



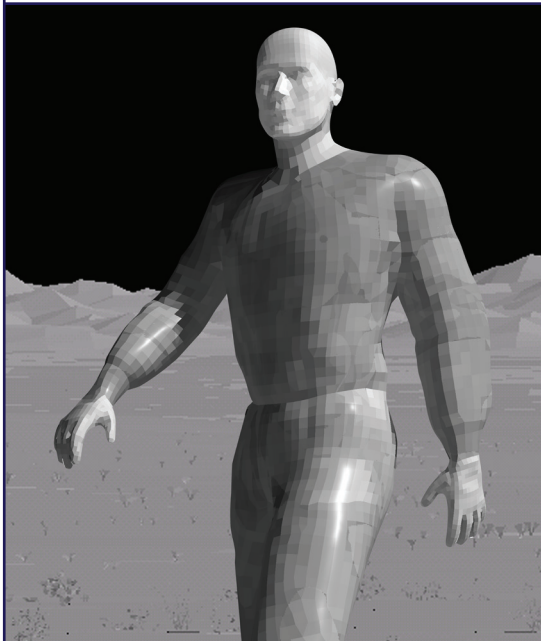
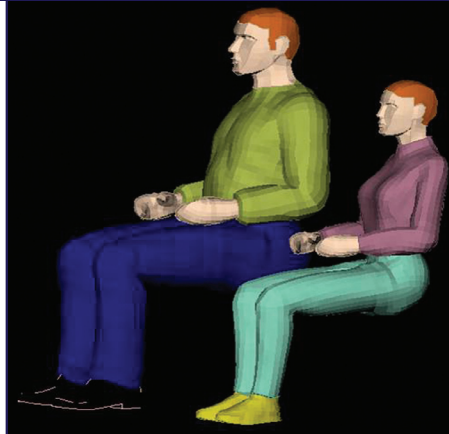
# ThermoAnalytics<sup>®</sup>

## Human Thermal Simulation

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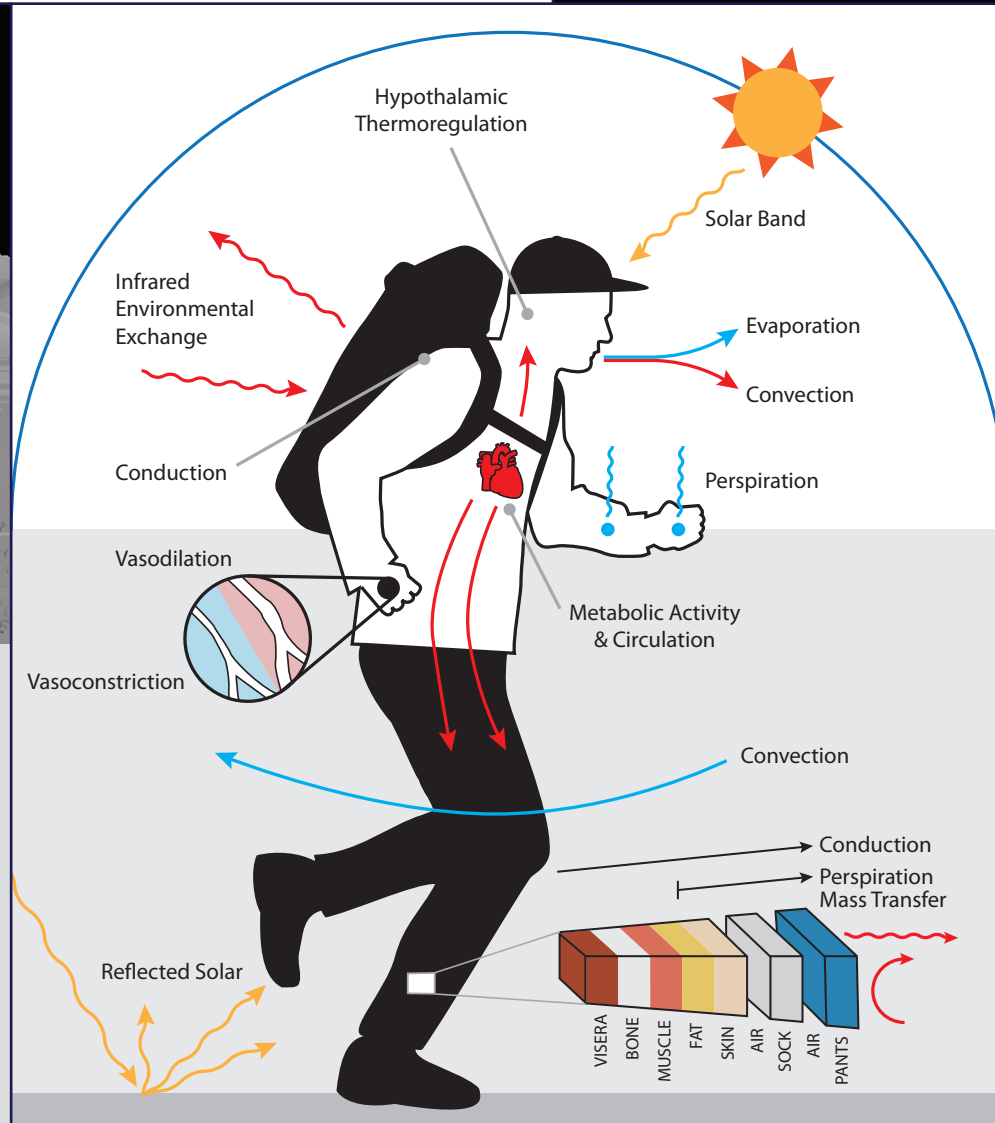
The Human Thermal Module is an advanced plug-in for analyzing human effectiveness within complex environments: indoor, outdoor, and in transportation systems. Our Thermal Simulation plug-in for RadTherm and MuSES software allows the user to place virtual humans into these environments and compute comfort indexes. Full

radiant, convective, and conductive heat transfer is accounted for, including localized thermoregulatory responses, such as perspiration, respiration, activity level, and blood flow changes. The Human Thermal Module provides the tools to design and optimize heating/cooling systems or improve clothing and uniform design.

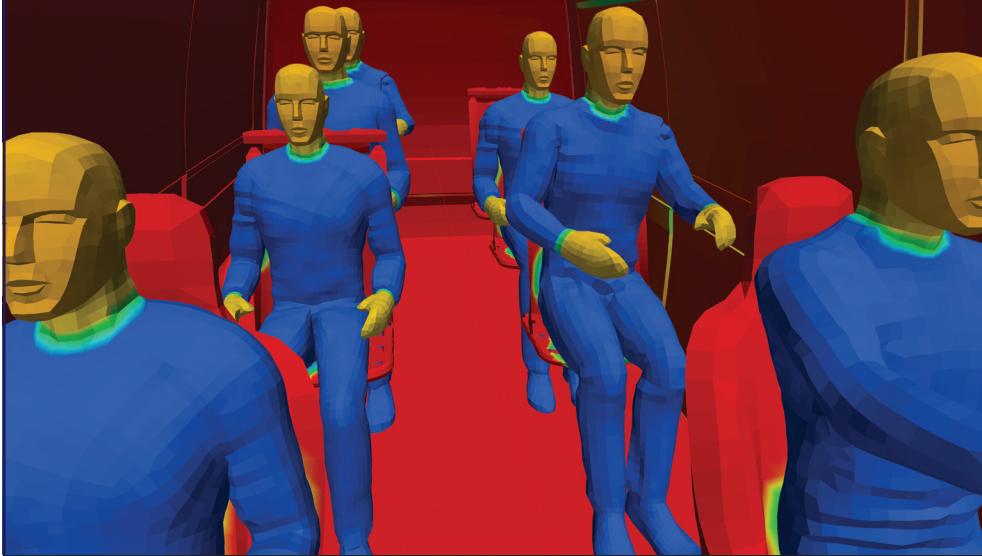


### Analysis with Virtual Models

The virtual human models have local body segments (e.g. upper arm, front chest, foot, etc) so users can apply layers of clothing or equipment in specific body regions. An integrated clothing database is included with detailed thermal and evaporative resistance data for over 100 articles. Complex multi-layer clothing can be accurately modeled with our advanced thermal solver.



# Human Effectiveness



## Features:

- Multiple state-of-the-art physiology models
- Improved calculations of human skin and core temperatures
- Physiogen utility for generating human models with variable heights and weights
- Model sizes that can vary from 1% to 99% of the population
- Visualize local thermal sensation or thermal comfort on 3D geometry to understand complex distributions

## Thermal and Infrared Signature Analysis

The Human Thermal Module predicts the human biological response to an environment and solves for skin and clothing temperatures throughout the body. The resulting skin and clothing temperatures are then used as inputs to MuSES' infrared radiance prediction. The same accurate background and environmental conditions that determined the virtual human's temperatures are further used to compute incident radiances and contrast.

### Common Applications

The Human Simulation Module predicts the effectiveness of virtual humans carrying out tasks at variable activity levels. It used for the design of clothing, aircraft environmental controls, vehicle HVAC systems, tents and buildings. This technology can also be applied to address the safety concerns of humans working in thermally significant environments, such as firefighters, pilots, foundry workers, and soldiers. For cold environments, the human module can assess local frostbite risk and loss of human effectiveness from hypothermia.

### Camouflage and Clothing Design

The clothing definitions used in the Human Thermal Module support resistance to heat and mass transfer of perspiration, and user-defined surface optical properties at infrared sensor wavelengths. This enables prediction of clothing surface temperatures and infrared radiances. Clothing performance can be simultaneously evaluated for human effectiveness and infrared signature. Our advanced rendering module includes image-based texturing to define camouflage patterns, enabling optimization of military uniform materials and concealment patterns.

### Custom Models and Microclimate Systems

Our research engineers can deliver a fully positioned and clothed virtual dummy placed into your environment. User routines to simulate microclimate cooling and dehumidification can also be delivered with full engineering reports and analyses. Contact us for an engineering review of your requirements.

