

147.

6345
Memorandum L-22

Page 1 of 10

Electronic Computer Division
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

To: Prof. Gordon S. Brown

From: Jay W. Forrester

Date: April 4, 1950

Subject: ACADEMIC PROGRAM IN THE FIELD OF AUTOMATIC COMPUTATION
AND NUMERICAL ANALYSIS

Reference: Letter of February 24 to Prof. Brown from Prof. S. H.
Caldwell

Abstract: M.I.T. is setting up new courses in the field of automatic
computation and numerical analysis and is working toward
a balanced program in this field. It is important that
proper academic recognition be given to students working
in this field. There is an ever growing demand for highly
trained technical staff in automatic computation and re-
lated subjects which M.I.T. is in an excellent position
to help fill.

In this note I wish to set down some comments stressing the importance of an academic program in the field of automatic computation and numerical analysis which will have full academic recognition. It is my understanding that the academic courses and catalogue changes recommended in the above letter from Prof. Caldwell have received favorable action. Because of the growing importance and general interest in the field and the demand for adequately trained technical persons, it seems important that we not only have the above courses but that they be properly integrated into the academic program so that men wishing to specialize in this field can receive proper recognition in the granting of advanced degrees.

I hope that arrangements can be so worked out that advanced degrees with specification of field can be taken either in electrical engineering or mathematics, depending on the candidate's principal interests and background of training. If this is done, I would expect that later the field of automatic computation would become a recognized specialization in other academic fields.

6345
Memorandum L-22

Page 2

The remaining paragraphs contain miscellaneous items pointing to the current importance and status of automatic computation at the present time. The field is a rapidly expanding one in which I am certain the gap is widening between demand for trained persons and adequate programs for giving this training. The acceleration in demand is still greater than the acceleration in supply. M.I.T. is in a unique position to establish a sound and active program complete with adequate academic degrees. Industry, other institutions, and government agencies are placing considerable dependence on M.I.T. for leadership.

During the current academic year, the Digital Computer Laboratory will have presented eleven papers at national conventions. These are listed chronologically in Appendix A.

A recent analysis by the Institute of Radio Engineers shows that out of twenty-six technical subdivisions of electronics the field of electronic computers ranked ninth during 1949 for the number of pages in the I.R.E. proceedings. In Appendix B is a listing of the twenty-six classifications arranged in the order of the amount of space devoted to them. I have made a count showing similar high percentages devoted to electronic computation and digital data handling in Electrical Engineering and the Electrical Engineering Transactions. During 1949, 4.7% of the articles in Electrical Engineering related to the field, and 9.5% of the articles in the Transactions were directly or closely related.

Last week I attended a conference of the Association for Computing Machinery held at Rutgers University at which some 321 persons were registered. These persons came from a total of 113 organizations which represent an interesting cross section of American industry, academic institutions, and government. In Appendix C is a list of the institutions represented at that meeting arranged according to the number of representatives from each as indicated.

At the meeting I talked to many of these persons, and a large percentage of them inquired about the possibility of filling their staff requirements from M.I.T. Because of the past history of M.I.T. in this field and the current work of the Center of Analysis and the Servomechanisms Laboratory, there is an increasing dependence on M.I.T. both for trained men and electronic, logical, and mathematical developments.

I feel it unwise to make this work a specialty of only one department. Because of the great dependence on both engineering and mathematics, our academic program should recognize and provide for both aspects.

6345
Memorandum L-22

Page 3

At the Rutgers conference Professor Howard Aiken gave a very good banquet address on this subject. He pointed out that no university now has an adequate academic program. Furthermore, in those few places where the student can piece together a program, the institution does not recognize such a course of study as adequate for an advanced degree. I am sure this arises from the newness of the field and that such academic recognition will soon be given in many places. M.I.T. is in a good position to be one of the first.


Jay W. Forrester

JWF:rb

Attachments: Appendix A
Appendix B
Appendix C

APPENDIX A

List of papers given at technical committee meetings by the
M.I.T. Digital Computer Laboratory staff during the
academic year 1949-50

<u>Title of Paper</u>	<u>Organization</u>	<u>Author</u>
"Role of Electronic High-Speed Computers in Psychological Research"	Symposium, Psychometric Society, Denver, Colorado, September 7, 1949	Jay W. Forrester
"The Digital Computation Program at M.I.T." Symposium on Large-Scale Digital Calculating Machinery	Harvard University, Cambridge, Massachusetts, September 13-16, 1949	Jay W. Forrester
"High-Speed Electronic Computing Devices"	National Meeting, American Chemical Society, Atlantic City, New Jersey, Sept. 19-23, 1949	Jay W. Forrester
"Marginal Checking as an Aid to Computer Reliability"	National Convention, Institute of Radio Engineers, New York City, March 6-9, 1950	Norman H. Taylor
"M.I.T. Electrostatic Storage Tube"	National Convention, Institute of Radio Engineers, New York City, March 6-9, 1950	Patrick Youtz, Stephen H. Dodd, Jr., Hans Klemperer
"An Accelerated Life Test for Cathode Interface in Receiving-Type Tubes"	Tenth Annual M.I.T. Conference on Physical Electronics, M.I.T., Cambridge, Massachusetts, March 30, 31, April 1, 1950	Edwin S. Rich, Bonnell Frost
"Digital Computers in Control Systems"	American Institute of Electrical Engineers, Meeting at Providence Rhode Island, April 26-28, 1950	C. Robert Wieser
"Electrostatic Memory for Information Systems"	"	Stephen H. Dodd, Jr.
"Computer Experience in Extending Tube Life"	"	Edwin S. Rich
"Marginal Checking - Preventative Maintenance for Electronic Equipment"	"	George C. Sumner
"New Developments in Pulsed Circuit Test Equipment"	"	Robert Rathbone

Analysis of Material in the IRE Proceedings for Calendar Year 1949

<u>Classifications</u>	<u>Total Pages</u>	<u>%</u>
1. Circuit Theory	177.6	16.7
2. Propagation Through Space	135.2	12.7
3. Electron Tubes and Thermionics	108.7	10.2
4. Nuclear Equipment and Methods	79.2	7.4
5. Measurements & Instruments (Excluding Industrial and Nuclear)	78.4	7.4
6. Antennas	67.0	6.3
7. Detection, Location, and Navigation Systems	54.1	5.1
8. Transmission Lines and Wave Guides	53.7	5.1
.....		
9. Electronic Computers	47.2	4.4
.....		
10. Miscellaneous Communication Systems	36.0	3.4
11. General Theory	33.5	3.2
12. Piezoelectricity	27.0	2.5
13. Miscellaneous	25.8	2.4
14. Frequency Modulation	18.4	1.7
15. Pulse Modulation	18.3	1.7
16. Television	18.1	1.7
17. Power Supplies	17.1	1.6
18. Audio Frequency and Recording Systems	14.9	1.4
19. Manufacturing	14.0	1.3
20. Broadcasting	13.7	1.3
21. Receiving Apparatus and Theory	12.8	1.2
22. Generating Apparatus and Theory	9.3	0.9
23. Industrial and Medical Electronics	4.0	0.4
24. Airborne, Marine, and Mobile Equipment	0.0	0.0
25. Facsimile	0.0	0.0
26. Non-radio and Radio Law	0.0	0.0

APPENDIX C

Organizations Attending the Automatic Computing Machinery Conference
March 27, 28, 29, 1950 at Rutgers University

(Number of representatives from each are indicated)

<u>Organization</u>	<u>Number Attending</u>
National Bureau of Standards	22
International Business Machines Corp.	19
Eckert-Mauchly Computer Corporation	16
Radio Corporation of America	15
Ballistic Research Laboratories	10
Metropolitan Life Insurance Company	10
University of Pennsylvania	10
Burroughs Adding Machine Company	9
Massachusetts Institute of Technology	7
University of Michigan	7
Northrop Aircraft	7
United States Navy	6
Engineering Research Associates	6
Monroe Calculating Machinery Co.	6
United States Census Bureau	5
Naval Proving Ground	5
Social Security Administration	5
American Cyanamid Co.	4
Cambridge Field Station	4
Bell Telephone Laboratories	3
E. I. duPont de Nemours & Co. Inc.	3
General Electric Company	3
Harvard University	3

6345
Memorandum L-22

Page 7

<u>Organization</u>	<u>Number Attending</u>
Naval Research Laboratory	3
Public Service Electric Gas Company	3
Raytheon Manufacturing Company	3
Remington Rand Corp.	3
Reeves Instrument Company	3
Rutgers University	3
Underwood	3
Westinghouse	3
Air Force Security Agency	3
Baltimore and Ohio Railroad	2
Bendix Aviation	2
Coast & Geodetic Survey	2
Department of Defense	2
Allan D. Dumont Company	2
Equitable Life Ass. Society	2
Federal Telecommunications Laboratories	2
General Motors Corp.	2
John Hancock Insurance Company	2
Intelectron Inc.	2
Missouri Research Laboratories	2
Munitions Bd. - Dept. of Defense	2
NACA	2
North Carolina State College	2
Ordnance Army	2
Power Equipment Company	2
Prudential Insurance Company	2

6345
Memorandum L-22

Page 8

<u>Organization</u>	<u>Number Attending</u>
Signal Corps Engineering Laboratories	2
Stevens Institute	2
Sylvania	2
Tidewater Association Oil Company	2
U. S. Postgraduate School (Annapolis)	2
Washington University	2
Aberdeen Proving Ground	1
Air Force Research Laboratory	1
Army Map Service	1
Atlantic Refining Company	1
Barber-Coleman Company	1
Bell Aircraft Corp.	1
Berkeley	1
Cornell Aeronautical Laboratories	1
Columbia University	1
Connecticut Mutual Life Insurance Company	1
Dominic & Dominic	1
Electronics Computer Corp.	1
Evans Signal Laboratory	1
Fairchild Engineering and Aircraft Corp.	1
Franklin Institute	1
General Precision Laboratories	1
Goodyear Aircraft Company	1
Henry Rose Stores, Inc.	1

6345
Memorandum L-22

Page 9

<u>Organization</u>	<u>Number Attending</u>
Hydrocarbon Research	1
International Telephone and Telegraph Co.	1
Johns Hopkins University	1
John H. Howard & Associates	1
Jordan Marsh Company	1
Hughes Aircraft Corp.	1
M. W. Kellogg Company	1
Kieckhefer Container Company	1
Arthur D. Little Company	1
Marchant Company	1
Mellon Institute	1
Mutual Life Insurance Company	1
Mutual Benefit Life Insurance Company	1
National Research Corporation	1
National Research Council of Canada	1
Naval Ordnance Laboratory	1
NCR	1
New Jersey Highway Department	1
New York University	1
A. C. Nielsen Company	1
Office of Air Research	1
Princeton University	1
Sears Roebuck, Inc.	1
Sperry Gyroscope Company	1

6345
Memorandum L-22

Page 10

<u>Organization</u>	<u>Number Attending</u>
Star Porcelain Co.	1
Standard Oil Development Co.	1
Teleregister Laboratories	1
United Aircraft	1
Union Carbide and Carbon	1
Union Switch and Signal Co.	1
United States Air Force	1
United States Army	1
United States Navy Electronics Laboratory	1
United States Navy Underwater Laboratory	1
University of California	1
University of North Carolina	1
Watson Laboratories	1
Wayne University	1
Western Electric	1
Zator Company	1
Mr. Alan Bloch	1
Mr. Gaelara Melilli	1
Mr. A. S. Roberts	1
Dr. George Stibitz	1
Mr. J. C. Wilberding	1