

Abstract of presentation at the Phi Beta Kappa address,
American Association for Advancement of Science,
February 28, 1974.

Title: " Do Scientists Understand Science?"

As Medawar and many others have pointed out, scientific papers sacrifice personal truth for the sake of clear exposition of varifiable public assertions of scientific fact. To that extent intellectual historians must beware of relying on such documents as they already know how to be skeptical of autobiographical rationalizations.

To the extent that the scientific process is not revealed in scientific publications, it may ^{be} credibly inferred that scientists do not understand science or at least that their perspective on the subject is limited to but a little more than their own personal and often subjective experience.

The talk was in large measure an appeal to scientists to be more actively interested in collaboration with historians and sociologists in order to achieve a better understanding of the larger frame of their work. There are however serious methodological limitations in the study of intellectual history, especially at the micro-level of specific case studies. Inevitably we will find poor records; unreliable witness and report; an inherent discontinuity of creative thinking at the micro-level; a retrospective urge to make the story interesting as well as accurate.

The major theme of the presentation was the pre-history of molecular genetics, especially in the interval between 1875 and 1945. This was an enlargement of a brief note (attached) and leans heavily on the ongoing collaborative study with Zuckerman, Merton, Thackrey and Elkana that has been mentioned elsewhere.

The finding in 1946 in which the author participated that bacteria were endowed with mechanisms for sexual reproduction, played a significant role in the further development of microbial and molecular genetics. However, the question may be asked why did the myth prevail for so long that bacteria are asexual!

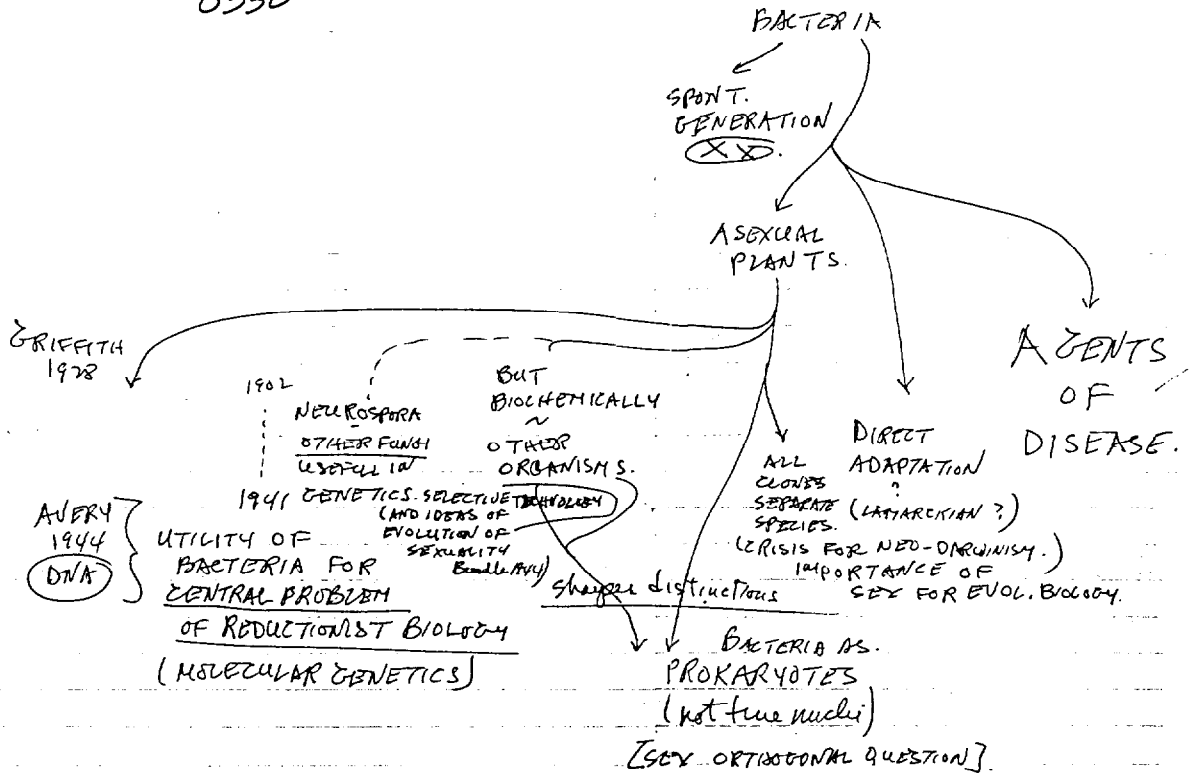
The origin of this myth was traced to the observations by von Leuwenhoek in 1675 who had observed protozoa copulating and remarked on their sexual behavior but notably failed to find comparable evidence for sex in his microscopic observations on bacteria. While there are many other subtleties that would need to be considered, this could be put down to the gross incapability of the microscope to go quite that far in the analysis of cellular processes. In 1875 Ferdinand Cohn systematized the biology of bacteria for the first time and was obliged to react strongly to a number of other myths about these organisms - for example, as an extrapolation of the shattered myth of spontaneous generation that there was but one species of bacterium which was capable of spontaneous evolution into the full variety of microbial forms as a matter of everyday contemporary experience. His conservative reaction postulated the strict genetic stability of bacteria (the doctrine of monomorphism) and rigidified the concept of bacterial asexuality even in the class name schizomycetes. Subsequently, the rapid separation of the disciplines of microbiology, as an applied medical subject of overwhelming human significance, from the main stream of basic academic biology, impeded a fundamental re-examination of these premises of microbiological science.

The renewal of evolutionary analysis in the 1940's, the general ferment to the greater social investment in scientific and especially in biological research during and immediately after WW II and a variety of other social, historical, intellectual and personal factors were reviewed as helping to explain the eventual re-examination and overturning of

the myth of asexuality.

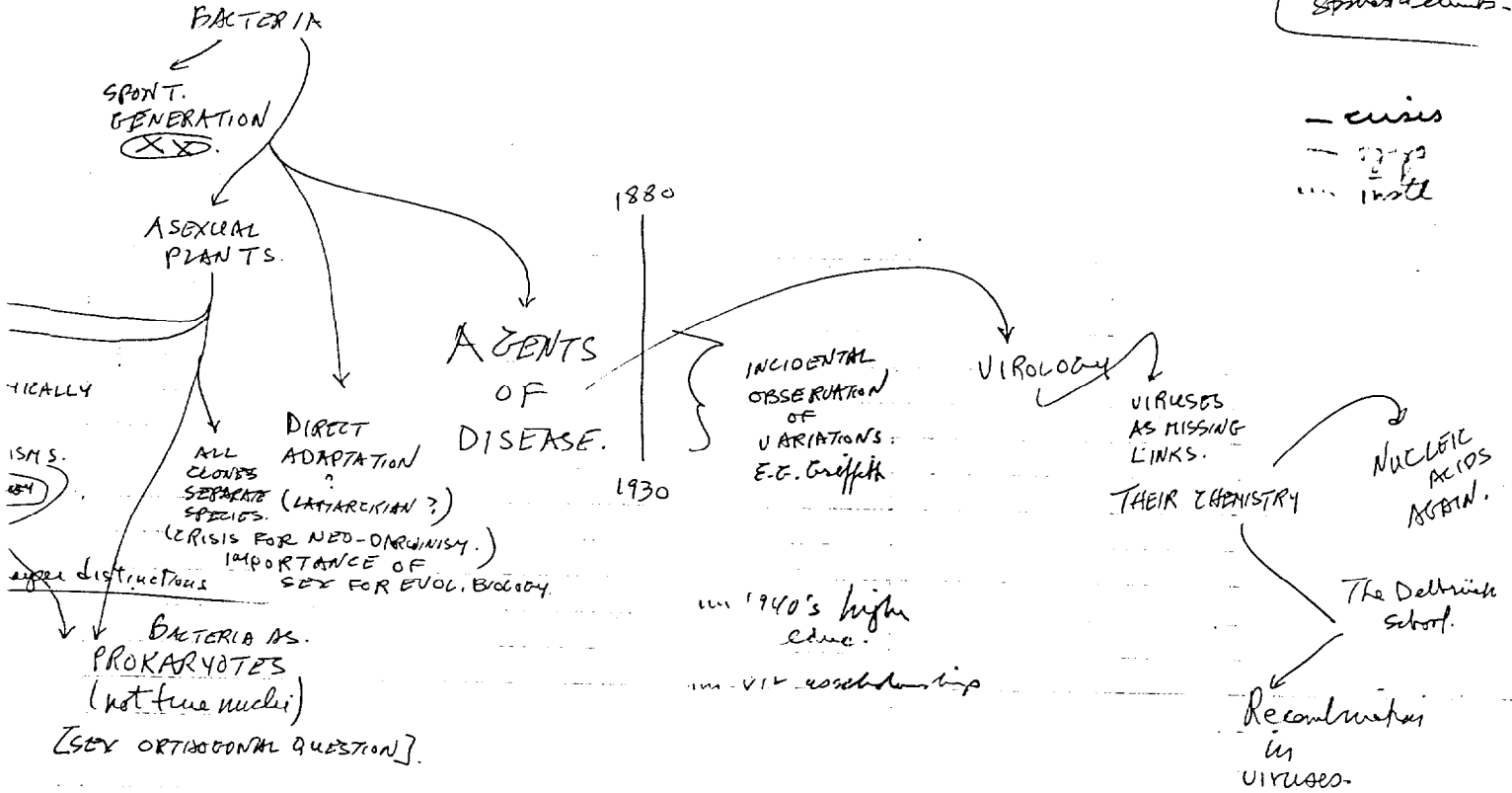
Behind the picture of premature and postmature discovery which is recounted here is an implied model of the nature of scientific progress which has been sketched out only in rather crude terms and requires much deeper examination.

2/6/74
0330



Total volume of
 Genes
 Spontaneous

- crisis
 - 1930s
 - 1940s



1940's. Adaptation
 Lysenko-Lamarck
 Fungal Genetics
 Unity of Biochemistry
 Sexual Reproduction
 in Evolutionary
 Theory
 Cytological and
 Biochemical Com-
 plexity of Bacteria
 Mutation analogies
 Avery → utility of bacteria for
 central problem of reduc-
 tionist biology

O.T.S.O.G. AT 4%
 ?
 → AREORE

TODAY
 6/70
 1/67
 2/63

DNA SEQUENCES SYNTHESIZED
 PHAGE DNA REPLICATED.

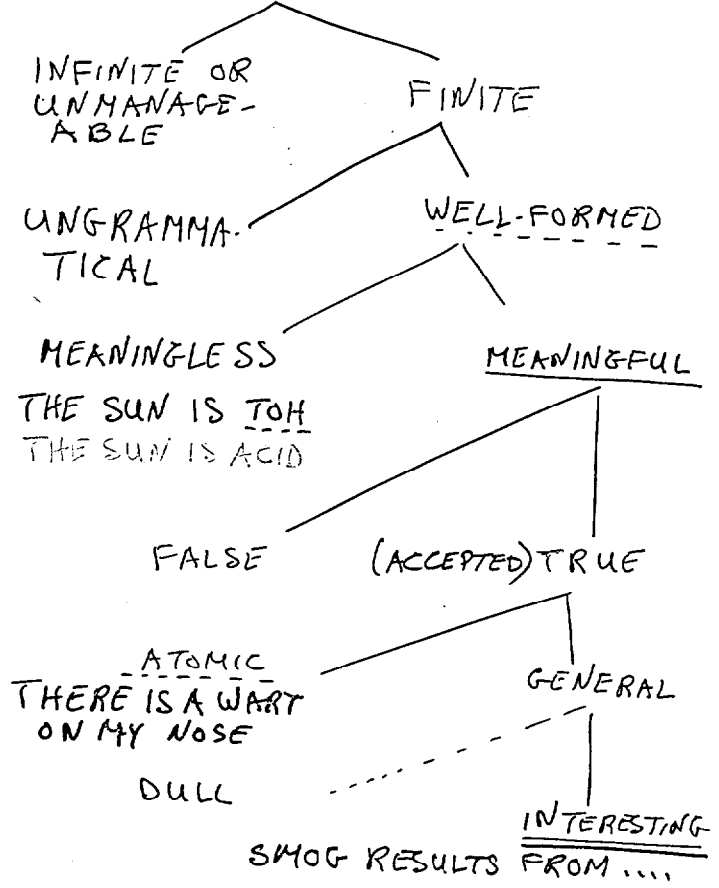
DNA POLYMERASE
DOUBLE HELIX
 1952 PHAGE TRANSDUCTION

1944 SEX IN BACT. AVERY
 NEUROSPORA

1928 DROSOPHILA GRIFFITH

1900 DARWIN MENDEL ↓ PASTEUR COHN
 1800

SENTENCES



1675 Leeuwenhoek sees Bacteria
 1692 Protozoa (copulating!)
 1860 Pasteur still debating S.G.
 1830s-1870 Foundations of Modern Bacteriology.

