obituary

Jerome Vinograd was born February 9, 1913 in Milwaukee, Wisconsin, and died July 3, 1976. After undergraduate work at the University of Minnesota, he studied colloid chemistry with H. Freundlich from 1931 to 1935, first in Berlin then in London. He completed his doctoral work with J. W. McBain at Stanford from 1937 to 1939 and was associated with the Shell Development Co. from 1941 to 1951 where he worked mainly on problems of surface films and colloids. At that time, he gave up a secure industrial career and came to the California Institute of Technology because of his intense desire to work in the exciting new area of molecular biology. His early work at Caltech dealt mainly with the physical chemistry of proteins.

His first outstanding contribution to molecular biology was the invention, in collaboration with Meselson and Stahl, of the method of equilibrium density gradient centrifugation of nucleic acids in caesium chloride solutions. This method has been elaborated in Vinograd's and other laboratories to take advantage of the effects on buoyant density of base composition, denaturation, alkaline titration, binding of metal ions and of dyes, and hydration. All told, equilibrium buoyant banding has been one of the key techniques in the explosive development of the nucleic acid side of molecular biology since the mid 1950s.

Vinograd's outstanding work in the past 12 years has been in the study of closed circular DNA. The distinction between supercoiled closed circles and open circles was recognised in 1965. The ethidium bromide method of buoyant banding for the isolation of closed circular DNA was invented in 1967. This method, which makes it possible to analyse for and to isolate closed circular DNA in the presence of massive quantities of linear and open circular DNA, is widely used, and is one of the main reasons why there has been such exciting progress in the study of closed circular DNAs in different kinds of cells.

Later work dealt with the properties of mitochondrial DNA from malignant cells and with the study of the replication of mitochondrial DNA, initiated by the discovery of D-loops in Vinograd's laboratory. More recently his students have made several important contributions to the studies of the properties of the nicking and closing enzyme which relaxes supercoiled DNA while leaving it covalently closed. The Vinograd group as well as the groups of Keller at Cold Spring Harbor and Wang at Berkeley observed that one can use gel electrophoresis and relaxation by an enzyme to count the number of turns in a closed circular DNA, and that there is a Boltzmann distribution in the number of superturns in molecules which are closed, under equilibrium conditions.

Vinograd was, by early training and in his approach to molecular biology, a physical chemist. He had a flair for recognising when an anomalous and unexplained observation, if subjected to fundamental physical chemical analysis, would lead to an unexpected and important result in molecular biology.

I have seen the special Vinograd touch many times. A simple example is the development of the velocity band centrifugation method by Vinograd, Bruner, Kent and Weigle in 1963. Shortley before, Jean Weigle had discovered that he could layer a dilute solution of viruses in aqueous buffer on to a sucrose solution (not a gradient) in a centrifuge tube, centrifuge and get a good sharp virus band. Vinograd was puzzled as to why the band was sharp, and reasoned that there must be some effect providing convective stability. He recognised that there had to be a self-generating (by diffusion) density gradient to provide convective stability; a careful study then led to the development of this general and widely used method.

I remember vividly a seminar at Caltech in late 1966 or early 1967 when J. B. LePecq described his studies on the binding of ethidium bromide (Etd Br) to DNA. An important point was that, unlike the common acridine dyes, there was a reasonable amount of binding at high salt concentration. Vinograd pointed out at the discussion which immediately followed that if the dye ion bound in 6 M CsCl it would cause a large shift in the buoyant density of the DNA because it would displace a Cs^+ ion. Experiments by W. R. Bauer (then a graduate student) showed that Etd Br would indeed decrease the buoyant density of DNA, but that the shift was much larger for a relaxed than for a closed circular DNA. On learning of this result, Vinograd immediately perceived the correct explanation in terms of the topological constraint on the unwinding of closed circular DNA, thus leading to the development of an extremely useful method for isolating closed circular DNA, as well as for studying the free energy supercoiling.

He suffered a major heart attack in 1954 and a second one in 1969. He accepted the resulting restrictions on his overall activities philosophically. But his condition did not affect the intensity with which he devoted himself to his scientific work. I remember him through all these years being in the laboratory regularly on evenings and weekends discussing and analysing experimental data in painstaking detail with his students, seeking a fundamental explanation for unexpected and unexplained results. His students and colleagues will miss his penetrating insight into technical problems and his wise counsel on general policy issues.

Vinograd was made a member of the National Academy of Sciences in 1968, and received numerous awards. He is survived by his wife Dorothy, and his two daughters Julie and Deborah by a previous marriage.

Norman Davidson

Person to Person

The Beilby Medal and Prize will be made to a British scientist for work in any field related to the special interests of Sir George Beilby (chemical engineering, fuel technology or metallurgy). Apply to The Convener of the Administrators, Sir George Beilby Memorial Fund, The Royal Institute of Chemistry, 30 Russell Square, London, WC1B 5DT.

The Commission of the European Communities is sponsoring travelling Fellowships for obstetricians, neonatologists and research workers who are actively engaged in perinatal monitoring. The successful applicants will spend three weeks in a centre for perinatal monitoring within the EEC, outside their own country. Applications to Commission of the European Communities, Directorate-General Research, Science and Education, X11/C-1, 200, rue de la Loi, 1049 Brussels.

Address and details of the work of Rose Selavy on stellar lightning (ref. Brecher, K., *Nature*, **261**, 542; 1976) would be appreciated by Mr E. W. Crew, 26 St David's Drive, Broxbourne, Herts, UK.

There will be no charge for this service. Send items (not more than 60 words) to Martin Goldman at the London office. The section will include exchanges of accommodation, personal announcements and scientific queries. We reserve the right to decline material submitted. No commercial transactions.