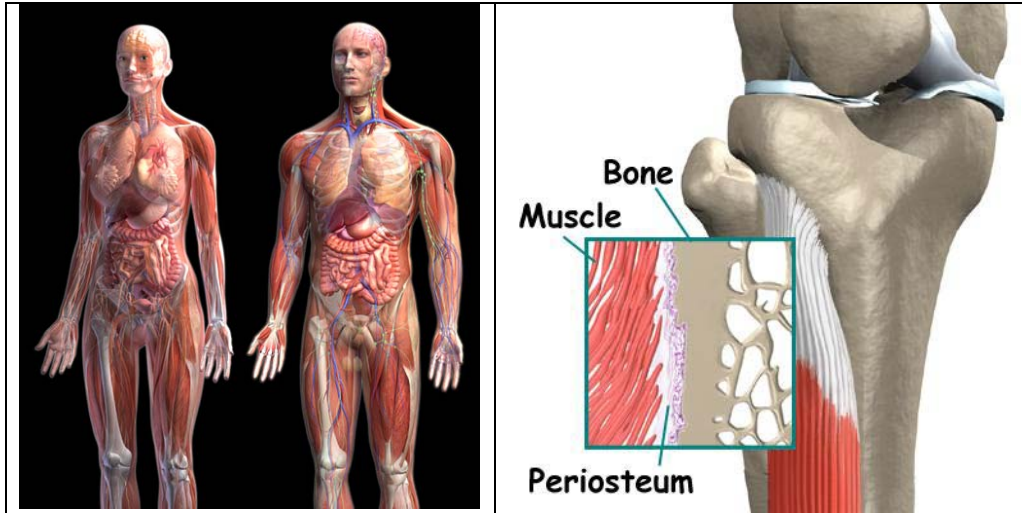


# The Digital Human Project: A Multidisciplinary Challenge to Advance Medical Practice and Clinical Research



**Figure 1.** Examples of 3D generated models of Anatomy.

## 1. Problems

Civilian and combat battlefield injuries can create unique medical situations that require significant expertise and experience to treat. Additionally, tiny variations in location of an injury can make diagnosis and treatment difficult without expertise that is beyond the normal level of those performing self- and buddy-aid. Unexpected variances in the patient's physiology or injuries can further complicate medical procedures during chaotic and rushed situations.

Medical simulations attempt to provide a predictive measure of human physiology and the use of these tools in medical diagnosis and training is well known. However, existing medical simulators use static models that cannot make predictions based upon attributes such as weight, sex, age, genetics, and existing medical history unless models are built for each possibility. Since current modeling systems use predefined attributes and assume all patients are the same, they are of limited use in civilian and combat situations. Current simulations fall short of providing accurate predictive measures training doctors how to make accurate medical decisions with unexpected physiology or complications. Additionally, the current state of medical modeling and simulation is characterized by disjointed research projects using a variety of unrelated models. The focus is usually placed on solving a very specific need or application with little attention paid to more comprehensive systematic approaches. This lack of unification prevents a single solution from being constructed to handle multiple types of medical situations.

## 2. Digital Human Project Presentation

Dr. Jayfus T. Doswell will present on the *Digital Human* project. The Digital Human project is being designed as an *online accessible simulated human platform* with the potential to improve the decision support and medical assistance capabilities of paramedics, combat medics, and first responders with far reaching implications to civilian long term health care providers. Researchers believe that the Digital Human will

## The Digital Human Project:

### A Multidisciplinary Challenge to Advance Medical Practice and Clinical Research

provide a tool to improve the delivery and quality of medical/surgical care throughout the battlespace.

The **Federation of American Scientists and Juxtopia, LLC** envision a grand challenge to dynamically simulate a human being ranging from its macro level systems (e.g., heart, immune system, lungs, etc.) to molecular systems that form DNA and individual cells. Unlike traditional static models, the Digital Human can be a flexible and scalable model that uses **predictive applied math, bioinformatics, and computational biology** to incorporate and simulate human physiological and variance, the patient's medical condition, and allows for personalized medical models to be created. As computational power increases more advanced biological models can be added to the system increasing the accuracy and use of the Digital Human.

The potential benefits of this approach merits combat medical significance. With predictive human models and high-fidelity simulations for medical training, battlefield injuries may be dynamically modeled to produce more accurate treatment plans, drug delivery consequences, and an overall more reliable decision support system. By integrating software algorithms and procedurally generated content, a 3D simulation of the patient can be created on the fly allowing doctors to get a pre-operation perspective of the patient before operating on them. Furthermore, by applying injury or illness models to the patient, the medical researcher or clinician will be able to build a functioning simulation for individualized medicine.

**About FAS:** FAS is a non-profit organization, founded in 1945 on science and technology policy issues including national security, energy, and education. We conduct research in partnership with a large number of US and international organizations.

The Learning Technologies Program is a FAS project to create a major national R&D program for using information technology to improve how we teach and learn.

#### **About Juxtopia, LLC**

Juxtopia®, LLC ([www.juxtopia.com](http://www.juxtopia.com)) is a biomedical and information technology (BIO-IT) company started in 2002. It is a leader in human performance products and services. Juxtopia® is located in the Emerging Technology Center in Baltimore, MD. Juxtopia® produces and sells a unique platform of human ergonomically engineered wearable devices that connect to the Juxtopia® software service platform in order provide personalized services to **improve human performance™** anytime, anywhere. This unique product/service platform integrates into your normal routine and enhances cognitive and physical capabilities to advance your decision making, prevent illness, injury, and disease, and assist during leisure activities. Juxtopia® patent pending product(s) and subscription based services collaborate to provide real-time performance assessment to improve both learning and health outcomes.

##