Computing in Medicine

Instructor: Dmitri A. Gusev

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CS 210: Computing and Culture

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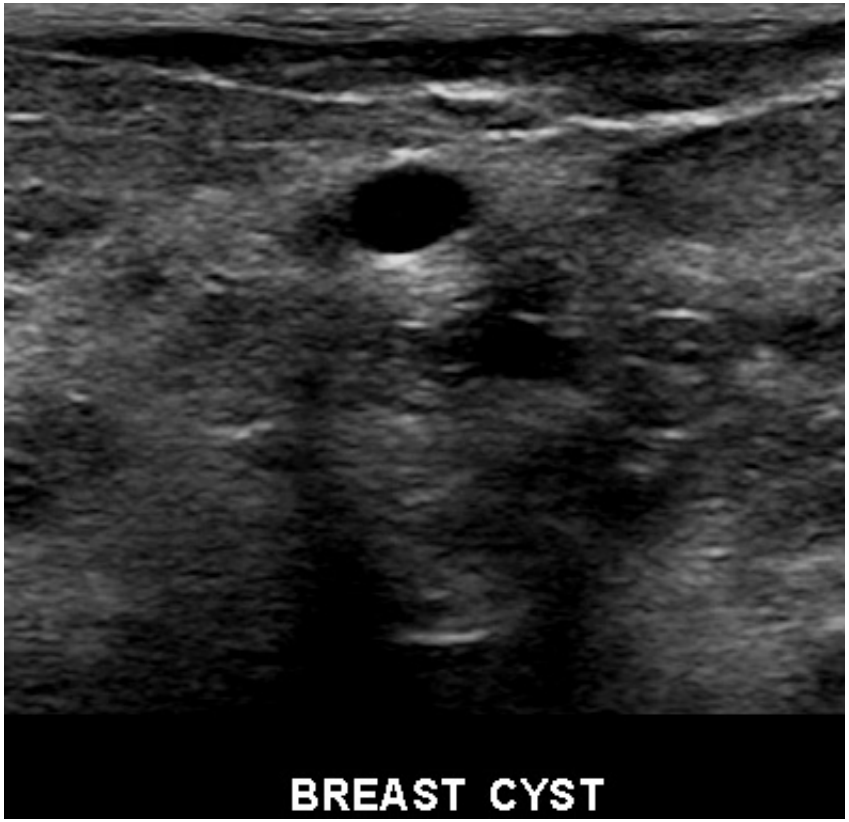
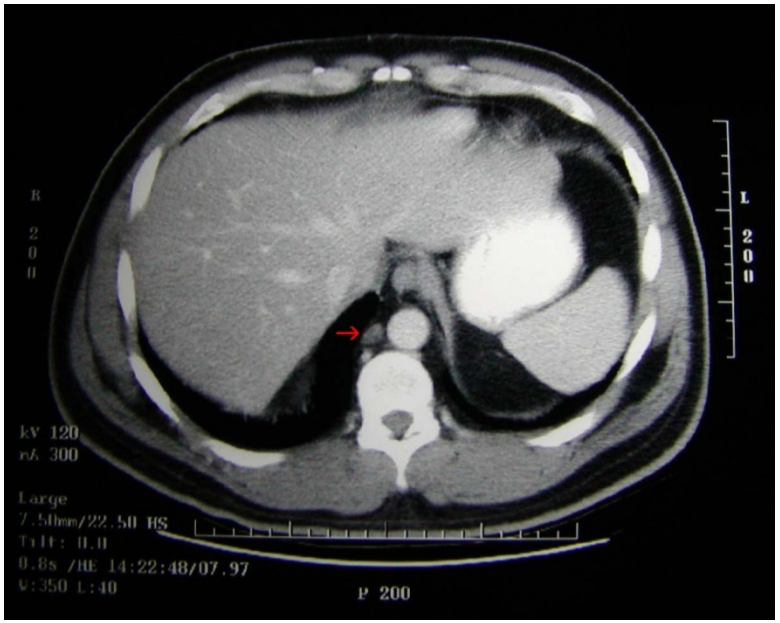
Ultrasonography

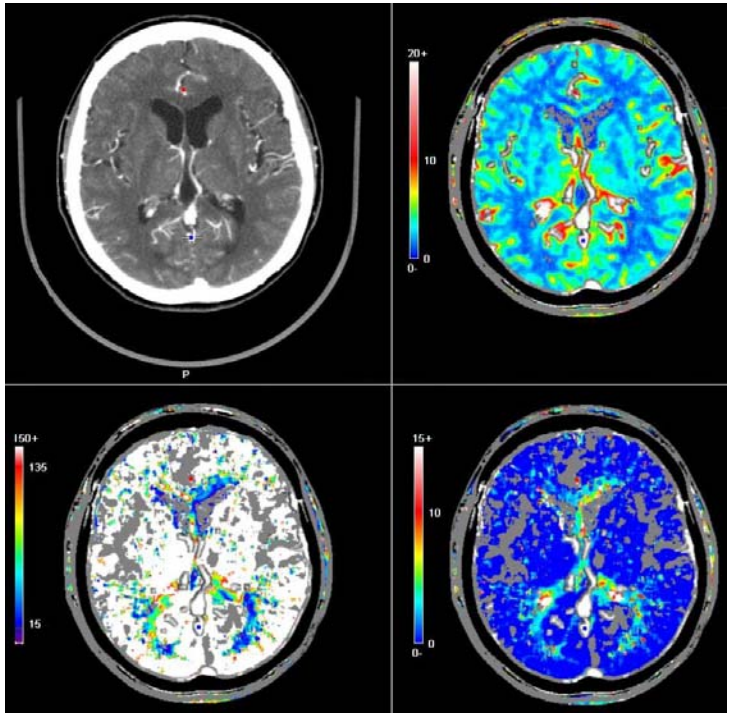
- Medical ultrasonography is an ultrasound-based diagnostic imaging technique used to visualize muscles and internal organs.
- “Ultrasound“: Acoustic signal with a frequency above the limit of human hearing (20 kilohertz). Typical diagnostic sonographic scanners operate in the frequency range of 2 to 18 megahertz
- Digital sonographic images are used as input to systems for computer-aided diagnostics and computer-assisted surgery

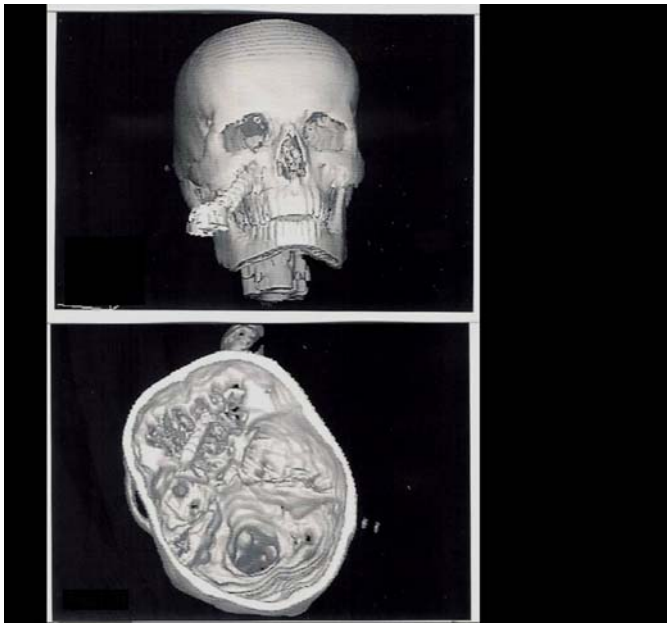


Computed Tomography

- CT: Digital geometry processing is used to generate a three-dimensional image of the internals of an object from a large series of two-dimensional X-ray images

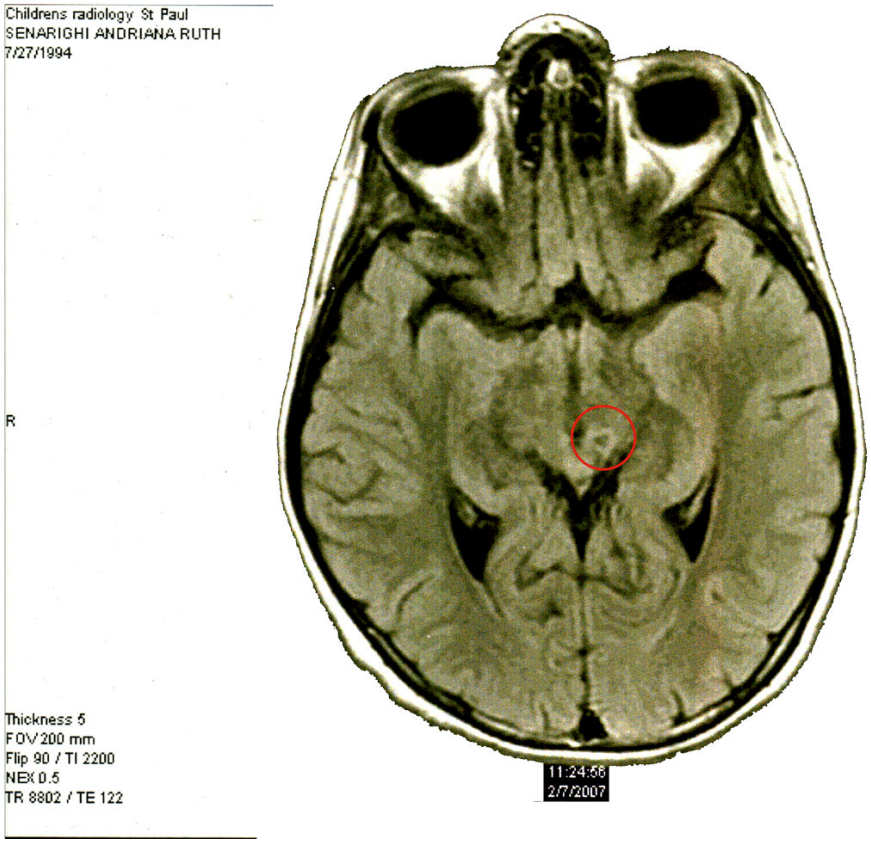






Magnetic Resonance Imaging (MRI)

- A computed tomography (CT) scanner uses X-rays, a type of ionizing radiation, to acquire its images, making it a good tool for examining bone and calcifications within the body, or structures (vessels, bowels). MRI, on the other hand, uses non-ionizing radio frequency (RF) signals to acquire its images and is best suited for non-calcified tissue. Aided by a computer, MRI is able to produce images from many different body angles and plans, which enables radiologists to quickly and precisely diagnose a wide variety of conditions.



Medical Expert Systems

- An expert system is a computer program that contains some of the subject-specific knowledge, along with the formalized knowledge and analytical skills of one or more human experts.

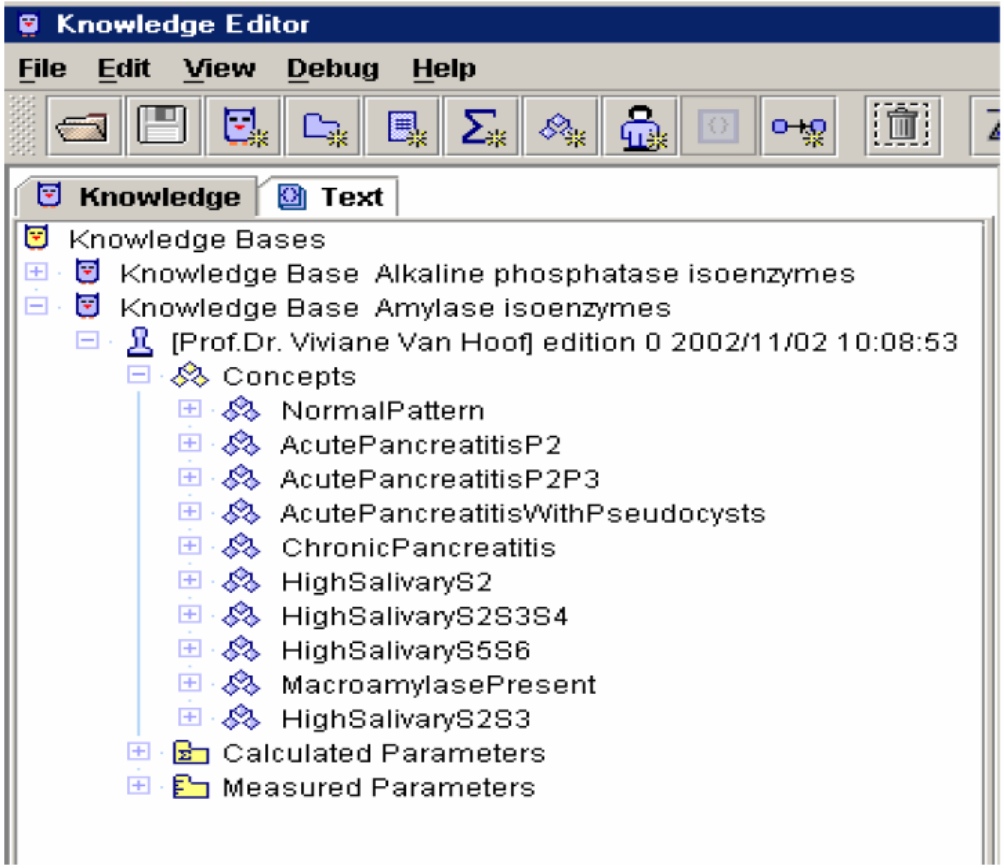
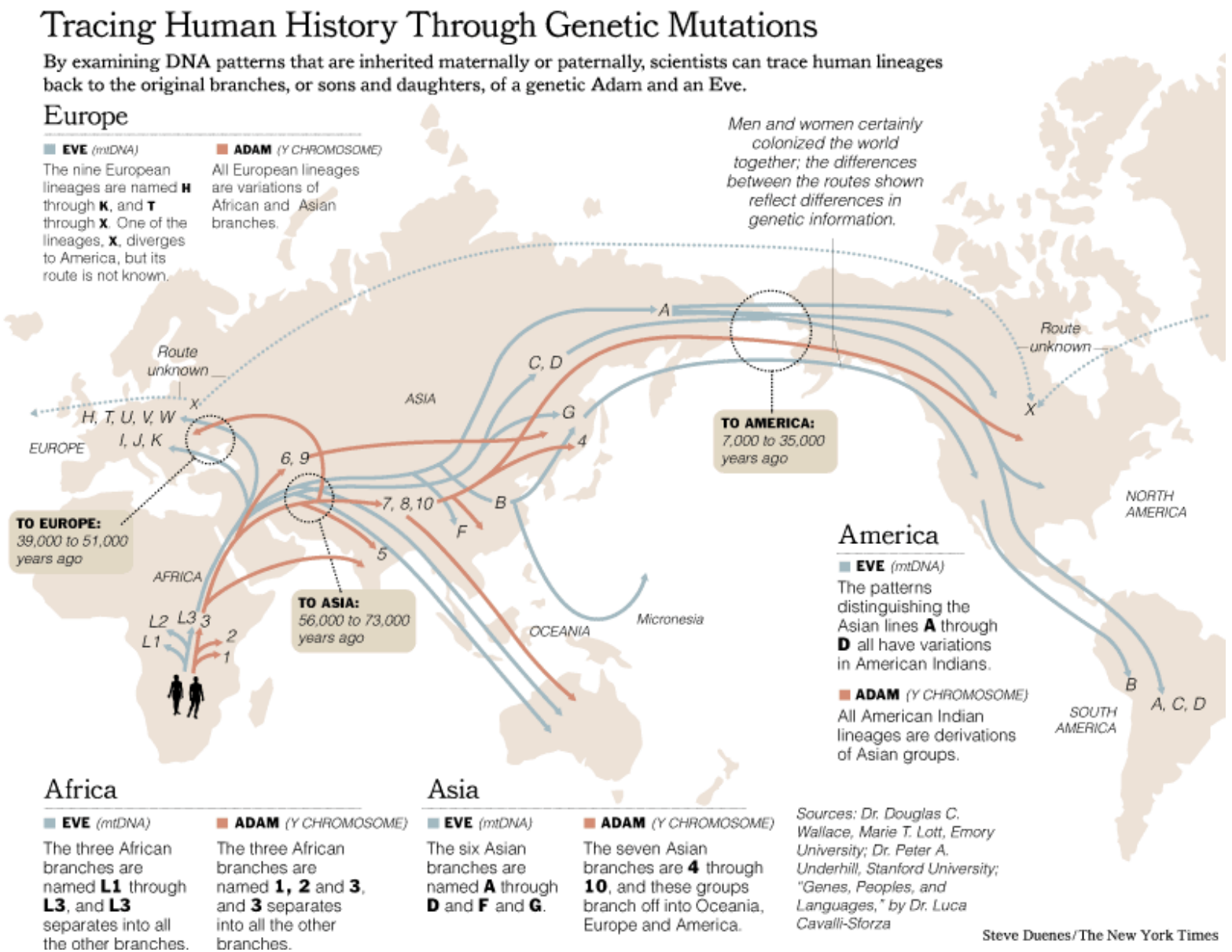
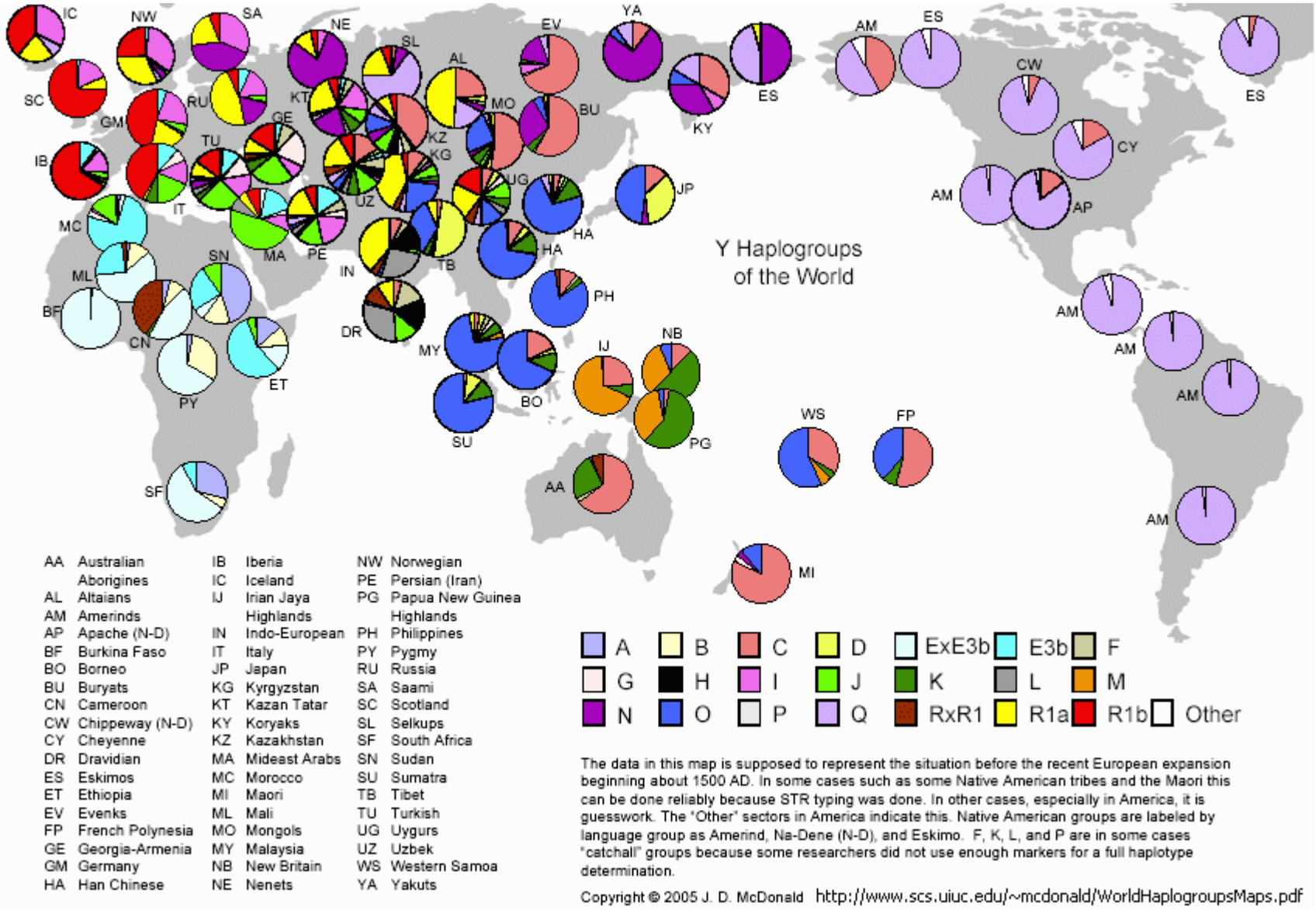


Figure 1 - Concepts that were defined in the j.MD isoamylase knowledge base

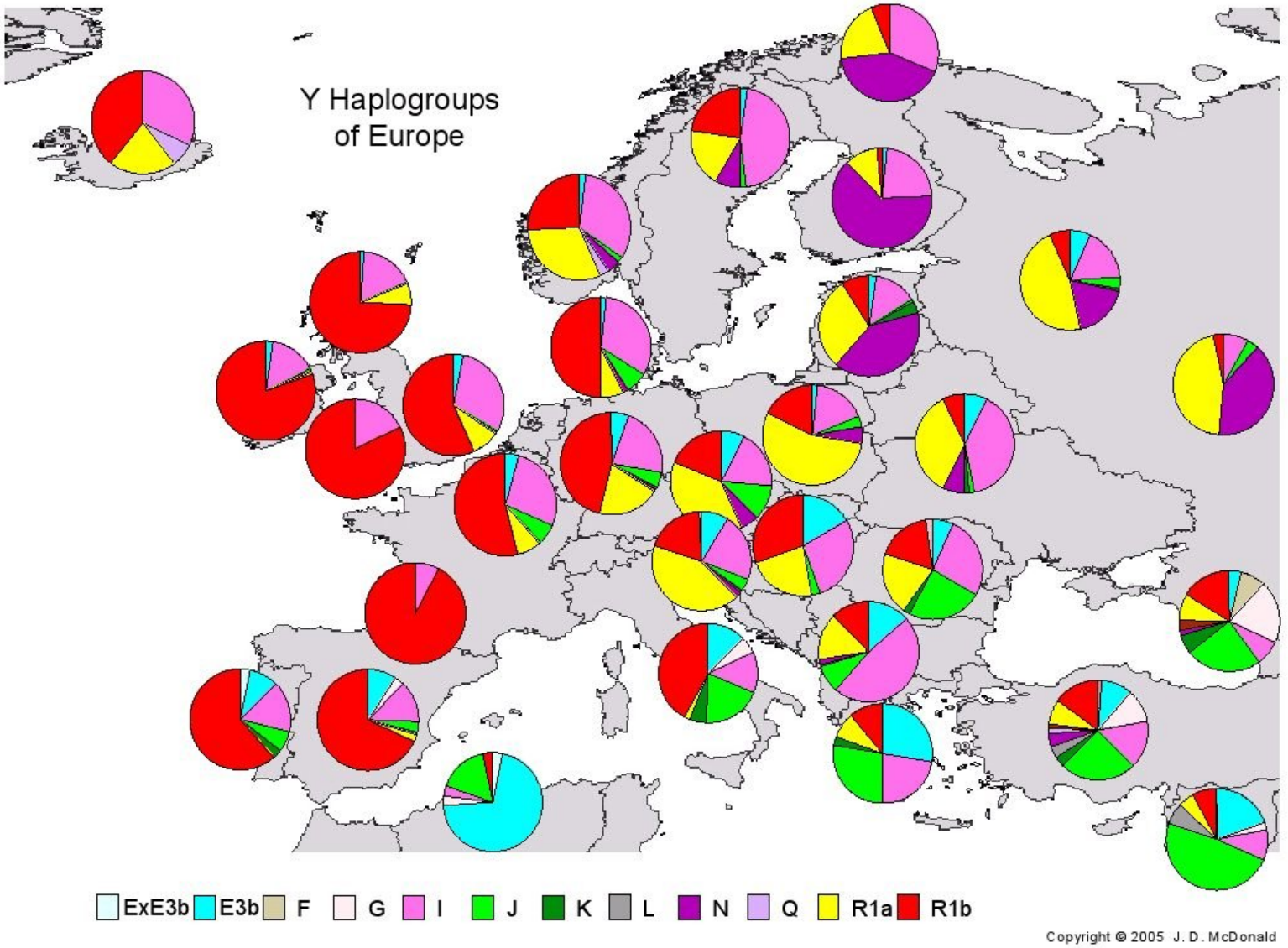
Computer Analysis of Genetic Data



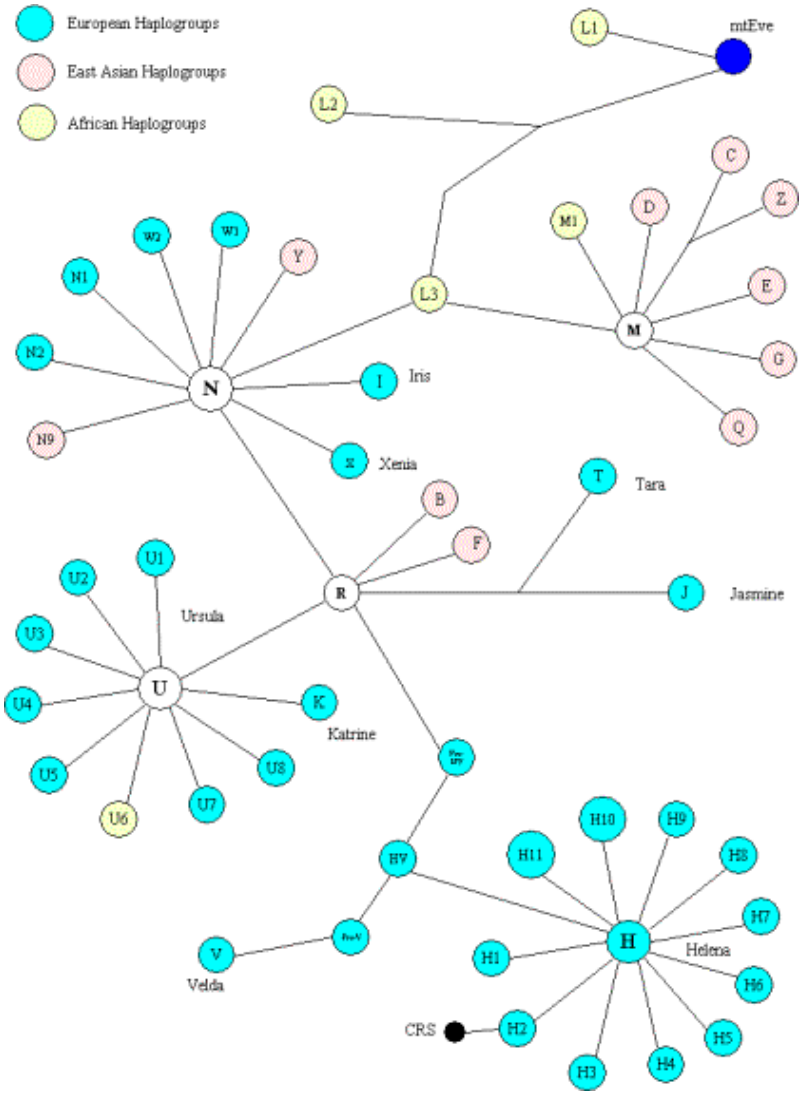
Y-Chromosome Map, World



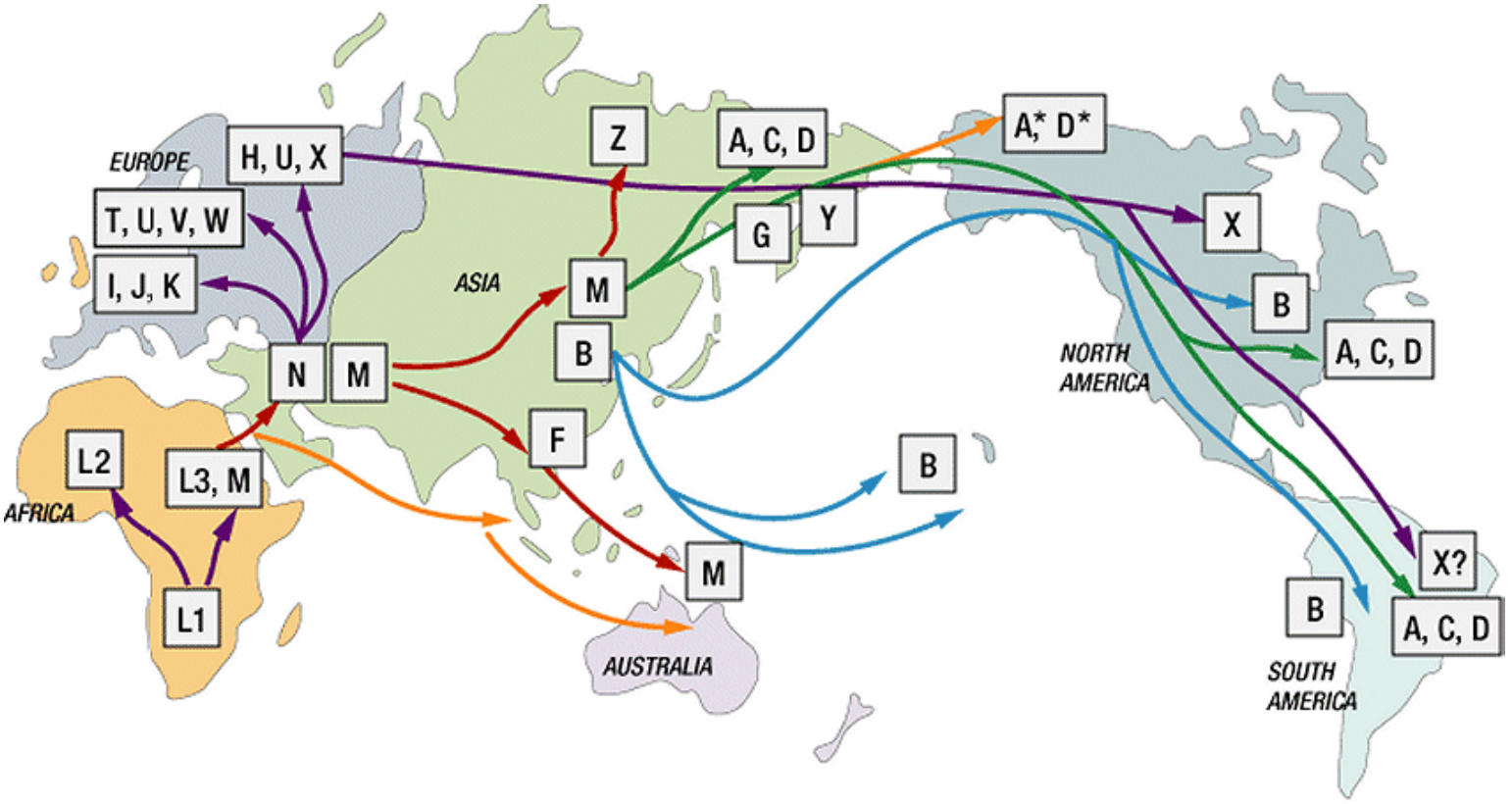
Y-Chromosome Map, Europe



mtDNA Haplogroups



mtDNA Migration Map



EXPANSION TIMES *(years ago)*	
Africa	120,000 - 150,000
Out of Africa	55,000 - 75,000
Asia	40,000 - 70,000
Australia/PNG	40,000 - 60,000
Europe	35,000 - 50,000
Americas	15,000 - 35,000
Na-Dene/Esk/Aleuts	8,000 - 10,000

FamilyTreeDNA
mtDNA Migrations Map

The Genographic Project

- https://www3.nationalgeographic.com/genographic/index.html