

Negentropy Evidentiary Entry T3

Analog Computer Techniques — Teaching and Research, University of Illinois College of Medicine, 1963–1968

Category I — Negentropy in Science Teaching

This entry documents the design and instruction of **Analog Computer Techniques** (Physiology 412), a graduate laboratory course at the University of Illinois College of Medicine, and its direct extension into the active research program on radiation-induced biological survival patterns.

Three-Part Evidentiary Test

Documented before-state The course justification states plainly: “No comparable course is offered.” No formal instruction

Identifiable ordering agent Dr. William J. Moressi, as instructor of record for Physiology 412, designed the course and its

Measurable after-state The department's own course justification identifies the course as foundational to its “rapidly e

Primary Sources Included in This Evidentiary Record

1. American National Red Cross, National Headquarters — letter from Richard Moore, Ph.D., Research Biophysicist, Blood Program, to Dr. William J. Moressi, February 28, 1966, requesting a preprint and analog-computer setup instructions for the biological survival-pattern model.
2. Biophysical Society Meeting abstract (WD1), “The Development of a Mathematical Model and Electronic Analog of a Hypothetical Biological Survival Pattern,” Wm. J. Moressi, J. C. Osburn, and C. C. Wunder, Dept. of Physiology, University of Illinois College of Medicine, and Depts. of Physiology and Chemical Engineering, University of Iowa.
3. University of Illinois Course Outline, “Analog Computer Techniques” (Physiology 412), Department of Physiology, dated April 25, 1964, prepared as a graduate laboratory course.



THE AMERICAN NATIONAL RED CROSS
NATIONAL HEADQUARTERS
WASHINGTON 6, D. C.

February 28, 1966

Dr. William J. Moressi
Department of Physiology
University of Illinois
College of Medicine
Chicago, Illinois

Dear Dr. Moressi:

I heard with pleasure your paper at the Biophysical Society Meeting. Would you please send me a preprint, if available or a reprint of papers describing some of the work? I am especially interested in your electronic analog of a biological survival pattern. Would you please send me instructions for setting this up on an analog computer?

Yours sincerely,

Richard Moore, Ph.D.
Research Biophysicist
Blood Program

RM/as

WD1

THE DEVELOPMENT OF A MATHEMATICAL MODEL AND ELECTRONIC ANALOG OF A HYPOTHETICAL BIOLOGICAL SURVIVAL PATTERN. Wm. J. Moressi, J. O. Osburn*, and C. C. Wunder., Dept. of Physiology, U. of Ill., Coll. of Med., Chgo., Ill. and Depts. of Physiology and Chem. Engr., U. of Iowa, Iowa City, Iowa.

Alterations in radiation-induced cellular survival patterns of increasing complexity are compared with those predicted from theoretical considerations. In the model development, which progresses from simple exponential, to sigmoidal (Gompertz type), and finally to complex sigmoidal (modified Gompertz) decay, a logical inference is drawn as to one of the ways in which a postulated 'survival factor' may influence survival dynamics. The term 'survival factor' is defined as any substance(s), inherent to the biological system, that plays an effective role, either by 'protection' and/or 'restoration', in the survival of that system. Primary consideration is given to (1) cumulative damage within a cell, (2) a cell's capacity for survival based on an assumed quantity of 'survival factor', and (3) a possible contribution of diffusible 'factor' to survival dynamics. The models are applied to data selected from the literature on a rational basis, i.e., data from investigations whose results suggested cellular 'protection' and/or 'restoration'. In order to justify, in a purely empirical sense, the application of the complex model, its survival pattern was tested with the data against patterns described by simple exponential, Gompertz, and "multihit-multitarget" models. Results indicate that the pattern described by the modified Gompertz equation has a statistically better 'fit' to the data employed than even that of the "multihit-multitarget" model without carrying with it the restrictive theoretical implications of a discrete number of "hits" and/or "targets" - especially when such definitive entities had not been indicated by the apparent nature of the investigative results.

UNIVERSITY OF ILLINOIS

COURSE OUTLINE

This blank is to be filled out for all new courses, both undergraduate and graduate. The phrase "new courses" means any course in a new field of knowledge and all reorganizations of, or major changes in, existing courses. The blank is to be used also in bringing factual information up to date even though the basic content remains unchanged.

Graduate

1. College or School _____ Date 4/26/64

2. Department Physiology Course Number 612

3. Title of Course Analog Computer Techniques.

4. Catalogue Description A laboratory course designed to acquaint the student with practical analog computer techniques in physiology. Each student will be required to set up and solve assigned problems on the departmental computer. Registration limited. One 3-hour period per week. Twelve to be accommodated. 1/2 unit. Alternate years. Dr. Moressi. Prerequisite: Physiology 301, 302, 303 and differential and integral calculus, or equivalents.

practical

set up and

limited.

Alternate y

differential

Quarter to be announced.

Quarter to be announced.

5. To be offered: Sem. I _____ Sem. II _____ Summer Only _____ Alternate Years X

6. Credit _____ Clock Hours _____ Expected Enrolment I 0 II 1 S _____

7. Is this course new? yes Revised? _____

To be arranged.

8. Days and Hours (check)

9. Expected distribution of registrations in terms of per cents.

	M	T	W	T	F	S
8						
9						
10						
11						
1						
2						
3						
4						
5						

Freshman	
Sophomore	
Junior	
Senior	
Graduate	<u>100</u>
Professional	
Total	<u>100</u>

10. Curricular Purposes of Course (Please answer all that are pertinent.)

a. Required in _____ curriculum.

b. Required for students majoring in _____

c. Elective for departmental major or specialization: Yes _____ No _____

d. Elective contributing to a general (liberal) education: Yes _____ No _____

e. Designed as an elective for students in _____
curriculum, department, etc.

Physiology, Biochemistry, Biophysics.

11. General Educational Purposes of Course (Please answer all that are pertinent.)

- a. General education..... Yes_____ No_____
- b. Departmental specialization..... Yes ☒ No_____
- c. Opportunity for student research..... Yes ☒ No_____
- d. Outgrowth of instructor's research program, past or present..... Yes ☒ No_____
- e. Furtherance of instructor's research program..... Yes ☒ No_____
- f. Professional or preprofessional training..... Yes ☒ No_____
- g. Why could the educational purposes of this course not be achieved by the modification of a course now being given? (Please be No comparable course is offered. Noted.
- _____
- _____

12. Relation to Other Courses (Please answer all that are appropriate.)

- a. Prerequisite(s) Physiology 301, 302, 303; differential and integral calculus, or _____
calculus. equivalents.
- b. This course is to be a formal prerequisite for _____
Name course(s)
- c. An introductory survey of the field of knowledge represented by your department..... Yes_____ No_____
- d. An introductory survey of a special area of knowledge within the total field represented by your department..... Yes ☒ No_____
- e. A further development of:
(i) A course described under "c"..... Yes_____ No_____
- (ii) A course described under "d"..... Yes_____ No_____
- f. An application to the departmental field of an area of knowledge represented by some other department.....
Name department and course(s)
- g. A summarizing and/or integrating course..... Yes_____ No_____
- h. In your judgment, does this course overlap to any considerable extent with any other course, either in your department or in another department?..... Yes_____ No ☒

If so, please name the common topics and the courses.

Topics	Courses
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

Please indicate the reasons why overlapping is justified_____

13. Analog computer techniques are rapidly becoming a basic research tool.

14. What is the exact place of this course in the development of the educational program of your department?

This course will become a basic course in our rapidly expanding Biophysics Program.

15. Topical Outline of Course (Give under major and minor headings the principal topics covered in this course together with the approximate number of class hours to be devoted to each topic. *Please be specific and inclusive* and avoid technical terms where possible.) Note: If this proposed course is a reorganization of, or an important change in, an existing course, prepare the outline so as to show the exact nature of the change

Introduction

A. Computing Components (linear)	1
B. Scaling	1
C. Linear Differential Equations (taken from physiological problems)	2
D. Multiplication and Function Generation	2
E. Nonlinear Differential Equations (taken from physiological problems)	2
F. Curve Fitting	1
G. Algebraic Equations	1
(1) Linear systems.	
(2) Roots of polynomials.	
H. Partial Differential Equations	1
I. The Checking of Computer Results	1
J. Introduction to Digital Computers	1

(Insert extra page if needed)

See next page

16. Basic Text for Proposed Course Johnson, C. E., Analog Computer Techniques, McGraw-Hill.

111.150

17. Special Syllabi Instruction Manual for Donner Computer.

(Give author and title)

18. Required Readings

(Name principal references)

19. Classroom, laboratory or other needed space (specify full needs) Computer Room

20. Remarks: Add any explanations or additional information that you believe would be helpful in the appraisal of this course

21. If this course is intended to replace an existing course or courses, specify

No

22. Sequence of action

Request prepared by _____ Date _____

Instructor(s)

Approved by Department _____ Date _____

(Head of Department)

Approved by College Policy Committee _____ Date _____

(Responsible Officer)

Approved by Graduate College _____ Date _____

(Dean of the Graduate College)

Approved by Provost _____ Date _____