the selection of participants to insure that the program will have the maximum impact on the participants in their choice of a career in Computer Science and on the discipline of Computer Science itself.

4.3 Matching Participants with Research Projects

After the student participants are selected, the P.D. will coordinate the assignment of students to specific faculty mentors and research projects. Each faculty mentor will be asked to select from the participants those students whose interests and qualifications match the requirements of one of the mentor's research programs and interview that group of students. Those students at institutions other than Hope College will be interviewed by phone. As a result of these interviews, each mentor will provide a priority list of those participants that she would like to supervise. The P.D. will then make the final assignments based on these priority lists as well as consultation with the mentors and the student participants. No assignment will be made that is not enthusiastically supported by both the mentor and the student participant.

FIRST YEAR
**SUMMARY
PROPOSAL BUDGET**

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING)

ORGANIZATION				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				PROPOSAL NO.		DURATION (MONTHS)	
AWARD NO.				Proposed		Granted	
Hope College Herbert L. Dershem							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	
				CAL.	ACAD	SUMR	Funds Granted By NSF (If Different)
1. Herbert L. Dershem, Project Director							\$ 3,000
2. Shirley V. Browne, Faculty Associate							500
3. Michael J. Jipping, Faculty Associate							500
4. Gordon A. Stegink, Faculty Associate							500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
6. (4) TOTAL SENIOR PERSONNEL (1-5)							4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL CLERICAL							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)							
TOTAL PERMANENT EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 20,000							
2. TRAVEL 1,000							
3. SUBSISTENCE 2,000							
4. OTHER							
() TOTAL PARTICIPANT COSTS							23,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER							1,000
TOTAL OTHER DIRECT COSTS							1,000
H. TOTAL DIRECT COSTS (A THROUGH G)							29,850
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
25% of student stipends							
TOTAL INDIRECT COSTS							5,000
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							34,850
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 34,850
PI/PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Herbert L. Dershem				9/23/91		INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
James M. Gentile				9/23/91		Initials-DGC	

SECOND YEAR

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETINGSUMMARY
PROPOSAL BUDGET

				FOR NSF USE ONLY		
ORGANIZATION				PROPOSAL NO.	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.	Proposed	Granted
Hope College						
Herbert L. Dershem						
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer
				CAL.	ACAD	SUMR
1. Herbert L. Dershem, Project Director						\$ 3,000
2. Shirley V. Browne, Faculty Associate						500
3. Michael J. Jipping, Faculty Associate						500
4. Gordon A. Stegink, Faculty Associate						500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
6. (4) TOTAL SENIOR PERSONNEL (1-5)						4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POST DOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL CLERICAL						
6. () OTHER						
TOTAL SALARIES AND WAGES (A+B)						4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)						
TOTAL PERMANENT EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 20,000						
2. TRAVEL 1,000						
3. SUBSISTENCE 2,000						
4. OTHER						
() TOTAL PARTICIPANT COSTS						23,000
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER (ADPE) SERVICES						
5. SUBCONTRACTS						
6. OTHER						1,000
TOTAL OTHER DIRECT COSTS						1,000
H. TOTAL DIRECT COSTS (A THROUGH G)						29,850
I. INDIRECT COSTS (SPECIFY RATE AND BASE)						
25% of student stipends						
TOTAL INDIRECT COSTS						5,000
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						34,850
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$34,850
						\$
PI/PD TYPED NAME & SIGNATURE*				FOR NSF USE ONLY		
Herbert L. Dershem				DATE	9/23/91	
INST. REP. TYPED NAME & SIGNATURE*				INDIRECT COST RATE VERIFICATION		
James M. Gentile				DATE	9/23/91	
				Date Checked	Date of Rate Sheet	Initials-DGC

THIRD YEAR
**SUMMARY
PROPOSAL BUDGET**

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING

ORGANIZATION				FOR NSF USE ONLY			
Hope College PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Herbert L. Dershem				PROPOSAL NO.	DURATION (MONTHS)		
					Proposed	Granted	
AWARD NO.							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL.	ACAD	SUMR	
1. Herbert L. Dershem, Project Director							\$ 3,000
2. Shirley V. Browne, Faculty Associate							500
3. Michael J. Jipping, Faculty Associate							500
4. Gordon A. Stegink, Faculty Associate							500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
6. (4) TOTAL SENIOR PERSONNEL (1-5)							4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL CLERICAL							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)							
TOTAL PERMANENT EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 20,000							
2. TRAVEL 1,000							
3. SUBSISTENCE 2,000							
4. OTHER							
() TOTAL PARTICIPANT COSTS							23,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER							1,000
TOTAL OTHER DIRECT COSTS							1,000
H. TOTAL DIRECT COSTS (A THROUGH G)							29,850
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
25% of student stipends							
TOTAL INDIRECT COSTS							5,000
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							34,850
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$34,850 \$
PI/PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Herbert L. Dershem				9/23/91		INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
James M. Gentile				9/23/91		Initials-DGC	

CUMULATIVE BUDGET
SUMMARY
PROPOSAL BUDGET

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING

				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (MONTHS)		
ORGANIZATION Hone College				AWARD NO.	Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Herbert L. Dershem							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL.	ACAD	SUMR	
1. Herbert L. Dershem, Project Director							\$ 9,000
2. Shirley V. Browne, Faculty Associate							1,500
3. Michael J. Jipping, Faculty Associate							1,500
4. Gordon A. Stegink, Faculty Associate							1,500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
6. (4) TOTAL SENIOR PERSONNEL (1-5)							13,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL CLERICAL							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							13,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							4,050
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							17,550
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)							
TOTAL PERMANENT EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 60,000							
2. TRAVEL 3,000							
3. SUBSISTENCE 6,000							
4. OTHER							
() TOTAL PARTICIPANT COSTS							69,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER							3,000
TOTAL OTHER DIRECT COSTS							3,000
H. TOTAL DIRECT COSTS (A THROUGH G)							89,550
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
25% of student stipends							
TOTAL INDIRECT COSTS							15,000
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							104,550
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$104,550
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY		
Herbert L. Dershem				9/23/91	INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date of Rate Sheet	Initials-DGC
James M. Gentile				9/23/91			

5.5 Budget Explanation

Item A.1. Project Director: It is estimated that the activities of the Project Director will require approximately one day per week for the 10 weeks of the project. Based on this estimate, an appropriate salary for the P.D. would be $\frac{1}{18}$ (2 weeks) of his academic year salary or \$3,000. No compensation is requested for work done on recruiting students for this project during the academic year.

Items A.2.-A.4. Faculty Associates: Requested faculty salary is \$250 per REU student supervised. It is expected that faculty will obtain the major part of their summer salary from outside sources. The \$250 represents a small part of a reasonable summer salary, but it is an incentive to the faculty mentor to give extra thought and time to the REU projects.

Item C. Fringe Benefits: This is based on the institutional rate of 30% of faculty salaries.

Item F.1. Stipends: Stipends are \$250 per week for 10 weeks for 8 students.

Item F.2. Travel: The \$1,000 will be available to assist students with their travel expenses between Hope College and their homes.

Item F.3. Subsistence: The cost of student housing is approximately \$35 per week for a total cost of \$350 per student. Hope College will subsidize $\frac{1}{2}$ of this amount, leaving \$175 per student to be paid by the grant. An amount of \$75 per student will be paid for food, making the total subsistence request \$250 per student.

Item G.6. Other: The \$1,000 budgeted for other costs will be used for miscellaneous costs such as postage, telephone, copying, and other general expenses, and to help defray the cost of off-campus speakers.

Institutional Support

The Computer Science Department and Hope College are committed to the principle that excellence in undergraduate education must include active student involvement in significant research. In support of this commitment, the college will contribute a substantial part of the resources required to carry out this REU project. The college will provide housing to the students at one-half of the normal cost as well as providing all of the services normally available to Hope summer students. These services include use of the physical activities center, the career and counseling center, library facilities, and computing facilities.

The college supports the research efforts of faculty and students through release time for faculty, faculty development grants, travel funds to scientific meetings, acquisition and maintenance of hardware and software, general secretarial and clerical support, and funds for expendable supplies.

The rate of administrative allowance for REU is 25% of student stipends. The college's standard overhead rate is 63.3% of all salaries and wages. The difference between these two amounts will be paid by Hope College as a contribution to this program.

A summary of Hope College contributions to the REU program is given in the table below:

Contributions of Hope College to REU Project		
	Annual	Total (3 yrs)
Housing, 8 students 10 weeks per student	\$1,400	\$4,200
Excluded indirect costs, 38.3% of student stipends	\$7,660	\$22,980
Physical Activities Center membership, \$35 per student	\$280	\$840
TOTAL	\$9,340	\$28,020

BIOGRAPHICAL SKETCHES AND INDIVIDUAL SUPPORT

Herbert L. Dershem

Academic Rank: Professor of Computer Science

Education:

B.S. University of Dayton, 1965

M.S. (Computer Science) Purdue University, 1967

Ph.D. (Computer Science) Purdue University, 1969

Experience:

Assistant Professor, Hope College, 1969-1974

Associate Professor, Hope College, 1974-1981

Professor, Hope College, 1981-

Visiting Research Scientist, Oak Ridge National Laboratories, 1977-1978

Visiting Professor, Boston University Overseas Program, 1982-1983

Honors and Awards:

NDEA Fellow, Purdue University, 1965-1968

Project COMPUTe Awardee, Dartmouth College, 1972

NASA/ASEE Summer Fellow, Goddard Space Flight Center, 1976

Oak Ridge Associated Universities Summer Fellow, 1977

Grants:

Co-Principal Investigator, "Introduction of the Computer in the Statistics Curriculum", NSF Office of Computing Activities, 1971-73

Principal Investigator, "A Modular Approach to the Introductory Course in Computer Science", NSF Local Course Improvement Program, 1978-1980

Co-Principal Investigator, "A Microcomputer Laboratory for use in Teaching Statistics", NSF Instructional Scientific Equipment Program, 1979-1980

Principal Investigator, "CSNET Membership in Support of Computer Science Research", NSF RUI Program, 1987-1990

Publications: (23 total, those since 1986 included below)

Proceedings of the Nineteenth SIGCSE Technical Symposium, H. Dershem, editor, Association for Computing Machinery, 1988

Programming Languages: Models and Structures, H. Dershem and M. Jipping, Wadsworth Publishing Company, 1990

Shirley V. Browne

Academic Rank: Assistant Professor

Education:

B.A., Indiana University, 1978

M.Ed., University of Illinois, 1980

M.S., Wichita State University (Mathematics), 1985

M.S., Purdue University (Computer Science), 1986

Ph.D., Purdue University (Computer Science), 1990

Experience:

Software Librarian and Applications Programmer, IFR, Inc, 1980-1981

Scientific Programmer, Cessna Aircraft Company, 1984

Instructor of Mathematics and Computer Science, Wichita State University, 1981-1985

Assistant Professor of Computer Science, Hope College, 1990-

Grants:

Principal Investigator, "Reliable Broadcast for Partitionable Networks", Research Planning Grant, National Science Foundation, 1991-1993

Publications:

"A Generic Algorithm for Transaction Processing During Network Partitioning", B. Bhargava and S. Browne, *Proc. 8th Conference on Foundations of Software Technology and Theoretical Computer Science*, Pune, India, December, 1988

"Quorum-based Recovery in Replicated Database Systems", S. Browne, Ph.D. thesis, Purdue University, May, 1990

"Adaptable Recovery Using Dynamic Quorum Assignments", B. Bhargava and S. Browne, *Proc. 16th International Conference on Very Large Databases*, Brisbane, Australia, August, 1990

"Communication-based Recovery in Replicated Databases", B. Bhargava and S. Browne, *Proc. 10th International Conference on Computer Communications*, New Delhi, India, November, 1990

"A Real-Time Group Membership Protocol", S. Browne, to be presented at the Second Great Lakes Computer Science Conference, Kalamazoo, MI, Oct. 17-19, 1991

"Fast Linear-Space Computations of Longest Common Sequences", A. Apostolico and S. Browne and C. Guerra, *Theoretical Computer Science* (to appear in 1992)

Michael J. Jipping

Academic Rank: Assistant Professor

Education:

B.S., Calvin College, 1981

M.S., University of Iowa (Computer Science), 1984

Ph.D., University of Iowa (Computer Science), 1986

Experience:

Assistant Professor, University of Iowa, 1986-1987

Assistant Professor, Hope College, 1987-

Grants:

Principal Investigator, "A New Course in Parallel Programming for Undergraduates", NSF Instrumentation and Laboratory Improvement, 1990

Publications: (Undergraduate co-authors indicated with an asterisk)

"An Information-Based Methodology for the Design of Concurrent Systems", M. Jipping, Ph.D. thesis, University of Iowa, 1986

"Performance Prediction in Distributed System Design", M. Jipping and R. Ford, *Proceedings of the 1986 Rockwell International Software Engineering Symposium*, 3.2.1-3.2.8, Cedar Rapids, IA, October, 1986

"Predicting Performance for Concurrency Control Design", M. Jipping and R. Ford, *1987 ACM SIGMETRICS Conference on Measurement and Modeling of Computer Systems*, 132-142, Alberta, Canada, May, 1987

Programming Languages: Structures and Models, H. Dershem and M. Jipping, Wadsworth Publishing Co., 1990

"Concurrent Distributed Pascal: A Hands-on Introduction to Concurrency", M. Jipping, J. Toppen*, and S. Weeber*, *Proceedings of the 1990 SIGCSE Technical Symposium, SIGCSE Bulletin*, **21**,1,94-99, February, 1990

"On the Performance of Concurrent Tree Algorithms", R. Ford, M. Jipping, R. Schultz, and B. Wenhardt, *Journal of Parallel and Distributed Computing*, **8**, 253-256, March, 1990

Gordon A. Stegink

Academic Rank: Associate Professor

Education:

A.B., Hope College, 1961

A.M., Washington University (Mathematics), 1963

Experience:

Assistant Professor, Dickinson College, 1965-1970

Assistant Professor, Grand Valley State College, 1970-1974

Manager, Computer Operations and User Services, Grand Valley State College, 1970-1981

Assistant Professor, Hope College, 1981-1987

Associate Professor, Hope College, 1987-

Honors and Awards:

Fulbright Lectureship, Malawi, 1990-91

Grants:

Principal Investigator, "An Undergraduate Computer Graphics Laboratory", NSF Instrumentation and Laboratory Improvement, 1989

Principal Investigator, "Algorithms in Fractal Geometry and Computational Geometry", Pew Midstates Science and Mathematics Consortium, 1989

Current and Pending Support for Research and Education in Science and Engineering

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

1. Name of Principal Investigator Herbert L. Dershem	Source of Support	Project Title	Award Amount (or Annual rate)	Period Covered by Award	Person-months or % of Effort Committed to the Project			Location of Research
					ACAD.	SUMM	CAL.	
A. <i>Current Support</i> List—if none, report none	none							
B. <i>Proposals Pending</i> 1. List this proposal	NSF-REU	REU: An Undergraduate Research Participation Program in Computer Science	94,050	3/15/92-9/30/94		15%	5%	Hope College
2. <i>Other pending proposals</i> , including renewal applications. If none, report none.	DARPA-Curriculum Development in Software Engineering & ADA	Use of Ada, Laboratories and Visualization in the Teaching of Data Structures and Discrete Math	23,010	6/1/92-6/1/93		70%	15%	Hope College
3. <i>Proposals planned to be submitted in near future.</i> if none, report none.								
IV. Name of co-principal investigator and/or faculty associate. A. _____ B. _____	See next page.							
III. <i>Transfer of Support</i> If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.								
IV. Other agencies to which this proposal has been/will be submitted								

USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support for Faculty Associates

Associates

Faculty Associate	Source of Support	Project Title	Award Amount	Period of Award	% of Effort Acad.	% of Effort Summer	Location of Project
Current Support							
Shirley V. Browne	NSF-RPG	Reliable Broadcast for Partitionable Networks	18,000	1/1/92-7/1/93	40	70	Hope College
Pending Support							
Shirley V. Browne	US Dept of Educ.	Challenge Grant Proposal for Increasing the Interest and Participation of Women in Computer Science	39,952	9/1/92-7/31/94	25	50	Hope College
Michael J. Jipping	NSF-RUI	Design Metrics for Concurrent System Software	121,774	6/1/92-7/31/94	25	100	Hope College

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING)**SUMMARY
PROPOSAL BUDGET**

FOR NSF USE ONLY

ORGANIZATION Hope College				PROPOSAL NO.		DURATION (MONTHS) Proposed Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Herbert L. Dershem				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By	Funds Granted By NSF
				CAL.	ACAD	SUMR	Proposer (If Different)
1. Herbert L. Dershem, Project Director							\$ 3,000
2. Shirley V. Browne, Faculty Associate							500
3. Michael J. Jipping, Faculty Associate							500
4. Gordon A. Stegink, Faculty Associate							500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
6. () TOTAL SENIOR PERSONNEL (1-5)							4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL CLERICAL							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)							
TOTAL PERMANENT EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 15,600							
2. TRAVEL 1,000							
3. SUBSISTENCE 1,500							
4. OTHER							
() TOTAL PARTICIPANT COSTS							18,100
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER							1,000
TOTAL OTHER DIRECT COSTS							1,000
H. TOTAL DIRECT COSTS (A THROUGH G)							24,950
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
25% of student stipends							
TOTAL INDIRECT COSTS							3,900
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							28,850
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$28,850
PI/PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Herbert L. Dershem				1/13/92		INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
James M. Gentile				1/13/92			Initials-DGC

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING)**SUMMARY
PROPOSAL BUDGET**

				FOR NSF USE ONLY		
ORGANIZATION				PROPOSAL NO.		DURATION (MONTHS)
Hope College						Proposed Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.		
Herbert L. Dershem						
A. SENIOR PERSONNEL: P/VPD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer
				CAL.	ACAD	SUMR
1. Herbert L. Dershem, Project Director						\$ 3,000
2. Shirley V. Browne, Faculty Associate						500
3. Michael J. Jipping, Faculty Associate						500
4. Gordon A. Stegink, Faculty Associate						500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
6. () TOTAL SENIOR PERSONNEL (1-5)						4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POST DOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL CLERICAL						
6. () OTHER						
TOTAL SALARIES AND WAGES (A+B)						4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000:)						
TOTAL PERMANENT EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 15,600						
2. TRAVEL 1,000						
3. SUBSISTENCE 1,500						
4. OTHER						
() TOTAL PARTICIPANT COSTS						18,100
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER (ADPE) SERVICES						
5. SUBCONTRACTS						
6. OTHER						1,000
TOTAL OTHER DIRECT COSTS						1,000
H. TOTAL DIRECT COSTS (A THROUGH G)						24,950
I. INDIRECT COSTS (SPECIFY RATE AND BASE)						
25% of student stipends						
TOTAL INDIRECT COSTS						3,900
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						28,850
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$28,850
P/VPD TYPED NAME & SIGNATURE*				FOR NSF USE ONLY		
Herbert L. Dershem				INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*				Date Checked	Date of Rate Sheet	Initials-DGC
James M. Gentile				1/13/92		

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Hope College				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Herbert L. Dershem				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL.	ACAD	SUMR	
1. Herbert L. Dershem, Project Director							\$ 3,000
2. Shirley V. Browne, Faculty Associate							500
3. Michael J. Jipping, Faculty Associate							500
4. Gordon A. Stegink, Faculty Associate							500
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
6. () TOTAL SENIOR PERSONNEL (1-5)							4,500
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL CLERICAL							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							4,500
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,350
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							5,850
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000;)							
TOTAL PERMANENT EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 15,600							
2. TRAVEL 1,000							
3. SUBSISTENCE 1,500							
4. OTHER							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							18,100
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							1,000
H. TOTAL DIRECT COSTS (A THROUGH G)							1,000
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							24,950
25% of student stipends							
TOTAL INDIRECT COSTS							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							3,900
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)							28,850
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							
PI/PD TYPED NAME & SIGNATURE*							\$28,850
Herbert L. Dershem				DATE	FOR NSF USE ONLY		
				1/13/92	INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date of Rate Sheet	Initials-DGC
James M. Gentile				1/13/92			

(SEE INSTRUCTIONS ON REVERSE
BEFORE COMPLETING)**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Hope College				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Herbert L. Dershem				AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.6. show number in brackets)				NSF Funded Person-mos.		
				CAL.	ACAD	SUMR
1. Herbert L. Dershem, Project Director						
2. Shirley V. Browne, Faculty Associate						
3. Michael J. Jipping, Faculty Associate						
4. Gordon A. Stegink, Faculty Associate						
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
6. () TOTAL SENIOR PERSONNEL (1-5)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POST DOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL CLERICAL						
6. () OTHER						
TOTAL SALARIES AND WAGES (A+B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000;)						
TOTAL PERMANENT EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 46,800						
2. TRAVEL 3,000						
3. SUBSISTENCE 4,500						
4. OTHER						
() TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER (ADPE) SERVICES						
5. SUBCONTRACTS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (SPECIFY RATE AND BASE)						
25% of student stipends						
TOTAL INDIRECT COSTS						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
PI/PD TYPED NAME & SIGNATURE*						
Herbert L. Dershem						
INST. REP. TYPED NAME & SIGNATURE*						
James M. Gentile						
DATE				FOR NSF USE ONLY		
1/13/92				INDIRECT COST RATE VERIFICATION		
DATE				Date Checked	Date of Rate Sheet	Initials-DGC
1/13/92						

Budget and Scope Revision
REU: An Undergraduate Research Participation Program in Computer Science
Proposal ID NO: CDA-9200118

Herbert L. Dershem
Hope College
Holland, MI 49423
(616)394-7508 *dershem@cs.hope.edu*

Statement of Revised Scope of Project - 1/13/92

The scope of the project has been reduced from eight students per year to six students per year. It is expected that one or two students will be supported each summer by other funds. Shirley Browne has received an NSF Research Initiation grant that will support a student during the summer of 1992. Mike Jipping has a proposal pending with NSF RUI that will provide summer student support as well. Therefore, in reducing our REU request to six students, we expect that we will still have seven or eight student participants each summer. The amount of the student stipend has been increased from \$250 to \$260 per month.

5.5 Budget Explanation - Revised 1/13/92

Item A.1. Project Director: It is estimated that the activities of the Project Director will require approximately one day per week for the 10 weeks of the project. Based on this estimate, an appropriate salary for the P.D. would be $\frac{1}{18}$ (2 weeks) of his academic year salary or \$3,000. No compensation is requested for work done on recruiting students for this project during the academic year.

Items A.2.-A.4. Faculty Associates: Requested faculty salary is \$250 per REU student supervised. It is expected that faculty will obtain the major part of their summer salary from outside sources. The \$250 represents a small part of a reasonable summer salary, but it is an incentive to the faculty mentor to give extra thought and time to the REU projects.

Item C. Fringe Benefits: This is based on the institutional rate of 30% of faculty salaries.

Item F.1. Stipends: Stipends are \$260 per week for 10 weeks for 6 students.

Item F.2. Travel: The \$1,000 will be available to assist students with their travel expenses between Hope College and their homes.

Item F.3. Subsistence: The cost of student housing is approximately \$35 per week for a total cost of \$350 per student. Hope College will subsidize $\frac{1}{2}$ of this amount, leaving \$175 per student to be paid by the grant. An amount of \$75 per student will be paid for food, making the total subsistence request \$250 per student.

Item G.6. Other: The \$1,000 budgeted for other costs will be used for miscellaneous costs such as postage, telephone, copying, and other general expenses, and to help defray the cost of off-campus speakers.

Budget and Scope Revision
REU: An Undergraduate Research Participation Program in Computer Science
Proposal ID NO: CDA-9200118

Herbert L. Dershem
Hope College
Holland, MI 49423
(616)394-7508 *dershem@cs.hope.edu*

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Item G.6. Other: The \$1,000 budgeted for other costs will be used for miscellaneous costs such as postage, telephone, copying, and other general expenses, and to help defray the cost of off-campus speakers.

From @hub.nsf.gov:engel@note.nsf.gov Fri Jan 10 17:15:28 1992
From: engel@note.nsf.gov
To: dershem@cs.hope.edu
Subject: reu proposal
Date: Fri, 10 Jan 1992 17:10:09 -0500

Professor Dershem:

I have been working on your REU proposal over the past several days. I am favorably inclined towards to project, however, I have some very difficult financial constraints at this time.

I would like to hold this grant, if I can make it, to 29,000. Would it be possible for you to do some rearranging of the budget, and come in at that number? If so, what I will need is a revised budget, co-signed by you and the institutional representative, along with a change of scope statement if there are any major changes in the nature of the program.

Please let me know if you can do this by e-mail as soon as possible. I would then like you to FAX me the material so I can begin processing it, and send the hard copy of the signed forms by surface mail.

I hope this is not too much trouble for you. I certainly would like to see this project funded.

Gerald L. Engel
Program Director, CISE REU Sites
202-357-7349 office
202-357-0320 FAX

reu proposal

From @hub.nsf.gov:engel@note.nsf.gov Fri Jan 10 17:45:54 1992
From: engel@note.nsf.gov
To: Herb Dershem <dershem@cs.hope.edu>
Subject: Re: reu proposal
Date: Fri, 10 Jan 1992 17:36:57 -0500

Thanks for the quick reply. I came to NSF on a two year IPA arriving last August. I have special projects for CISE which is a little of everything including REUs.

I can go either way on the years. I suspect a one year would be a good idea here. That would provide a years running experience for the next competition, and you could them come in at a higher number. In fact the more I think of it, that would be my recommendation.

Again, thanks for the quick feedback.

Jerry Engel

Re: reu proposal

From @hub.nsf.gov:engel@note.nsf.gov Fri Jan 31 10:13:58 1992
From: engel@note.nsf.gov
To: Herb Dershem <dershem@cs.hope.edu>
Subject: Re: reu inquiry
Date: Fri, 31 Jan 1992 10:11:11 -0500

Herb:

The REU Jacket has cleared my desk. I do not have enough experience to know how long the next step takes, but would suspect that it will be no more than a month. Basically, a research office cannot award a grant, only recommend one. The award must come from the Division of Grants and Contracts. That is the step I am unsure of, especially in a specific program (i.e. they may insist on holding until they can do all of them). In any event, based on my positive recommendation, I would go ahead and recruit. I would carefully state that the final award is subject to final approval by NSF. Virtually all of our funded projects do that.

Regarding infrasturcture, I would not encourage you to apply for the II Small Scale. If you take a position of there being three super-star research departments in CS in the country, the intent of the II Large Scale was to bring the next 20 up to that level. The Samll scale was to bring the next 40 up to the second level. I do not recall of there ever being a proposal in either program from a small college.

In any event, I am putting into todays mail, the brochures on all four of the II programs. I am also putting in a brochure on the academic research infrastructure program. This one is not a CISE program. It is the case, however, that there are provisions to handle a variety of types of schools, and funds are even allocated to insure that. Do note the unrealistically tight deadline, and the fact that it requires 100 % match. Though these present problems, it also means there may not be too many applicants this year.

Finally, never forget the Research Instrumentation Programs, the IRI programs and the Research Opportunity Awards. These latter are for faculty at smaller schools, to give an opportunity to work on an existing NSF project. Summer support, some academic year support, and possibly even some equipment are possible.

Hope this all helps.

Jerry

Re: reu inquiry



HOPE COLLEGE
HOLLAND, MICH. 49423-3698

NEWS

OFFICE OF PUBLIC RELATIONS: DeWitt Center / Tom Renner, Director of Public Relations / Office: (616) 394-7860 / Home: (616) 637-2892
FAX: (616) 394-7922

FOR IMMEDIATE RELEASE

April 8, 1992

HOPE HOLDS NSF-REU GRANTS IN FOUR SCIENCE DISCIPLINES

HOLLAND -- Hope College holds grants from the National Science Foundation's (NSF) "Research Experiences for Undergraduates" (REU) program in four different science disciplines: biology, chemistry, computer science and mathematics.

Through the grants, undergraduate students from both Hope and elsewhere will be able to conduct research on a full-time basis with Hope faculty members this summer, and will receive stipends as well as support for summer housing, travel and other expenses. They will join students whose summer research at Hope is being supported in other ways.

According to Dr. James Gentile, who is dean for the natural sciences and the Kenneth G. Herrick Professor of Biology at Hope, preliminary investigations have found that the college is one of only a few institutions, if not the only institution, in the United States to have four REU programs this summer.

"In my opinion, it means that we are recognized at the national level--by the NSF--as being a leading, if not the leading, college institution that engages undergraduate students in hands-on research with faculty in the sciences, computer science and mathematics," Gentile said.

Biology's grant was one of only about 20-30 awarded last year; chemistry's was one of only 51 awarded last year; computer science's was one of only approximately 15 awarded this year; and mathematics' was one of only 20 awarded this year.

Gentile noted that the hands-on experience that the NSF-REU grants will provide students is a valuable part of a science education. "Hands-on learning is the best way of learning for students," he said.

The department of biology's grant will support 10 students--five

-more-

from Hope and five from other institutions--for 10 weeks. Areas of research will range from the molecular biology of nitrogen fixation, to environmental physiology and biochemistry to host-parasite relationships.

This summer will be the second summer under biology's three-year grant, which is being administered by Anthony Nieuwkoop, assistant professor of biology.

Eight students will work for 10 weeks through the department of chemistry's grant--four from Hope and four from elsewhere. Students working in the department will be involved in laser spectroscopy, synthetic organic chemistry, biochemistry, organometallic chemistry and analytical chemistry.

This is the department's second summer under the grant, which is being administered by Michael Seymour, associate professor of chemistry.

The department of computer science's grant is providing 10 weeks' worth of support this summer for six students--three from Hope and three from other institutions. Areas of research will include neural networks, voice recognition and graphics algorithms.

The coming summer will be the department's first with the three-year grant, which will also support student researchers in 1993 and 1994. The grant is being administered by Herbert Dershem, professor of computer science and chairperson of the department.

The department of mathematics holds its NSF-REU grant jointly with Calvin College of Grand Rapids. The grant will support eight students--half from Hope or Calvin, and half from other institutions--for eight weeks. Projects in pure and applied mathematics will include algebra, analysis, differential equations, dynamical systems, recursion theory and topology.

The two-year grant will continue through the summer of 1993. The project directors are David Carothers, associate professor of mathematics and chairperson of the department at Hope, and Gerard Venema, professor of mathematics at Calvin.

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

Office of Cross-Disciplinary Activities
CISE Directorate

General Information for Applicants
CISE REU Sites Program 1991

This year 43 proposals were received and reviewed within the CISE Directorate. In accordance with the usual practice, a group of independent scientists and engineers was convened to provide evaluation of the submitted proposals. These reviewers considered proposals within their area of expertise, and made recommendations relative to their funding. Based on the review panel recommendations, and with funds available to this program, approximately 35% of these proposals were recommended for award.

Enclosed are verbatim copies of all completed reviews, and well as summary review forms, and a panel summary. In reviewing this material, please keep in mind that the reviewers are addressing their comments primarily to NSF, not to the proposer. Although many reviewers do provide helpful information, they sometimes make remarks without giving detailed references or providing specific suggestions for improvement. Some reviews may contain non-substantive, irrelevant or erroneous statements that the program officer did not use. Such comments are so marked.

Decisions about particular proposals are often very difficult, and factors other than reviewer comments and ratings enter into the decision. While the merit of the proposal in computer and information science and engineering, and its merit in relation to other proposals received in the same competition are always critical considerations, maintaining appropriate balance among subfields, the availability of other funding, the total amount of funds available to the program, and the geographic distribution of work supported by the Foundation are also important.

If you would like further information about the evaluation of the proposal itself, please contact Gerald L. Engel, CISE Special Projects, at 202-357-7349, or e-mail at gengel@note.nsf.gov.

Information about reconsideration of declined proposals is found in NSF's Grant Policy Manual, which should be available at your institution, usually at the office that formally submitted your proposal.

Foundation policy is to accept a revised proposal for review and evaluation as a new proposal, in accordance with the designated proposal deadlines, if reviewers' comments have been substantially addressed.

National Science Foundation

Special Emphasis Panel for CISE/CDA Research Experiences for Undergraduates

(1) The Special Emphasis Panel for the Research Experiences for Undergraduates (REU) met in a closed session on December 9, 1991. The meeting was devoted to the review and evaluation of CISE REU Sites proposals.

(2) Twelve panel members were present during the meeting. The panelists were organized into four subpanels. Each subpanel met during the morning. The entire panel met in the afternoon. The names of the panelists are not being released in order to protect the confidentiality of those who reviewed particular proposals, since individual identities could be inferred from the area of specialization of the individual.

(3) Staff members acting as Federal Officers during the meeting were as follows:

Gerald L. Engel, Program Director, CISE/OCDA
Harry G. Hedges, Program Director, CISE/CCR
Paul T. Hulina, Program Director, CISE/MIPS
David A. Staudt, Assoc. Program Director, CISE/NCRI
Virginia Eaton, Program Director, EHR/RCD

(4) The meeting began with John Cherniavsky, Acting Head of the Office of Cross-Disciplinary Activities welcoming the panelists, and presenting a brief description of the REU program. Gerald Engel then gave a conflict of interest reminder to all of the panelists, and the panelists read and signed the COI forms. Members were also cautioned about the confidentiality of the proposals under review and of the confidentiality of the identities of the panel members.

(5) Proposals had been mailed to the panelists prior to the panel meeting. One additional proposal was received, from MPS which is also considering it, too late to be mailed. This was provided to the appropriate subpanel at the start of their deliberations, and ample time was allowed for it to be read and considered. Including the proposal sent from MPS, the panel

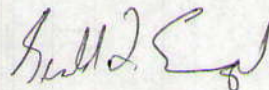
reviewed and evaluated 43 proposals for their suitability for funding under the REU guidelines. The proposals covered areas of research in each of the five divisions of CISE. Each subpanel reviewed a set of proposals. Each submitted an NSF form 1 for each proposal reviewed, as well as a form rating the proposal on a point scale from 1 (poor) to 5 (excellent). In addition, individual panel summaries were prepared by a member of the subpanel, listing the strengths and weaknesses of the proposal, as well as a funding priority level. These summaries were approved by the rest to the subpanel members not excused for COI reasons. The panel summaries are filed in the appropriate jackets, and anonymous copies are returned to the principal investigators along with anonymous verbatim reviews. The panel summaries are deemed advisory to the program officer.

Following the subpanel's deliberations, the entire panel met to determine the collection of proposals to be recommended for funding. Thirteen proposals were recommended for funding. An additional seven proposals were placed in priority order should additional funding be possible. The panel also made recommendations that six of the proposals be considered for multiple year continuing grants.

(6) No disqualifying conflicts of interest were noted at the level of subpanel, or full panel deliberations.

(7) These minutes are an accurate summary of the matters discussed and the conclusions reached at this meeting.

Certified by:



Gerald L. Engel, Chair
Special Emphasis Panel for
CISE REU

Date: 1/27/72

Program Director's Note

CDA-9200118

Hope College

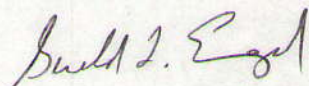
Herbert L. Dershem

REU: An Undergraduate Research Participation Program in Computer Science

The original proposal was to bring eight students each of three summers, to the Hope College Campus for a ten week period. In this time, the students would be provided with a research experience and given encouragement to pursue a career in computer science research. It is anticipated that half the participants will be from Hope College, and half from other institutions. A strong emphasis is to be placed on the recruitment of women and minorities.

The panelists found significant strength in this proposal. They were impressed with the overall quality of the project proposed, the management plan, and the record of previous experience with undergraduate research programs. There was some concern, however, that some of the participating faculty may not have had as much experience as researchers as desirable, and hence that the project was a bit ambitious.

The panel recommended that the proposal be funded if funds are available. I concur that this is an excellent project. I have discussed the issue of scope with the PI, and he has agreed to reduce the scope of the project to work with six rather than eight students. With this change, I recommend funding of this proposal as a three year continuing grant. In 1992, I recommend funding at the level of \$28,850 as requested in the revised budget. Upon acceptance of appropriate reports and materials, I recommend funding in 1993 at the level of \$ 28,850, and similarly at the level of \$ 28,850 for 1994.



Gerald L. Engel

Program Director, REU Sites

January 15, 1991

REU SITES

PROPOSAL SUMMARY

DECEMBER 9, 1991

PROPOSAL NUMBER 92-00118 (HOPE)

STRENGTHS:

Previous experience with undergraduate research prog.
selection and recruitment plan.
Project management plan.
Good overall proposal.

WEAKNESSES:

(Undergraduate only institution) irrelevant to decision ⁹²⁻⁰⁰¹¹⁸
Some participating faculty do not appear to
be active in research.

PRIORITY

Fund if funds are available.

92-00118
Hope

REU PROPOSAL EVALUATION FORM

PROPOSAL NO:

INSTITUTION

P.I.

PLEASE RATE THE PROPOSAL ON EACH OF THE CRITERIA BELOW
USE A SCALE OF 5 (EXCELLENT) TO 1 (POOR)

RATING

1. APPROPRIATENESS AND VALUE OF EXPERIENCE FOR THE STUDENT	4
2. QUALITY OF SUPERVISOR AND FACILITIES	4
3. OVERALL MERIT OF RESEARCH ACTIVITIES	4
4. PARTICIPANT SELECTION AND RESEARCH MATCHING PROCEDURES	4
5. PLANS FOR STUDENT PARTICIPATION AND FOLLOW-THROUGH	4
6. ARRANGEMENTS FOR MANAGING THE PROJECT	4
7. INSTITUTION'S RECORD IN MOTIVATING STUDENTS TO CAREERS IN MATH, SCIENCE, AND ENGINEERING	4
8. INSTITUTIONAL COMMITMENT TO THE PROJECT	4
9. PLANS FOR INCORPORATING UNDERREPRESENTED GROUPS	4

COMMENTS

OVERALL
RATING

4

REVIEWER NAME:

SIGNATURE:

REU PROPOSAL EVALUATION FORM

PROPOSAL NO:

92-00118

INSTITUTION

HOPE COLLEGE

P.I.

Herbert L. Pech

PLEASE RATE THE PROPOSAL ON EACH OF THE CRITERIA BELOW
USE A SCALE OF 5 (EXCELLENT) TO 1 (POOR)

RATING

1. APPROPRIATENESS AND VALUE OF EXPERIENCE FOR THE STUDENT	4
2. QUALITY OF SUPERVISOR AND FACILITIES	3
3. OVERALL MERIT OF RESEARCH ACTIVITIES	3
4. PARTICIPANT SELECTION AND RESEARCH MATCHING PROCEDURES	5
5. PLANS FOR STUDENT PARTICIPATION AND FOLLOW-THROUGH	5
6. ARRANGEMENTS FOR MANAGING THE PROJECT	5
7. INSTITUTION'S RECORD IN MOTIVATING STUDENTS TO CAREERS IN MATH, SCIENCE, AND ENGINEERING	3
8. INSTITUTIONAL COMMITMENT TO THE PROJECT	4
9. PLANS FOR INCORPORATING UNDERREPRESENTED GROUPS	4

COMMENTS

OVERALL
RATING

4

REVIEWER NAME:

SIGNATURE:

REU PROPOSAL EVALUATION FORM

PROPOSAL NO:

INSTITUTION

P.I.

PLEASE RATE THE PROPOSAL ON EACH OF THE CRITERIA BELOW
USE A SCALE OF 5 (EXCELLENT) TO 1 (POOR)

	RATING
1. APPROPRIATENESS AND VALUE OF EXPERIENCE FOR THE STUDENT	4
2. QUALITY OF SUPERVISOR AND FACILITIES	3
3. OVERALL MERIT OF RESEARCH ACTIVITIES	4
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6. ARRANGEMENTS FOR MANAGING THE PROJECT	5
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8. INSTITUTIONAL COMMITMENT TO THE PROJECT	4
9. PLANS FOR INCORPORATING UNDERREPRESENTED GROUPS	5

COMMENTS

OVERALL
RATING

4

REVIEWER NAME:

SIGNATURE:

PROPOSAL EVALUATION FORM

PROPOSAL NO. 92-00118	INSTITUTION HOPE COLLEGE	PLEASE RETURN BY
PRINCIPAL INVESTIGATOR HERBERT L. DERSEHEM		NSF PROGRAM REU
TITLE REU: An Undergraduate Research Participation Program in Computer Science		
<p>Please evaluate this proposal using the criteria presented on the back of this review form. Continue on additional sheet(s) as necessary.</p> <p>* Well thought out philosophy of approach</p> <p>* Appropriate supervision & facilities</p> <p>* Demonstrated value of educational experience & faculty & institution commitment.</p>		
<p>CONFLICT OF INTERESTS</p> <p>If you have an affiliation or financial connection with the institution or the person submitting this proposal, this might be construed as a conflict of interest. Please advise the National Science Foundation on a separate page and attach to your review. If you do not have a conflict of interest, please check the box below.</p> <p><input type="checkbox"/> YES, I have a conflict of interest.</p> <p><input checked="" type="checkbox"/> NO, I do not have a conflict of interest.</p>		
<p>CONFIDENTIALITY OF PROPOSALS AND PEER REVIEWS</p> <p>The Foundation receives proposals in confidence and is responsible for protecting the confidentiality of their contents. In addition, the confidentiality of reviews will be kept confidential to the maximum extent possible. For this reason, please do not copy, quote, or otherwise use information from this proposal. If you believe that a colleague can make a substantial contribution to the review, please consult the NSF Program Officer before discussing the contents of the proposal or the reviewer's name. When you have completed your review, please return the review form to the Program Officer.</p>		
OVERALL RATING:	<input type="checkbox"/> EXCELLENT <input checked="" type="checkbox"/> VERY GOOD <input type="checkbox"/> GOOD <input type="checkbox"/> FAIR <input type="checkbox"/> POOR	

PROPOSAL EVALUATION FORM

PROPOSAL NO. 92-00118	INSTITUTION Hope College	PLEASE RETURN BY
PRINCIPAL INVESTIGATOR Herbert L. Dershem		NSF PROGRAM Research Experiences for Undergraduates
TITLE REU: An Undergraduate Research Participation Program in Computer Science		
<p>Please evaluate this proposal using the criteria presented on the back of this review form. Continue on additional sheet(s) as necessary.</p> <ul style="list-style-type: none"> • The institution has run a program of UG research for the past three yrs from local funds. • The proposed projects seem to be useful and interesting but there is no unifying theme. • The PI and involved faculty appear qualified to direct the projects. The institution is noted for teaching and not research. • Equipment to support the projects seems adequate. • Student recruitment and selection has been well-conceived and will reach beyond the institution & will seek out under-represented groups. • Project management has been well thought out. • Institutional commitment is excellent. 		
<p>OVERALL RATING: <input type="checkbox"/> EXCELLENT <input type="checkbox"/> VERY GOOD <input checked="" type="checkbox"/> GOOD <input type="checkbox"/> FAIR <input type="checkbox"/> POOR</p>		

PROPOSAL EVALUATION FORM

PROPOSAL NO. 92-00118	INSTITUTION Hope College	PLEASE RETURN BY
PRINCIPAL INVESTIGATOR Derstem, H.		NSF PROGRAM REU
TITLE REU: An Undergraduate Research Participation Program in Computer Science		
<p>Please evaluate this proposal using the criteria presented on the back of this review form. Continue on additional sheet(s) as necessary.</p> <p><i>See attached</i></p> <p><i>7/11/92</i></p>		
<p>OVERALL RATING: <input type="checkbox"/> EXCELLENT <input type="checkbox"/> VERY GOOD <input checked="" type="checkbox"/> GOOD <input checked="" type="checkbox"/> FAIR <input type="checkbox"/> POOR</p>		

REU Proposal Evaluation

Proposal No: 92-00118

PI: Dershem

It's encouraging to see a small liberal arts college that encourages and provides support for research in its faculty and students.

While none of the potential areas of research are going to set the world on fire, they are appropriate for undergraduate research and have the potential to add knowledge to the computer science field. The facilities seem adequate if there isn't a lot of teaching or other research going on concurrently in the department. One concern is that Professor Stegink's projects seem to light in real research and seem more like implementation projects. It's also unclear if the senior faculty participants are truly active researchers. Role models are important.

Another concern is that the students will not have the opportunity to interact with current graduate students. Working with current graduate students gives the undergraduate participants a good feel for what graduate school and research are really like. Bring in alumni who are currently in graduate school for talks helps, but some interaction with a school that has a graduate program would be better.

NATIONAL SCIENCE FOUNDATION
1800 G STREET, N.W. • WASHINGTON, D.C. 20550

MAR 12 1992

Grant No. CDA-9200118
Proposal No. CDA-9200118

Dr. John H. Jacobson
President
Hope College
Holland, MI 494233698

Dear Dr. Jacobson:

The National Science Foundation hereby awards a grant of \$28,850 to Hope College for support of the project described in the proposal referenced above, as modified by the revised budget dated January 13, 1992.

This project, under the direction of Herbert L. Dershem, Department of Computer Science, is entitled:

"REU: An Undergraduate Research Participation Program in Computer Science."

This award is effective April 1, 1992 and expires September 30, 1993. A 6 month unfunded flexibility period is included in this award.

This is a continuing grant which has been approved on scientific/technical merit for approximately 3 years. Contingent on the availability of funds and the scientific progress of the project, NSF expects to continue support at approximately the following levels:

FY93) \$28,850

FY94) \$28,850

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to GC-1 Grant General Conditions (10/91).

The budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Gerald L. Engel (202) 357-7349. The cognizant NSF grants official is Myra B. Galinn (202) 357-9653.

Sincerely yours,

/s/ Wayne K. Thomas
Grants Officer



HOPE COLLEGE

OFFICE OF COLLEGE ADVANCEMENT

March 10, 1993

Mr. Wayne K. Thomas
Grants Officer
National Science Foundation
1800 G. Street, NW
Washington, D.C. 20550

Re: Grant No. CDA-9200118
Amendment No. 01
Proposal No. CDA-9346092

Dear Mr. Thomas:

I am pleased to acknowledge your letter of March 2, 1993, regarding the additional support of \$28,850 for the project under the direction of Herbert L. Dershem, Department of Computer Science. We understand that the total award is \$57,700 and expires September 30, 1994. The project is entitled:

"Continuing REU Site: An Undergraduate Research Participation Program in Computer Science."

We pledge our best efforts to use these resources wisely and in accordance with the terms and conditions set forth previously.

Sincerely,

John H. Jacobson
President

JHJ:dkb

pc: Provost Jacob E. Nyenhuis
Robert De Young
Herbert L. Dershem
Dean James Gentile
Barry Werkman

NATIONAL SCIENCE FOUNDATION
1800 G STREET, N.W. • WASHINGTON, D.C. 20550

MAR 2 1993

MAR 03 1993

RECEIVED OFFICE

Grant No. CDA-9200118
Amendment No. 01
Proposal No. CDA-9346092

Dr. John H. Jacobson
President
Hope College
Holland, MI 494233698

Dear Dr. Jacobson:

The National Science Foundation hereby awards \$28,850 to Hope College for additional support of the project described in the proposal referenced above.

This project, under the direction of Herbert L. Dershem, is entitled:

"Continuing REU Site: An Undergraduate Research
Participation Program in Computer Science."

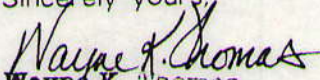
The award with this amendment totals \$57,700 and expires September 30, 1994.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to GC-1 Grant General Conditions (10/91).

Except as modified by this amendment, the grant conditions remain unchanged.

The cognizant NSF program official for this grant is John Cherniavsky (202) 357-7349. The cognizant NSF grants official is Margaret A. Weller (202) 357-9653.

Sincerely yours,


Wayne K. Thomas
Grants Officer

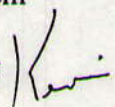
code e



HOPE COLLEGE

HOLLAND, MICHIGAN 49423-3698

Business Office

DATE: March 23, 1993
TO: Herb Dershem
FROM: Kevin Kraay 
SUBJECT: National Science Foundation Award

Congratulations on your approval for a National Science Foundation grant in the amount of \$28,850 for the project entitled "Continuing REU Site: An Undergraduate Research Participation Program in Computer Science."

The account number 5-22799 has been assigned to this grant. Please use this number for all expenses associated with the grant.

Will you please send me a copy of the budget for this grant. **The account number will be activated when the budget information is received and entered into the Financial Record System.**

The Drug-Free Workplace Act of 1988 requires Hope College to certify that we will maintain a drug-free workplace. This certification took place on the application for the NSF grant when you applied.


It also requires the College to provide to each employee working with a Federally sponsored program the College's policy on drugs. A copy of this policy is attached for your reference.

Please contact me if you have any questions.

MEMORANDUM

Date: March 25, 1993

To: Kevin Kraay

From: Herb Dershem 

Subject: NSF REU grant

Thank you for setting up an account for the NSF REU grant. The budget for this year of the program is attached. Please note that this is identical to the budget for last year's grant which was charged under 5-22793. In fact, since the publicity for this year's program needed to be sent out before the approval was received for the new grant, I have charged some of the postage and duplication expenses to the old number and now need to transfer those expenses to the new account. Should I do that with a transfer?

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

PROPOSAL NO.	DURATION (MONTHS)	
	Proposed	Granted
AWARD NO.		

INSTRUCTIONS ON REVERSE
ARE COMPLETING

INSTITUTION

Hope College

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR

Herbert L. Dershem

A. SENIOR PERSONNEL: P/VPD, Co-PI's, Faculty and Other Senior Associates
(List each separately with title, A.6. show number in brackets)

	NSF Funded Person-mos.			Funds Requested By Proposer	Funds Granted By NSF (If Different)
	CAL.	ACAD	SUMR		
1. Herbert L. Dershem, Project Director				\$ 3,000	\$
2. Shirley V. Browne, Faculty Associate				500	
3. Michael J. Jipping, Faculty Associate				500	
4. Gordon A. Stegink, Faculty Associate				500	
5. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
6. () TOTAL SENIOR PERSONNEL (1-5)				4,500	

B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)

1. () POST DOCTORAL ASSOCIATES					
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS					
5. () SECRETARIAL CLERICAL					
6. () OTHER					

TOTAL SALARIES AND WAGES (A+B)

4,500

C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)

1,350

TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)

5,850

D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$1,000;)

TOTAL PERMANENT EQUIPMENT

E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)

2. FOREIGN

F. PARTICIPANT SUPPORT COSTS

1. STIPENDS	\$ 15,600
2. TRAVEL	1,000
3. SUBSISTENCE	1,500
4. OTHER	

() TOTAL PARTICIPANT COSTS

18,100

G. OTHER DIRECT COSTS

1. MATERIALS AND SUPPLIES	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION	
3. CONSULTANT SERVICES	
4. COMPUTER (ADPE) SERVICES	
5. SUBCONTRACTS	
6. OTHER	

TOTAL OTHER DIRECT COSTS

1,000

H. TOTAL DIRECT COSTS (A THROUGH G)

1,000

I. INDIRECT COSTS (SPECIFY RATE AND BASE)

25% of student stipends

TOTAL INDIRECT COSTS

3,900

J. TOTAL DIRECT AND INDIRECT COSTS (H + I)

28,850

K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)

L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)

\$28,850

P/VPD TYPED NAME & SIGNATURE*

Herbert L. Dershem

DATE

1/13/92

FOR NSF USE ONLY

INDIRECT COST RATE VERIFICATION

INST. REP. TYPED NAME & SIGNATURE*

James M. Gentile

DATE

1/13/92

Date Checked

Date of Rate Sheet

Initials-DGC

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD • ARLINGTON, VIRGINIA 22230

Award Date	December 9, 1993
Grant No.	CDA-9200118
Amendment No.	002

Dr. John H. Jacobson
President
Hope College
Holland, MI 49423-3698

Dear Dr. Jacobson:

The National Science Foundation hereby awards \$28,850 to Hope College for additional support of the project described in the proposal referenced above.

This project, under the direction of Herbert L. Dershem, Department of Computer Science, is entitled:

"Continuing REU Site: An Undergraduate Research Participation Program in Computer Science."

This award with this amendment totals \$86,550 and expires September 30, 1995.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to GC-1 Grant General Conditions (01/93).

Except as modified by this amendment, the grant conditions remain unchanged.

The cognizant NSF program official for this grant is John Cherniavsky (202) 357-7349. The cognizant NSF grants official is Margaret A. Weller (703) 306-1213.

Sincerely,

Signed
Margaret A. Weller
Grants Officer



HOPE COLLEGE

OFFICE OF THE PRESIDENT

December 16, 1993

Ms. Margaret A. Weller
Grants Officer
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Re: Grant No. CDA-9200118
Admendment No. 002

Dear Ms. Weller:

I am pleased to acknowledge your letter of December 9, 1993, regarding the additional support of \$28,850 for the project under the direction of Herbert L. Dershem, Department of Computer Science. We understand that the award now totals \$86,550 and expires September 30, 1995. The project is entitled:

"Continuing REU Site: An Undergraduate Research
Participation Program in Computer Science."

We pledge our best efforts to use these resources wisely and in accordance with the terms and conditions set forth previously.

Sincerely,

John H. Jacobson
President

JHJ:lt

pc: Provost Jacob E. Nyenhuis
Robert De Young
✓ Herbert L. Dershem
Gordon Stegink
James Gentile, Dean for the Natural Sciences
Acting Dean Elliot Tanis
Barry Werkman

NATIONAL SCIENCE FOUNDATION
1800 G STREET, NW
WASHINGTON, DC 20550

BULK RATE
POSTAGE & FEES PAID
National Science Foundation
Permit No. G-69

PI/PO Name and Address

Herbert L. Dershem
 Computer Science
 Hope College
 Holland MI 49423

NATIONAL SCIENCE FOUNDATION FINAL PROJECT REPORT

PART I - PROJECT IDENTIFICATION INFORMATION

1. Program Official/Org.	Gerald L. Engel		
2. Program Name	Research Experiences for Undergraduates		
3. Award Dates (MM/YY)	From: 04/92	To: 09/93	
4. Institution and Address	Hope College Holland MI 49423		
5. Award Number	CDA-9200118		
6. Project Title	REU: An Undergraduate Research Participation Program in Computer Science		

This Packet Contains
NSF Form 98A
And 1 Return Envelope

NSF Grant Conditions (Article 17, GC-1, and Article 9, FDP-II) require submission of a Final Project Report (NSF Form 98A) to the NSF program officer no later than 90 days after the expiration of the award. Final Project Reports for expired awards must be received before new awards can be made (NSF Grants Policy Manual Section 677).

Below, or on a separate page, provide a summary of the completed projects and technical information and attach it to this form. Be sure to include your name and award number on each separate page. See below for more instructions.

PART II - SUMMARY OF COMPLETED PROJECT (for public use)

The summary (about 200 words) must be self-contained and intellegible to a scientifically literate reader. Without restating the project title, it should begin with a topic sentence starting the project's major thesis. The summary should include, if pertinent to the project being described, the following items:

- The primary objectives and scope of the project
- The techniques or approaches used only to the degree necessary for comprehension
- The findings and implications stated as concisely and informatively as possible

See separate sheet

PART III - TECHNICAL INFORMATION (for program management use)

List references to publications resulting from this award and briefly describe primary data, samples, physical collections, inventions, software, etc. created or gathered in the course of the research and, if appropriate, how they are being made available to the research community.

See separate sheet

Principal Investigator/Project Director Signature	Date

<p>IMPORTANT:</p> <p>MAILING INSTRUCTIONS</p> <p>Return this <i>entire</i> packet plus all attachments in the envelope attached to the back of this form. Please copy the information from Part I, Block I to the <i>Attention line</i> on the envelope.</p>
--

PART IV — FINAL PROJECT REPORT — SUMMARY DATA ON PROJECT PERSONNEL

(To be submitted to cognizant Program Officer upon completion of project)

The data requested below are important for the development of a statistical profile on the personnel supported by Federal grants. The information on this part is solicited in response to Public Law 99-383 and 42 USC 1885C. All information provided will be treated as confidential and will be safeguarded in accordance with the provisions of the Privacy Act of 1974. You should submit a single copy of this part with each final project report. However, submission of the requested information is not mandatory and is not a precondition of future award(s). Check the "Decline to Provide Information" box below if you do not wish to provide the information.

Please enter the numbers of individuals supported under this grant.
Do not enter information for individuals working less than 40 hours in any calendar year.

	Senior Staff		Post-Doctorals		Graduate Students		Under-Graduates		Other Participants ¹	
	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.
A. Total, U.S. Citizens	2	1					5	1		
B. Total, Permanent Residents										
U.S. Citizens or Permanent Residents ² :										
American Indian or Alaskan Native ...										
Asian.....										
Black, Not of Hispanic Origin.....										
Hispanic.....										
Pacific Islander.....										
White, Not of Hispanic Origin.....	2	1					5	1		
C. Total, Other Non-U.S. Citizens										
Specify Country										
1.										
2.										
3.										
D. Total, All participants (A + B + C)	2	1					5	1		
Disabled³										

☒ Decline to Provide Information: Check box if you do not wish to provide this information (you are still required to return this page along with Parts I-III).

¹Category includes, for example, college and precollege teachers, conference and workshop participants.

²Use the category that best describes the ethnic/racial status for all U.S. Citizens and Non-citizens with Permanent Residency. (If more than one category applies, use the one category that most closely reflects the person's recognition in the community.)

³A person having a physical or mental impairment that substantially limits one or more major life activities; who has a record of such impairment; or who is regarded as having such impairment. (Disabled individuals also should be counted under the appropriate ethnic/racial group unless they are classified as "Other Non-U.S. Citizens.")

AMERICAN INDIAN OR ALASKAN NATIVE: A person having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.

ASIAN: A person having origins in any of the original peoples of East Asia, Southeast Asia and the Indian subcontinent. This area includes, for example, China, India, Indonesia, Japan, Korea and Vietnam.

BLACK, NOT OF HISPANIC ORIGIN: A person having origins in any of the black racial groups of Africa.

HISPANIC: A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

PACIFIC ISLANDER: A person having origins in any of the original peoples of Hawaii; the U.S. Pacific Territories of Guam, American Samoa, or the Northern Marianas; the U.S. Trust Territory of Palau; the islands of Micronesia or Melanesia; or the Philippines.

WHITE, NOT OF HISPANIC ORIGIN: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

THIS PART WILL BE PHYSICALLY SEPARATED FROM THE FINAL PROJECT REPORT AND USED AS A COMPUTER SOURCE DOCUMENT. DO NOT DUPLICATE IT ON THE REVERSE OF ANY OTHER PART OF THE FINAL REPORT.

1992 Hope College REU Progress Report

The Hope College Computer Science REU program had as its primary objective to provide a significant undergraduate research experience for six highly qualified students.

In February, 1992, after we were notified of the awarding of our grant, we sent information about the Hope REU program to most undergraduate Computer Science departments in the United States. We contacted as many as possible via the InterNet and mailed announcements to other schools that we thought would have good candidates. We received 82 applications from institutions other than Hope College and 7 applications from Hope students. After an extensive selection process which involved all three of the participating faculty, we chose 6 students to participate, three from Hope College, one from Plymouth State University, one from Taylor University, and one from the University of Dayton.

The research program began on June 1, 1992 and extended until August 7. The participants were placed in research teams, two working with each professor. A third member was added to one team with support from the Pew Midstates Consortium, and an additional student was funded by local funds to serve as the systems programming assistant to all groups.

The three projects were as follows:

Project title	Faculty Supervisor	Undergraduates
An Object Oriented Application/ Programmer Interface for Network Programming	Shirley Browne	Jennifer Howell Ming Shu* Robert Wohlfarth
Using the Computer to Visualize and Simulate Models of Abstract Computation	Herbert Dershem	Brett Folkert Ryan McFall
Development of Parallel Ray-Tracing Algorithms	Gordon Stegink	Eric Matthews Mike Shield

* Supported by Pew Midstates Consortium Undergraduate Research Grant.

In addition to the research work that was carried out, and weekly seminars which were devoted to reports on the research, several other activities were provided in the program. Professor Dershem conducted a preparation seminar for the Computer Science GRE in four weekly evening sessions. The entire group of students and faculty attended the SIGGRAPH Annual Conference together. Weekly social gatherings were held at the homes of the faculty or other suitable locations.

At this time, three papers have been presented as a result of this summer's work. Eric Matthews and Michael Shield presented a paper on their work with Professor Stegink at the Argonne Symposium for Undergraduate Research on November 7, 1992. Two papers were presented at the Pew Midstates Consortium Undergraduate Research Symposium on November 14, 1992, one by Ryan McFall on his work with Professor Dershem and the other by Ming Shu on his work with Professor Browne. Future plans include a presentation by students Howell, Wohlfarth, and Shu submitted to the 1993 Symposium on Applied Computing in Indianapolis on February 14-16 and a panel presentation on the REU program at the 1993 SIGCSE Symposium in Indianapolis on February 18-19 with Professor Dershem and Ryan McFall serving as panelists.

1993 Hope College Computer Science REU Progress Report

The Hope College Computer Science REU program had as its primary objective to provide a significant undergraduate research experience for six highly qualified students.

In January, 1993, we sent information about the Hope REU program to most undergraduate Computer Science departments in the United States. We contacted as many as possible via the InterNet and mailed announcements to other schools that we thought would have good candidates. We included a special mailing to the Computer Science departments at predominately minority institutions and to the minority affairs officers at major universities. We received 59 completed applications from institutions other than Hope College and 11 applications from Hope students. After an extensive selection process which involved all three of the participating faculty, we chose 6 students to participate, three from Hope College, one from Plymouth State University, one from DePauw University, and one from the Gustavus Adolphus College.

The research program began on May 24, 1993 and extended until July 30. The participants were placed in research teams, two working with each professor. Two additional members were added to one team with support from a NASA grant, and an additional student volunteer was added to another group as a programming support person. There were nine student participants in all. In addition, the pool of applicants for the REU program provided two summer research students for Professor Shirley Browne of the Hope College Computer Science Department who spent the summer of 1993 doing research at the University of Tennessee and Oak Ridge National Laboratories on the XLib project. Those two students were supported by funding from the Department of Energy.

The three projects at Hope College were as follows:

Projects	Faculty Supervisor	Undergraduates
Algorithm Visualization & Animation	Herbert Dershem	Wendy Barth Cheri Bowsher *Bob Chen
Parallel Genetic Algorithms	Gordon Stegink	Russell Nelson Bryan Showers
Software Development Environments for Parallel Programming	Michael Jipping	**Jonathan Beard **Michael Crider Serge Hallyn Nicholas Rahn

*Volunteer undergraduate assistant

** Supported by grant from NASA

In addition to the research work that was carried out, and weekly seminars which were devoted to reports on the research, several other activities were provided in the program. Professor Dershem conducted a preparation seminar for the Computer Science GRE in four weekly evening sessions. Weekly social gatherings were held at the homes of the faculty or other suitable locations.

At this time, three papers have been presented as a result of this summer's work. Russell Nelson and Bryan Showers presented a paper on their work with Professor Stegink at the Pew Midstates Consortium Undergraduate Research Symposium on November 7, 1993. A paper was presented at the Argonne Symposium for Undergraduate Research on November 5, 1993 by Wendy Barth and Cheri Bowsher on their work with Professor Dershem. The four students who worked with Professor Jipping presented their results at Langley Space Flight Center on October 22, 1993.

In the past year several papers by 1992 participants have been presented and accepted for publication and presentation. Howell, Wohlfarth, and Shu presented a paper at the 1993 Symposium on Applied Computing about their work with Professor Browne in the summer of 1992. Ryan McFall presented his work as a member of a panel on the REU program at the 1993 SIGCSE Symposium. In addition, McFall and Dershem have co-authored a paper on their work which will be presented at the 1993 SIGCSE Symposium and included in the Proceedings.

NATIONAL SCIENCE FOUNDATION
4201 Wilson Blvd.,
Arlington, VA 22230

BULK RATE
POSTAGE & FEES PAID
National Science Foundation
Permit No. G-69

PI/PD Name and Address

Herbert L. Dershem
Computer Science
Hope College
Holland

MI 49423

NATIONAL SCIENCE FOUNDATION FINAL PROJECT REPORT

PART I - PROJECT IDENTIFICATION INFORMATION

1. Program Official/Org.	John Cherniavsky - CDA	
2. Program Name	OFFICE OF CROSS-DISCIPLINARY ACTIVITIES	
3. Award Dates (MM/YY)	From: 04/92	To: 09/95
4. Institution and Address	Hope College Holland MI 49423	
5. Award Number	9200118	
6. Project Title	Continuing REU Site: An Undergraduate Research Participation Program in Computer Science	

This Packet Contains
NSF Form 98A
And 1 Return Envelope

PART IV -- FINAL PROJECT REPORT -- SUMMARY DATA ON PROJECT PERSONNEL

(To be submitted to cognizant Program Officer upon completion of project)

The data requested below are important for the development of a statistical profile on the personnel supported by Federal grants. The information on this part is solicited in response to Public Law 99-383 and 42 USC 1885C. All information provided will be treated as confidential and will be safeguarded in accordance with the provisions of the Privacy Act of 1974. You should submit a single copy of this part with each final project report. However, submission of the requested information is not mandatory and is not a precondition of future award(s). Check the "Decline to Provide Information" box below if you do not wish to provide the information.

Please enter the numbers of individuals supported under this grant.

Do not enter information for individuals working less than 40 hours in any calendar year.

	Senior Staff		Post-Doctorals		Graduate Students		Under-Graduates		Other Participants ¹	
	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.
A. Total, U.S. Citizens	3	1	—	—	—	—	12	5	—	—
B. Total, Permanent Residents	0	0	—	—	—	—	0	0	—	—
U.S. Citizens or Permanent Residents ² :										
American Indian or Alaskan Native	0	0	—	—	—	—	0	0	—	—
Asian	0	0	—	—	—	—	0	0	—	—
Black, Not of Hispanic Origin	0	0	—	—	—	—	0	0	—	—
Hispanic	0	0	—	—	—	—	0	0	—	—
Pacific Islander	0	0	—	—	—	—	0	0	—	—
White, Not of Hispanic Origin	3	1	—	—	—	—	12	5	—	—
C. Total, Other Non-U.S. Citizens										
Specify Country										
1.										
2.										
3.										
D. Total, All participants (A + B + C)	3	1	—	—	—	—	12	5	—	—
Disabled³	0	0	—	—	—	—	0	0	—	—

☐ Decline to Provide Information: Check box if you do not wish to provide this information (you are still required to return this page along with Parts I-III).

¹ Category includes, for example, college and precollege teachers, conference and workshop participants.

² Use the category that best describes the ethnic/racial status for all U.S. Citizens and Non-citizens with Permanent Residency. (If more than one category applies, use the one category that most closely reflects the person's recognition in the community.)

³ A person having a physical or mental impairment that substantially limits one or more major life activities; who has a record of such impairment; or who is regarded as having such impairment. (Disabled individuals also should be counted under the appropriate ethnic/racial group unless they are classified as "Other Non-U.S. Citizens.")

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ASIAN: A person having origins in any of the original peoples of East Asia, Southeast Asia or the Indian subcontinent. This area includes, for example, China, India, Indonesia, Japan, Korea and Vietnam.

BLACK, NOT OF HISPANIC ORIGIN: A person having origins in any of the black racial groups of Africa.

HISPANIC: A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

PACIFIC ISLANDER: A person having origins in any of the original peoples of Hawaii; the U.S. Pacific territories of Guam, American Samoa, and the Northern Marianas; the U.S. Trust Territory of Palau; the islands of Micronesia and Melanesia; or the Philippines.

WHITE, NOT OF HISPANIC ORIGIN: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

National Science Foundation Final Project Report

Summary of Completed Project

Grant Number: CDA-9200118

Amount of Award: \$86,550

Support Period: April 1, 1992 to September 30, 1995

Title: REU: An Undergraduate Research Participation Program in Computer Science

The REU program in Computer Science at Hope College provided talented undergraduates with a meaningful research experience to encourage them to consider a career in computer science research. The primary objective of the project was to expose the students to the techniques, attitudes, and rewards of computer science research and to provide encouragement and direction in the pursuit of such a career. A strong effort was made to recruit women and minority students into the program.

Six participants were selected each year, three from Hope and three from other institutions. These students worked with a Hope College faculty mentor for ten weeks during the summer in the Hope College Computer Science laboratory. Areas of research included parallel algorithms, genetic algorithms, graphics algorithms, machine simulation, development of tools for parallel software development, and algorithm animation. The students performed independent research, gave oral presentations on their work, attended workshops on graduate school, and prepared scientific papers and presentations.

National Science Foundation Final Project Report

Technical Information

Grant Number: CDA-9200118

Amount of Award: \$86,550

Support Period: April 1, 1992 to September 30, 1995

Title: REU: An Undergraduate Research Participation Program in Computer Science

1 Summer, 1992

1.1 Recruitment

In February, 1992, information about the Hope REU program was sent to most undergraduate Computer Science departments in the United States. We contacted as many as possible via the InterNet and mailed announcements to other schools that we thought would have good candidates. We received 82 applications from institutions other than Hope College and 7 applications from Hope students. After an extensive selection process which involved all three of the participating faculty, we chose 6 students to participate, three from Hope College, one from Plymouth State University, one from Taylor University, and one from the University of Dayton.

1.2 Projects

The research program began on June 1, 1992 and extended until August 7. The participants were placed in research teams, two working with each professor. A third member was added to one team with support from the Pew Midstates Consortium, and an additional student was funded by local funds to serve as the systems programming assistant to all groups.

The three projects were as follows:

An Object Oriented Application/Programmer Interface for Network Programming

Faculty Mentor: Shirley Browne

Undergraduate Researchers: Jennifer Howell, Ming Shu*, Robert Wohlfarth

*** Supported by Pew Midstates Consortium Undergraduate Research Grant.**

This project developed an Application/Programmer interface designed to support a structured approach to network programming. Special attention has been paid to the needs of multimedia applications and to the future requirements of network protocols. After surveying the current approaches, the need was observed for an interface which provides ease of use, extensibility, and portability. An object-oriented method, which will meet these needs, was proposed and described. Certain features of real-time applications, such as synchronization, are not currently supported, but will be addressed as areas for further study.

Using the Computer to Visualize and Simulate Models of Abstract Models of Computation

Faculty Mentor: Herbert Dershem

Undergraduate Researchers: Brett Folkert, Ryan McFall

There are many models of computation including finite state automata, push down automata, and Turing Machines. A program called TUMS has been developed to aid in the construction and understanding of these models. With this tool, the student will better understand the capabilities and limitations of a particular model because the student will be able to build and execute specific machines in a visually manipulated environment.

Photosynthesis: An Object Oriented Test Bed for Parallel Ray Tracing

Faculty Mentor: Gordon Stegink

Undergraduate Researchers: Eric Matthews, Mike Shield

Ray tracing has emerged as one of the most popular techniques for image synthesis. However, its

computationally intense nature makes it practical only on dedicated computer graphic workstations and supercomputers. Beyond efficiency schemes such as bounding volumes and octrees, the next step appears to lie in concurrent solutions. Photosynthesis was developed as an object oriented test bed for ray tracing in parallel, utilizing existing hardware and PVM (Parallel Virtual Machine). PVM was developed at Oak Ridge National Laboratory and enables networked computers to function as a single computing resource. Photosynthesis is a PVM application comprised of two separate processes that break the viewplane into sections for rendering on different processors. The diversity of PVM coupled with object oriented design makes Photosynthesis very adaptable software for experimental ray tracing.

In addition to the research work that was carried out, and weekly seminars which were devoted to reports on the research, several other activities were provided in the program. Professor Dershem conducted a preparation seminar for the Computer Science GRE in four weekly evening sessions. The entire group of students and faculty attended the SIGGRAPH Annual Conference together. Weekly social gatherings were held at the homes of the faculty or other suitable locations.

1.3 Post-Summer Results: Presentations and Papers

Eric Matthews and Michael Shield presented a paper on their work with Professor Stegink at the Argonne Symposium for Undergraduate Research on November 7, 1992.

Two papers were presented at the Pew Midstates Consortium Undergraduate Research Symposium on November 14, 1992, one by Ryan McFall on his work with Professor Dershem and the other by Ming Shu on his work with Professor Browne.

Jennifer Howell, Robert Wohlfarth, and Ming Shu presented a paper at the 1993 Symposium on Applied Computing about their work with Professor Browne in the summer of 1992.

Ryan McFall presented his work as a member of a panel on the REU program at the 1993 SIGCSE Symposium. In addition, McFall and Dershem have co-authored a paper, "Finite State Machine Simulation in an Introductory Lab," which was presented at the 1994 SIGCSE Technical Symposium on Computer Science and included in the Proceedings.

2 Summer, 1993

2.1 Recruitment

In January, 1993, we sent information about the Hope REU program to most undergraduate Computer Science departments in the United States. We contacted as many as possible via the InterNet and mailed announcements to other schools that we thought would have good candidates. We included a special mailing to the Computer Science departments at predominately minority institutions and to the minority affairs officers at major universities. We received 59 completed applications from institutions other than Hope College and 11 applications from Hope students. After an extensive selection process which involved all three of the participating faculty, we chose 6 students to participate, three from Hope College, one from Plymouth State University, one from DePauw University, and one from the Gustavus Adolphus College.

2.2 Projects

The research program began on May 24, 1993 and extended until July 30. The participants were placed in research teams, two working with each professor. Two additional members were added to one team with support from a NASA grant, and an additional student volunteer was added to another group as a programming support person. There were nine student participants in all. In addition, the pool of applicants for the REU program provided two summer research students for Professor Shirley Browne of the Hope College Computer Science Department who spent the summer of 1993 doing research at the University of Tennessee and Oak Ridge National Laboratories on the XLib project. Those two students were supported by funding from the Department of Energy.

The three projects at Hope College were as follows:

AdaVision and THREADS: Algorithm Animations and Experimental Laboratories for Teaching a Data Structures Course in Ada

Faculty Mentor: Herbert Dershem

Undergraduate Researchers: Wendy Barth, Cheri Bowsher, Bob Chen*

***Volunteer undergraduate assistant**

The goal of the project is to implement a laboratory for the data structures course using Ada and algorithm visualization and animation techniques. The work involved enhances the course and contributes to the learning success of enrolled students. The first half of the project, AdaVision, is an instructional aid consisting of six algorithm animations. The second half of the project consists of the development of a tool called THREADS used to run experiments in a laboratory setting.

AdaVision combines Ada code with dynamic images to serve as a teaching tool for data structures courses taught in Ada. Using the algorithm animation package XTANGO, animations are created so students may view the connection between Ada code and the action of algorithms on data and data structures. With the exception of the AVL insertion, the Ada code associated with each algorithm appears in the display area of XTANGO.

THREADS (Test Harness for Repetitive Experiments on Ada Data Structures) is a tool that can be used to run tests on data structures and algorithms in a laboratory setting, reporting back to the user some type of measurement of the test. The tests are black box programs that are implemented separately, using Ada packages, and may be tested and run separately as well. Because of THREADS' use of Ada packages, students are exposed to more data structures and algorithms. Students will spend their time seeing and experiencing the effects of algorithms instead of coding the algorithms and corresponding data structures. This should increase their ability to analyze the effectiveness and/or efficiency of different approaches to a problem.

The Genetic Algorithm Parallel Programming Project

Faculty Mentor: Gordon Stegink

Undergraduate Researchers: Russell Nelson, Bryan Showers

The Genetic Algorithm Parallel Programming Project is a combination of the study of Genetic Algorithms and Parallel Programming. The Genetic Algorithm portion of the project involves a graphical interface program that enhances the visualization of the results of a basic Genetic Algorithm program. The program illustrates a Genetic Algorithm which finds a path between two points, subject to constraints. Chromosome bits represent the directions of the pieces of the path. The Genetic Algorithm starts by taking random guesses on finding this path. As the algorithm cycles through subsequent generations it evolves into a single path. The program visualizes the different paths taken as values in a color ramp. As a piece of the path is more frequently traveled the color darkens. Similarly, as a piece is less frequently traveled the color of the path gets lighter. The study of Parallel Programming used PVM (Parallel Virtual Machine), and implemented a non-graphical Simple Genetic Algorithm program in which several populations ran at the same time, each on its own slave machine under the control of a master machine.

An Empirical Case Study of Software Integration Techniques

Faculty Mentor: Michael Jipping

Undergraduate Researchers: Jonathan Beard*, Michael Crider*, Serge Hallyn, Nicholas Rahn

*** Supported by grant from NASA**

Software integration refers to various ways of building an infrastructure in which separate programs can work together. The software engineering community has specified and researched several different methods for integrating software; some of these have been specified as standards for the software community. This project studies the effectiveness of implementations of two different strategies: ToolTalk, from Sun Microsystems, implements control integration and the Portable Common Tool Environment (PCTE), from Emaraude, implements data integration. The project studied the methods, the features of each integration technique used, sought to summarize experience gained in the implementation, and evaluated each method in the light of the software implementation.

In addition to the research work that was carried out, and weekly seminars which were devoted to reports on the research, several other activities were provided in the program. Professor Dershem conducted a preparation seminar for the Computer Science GRE in four weekly evening sessions. Weekly social gatherings were held at the homes of the faculty or other suitable locations.

The research program began on May 24, 1993 and extended until July 30. The participants were placed in research teams, two working with each professor. Two additional members were added to one team with support from a NASA grant, and an additional student volunteer was added to another group as a programming support person. There were nine student participants in all. In addition, the pool of applicants for the REU program provided two summer research students for Professor Shirley Browne of the Hope College Computer Science Department who spent the summer of 1993 doing research at the University of Tennessee and Oak Ridge National Laboratories on the XLib project. Those two students were supported by funding from the Department of Energy.

2.3 Post-Summer Results: Papers and Presentations

Russell Nelson and Bryan Showers presented a paper, "The Genetic Algorithm Parallel Programming Project" at the Pew Midstates Consortium Undergraduate Research Symposium in Chicago on November 7, 1993.

A paper entitled "AdaVision and THREADS: Algorithm Animations and Experimental Laboratories for Teaching a Data Structures Course in Ada," was presented at the Argonne Symposium for Undergraduate Research on November 5, 1993 by Wendy Barth and Cheri Bowsher on their work with Professor Dershem.

The four students who worked with Professor Jipping presented their results in a technical symposium at Langley Space Flight Center on October 22, 1993.

3 Summer, 1994

3.1 Recruitment

In January, 1994, we sent information about the Hope REU program to most undergraduate Computer Science departments in the United States. We contacted as many as possible via the InterNet and mailed announcements to other schools that we thought would have good candidates. We included a special mailing to the Computer Science departments at predominately minority institutions and to the minority affairs officers at major universities. The majority of contacts were made on the internet. Forms were made available on the World Wide Web and via FTP. Announcements were distributed to the USENET newsgroup Comp.Edu and to various other lists. We received 65 completed applications from institutions other than Hope College and 12 applications from Hope students. After an extensive selection process which involved all three of the participating faculty, we chose 6 students to participate, three from Hope College, one from St. Joseph College in Indiana, one from Susquehena University, and one from the Haverford College.

3.2 Projects

Creating an Integrated Concurrent System Design Environment

Faculty Mentor: Michael J. Jipping

Undergraduate Researchers: Mike Crider*, Serge Hallyn*, John Duperon, Heather Mintz

* Supported by grant from NASA

The overall goal of the research project was to develop an integrated set of tools capable of designing and evaluating parallel system software in the context of various parallel hardware configurations. The research continued work started by the principal investigator as part of a research team at NASA Langley Research Center investigating tool integration methods and at Hope College on parallel software design tools.

This work was the second part of the overall project, beginning to investigate and construct an integrated design environment. The environment design philosophy, its components, and the way they integrate together and with existing tools were developed. Specifically, a graphical user interface to an integrated tool environment was constructed along with a tool to seek out and correct anomalies in parallel program code.

Algorithm Visualization and Animation

Faculty Mentor: Herbert L. Dershem

Undergraduate Researchers: Cheri Bowsher, Darrick Brown

The overall goal of this project is to implement a laboratory for the data structures course using Ada, algorithm visualization and animation techniques, and algorithm measurement using a tool called THREADS. Manuals have been developed to be used by students to guide their work in the laboratory. The work done in this project enhances the course and contributes to the learning success of the enrolled students.

Previous work on this project includes 6 completed algorithm animations and a basis for the THREADS program. The previously created animations include linked list, infix to postfix conversion, binary tree insert and delete, AVL tree insertions with rotations, splay tree zig-zag and zig-zig rotations, and AVL single and double rotations. Previous work on THREADS included the creation of the interface and fundamental program routines.

The philosophy used in developing the laboratory maintains that individual laboratory sessions be closed, use Ada packages, involve algorithm measurement experiments, and make use of algorithm animation. A closed laboratory means that collectively, all students have a scheduled time to work in the lab setting. An instructor is also present at this time to aid and direct their work. Many of the Ada packages are already developed, and any packages that do not already exist can be easily implemented by the students. Thus, more data structures can be covered in the course. The animations help students become more familiar with algorithms and the experiments allow students to experience different qualities of the algorithms.

Electric Darwinism: Finding an Ideal Path Using Genetic Algorithms

Faculty Mentor: Gordon A. Stegink

Undergraduate Researchers: Deborah Kaplan, Nick Slager

Our program, Road, is a genetic algorithm designed to evolve the best possible path between two "houses". The initial population of paths is a selection of chromosomes in which each randomly generated allele corresponds to the instruction to move one space "east", "northeast" or "southeast". The fitness of the path is determined by the distance between its final destination and its intended goal, and by the area between the given path and the straight path between the two houses. Along the path are obstacles which try to hinder the line from reaching its given destination. The hindering objects are randomly placed on the screen; each type of object (a "village", or some "terrain"), has a set value by which it effects fitness. As the "roads" run, the program graphics produce a visual representation of the algorithm. By imitating nature's methods of improvement, our program dynamically optimizes the route between the two houses.

In addition to the research work that was carried out, and weekly seminars which were devoted to reports on the research, social gatherings were held at the homes of the faculty or other suitable locations.

The research program began on May 23, 1994 and extended until July 29. The participants were placed in research teams, two working with each professor. Two additional members were added to one team with support from a NASA grant. There were eight student participants in all.

3.3 Post-Summer Results: Papers and Presentations

Cheri Bowsher and Darrick Brown presented the results of their research at the Argonne Undergraduate Research Symposium in November, 1994.

Mike Crider, Serge Hallyn, John Duperon, and Heather Mintz presented the results of their research at the NCUR meeting in April, 1995.

4 Bibliography

The following is a bibliography of publications and presentations from Hope College REU Computer Science project at the time of the preparation of this report. Others are planned for the near future.

4.1 Papers presented

McFall*, R. 1992. Using the Computer to Visualize and Simulate Abstract Models of Computation. Pew Midstates Consortium Undergraduate Research Symposium. Grinnell, IA., October

Shu*, M. 1992. An Object-Oriented Application/Programmer Interface. Pew Midstates Consortium Undergraduate Research Symposium. Grinnell, IA.

Matthews*, E. and M. Shield*. 1992. Photosynthesis: An Object-Oriented Test Bed for Parallel Ray Tracing. Argonne Symposium on Undergraduate Research. Argonne, IL.

Howell*, J., R. Wohlfarth*, and M. Shu*. 1993. An Object-Oriented Application/Programmer Interface for Network Programming. Symposium on Applied Computing. Indianapolis, IN.

Engel, G., H. Dershem, R. McFall*, A. Lopez, and S. Wiltz. 1993. Research Experience for Undergraduates Panel. SIGCSE Technical Symposium on Computer Science Education. Indianapolis, IN.

Nelson*, R. and B. Showers*. 1993. The Genetic Algorithm Parallel Programming Project. Pew Midstates Consortium Undergraduate Research Symposium. Chicago, IL.

Barth*, W. and C. Bowsher*. 1993. AdaVision and THREADS: Algorithm Animations and Experimental Laboratories for Teaching a Data Structures Course in Ada. Argonne Symposium for Undergraduate Research. Argonne, IL.

Dershem, H. 1993. Algorithm Animation for Data Structures. United States Air Force Academy Computer Science Colloquium. USAF Academy, CO.

Jipping, M., S. Hallyn*, M Crider*, N. Rahn*, and J. Beard. 1993. An Empirical Case Study of Software Integration Techniques. NASA Langley Space Flight Center Symposium. Langley, VA.

McFall*, R. and H. Dershem. 1994. Finite State Machine Simulation in an Introductory Lab. SIGCSE Technical Symposium on Computer Science Education. Phoenix, AZ.

Dershem, H., C. Bowsher*, D. Brown*. 1994. AdaVision and THREADS: Algorithm Animations and Experimental Laboratories for Teaching a Data Structures Course in Ada. Argonne, IL.

4.2 Papers Published

Howell*, J., R. Wohlfarth*, and M. Shu*. "An Object-Oriented Application/Programmer Interface for Network Programming," Proceedings of the 1993 Symposium on Applied Computing, 1993.

McFall*, R. and H. Dershem. "Finite State Machine Simulation in an Introductory Lab," SIGCSE Bulletin, 26,1 (1994), pp. 126-130.