August 6, 1948

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Dear Tracy:

Thank you very much for your letter of July 29. I re-
ceived just a day ago the draft of your paper from Hor-
owitz. I shall write you in a few days after I have
had a little time to digest it.

With respect to Delbruck's idea, I think I know what he
is driving at although of course I cannot be sure until
I see a firsthand account of the hypothesis he is pro-
posing. You may recall from some of my early papers,
of which you probably have copies, that I have fooled
around a little with the theory by open systems in
steady states, or as Delbruck calls them, "flux equil-
ibria". I have, therefore, a little experience with
the properties of such systems and as a matter of fact,
about six years ago I tried to use this sort of formu-
lation to explain cellular differentiation. I gave a
paper on it at Woods Hole, but never published it. In
any case, I think this can be stated.

It seems to me what would be necessary would be to have
a system which possesses a set of steady state conditions
which are seperated from each other by a finite interval
so that small but finite displacements from any given
steady state condition would not lead to a permanent mod-
ification, but on the contrary would lead to the return
to the condition from which the system was disturbed.
External disturbances, however, which exceeded a certain
finite critical value would be able to shift the system
to a new steady state which would then again be maintained
in the face of small disturbances until again a sufficient-
ly large disturbance occurred in the environment. This
situation is probably more adequately expressed by an in-
ertia rather than a momentum effect. It turns out that it
is very simple to set up models which would possess this
kind of stability.

I have just worked out the mathematics for a very simple system involving a single chemical reaction in which two alternative steady state values are possible, and these are separated by a finite interval. It would not be difficult to have any number of possible steady state values.

I shall have to think a little bit more about this before estimating its explanatory value for the situations with which we are both concerned. There are certain difficulties which I think this formulation will encounter but I am not sure that they cannot be overcome. At the present moment I would say quite definitely that the idea is very worthy of consideration and discussion. I am hoping that we will get the opportunity in Washington to go into the matter further. In the meantime, I shall play around a little further with the mathematics of the situation. I don't know how much time I can devote in my talk to a discussion of this problem unless Delbruck is there. It is not easy to discuss another fellow's theory in the absence of a concrete statement of its contents. It is conceivable that my guess as to what Delbruck was driving at is completely incorrect.

By the way, I would appreciate your letting me know as soon as you can what hotel you will stay at, since I would like, if possible, to get reservations in the same place or nearby.

With best regards,

                              Cordially yours,

                              S. Spiegelman

SS/bks