

**GENERAL**  **ELECTRIC**  
COMPANY

**ELECTRONICS LABORATORY**

ELECTRONICS PARK, SYRACUSE, NEW YORK

TELEPHONE GRANITE 6-4411

January 14, 1959

Dr. Adrian Kantrowitz  
Director of Cardiovascular Surgery  
Maimonides Hospital of Brooklyn  
4802 Tenth Avenue  
Brooklyn 19, New York

Dear Dr. Kantrowitz:

Our "heart team" has now had sufficient time to crystallize a few approaches to your booster heart electronics problem and we feel that this would be an opportune time to invite you to the Electronics Laboratory for further discussions. February 6th or 9th would be suitable for us (Ernie Stern tells me that you're a ski enthusiast and so we're trying to arrange a date which adjoins a weekend during which you may wish to test our slopes!). Other available dates would be February 20th or 23rd if you find the 6th or 9th inconvenient. Please let us know what days would be suitable for you.

In the meantime I'd like to describe some of the things which we're doing now in preparation for your visit. Please feel free to redirect our efforts if you conclude that these preliminary efforts are not in accordance with your needs or are not justified by the physical ramifications of the problem.

We have started three equipment-oriented projects which I shall refer to below as the "Laboratory Model", "Intermediate Model" and "Internal Model". The objective of the Laboratory Model Development is to provide you with laboratory test equipment which will afford you a means for obtaining quantitative electrical data required by us for the design of practical prototypes. We envision that you can use this equipment on the operating table to determine such parameters as: (a) amplification required between nerve excitation point and electronic trigger output; (b) delay times required between nerve excitation input and booster-heart trigger signal; (c) amplitude and frequency required of stimulating signal at muscle output. Hence, we hope that this first equipment may provide you with a convenient vehicle to determine directly the required electrical characteristics of the ultimate booster-heart electronic circuitry without resorting to indirect measurements which require a variety of instruments not conveniently available to you. Furthermore, we hope this equipment will be ready by the time you visit us.

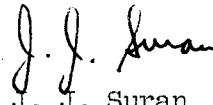
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The objective of the Intermediate Model Development is to provide you with our first practical device which may be used in conjunction with a living system off the operating table. The energy source for this model will be external to the body with part or all of the remaining electronic circuits contained within the body. We hope to discuss in great detail with you, during your visit here, the pros and cons of alternative approaches to the design of this model. In the meantime, I'm enclosing with this letter a description of some of our first experiments and ideas on this subject with the hope that this "advance" information may serve as a basis for mutual discussions during your visit.

The ultimate objective of the Internal Model Development phase of the program is to supply you with electronic equipment which may be fully contained within the organism. This objective is predicated on the hope that we can "tap" the internal organs for the energy required by the control electronics. Since the energy supply is the most critical problem of this part of the program, we will undoubtedly require a great deal of physiological information from you concerning possible organic areas of electrodynamic, mechanical or thermal gradients for energy sources. We hope we will have the opportunity to discuss this problem in at least a preliminary manner during your forthcoming visit.

We will look forward to seeing you here in Syracuse and hope that your trip will be both enjoyable and fruitful. In the meantime, best wishes from all of us.

Sincerely,



J. J. Suran  
Manager-Advanced Circuits  
Electronics Laboratory

ad

cc: H. Abbott  
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