Table 2. Ratio of Specific Activities of Fission Products, at a time 18 months after Fission, calculated from Fission Yield Data for Different Types of Fission

	$\frac{^{95}Zr+^{95}Nb}{^{144}Ce}$	$\frac{^{106}Rh}{^{144}Ce}$	$\frac{^{125}Sb}{^{144}Ce}$	$\frac{^{137}Cs}{^{144}Ce}$	$\frac{^{90}Sr}{^{137}Cs}$
^{235}U n_{th}	0·15	0·07	0·004	0·11	0·93
^{235}U nf	0·17	0·10	0·02	0·13	0·71
^{239}Pu nf	0·17	1·7	0·06	0·17	0·36
^{238}U nf	0·15	0·60	0·08	0·15	0·48
^{238}U n_{14}	0·17	0·95	0·24	0·17	0·51
^{235}U n_{14}	0·19	0·43	0·32	0·16	0·82
Experimental value Feb. 1960	<0·14	0·57	0·36	~0·14	—

n_{th}, thermal neutrons; nf, fission spectrum neutrons; n_{14}, 14 MeV. neutrons.

fugation, the beryllium was precipitated with excess ammonia and mounted on a planchette. The γ-spectrum of this precipitate consisted solely of a line at 0·476 MeV., and was identical with that of a beryllium-7 reference standard. There was no measurable β-activity.

Relative Concentrations of Fission Products

Table 1 gives our observed concentrations in air of fission products associated with atmospheric dust during February 1960. Table 2 gives the relative activities of a number of nuclides eighteen months after fission, computed from published data[3] for different fissile materials and various neutron energies. It should be noted, however, that these ratios may need modification when applied in the case of a nuclear detonation. It will be seen that the ratios rhodium-106 : cerium-144 and antimony-125 : cerium-144 are sensitive to the type of fission process. Taken together, our experimental ratios (Table 2) agree best with the theoretical values for 14 MeV. fission of either uranium-235 or uranium-238, and in particular the high antimony concentrations which we have observed do not appear compatible with data for thermal neutron fission of uranium-235. The 14-MeV. neutrons are unlikely to be produced in a normal fission process, but they could be the result of a fusion reaction.

Concentration of Nuclides produced by Cosmic-rays Relative to Fission Products

Table 1 includes data for non-gaseous cosmic-ray produced nuclides. With the exception of beryllium-7, for which our measurements are quoted, the values are estimated from published concentrations in rainwater[11] on the assumption that the relative amounts in air and in rain are the same as for beryllium-7. It should be noted that the activity of beryllium-7 measured by us lies within the range of values 0·5–15 × 10^{-17} c./litre of air (1–30 atoms per litre) reported in Canada in 1956[12].

Table 3 contains some preliminary measurements of the specific activities of beryllium-7, rhodium-106, and antimony-125 in air samples collected during the early months of 1960. The seasonal rise in the beryllium-7 concentration is well known[12], and it is interesting to note that the fission-product concentrations are changing proportionally. This is demonstrated by the constancy of the ratios of antimony-125 : beryllium-7 and rhodium-106 : beryllium-7 activities.

Table 3. Rhodium-106, Antimony-125 and Beryllium-7 Concentrations in Air Samples

Mean collection date	Specific activity at time of collection in 10^{-17} c./litre			$\frac{^{106}Rh}{^{7}Be}$	$\frac{^{125}Sb}{^{7}Be}$
	^{7}Be	^{106}Rh	^{125}Sb		
2/1/60	1·4	0·26	0·12	0·19	0·09
30/1/60	1·6	0·24	0·18	0·15	0·11
18/2/60	2·2	0·41	0·27	0·19	0·12
4/3/60	3·4	0·48	0·32	0·14	0·09

It is noteworthy that by the beginning of 1960 the specific activity of fission products in the air at ground-level has fallen to a value comparable with that of naturally produced beryllium-7. The presence of beryllium-7 and antimony-125 complicates the estimation of the absolute amount of rhodium-106.

We wish to express our appreciation of the guidance and encouragement of Prof. W. V. Mayneord, in whose laboratories the work was carried out. We also wish to thank Dr. D. M. Taylor for help in preparing reference standards.

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OBITUARIES

Dr. O. J. Silberrad

The thinning ranks of those British chemists who were trained in Germany before the First World War were further diminished on June 17 by the death of Dr. Oswald John Silberrad at his home at Dryads' Hall, Loughton, Essex, at the age of eighty-two.

Silberrad was educated at Dean Close Memorial School, Cheltenham, the City and Guilds Technical College and the University of Würzburg. In 1902, at the early age of twenty-four, he became the first superintendent of the Chemical Research Department at Woolwich, which was under the ægis of the War Office. The new Department could claim to be the first to be created on modern lines specifically for armament research, although the Government organization that is now the Chemical Inspectorate had from its inception, half a century before, concerned itself with research into materials and explosives as well as with its primary function of inspection, and there was also a military experimental establishment concerned with ballistics.

The next four years were busy ones for the young superintendent. He went to Germany to study the comparable organizations there and designed the new laboratories and other equipment. He gathered a small but enthusiastic staff around him, including as his chief assistant and deputy Dr. R. C. Farmer, a fellow student at Wurzburg who, with Dr. Godfrey Rotter (later director of explosives research in the establishment) and Dr. Harold Moore (later director, British Non-Ferrous Metals Research Association), among the seniors, survives him.

This period saw not only the discovery of tetryl and of the means of causing lyddite to detonate effectively in shell (it had conspicuously failed to do this in the Boer War), but also the introduction of T.N.T. into the Service and research into flashless and smokeless propellants and into steels for guns, shells and armour.

Silberrad reported to the Explosives Committee of the War Office, the chairman of which was Lord Rayleigh. In 1906, this Committee was disbanded, and in the same year Silberrad resigned, to become for the rest of his career a consulting research chemist and director of the Silberrad Research Laboratories. Had he remained in Government service, where he was such a distinguished pioneer of modern 'conventional' armaments research, there is no doubt that high office and honours could have been his.

His connexion with the armaments field was not, however, completely severed by his resignation, for in 1908 he was instrumental in providing the Admiralty with a special alloy capable of resisting the erosion suffered by the propellers of high-speed turbine-driven warships. Because of this erosion, the future of such vessels and liners had appeared somewhat problematical. Also, in conjunction with the firm of Hotchkiss, he worked on erosion-resisting steel for guns. Then, in the First World War he was honorary consulting chemist to the Ministry of Munitions. An outstanding achievement of this period was the successful process for manufacturing large charges of lyddite in iron instead of earthenware vessels. This enabled an improved synthesis, requiring a higher temperature than was practicable with the original method, to be used. He also turned his attention once more to flashless propellants and developed one for use in large howitzers.

Silberrad was a brilliant experimenter, and among other achievements of his fertile brain were a new chlorinating agent; a method of manufacturing isoprene; a new means of blasting petroleum wells; and the production of dyestuffs from T.N.T. residues.

I have very pleasant memories of a visit paid to Dryads' Hall and its adjoining laboratory in 1953, when I was collecting material for an article in connexion with the golden jubilee of Silberrad's old establishment, which by then had become the Armament Research Establishment of the Ministry of Supply. I was most hospitably and kindly received by Dr. and Mrs. Silberrad and given access to many old photographs and exhibits, over the assembly of which much trouble had been taken. This first, and unfortunately the last, personal contact with Dr. Silberrad left an impression of a man of intense mental vigour, drive and alertness, in spite of his seventy-five years and the fact that at the time he had not fully recovered from an attack of thrombosis.

Mrs. Silberrad survives her husband, with the only son of the marriage.

J. S. Grew

Dr. Eric Ellenbogen

Dr. Ellenbogen was born in Vienna in 1921 and emigrated to the United States in 1940. He received his B.S. degree in chemistry from Indiana University in 1943. During 1943–46 he served with the United States Army in India and Burma. After his discharge, he studied at the Brooklyn Polytechnic Institute, working on inorganic plastics. In 1946 he entered Harvard University, received his M.A. in 1947 and his Ph.D. in 1949 under the guidance of Dr. J. L. Oncley. His dissertation dealt with the determination of the physical-chemical properties of insulin. From 1947 until 1949 he was a teaching assistant in the University Laboratory of Physical Chemistry Related to Medicine and Public Health, Harvard University. He was awarded a U.S. Public Health Service Postdoctorate Research Fellowship in 1949, which he held until 1951 in the Department of Biochemistry, Columbia University College of Physicians and Surgeons, under the sponsorship of the late Dr. E. Brand, studying the properties of tri- and tetrapeptides of specific steric configurations. In 1951 he was appointed research associate in the Department of Biochemistry and Nutrition, Graduate School of Public Health, University of Pittsburgh, and was promoted to assistant professor in 1952 and associate professor in 1957.

In 1959 he took leave from his post at the University of Pittsburgh to travel to the Weizmann Institute at Rehovot, Israel, to study with Prof. E. Katchalski, doing research on physical properties of certain polypeptides as models for certain proteins of biological significance. On the way back from the Weizmann Institute to the United States, Dr. Ellenbogen died of a coronary occlusion in Marseilles on May 29, 1960. He is survived by his wife Lois and two children.

He belonged to several American and British learned societies. His contributions to biochemistry include the study of the physical-chemical behaviour of insulin in dilute solution, the physical chemistry of specific polypeptides, the isolation of a non-insulin hypoglycæmic factor from pancreas, and the physical-chemical characterization of cardiac myosin.

Robert E. Olson

Prof. Eduard Reichenow

Eduard Reichenow, the eminent German protozoologist, died on March 23 in his seventy-seventh year. He was born in Berlin and was the product of a race versed in the natural sciences: his father, Anton, was a well-known ornithologist; his grandfather, Cabanis, a zoologist of note. He himself married Lilly Mudrow, of international fame in the field of malariology and who collaborated with him in his later work on avian malaria; her death three years ago cast a cloud over his life from which he was scarcely able to emerge.

Reichenow was educated at Schiller-Realgimnasium in Charlottenburg; later he entered the Universities of Heidelberg, Berlin and Munich, where he graduated in natural science.

He was associated with the Institute of Tropical Medicine, Hamburg, for most of his academic years, first as a student, for many years as director of its Department of Protozoology, and finally as its president. He travelled extensively in the pursuit of his work, and some of these journeys produced results of great scientific value—the discovery of malaria parasites in gorillas in the Cameroons, the