

Lecture #3

Friday, May 10

Agenda

1. Collect diaries

- Paper preferred
- Email allowed
- Can provide paper and also email!

2. GEM presentations

- We will GONG you if you take too long
 - » But we will be a little soft on time
- After each presentation, anyone can ask a question
- Discussion should be short
- Two awards
 1. Staff selection of best presentation
 2. Students elect best presentation
 - We will provide 3-5 nominations

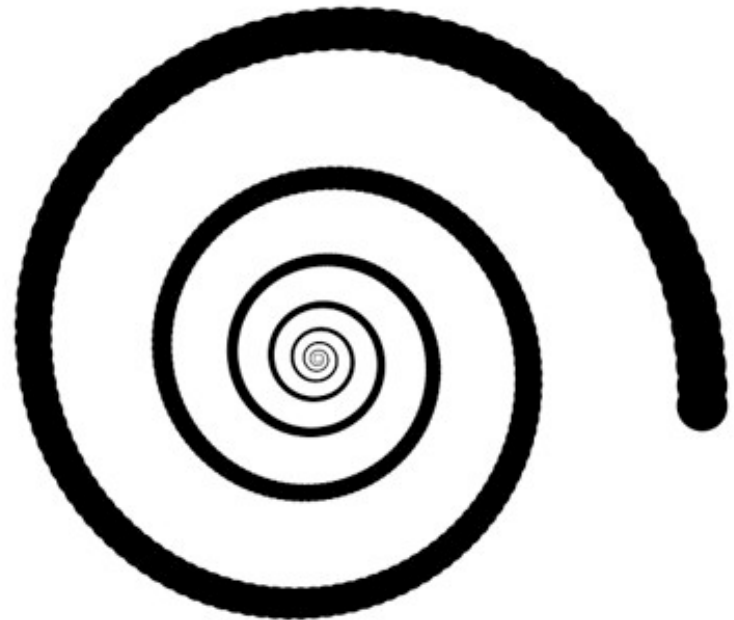
3. Course Retrospective

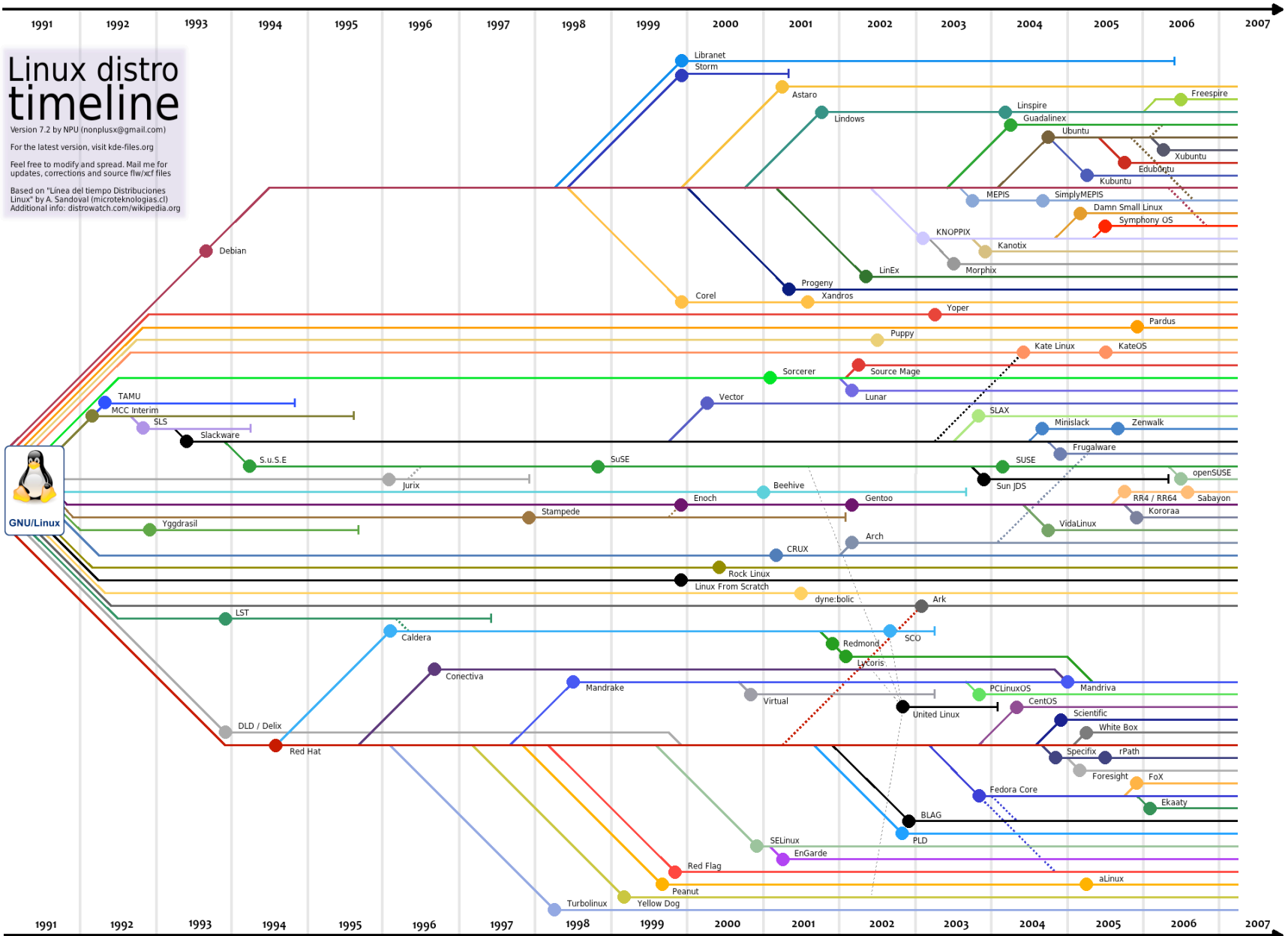
4. Course Feedback

5. Certificates, class picture

Taking an Evolutionary Worldview

- 1. Self-Assessment: your current understanding of an evolutionary system**
 - By example, Active Learning
- 2. Evolution of Strategies**
 - Prisoners Dilemma
 - Role play exercise of Evolutionary NIPD
 - Fitness => Competition => Selection => Inheritance => Fitness...
- 3. Biological Evolution**
 - Criteria for evolution
 - Inheritance and variation of traits
 - Sexual selection
 - Evolutionary Gems
- 4. Evolutionary computation**





Linux distro timeline
Version 7.2 by NPU (nonplus@gmail.com)
For the latest version, visit kde-files.org
Feel free to modify and spread. Mail me for updates, corrections and source flw/xcf files
Based on "Linea del tiempo Distrociones Linux" by A. Sandoval (microtecnologias.cl)
Additional info: distrowatch.com/wikipedia.org



Prisoner's Dilemma



Evolving NIPD Strategies

- N: different opponents
- I: Iterated

Generation Loop

- Population of different organisms
- Each has a strategy, m
- Organisms play k iterations
 - » OrganismFitness = total
- Fitter organisms have higher fitness

End Loop



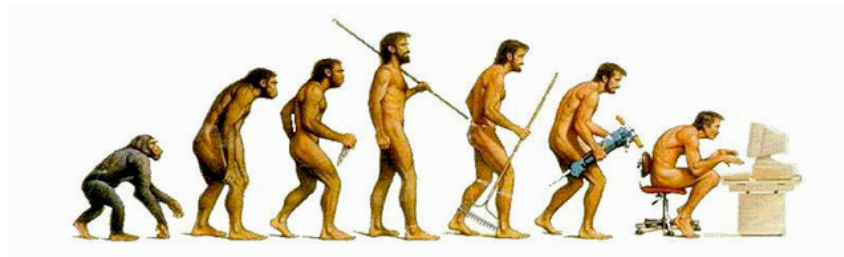
an

Elements Required for Evolution

- The Units of Selection Author(s): R. C. Lewontin
Source: Annual Review of Ecology and Systematics, Vol. 1 (1970), pp. 1-18
- **The individual struggle for existence has three principles:**
 - Variation between “individuals”
 - Differential fitness, i.e. different rates of survival and reproduction for different “individuals”
 - Heritability of fitness. No particular mechanism of inheritance needs to be specified, only a correlation in fitness between parent and offspring

Expanding Your Understanding of Evolutionary Systems

- **Challenging**
 - **New info communication and knowledge transfer strategies**
 - » **Active learning**
 - **Think**
 - **Pair**
 - **Share**
 - » **Role playing**
 - **You received formal information in English**
 - » **on slides and**
 - » **in papers**
 - **You received oral information in English**
 - **You received exercises in Python**
- **You practiced via**
 - **Writing**
 - **Oral presentation**
 - **Programming**



http://daily.swarthmore.edu/static/uploads/by_date/2009/02/19/evolution.jpg

Why is this course not all programming?

- **Anyone/anywhere can learn a programming language**
- **More important to understand the underlying concepts you are trying to abstract into computation**
- **Then there is not only one program**
 - There is a body of programs
 - There is a collection of ideas and solutions that can be designed and implemented by software.



I hear, and I forget
I see, and I remember
I **do**, and I understand.

- Confucious

May 23-24, 2009

Thomas Moore



Natural selection in speciation

----Zoe(王卓敏)

what is natural selection?

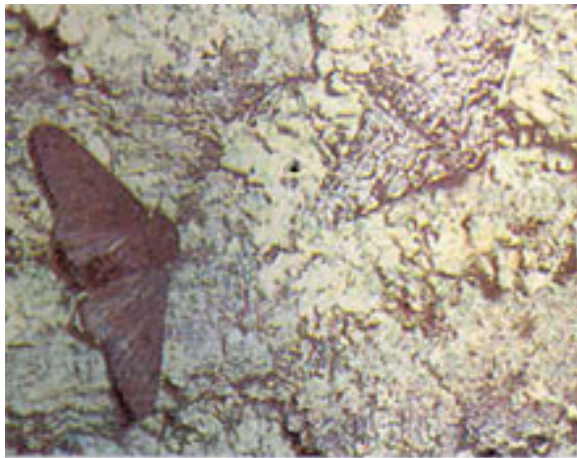
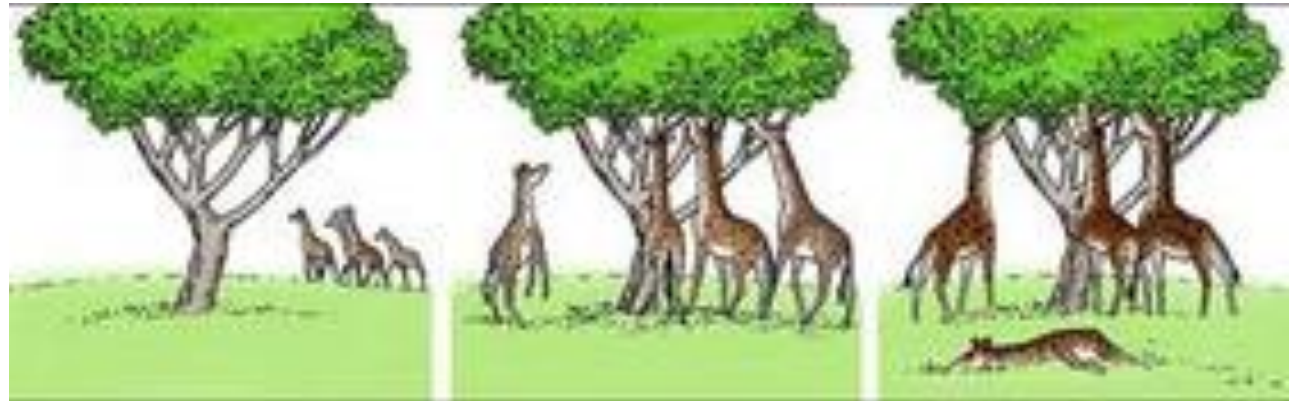
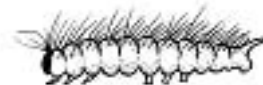
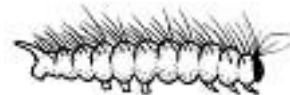
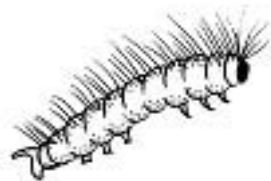
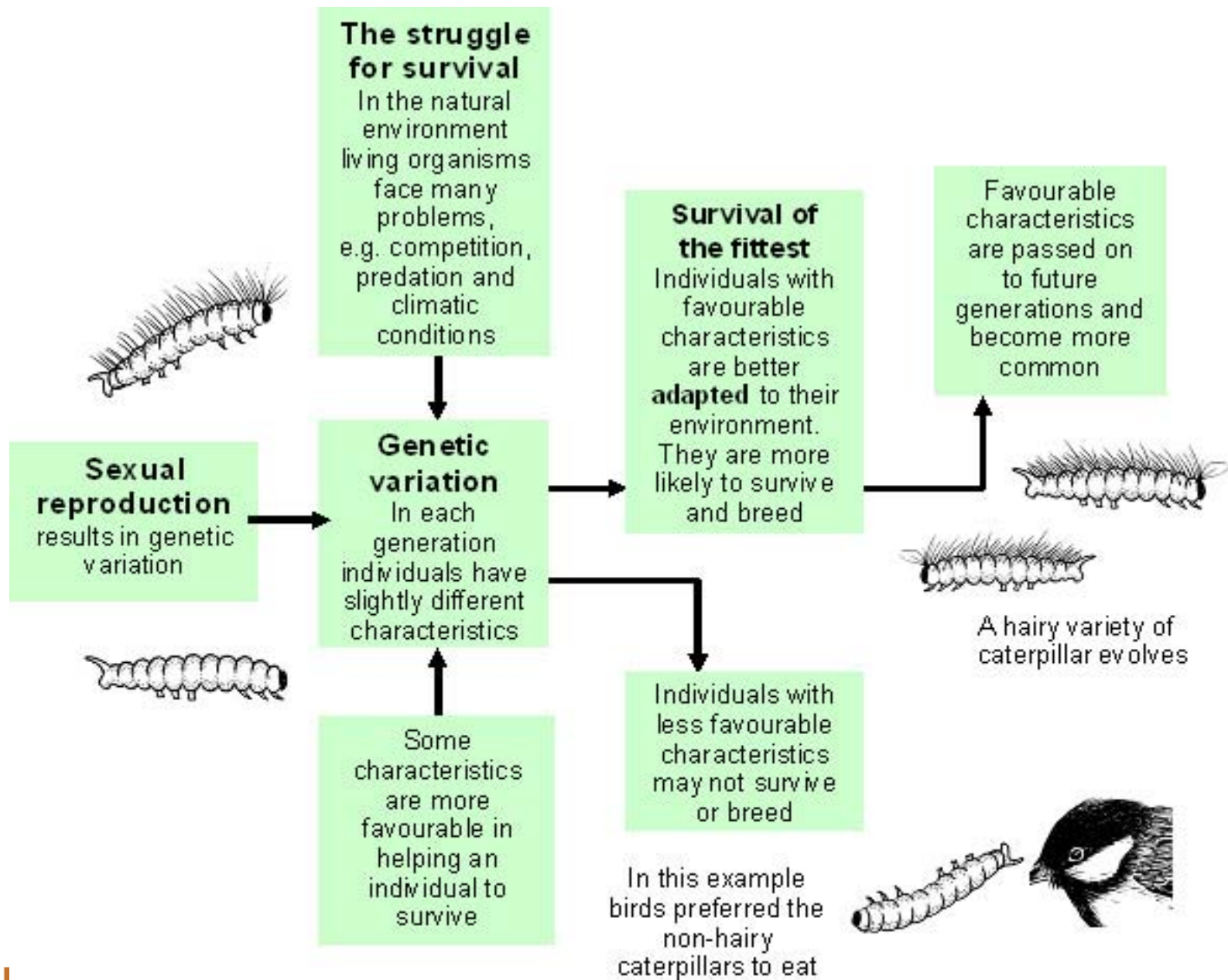
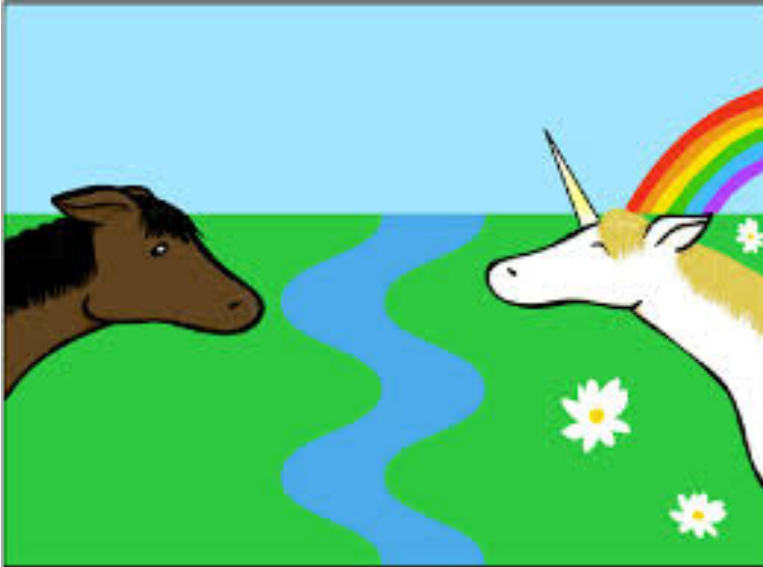


图 7-2 长满地衣的树干上的桦尺蠖

The more advantageous trait becomes more common in the population



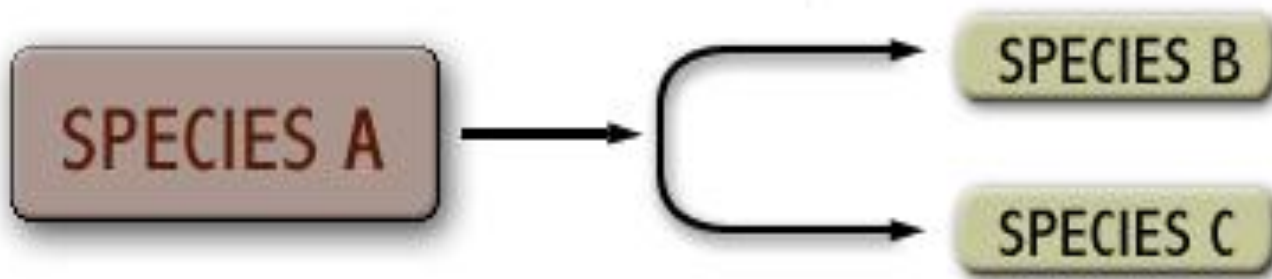
what is speciation



reproductive
isolation

- geographic isolation

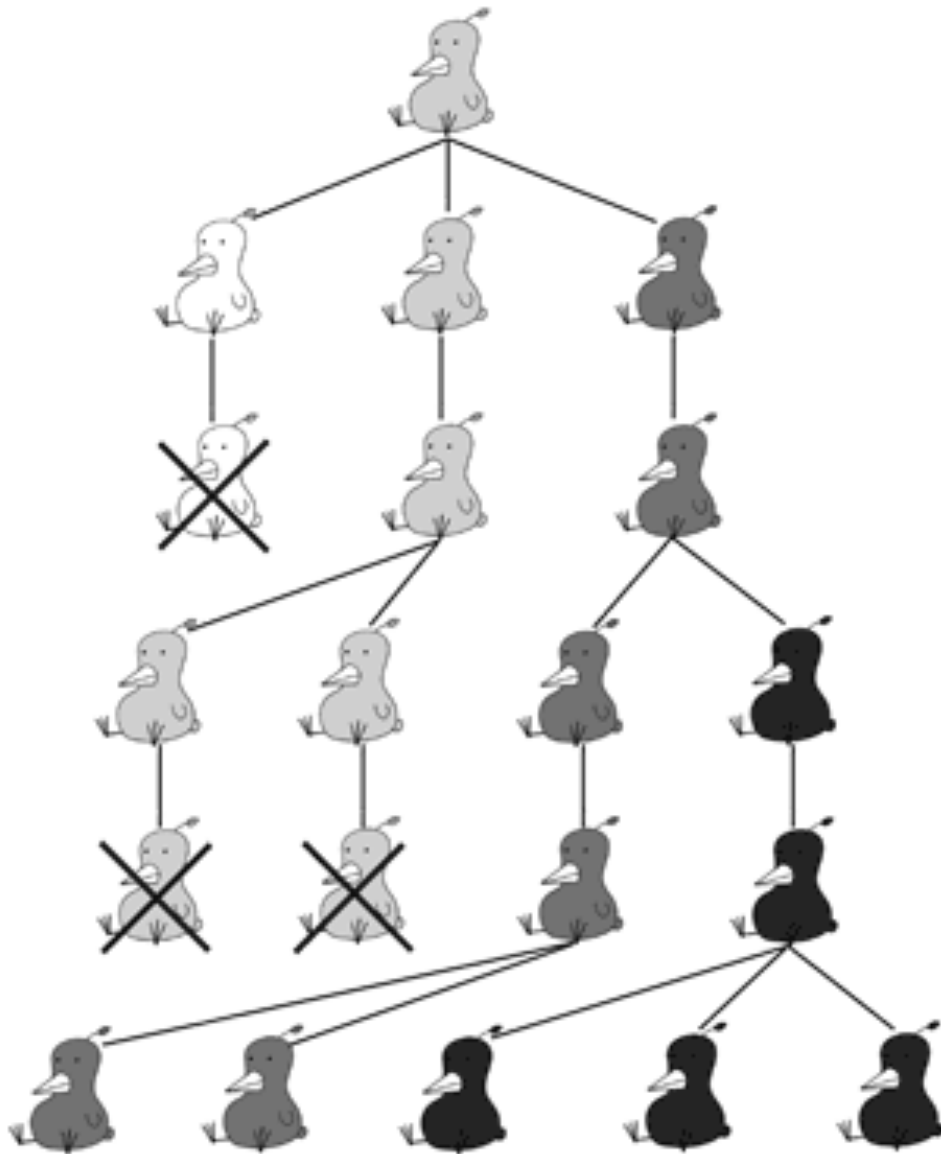




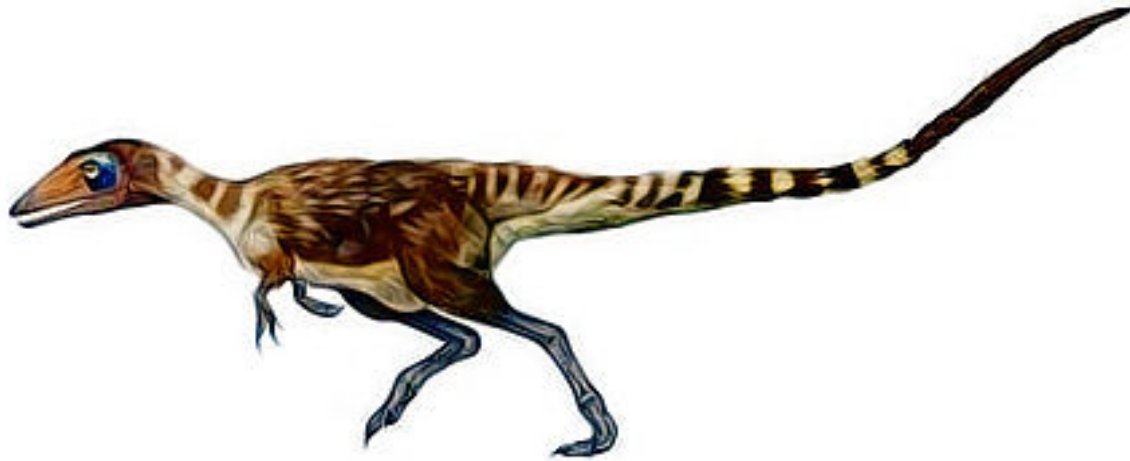
Multiplicative Speciation



Phyletic Speciation



<http://a.hiphotos.baidu.com/baike/c%3DbaikeA1%2C10%2C95/sign=82bc043b918fa0ec6bc7335c4ffc3caf/1ad5ad6eddc451da61a7cae3b6fd5266d1160924ab181a59.jpg>



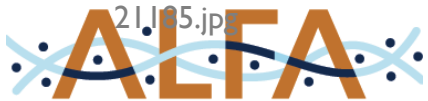
中华龙鸟 (ZhongHuaLongNiao)

生存于距今年内1.4亿年的早白垩世。1996年在中国辽西热河生物群中发现它的化石。开始以为是一种原始鸟类，定名为“中华龙鸟”，后经科学家证实为一种小型食肉恐龙。

远古生物 REMOTE ANTIQUITY LIFE-FORM

<http://a4.att.hudong.com/72/54/013000003359341240315480>

21165.jpg

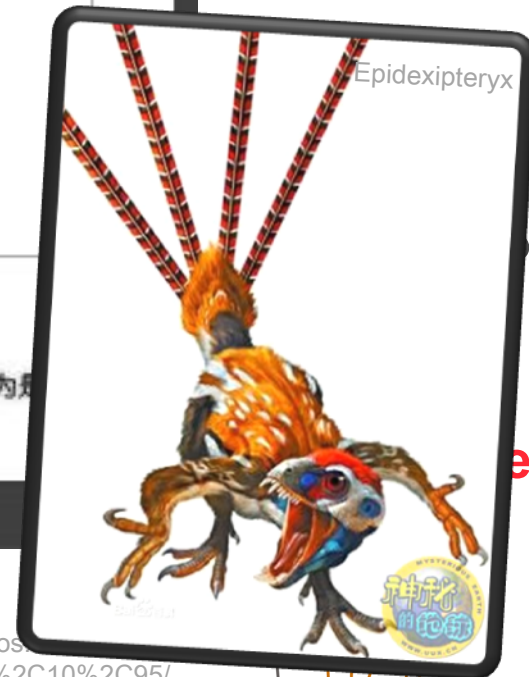


ANYSCALE LEARNING FOR ALL

“transitional forms”

common

attractive



<http://h.hiphotos.com/baike/c%3DbaikeA1%2C10%2C95/sign=da3727d74710b912abc1a1afaa94994275882b2b7d0a20cf4268b9eb376094b36adaf2edda3cca17e.jpg>

CSAIL

GEM 10 Selective survival in wild guppies.

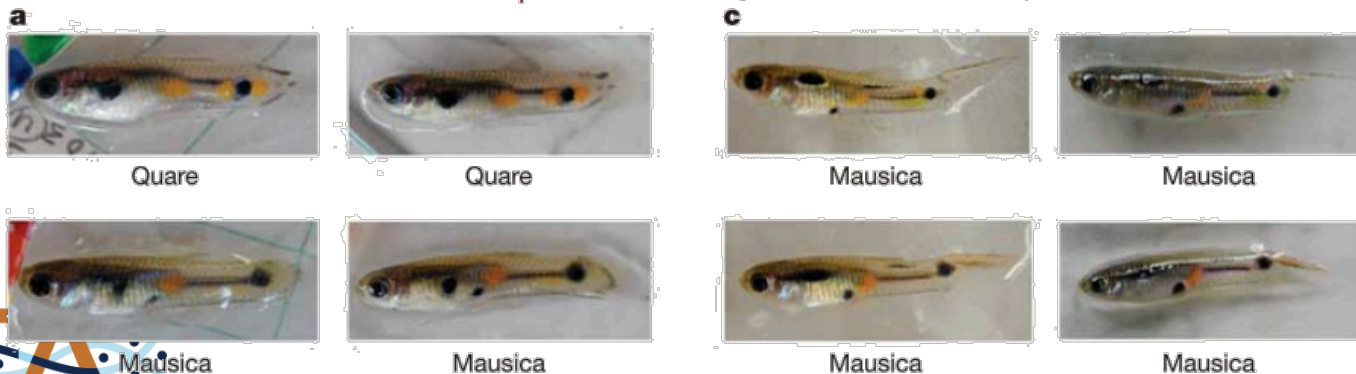
Frequency-dependent survival in natural wild guppy population

- Idea: Selection favors rare types.
- Summary: Experiments show that frequency-dependent survival occurs in natural guppy populations.

Table 2 | Recapture rates by population and year*

Site	Year	Rare	Common
Mausica	2003	0.88 (0.08)	0.72 (0.04)
Mausica	2004	0.79 (0.12)	0.66 (0.08)
Quare 1	2003	0.79 (0.07)	0.75 (0.04)
Quare 1	2004	1.00 (0.00)	0.67 (0.10)
Quare 7	1996	1.00 (0.00)	0.61 (0.10)
Quare 7	1999	0.60 (0.11)	0.74 (0.08)

* Values for rare and common morphs are means (and standard errors).



1. Land-living ancestors of whales

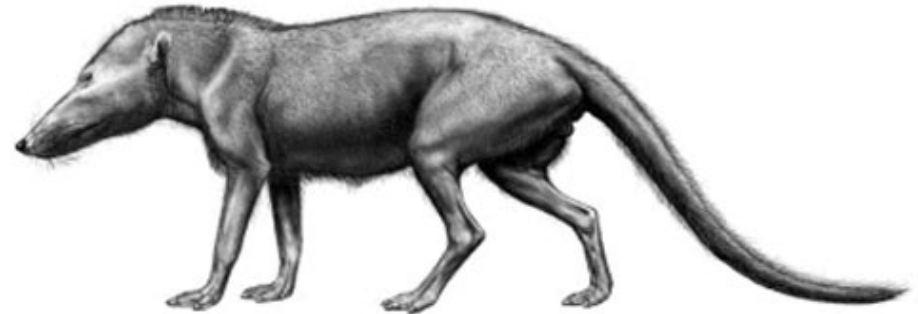
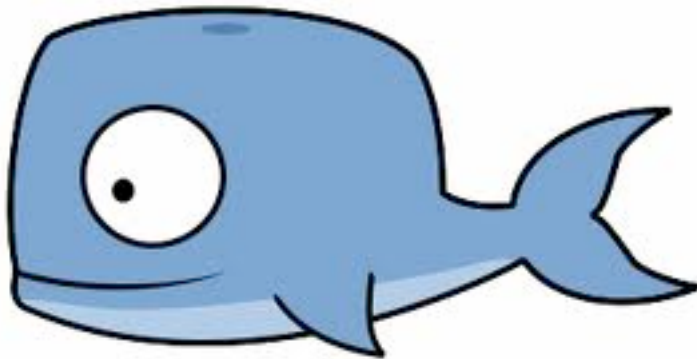
- **Whales are mammals not fish!**
- **numerous fossils** point to Ambulocetus — have characteristics now seen only in whales
- spent much of its time in water
- Only in the state does man have a rational existence. —Hegel



Ambulocetus

The Evolution of Whales

John





SuWei jun Tele-Comunication

Ed. Truies, pinx.

Deger

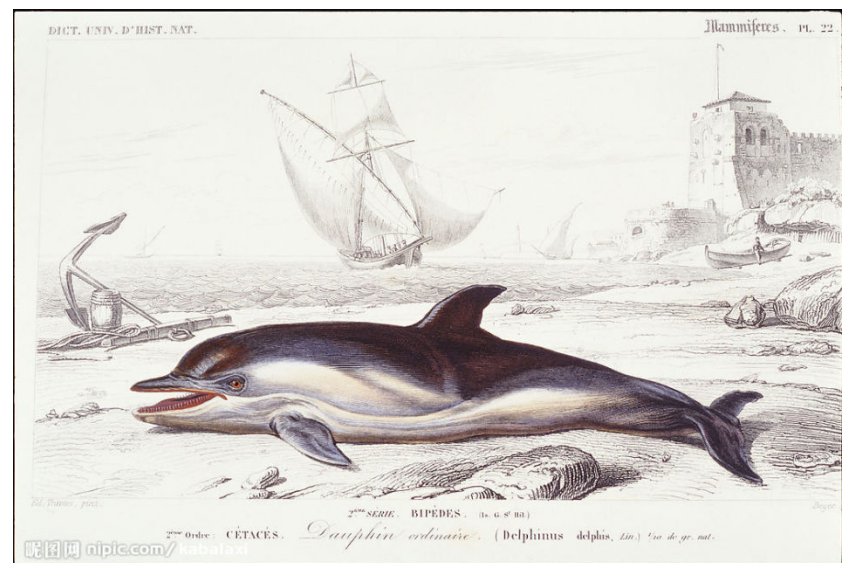
2^{ème} SERIE. BIPEDES. (No. 6. 8^o III.)

2^{ème} Ordre: CÉTACÉS.

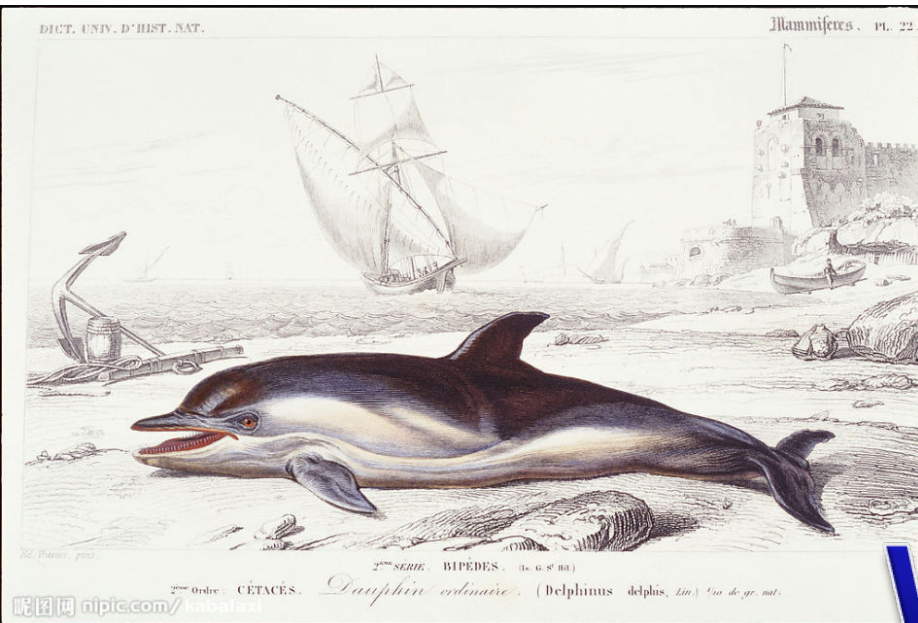
Dauphin ordinaire. (Delphinus delphis, Lin.) 1/10 de gr. nat.

MAMALS





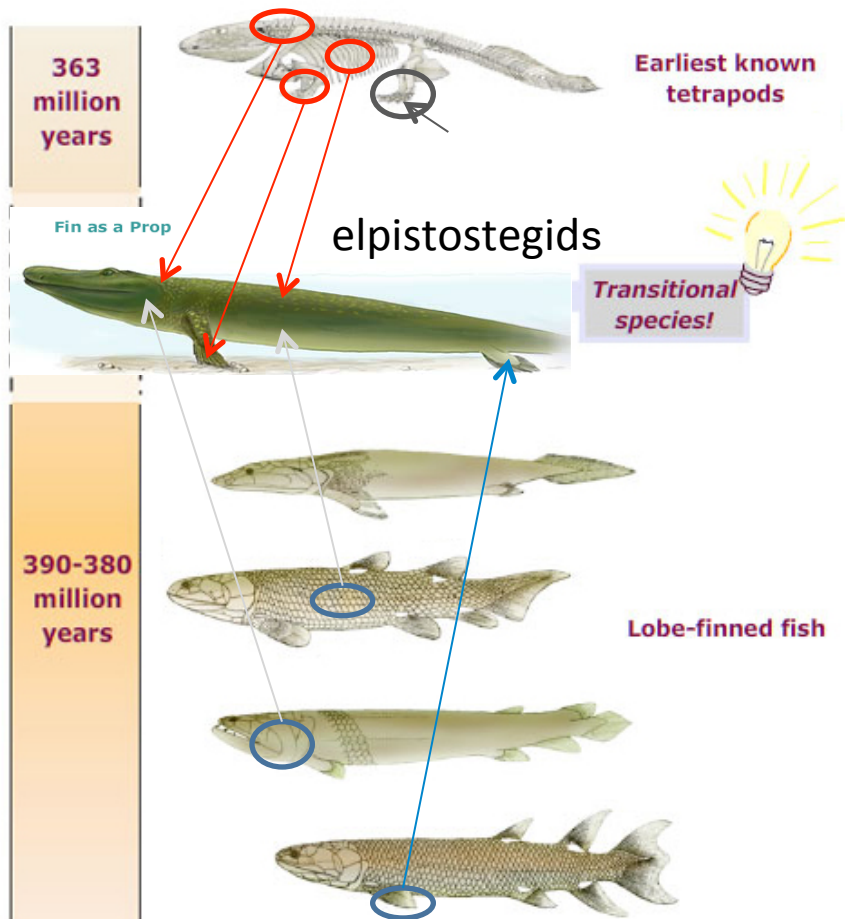
Landing ancestor of whales



Weijun Su



From water to land



QUICK STATS

Age: 375 million years old
Found: Ellesmere Is., Nunavut, Canada
of individuals uncovered to date: over 10
Size Range: smallest = 3 feet long
largest = 9 feet long
Nickname: 'fishapod'

?

Alan



CSAIL



From water to land —from fish to human

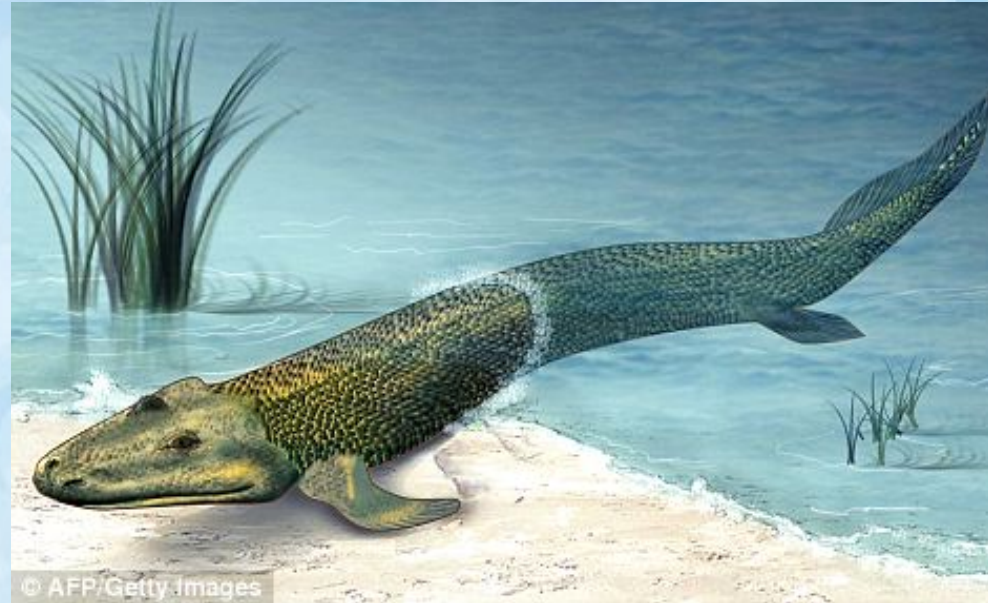


Tiktaalik—the missing link

Curiosity Survival



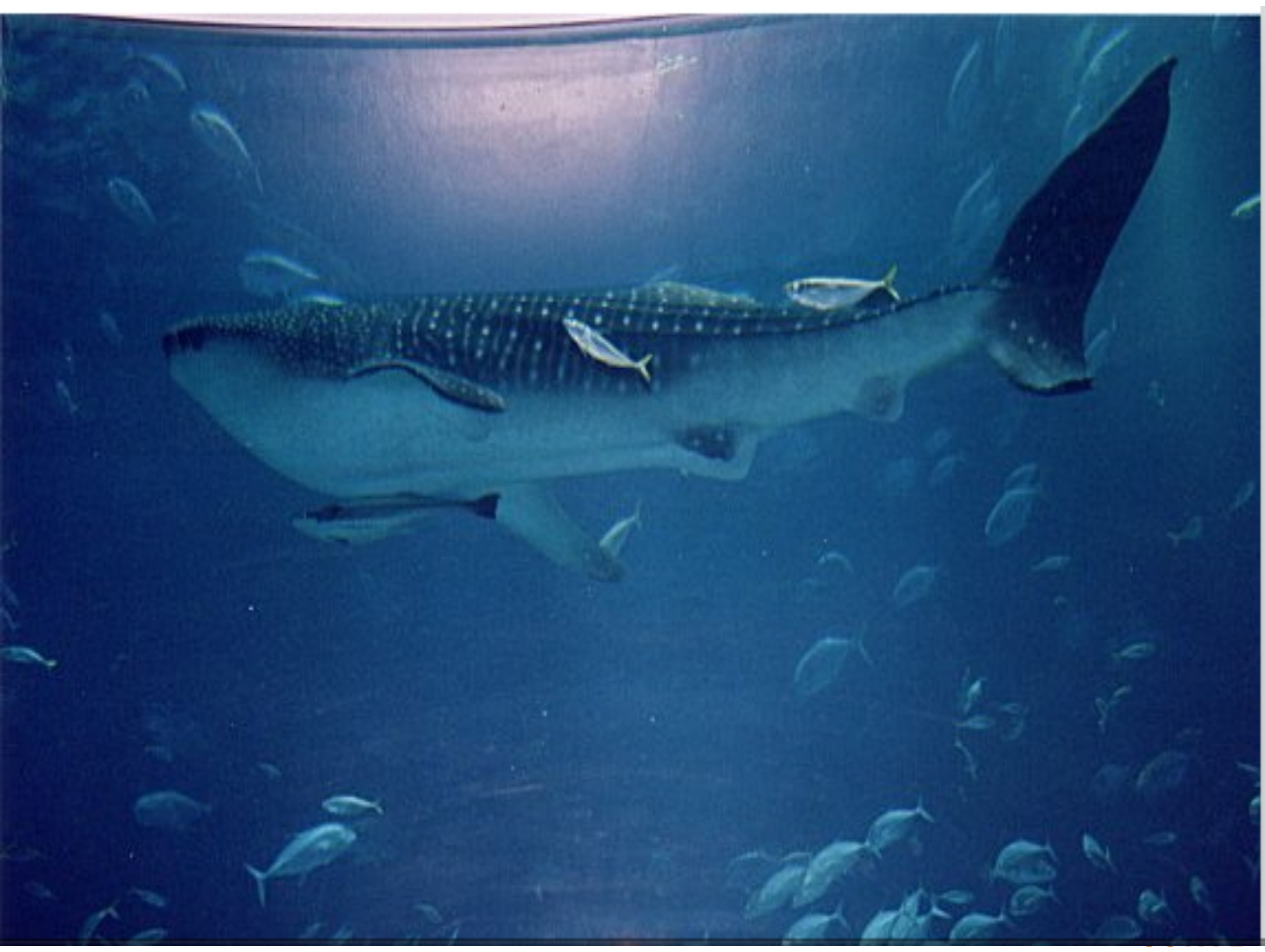
Legs



By Mona

Land-living ancestors of whales

particia

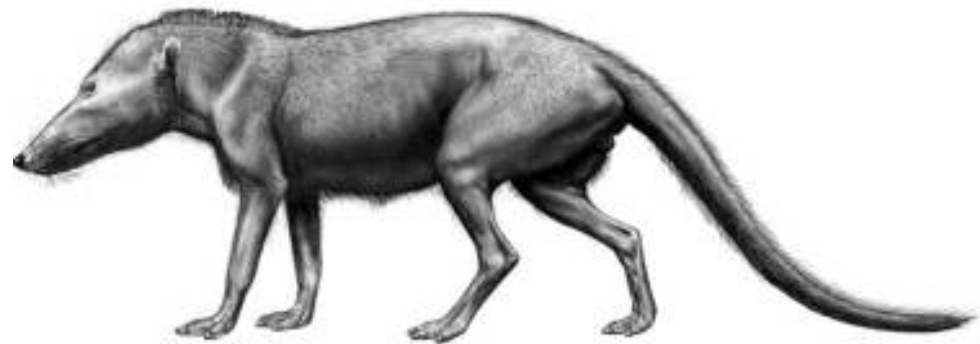
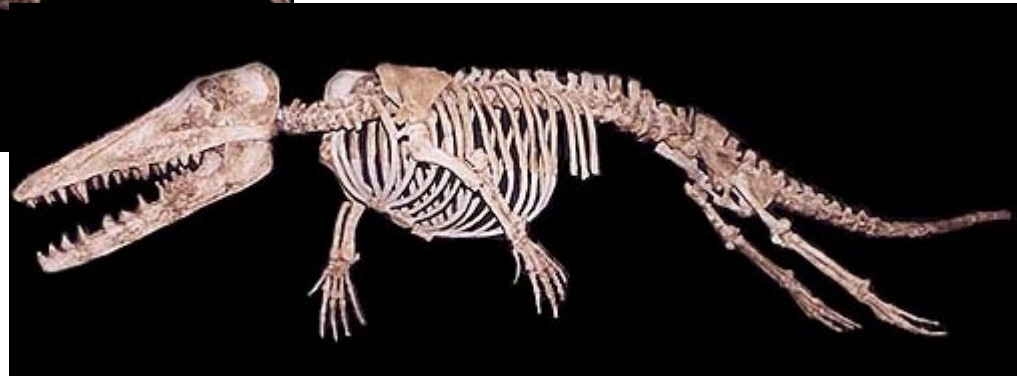


Fossils offer crucial clues for evolution

The time capsule



At first, we all believe that.....



THE ANCESTORS



INDOHYUS?



The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.

INDOHYUS?

RAOELLIDS?


RACCOON



Why did they leave land and go into water?

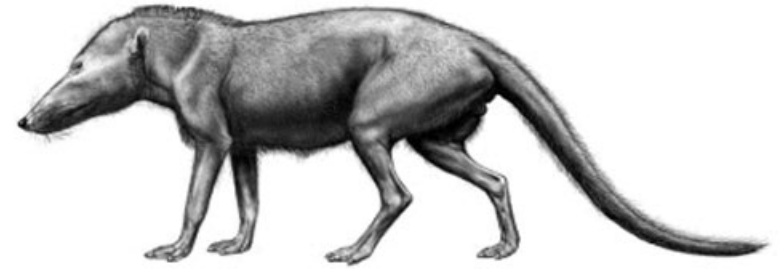
dietary change



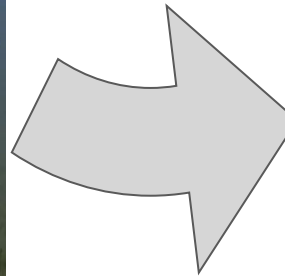
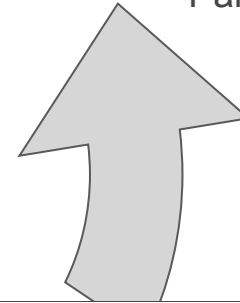
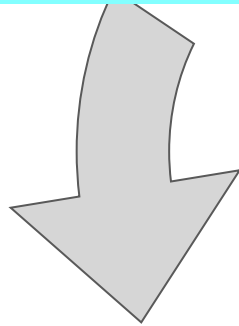
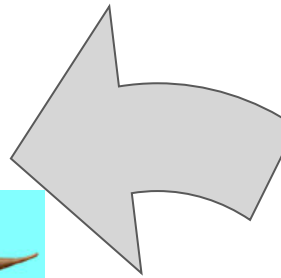
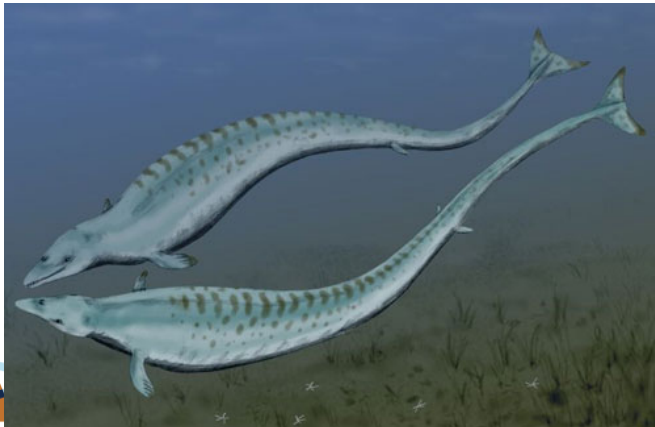
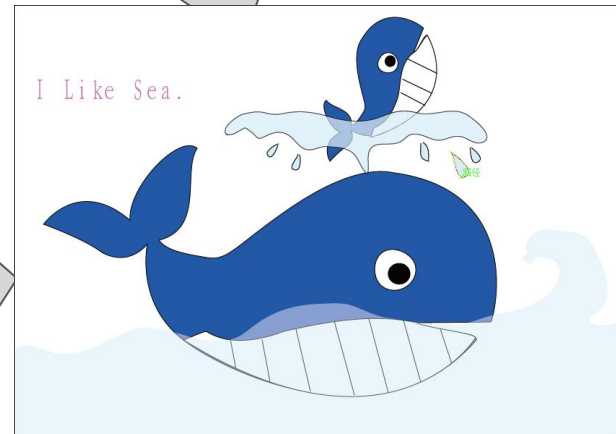
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Land-living ancestors of whales



Pakicetus



The origin of feathers



Q: Archaeopteryx = Dinosaur Or Bird ?

In Liaoning Province **found** Dinosaur with feathers !



Much more feather-clad **found** **Reasons?**



Epidexipteryx

Answer: Dinosaur !



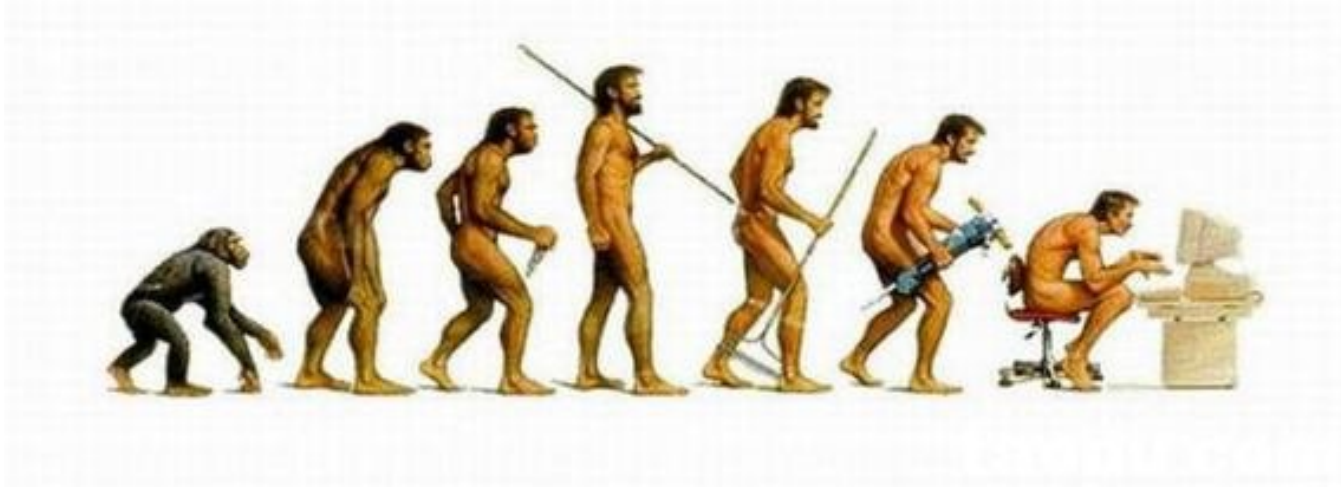
10. Selective survival in wild guppies



If you are rare, nature will prefer you.

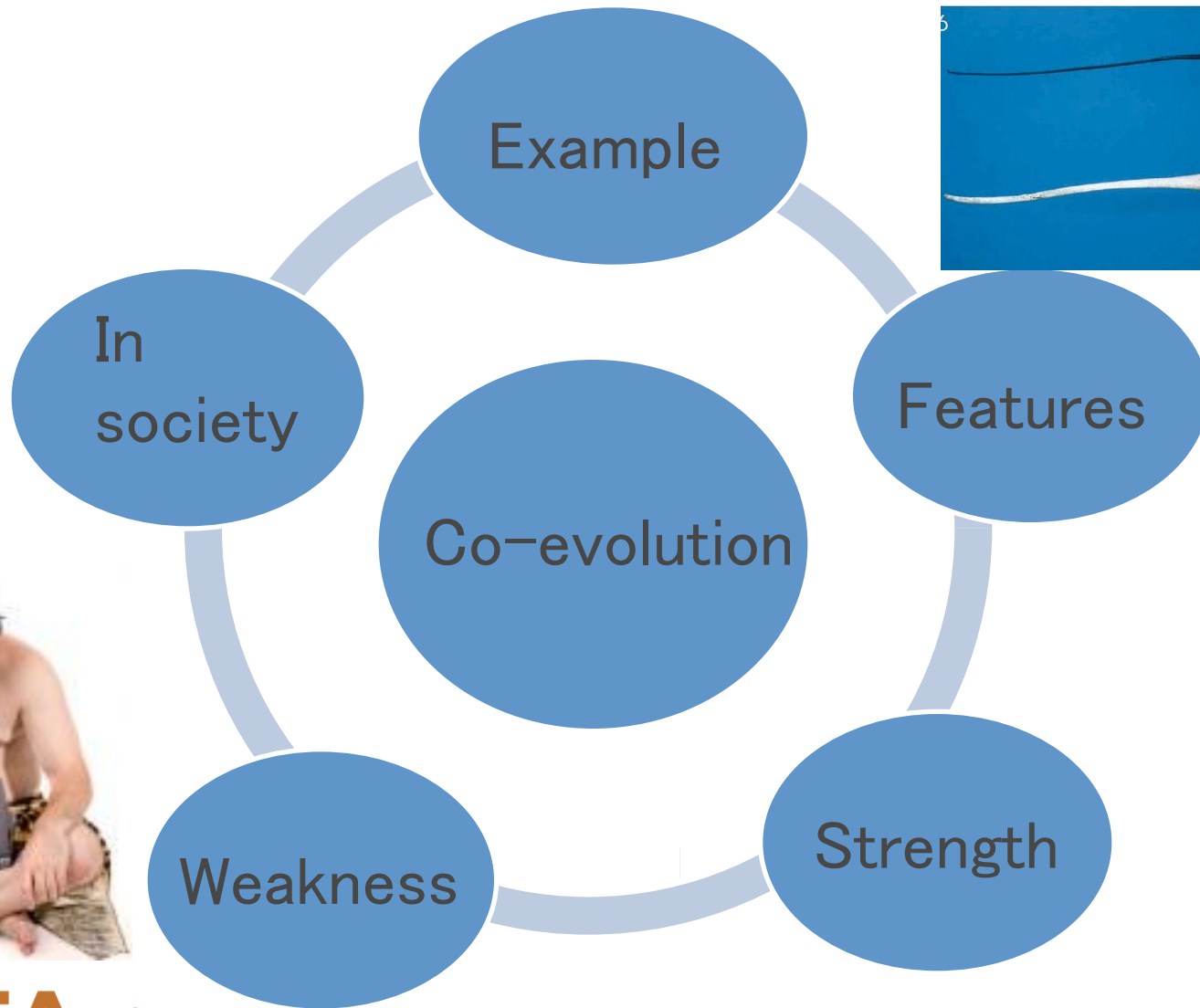


Natural selection in speciation



- what
- why
- examples

8. A case of co-evolution



Natural
selection

Body size

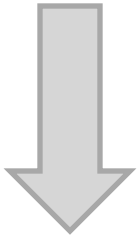
Reproductive
isolation



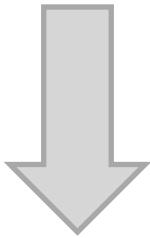
This picture is drawn by my roommate, M

From water to land

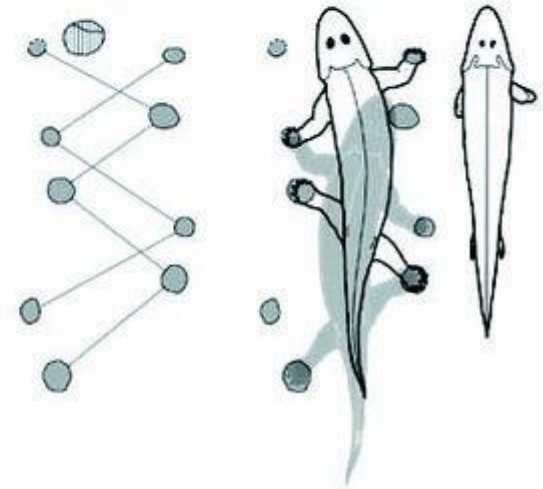
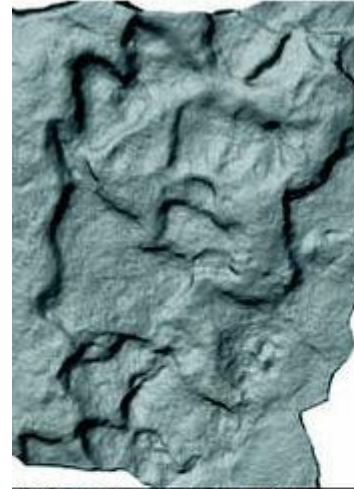
Fish evolved legs



*Came on land
and adapted the
life*

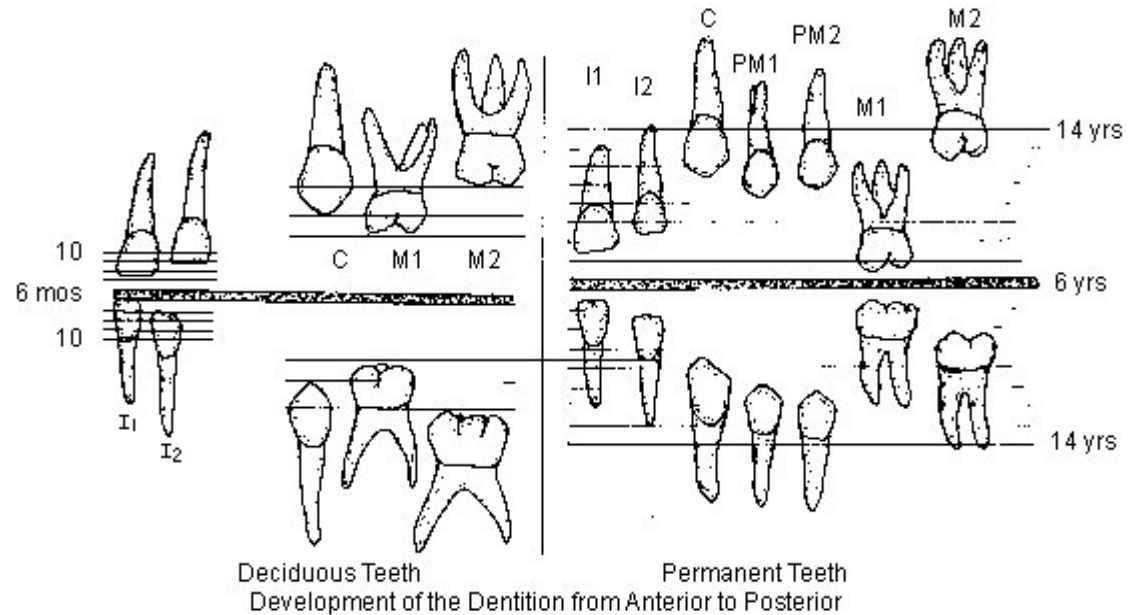


Tetrapods



The evolutionary history of

Teeth



<http://www.uic.edu/classes/orla/orla312/Teeth%20in%20Function%3B%20Life%20History%20of%20Teeth.htm>

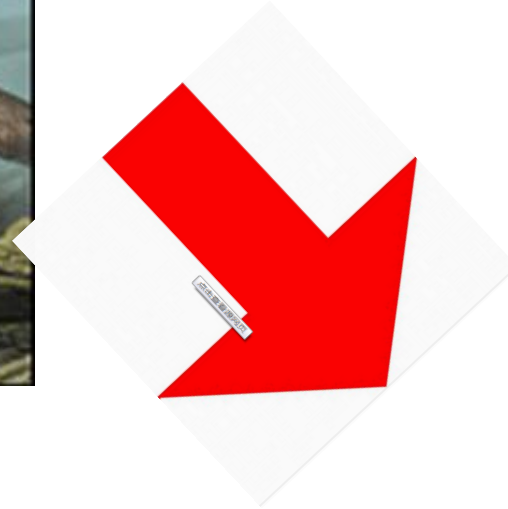
Whales



the mammals in
the sea

whales' ancestor—Indohyus





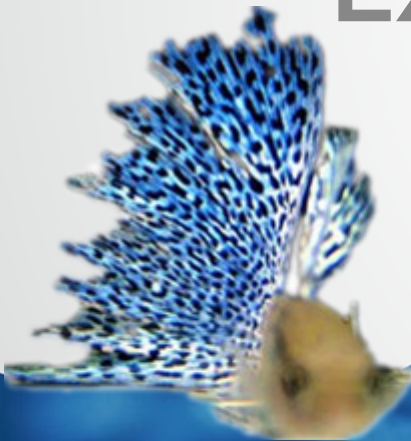
time goes by



10 Selective survival in wild guppies

Yan

Experiment in Trinidad



co-evolution

Guo Hao

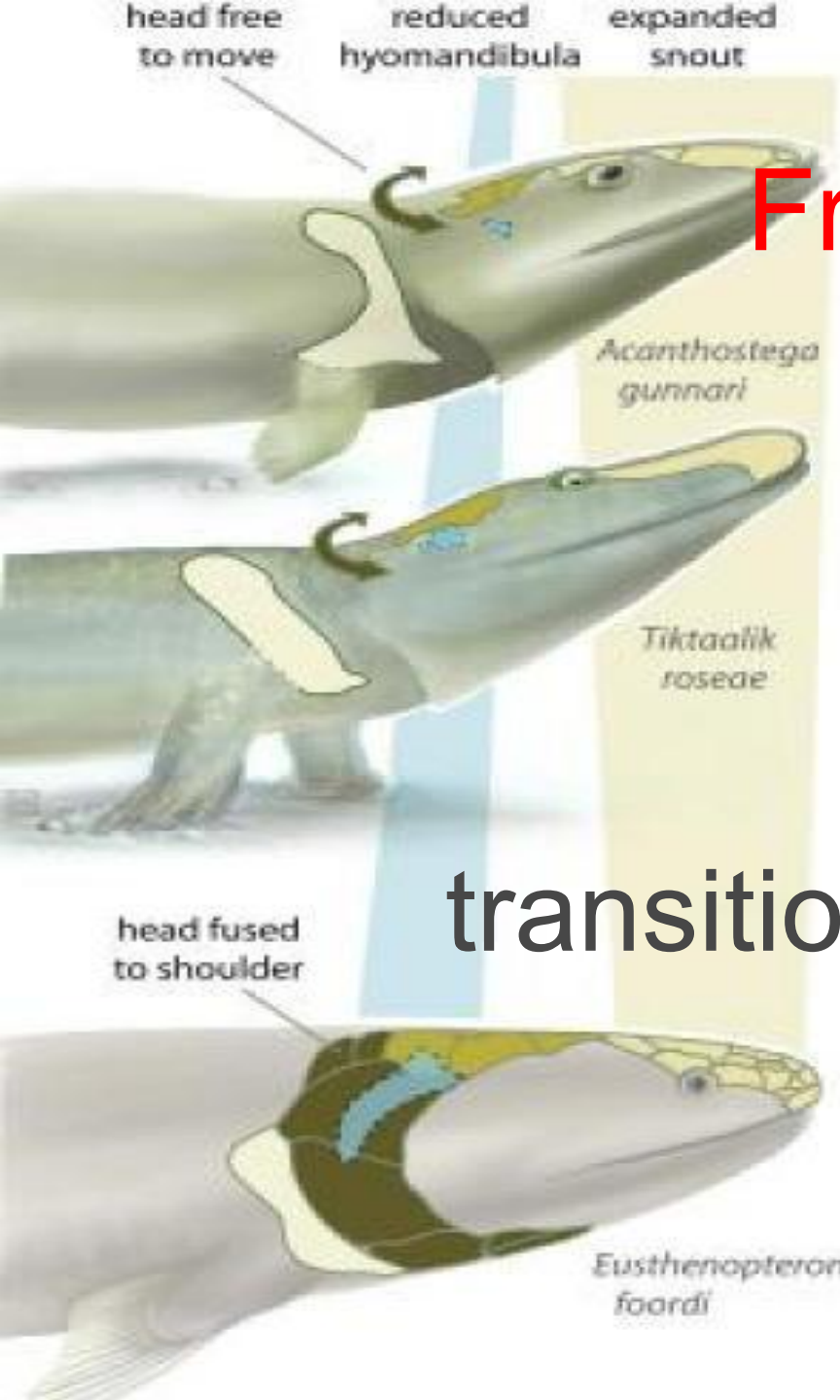


tiger



百度猫科猛兽吧

© Argem. Hanzhou

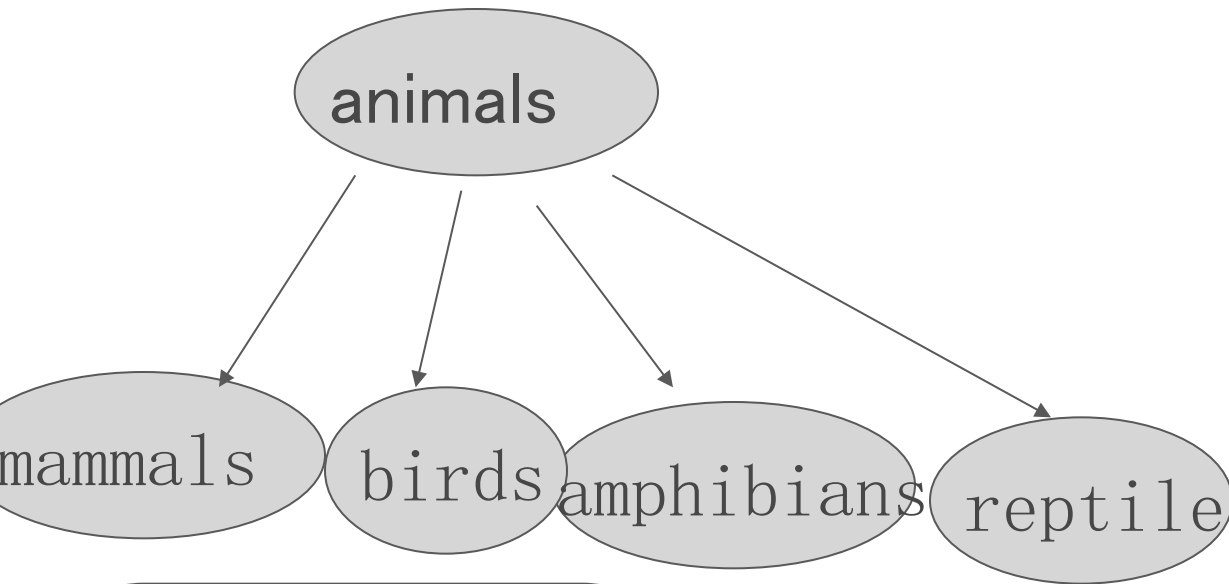


From water to land

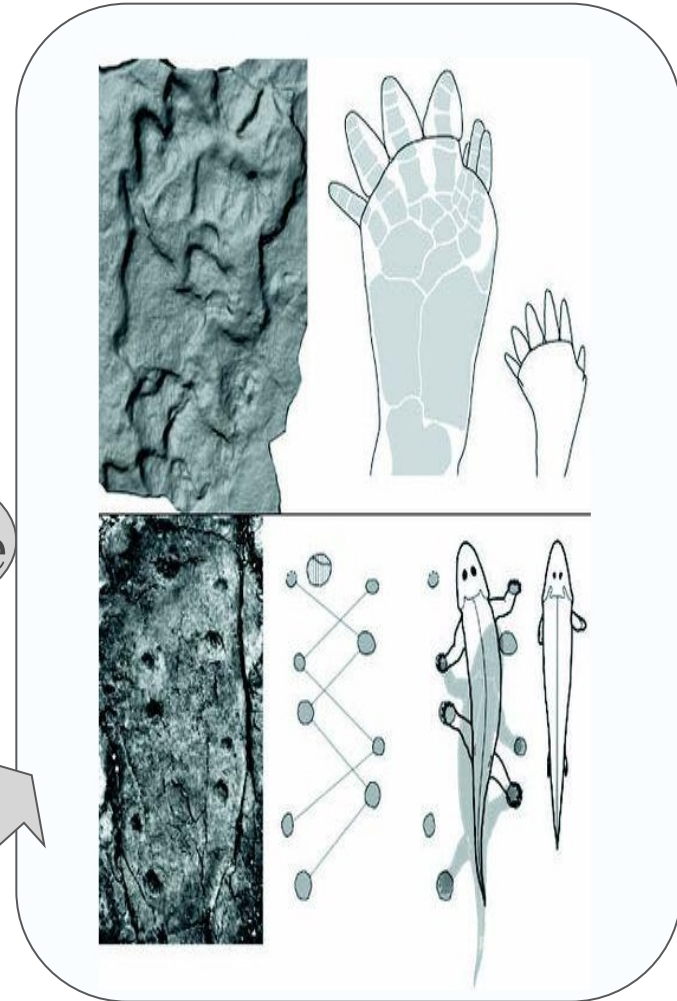


transition , wetland

From water to land



tetrapod



elpistostegid 希
望螈类

giant salamander 娃娃鱼

Guppies



- Variants are favoured when rare, and selected against when common.

**Natural
selection**

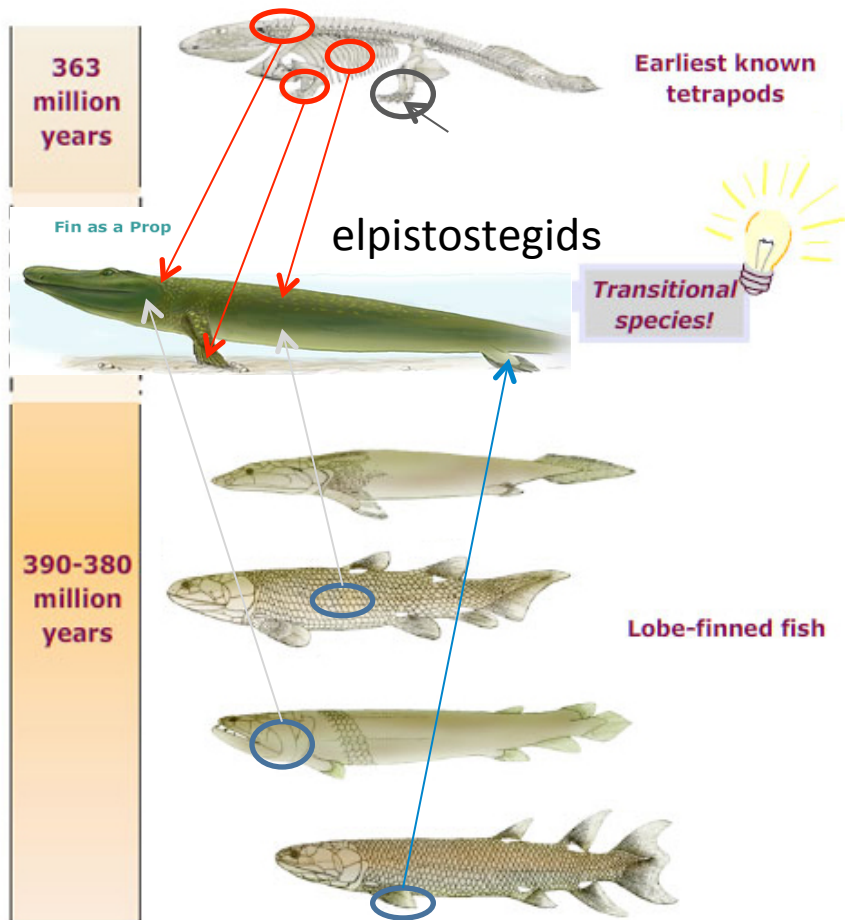
By Niyachen



Three excellent talks

- Alan - Tetrapods
- Chebur - Coevolution
- Jessie-2 - Guppies

From water to land



QUICK STATS

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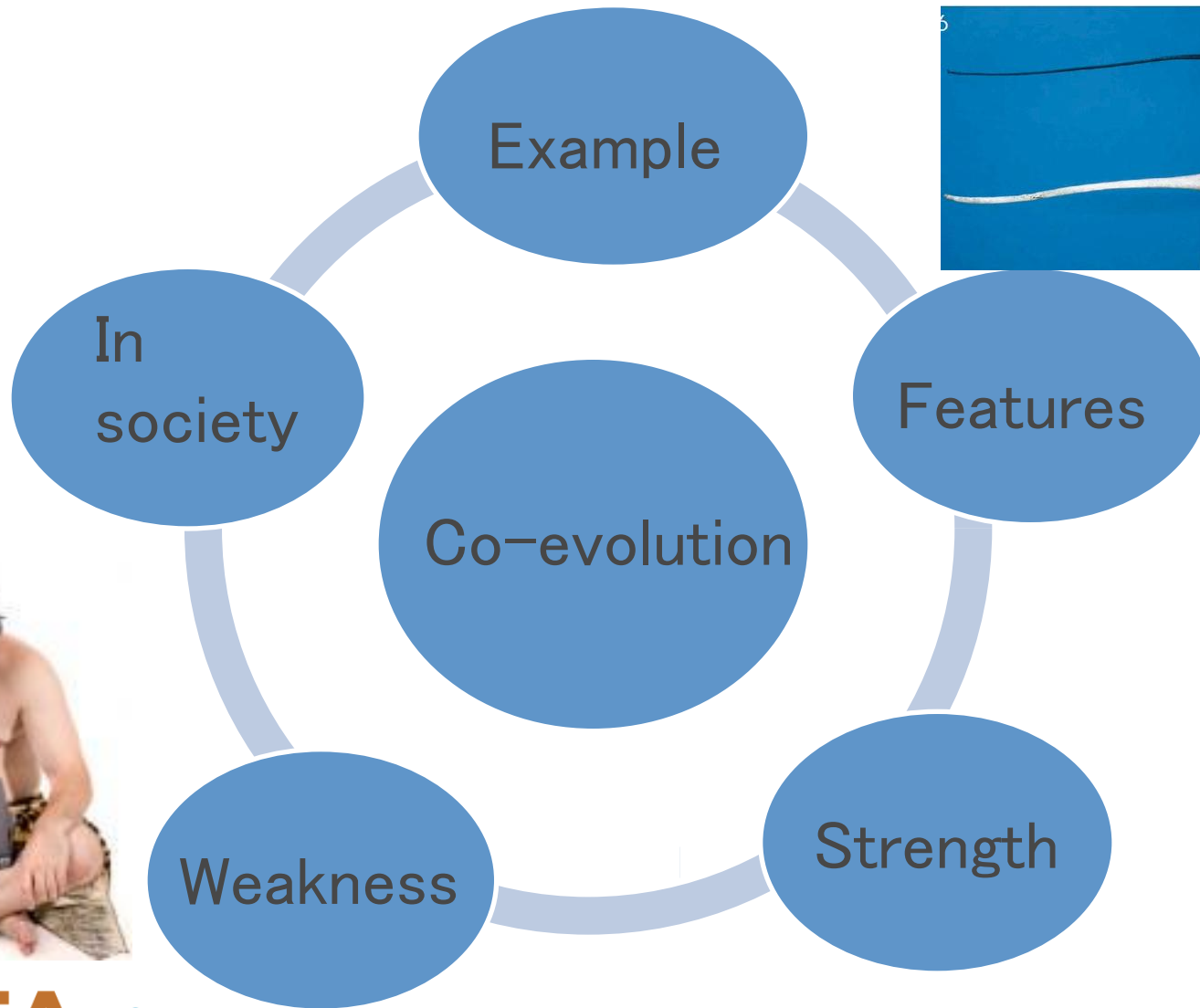
?

Alan



CSAIL

8. A case of co-evolution



10. Selective survival in wild guppies



If you are rare, nature will prefer you.



And the winner is

- **Alan**

Honorable mentions

Una-May's statistics

6 are Excellent

5 more are Very Good

Erik

7 are Excellent

7 more are Very Good

- **Nicole**
- **Patricia**
- **Winnie**

Nominations for Student Voting

- **Rainy**
- **Mona**
- **Joe**

- **Put one name on paper and we will collect and count now.**
- **Rainy won**

Collecting Your Feedback

- **STU questionnaire**

Help us by completing it thoughtfully

- **MIT: Would you tell your friend, who has the chance to take this course next year, to take it?**

- “Would you recommend this course to a friend”
- YES or NO
- Add any further comments

- DO THIS NOW

Acknowledgements

- **Shantou University**
 - Provost Gu, Peihua
 - Lab Management
 - » Zhang Jie
 - Teaching Assistant
 - » Meijuan Yan
 - Lab Assistants

- **YOU!**



<http://abovethelaw.com/uploads/2012/01/thanks-keyboard.jpg>

Congratulations and Goodbye!

- **Certificates**
- **Class picture**

- **Games after lunch?**
 - **Volleyball? Soccer?**