co-regulated with endogeneous *rp* genes; instead excess L25 is synthesized, which in turn may block further translation of its own message. A link between nucleolar activity and *L25* gene expression is provided by a homologous sequence present in 26S rRNA and L25 messenger RNA, either of which can bind the L25 protein.

The yeast system has similarities with the regulation of expression of rpL1 in *Xenopus* (Beccari). Accumulation of L1 resulting from an increase in *L1* gene dosage by microinjection into oocytes, leads to blocking of the removal of introns from the *L1* gene transcript. A regulatory sequence is again implicated, here located in the introns of the *L1* gene transcript and in 28S rRNA. Binding of excess L1 to its own gene transcript would effect autogenous regulation by blocking processing and hence further production of L1 until it is removed by binding to rRNA.

In the nucleolus, the predominant proteins are neither transcription factors nor individual rps. Of particular interest are the silver-staining phosphoproteins with relative molecular masses around 100K. Their amino-acid sequences, derived from protein chemistry (H. Busch, Baylor College, Houston) and cDNA sequencing (M. Caizergues-Ferrer, CNRS, Toulouse), contain conserved functional domains. One, rich in glutamic and aspartic acids, is thought to interact with chromatin; another, rich in glycine and dimethylarginine, is found in various RNA-binding proteins. Because they are only transiently associated with rRNA gene transcripts and are located in the inner fibrillar regions of the nucleolus, these proteins seem to be involved in relatively early stages of rRNA processing.

A completely different acidic nucleolar protein of 40K (B. Hügle, DKFZ, Heidelberg), associated with preribosomal particles in the cortical granular component of nucleoli and with the nucleoplasmic 65S precursor of the ribosomal large subunit, seems to be functional later. As it is never found outside the nucleus, its primary function seems to be the transport of preribosomal particles. Another important difference is that the silver-staining proteins, together with RNA polymerase I, remain associated with the NOR during mitosis whereas the 40K protein is distributed with some ribosomal protein over the entire surface of the chromosomes. Other nucleolar proteins are distributed into the cytoplasm during mitosis.

Obviously the mechanisms involved in bringing these dispersed components together to construct new nucleoli require much further study. One way into the problem might be to create novel NORs by microinjecting cells with recombinant plasmids containing rRNA genes that would fuse and integrate into chromosomal sites. This approach might also tell us whether intranuclear positioning is important — does the NOR have to be brought into close association with the nuclear envelope before nucleolar development can proceed? □

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100 years ago

The fresh-water mussel closes its shell by contraction of two strong muscles — one before and one behind; but how does it open its shell? This has recently been studied by Herr Pawlow. The animal was fixed on a board by one shell, while the other shell was connected by a silk thread with the short arm of a lever, the longer arm of which indicated the movements on a slowly-rotating drum. . . there are two classes of nerve-fibres connected with the muscles — the one motor, producing contractions; the other inhibitory, producing relaxation.

From *Nature* **33** 106, 3 December 1885.

Meteorites

Siderophile-enriched sediments and meteoritic debris

from Richard A. F. Grieve

Low sedimentation rates make deep-sea sediments a relatively rich depository for the extraterrestrial materials that bombard the Earth. F. T. Kyte and D. E. Brownlee (*Geochim. cosmochim. Acta* **49**, 1095; 1985) give details of an important find of meteoritic debris in the Antarctic Basin, which provides evidence that sediments chemically enriched in siderophile elements, those elements that tend to concentrate with iron, are associated with meteoritic material. This discovery, initially reported in *Nature* (**292**, 417; 1981), clearly demonstrates that large impact events can produce siderophile-enriched sediments, the postulated explanation for the origin of the iridium anomaly found at the Cretaceous–Tertiary boundary.

Siderophile elements, which include cobalt, nickel, iridium and platinum, occur preferentially with native iron. As a result, they are relatively depleted in the Earth's crust and concentrated in the core. Certain meteorites, however, are relatively rich in siderophiles, and local enrichments in siderophiles have been found in so-called impact melt rocks associated with some terrestrial meteorite impact structures. It had been suggested that siderophile-enriched sediments could also result from the presence of meteoritic material but until now no direct association of siderophile-enriched sediments and meteoritic material had been observed.

The meteoritic material was discovered in two piston cores, recovered from water approximately 5 km deep at sites 120 km apart, at 57°00′S, 89°12′W and 57°47′S, 90°48′W. Palaeomagnetic stratigraphy indicates that the meteoritic debris is from an event that took place in the late Pliocene, 2.3 Myr ago. A search in contemporaneous sediments recovered from the North Pacific sea floor has failed to detect an equivalent siderophile anomaly. Although the exact spatial distribution of the Antarctic debris is unknown, the event was clearly not global in scale, unlike the event thought to have occurred at the Cretaceous–Tertiary boundary.

The estimated infall of meteoritic material in one of the Antarctic cores is about 100 mg cm^{-2}. This rivals the most recent estimate of the average global outfall of meteoritic (chondritic) material of about 140 mg cm^{-2} at the Cretaceous–Tertiary boundary by F.T. Kyte, J. Smit and J.T. Wasson (*Earth planet. Sci. Lett.* **73**, 183; 1985). In this core, enrichments in the siderophile element iridium are obviously correlated with the meteoritic material and reach a maximum of approximately 5 ng g^{-1}. This is roughly an order of magnitude less than the maximum values reported for the Cretaceous–Tertiary boundary at Caravaca, Spain. Variation in the relative abundances of siderophiles is a geochemical characteristic of various meteorites and the difference indicates that the Antarctic projectile differed in composition from that postulated to have caused the Cretaceous–Tertiary iridium anomaly.

Because the Antarctic debris is of relatively coarse-grained nature, with particles up to several millimetres in diameter, the type of projectile can be identified with some confidence. Three types of particle have been recovered: vesicular glasses; brecciated and shocked basalt; and Fe–Ni metal. Most of the iridium is in the vesicular particles, which make up more than 90 per cent of the recovered particles and contain about 150–200 ng iridium per gram. The vesicular particles have some textural similarities to meteor ablation spheres but their composition is similar to that of basalt. The identifiable basalt particles consist primarily of the minerals plagioclase and pyroxene and are often enclosed in vesicular material. The basaltic particles could originate either from projectile material or from ocean-floor basalts. Although no chemical analyses are presented, it is clear from the mineral chemistry, particularly the manganese content of the pyroxenes, that they represent material from the group of meteorites termed basaltic achondrites, probably of the howardite type.