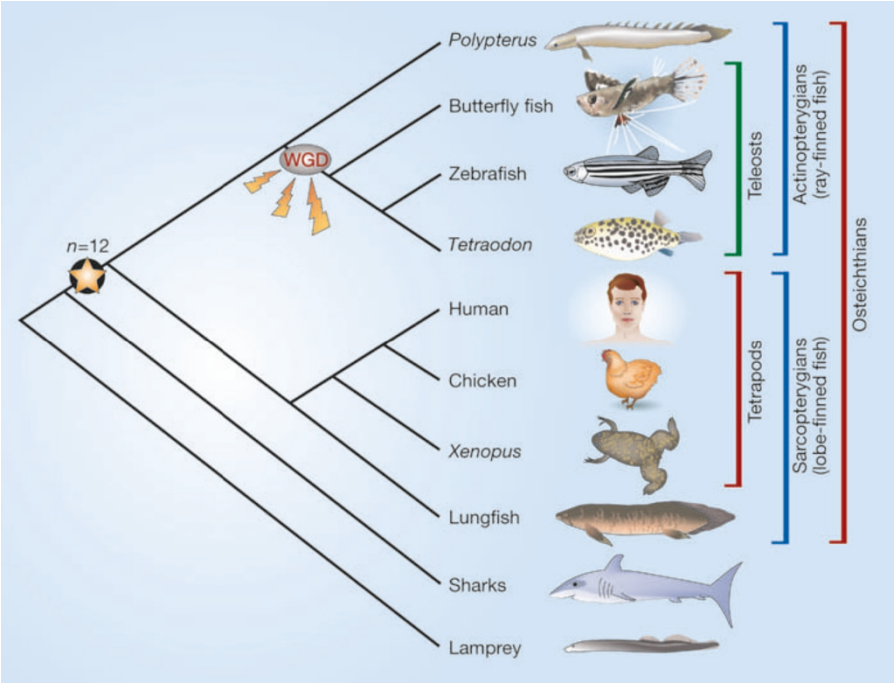

Figure 1 **Evolutionary relationships between humans, pufferfish and other vertebrates. Jaillon *et al.*[2] have sequenced the genome of the pufferfish *Tetraodon nigroviridis*. By comparing this genome sequence with that of humans, the authors deduce that the extinct ancestor of actinopterygians (ray-finned fish, including pufferfish) and sarcopterygians (lobe-finned fish, the lineage that gave rise to humans) had 12 pairs of chromosomes ($n=12$). They also show that a whole-genome duplication (WGD) occurred during the evolution of ray-finned fish.**

Pufferfish and zebrafish belong to distinct taxonomic orders of fish, so the duplication must have occurred early in teleost evolution. As previously pointed out[7], this implies that traces of the ancient whole-genome duplication should be found in more than 20,000 species of living teleost fish. But teleosts do not make up the whole of the ray-finned fish. Significantly, a study of one of the Hox-gene clusters of an earlier (more 'basally') branching ray-finned fish, *Polypterus* (Fig. 1), found no evidence of a genome duplication[9]. Together with data from other basal actinopterygians[10], this suggests that the genome duplication occurred close to the origin of the teleost fish themselves, perhaps 230 million years ago.

Less clear are the biological consequences. It is tempting to suggest that the species richness of the teleosts is somehow related to the whole-genome duplication, either because natural selection has 'exploited' the extra genes, or because differential mutation of duplicate genes caused reproductive isolation, facilitating speciation[11]. However, much of teleost diversity is found in just one group, the acanthopterygians ('spiny fins'), which underwent a massive increase in diversity only around 55 million years ago. So if the whole-genome duplication did affect species richness, it was not immediate, and further studies of morphological and genetic evolution in teleosts will be needed to resolve the mechanisms involved.

A final lesson from the *Tetraodon* study[2] concerns the power of comparative genomics, both for gaining insights into mechanisms of genome evolution and for deducing genome organization in extinct species. But we have a long lineage of extinct ancestors, which means that a wide range of genomes will need to be compared if we want to look at each node in our evolutionary history (Fig. 1). Particularly useful will be complete genome sequences for a shark, a lamprey and amphioxus, as each will provide insight into yet more ancient ancestral states. We may not have long to wait: this year the Joint Genome Institute in California began sequencing the amphioxus genome, while the National Human Genome Research Institute has announced plans to sequence that of the sea lamprey. ■

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100 YEARS AGO

The Cultivation of Man. **The author of this book is very much in earnest. He condemns modern civilisation in strong terms for its many vices, especially for its worship of money and the mammonite marriages that result from it, and urges that men should apply to their own species the methods of the breeder of cattle. He recommends polygamy, apparently in all seriousness, and not as a mere counsel of perfection. It would, of course, destroy the family, but to this Mr. Witchell has no objection… Certainly he speaks out fearlessly, and that is no small merit. But it is to be regretted that he did not study his subject more before writing. "Natural selection," he says, "is sometimes operative, chiefly among the poor." Considering that in England nearly fifty per cent. of the population die before the average age of marriage, this is a wonderful understatement. If we bear the facts in mind, we can hardly agree with Mr. Witchell that the business man is "the surviving type," *i.e.* apparently the type that is to survive to the exclusion of others. Business men are not a separate species. There is a continual upward movement of able men from the great underlying social stratum, and from this stratum directly or indirectly our successful men, as we call them, have emerged.**
From *Nature* 20 October 1904.

50 YEARS AGO

Anatomist, pathologist, epidemiologist, sanitarian and clinician, and one of the most advanced thinkers in the history of the medical sciences, Giovanni Maria Lancisi was born in Rome three hundred years ago, on October 26, 1654… It was at [Pope] Clement's request that in 1707 he wrote his monumental treatise "De subitaneis mortibus", in which he carefully records the pathological lesions of the brain and heart observed at autopsy, gives the first description of syphilis of the heart and of growths on the valves, and lists hypertrophy and dilatation of the heart as a cause of sudden death. Lancisi's book, "De motu cordis et aneurysmatibus" (1728), is another landmark in the history of heart disease, for it stresses the significance of heredity, syphilis and violent emotions as causes of aneurysm… In the tercentennial year of his birth he is gratefully remembered chiefly for having laid the foundation for a true understanding of the pathology of the heart.
From *Nature* 23 October 1954.