3D Scanning…

and more.

John Kappelman
Department of Anthropology
UT Austin

Database vs Interactive Teaching and Learning Environment

- "Hands on" teaching and learning
- Scientific method
- Data collection
  - Skeletal elements
  - Assessing behaviors
- Quantification and hypothesis testing
- Instantaneous feedback

The Audience…

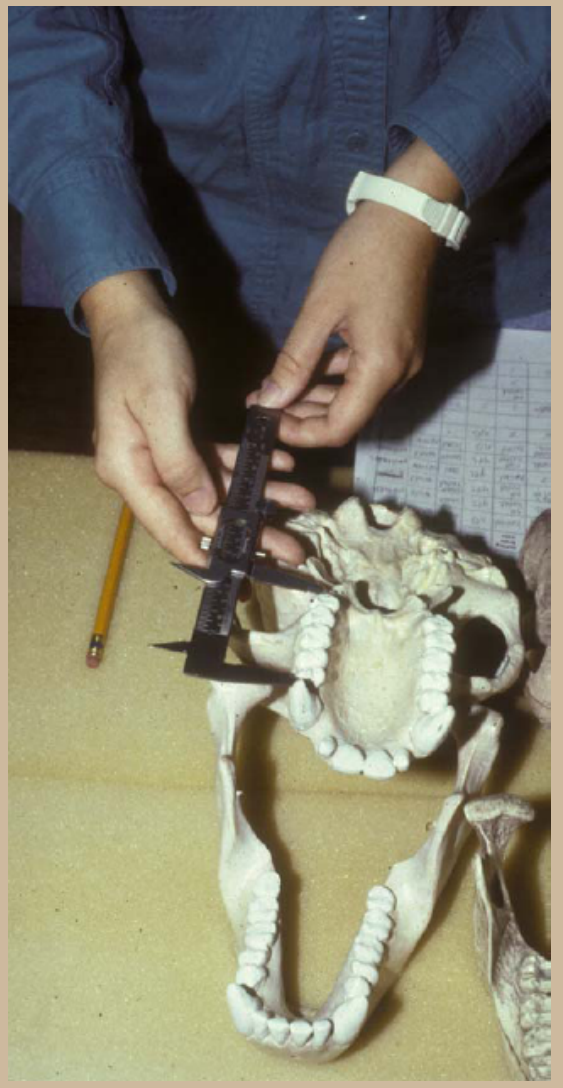
Population of diverse learners,

from the K…

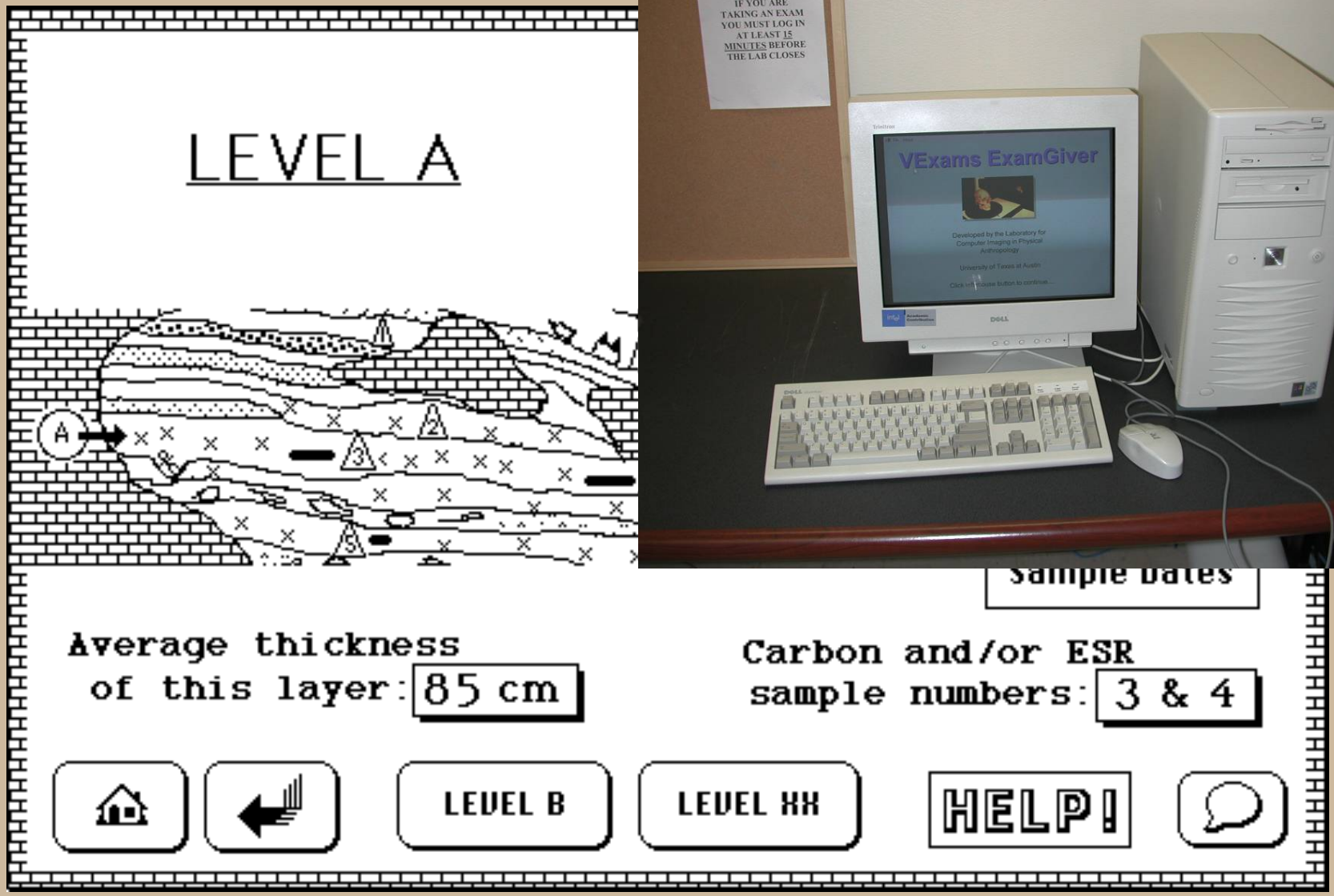
to the grey.

Digital Challenge: how to make the methods, data, and analysis process available and accessible

- Combine the best of the traditional teaching methods with the newest of the technologies and rethink the basic assumptions of knowledge discovery and transfer
- Transform what is perceived to be the "impersonal" computer interface into an interactive learning tool where the user is in the control seat



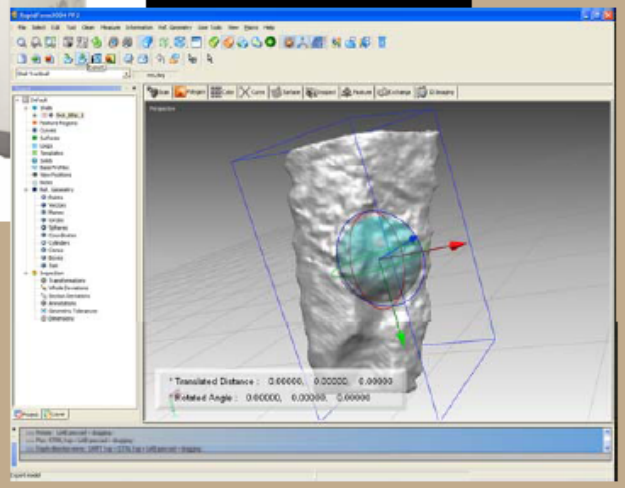
Learning Modules: 1980s…



Apple HyperCard: late 1980s

Development and Delivery

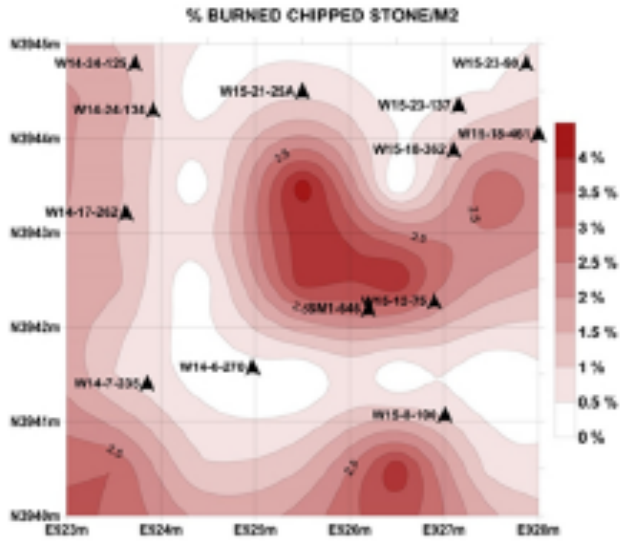
- 2-D and 3-D data capture and rendering
- *Learning modules*
  - *Virtual Laboratories*
  - *eSkeletons.org*
  - *eForensics.info*
  - *eFossils.org*
- *Repurposing basic data*
  - *Laptops and handhelds*
  - *eSkeletons kids' portal*
  - *3-D printouts at varying scales*
- *Evaluation*
  - *Vexams and testing lab*

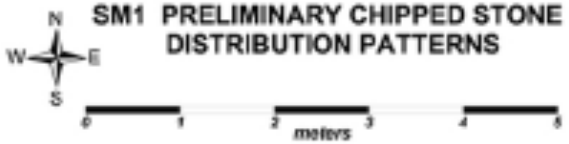


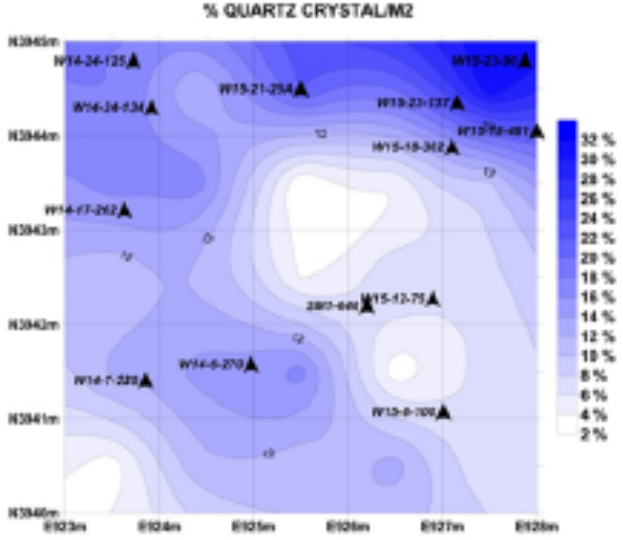
Data Acquisition

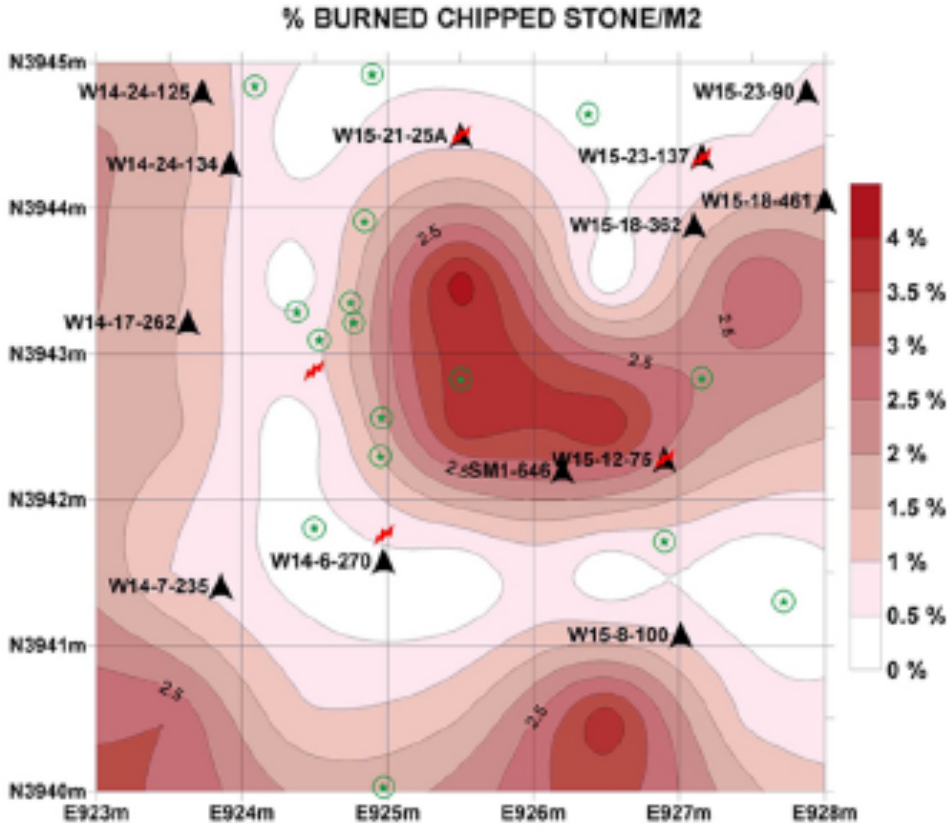
The University of Texas
High Resolution
X-Ray CT Facility

Minolta surface
scanning

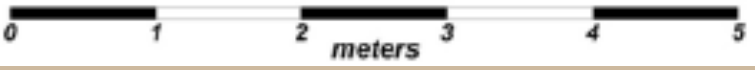




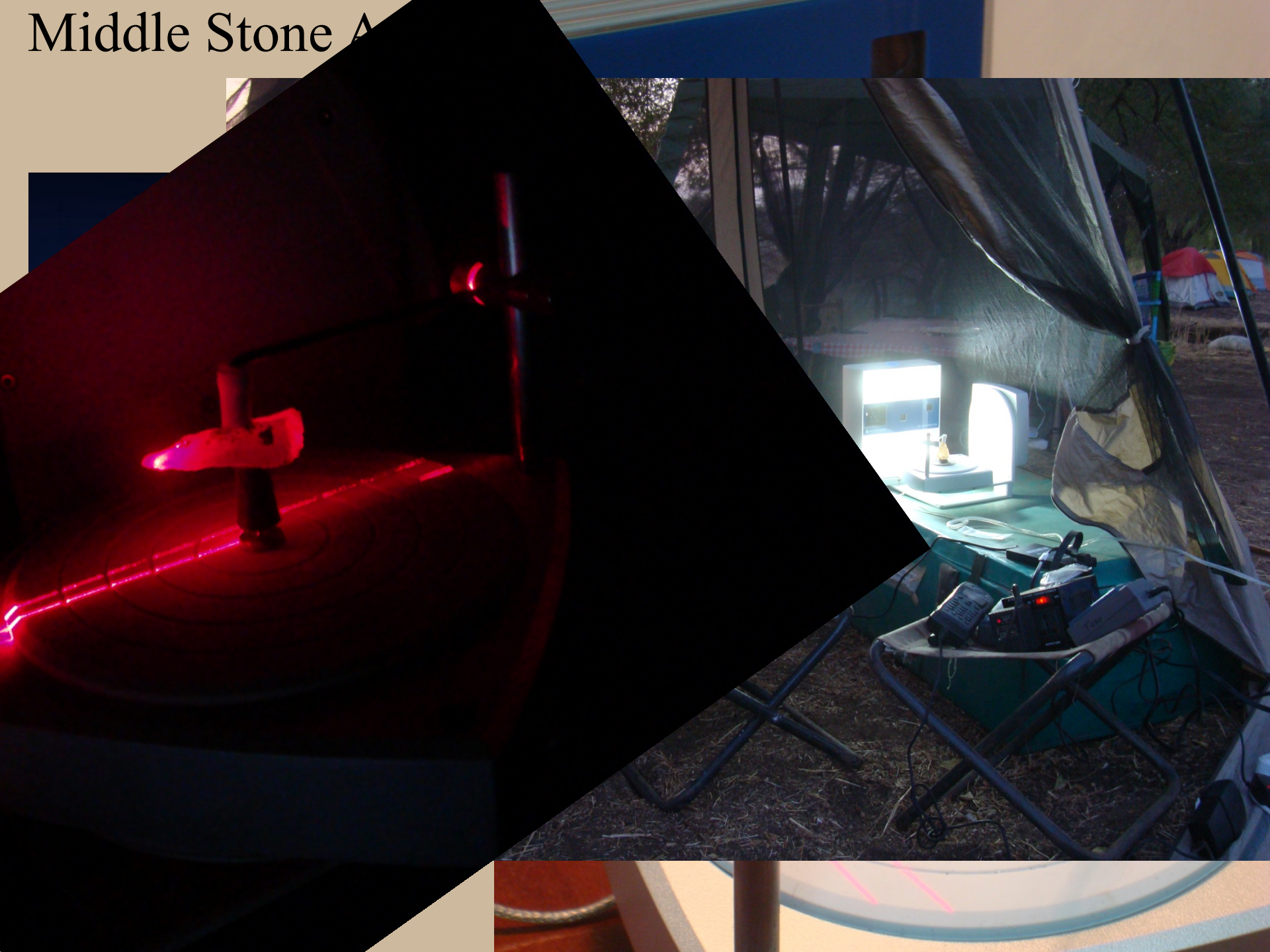




SM1 PRELIMINARY CHIPPED STONE DISTRIBUTION PATTERNS
MICROWEAR MASTER GROUP AND POINTS



Middle Stone A



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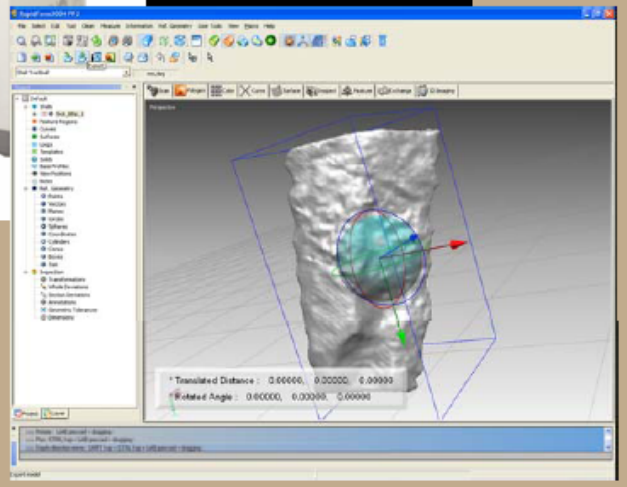

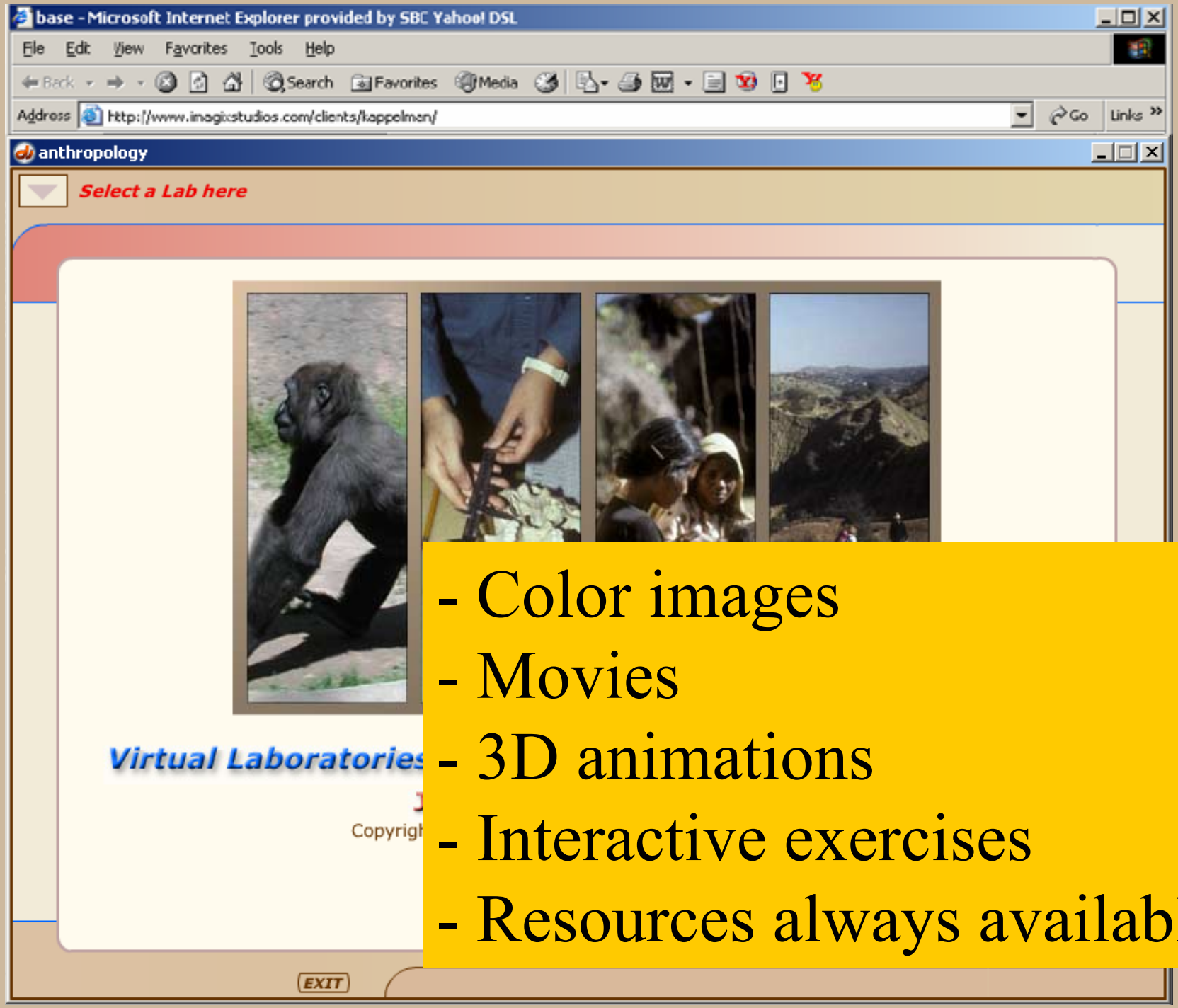
base - Microsoft Internet Explorer provided by SBC Yahoo! DSL
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Back Search Favorites Media
Address http://www.imagicstudios.com/clients/kappelman/
Go Links
anthropology
Select a Lab here
Virtual Laboratories
Copyrigh
EXIT
- Color images
- Movies
- 3D animations
- Interactive exercises
- Resources always available

Development and Delivery

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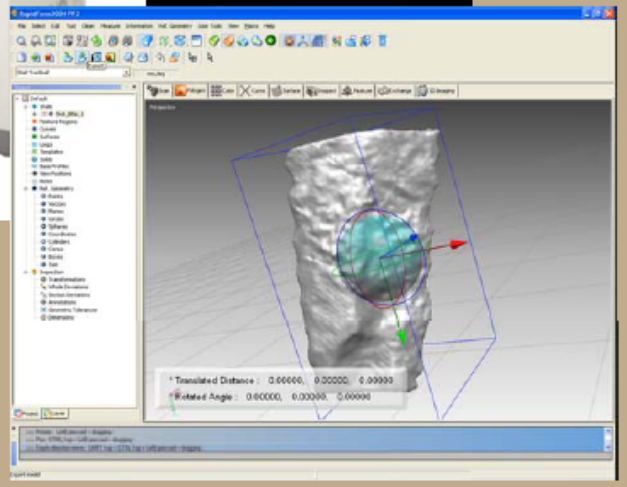
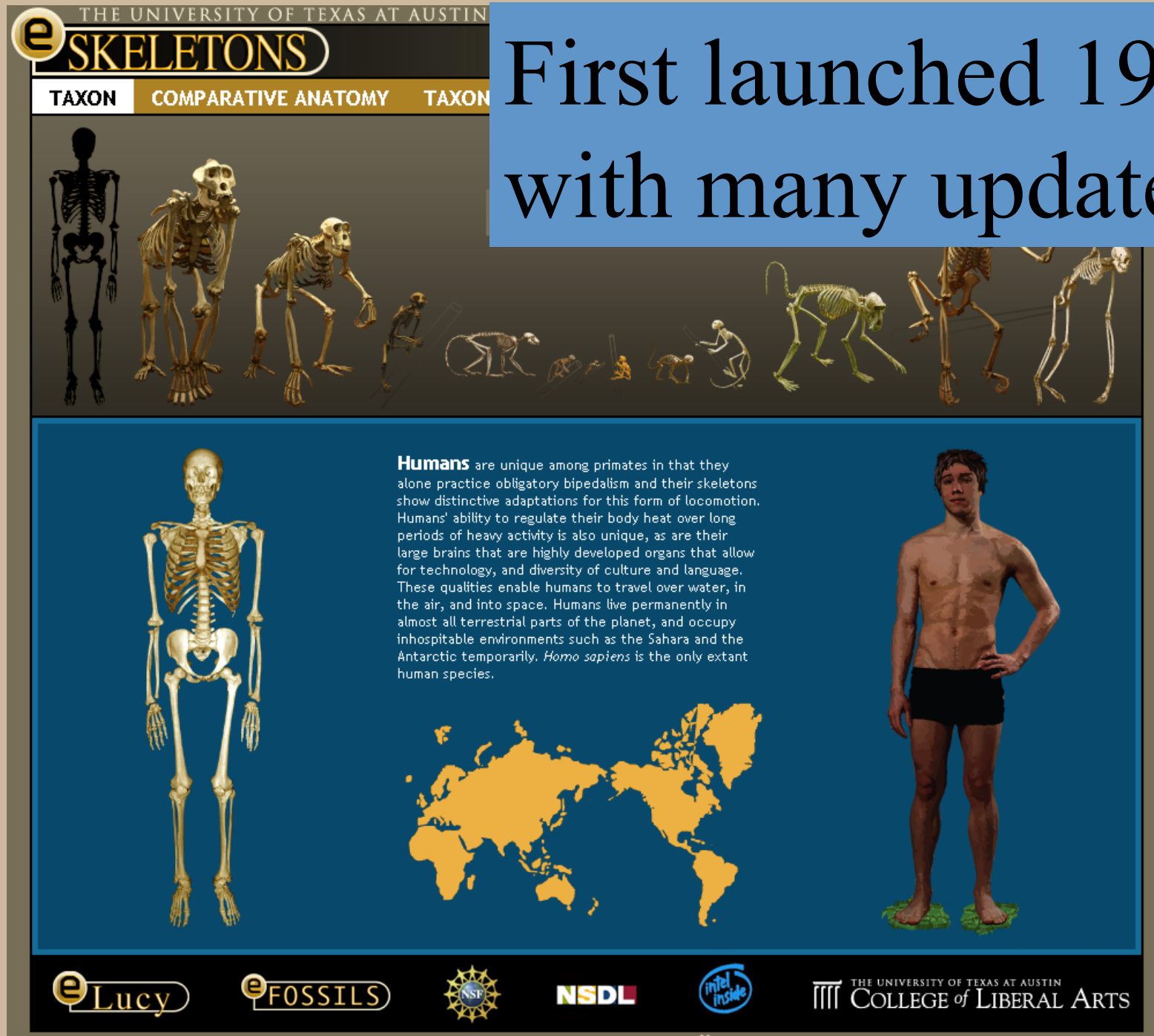




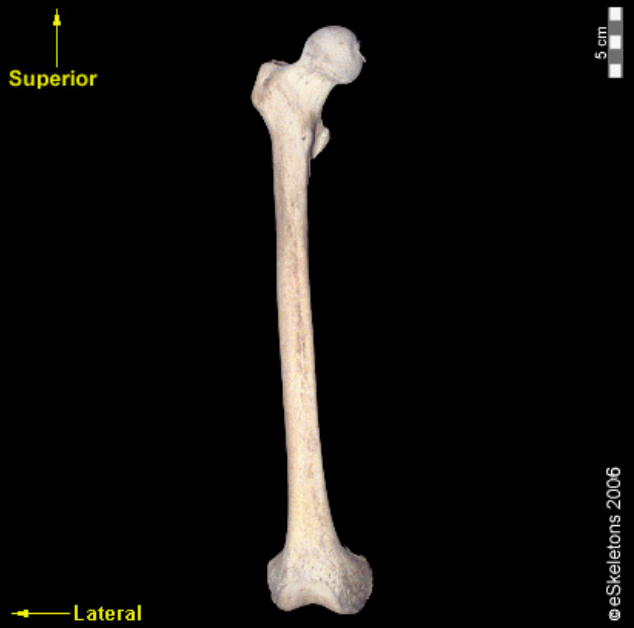
First launched 1998, with many updates...

Human: Femur

Please select a bone for viewing:

Femur
Fibula
Os Coxa
Patella
Tibia

MORPHOLOGY | ORIGINS | INSERTIONS | ARTICULATIONS | MOVIE | PROVENIENCE



First launched 2008

THE UNIVERSITY OF TEXAS AT AUS

eLucy

meet Lucy

eLucy is a website that will help you to learn about the world's most famous fossil, Lucy, a member of the species Australopithecus afarensis, who lived 3.2 million years ago. Lucy was discovered in 1974 in Ethiopia, and she is unique because over 40% of her skeleton was recovered, making her one of the most complete australopithecine fossils ever found. This website provides activities and lessons that will help you to learn about Lucy's place within the history of human evolution. Some activities are online, but others can be completed offline. After studying Lucy, you can investigate other aspects of human evolution at eFossils.org. You can learn more about the human and primate skeleton at eSkeletons.org.

Lucy began her public tour of the United States in 2007 in the exhibit, "Lucy's Legacy: the Hidden Treasures of Ethiopia."

COMPARE LUCY

Visitors can view individual bones from Lucy and compare her bone morphology with the anatomy of chimpanzees and modern humans. Just select an element to get started.

STUDENTS > Activities

This section contains crosswords, puzzles, life-size printouts and other activities to help students learn more about Lucy and human origins.

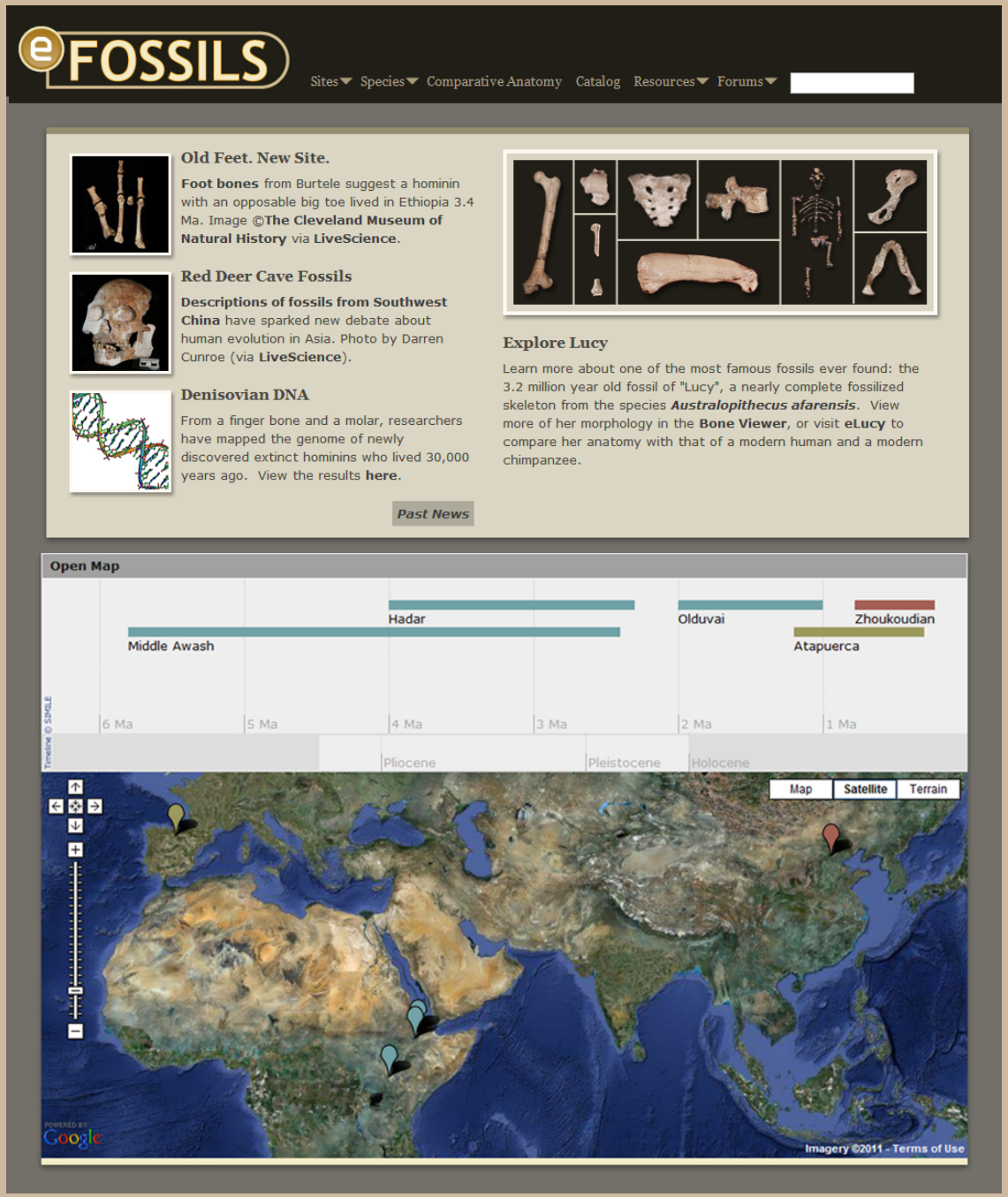
TEACHERS > Lessons

This section is a collection of lessons and suggested activities that may be used to supplement science classes focusing on human evolution and human origins.

First launched 2011

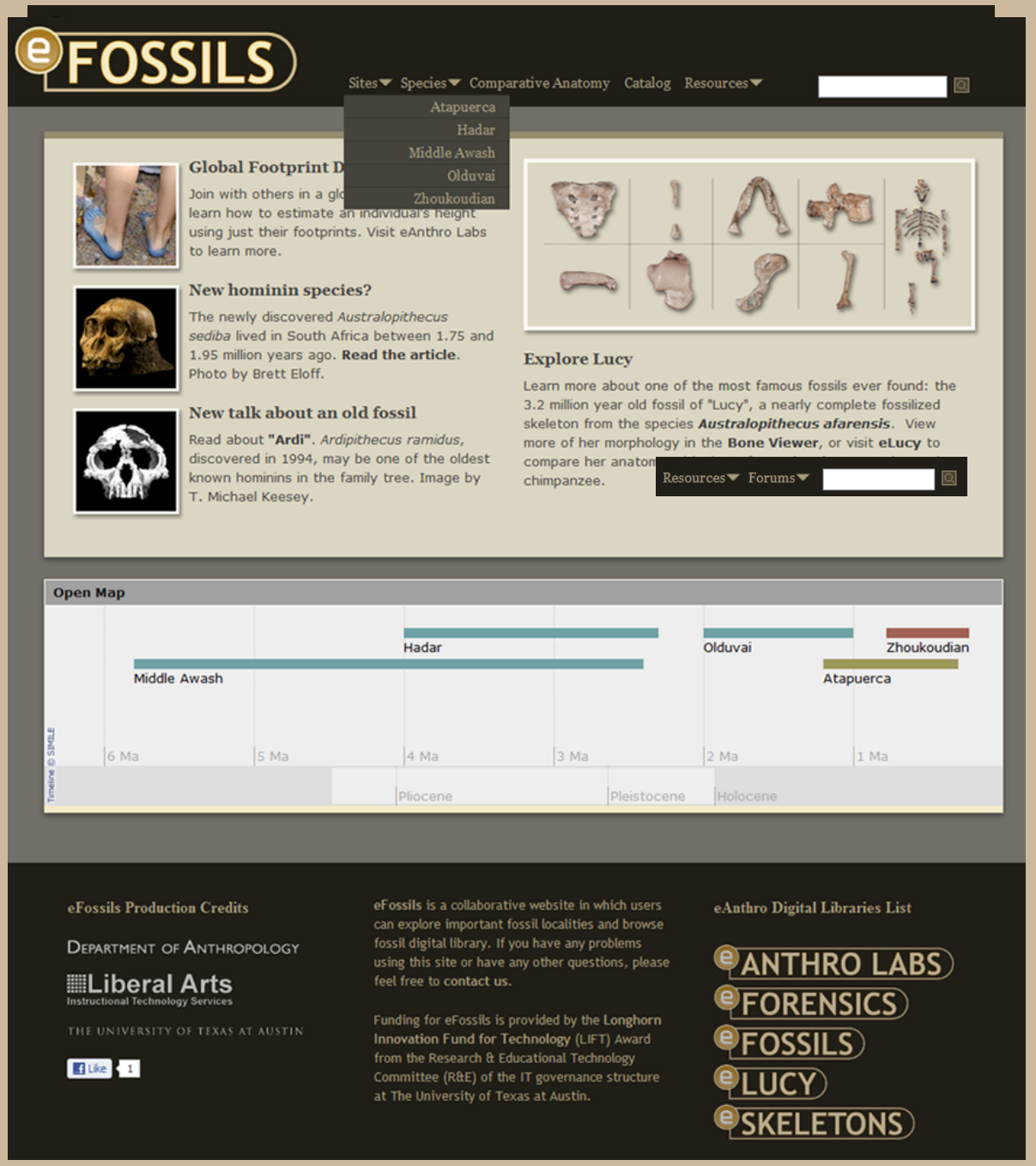
eFossils.org

a collaborative website and community database for the study of human evolution



Navigation

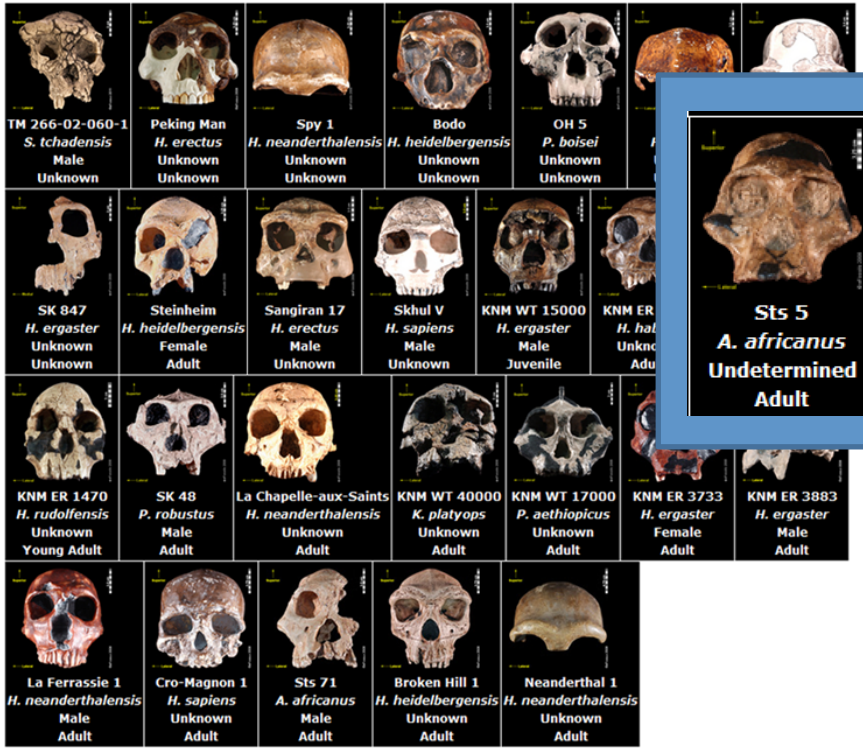
- ***In The News*** link
- Time line
- Map
- Pull-down menus
- e.g.: Sites
  - Hominins
  - Archaeology
  - Fauna
  - Paleoecology
  - Bibliography and links



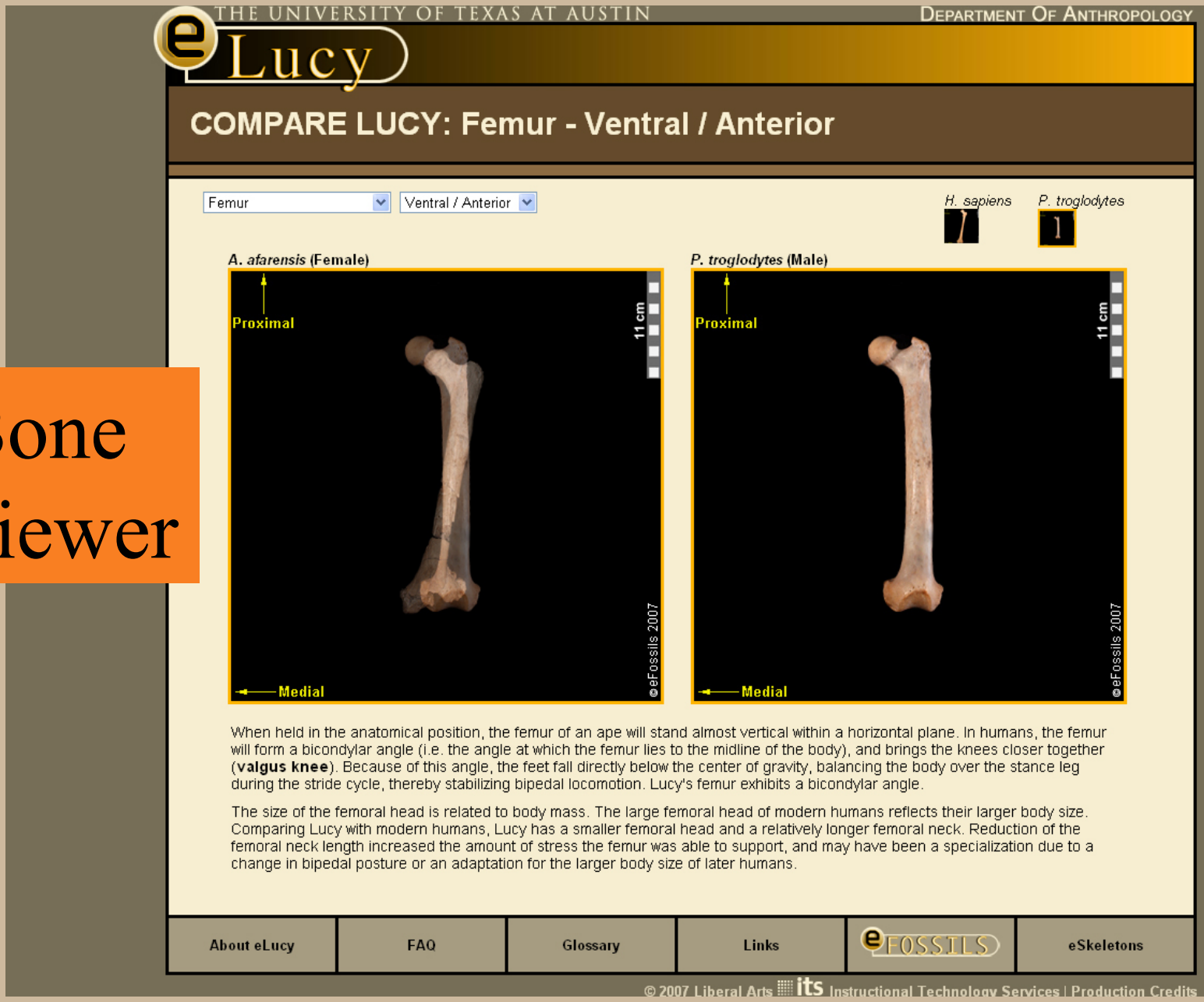
Comparative Anatomy

Bones	View	Hominins	Specimen Number
Cranium	Anterior	*Australopithecus africanus*	Bodo
Femur	Inferior	*Homo erectus*	Broken Hill 1
Fibula	Lateral Left	*Homo ergaster*	Cro-Magnon 1
Humerus	Lateral Right	*Homo habilis*	KNM ER 1470
Lumbar Vertebra	Posterior	*Homo heidelbergensis*	KNM ER 1813
Mandible	Proximal	*Homo neanderthalensis*	KNM ER 3733
Maxilla	Superior	*Homo rudolfensis*	KNM ER 3883
Os Coxa		*Homo sapiens*	KNM WT 15000
Os Coxae		*Kenyanthropus platyops*	KNM WT 17000
Patella		*Paranthropus aethiopicus*	KNM WT 40000
Pelvis		*Paranthropus boisei*	La Chapelle-aux-Saints
Radius		*Paranthropus robustus*	La Ferrassie 1

+ image size Reset



Bone viewer


THE UNIVERSITY OF TEXAS AT AUSTIN
DEPARTMENT OF ANTHROPOLOGY
eLucy
COMPARE LUCY: Femur - Ventral / Anterior
Femur
Ventral / Anterior
H. sapiens
P. troglodytes
A. afarensis (Female)
Proximal
11 cm
Medial
©eFossils 2007
P. troglodytes (Male)
Proximal
11 cm
Medial
©eFossils 2007
When held in the anatomical position, the femur of an ape will stand almost vertical within a horizontal plane. In humans, the femur will form a bicondylar angle (i.e. the angle at which the femur lies to the midline of the body), and brings the knees closer together (valgus knee). Because of this angle, the feet fall directly below the center of gravity, balancing the body over the stance leg during the stride cycle, thereby stabilizing bipedal locomotion. Lucy's femur exhibits a bicondylar angle.
The size of the femoral head is related to body mass. The large femoral head of modern humans reflects their larger body size. Comparing Lucy with modern humans, Lucy has a smaller femoral head and a relatively longer femoral neck. Reduction of the femoral neck length increased the amount of stress the femur was able to support, and may have been a specialization due to a change in bipedal posture or an adaptation for the larger body size of later humans.
About eLucy
FAQ
Glossary
Links
eFOSSILS
eSkeletons
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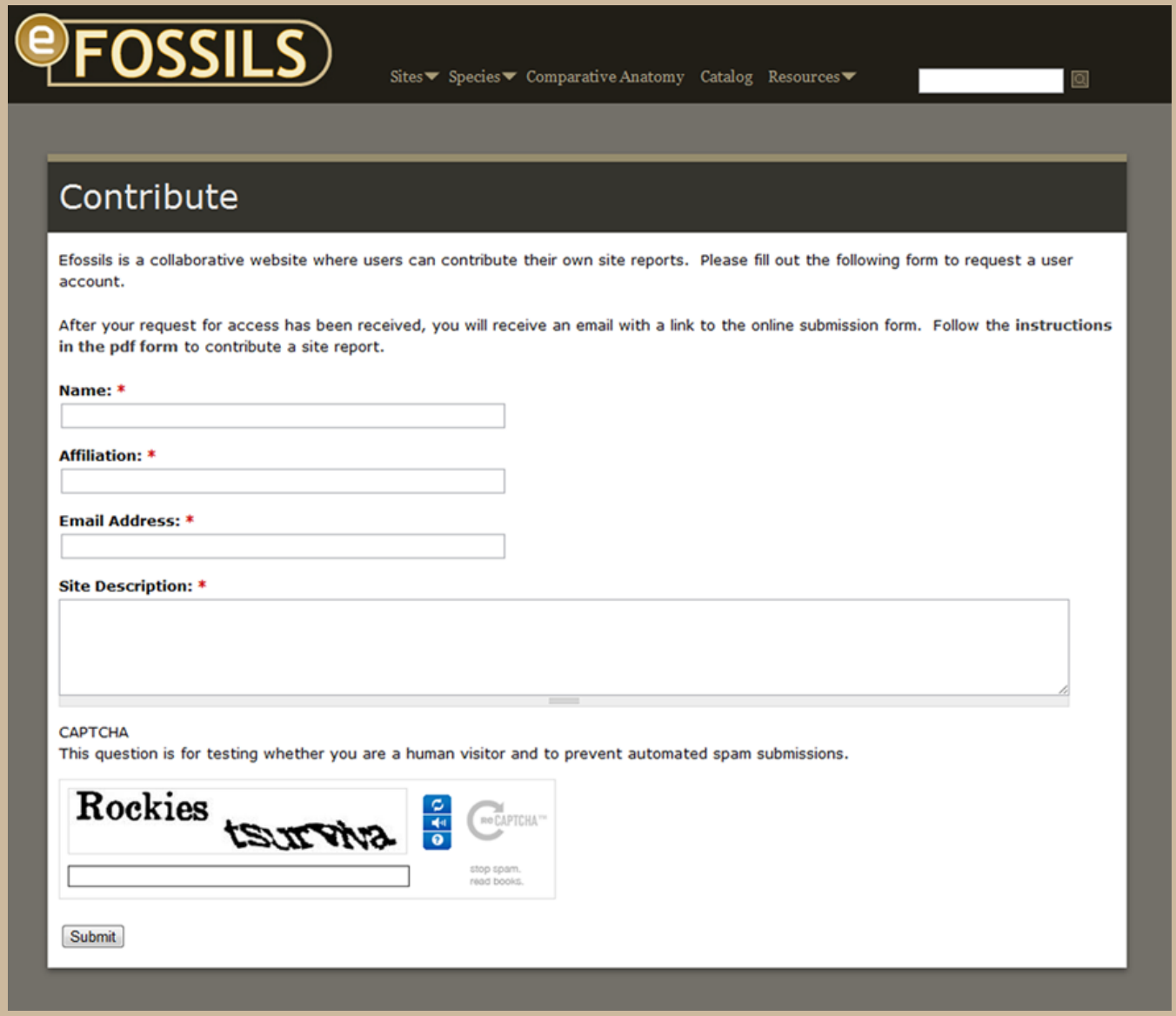
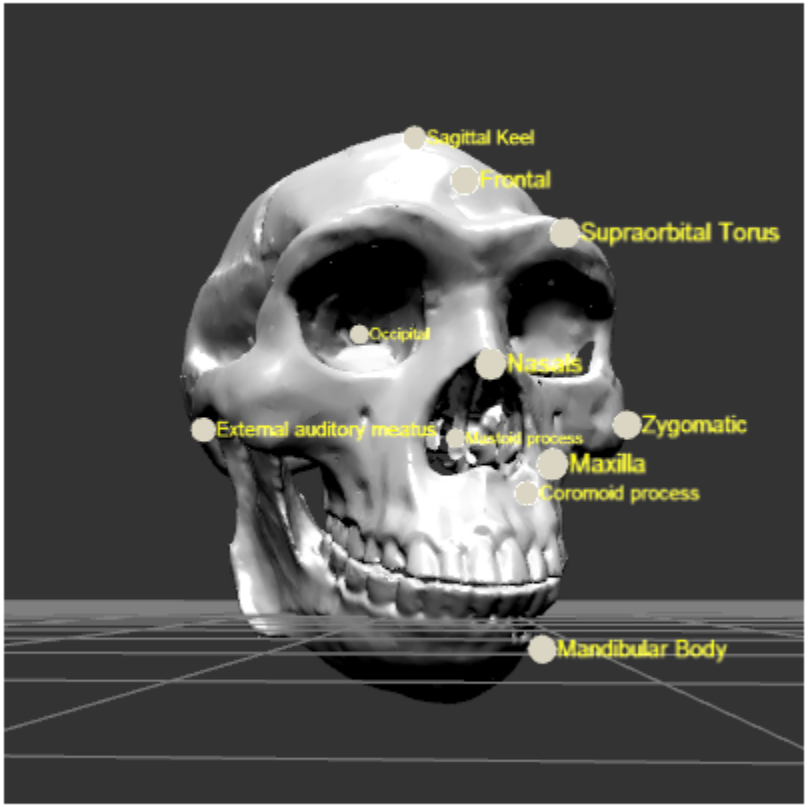
Community website: add a site



eFOSSILS

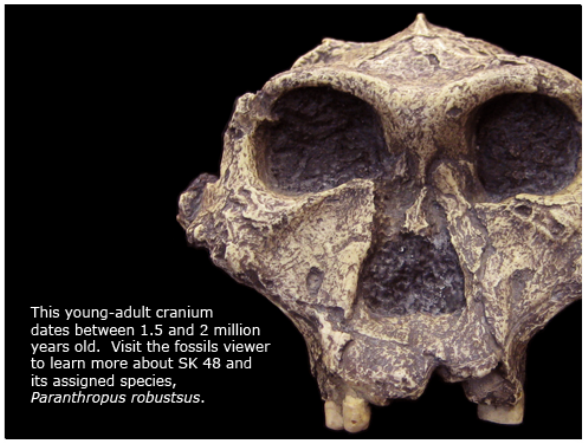
Phong ▼ Skull 0 ▼ Default ▼



Instructions | **Shader** | Scene | Points | Canvas

Ambient Amount
Ambient Red
Ambient Green
Ambient Blue
Diffuse
Specular
Shininess

☑ Camera ☑ Cam Mode ☐ Rotate ☑ Morphology



Recent News

13 March 2013: Key differences in the in the brains of Neadnerthals and modern humans...(Proceedings of the Royal Society B)

15 Nov 2012: As reported in **Science**, Neanderthals and *Homo sapiens* may have inheritied use of spear points from an earlier ancestory...

3 Oct 2012: A recently discovered juvnile skull may hold clues as to when early humans began including meat as a regular part of their diet. Read the article in **PLOS**.

past news

Discussions

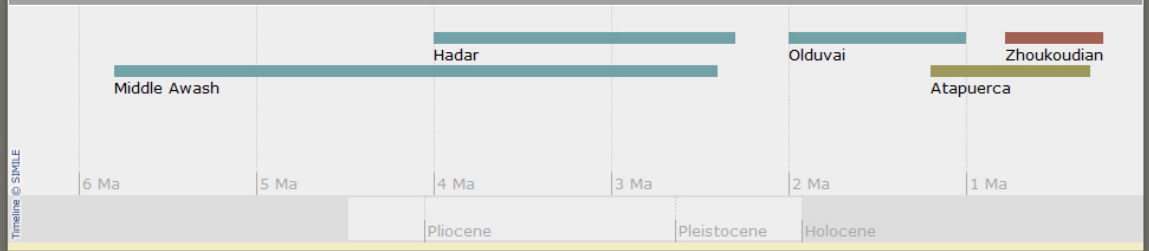
Australopithecud sediba was recently suggested as a possible ancestor to early Homo (4 replies).

AL666 should not be assigned to homo habilis as the majority of the traits used to identify the specimen as *Homo habilis* are also seen in australopiths.

Early human acnestors radiated out of Africa a little less than 2 Ma, according to the most recent data. However, little is know as to what affected these prehistoric migrations...

more discussions

Open Map



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Like

eFossils is a collaborative website in which users can explore important fossil localities and browse the fossil digital library. If you have any problems using this site or have any other questions, please feel free to contact us.

Funding for eFossils was provided by the **Longhorn Innovation Fund for Technology** (LIFT) Award from the Research & Educational Technology Committee (R&E) of the IT governance structure at The University of Texas at Austin.

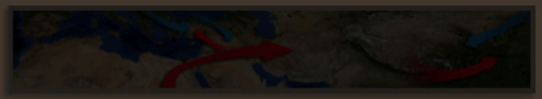
eAnthro Digital Libraries List

- eANTHRO LABS
- eSKELETONS
- eFORENSICS
- eFOSSILS
- eLUCY

eANTHRO LABS

On the Track of Prehistoric Humans

Temperate Migrations



Got an idea for a new eAnthro Lab?

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Like 1

eAnthro Labs is a digital database of community run laboratory exercises. Anyone insterested in a particular hypothesis may contribute to an existing lab or propose one of their own.

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eAnthro Digital Libraries

- eANTHRO LABS
- eFORENSICS
- eFOSSILS
- eLUCY
- eSKELETONS

eANTHRO LABS

On the Track of Prehistoric Humans: Learn how to collect data and apply correlations to the fossils record. Plot your data with others from around the world.

On the Track of Prehistoric Humans

Temperate Migrations

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- eSKELETONS

eANTHRO LABS

FOOTPRINTS FOUND at Laetoli, Tanzania, in 1976 that date to 3.7 million years ago are among the most spectacular fossil discoveries because they record a moment in time when many different animals walked through wet volcanic ash leaving behind their tracks. Among these animals were several prehistoric humans who belonged to the species *Australopithecus afarensis*, a small brained, bipedal hominin that lived in East Africa from about 4 to 2.8 million years ago. Their footprints were preserved when the ash dried and hardened, and was covered by another layer of volcanic ash.

The Laetoli Trackways offer a unique opportunity to explore how scientists study the behaviors of fossil organisms because the tracks, quite literally, record a snapshot of how *Au. afarensis* walked. The trackways also permit us to take measurements of both foot length and stride length of these individuals; however, other interesting information about this species, its height for example, is unknown.

Can we use the relationship between foot length and stride length versus height in living humans to estimate the stature of these fossil humans? If you look at the people around you, you'll note that there is a general relationship between foot length, stride length, and height: shorter people generally have shorter feet and take shorter strides, while taller people have longer feet and take long strides. This general relationship can be evaluated by measuring a large sample of people and, if the relationship (or correlation) is strong, it can be used to estimate or predict the height of *Au. afarensis*.

Try it yourself. You can measure and evaluate the correlation between foot length and stride length versus body height, and then use these data to estimate the height of the Laetoli hominins.

e-Fossils Production Credits

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eAnthro Labs

Anthro Labs is a collaborative website in which participants can upload their own data to explore a hypothesis. If you have any problems using this site or have any questions, please feel free to **contact us** .

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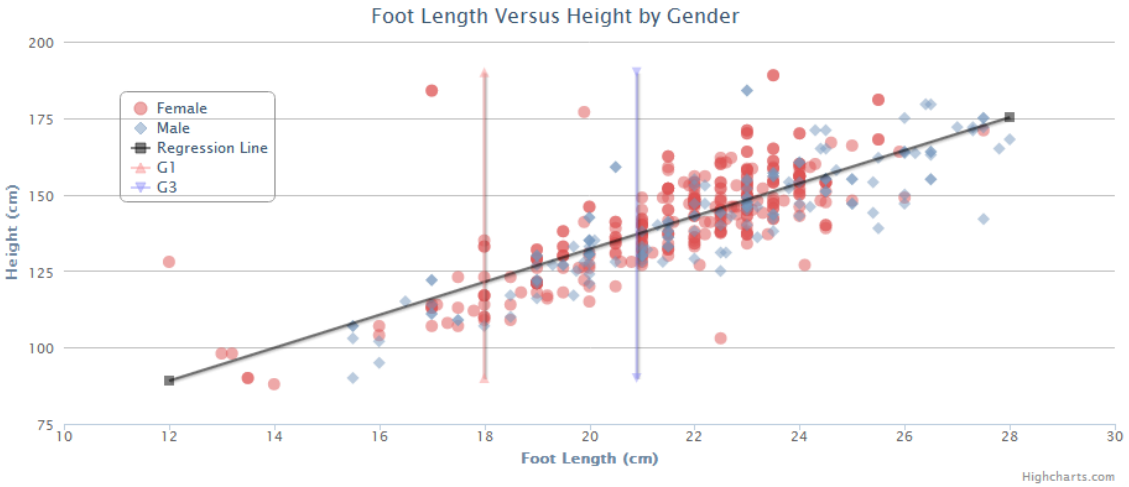
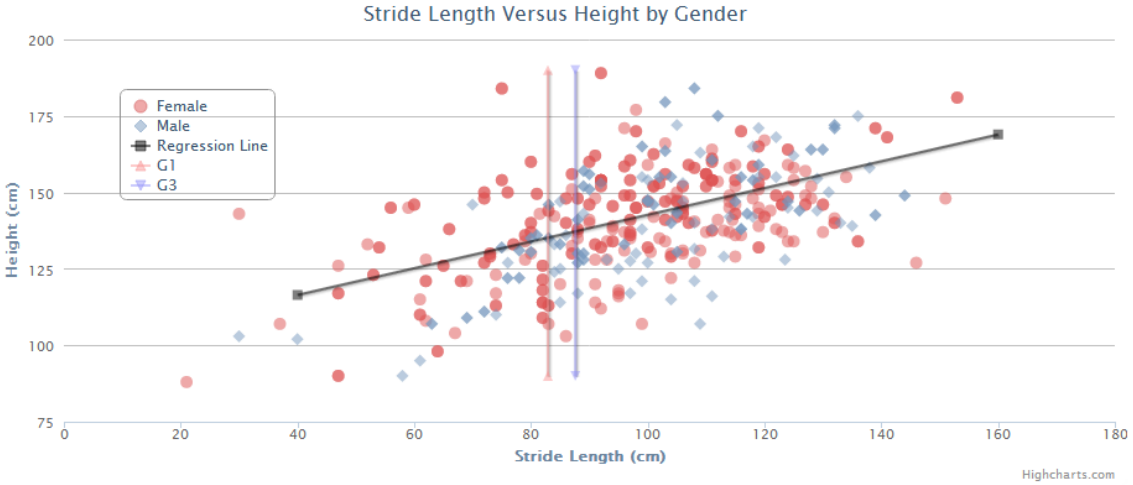
- eLUCY

Trackways Exercise *On the Track of Prehistoric Humans*

When the measurements are graphed, you will see a trend in the data that correlates the relationship between foot length and height, and stride length and height. Note that individuals with longer strides and longer feet appear to be taller than those individuals with shorter feet and shorter strides. The foot length and stride length of the Laetoli footprints can be measured and plotted as well. From this data, an estimate can be made for the height of the individuals who made the tracks at Laetoli, answering the question, "How tall were the australopiths?"

view ALL published data sets | view prehistorictrackways.gmail.com's published data sets | Filter Data | See who's contributing





eANTHRO LABS

Collaboratorium: some problems require participation of the field

eAnthro Digital Libraries

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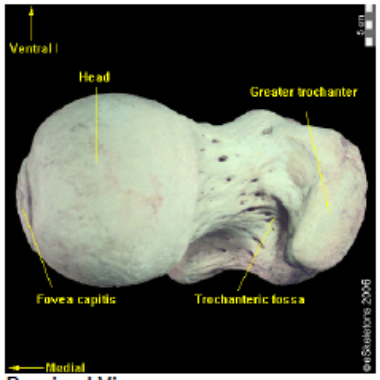
- eFORENSICS
- eFOSSILS
- eLUCY
- eSKELETONS

Human Osteology Guide, mastered in Adobe Acrobat Pro Extended with 3D embedded objects

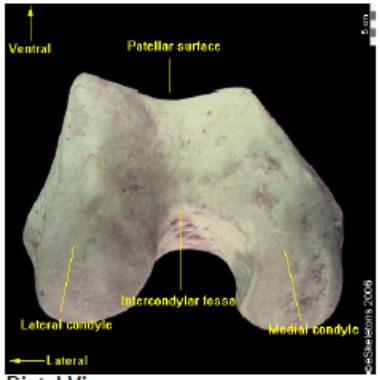
The femur is the proximal bone of the hindlimb. It is the largest bone in the human body. The femur articulates proximally with the acetabulum of the os coxa to form the hip joint. Distally, the femur articulates with the tibial condyles to form the knee joint. Click on the bone at right to enable the interactive 3D viewer. Use your mouse and the toolbar to rotate, zoom, and pan the image.



Proximal View

Proximal Femur

The proximal femur is dominated by its massive, nearly spherical **head**. The articular surface of the femoral head is disrupted by the **fovea capitis**, an excavated depression in the otherwise smooth surface. The head is connected to the rest of the femur by its **neck**. Two roughed trochanters on the proximal femur provide important muscle attachment sites. The **greater trochanter** projects superiorly from the dorsal surface of the proximal tibia. The *gluteus medius* and *gluteus minimus* muscles take origin here and serve as critical hip stabilizers during walking. Further distally, several major hip flexors take origin from the **lesser trochanter.** The two trochanters are united by an **intertrochanteric crest** on the dorsal surface of the proximal femur and an **intertrochanteric line** on the ventral surface.

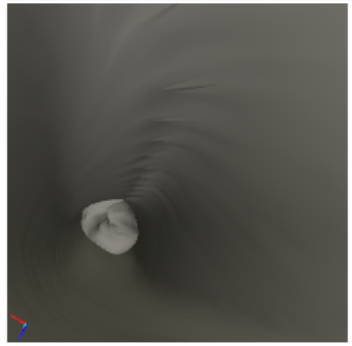


Distal View

Distal Femur

The distal femur bears two large articular condyles which rest on the corresponding condyles of the tibial plateau. The broader **lateral condyle** is separated from the narrower, more curved (in distal view), **medial condyle** by a broad depression known as the **intercondylar fossa**. The medial condyle projects further distally such that the shaft tilts laterally when the condyles are set upon a flat surface (*e.g.* the tibial plateau). The two condyles merge ventrally as the **patellar surface**, an articular facet for the patella. The **medial epicondyle** and **lateral epicondyle** sit just proximal to the condyles, where they provide attachment sites for the collateral knee ligaments. The lateral epicondyle is separated from the lateral condyle by the **popliteal groove**.

Human Osteology Guide, mastered in Adobe Acrobat Pro Extended with 3D embedded objects



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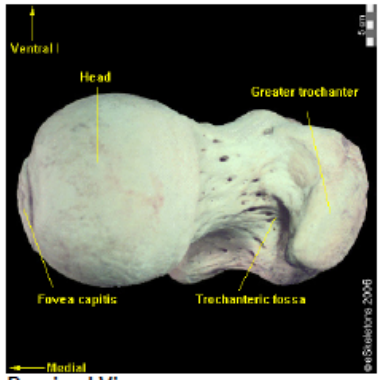
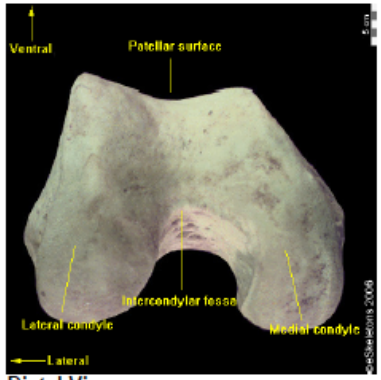


Proximal View

Proximal Femur

The proximal femur is dominated by its massive, nearly spherical **head**. The articular surface of the femoral head is disrupted by the **fovea capitis**, an excavated depression in the otherwise smooth surface. The head is connected to the rest of the femur by its **neck**. Two roughed trochanters on the proximal femur provide important muscle attachment sites. The **greater trochanter** projects superiorly from the dorsal surface of the proximal tibia. The *gluteus medius* and *gluteus minimus* muscles take origin here and serve as critical hip stabilizers during walking. Further distally, several major hip flexors take origin from the **lesser trochanter.** The two trochanters are united by an **intertrochanteric crest** on the dorsal surface of the proximal femur and an **intertrochanteric line** on the ventral surface.



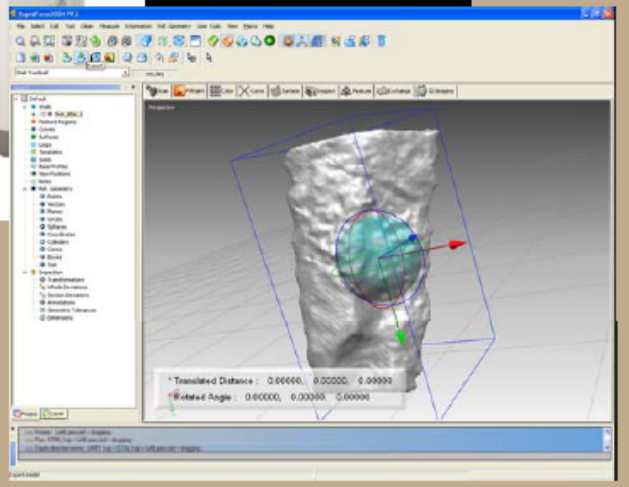
Distal View

Distal Femur

The distal femur bears two large articular condyles which rest on the corresponding condyles of the tibial plateau. The broader **lateral condyle** is separated from the narrower, more curved (in distal view), **medial condyle** by a broad depression known as the **intercondylar fossa**. The medial condyle projects further distally such that the shaft tilts laterally when the condyles are set upon a flat surface (*e.g.* the tibial plateau). The two condyles merge ventrally as the **patellar surface**, an articular facet for the patella. The **medial epicondyle** and **lateral epicondyle** sit just proximal to the condyles, where they provide attachment sites for the collateral knee ligaments. The lateral epicondyle is separated from the lateral condyle by the **popliteal groove**.

Development and Delivery

- *2-D and 3-D data capture and rendering*
- *Learning modules*
  - *Virtual Laboratories*
  - *eSkeletons.org*
  - *eForensics.info*
  - *eFossils.org*
- Repurposing basic data
  - Laptops and handhelds
  - eSkeletons kids' portal
  - 3-D printouts at varying scales
- *Evaluation*
  - *Vexams and testing lab*



3-D printouts at varying scales

- Files of 3-D scans available for downloading by users
  - Engineering modeling
  - Health care professionals and students
- eFossils and the Lucy Exhibit
  - Lucy's tour of the U.S.

Possibilities of New Technology

Human hand study set
- Create more resilient print-outs of carpal bones for osteology students

- Allows for 3D Rendering of Internal Structures:
- Sagittal cross-section of human cranium

Development and Delivery

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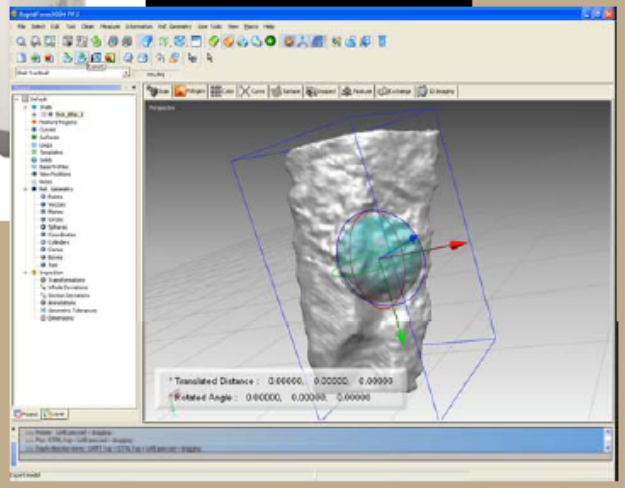
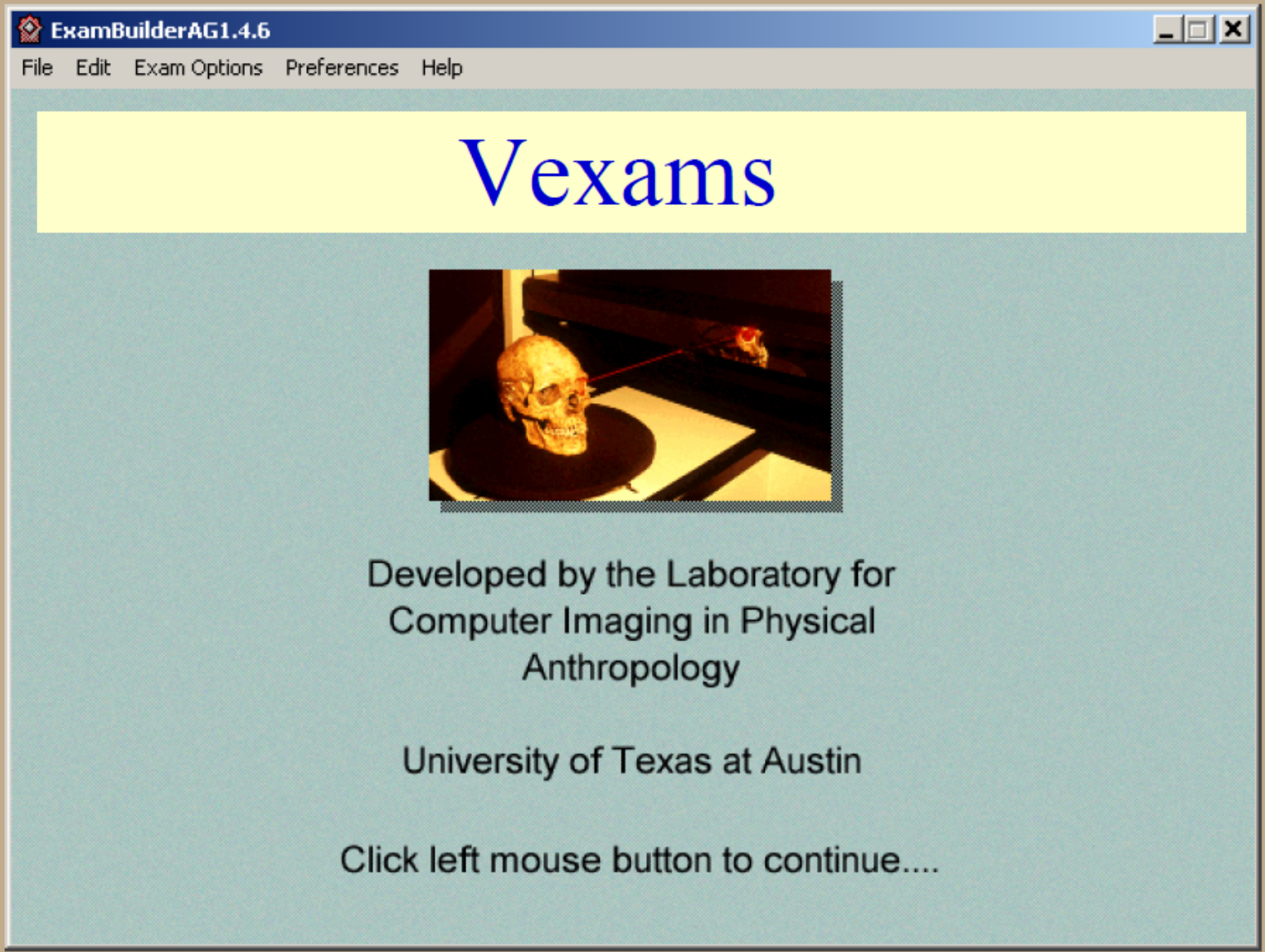
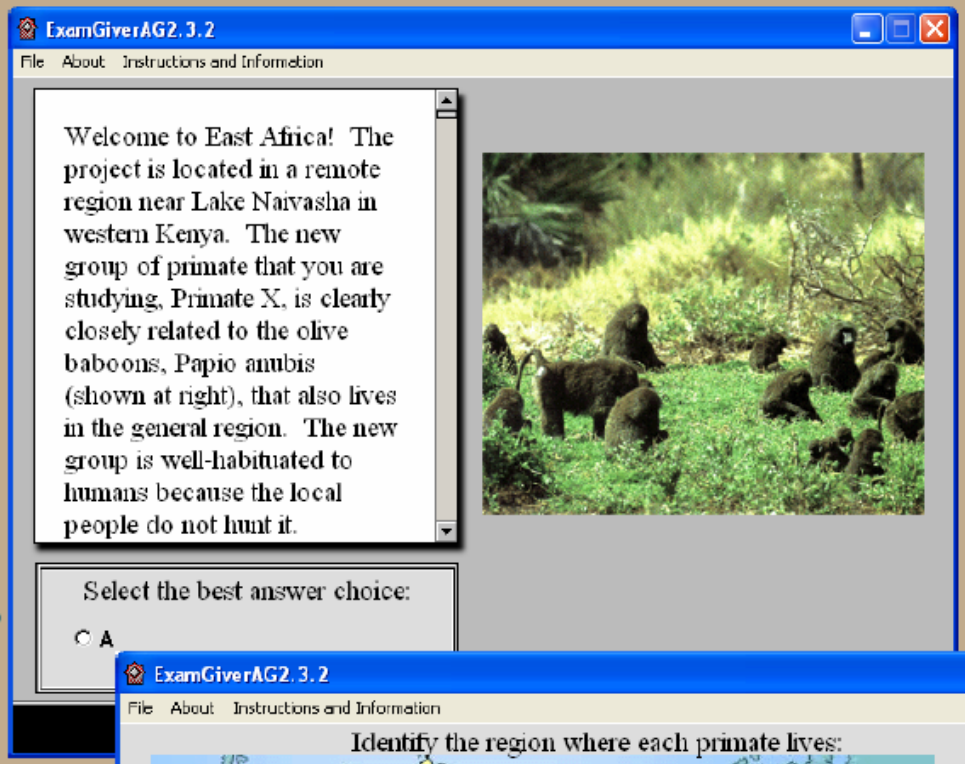


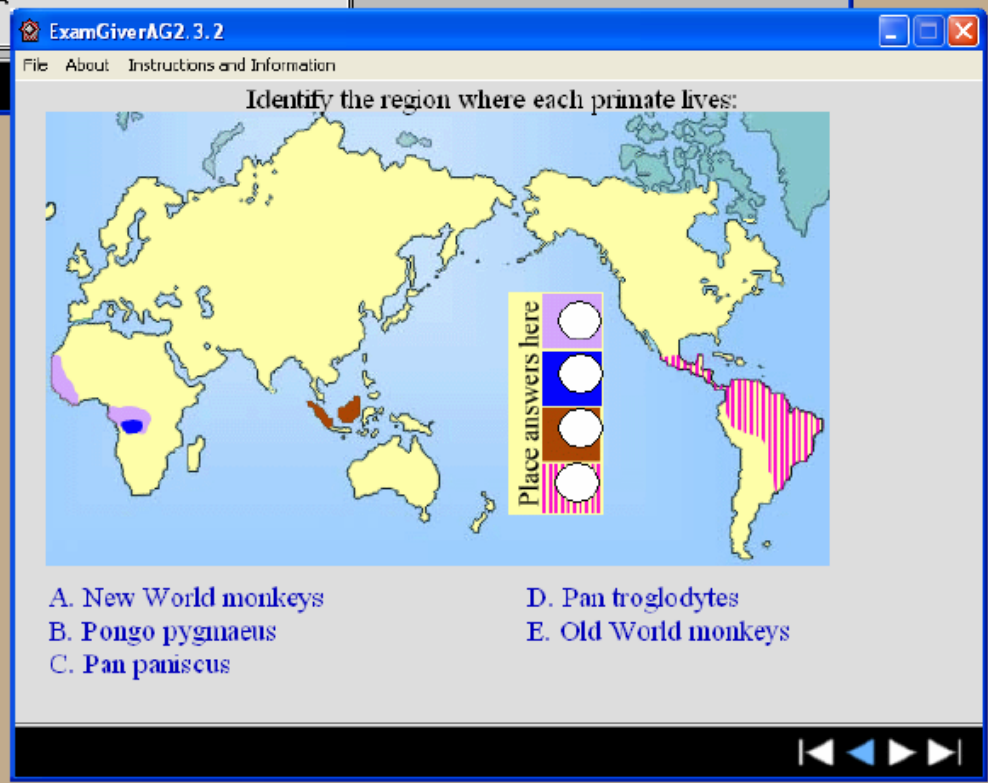
Vexams: an interactive multimedia computer-based evaluation program



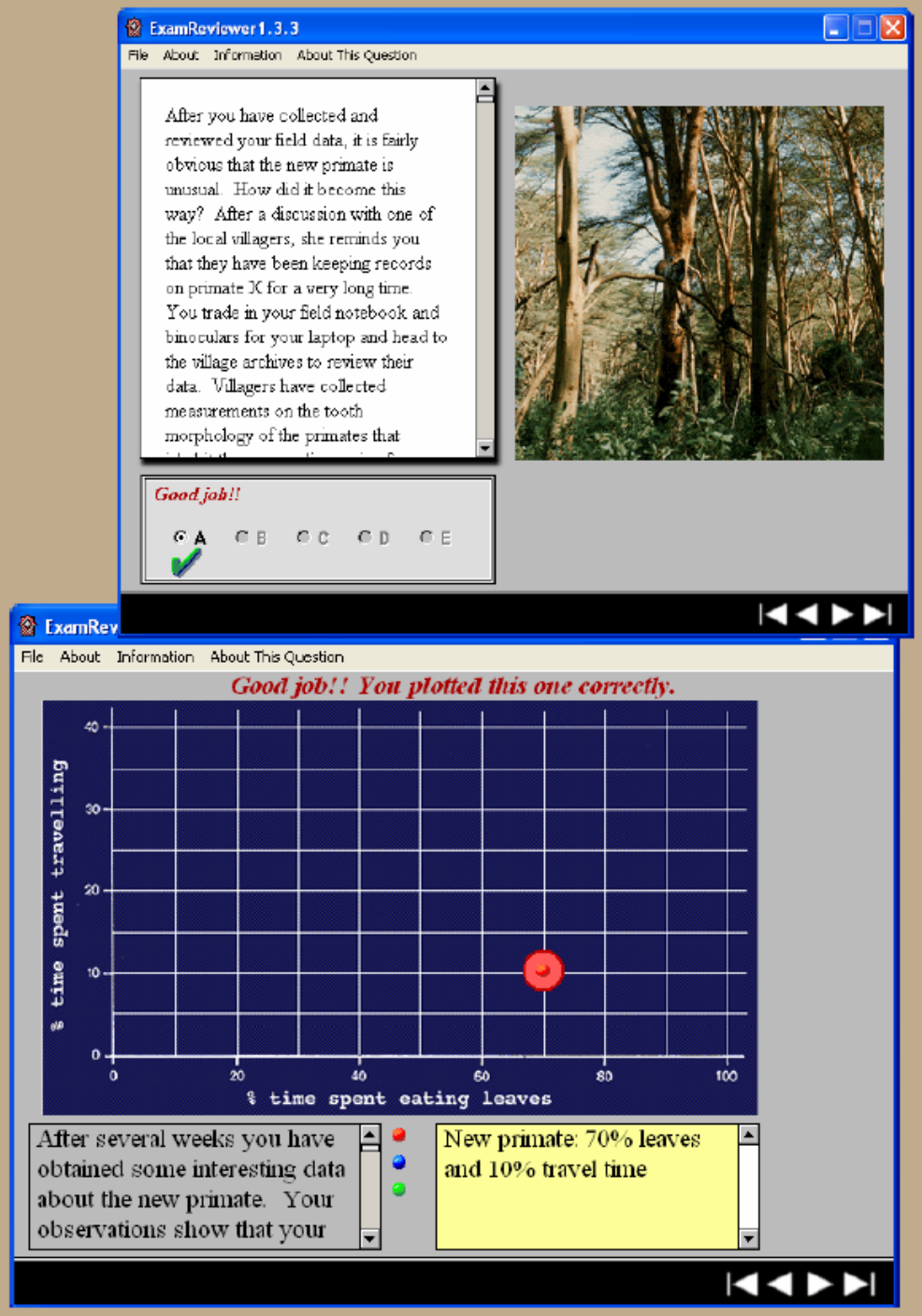
VExams

- Integrate media
- Content drawn from full range of course content
- Integrate content with
  - Multiple choice
  - Matching
  - T/F
  - Fill-in
  - Interactive questions



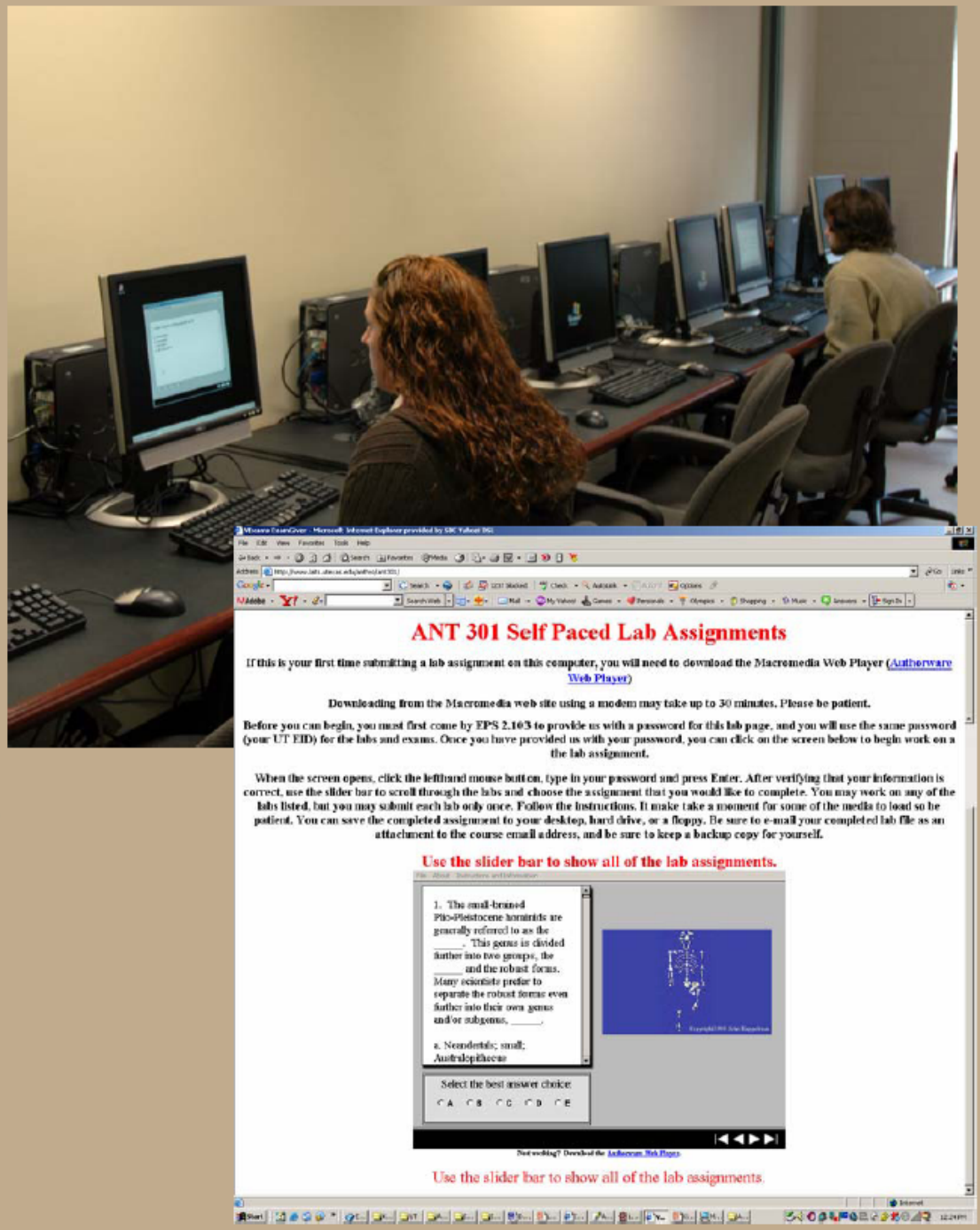


- Fixed number of questions
  - Random
  - Fixed
  - Unique but uniform exam
- Grade calculated automatically at end of exam
- Exam review
- 24/7 testing
- Centralized testing facility
  - Fill-in
  - Interactive



Testing Facility

- ID checked and proctored exams
- One time or many times for highest score, better understanding
- Timed, or not
- Web-based for low or no (review) credit
- Initial support from Intel and Microsoft



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