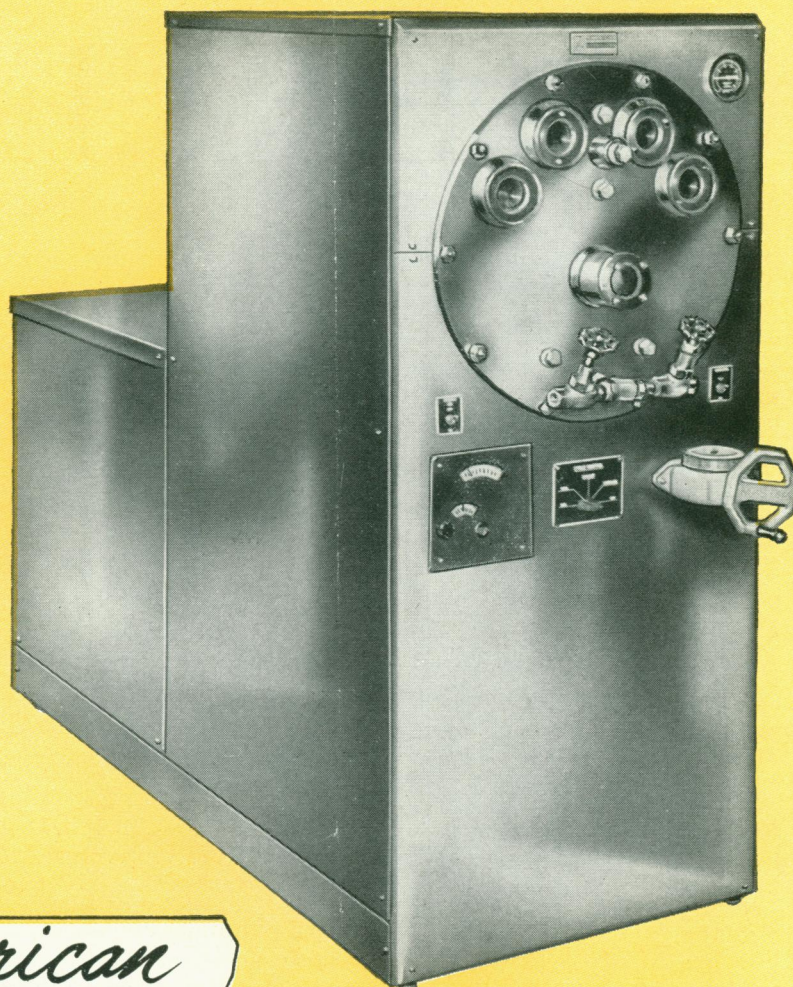


# SCIENCE

22 August 1958

Volume 128, Number 3321

<b>Editorial</b>	Fare Enough .....	385
<b>Articles</b>	Formation of Elements in the Stars: <i>M. and G. Burbidge</i> .....	387
	To build all the elements requires that eight nuclear processes occur as the conditions become ripe.	
	Long-Term Fallout: <i>M. Eisenbud and J. H. Harley</i> .....	399
	A summary of measurements made through June 1957 by the gummed-film network of the AEC is presented.	
<b>News of Science</b>	Excerpts from the Summary and Conclusions of <i>Report of the United Nations Scientific Committee on the Effects of Atomic Radiation</i> ; other events .....	402
<b>Book Reviews</b>	E. A. Hoebel's <i>Man in the Primitive World</i> , reviewed by <i>R. L. Birdwhistell</i> ; other reviews .....	409
<b>Reports</b>	Isolation of Colorado Tick Fever Virus from Rodents in Colorado: <i>C. M. Eklund, G. M. Kohls, W. L. Jellison</i> .....	413
	Taxonomic Implication of Actinophage Host-Range: <i>S. G. Bradley and D. L. Anderson</i> .....	413
	Detection of Ultraviolet Absorbing Spots on Paper Chromatograms by Blueprint Paper: <i>H. T. Gordon</i> .....	414
	Determination of Deuterium Oxide in Water by Measurement of Freezing Point: <i>P. B. Reaser and G. E. Burch</i> .....	415
	Accumulator Plants and Rock Weathering: <i>T. S. Lovering</i> .....	416
	Long-Lived Cobalt Isotopes Observed in Fallout: <i>P. O. Strom et al.</i> .....	417
	Ontogeny of Hemoglobin in the Skate <i>Raja binoculata</i> : <i>C. Manwell</i> .....	419
	Density of the Upper Atmosphere: <i>T. E. Sterne</i> .....	420
	Density Determinations Based on the Explorer and Vanguard Satellites: <i>I. Harris and R. Jastrow</i> .....	420
	Growth Promotion in Pea Epicotyl Sections by Fatty Acid Esters: <i>B. B. Stowe</i> ..	421
	Action of Salicylate on Metabolism of Acetate-2-C <sup>14</sup> in the Rat: <i>M. J. H. Smith</i> ..	423
<b>Departments</b>	Letters; Meetings; Equipment .....	424



## American BIOGEN

### for CONTINUOUS CULTURE OF MICROORGANISMS . . . IN LARGE QUANTITIES

● Biogen is a completely new apparatus which produces extremely large quantities of specific microorganisms quickly, economically and continuously, under well defined conditions.

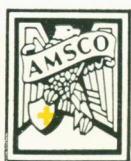
For the first time, vastly increased investigations requiring large populations of microbial cells become fully practical in such diverse fields as Bacterial Physiology, Enzymology, Genetics, Pharmacology, Fermentation Studies, and Virology (including Bacteriophage).

The Biogen is self-sterilizing and has complete controls on the front panel which govern the sterilization cycle, rotation of the multi-

finned agitator and the temperature within the chamber. Chamber temperature is maintained at  $\pm 1/2^\circ$  C. within a range of  $20^\circ$  C. to  $85^\circ$  C. A filtered air intake provides sterile aeration of the medium within the chamber.

In a recent typical run, with *E. coli B* employing 1% glucose as the limiting growth factor, a maximum population of  $1.68 \times 10^{10}$ /ml. was attained. In 10 hours, on a continuous process, at a flow rate of 10 liters/hour, 14 grams/liter of wet weight cells were harvested. Total yield for the 10-hour run: 1400 grams.

Write for technical literature . . . Bulletin IC-605



**AMERICAN  
STERILIZER**

ERIE • PENNSYLVANIA

World's largest designer and manufacturer of  
Sterilizers and Equipment for Biological Research



# The place of the Particle Accelerator in Basic Research...

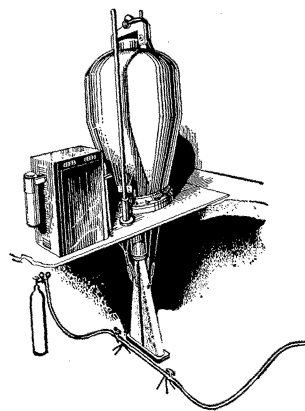
## Radiation Effects in the Gaseous Phase — IX

Widespread study of the effects produced in organic and inorganic gases by high-energy particle bombardment is providing a better understanding of reaction kinetics, revealing new methods for chemical synthesis, and contributing to the new field of missile technology.

### Organic Research

Complex organic molecules have been irradiated at low pressures to determine the number of dissociations per unit-energy input and to measure the lifetime of the resultant ions and free radicals. From such information, one can estimate the most probable location of the dissociation in long-chain hydrocarbons. Locating specific reactive groups at the ends of these chains permits the study of energy transfer along the chain. There is some evidence that random interactions will migrate to a weak molecular bond where chemical reaction occurs. Studies comparing ionic and free-radical mechanisms for energy transfer show that the ionic lifetimes are surprisingly long.

In addition to the gaseous phase alone, heterogeneous systems of gases or liquids and solids have been studied in relation to the catalysis of organic reactions. In such systems, these reactions occur under conditions where the reactive component is highly dispersed on a mineral support. It is believed that the products of the radiolysis of hydrocarbons may be changed under such conditions and the studies are bringing to light new methods of chemical synthesis.



### Inorganic Studies

In the inorganic field, studies of plasmas and gaseous reactions have been carried out by particle bombardment at pressures ranging from thousands of atmospheres down to near vacuum. The understanding of interactions between activated gases and of plasma stability at low ion concentrations is of extreme importance in a number of fields.

Recently, interest has grown in the possibility of using heavy-ion bombardment for producing moderate electron densities in gases to investigate reactions between plasmas and solid surfaces. This is of great importance in the missile field, since these missiles travel with sufficient velocity in the rarified upper atmosphere to produce a surrounding sheath of ions that can react with the missile skin to produce surface damage.

The study of reaction kinetics in gases by means of radiation is contributing to our understanding of industrial chemical processes based on gas-phase reactions. It also appears that

knowledge of gaseous reactions may contribute to our presently incomplete understanding of liquid-state phenomena.

### The Van de Graaff as a Radiation Source

One of the most versatile sources of radiation used in these studies is the Van de Graaff® particle accelerator. It can accelerate electrons, protons, and heavier ions, and it produces intense beams that are very homogeneous in energy and variable over a wide range of energies. Continuous or pulsed operation can also be provided, with pulses ranging in width from millimicroseconds to thousands of microseconds.

The beam intensities produced permit the use of these machines in studies requiring a high yield of reaction products. Because the energy and type of particle can be varied, it is possible to investigate linear energy transfer in a gas. The energy definition, considerably better than that obtainable with any other type of accelerator in the same energy range, and the applicability of pulsing techniques, make the Van de Graaff a precision instrument for the study of chemical reaction kinetics and the lifetime of the reactive components.

*You are invited to visit the HIGH VOLTAGE ENGINEERING exhibit at the 2nd International Exhibition on Peaceful Uses of the Atom, Geneva, Switzerland. On display: a 5.5-Mev Van de Graaff positive-ion accelerator; model of new Tandem Van de Graaff; and photomurals showing uses of HIGH VOLTAGE equipment.*

HIGH VOLTAGE ENGINEERING CORPORATION



BURLINGTON

MASSACHUSETTS