

Title -

Proposed Budget

January 1, 1960 to December 31, 1960

Personnel (including *7% change*)

Senior staff, microbiology (summer salaries)	\$ 4,000
Instructor, 12 months	9,000
Technical Assistantx	4,000
Secretary	3,000
7% charge for fringe benefits for <i>instructor</i> technician, <i>secretary</i>	<u>\$20,000</u> 1,100
	21,700

*for visiting professor or staff member*

Training stipends

Senior postdoctoral fellow (1)	\$ 7,500
Predoctoral fellows (2)	4,000
Postdoctoral fellow (1)	5,000
Teaching assistant (1)	<u>2,000</u> 1,800
	\$18,500
	18,300

Permanent equipment

Warburg manometer; fraction collector; refrigerated centrifuge; counter and scaler; colorimeters, other	\$26,000
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Consumable supplies

Glassware, chemicals, radioactive tracers, animals	\$ 8,200
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Travel

<del>For</del> trainees	900
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Other expenses

Tuition and fees of predoctoral trainees	\$ <del>4,200</del> 4,500
Office supplies, telephone, hourly help, books and journals, publication costs (trainees)	<u>2,000</u>
	\$ <del>6,200</del> 6,500

SUBTOTAL

<del>\$79,800</del>	81,600
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Indirect costs

(8% overhead (excluding \$26,000 for permanent equipment))	\$ <del>4,304</del> 4,448
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TOTAL

<del>\$84,104</del>	86,048
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1st	additional year	\$65,000
2nd	" "	65,000
3rd	" "	65,000
4th	" "	65,000

## I. Proposed Program

A. Purpose: We are ~~in the process of~~ organizing within the Biology Department at M. I. T. a teaching program in Microbiology aimed at fulfilling what we think will be special needs of microbiologists in the next ~~next~~ decade. We wish to ~~organize~~ <sup>center our</sup> teaching and research training around the concepts of cellular physiology and molecular organization of the cell. Assuming that the task of biology as a science is to explain the organization of living matter at all levels (molecular, cellular, organismic, <sup>phylogenetic</sup> taxonomic), we propose to develop the structural and functional approach emphasizing simplicity and unity of pattern rather than complexity and diversity.

We plan to introduce the student first, in a generalized way, to the properties and functions of living matter - composition, energetics, nutrition, growth, regulation, reproduction, and variation - and then to present groups of <sup>micro</sup>organisms as ~~specific~~ <sup>illustrations</sup> solutions of the problem of maintenance of biological organization under specific evolutionary circumstances.

This approach is suitable for the training of microbiologists who plan to use microorganisms for the solution of basic biological

problems. It is also especially suitable for introducing to <sup>modern</sup> biology

persons whose basic training has been in physics and chemistry, as well as for giving basic training in molecular biology to persons already trained in medicine.

It makes it possible to utilize as training materials, for complementary

purposes, both true microorganisms and animal or plant cells handled

as microorganisms. The recent work of Eagle, Puck, and others has

provided tools for utilizing this newer aspect of microbiology; yet,

metazoan cell microbiology has seldom been made an integral part of

the teaching of microbiology in the way we plan to use it because of

traditional separation of interest and because ~~the~~ microbiology has

seldom been utilized as one of the main areas for training biologists.

We expect that joining the study of true microbes and of metazoan cells <sup>cultivated in vitro</sup> ~~in culture~~ into a common teaching program will do justice to the

heuristic value of microbial studies in biology and will also dispose of

optimistic over-simplifications. Feedbacks between the study of microbes

<sup>the study</sup> and ~~that~~ of isolated cells from ~~the~~ multipellular organisms should be mutual

and equally beneficial.

Experience in some departments has shown that students

trained as microbiologists by a program centering on molecular biology

and cellular physiology can later master <sup>easily the</sup> applied areas of microbiology without ~~need~~ need for extensive formal training in those areas.

The proposed program requires a great deal of emphasis and preparation in basic science. M. I. T. should provide <sup>a most</sup> ~~an unusually~~ favorable environment. Coupled with strong programs in molecular biology, enzymology, genetics, and biophysics, this teaching of microbiology should provide a group of trainees equipped to teach cellular biology as well as microbiology and to apply the methods of cellular biology to the study of problems such as cancer, cellular immunity, and virus research.

B. Training Plan: Training in microbiology at M. I. T. is just beginning, so that we start with a clean slate. We plan to establish as basic courses:

(1) Microbiology (prerequisite: General Biochemistry) covering the composition, energetics, nutrition, growth, variation, and cellular organization of microbial cells, especially bacteria.

(2) Experimental Microbiology: A laboratory course on the manipulations and measurements proper to microbiology; including

isolation, cultivation, analysis and functional studies on bacteria, other microbes, and mammalian cells in vitro.

(3) Microbial Physiology: The study of cellular functions, especially growth, biosynthesis, metabolism, <sup>permeability,</sup> regulation, and sexuality as revealed in microorganisms and other cells studied as microorganisms.

*Microbial Genetics and*  
(4) Virology: ~~The relation of viruses to cells and to cellular heredity.~~ *The study of cellular genetics and heredity of viruses in relation to cellular heredity and cellular function.*

Courses (1) and (2) will be open to advanced undergraduates; the other courses, as well as seminars and research courses, will be for graduate students only.

The teaching of these courses will be done ~~mainly~~ by a staff consisting of three senior professors, plus one or two junior staff members. ~~We plan to add to the senior staff one person whose main research interest~~ ~~is microbial physiology.~~ There is being established a Committee on Microbiology, consisting of the microbiology teaching staff plus other members of the <sup>Biology</sup> Department, including at least one member from biophysics and one from biochemistry. This Committee will organize and supervise the program of the trainees.

We propose to provide training at the predoctoral and postdoctoral levels. The predoctoral trainees, graduate students with presumably various backgrounds, will receive training in mathematics, *biochemistry* physics, chemistry, genetics, cytology, and biophysics, in addition to microbiology. Emphasis will be more on thorough training than on speed of obtaining a degree. Postdoctoral trainees will be encouraged to come not only from microbiology and *other areas of* biology, but also from *medicine,* physics and chemistry. *especially hope* We ~~also~~ plan to include among the postdoctoral trainees several medical graduates, who wish to *pursue a* ~~make~~ *their* career *in* basic microbiology applied to *research* medical problems.

Since biophysics, biochemistry, cytochemistry and molecular biology are all located in the same Department, and since the teaching of microbiology is being undertaken as part of the Department's integrated program, our trainees will have the benefit of a first-class setup in basic science applied to biology. They will have intimate association, advice, and supervision from leading experts in various fields, for example, Professors Buchanan, Hall, Levinthal, Rich, Schmitt, and Sizer. In fact, we hope that our trained microbiologists will be equally at home in all aspects of molecular biology.

Our trainees will take part in the teaching program. We expect all predoctoral trainees to spend some time as teaching assistants, while the postdoctoral trainees will cooperate in the supervision of graduate students and in advanced teaching programs. *in microbiology*

In the first year, we should probably have only two postdoctoral and three predoctoral trainees supported by the training grant. Other graduate students and postdoctoral fellows will be supported as teaching assistants, research assistants, or research associates. In following years, we plan to expand this training program to support additional trainees. The sum requested specifically for trainee stipends in the following years will be \$30,000 (not including tuition).

## II. Staff and Facilities

### A. Staff

1. S. E. Luria, Professor of Microbiology
2. B. Magasanik, Professor of Microbiology, *(starting 1/1/60)*
3. Associate Professor of Microbiology (to be appointed), *(starting July 1, 1960.)*
4. Instructor (to be appointed) *(starting January 1, 1960.)*