der Schicht und den Austrittsprozeß der Elektronen aus der Schicht ansehen. Letzterer wird vermutlich nicht mit der temperaturbedingten Erhöhung der Quantenausbeuten in Verbindung gebracht werden können. Weiter könnte, wenn die Erhöhung der Emission durch eine Änderung des Ablösungsmechanismus verursacht wäre, dies nur durch Erhöhung der Anregungswahrscheinlichkeit möglich sein, was eine Erhöhung der Absorption wie beim Excitonenprozeß bedingen würde. Vorläufige orientierende Messungen im kritischen Temperaturbereich haben gezeigt, daß die Absorption der Durchsichtkathode sich nicht wesentlich erhöht, daß also keine Resonanz des Anregungsprozesses vorliegen dürfte. Eine Änderung von Vorzugsrichtungen des Anregungsprozesses könnte sich in Polarisationsmessungen [6] bemerkbar machen; eine Messung bis 100 °K zeigte allerdings — wie hier nur kurz berichtet sei — an den Multialkalikathoden keine Änderung der Polarisationsausbeuteverhältnisse, wobei jedoch eine genauere Untersuchung des kritischen Temperaturbereiches zwischen 110° und 130 °K noch aussteht. Wenn der Ablösungsmechanismus in dem kritischen Temperaturbereich stark temperaturabhängig wäre, so würde die Vermutung verstärkt, daß die lichtelektrische Anregung in der Kathode ein mit Phononen verknüpfter Mehrteilchenprozeß ist [6]. Die Phononenverteilung dieses Bereiches würde dann eine resonanzartige Begünstigung dieses Prozesses ergeben.

Es könnte aber auch möglich sein, daß die Erhöhung der Quantenausbeute in dem kritischen Temperaturbereich durch eine Herabsetzung der Energieverluste der angeregten Elektronen in der Kathode bewirkt wird. Es kann angenommen werden, daß in ähnlichen Betrachtungen wie der Transporttheorie die hauptsächlichsten Energieverluste der Elektronen durch Streuungen an Phononen entstehen. Eine derartige resonanzartige Ausschaltung des Streuprozesses würde auch für andere Festkörperfragen von Interesse sein.

Die kürzlich mitgeteilten [1] und die hier vorliegenden Ergebnisse sind vorläufiger Art. Wir behalten uns vor, demnächst eine ausführliche Veröffentlichung über das Gesamtgebiet zu bringen.

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Radiation Ages of Chondrites

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The concentrations of tritium and of all the isotopes of helium, neon, and argon have been determined in some chondrites. The technical procedures have been described briefly in previous publications [1, 2]. The results pertinent to this note are summarized in table 1. The amount of Ramsdorf available was not sufficient for a tritium measurement. Our rare gas results agree reasonably well with those of Goebel et al. [8].

Radiation ages are calculated from He^3/H^3 ratios, assuming equal direct production rates for tritium and helium-3. He^4 and A/K ages are estimated on the basis of the average contents of the elements uranium, thorium, and potassium in chondrites which are $U = 1.1 \cdot 10^{-8}$ g/g [3], Th/U = 3.6 [4], and K = 0.085% [5, 6]. These ages are given in table 2, together with those from chondrites for which He^3/H^3 radiation ages have been published before [1, 7, 8]. The results from Abee by Begemann et al. [9] are not included here, as this stone is an achondrite according to Urey and Mayeda [10].

In the histogram (Fig. 1) we have distinguished between two groups of chondrites: those with high and those with low radioactive He^4 and A/K ages. It is remarkable that all the chondrites belonging to the first

	Benton	Kandahar	Mezel	Ramsdorf
H^3 dpm/gm	0.62	0.48	0.42	—
$He^3 \times 10^8$ cc STP/gm	48.5 ± 1.0	41	7.8 ± 0.1	6.55 ± 0.15
He^4 cc STP/gm	1220 ± 40	1150	340 ± 10	145 ± 6
Ar^{40} cc STP/gm	4450 ± 250	6200	2750 ± 150	160 ± 20

Table 1. Tritium and rare gas isotope contents in some chondrites.

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	year of fall	He^3/H^3 age m. y.	He^4 age m. y.	A/K age m. y.
Monte das Fortes[1]	1950	23.6	4000	—
Elenovka[1,11]	1951	23.6	4100	4000
Breitscheid[7,12,13,14]	1956	22.1	2600	3300
Benton	1949	20.0	3600	3800
Kandahar	1959	21.8	3500	4300
Mezel	1949	4.7	1300	3100
Ramsdorf[8]	1958	3.4	400	370
Kunashak[1,11]	1949	2.8	400	700

Table 2. He^3/H^3 radiation ages of chondrites.

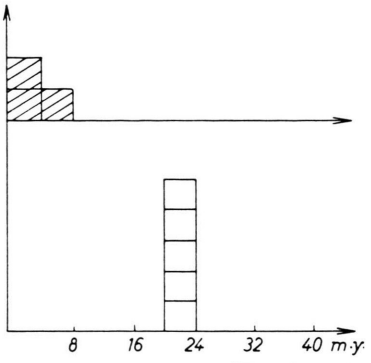

Fig. 1. He^3/H^3-Ages of Chondrites. □ He^4-Age $> 2 \cdot 10^9$ yrs; ▨ He^4-Age $< 2 \cdot 10^9$ yrs.

group give He^3/H^3 radiation ages of 22 ± 2 million years. This strongly implies that many of the chondrites arriving at the earth were created in a single break-up process about 22 million years ago *.

The strong correlation between low radioactive rare gas ages and low radiation ages can be explained best by rare gas losses from these meteorites during the time between the break-up process and the collision with the earth. Therefore, the low radiation ages of the three chondrites of the second group are not necessarely representing break-up times.

It can be seen from Fig. 2, that in the group of chondrites which does not exhibit rare gas losses the He^3 content rises with the H^3 content. This shows that the knowledge of the degree of shielding from the measurement of H^3 or other radioactive spallation products is important in order to prove the existence of this line in the spectrum of radiation ages of chondrites. In fact, radiation ages calculated under the assumption of a constant He^3 production rate would give a standard

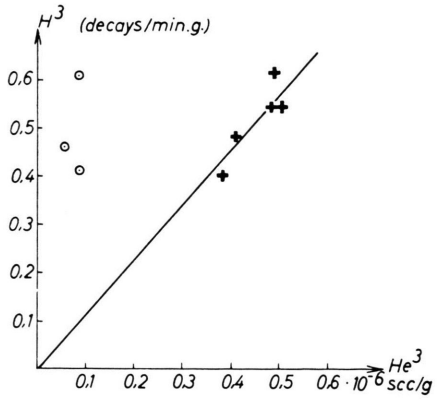

Fig. 2. H^3 versus He^3 Content in Chrondrites. + He^4-Age $> 2 \cdot 10^9$ yrs; ○ H^4-Age $< 2 \cdot 10^9$ yrs.

deviation of 11%, whereas the radiation ages from He^3/H^3 ratios give a standard deviation of 6%.

A substantial number of He^3-measurements on chondrites has been published [15–19]. Again low radioactive rare gas ages are correlated with low He^3-contents. Assuming some average production rat for He^3 (1 Atom/min. gm.) one would arrive at figures between 10 and 30 m. y. for the radiation ages of most of the chondrites with high radioactive rare gas ages. It is quite possible that this distribution would be narrowed considerably if radiation ages could be obtained from He^3/H^3 ratios, just as it is the case with chondrites for which tritium contents are known. However, in some cases (for instance BEARDSLEY [18] or NADIABONDI [19]) the He^3 contents are so much different from the average that radiation ages close to 22 m. y. cannot be expected for these falls, unless there exist much larger variations in production rates than those known from tritium determinations up to now.

In spite of the limited number of individual measurements, it is statistically very unlikely that the 22 m. y. radiation age peak will disappear when He^3/H^3 radiation ages are measured on a much larger number of chondrites. We think, therefore, that the existence of this peak points toward a particular event in the history of the planetary system.

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* The numerical value of the age of this event may be subject to a limited correction if the assumed production ratio of He^3 and H^3 would have to be modified due to future target results.

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