distance along the axis of the field, and M is the magnetic moment induced in the ferromagnetic cyclinder by the field H. If M is roughly proportional to μH, where μ is the permeability of the cylinder, then $F\propto \mu HdH/dX$. Consequently, it is possible to adjust H and dH/dX so that F varies very slowly with height. This has been done by proper shaping of the field of the solenoid and by supporting the ferromagnetic cylinder well below the solenoid. Also in some experiments an additional solenoid with a constant current was used to support a portion of the weight of the suspended body.

When the apparatus is properly adjusted, the suspended body shows no motion, as viewed through a microscope focused on scratches on the suspended cylinder except when a vertical force is applied to the suspended cylinder. Consequently, the elevation of the suspended cylinder in the field of view of the microscope is a measure of the applied force. However, it is preferable in practice to measure the change in the current or voltage in the circuit as a function of the vertical force on the suspended cylinder. With a suspended steel cylinder 10 mils in diameter and 50 mils long, changes in force on the cylinder of the order of 10^{-9} gram weight could be observed. The balance was calibrated by suspending the cylinder in a glass chamber which could be evacuated and then determining the change in buoyancy of the air on the suspended body when the air pressure around the body was varied.

The above magnetic suspension balance may be used in almost any experiment where small changes in mass or force are to be determined. It is especially suited to experiments where the weighing must be carried out in an evacuated or enclosed chamber, under a transparent liquid, etc., where no mechanical connections to the outside are possible. Also the same apparatus may be used to support and weigh over a wide range of masses or forces.

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Preparation of Transplutonium Isotopes by Neutron Irradiation

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THE first production of isotopes of the transplutonium elements americium (atomic number 95) and curium (atomic number 96) was reported[1] by the present authors in a preliminary way in 1945 and more recently[2] in a more complete fashion. In these communications it was pointed out that a number of americium isotopes can be formed in cyclotron bombardments with various charged particles, and in particular that the ~500-yr. Am^{241} can be produced with approximately 40-Mev helium ions according to the reactions $U^{238}(\alpha,n)Pu^{241}\xrightarrow{\beta^-\ (10\ \text{yr.})}Am^{241}$. It was also reported that a number of curium isotopes can be formed by cyclotron bombardments with charged particles and in particular that the ~150-day Cm^{242} can be prepared by the 40-Mev helium ion bombardment of Pu^{239} according to the reaction $Pu^{239}(\alpha,n)Cm^{242}$. In addition it was stated that Cm^{242} can be formed by neutron irradiation of Am^{241} according to the reactions $Am^{241}(n,\gamma)Am^{242}\xrightarrow{\beta^-}Cm^{242}$ where Am^{242} exists in two isomeric states with half-lives for beta-emission given as 17 hr. and some 10^2 to 10^3 yr.

The purpose of the present note is to point out that the isotope Am^{241} can also be formed by neutron irradiation, according to the following reactions $Pu^{239}(n,\gamma)Pu^{240}(n,\gamma)Pu^{241}\xrightarrow{\beta^-\ (10\ \text{yr.})}Am^{241}$. This method of production was first observed by the authors late in 1944, and the use of the chain reacting piles as a source of neutrons makes it the best for the production of weighable amounts of Am^{241}. (The first evidence for the reaction $Pu^{239}(n,\gamma)Pu^{240}$ was that of Chamberlain, Farwell, and Segrè.[3]) In fact, the intense irradiation of large quantities of plutonium leads to the production of *milligram amounts* of Am^{241}. The cross section of Am^{241} for the n,γ-reaction is such that it is possible with long irradiations at high neutron fluxes to transmute a substantial fraction of it to Cm^{242}.

The fact that the elements americium and curium, as represented by their isotopes Am^{241} and Cm^{242}, can be prepared in substantial quantity in this manner by pile neutron irradiations makes it possible to investigate rather completely the chemical properties of these elements by use of weighable amounts. The existence of these reactions makes it quite likely that even higher mass isotopes can be prepared by n,γ-reactions, and in fact further work at this laboratory, to be published soon, indicates that this is indeed the case.

This work was performed at the wartime Metallurgical Laboratory, University of Chicago, Chicago, Illinois (now the Argonne National Laboratory) under the auspices of the Manhattan District, and at the Radiation Laboratory and Department of Chemistry, University of California, Berkeley, under the auspices of the Manhattan District and the AEC.

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The Elastic and Photoelastic Constants of Fused Quartz

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EVEN though numerous investigations have been carried out on the various physical properties of fused quartz, the only known work on its photoelastic properties is that of Heymans and Williams,[1] who have determined the value of $(p-q)$ from bending experiments on a bar of fused silica, p and q being Neumann's strain-optical constants. In the present investigation the absolute values of p and q have been determined, and the results obtained are given below. The details of the method adopted will be published elsewhere.[2] The specimen studied was obtained from the Thermal Syndicate Ltd., England, and was in the form of a rectangular block of dimensions 2.7×1.6×0.85 cm.

The elastic constants of fused quartz were determined by Hiedemann's method;[3] i.e., by observing the diffraction patterns produced by standing ultrasonic waves in the medium itself. Mueller[4] has shown that this method, with slight modifications, can be used to determine the value of p/q for isotropic substances. Using incident light polarized at 45° to the sound wave front, the light diffracted by the longitudinal waves is viewed through an analyzer. Then the analyzer is rotated through an angle θ, from the initial crossed position, to get the extinction of the first-order longitudinal pattern. By plotting the angle θ against the sound amplitude and extrapolating, it is possible to obtain "$\theta_{\max}$" corresponding to zero amplitude, which is given by the relation [Eq. (25) of reference 4]

$$\tan(\theta_{\max}+45°)=p/q.$$

By this method the value of p/q for fused quartz was determined by the author and was found to be 2.85.