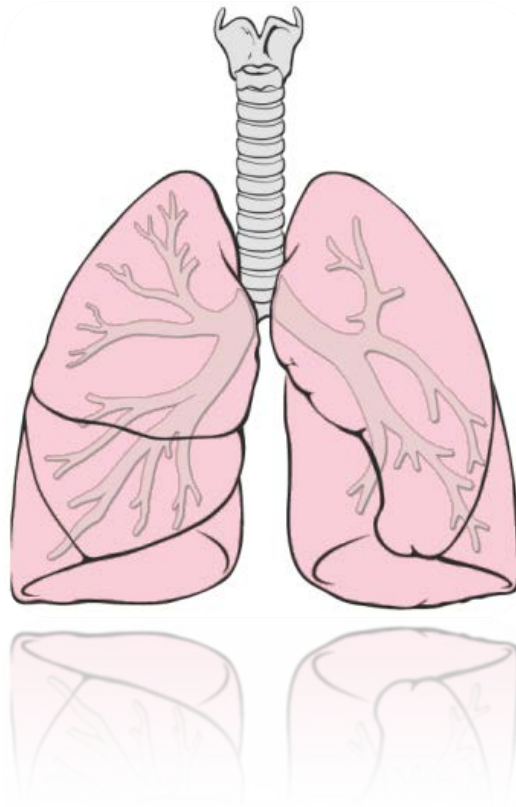


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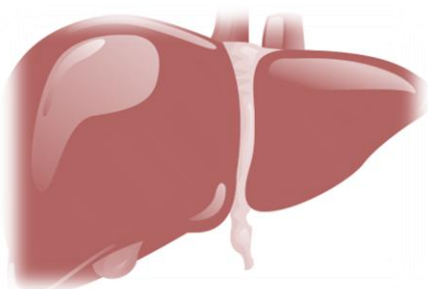


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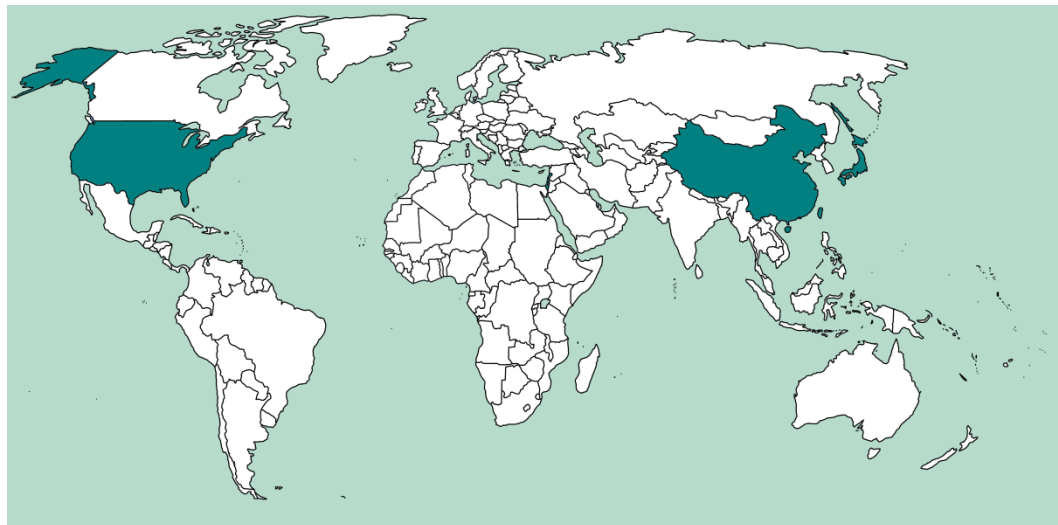
Yokohama, JAPAN

Artificial Liver from Stem Cells

Artificial organs made in laboratories give hope to the much-needed patients. Scientists around the world have been working on stem cells from various sources for over a decade, hoping to find lab-made tissues or organs to treat different kinds of diseases. Regenerative medicine using two major types of stem cells - embryonic stem cells, which are harvested from embryos, and reprogrammed "induced pluripotent stem cells", often taken from skin or blood, aims to produce functional organs for plantation. A study group led by Dr. Takanori Takebe from the Yokohama City University Graduate School of Medicine in Japan, used iPS cells to make three different cell types that would normally combine in the natural formation of a human liver in a develop-



ing embryo - hepatic endoderm cells, mesenchymal stem cells and endothelial cells - and mixed them together to see if they would grow. They found the cells grew and began to form three-dimensional structures called "liver buds" - a collection of liver cells with the potential to develop into a full organ. When they transplanted them into mice, the researchers found the human liver buds matured, the human blood vessels connected to the mouse host's blood vessels and they began to perform many of the functions of mature human liver cells. The Japanese researchers paved the way for more promising or-



gan-developing experiments even it is still need time to treat patients with lab-grown livers. ■

Hazor, ISRAEL

Pharaoh's Sphinx Paws

Who can tell the story about ancient Israel and Egypt? In fact we can learn something from the Bible. The feet of an Egyptian sphinx the fragment of the statue's front legs, was found in Hazor, a UNESCO World Heritage Site just north of the Sea of Galilee. Between the paws is a hieroglyphic inscription with the name of king Menkaure (sometimes called Mycerinus), who ruled Egypt during the Old Kingdom more than 4,000 years ago and built one of the great Giza pyramids. Researchers believed it was more likely that the sphinx was brought to Israel later on, during the second millennium B.C. Dr. Amnon Ben-Tor, one of the Hebrew University archaeologists led the excavations thought that descriptor could be a clue the sphinx originated in the ancient seat of sun worship, Heliopolis, which is

today mostly destroyed and covered up by Cairo's sprawl. Hazor was strategically located at a crossroads between Egypt and Babylon. Initially a Canaanite city, it had been fortified since the early second millennium B.C., conquered by the Israelites, rebuilt under King Solomon and ultimately destroyed by the Assyrians in 732 B.C. ■ <http://www.livescience.com/38045-egyptian-sphinx-paws-found-in-israel.html>

Atlanta, USA

Why Men Love Breasts

Hey, Guy, do not fix your eyes on breasts. Dr. Larry Young, a professor of psychiatry at Emory University gave us an explanation why straight men do devote so much headspace to those

big, bulbous bags of fat drooping from women's chests. It is complex social behaviors. The researchers thought that human evolution has harnessed an ancient neural circuit that originally evolved to strengthen the mother-infant bond during breast-feeding, and now uses this brain circuitry to strengthen the bond between man and woman as well. The study found that nipple



stimulation enhances sexual arousal in the great majority of women, and it activates the same brain areas as vaginal and clitoral stimulation. When a sexual partner touches, massages or nibbles a woman's breasts, this triggers the release



of oxytocin, aka the “love drug”, in the woman’s brain, just like what happens when a baby nurses. But in this context, the oxytocin focuses the woman's attention on her sexual partner, strengthening her desire to bond with this person. Monogamous relationships and the fact that we are upright and have face-to-face sex make it possible for us human. Breast attractive behavior for men may be the basis of development and evolution.■

<http://www.livescience.com/23500-why-men-love-breasts.html>

Washington DC, USA

Mother’s Love or?

Escaping from the impending danger is the nature of the bio-creatures. Prairie dogs lived in the Great Plains of North America can detect predators from far away. They are watching and letting others know about the upcoming enemies. What an act! In an episode of “North America” on Discovery Channel, one brave prairie dog warns the colony and risks its life to drive a deadly rattlesnake away from its den and away from its babies. It is an encouraging story about serpent versus rodent, and also it is venomous bite



versus sharp claws and teeth. It is the love from the parents, and it is the distinctive nature of prairie dogs to alarm their colony to escape from dangerous attackers.■

Beijing, CHINA

Lifespan and Air Pollution

Pollution is the unavoidable result of industrialization. We must face and take cost of it. A recent study conducted by researchers from China, Israel and the United States reported that the half-billion people lives in northern China in the 1990s have an average of 5½ years less than their southern counterparts because of the heavy air pollution from coal burning. Scientists collected data for 90 cities, from 1981 to 2000, on the annual daily average concentration of total suspended particulates – 100 micrometers or less in diameter. They found that the difference in life expectancies was almost entirely due to an increased incidence of deaths classified as cardio-respiratory origins. The government allows free coal for

fuel boilers to heat homes and offices to cities north. China plans to release hourly air pollution monitoring data in 74 of its biggest cities starting on 2013 New Year’s Day, state media said on Sunday, in a sign of increasing responsiveness to quality-of-life concerns among prosperous urban people.■



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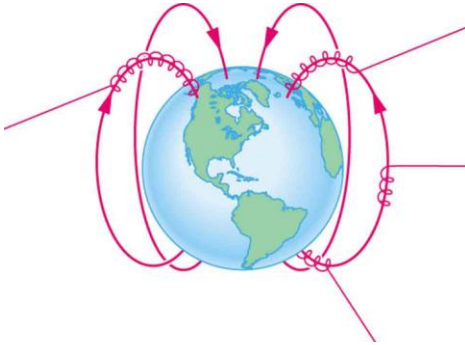
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SPACE PHYSICS

Energetic Electron Acceleration

A study group headed by Dr. Fu from Beihang University, China, re-



<http://cnx.org/content/m42375/latest/?collection=col111406/latest>

ported their finding on the mechanism that produces energetic electrons during magnetic reconnection in *Nature Physics*. Magnetic reconnection is a fundamental process responsible for stellar flares, substorms, and disruptions in fusion experiments. Studies on the solar chromosphere and the Earth's magnetosphere showed significant electron acceleration during reconnection, but in the solar wind, energetic electrons are absent. In their study, the researchers showed that energetic electron acceleration is caused by unsteady reconnection. In the Earth's magnetosphere and the solar chromosphere, reconnection is unsteady, so energetic electrons are produced; in the solar wind, reconnection is steady, so energetic electrons are absent. The researchers concluded that the very strong acceleration observed during substorms and impulsive solar flares occurs during unsteady reconnection. - FW

Nat Physics 2013; 9(7), 426.

MATERIALS

3-D Hybrid Nanocolloids

Dr. Peer Fischer from Max Planck Institute for Intelligent Systems, Germany, presented their study to the *Nature Materials* showed a way to quickly obtain complex nanocolloids with established techniques and in useful numbers that could otherwise not be synthesized with existing methods. In their scheme, they offered control over both the choice of materials and the 3-dimensional (3-D) shape with feature sizes down to 20 nm. In general, tuning the optical, electromagnetic and mechanical properties of a material requires simultaneous control over its composition and shape. It is really difficult for complex structures at the nanoscale because surface-energy minimization generally causes small structures to be highly symmetric. In the study, the researcher combined low-temperature shadow deposition with nanoscale patterning to realize nanocolloids with anisotropic three-



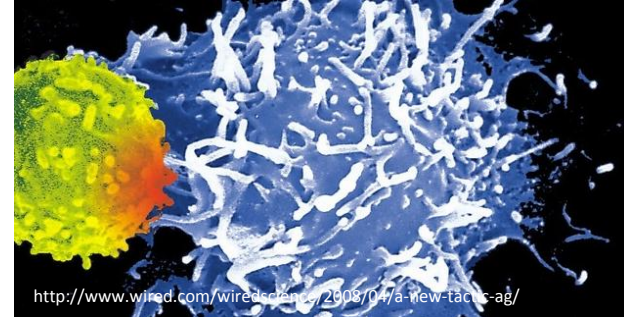
dimensional shapes, feature sizes down to 20 nm and a wide choice of materials. Their technique as the researcher discussed that will offer a general route to the fabrication of complex 3-D nanostructures with tailored electric, magnetic, optical and mechanical properties. - MPW

Nat Mater 2013; doi:10.1038/nmat3685

MEDICAL IMMUNOLOGY

Shp1 and T Cell Homeostasis

T cells are characterized by their ability to expand in an antigen-specific manner during an immune challenge. The protein-tyrosine phosphatase Shp1 is expressed



<http://www.wired.com/wiredscience/2006/04/a-new-tactic-ag/>

ubiquitously in hematopoietic cells and is generally viewed as a negative regulator. A study group led by Drs Pamela S. Ohashi and Benjamin G. Neel from the University Health Network, Canada, showed that mutations in *Ptpn6*, an encoder of Shp1, resulted in widespread inflammation and premature death. To define the T cell-intrinsic role of Shp1, the researchers characterized mice with a T cell-specific Shp1 deletion. Interestingly, thymocyte selection and peripheral TCR sensitivity were unaltered in the absence of Shp1. Instead, *Shp1^{fl/fl} CD4-cre* mice had increased frequencies of memory phenotype T cells that expressed elevated levels of CD44. Activation of Shp1-deficient CD4⁺ T cells also resulted in skewing to the Th2 lineage and increased IL-4 production. After IL-4 stimulation of Shp1-deficient T cells, Stat 6 activation was sustained, leading to enhanced Th2 skewing. Blocking or genetic deletion of IL-4 in the absence of Shp1 resulted in a marked reduction of the CD44^{hi} population. Therefore, Shp1 is an essential negative regulator of IL-4 signaling in T cells. - TK

J Exp Med 2013; 210 (7): 1419.



Fishes and Water Plants (魚藻圖)

By **Miao Fu** (繆輔, 15th century), Ming Dynasty (1368-1644)

Hanging scroll, ink and color on silk, 171.3 x 99.1 cm, Palace Museum, Beijing, China

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Accuracy of Palpation for Cricothyroidotomy ^{PC}

Xiaofeng Shen, * Shiqin Xu, * Fuzhou Wang, *^Δ

CRICOTHYROIDOTOMY IS A practical procedure that is critical for patients in the context of emergency. Accurately identify the cricothyroid membrane takes a crucial part in determining the success of cricothyroidotomy. However, it is not that easy for clinicians when facing patients with different conditions that limit the palpation accuracy. Obesity is a risk factor for the failure of cricothyroidotomy. Special care is needed for obese patients. We herein build a mathematic model to explain why it is hard for obese patients to be palpated, and we also give recommendations based on the model on how to increase the rate of the palpation accuracy.

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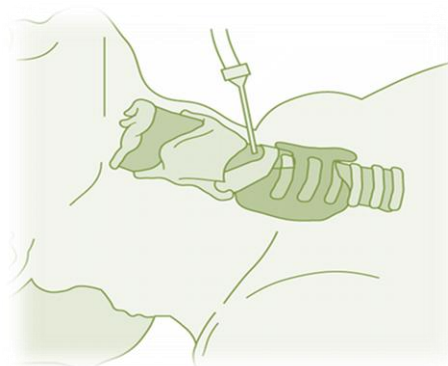
SCI INSIGHTS 2013; 1(3): 30-31.

Keywords: Cricothyroid membrane - Obesity - Cricothyroidotomy - Emergency - Mathematic model

RECENT study showed the successful rate for palpation accuracy to identify the cricothyroid membrane (CTM) in female patients is low (1). The researchers merely got a some 25% success (10/41) and 0% (0/15) in identifying the CTM in non-obese and obese patients, respectively when the neck was in the supine neutral position, and ~30% (12/41) and about 7% (1/15) in both kinds of patients when the neck was extended maximally. These were interestingly as same as another report by Dr Elliott and colleagues in which only 30% attempts by anesthesiologists accurately marked the skin area over the CTM (2). To such a low accuracy of the CTM identifi-

cation, I analyzed theoretically how they occurred and wanted to give an explanation for this phenomenon.

As showing in the Figure 1 (panels A and B), the cervical spine will form an angle (θ) between the line b in the neutral position and line d in the extended position. This is the normal and typical change when we perform cricothyroidotomy and neck examination. We mimicked this situation and modeled the neck like a cylinder theoretically (Panel C in the Fig. 1). Thus, in this model, the



middle point as showing the dot “m” will not shift up and down when both cephalic and caudal sides changing their positions simultaneously (Panel D in the Fig. 1), at this position, therefore, the y axis of the coordinate will not be displaced by the extension and still directs upward tangentially to the middle line. However, this is not the actual clinical situation; generally our necks will be extended with only cephalad backwards (Panel E in the Fig. 1) which will result in a shift of dot “m” upwards to the position of

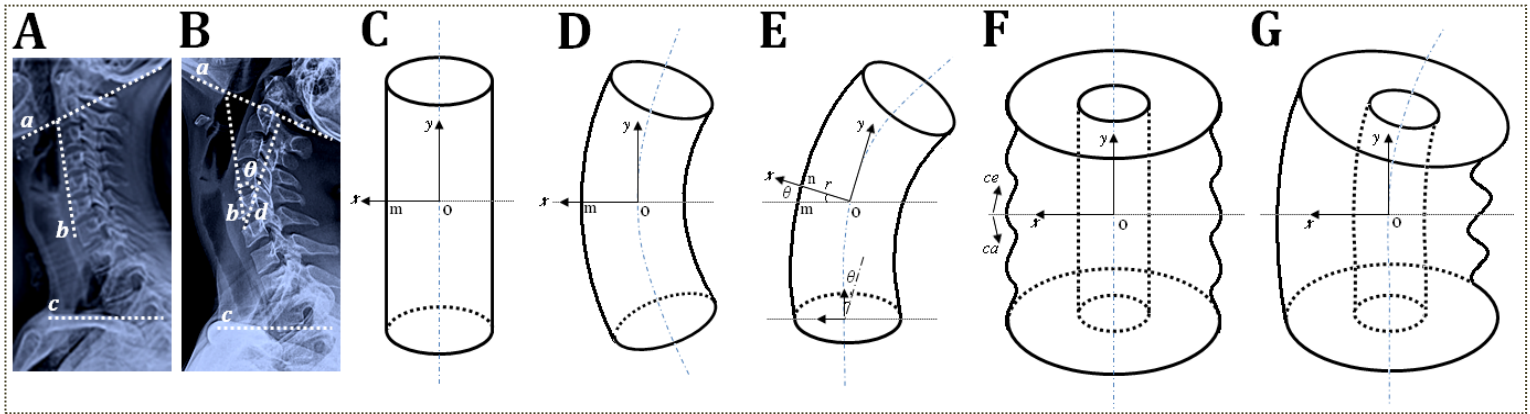


Figure 1. Calculation model of the extended neck for palpation accuracy. (A and B) Lateral radiography of the cervix in supine neutral and maximally extended positions; (C to E) simplified model of the cervix for the shift of the palpation point when the neck is extended in nonobese population; (F and G) obesity model for palpation accuracy. r denotes the radius; θ denotes the radian; ce means cephalad; ca means caudad.

dot “n”. So an angle between the lines of “ om ” and “ on ” formed, and this is exactly the angle of “ θ ” in the panel B. According to the mathematic formula of arc length of a sector,

$$a = \frac{\pi \cdot r \cdot \theta}{180^\circ} = \frac{C \cdot \theta}{360^\circ}$$

where a is the arc length, r is the radius, θ is the radian, and C is the neck circumference, thereafter we calculated the arc length of “ mn ” on the bases of the reported normal ranges of θ (10-30°, the maximal extension angle of the human neck) (3) and C (37.5 cm and 40 cm in female and male, respectively) in nonobese population. As thus the real palpation point will shift upward the following distance: $a_{\text{male}} = 1.11-3.33$ cm, and $a_{\text{female}} = 1.04-3.13$ cm. Meanwhile, given the movement tendency of skin during palpation and the possible rotation of the axial neck, so this theoretic calculation will encounter alteration and may be moved up or down, or left or right. For the patients of Drs Aslani et al. (1), their changing ranges of the skin palpation point

were $a_{\text{nonobese}} = 0.97 \pm 0.08 - 2.91 \pm 0.24$ cm, and $a_{\text{obese}} = 1.12 \pm 0.11 - 3.36 \pm 0.34$ cm. Nonetheless, it is more complex when assessing such changes in the obesity because of the increased neck circumferences of obese patients (Panel F in the Fig. 1) (4), which will lead to a relatively smaller extending angle than that in the normal people, plus the stretch of the wrinkled skin (Panel G in the Fig. 1), so the palpation point will move far easier on the fattened neck and in fact cannot be assessed using this theoretic proposal. Therefore, the elevated palpation point will lower down when the extended neck returned back normal, which will undoubtedly result in a big change in the accuracy of the identification of the actual CTM in nonobese adult patients and a more difficult situation in obese patients, after all, a clinically meaningful 0.5cm shift will result in a failure of cricothyroidotomy. ■

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Conflict of Interests

None

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