11.7.1977

Professor Sir Francis Crick
Salk Institute
La Jolla, Cal.

Dear Francis

Thank you very much for your devastating criticisms of my chapter on biosystems. I will certainly make a serious effort to correct the scientific mistakes you point out, and I will ask for help to revise the rest.

While those mistakes are inexcusable, I don't believe they ruin my program, which is to construct a new philosophy relevant (and even close) to science as well as formally rigorous. I cannot explain my program in a letter, but this much I'd like to say:

1. While I applaud any scientific idea that has proved (or just promises) to have some heuristic power, such as the notion of genetic information, I become impatient if the idea does not get clarified at some time, the more so if, in addition to being scientifically fertile, it is philosophically obnoxious because it reinforces, say, an anthropomorphic world view--as is the case with the idea that the genes carry the "instructions" for protein synthesis, etc. A time comes when the embryo has got to grow into a full-fledged scirntific idea. This clarification may well call for the use of some mathematically simple yet basic and powerful concepts, such as those of set and function. If something of the sort had been done with the "central dogma", there might be little room left for misunderstandings of the kind you had to dispell in your note in Nature (1970)--for which, incidentally, many thanks. Likewise Faraday's field ideas would have remained in the limbo, and would have given rise to endless verbal disputations, hadmit not been for Maxwell's precise rendering (and completion) of them. Don't you agree? Of course you do.

2. Science, even theoretical physics, is shot through with basic yet nebulous notions that ought to be elucidated. Examples: the notion of a reference frame, the entire set of chemical (or rather stoichiochemical) equations, the concept of a property, that of a biosystem, that of mind. In my work I have tried to clarify some such key concepts that everyone uses but nobody cares to elucidate. This, while quite irrelevant to daily life concerns, becomes important when discussing foundational and philosophical problems. Of course one does not learn arithmetic by reading FRege or Russell on the foundations of arithmetic and one does not learn chemistry or biology by reading that ignoramus, M.B. But this is not the point: the aim of foundational research is not to discover new

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facts or to build new theories--that's your job--but to clarify and systematize previpusly obscure ideas, particularly those that, if misunderstood, may cause great harm. Remember that confusion is far worse than error (F. Bacon).

I should greatly appreciate yonr talking the matter over with Dr Leslie Orgal, as you kindly suggest. I believe I am still teachable, at least by scientists. And I amfa firm believer in the cooperation among scientists and philosophers--the only way to educate philosophers in scientific matters, and to educate scientists in philosophical matters. Of course it takes patience. But, let me assure you, on both sides.

Cordially

Mario Bunge