

## Dig up the dinosaur 挖掘恐龙

### Become a fossil hunter and dig up a dinosaur 变身为化石猎人挖掘恐龙

How does a scientist set about digging up a large fossil, like a dinosaur? How can scientists ensure that they obtain the maximum evidence from their discoveries and do not accidentally destroy vital clues?

科学家是如何挖掘象恐龙这样的大型化石的？科学家是如何确保从发现中得到尽量多证据的同时，又避免损坏这些关键的线索？

Set up a tray full of dry sand, in which is hidden the dismembered bits of a toy dinosaur skeleton. 用沙把盘子填满，在里面埋一副拆散的玩具恐龙骨架。

Alternatively, the bones of one dead animal or small chicken could be scattered throughout the sand (having first boiled and sun-dried the bones to sterilise them). After all, extinct dinosaurs are closely related to modern birds! Leave one or two bits of bone sticking out, as might happen with a real skeleton buried in desert sand.

Another variation is to assemble part of the skeleton and leave the pupils to find the missing bits.

或者把动物的骨头，例如鸡骨头，分散在沙里面（先用水煮并晾晒的方法给骨头杀菌）。毕竟绝种的恐龙跟现代鸟类是近亲！让一两块骨头露在外面，就好像真正的骨架埋在沙漠里的情况一样。另一种方式是把部分骨架装配好，让学生找缺少的零件。

Make a simple grid across the tray with string or rubber bands, to make, say four squares by three. Provide the pupils with a similar grid, to the same scale, on paper, or drawn with chalk on a board. 用细绳或橡皮筋给盘子做一个简单的栅格，把它分成若干个小方格，比如说，4x3 个方格。在纸上或黑板上画同样比例的栅格，给学生使用。

Give pupils some simple digging equipment, such as an old paintbrush and a couple of spoons. Tell them the story of the 19<sup>th</sup> century American scientists who dug up dinosaur bones as quickly as possible, without noting too carefully where they came from. Scientists from rival universities even went and smashed up their rivals' fossil bones, in order to be first to display a dinosaur. 给学生一些简单的挖掘工具，比如说一个旧的画笔和两个勺子。告诉他们 19 世纪美国科学家如何不记录化石的位置而用最快的速度挖掘恐龙骨头的故事。敌对大学的科学家甚至会破坏他们对手的化石，为的是使自己成为第一个发现恐龙的人。

Then ask pupils to dig up the buried skeleton, but to be more "scientific" about their methods than

the old timers. As each piece is revealed, it should be put down on the grid at the correct place and drawn around to show the outline of the bone. The excavated sand should be put in a spare pot. 然后让学生把埋藏在沙里面的骨架挖出来，但要用比老前辈们更“科学”的方法。对每一块发现的骨头，都要在栅格上记录正确的地点，和画出骨头的轮廓。挖出来的沙子要放在罐子里面。

When the pupils have finished, they should see if they can reconstruct the dinosaur (or chicken!). 学生结束挖掘后，他们该看看他们能否重组那只恐龙（或小鸡！）。



A reconstructed *Triceratops* model (Photo: P. Kennett)  
重组后的三角恐龙模型（图：P.Kennett）



Digging up the dinosaur – very carefully! (Photo: P. Kennett)  
挖掘恐龙 - 小心翼翼！（图：P.Kennett）



The reconstructed skeleton proudly displayed (Photo: P. Kennett)  
骄傲地展示成功重组的恐龙骨架（图：P.Kennett）

## The back up

### 备忘

**Title:** Dig up the dinosaur

**题目:** 挖掘恐龙

**Subtitle:** Become a fossil hunter and dig up a dinosaur

**副标题:** 变身化石猎人挖掘恐龙

**Topic:** Digging up buried 'bones' in a systematic manner and reconstructing the skeleton

**主题:** 用系统的方法挖掘在地下的“骨头”并重组骨架。

**Age range of pupils:** 6-11 years

学生年龄范围：6-11 岁

**Time needed to complete activity:** About 20 minutes

活动所需时间：大约 20 分钟

**Pupil learning outcomes:** Pupils can:

学生学习成果：学生可以：

- work systematically to reveal hidden objects;
- 系统地发掘埋藏的物体；
- map their findings in the positions where they were found;
- 在图上标示物体被发现的位置；
- reconstruct a model skeleton;
- 重组一个骨架模型；
- explain whether the animal was buried *in situ*, or was eroded and scattered before burial.
- 解释动物是在原位埋葬还是在受到过侵蚀和分散后才被埋起来的。

**Context:**

### 背景

This activity provides practice in working systematically, in contrast to simply grabbing an item as it is discovered. It could be used to amplify work on fossilisation. The use of a grid could be used to reinforce a lesson in maths or geography. 这个活动训练学生科学系统地工作，而不是发现了一个东西就简单地把它挖出来。可以用于展现化石工作是怎么样的。对栅格的使用可以用作数学和地理课堂的辅助内容。

### Following up the activity:

后续活动

- The bones can be arranged in the positions in which the creature “died”, and pupils can be encouraged to say how it might have become fossilised.
- 骨头可以被摆放成动物死时的姿态，然后鼓励学生解释它可能是怎样变成化石的。
- The bones can be jumbled up, to simulate erosion of the remains before burial.
- 可以把骨头弄乱来模仿残骸在被埋藏前受到侵蚀的情况。
- Some bones can be cut or broken, and pupils asked to think about the cause of death, such as predation.
- 可以把一些骨头切断，然后让学生思考动物的死因，比如说被猎食。
- Carry out a websearch to see what the dinosaur might have looked like in life.

- 展开网络搜索，看看活的恐龙会是什么样的。
- Visit a museum where good specimens of vertebrate fossils may be seen.
- 参观有脊椎动物化石良好样本展出的博物馆
- If possible, visit a real site where fossils may be found.
- 可能得话，参观真实的化石发现点。

### Underlying principles:

#### 背后的原理:

- The evidence on how fossils have been preserved must be recorded carefully at the time of discovery.
- 一定要在发现化石的时候细心记录化石是如何被保存下来的证据
- We use our understanding of the lifestyle of modern organisms to help us to understand how extinct ones might have lived.
- 我们运用对现代生物体生活方式的理解来帮助理解绝种生物是如何生活的。
- Evidence for the life and death of the animal includes the distribution of the parts in the rock and any damage to those parts by predation etc.
- 动物如何生活和死亡的证据包括残骸在岩石里的分布状况，和是否受到过猎食者损伤等信息。

### Thinking skill development:

#### 思维方式发展

Pupils use their discoveries to construct the skeleton of the original creature, and then 'bridge' between the remains and the once-living animal. 学生用他们的发现重组动物的骨架，然后把残骸和曾经生猛的动物‘联系’起来。

### Resource list:

#### 资源清单:

- a large tray, washing up bowl or cardboard box (e.g. 40 x 30 cm)
- 一个大的盘子，或者洗餐具用的大碗，或者纸板盒子（大概 40x30 厘米）
- plenty of dry sand
- 大量沙子
- a wooden or plastic dinosaur skeleton, (which can be dismembered), obtained from a toyshop, or cut out on thin plywood from the template on page 3
- 木或者塑料的恐龙骨架（可拆散的）。可以从玩具店买到，也可以用薄夹板按照第三页上的模板裁剪制成。
- or a chicken carcass, boiled, sun-dried and dismembered
- 或者一个鸡骨架，经水煮，晾晒并拆散。
- a few old paintbrushes and spoons
- 一些旧画笔和勺子
- a spare container for surplus sand
- 一个备用容器来装多余的沙子

**Useful links:** The science of digging up dinosaurs: 有用链接: 挖掘恐龙的科学:

<http://www.nationalgeographic.com/xpeditions/lessons/17/g68/serenodig.html>

**Source:** Hawley, D.J. (1995) Dinosaur detectives discovery dig: a palaeontological simulation. *Teaching Earth Sciences*, 20 (2), pp 53-55, Earth Science Teachers' Association.

**来源:** Hawley, D.J. (1995) 恐龙侦探-发现和挖掘: 一个古生物学的仿真实验  
*地球科学教育*, 20 (2), 53-55 页, 地球科学教师协会。

注: 此文档由 Victor (Pan Weixiang) 编译, 邵延秀修改完成

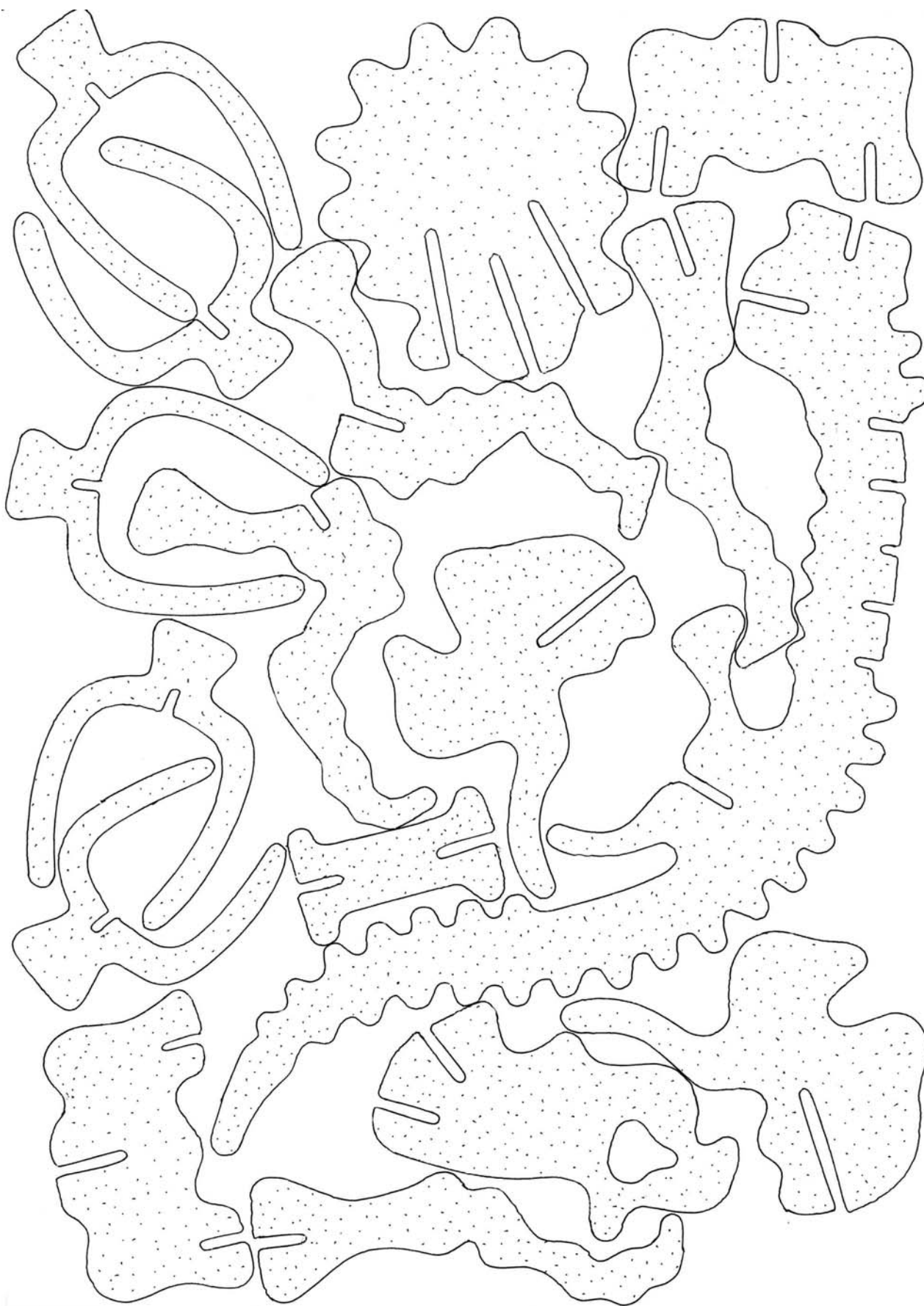
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Template for making a model of the skeleton of *Triceratops*  
三角恐龙骨架模型的模板