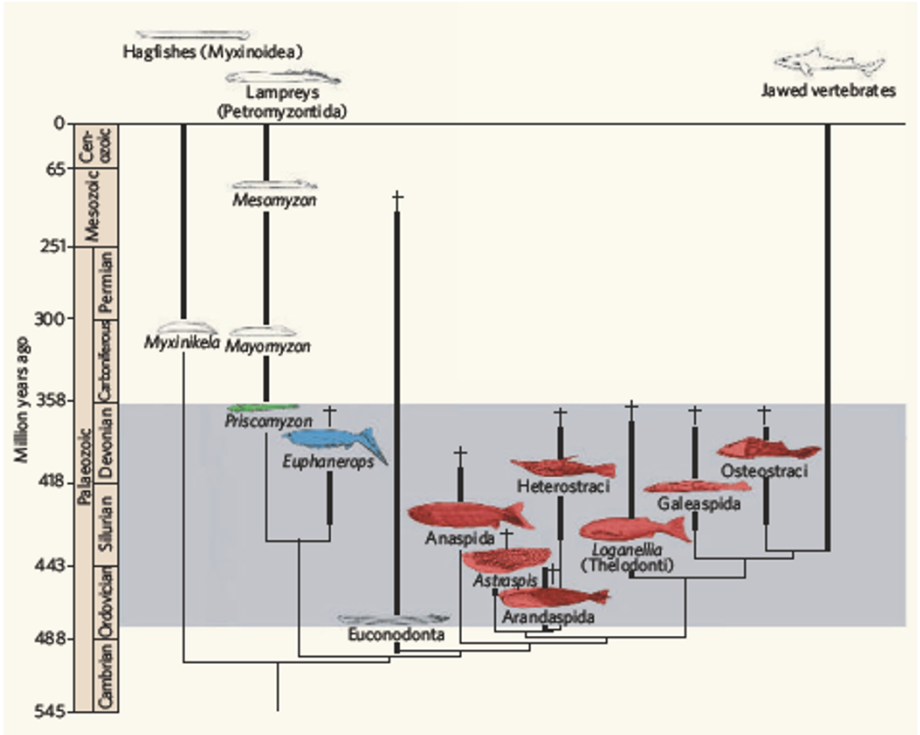

Figure 1 | Vertebrate tree. Lampreys and hagfishes are the only two living groups of jawless vertebrate. The 360-million-year-old lamprey *Priscomyzon* (green) discovered by Gess *et al.*[1] is very similar to modern lampreys, even though it dates from the twilight age (grey area) of the armoured jawless vertebrates (known as ostracoderms, in red) that were once considered to be ancestors of hagfishes and lampreys[2,15]. The evolutionary tree now proposed by Gess *et al.* (simplified version shown here; crosses indicate extinction dates) agrees with the current consensus that ostracoderms are more closely related to jawed vertebrates than to lampreys or hagfishes[1,7–9,12,14]. This suggests that living jawless vertebrates and their forerunners never developed an extensive bony skeleton[14], and that their origin must lie among early Palaeozoic jawless vertebrates that lacked scales and bone, such as *Euphanerops*[1,13] (blue).

or anaspids[2] (Fig. 1). The evolutionary divergence of the two cyclostome groups from each other was regarded as relatively recent, possibly occurring during the Mesozoic period 251–65 Myr ago. So the subsequent discovery of 300–330-Myr-old fossil lampreys and hagfishes from the Carboniferous period came as a surprise[3]. These fishes are exceptionally preserved as soft-tissue imprints and are almost identical to their modern successors. Nevertheless, there remained a gap of at least 35 Myr between these early cyclostomes and their previously supposed ancestors from the Devonian period, during which time they could have evolved by losing their mineralized skeleton.

But Gess and colleagues' fossil lamprey[1], *Priscomyzon*, actually dates from the late Devonian period. *Priscomyzon* shows characteristic lamprey features, such as a grotesquely large sucker armed with horny teeth that surrounds the mouth, and a basket-like gill skeleton. This shows that lamprey morphology has been astonishingly stable for 360 Myr, and proves that lampreys and hagfishes had already diverged by late Devonian times, earlier than previously thought. Admittedly, *Priscomyzon*, like the Carboniferous lampreys, differs from its modern equivalents in minor details; compare this with the recently described 125-Myr-old *Mesomyzon*[4], the first Mesozoic lamprey, which would probably go unnoticed in a present-day brook (Fig. 1). The large sucker of *Priscomyzon* suggests that, like some modern-day lampreys, it could fasten on to other fishes and suck their blood. Yet only 19 living lamprey species (out of 38) feed this way[5]. Other lampreys mainly use their sucker to either secure themselves while at rest or carry stones for nest building.

The relationships between living hagfishes, lampreys and jawed vertebrates are hotly debated, because of conflicting distributions of morphological and physiological traits on the one hand, and of DNA and RNA sequence data on the other. The morphological and physiological aspects suggest that lampreys (but not hagfishes) are the sister group of jawed vertebrates[1,3,6–9], whereas gene sequences generally suggest that lampreys and hagfishes are sister groups[10,11]. Fossils sometimes help to resolve such conflicts, by revealing combinations of traits in an extinct species that better support a particular relationship. Frustratingly, *Priscomyzon* does not help in resolving the problem of lamprey relationships, because it provides no new informative combinations of characteristics compared with post-Devonian and extant lampreys.

Morphology-based evolutionary trees of living and fossil vertebrates have long been prone to change. The tree diagrams yielded by computer programs since the early 1990s

50 YEARS AGO

Graduate Employment: A Sample Survey — The desirability of information of this kind has been recognized ever since 1946, when the Barlow Committee's Report on Scientific Man-power sowed the seeds for what has become a widespread concern about Britain's chronic shortage of scientists and engineers; about the deleterious effect of the shortage on our national position; about the scarcity of teachers of science and mathematics; and about the failure of our educational system to weave into the pattern of general culture an appreciation of scientific matters and more important, an awareness of the incredible speed with which their influence over human affairs is growing.
From *Nature* 27 October 1956.

100 YEARS AGO

"The recent radium controversy" — I was absent from Montreal during the time of the interesting discussion which appeared in the *Times*... In the course of this discussion some weight has been attached to a remark in the second edition of my book "Radio-activity" *viz.* that radium is a compound of helium and lead... Lord Kelvin quite correctly quotes my words, but I feel that the statement is liable to leave an erroneous impression of my views on the question... At the risk of being somewhat lengthy, I should like to quote fully some statements made in my book... "If the α particle is a helium atom, at least three α particles must be expelled from uranium (238.5) to reduce its atomic weight to that of radium (225). It is known that five α particles are expelled from radium during its successive transformations. This would make the atomic weight of the final residue 225 − 20 = 205. This is very nearly the atomic weight of lead, 206.5. I have for some time considered it probable that lead is the end or final product of radium." ... I think that the above quotation makes my position clear on this subject. E. Rutherford
From *Nature* 25 October 1906.

50 & 100 YEARS AGO