

大自然走过的痕迹

The Footprint of Nature: Ichthyolite

鱼
化石

或带肩带，背鳍小，背鳍或大小相等，叉形尾。圆鳞，较厚。



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东方出版社

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東方出版社

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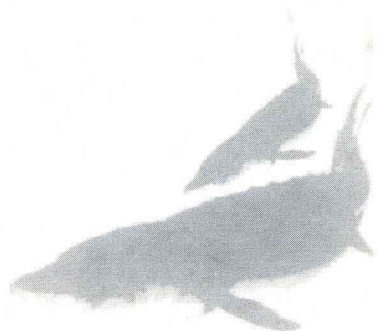
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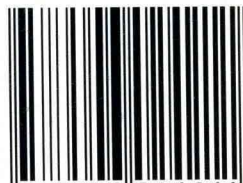
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书盒鱼化石介绍——狼鳍鱼

狼鳍鱼化石是热河生物群早期三个代表化石品种之一，地质年代约在至少1亿年以上。狼鳍鱼是中国发现的最早原始真骨鱼类，学术界曾把藏有狼鳍鱼化石的地层确定为晚侏罗纪地层，并以狼鳍鱼的消失作为划分侏罗纪与白垩纪的界线。

狼鳍鱼个体较小，一般10-20cm。分布于中国、朝鲜、蒙古、俄罗斯西伯利亚外贝加尔地区。头大，眼大，眶上感觉沟终止于顶骨，头部感觉沟的分布与古鳕类的相似。齿骨较大，齿骨自前向后逐渐加高，牙齿排列成行，大小近于一致。前鳃盖骨下枝较上枝宽大，下鳃盖骨颇小；鳃条骨纤细。脊椎椎体呈筒状，中部略收缩，有上神经棘和上髓弓小骨。胸鳍大，内侧有一粗大不分叉的鳍条；背鳍和臀鳍的起点相对，或稍靠前，或稍居后，背鳍小于臀鳍或大小相等；叉形尾。圆鳞，较厚。



Lycoperon ichthyolite is one of the three representational ichthyolites in early biota in Rehe. Lycoperon lived in at least 100 million years ago.

For the earliest original Teleostei found in China, the academia once confirmed the stratum which wraps Lycoperon ichthyolite as the late Jurassic period stratum, and compartmentalized the time between the Jurassic period and the Cretaceous period by the disappearance time of Lycoperon.

Lycoperon is small, general 10cm-20cm in length, distributing in China, Korea, Mongolia and the Transbaikian of Siberian in Russia. It has a big head and two big eyes, and the sense fossa on eye sockets continues to parietal bone. The sense fossa distribution on head is similar to the Palaeoniscus. The dental is big and run-up little by little from the front to the back. The teeth arrange in rows and the size is approximately the same. The lower limb bone of preoperculum is bigger than upper limb bone. The suboperculum is small. The branchiostegal rays are slim. The backbone cone looks like a canister in shape, and the middle shrinks a little. Lycoperon has supraclavicular neural spine and superior neural arch ossicle. The pectoral fin is big, and has a crassitude and not-bifurcate fin ray inboard. The jumping-off point of dorsal fin and the anal fin is face to face, one is a bit forward or one is a bit backward. The dorsal fin is smaller than the anal fin or two are equal in size. Lycoperon has a furcation tail and round squamulae which are a bit thick.



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What is fossil?
什么是化石？

地球上生命的系统演化螺形图

The spiral schema of the life evolution on the Globe

2亿年前, 恐龙出现
200 million years ago, the dinosaur
came into being

侏罗纪 1.95亿 - 1.4亿年前
Jurassic: 195-140 million years ago

三叠纪 2.3亿 - 1.95亿年前
Triassic: 230-195 million years ago

二叠纪 2.8亿 - 2.3亿年前
Permian: 280-230 million years ago

石炭纪 3.45亿 - 2.8亿年前
Carboniferous: 345-280 million years ago

前寒武纪
Precambrian

泥盆纪 3.95亿 - 3.45亿年前
Devonian: 395-345 million years ago

志留纪 4.35亿 - 3.95亿年前
Silurian: 435-395 million years ago

前寒武纪 4.6亿 - 5.7亿年前
Precambrian: 4.6 billion - 5.7 billion years ago

46亿年前地球形成
The Globe system came into being 4.6 billion years ago

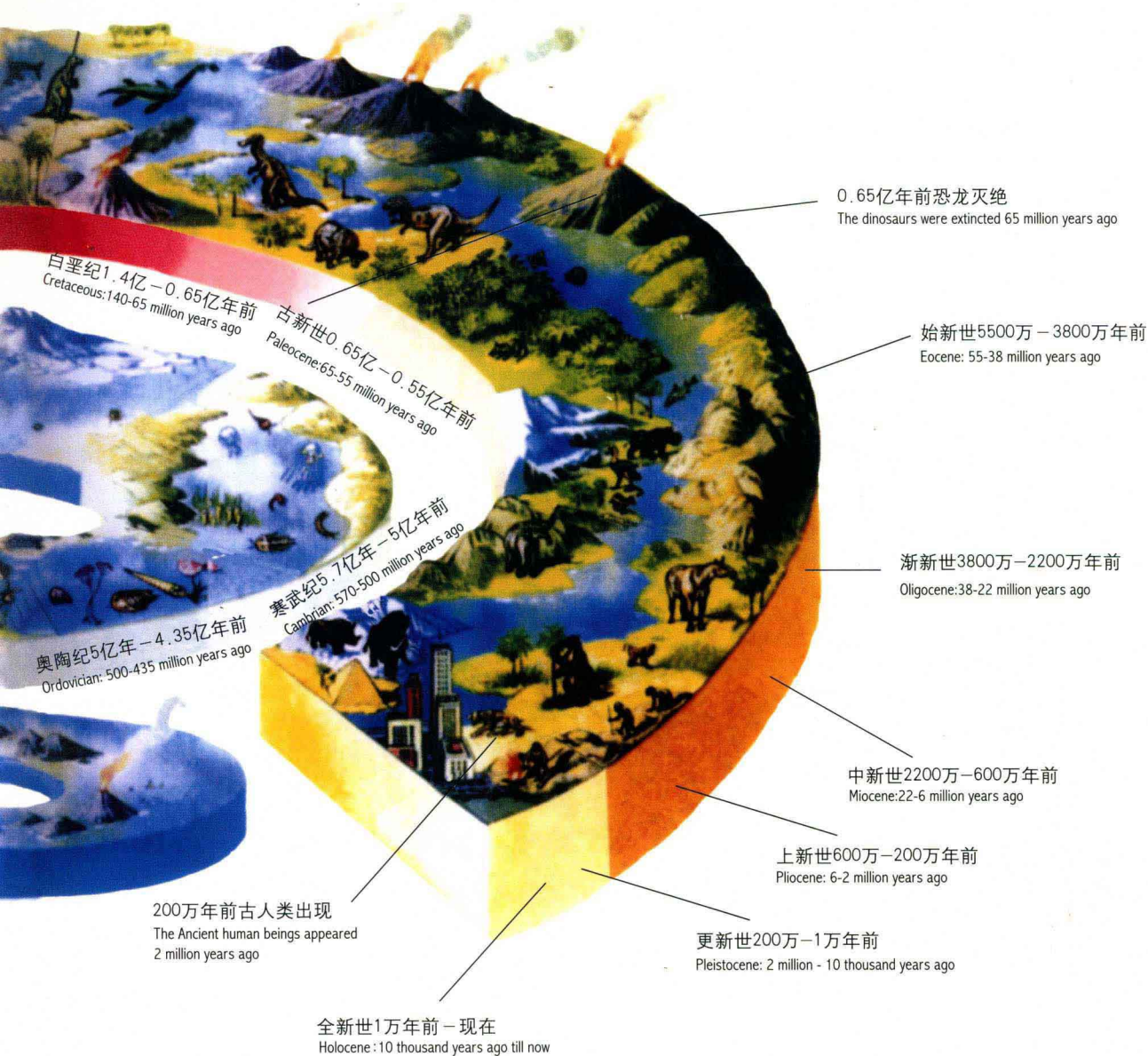
What is fossil?

Fossil is the appellation of organism bodies, reliquiae and relics which by landification and preserving in all geologic period rocks. After the organism died, the organic substance in body were replaced by mineral substance then formed the fossil. The form of fossil is a very hard and long process, depending on a series of special environments and geologic processes. Since there were lives in earth for several billion years, most species have been disappeared and only a few of them have been preserved and turned into hard fossils.

These rare fossils preserve the antique spatio-temporal things and help modern people to explore the earth in remote antiquity. The human being spends several centuries in knowing about the nature of geologic age and the verge of different eras. The fossils play a very important role in knowing the knowledge. In 1832, Lyell. Charles found the years of sedimentary rock stratum have some relations with fossils which existed in these stratum. Some species only can be found in special stratum, so they are called standard fossil. Using these fossils as the standard, we can confirm the year of corresponding sedimentary rock stratum, which belongs to the same geologic age when having the same fossils.

什么是化石?

化石, 是保存在各地质时期岩层中石化了的生物遗体、遗迹和遗物的总称。当生物死去后, 体内的有机物质被矿物质取代, 便成为化石。化石的形成是一个异常艰难的漫长历程, 依赖于一系列特殊的自然环境与地质作用。自地球出现的几十亿年以来, 绝大多数的生命体都消失得无影无踪, 它们中只有极少的一部分得以保存下来, 变成比围岩更坚硬的化石。



ichthyolite

鱼化石

这些珍贵的化石将遥远的时空凝固且存留，带领今天的人类踏上通往荒古的神秘旅程。人类花了好几个世纪的时间，才掌握了地质年代的真正本质和各期分界。这其中化石扮演了至关重要的角色。1832年莱伊尔发现沉积岩地层的年代和藏于其中的化石之间有某种关联存在。有些物种只能在特定的地层中找到，人们称这种化石为“标准化石”。这样，以这些化石为基准，就可以确定出沉积岩层的相对年代，含有同样化石的地层属于相同的地质年代。

How to form the fossil?

化石是怎样形成的？



(一) 生命体死亡

在遥远的地质年代（约从几十亿到至少几十万年前），生物体死去后，机体很快开始腐烂。随着一系列物理和化学变化，用不了多久原先的躯体上就只剩下那些比较坚硬的组织，例如骨骼、牙齿、甲壳、鳞片、头角，甚至植物的茎干等。它们能够保存相对较长的时间。但是正如绝大多数生物体经历的那样，其死亡环境往往不适合形成化石，这样即使是坚硬的组织也无法保存下来。

1. The organism died

In remote geologic years (from about several billion years to at least several hundred thousand years ago), after they died, the organisms were quickly decomposed. By a series of physical and chemical changes, after a short time, the former body only leaves some harder tissues which can be kept longer, such as bones, teeth, testae, squamae even stalks of plants and so on. However, like most of organisms, they cannot form fossils owing to the environment of death. So, even some harder tissues can't be preserved.

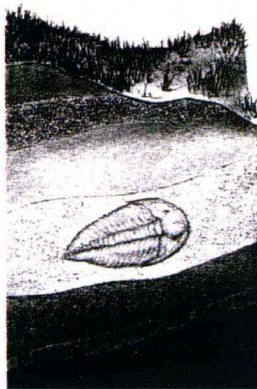


(二) 迅速埋葬

然而大自然的神奇魔力终究使历史的瞬间得以凝固。只要生命体的遗骸能够在最短的时间内被埋葬，便有可能避免腐烂。这种情形在迅速沉积的自然条件下最容易实现，例如：浅海、沼泽、湖泊、河流、三角洲的淤泥等，流动的水有助于矿物质很快沉积并发生置换。

2. Quickly buried

However, the nature's magic power can make the history and the time freeze. As long as the reliquia of organism can be buried in a short time after they died, the body can escape from rot. It is easy to come true on the natural condition of shallow sea, swamp, lake, river, and delta sillage in which the flowing water can help to form the mineral composition sediment right away and be replaced.



3. The reliquiae keeping for a long time

Since then, during the longer years, the mineral composition in body continuously became sediments, which avoid being rot by oxygenation process because of air isolation. At the same time, with pressure increasing and the terrestrial heat affecting, the rare fossils form.



4. Recurring to the earth's surface

It is hardly possible to make the reliquiae become fossil, so, the possibility of the fossil found by human being is finally even less. By the lithosphere movement and the process of efflorescing, the deeper stratum gradually come to the earth's surface. Then the fossil preserved in the stratum is exposed in air. Sand blown by wind constantly corrodes the fossil, and if nobody found them in time and dug them out, they will disappear quickly. Human activities, such as road building and cave digging, will destroy these fossils, which have great difficulty in unveiling on the earth surface. So, we can see how rare these ancient life-forms fossils are!

(三) 残骸长存

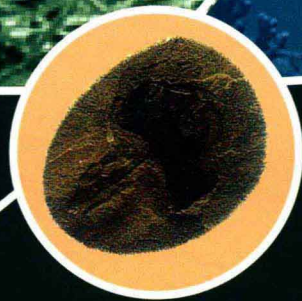
此后，在接下来的漫长岁月里，矿物质在生物体遗骸上不断沉积，空气被隔绝而避免了氧化腐烂，压力增加，地热也产生影响，最终珍贵的化石得以形成。

当然，地壳的频繁活动常常使地层发生移动，而化石作为地层的一部分也会参与到剧烈的地质活动中，并最终消失。

(四) 重现地表

如果说由生命遗骸形成化石已经只是极小可能的话，那么最终重现地表被人类发掘的化石则更是微乎其微。随着地壳运动和风化作用，深处的地层逐渐露出地表，使得其中所保存的化石暴露在空气中。风沙不断地侵蚀，如果人们没有及时与它们相遇并将其发掘，这些化石也将很快消失殆尽。此外，人类活动，比如修建道路、挖掘山洞也会使这些好不容易露出地表的化石被毁坏。可见古生物化石是多么的难得和珍贵。





**What is
living fossil?**
何谓“活化石”？

何谓“活化石”？

人们常以为化石都是地球浩劫中灭绝了的生物变成的。事实上大部分化石的确如此，但有些形成化石的物种也幸存下来。它们之中的一些，曾在地质历史时期繁盛一时，分布遍及地球各地，但今天却十分罕见，仅在个别地域出现。这些现存的稀少物种被视若珍宝，人们形象地称之为“活化石”。

可见所谓“活化石”也就是处于残余阶段的生物，古生物学上又称为“孑遗分子”。现在世界上著名的活化石有：银杏、水杉、鸚鵡螺、中华鲟、扬子鳄、大熊猫、考拉、袋鼠、麋鹿等。



大熊猫

What is living fossil?

We usually believe that the fossil is formed by the extinct life-form died from the earth's movement. In fact, most of fossils are formed in this way. However, a number of species which had been forming fossils is still alive. Some of species once were in full flourish and distributed all over the world. But nowadays, they are rare, and only can be seen in special areas. So, today, we call these rare fossils living fossil.

So, living fossil is also the life-form, which is at the verge of extinct. In paleontology they are called relic molecule. Nowadays, there are some noted living fossils as follows: Gingkgo, Metasequoia, Nautilus pompilius, Acipenser sinensis, Alligator sinensis, Giant panda, Koala, Kangaroo, Elk and so on.



考拉



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Looking for fossil area

寻找化石地



寻找化石地

多数沉积岩如泥岩、页岩、石灰岩出露的地区能采到化石。道路的切坡、采石场、波浪冲刷的河岸以及悬崖，常剥露出大量化石，是理想的寻找化石的地点。软岩石出露之处，若岩石没有严重变形也是很好的采集地点。硬岩石则发掘十分困难，且不易得到好的标本。

Looking for fossil area

We can find fossils in many sediment-rocks areas such as mud-rock, shale, and lime-rock. Some areas in which many fossils frequently exposed are the perfect spots to look for fossils like the chop-slope of roads, stone pits, wave-rushed banks and cliffs and so on. The soft-rocks are fit for picking up fossils if the rocks were not bad distorted. It is difficult to dig out the fossils in hard-rocks or get the better specimen.

分辨化石种类

鉴别化石种类，需要兼备古生物学与地质学知识。首先要清楚化石采自什么岩层，比如，不可能从白垩纪地层中采到三叶虫，也不可能从泥盆纪岩石中发现哺乳动物化石。

Differentiating fossil species

For differentiating fossil species, we need both paleontology and geology knowledge. At first, we must know which terrane the fossil comes from. For example, it isn't possible to pick up the trilobite from the Cretaceous period stratum or the mammal fossils from the Devonian rocks.

Differentiating fossil species 分辨化石种类