Sound of Science 理聲
Newsletter of Science Promotion Team
June, 2010 二零一零年六月號

Message in a dinosaur's teeth

Spinosaurs were large, meat-eating dinosaurs whose fossilized remains are often found in the same areas as the bones of tyrannosaurs (such as *Tyrannosaurus rex*). Fans of the movie *Jurassic Park III* may remember the spinosaur as the cranky dinosaur — the one with a sail-shaped fin on its back — that destroyed an airplane, ate a few people and took down a *T. rex*.

Paleontologists have wondered how such giants as spinosaurs and tyrannosaurs, both meat-eating and ferocious, could live in the same place while competing for food. In a recent study, a French researcher named Romain Amiot may have found the answer. Amiot, from the University of Lyon 1 in Villeurbanne, France, thinks that spinosaurs may have spent parts of their days in the water, thus avoiding clashes with tyrannosaurs, which lived on the land.

Preserved in the fossilized teeth of spinosaurs is chemistry hinting that the creatures (shown in an artist's reconstruction) spent much of their time in the water, as crocodiles and hippos do today.

This study isn't the first one in which scientists have suggested spinosaurs spent time in the water. The creatures' fossilized skeletons show they had long snouts, the way crocodiles do, and studies of spinosaur fossilized stomachs show that the creatures ate fish. But spinosaur skeletons don't show adaptations to living in the water or swimming — they don't have specialized feet, for example.

In this case, however, the bones didn't tell the whole story. For Amiot and his team, it was the dino teeth that did the talking. Spinosaur teeth are smooth and shaped liked cones — more like those of modern crocodiles than of tyrannosaurs. An analysis of the chemical makeup of the teeth turned up even more evidence.

In particular, the researchers studied oxygen. At its center, an atom contains a nucleus, and the nucleus of an oxygen atom usually contains eight protons and eight neutrons. (Protons and neutrons are the particles in the nucleus of every atom.) But some kinds of oxygen are heavier — most of its atoms may each have 10 neutrons, instead of eight, for example. When an oxygen atom has 10 neutrons, or 18 total particles in its nucleus, it is called oxygen-18. In general, when an atom has a different number of neutrons in its nucleus, it is called an isotope.

Oxygen-18 is an oxygen isotope.
Animals that live in the water, such as hippos and crocodiles, have different proportions of oxygen and oxygen-18 in their bones and teeth than animals that live on land. Amiot and his team looked at the proportions of oxygen isotopes in the fossilized spinosaur teeth. Comparing these ratios to those found in fossilized teeth and bones from other animals of the spinosaurs' day, the researchers found a closer resemblance to water animals such as crocodiles and turtles than to land animals such as tyrannosaurs.
This analysis shows that spinosaurs probably spent part of their lives in lakes and rivers. This may solve the riddle of the grumpy neighbors: If spinosaurs lived and fed in the water, then they wouldn't be competing with tyrannosaurs on the land. (And if the spinosaur had simply stayed in the water in Jurassic Park III, the plane would have been okay, the people could have left, and the movie would have been a lot shorter.)
The study may "solve the big ecological problem of how spinosaurs could live in the same areas as tyrannosaurs," Amiot told *Science News*. "They were avoiding competition for food and territory by dividing up the ecosystem."

The bug that may have killed a dinosaur

The holes in a T.rex jaw were probably left by a parasite, the new work suggests.

Sue is a famous *Tyrannosaurus rex* whose skeleton lives in the Field Museum in Chicago. Small, smooth holes in Sue's jawbones have been a scientific mystery for years, and scientists want to know how they formed. Some researchers have believed, for example, that the holes resulted from a dino-on-dino fight.
Scientists may have solved the mystery in Sue's jaws. A new study suggests that the holes were caused by something much smaller than another dinosaur. In the new study, researchers say the holes may have come from infection by a tiny parasite — and that infection may have killed the mighty dinosaur.
A parasite is an organism that cannot live on its own. Instead, it feeds and lives on another organism. In Sue's case, the guilty parasite is called *Trichomonas*. Unlike the dinosaurs, which became extinct about 65 million years ago, different kinds *Trichomonas* still live on the Earth.
In the worst cases, a *Trichomonas* infection can cause tissues to swell and block the throat. It can also cause the jaw to rot — and leave holes in the bones. These symptoms would be bad news for a *T. rex* with a nasty *Trichomonas* infection. Unable to swallow food, the dinosaur would eventually die of thirst or starve.
"There are some things you can survive," Ewan Wolff, one of the researchers, told *Science News*. "But not having a hole in the back of your throat is not one of them."

Today, this parasite often infects such birds as pigeons, turkeys and chickens — and it was a bird that gave Wolff a clue. Wolff is a paleontologist at the University of Wisconsin–Madison. He says the shapes, sizes and locations of the holes in Sue's jaw are different than what you would expect if the holes had been caused by a dino fight or by another kind of infection. So he and his colleagues started looking for another explanation, and they looked at the bones of modern birds and crocodiles that had various diseases.

The scientists caught a break with the skull of an osprey, a fish-eating hawk easily recognized by its dark back and white chest. The osprey had holes in its jaws similar to Sue's, and the scientists knew that when the bird was alive it was infected with *Trichomonas*. They started looking at other *T. rex* skulls and found nine, including Sue's, with the telltales holes of a *Trichomonas* infection.

"Either this was a fantastic coincidence, or this was a very common disease in *T. rex*," Wolff told *Science News* about the match between the osprey and Sue.

Scientists aren't sure how the *T. rex* caught the parasite. Perhaps it ate an infected animal. Wolff says the parasite may also have been spread from dino to dino through face-biting or cannibalism.

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Website: http://210.3.43.253/~lck/science/spt0910/spt0910.htm

Topic of Science Quiz 你知道唔知道? in June

11th, 24/5-4/6: **Friction**

Questions are posted on the notice board of Science Promotion Team near the Staff Common Room. Students can find the five questions and get the answer sheets on our board. After filling in your answers, put it into the box provided. Students who can get all the answers correct will be awarded a small gift.

Lunch Time Video Shows: 12:20 p.m. @ Chem. Lab. (Room 512)

Date	Name of Program	Phy	Chem	Bio
1/6/2010 (Tue)	The Universe - Alien Planets 宇宙：日外行星 (Part 2)	🗁	🗁	🗁
4/6/2010 (Fri)	Investigation X-UFO Outbreak 超自然調查檔案 – UFO 總動員 (Part 1)	🗁	🗁	🗁
8/6/2010 (Tue)	Investigation X-UFO Outbreak 超自然調查檔案 – UFO 總動員 (Part 2)	🗁	🗁	🗁

新一代文化協會科學創意中心科普講座

名稱：再生能源的新發展 **日期：26-6-2010 (Sat)** **時間：11:00-12:30**

簡介：彭栩怡先生(愛潔科技有限公司)

內容：地球的資源隨著人類發展日漸減少，燃燒化石燃料令環境受嚴重污染，全球暖化、氣候改變帶來的惡果逐漸浮現。爲確保有足夠能源供應，及明日之後人類仍可持續發展，科學家及學者正研究新型而不影響環境的可再生能源，當中又以風力及太陽能最適合香港這片彈丸之地。講座將介紹兩者發電的原理、現有技術及其在全球與香港的發展情況。

費用全免，有專車接送往返九龍塘地鐵站。有興趣同學請到化學實驗室門外壁報板上簽名，先到先得。

太空館專題講座

6-6-2010 (Sun)	3:00-4:30pm	2010 年 7 月 11 日的日全食	香港太空館演講廳	余惠俊先生(香港天文學會掩星組組長)

繼去年 7 月 22 日本世紀最長的日全食後，今年 7 月 11 日在南太平洋將再次出現一次日全食，爲本港天文愛好者提供另一次觀測日全食的機會。這次講座將探討日食的成因、見食時間長短的關係、出現這次日食的條件及預測當天日全食的狀況；有關這次日全食的觀測項目、觀測方法、所需設備、見食地區的情況、天氣對觀測的影響及觀測團隊的安排等亦會逐一介紹。此外，講者還會分享過往天文同好到外地觀測日全食的經驗和成果。

12-6-2010 (Sat)	3:00-4:30pm	淺談中國曆法	香港太空館演講廳	李爲君先生(香港太空館助理館長)

無可否認，時至今日公曆已成爲我們日常生活不可或缺的一部份；至於農曆，則可能要在一些傳統習俗，例如春節，又或婚喪喜慶才會遇到。其實中國曆法的內容遠不止此，譬如，任何一個農曆曆日已顯示了當天月球的盈虧及大約的出沒時間。在中國漫長的歷史歲月中，無論皇朝如何興衰、政權怎樣更替，頒布曆法總是當權者維繫政權的必要手段。我們翻開歷代一部又一部的天文志及律曆志，在艱澀難明的文字背後，會發現古人在編纂曆法時，除了要編排曆日、定朔望節氣，更要預測日月食及五大行星(水、金、火、木、土)的運行及出沒等。在沒有望遠鏡及先進計算工具的年代，編纂曆法絕不是一件輕鬆的工作。究竟中國的曆法有甚麼內容？蘊含了甚麼天文學的概念？在本講座中講者將爲你娓娓道來。

費用全免，先到先得。

香港科學館專題展覽

香港科學館將於三月至八月期間展出兩個專題展覽。詳情如下：

1. 《神州生態 – 中國野生動植物標本展》 (至 31-8-2010)
   邀請你一同探索中國豐富的野生動植物資源，希望能喚起大家對自然生態的關注，以及認識生物多樣性和生物之間互存相依的關係。
2. 《轉基因魚快速檢測雌激素類污染》 (至 11-7-2010)
   越來越多的化學物，甚至那些過去被認為很 "安全" 的化學物，由於會擾亂內分泌系統，現在已被歸類為 "內分泌干擾素"。內分泌干擾素 (尤其是雌激素類內分泌干擾素) 的污染問題，正威脅著各種生物和人類的健康，成為了全球最嚴重的環境問題之一。發展一個既可靠又能準確快速檢測雌激素類內分泌干擾素的方法實為刻不容緩。由香港城市大學生物及化學系鄭淑嫻副教授領導的研究小組，最近就培育出一種轉基因耐鹽鯖鰮魚。該魚能敏銳地偵測出雌激素類內分泌干擾素的存在，並通過發出不同强度的綠色螢光來反映雌激素的活性水平。除了敏感度高及操作容易外，這方法亦兼具快速及低成本這些優點。

優惠票：$17.5 (適用於全日制學生)　星期三免費入場之安排及博物館週票不適用於此展覽