February 19, 1966

Mr. Rolf Bjornerstedt
Research Institute of Nationa Defence
Forsvarets Forskningsanstalt
Avdelning 4,
Stockholm 80, Sweden

Dear Mr. Bjornerstedt:

I am glad to be able to accept your invitation to attend the Swedish Pugwash Group meeting of March 21-22. I do not yet know whether Geoffrey Edsall is interested in coming, but I will attempt to contact him very soon.

I have not given a great deal of thought to the problem of detecting airborne microorganisms. However I imagine the following approach is worth discussing and has in fact undoubtedly been discussed at length by experts in the field already.

Detection apparatus might consist of the following sequence of components. A mechanical filter or other sorting device to screen out particles larger than a preselected size. Second, a moving tape on which bacteria and viruses or small clumps of these forms would impact. The tape could then be treated with a variety of florescent antibodies. The tape would then be washed to remove excess antibody or possibly counter staining would be performed. Then the tape would be exposed to exciting radiation of the appropriate wave length or wave lengths and a flying spot scanning operation could reveal the number, intensity, and spectral characteristics of florescent objects. Information from the scanner could then be fed into a small computer which could present an evaluation of the organisms probably present.

Various difficulties may be anticipated in the development of the instrument described above. Cross-reaction between various cellular and viral antigens should be anticipated.

It may be that problems of this nature could be largely surmounted by using extremely pure antibodies either in sequence or competitively. Information regarding the florescence obtained after treatment with several different antibodies pooled with information regarding particle size and the even shape could then be fed into a computer which would have in its memory standard information about known bacteria and viruses in comparison with the incoming information. There might be some problem in obtaining a strong enough signal to identify important but minor antigens or to identify small viruses. Methods might be devised for amplifying small signals electronically or by using a flourscent secondary antibody against a non flourscent primary antibody which itself is directed against the antigen of interest. Background not due to flourscence might be reduced by the use of very low temperatures. I'm not sure whether such thermal background noice would represent a real problem. Background due to non thermal flourscence might be greatly reduced by using monocromatic exciting rediation possibly using several different wave lengths on different scans. Also, the spectrum of the emitted radiation might be analyzed. Quite aside from the spectral analysis of emitted radiation itself one might also measure time constance of the flourscence. This could be done either with pulsed excitation or perhaps more easily by measuring phase shifts between emitted radiation and the exciting beam using in this case an exciting beam of oscilating intensity.

Other methods completely different from the one described above could be imagined. These would include scattering and spectral measurements through large volumes of air. Measurements of diaelectric change between closely spaced electrodes in a flow tube, mass spectrographic analysis of airborne solids following preliminary particles and gases.

I am sure that many other ideas can be suggested. However, I for one would not be willing to go too far with a purely technical discussion unless there was good reason to believe that a number of European nations both East and West were definately interested in our further efforts. More specifically, it seems to me that the rapid detection discussion group should not go too far without requiring some progress with the experimental inspection plan. For this reason I think it

imperative that the participants in the coming Stockholm meeting should include not only technical experts but persons with some administrative responsibility able to make tentative plans for our inspection effort and able also to discuss our approach to the inhibition of the development of biological weapons and the curtailment of secrecy in medical and biological research. I know that such persons will be present on the Swedish side and I urge you to obtain the participation of their opposite numbers from the other countries involved.

With best regards,

Sincerely yours,

Matthew Meselson