

GEORGIA INSTITUTE OF TECHNOLOGY  
OFFICE OF RESEARCH ADMINISTRATION  
SPONSORED INSTRUCTION  
RESEARCH PROJECT INITIATION

Date: August 11, 1975

Project Title: **Graduate Program In Biomedical Information Science**

Project No: **G-36-508 (Continuation of G-36-507)**

Principal Investigator **Dr. Vladimir Slamecka**

Sponsor: **DHEW/PHS/NIH - National Library of Medicine**

Agreement Period: From 7/1/75 Until 6/30/76

Type Agreement: **Grant No. 5-T01-LM00147-03**

Amount: **\$103,888 - new funds awarded.**  
**17,139 - unobligated balance from 02 year.**  
**\$121,027 - Total Funding for 03 year.**

Reports Required: **Interim Progress Report w/any continuation application.**  
**Final Progress Report within 90 days of project termination.**

Sponsor Contact Person (s):

**TECHNICAL MATTERS**

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**Program Officer**  
**Division of Biomedical Information**  
**Support**  
**National Library of Medicine**  
**Bethesda, Maryland 20014**  
**Phone: (301) 496-4221**

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**Phone: (301) 496-4221**

Assigned to: **Information and Computer Sciences**

**COPIES TO:**

Principal Investigator	Library
School Director	Rich Electronic Computer Center
Dean of the College	Photographic Laboratory
Director, Research Administration	Project File
Director, Financial Affairs (2)	
Security-Reports-Property Office	
Patent Coordinator	Other _____

GEORGIA INSTITUTE OF TECHNOLOGY  
OFFICE OF CONTRACT ADMINISTRATION  
SPONSORED PROJECT TERMINATION

Date: July 20, 1978

Project Title: Graduate Program in Biomedical Information Science

Project No: G-36-508

Project Director: Dr. S.D. Brunjes (formerly Dr. V. Slamecka)

Sponsor: DHEW/PHS/NIH National Library of Medicine

Effective Termination Date: 6/30/77 (end 03 Budget Period)

Clearance of Accounting Charges: n/a - all have cleared

Grant/Contract Closeout Actions Remaining:

- Final Invoice and Closing Documents
- Final Fiscal Report
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate
- Classified Material Certificate
- Other Terminal Progress Report (NLT 9/30/77)

Assigned to: Information & Computer Science (School/Laboratory)

COPIES TO:

Project Director  
Division Chief (EES)  
School/Laboratory Director  
Dean/Director-EES  
Accounting Office  
Procurement Office  
Security Coordinator (OCA)  
Reports Coordinator (OCA)

Library, Technical Reports Section  
Office of Computing Services  
Director, Physical Plant  
EES Information Office  
Project File (OCA)  
Project Code (GTRI)  
Other \_\_\_\_\_

## APPENDIX II

GRADUATE PROGRAM IN BIOMEDICAL INFORMATION AND COMPUTER  
SCIENCE: SUMMARY OF PROGRESS, 1972 - 1975

This document is a performance analysis and summary of the Graduate Program in Biomedical Information and Computer Science offered jointly by the Georgia Institute of Technology and Emory University under partial support of NIH Grant LM 00147 from the National Library of Medicine. The report covers the period of September 1972 through September 1975.

Tables 1 and 2 show the number of students in the program and their enrollment status. Table 1 shows that the total number of matriculated students in the program thus far is 42, of whom 32 have graduated or are still in the program. A significant portion of the 10 students who dropped out from the program, as a rule after one academic quarter, were international students. Table 2 is a similar analysis of the students in the program supported by grant LM 00147. It shows that of the total of 24 individuals supported only two have dropped out, both at the end of the first quarter of their support, and both for legitimate reasons (maternity in the case of one student, and acceptance of a more lucrative post-doctoral research fellowship at another university in the case of the other student).

Tables 3 and 4 show data on the backgrounds of the students enrolled in the Graduate Program in Biomedical Information and Computer Science, by school of origin and by subject field. The data are shown only for students who have either completed the degree requirements or are still in the program.

Table 5 shows a program of study at the doctoral level taken by an NLM trainee.

Table 6 shows the current employment of the 15 students who received the M.S. degree from the Graduate Program in Biomedical Information and Computer Science. The data shows that with the exception of one student (who graduated in September 1975 and has not yet accepted a position) all graduates are active in the information sciences, either professionally or as advanced students; and that 10 of them are active in biomedical information processing fields. Of the 11 NLM trainees who received Master's degrees under partial support of grant LM 00147 nine are active in biomedical information processing professions or research; one is active in the energy field (mathematical modelling); and one in military intelligence.

Table 7 is a list of publications authored by individuals associated with the Graduate Program in Biomedical Information and Computer Science either as faculty or students during the past three years. NIH grant LM 00147 has supported some of these publications at least indirectly (to the extent that their authors were recipients of traineeships or partial salary support from this grant). A small number of the publications shown are authored by alumni from the graduate program after graduation.

Table 1. Enrollment Status: All Students

1. Total Number of students matriculated	42
2. Of these, a) still in program	17
b) graduated (M.S.)	15
c) dropped (no degree)	10

Table 2. Enrollment Status: NLM Trainees

1. Number of individuals receiving support	
a) 1 quarter	2
b) 5 quarters or less	16
c) more than 5 quarters	<u>6</u>
	24
2. Of these, a) still in program	11
b) graduated (M.S.)	11
c) dropped (no degree)	2

Table 3. Student Distribution by School of Origin  
(Highest Earned Degree)

<u>School</u>	<u>No. of Students</u>
Georgia Institute of Technology	5
Emory University	3
Akron University	1
Brigham Young University	1
Davidson College	1
Duke University	1
Florida State University	1
Kent State University	1
Monterrey Institute of Technology	1
Northwestern University	1
Oglethorpe University	1
Purdue University	1
Southern Illinois University	1
S.U.N.Y., Binghamton	1
S.U.N.Y., Buffalo	1
University of Alabama	1
University of California at San Diego	1
University of Chicago	1
University of Florida	1
University of Illinois	1
University of Maryland	2
University of Puerto Rico	1
University of Rochester	1
University of Tennessee	2
<b>Total</b>	<b>32</b>

Table 4. Student Distribution by Subject Field  
(Highest Earned Degree)

<u>Subject Field</u>	<u>No. of Students</u>
Anesthesiology	1
Animal Science	1
Biological Science	1
Biology	1
Biomedical Engineering	2
Computational Systems for Administration	1
Computer and Information Science	1
Computer Science	2
Electrical Engineering	2
Industrial Engineering	1
Information and Computer Science	1
Library Science	1
Linguistics	1
Mathematics	9
Physics	4
Pre Med	2
Zoology	<u>1</u>
Total	32

Table 5. A Doctoral Program of Study

(James J. Dunion)

Fall Quarter 1972Course

AH 200 Medical Terminology  
 ICS 145 Semiotics  
 ICS 452 Logic Design  
 ICS 458 Computer Systems

Winter Quarter 1973

AH 305 Biomedical Electronics  
 BISC 300 Health Care Processes & Systems  
 ICS 445 Logistic Systems  
 ICS 656 Computer Operating Systems  
 ICS 661 Computer Language Design

Spring Quarter 1973

AH 303 Medical & Surgical Diseases  
 BICS 320 Medical Instrumentation & Techniques  
 Biol 311 Anatomy & Physiology  
 ICS 625 Cybernetics  
 ICS 646 Philosophy of Mind  
 ICS 706 Special Problems

Summer Quarter 1973

ICS 608 Natural Language  
 ICS 628 Theory of Models  
 ICS 652 Advanced Computer Organization  
 ICS 799 Ph.D. Thesis Preparation

Fall Quarter 1973

ICS 6360 Artificial Intelligence  
 ICS 8999 Ph.D. Thesis Preparation

Winter Quarter 1974

ICS 7999 Preparation for Ph.D.  
 Qualifying Exam  
 (Internship at Grady  
 Hospital, Atlanta, Ga.)  
 BISC 399 Ph.D. Research

Spring Quarter 1974

BISC 310 Biomedical Literature and Libraries  
 BISC 397 Directed Study  
 ICS 6363 Pattern Recognition  
 ICS 7999 Preparation for Ph.D.  
 Qualifying Exam

Summer Quarter 1974

BISC 397 Directed Study  
 ICS 7999 Preparation for Ph.D.  
 Qualifying Exam  
 ICS 8501 Special Problems

Fall Quarter 1974

BISC 397 Directed Study  
 ICS 4120 Information Processes  
 ICS 6152 Theory of Automata

Winter Quarter 1975

BISC 397 Directed Study  
 PHS 302 Neurobiology  
 PHS 351 Mammalian Physiology  
 ICS 7999 Preparation for Ph.D.  
 Qualifying Exam  
 Psy 4754 Human Information Processing

Spring Quarter 1975

BISC 399 Research  
 PHS 351B Mammalian Physiology  
 ICS 7999 Preparation for Ph.D.  
 Qualifying Exam  
 ICS 8102 Special Topics (Graphic Theory)

Summer Quarter 1975

BISC 397 Directed Study  
 ICS 8999 Ph.D. Thesis Preparation

Table 5. Continued

Mr. Dunion has completed all of the coursework requirements for the Ph.D. degree. The balance of his program of study will consist of directed study at Emory University and Ph.D. Thesis Preparation at the Georgia Institute of Technology.

FOREIGN LANGUAGE REQUIREMENT: Russian, Passed March, 13, 1975

MINOR AREA OF STUDY: Physiology, Completed Spring Quarter 1975

Table 6. Employment of M.S. Graduates

<u>NAME</u>	<u>POSITION &amp; EMPLOYER</u>	<u>NATURE OF DUTIES</u>
Blair, James J. III	Programmer, McDonald Douglas, Biomedical Section, Peoria, Illinois	Medical programming
Bradshaw, Charles R.*	U.S.A.F.	Trainee in computer applications to military intelligence
Clapp, Michael J.*	Programmer/Analyst, American Hospital Supply, Flint, Michigan	Design and implementation of hospital related financial systems
Colle, Anthony J.*	Associate Programmer, IBM Systems Communication Division, Kingston, N.Y.	Development of an IBM Time Sharing System
Harbort, Robert A. Jr.*	Director, Bioengineering Dept., Crawford W. Long Hospital, Atlanta, Georgia	In charge of hospital computing
Henne, Randy L.*	Computer Applications Programmer, Union Carbide Corporation, Oak Ridge National Laboratory, Nuclear Physics Division, Oak Ridge, Tennessee	Establishment of a Biomedical Computer Technology Infor- mation Center Nuclear Physics Division
Jackson, David C.	Substation Engineer, Georgia Power Company, Atlanta, Georgia	Design of computer-based information system for estimating construction cost and scheduling.
Jaffe, Jules S.*	Ph.D. Student, Graduate Group Biophysics, University of California at Berkeley. Awarded a Public Health Service Traineeship in Biophysics	Research Area: Computer Simulation of Chemical Networks
Moreno, Migual A.	(Graduated September 1975 and has not as yet accepted a position)	
O'Brien, Neal P.*	1974/75-Systems Analyst, ** University of Oregon, Portland, Oregon	Design of a computer-based program for medical audit

Pate, Fred L.*	Process Analyst, Catalytic, Inc., Wilsonville, Alabama	Computer-based models of coal refinement
Pehler, John S.*	Project Leader, Medical Data Processing Section, Methodist Hospital, Memphis, Tenn.	System development of medical records
Rogers, Joseph D. Jr.*	Systems Analyst I, Medical University of South Carolina, Vermillion, South Carolina	Development of computerized patient records
Smith, Linda C.	Ph.D. Student, Program in Information Transfer, Syracuse University. Awarded a Graduate Fellowship	Research Area: Library Information Systems
Stanko, Thomas M.*	Systems Analyst, Calspan Technology Products, Inc., Buffalo, N.Y.	Design of a fingerprint ID system on mini-computers

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\*NIH grant LM 00147 trainee.

\*\*Currently seeking position in San Francisco area.

Table 7. Bibliography of Publications by Faculty, Students and Alumni of the Graduate Program in Biomedical Information and Computer Science, 1972-1975.

A. PUBLISHED

- Harbort, R.A., Sprawls, P., and Stahl, R.S., "Image Enhancement and Analysis in Nuclear Medicine." IEEE Transactions: Nuclear Science, Vol. NS-20, No. 1, pp. 259-265, February 1973.
- Kitay, D.Z., and Harbort, R.A., "Iron and Folic Acid Deficiency in Pregnancy." Clinics in Perinatology, Vol. 2, No.2, September 1975.
- Larose, J.H., Johnson, W.O., and Harbort, R.A., "Whole Body Immobilizer." Journal of Nuclear Medicine, Vol. 14, No. 5, p. 301, May 1973.
- Root, W., Harbort, R.A., Moses, A.R., Kirchner, A., and Mitchell, J., "The Cylindrical Assumption in Treatment Planning and Its Effect on Off-axis Dose Calculations." In: Proceedings of the RSNA National Symposium, Chicago, Ill., December 1974.
- Sias, Fred R. Jr., "Mini-based Networks: Antidote to Spiraling Cost of Health Care." The Data Communications User, pp. 7-11, 1974.
- Sias, Fred R. Jr., and Covert, J.R., "Improved User Access Security for Massachusetts General Hospital Utility Multi-Programming System (MUMPS)," In: Proceedings of the 1974 MUMPS User's Group Meeting, Denver, Colorado, 1974.
- Sias, Fred R., Jr., "The Economics of Medical Information Systems." Symposium Record: Minicomputer Trends and Applications 1973, IEEE Computer Society, National Bureau of Standards, Gaithersburg, Maryland, April 4, pp. 27-33, 1973.
- Slamecka, V., (ed) Extending the Utility of Biomedical Knowledge. Atlanta, Georgia, Georgia Institute of Technology, 1975 (Technical Report, School of Information and Computer Science).
- Slamecka, V., "Objectives and Strategies of Biomedical Information Science." In: Proceedings of the First IFIP World Conference on Medical Informatics, Stockholm, Sweden, pp. 29-32, August 1974.
- Slamecka, V., "Federally Sponsored Research in Medical Information Processing in the Federal Republic of Germany." Report submitted to the National Library of Medicine, National Institutes of Health, Bethesda, Maryland, November 1974.
- Slamecka, V., "The Health Information Sciences: Objectives and Strategies." In: Proceedings of the Conference on Information Science and Biomedical Communications Research, U.S. Department of Health, Education, and Welfare, NLM, Bethesda, Maryland., October 5, 1972.
- Smith, Linda C., "Systematic Searching of Abstracts and Indexes in Interdisciplinary Areas." Journal of the American Society for Information Science, Vol. 25, No. 6, p. 343, 1975.

Sprawls, P. and Hoffman, J., "Image Quality in Computerized Axial Tomography." In: Proceedings of the Society of Photo-Optical Instrumentation Engineers, Vol. 70, Medicine IV, 1975.

Sprawls, P., and Slamecka, V., "Graduate Education in Health Information Processing." Journal of Clinical Computing, 1972.

#### B. ACCEPTED FOR PUBLICATION

Bell, P.R., Bell, M.R., Dillon, R.S., Henne, R.L., and Ross, D.A., "Nonlinear Processing Methods for Nuclear Medicine Image." To appear in the Proceedings of the ANS meeting, San Francisco, California, November 1975.

Bell, P.R., Dillon, R.S., Henne, R.L., Ross, D.A., DeLand, F.H., and Fisher, D.J., "Conclusions from the Examination of Some Quantitative Vertex Brain Perfusion Sequences." To appear in the Journal of Nuclear Medicine.

Harbort, R.A., "Reasons for Choosing Virtual Memory Computer Systems." To appear in the Proceedings of the Computerworld Computer Caravan, Atlanta, Georgia, February 1975.

Heymsfield, S., and Campbell, E.J., "The Application of Commulative Summation Analysis to a Medical Data Base." To appear in the Proceedings of the Southeastern ACM Meeting, Raleigh, North Carolina, April 1975.

Owen, S., Shulman, N., Binge, J., Bentley, E., and Mann, Stephen S., "The 3R's and HBP: A Unique Approach to School Health and High Blood Pressure Education." To appear in the Proceedings of the 103rd APHA Annual Meeting, Chicago, Illinois, November 16-20, 1975.

Maskewitz, B.F., McClain, W.J., and Henne, R.L., "The Biomedical Computing Technology Information Center (A Focus for the Sharing of Computer Programs and Technology in Biomedicine)." To appear in the Proceedings of the Fifth National Conference, Society for Computer Medicine, Chicago, Illinois, November 12-14, 1975.

McClain, W.J., Henne, R.L., and Maskewitz, B.F., "The Digital Computer in Nuclear Medicine." To appear in the Proceedings of the ANS meeting, San Francisco, California, November 1975.

Root, W., and Harbort, R.A., "Three Dimensional Treatment Planning-An Analysis." Radiology, 1975 (in press).

Sias, Fred R. Jr., and Covert, J.R., "A New Implementation of Standard MUMPS in a Multi-Language Environment." To appear in the Proceedings of the 1975 MUMPS User's Group Meeting, St. Louis, Missouri, September 18 & 19, 1975.

Slamecka, V., and Gehl, J.M., "Formal Programs of Education in Biomedical Cybernetics." Advances in Cybernetics and Systems (J. Rose, ed.), London: Gordon and Breach (to appear).

Sprawls, P. and Moses, A.R., "Geometric Resolution Limit Patterns." To appear in Journal of Radiology.

C. IN PREPARATION/SUBMITTED FOR PUBLICATION

Badre, A.N., and Dunion, J.J., "The Role of Iconic Data in the Medical Decision Process." (in preparation)

Badre, A.N., and Slamecka, V., "On Problem Solving Approaches to Clinical Decision Processing." Submitted to Biomedical Communications.

Campbell, Eric J., Investigation of a Formal Data Structure for Input Data Validation in Automated Medical Records, Atlanta, Georgia: Georgia Institute of Technology, Ph.D. Dissertation (in preparation).

Dunion, James J., Medical Image Enhancement as a Problem Solving Activity, Atlanta, Georgia: Georgia Institute of Technology, Ph.D. Dissertation (in preparation).

Mann, Stephen S. II, A Methodology for Aggregate Analysis of Medical Records, With an Example Using Renal Clinic Protocols, Atlanta, Georgia: Georgia Institute of Technology, Ph.D. Dissertation (in preparation).

Stafford, Richard A. An Investigation into the Theory and Methodology of An Advanced Medical Data Acquisition Interface, Atlanta, Georgia: Georgia Institute of Technology, Ph.D. Dissertation (in preparation).