Resources to Support Bio-engineering and Biological Materials Education

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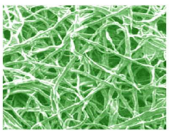
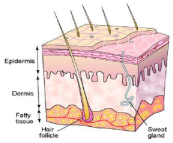

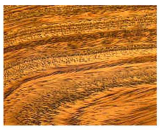
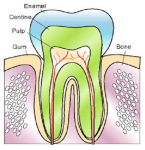

Background

At present, the potential contribution of Engineering and Materials Sciences to the Bio-sciences are of particular interest. These contributions can be on new experimental techniques, simulation methods of the physical sciences that contribute to bio-engineering, and development of new procedures and more effective treatments for the health industry, while nature can suggest ways to make new materials to engineers and material scientists.

A bio-materials database aimed at engineering students should aim to:

- Capture the mechanical and thermal properties of biological materials (i.e. stiffness, strength, elasticity, resilience, toughness and thermal protection)
- Allow comparison of these with the equivalent properties of biomaterials and other materials.

Description of Databases

The CES EduPack Bioengineering (Level 1&2, Level 3) databases contain records of natural and bio-materials (man-made materials designed to replace natural materials). Rather than storing many records for each variant, representative data are presented, usually as a single record. These databases enable:

- Retrieval and comparison of properties of natural and man-made biomaterials, in a consistent framework
- The construction of material property charts for natural materials
- Exploration of basic structural building blocks (minerals, polysaccharides and proteins) that give the great diversity found in bio-materials
- Substitution studies exploring the potential for one to substitute for another, suggesting where manmade Materials might best be used for implants and organ replacement
- Bio-mimicry: designing man-made composites and structures that mimic those of the natural world

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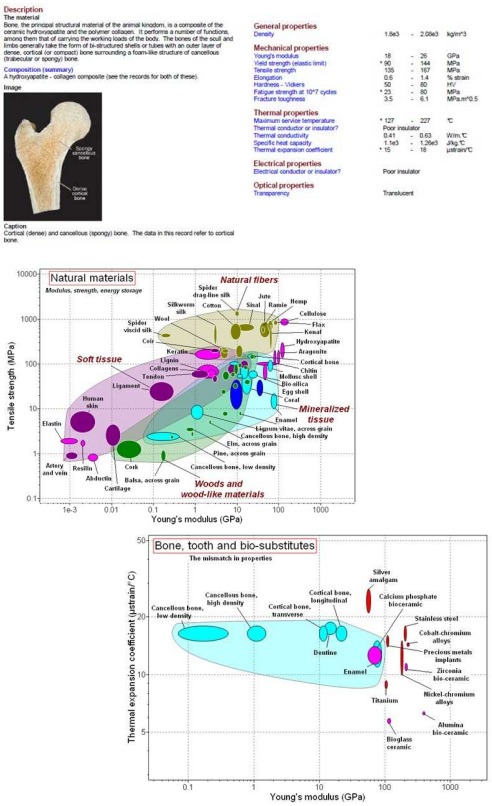
GRANTA MI MATERIAL INTELLIGENCE

Introductory Teaching Level 1&2

It contains 85 natural materials and bio-materials records and for 94 standard metals, polymers, ceramics and composites of engineering.



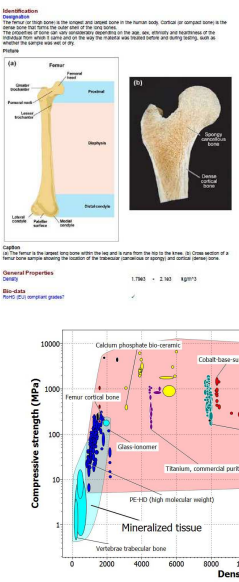
Advanced Teaching Level 3 (under development)

The development of level 3 has been driven by the need to provide a bridge between the basic information of levels 1 & 2 and the detailed data provided by the medical reference database that are available.

As a result, some detailed information from the Medical Materials and the Human Biological Materials (HBM) databases is incorporated into this new bioengineering module.

The focus is on increasing the number of materials that are being used in bioengineering applications and the materials that they interact within the human body.

The database contains > 1500 records biomaterials, metals, polymers, ceramics and composites of engineering.



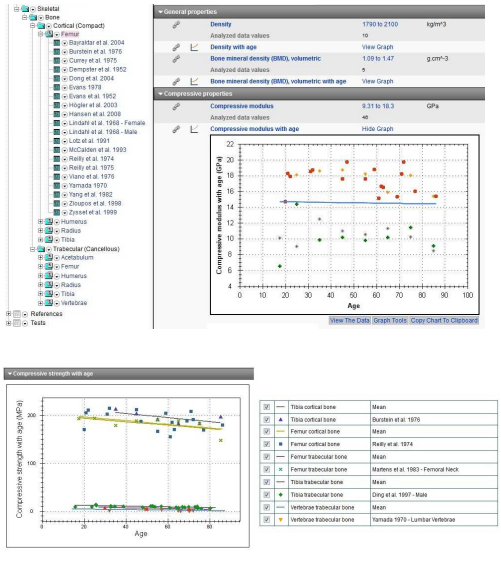
Advanced Teaching and Research Human Biological Materials (HBM)

The HBM database provides a single location of mechanical property data related to the human body, which is fully referenced to the original source material.

The database focuses on the properties of the skeletal tissues and presents information from the cortical and trabecular structures of the different bones, such as the femur, humerus and vertebrae.

Where possible, dependencies such as age are presented in graphical form, enabling the user to visually see how different properties are affected.

The database is primarily a reference resource that enables users to quickly extract the relevant information from for further analysis and fully supports Finite Element Analysis (FEA).



Future Developments

The **bioengineering level 3 database** is currently within development and will aim to combine the introductory information presented within the EduPack software with a selection of data from the more advanced Granta medical databases.

Both the Medical Materials and the Human Biological Materials databases will provide bio-engineering specific information aimed at final year undergraduate and postgraduate taught students. It includes a selection of biomaterials used in bio-engineering applications and a greater range of human bone data, enabling comparisons between the two.

The **Human Biological Materials database** is undergoing development with the aim to provide a comprehensive data source. The number of materials is increased, the quality of the data presented is enhanced and made as relevant as possible for researchers. Users should be able to identify specific information related to their research area, which can then be easily extracted for further analysis and the original source material can be accessed for greater detail.

Interested? If you are interested in potentially using these developments, please contact: Dr. Ana Pereira - ana.pereira@grantadesign.com