A field of 10^{-12} gauss would have several interesting effects. Its value agrees with the 10^{-11} to 10^{-13} gauss which Alfvén has assumed[3] to confine most of the observed cosmic rays within the galaxy. Protons and electrons from outside the galaxy could not reach the galactic plane near the sun unless their energies exceeded about 10^{13} electron volts. The rotation of the galaxy in this magnetic field would produce a slight separation of electrical charges, with a resultant radial electrical field of about 10^9 volts per 1000 parsec.; this field would cancel the magnetic force on a charge revolving in a circular orbit around the galactic center. Since the interstellar ions have thermal motions superimposed on their revolution about the galactic center, their paths relative to axes rotating with the galaxy would be curved by the magnetic field; at a mean thermal velocity corresponding to about 10,000°K, the radii of curvature for electrons and protons would be 0.2 and 8 astronomical units, respectively. The rotation of interstellar clouds containing ionized gas would tend to be slowed down by the eddy currents generated, thus facilitating the formation of stars. While these effects require further study, there is little question but that the possible presence of a galactic magnetic field must be taken into account in discussions of interstellar phenomena.

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Discovery, Identification, and Characterization of 2.8*d* Ru^{97}*

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DURING the course of a series of investigations, which sought to disentangle many inaccuracies concerning the mass and element assignments of radioactive isotopes of Ru and Rh, a new Ru activity was discovered.

The observation of this isotope was made possible by examining deuteron and neutron-bombarded Ru samples after decay of the 4.5*h* Ru^{105} (i.e., formation of 36.5*h* Rh^{105} daughter activity) was practically complete (76 hours after bombardment) and after purification of Ru by distilling it as RuO_4 from fuming $HClO_4$ solution. This Rh-free Ru fraction showed a complex decay and graphical resolution of the decay curve gave 42*d* and ~3 day components. The 42*d* activity was shown in other experiments to be a Ru isotope, identical with the 45*d* Ru produced in fission.[1,2]

The characterization of the half-life and radiations of this short-lived activity was accomplished by using differential absorption-decay curve techniques. In these experiments, two families of decay curves, which used 25 different thicknesses of Al (from 0 added absorber to 1.51 g/cm² Al) and 8 different thicknesses of Pb (from 0.161 g/cm² Pb to 3.96 g/cm² Pb), were measured for a period of about 80 days. Each of the 33 decay curves was plotted and graphically analyzed into a 42*d* and a short-lived component. The average half-life value of the short-lived component was found to be 2.8 ± 0.3 days.

By plotting an isochron*** from data for the 2.8*d* activity and resolving this absorption curve into its components, intense $18._2$ kev x-rays (150 mg/cm² Al half-value thickness) weak 0.2 Mev electrons (6–7 mg/cm² Al initial half-value thickness, 40–60 mg/cm² Al range), and 0.23-Mev gamma rays (0.9 g/cm² Pb half-value thickness) were found to be present. The relative intensities of these three types of radiation at zero added absorber (~20 mg/cm² total absorber) were 26:24:6.

The assignment of this isotope to mass 97 was based on the following considerations. By slow neutron activation only radio-isotopes Ru^{97}, Ru^{103}, and Ru^{105} would be produced. The 4.5*h* Ru→36.5*h* Rh decay chain, which was formed in slow neutron and deuteron-irradiated Ru and which was found to emit only negatrons, was assigned to mass number 105, since no other mass assignment would permit chain decay by negatron emission. The assignment of the 42*d* isotope to mass number 103 was based; (1) on Livingood's observation[3] that a 46*d* activity in deuteron-bombarded Ru emitted only negatrons; (2) on our observation that these negatrons were nuclear beta-radiations; (3) on arguments concerning the observed gamma-ray intensity ratio, $I_{2.8d/42d}=\sim 2$, at the end of bombardment. Using the assumption that the activation cross sections for Ru^{96} and Ru^{102} did not differ greatly and that the bombardment time was effectively "indefinitely short," it was found that the observed and predicted ratios were in much closer agreement for the assignments 2.8*d* Ru^{97} and 42*d* Ru^{103}, than for the assignments, 42*d* Ru^{97} and 2.8*d* Ru^{103}.

From the foregoing facts, observations, and deductions, the most probable decay process for Ru^{97} appeared to be *K* capture since the x-ray/γ-ray ratio of ~4 and the presence of low energy electrons (~0.2 Mev) pointed to partial conversion of the 0.23 Mev γ-ray rather than low energy positron emission, which could be the alternate mechanism. Also, the $18._2$ kev x-ray energy corresponded to that expected for element 43 formed by *K* electron capture in Ru.

A search for the daughter 43 activity of the 2.8*d* Ru^{97} did not give conclusive results since 42*d* Ru^{103} contaminated the element 43 fraction, isolated as the tetraphenyl arsonium salt. However, the data indicated 43^{97} must be long-lived and from absorption measurements in a windowless counter there was evidence that a very soft beta-ray was present. It was considered likely that this radiation was due to the 0.097-Mev electrons from the 90*d* isotope discovered by Cacciopuoti.[4]

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*** The term, isochron, as used here, may be defined as an absorption curve obtained at any specified time from a family of decay curves through selected absorbers.

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