

# The Tower of Life Experience

Working with Artistic Interpretation: an  
engineer's perspective

Dr Rupert Soar

Freeform Engineering Ltd

# The TERMES Trust

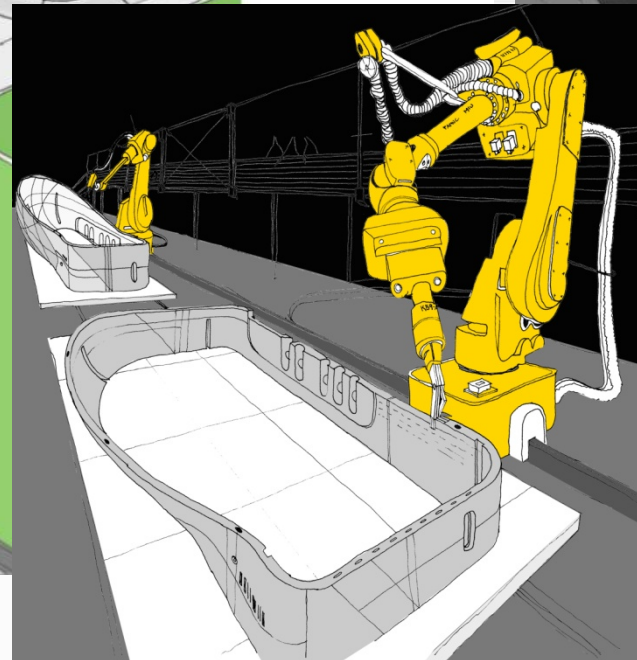
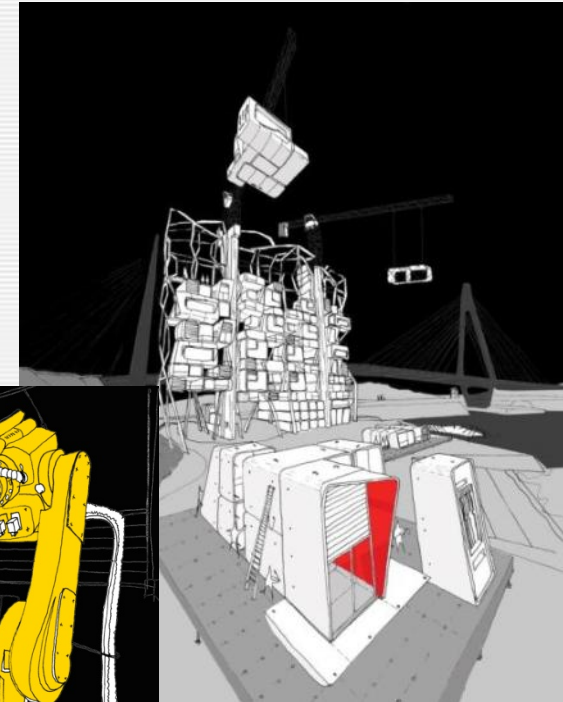
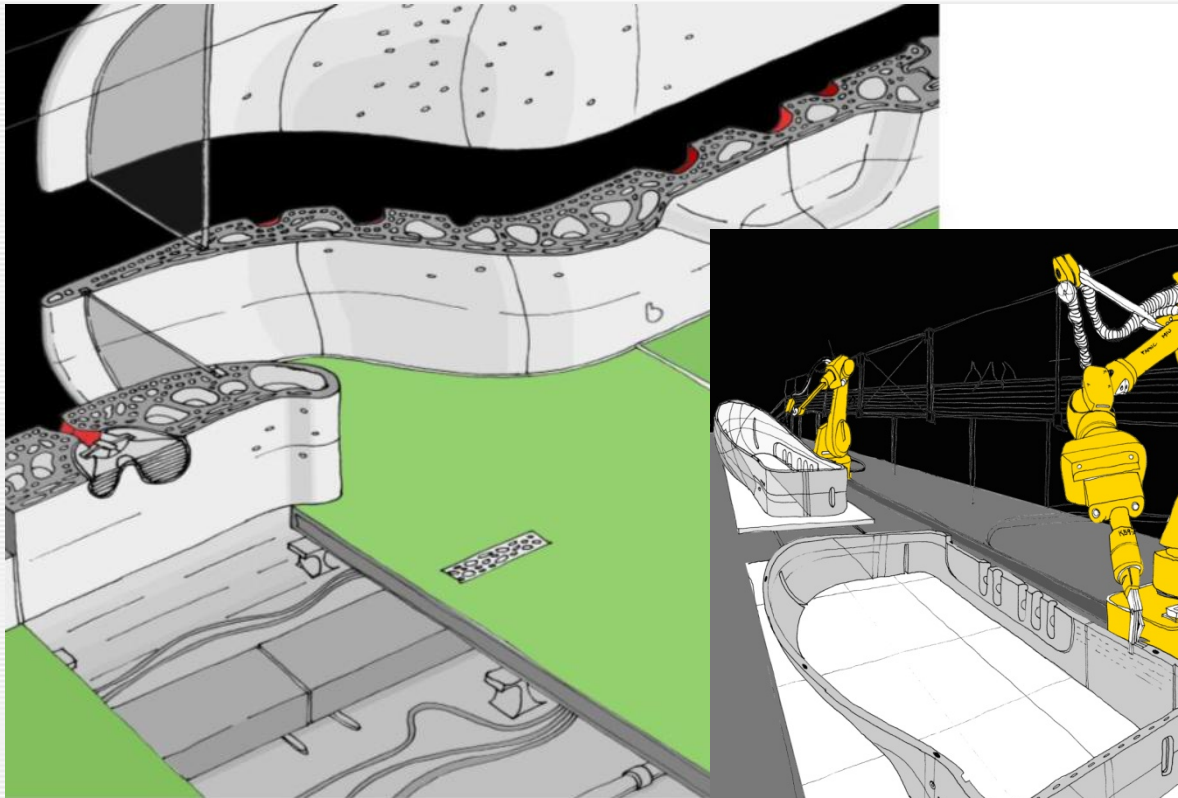
- Namibian Trust set up to share ideals and interests of its founder's.
  - Working to bring about changes towards sustainable construction
  - Academically led with research focus for new technologies
  - Driving new understanding of Nature to practical and commercial application.
- Already a collaboration for over 5 years
  - Dr Rupert Soar-Freeform Engineering Ltd (Nottingham, UK)
  - Prof J Scott Turner-State University of New York, (USA)
  - Dr Eugene Marais-The National Museum of Namibia
- Combining construction engineering, robotics, simulation, artificial intelligence, physiology and entomology
  - With its focus on Macro-termites of Sub Saharan Africa.
  - How do their mounds exchange respiratory gasses without affecting the delicate balance/stasis found inside the nest?
  - We have not solved this problem with our homes
- The termites have!!

# What Do We Do?

- Throw every piece of technology we can lay our hands on to understand nature more fully and exploit it.
- Modern sensing and computing is allowing us to study nature in very fine detail
  - Importantly we are not trying to mimic architectures, structures or functions.
  - We are into processes and how energy flows are managed by organisms and their structures.
- With modern computer fabrication methods we will soon be able to reproduce self-regulatory systems into buildings.

# Membranes not Barriers

- Defining the Epithelium.



Freeform

Engineering

# Infiltration of the Mound



# Underground Structure



Freeform

Engineering

# Mound Wash



Freeform

Engineering

# Mound Structure



Freeform

Engineering

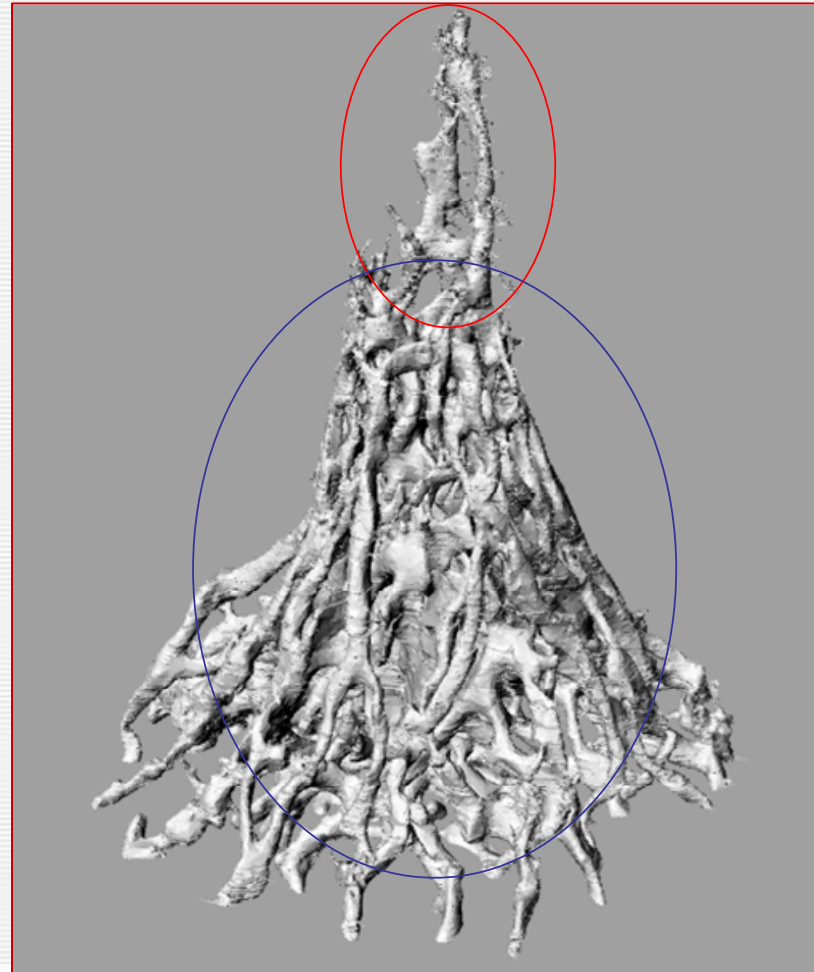
# Slice and Scan



Freeform

Engineering

# The Digital Model



Freeform

Engineering

# How Did we Get Involved with Festival

- Generated publicity internationally
- The Festival team heard about the work and contacted us
- They were looking for a 'Tower of Life' centre piece
  - Was not defined at that stage
  - Termite mound is a tower shape
- Festival's objectives fit perfectly with our own
  - Public dissemination
  - Opportunity to use the digital data
    - Models, exhibitions, walk through, fly through, extensive imagery and documentation over 5 years.
- Our story looks to the future of biology and engineering on the macro scale
  - It forced us to look at nature with new eyes and open minds
  - The discovery of the ventilation system, over turns 50 years of thinking about circulatory flows.
- Besides – no-one's yet been inside one – until now!!

# Why Did We Get Involved?

- We have a new message – how do we get it out there?
- Festival is a new approach to public dissemination
  - High publicity, public debate, collectivism
  - Using art's ability to communicate complex ideas
    - Creating something arresting with a strong message within
- A broader appeal than a peer review journal
  - Much of the discussion about our subject is in the public domain
- Festival enhances public domain discussion
  - Through experiencing, interaction and open debate
  - By exposing cutting edge ideas to public scrutiny
- Our work questions current thinking on sustainable construction
  - Move beyond green materials to green design
  - Integrating energy harvesting into the fabric of a building
    - Not 'bolt on'
    - Walls as membranes not barriers
- Social insects discovered this eons ago

# What are We Doing With Festival

- Chris will take you through the details and how this remarkable interpretation came about....
- With the Tower of Life, we have a weekend to put across our story and enthusiasm to around 40,000 people.
- We will use live presentation, videos, and TV documentary.

# What the Tower Represents

- A symbol for humankind's new awakening to Nature
- A reproduction, at human-scale, of the remarkably complex interior deep within a *Macro*-termite mound
- A world where the senses of touch, taste, smell and hearing give *Macro*-termites no perception of being confined
- A glimpse into an invisible world, created so we can both see it and, for the first time, hear it
- A message that humankind is not the only complex society on earth
- That many of the advanced solutions to sustainable house building have long been known by our fellow organisms
- A story that we are an intricately linked component of the 'milieu of life' on this planet
- A three dimensional 'thumbnail' from a real mound

# The Challenge of Interp

- Very limited time (per visitor) to get a large story across.
- For example:
  - How termite mounds ventilate by breathing, like we do, and not like chimneys
  - How this discovery relates to sustainable construction and how we can build our homes the same
  - The latest images and sounds from inside *Macro*-termite mound
  - The amazing technology of freeform fabrication will allow us to recreate this solution
  - How giant robotic freeform construction machines will print ‘living’ homes and are already
  - How individual *Macro*-termites become a collective swarm and how their behavior changes so that they begin performing the actions of a larger creature (becoming the cells in an organism we see as the mound).
  - How this knowledge is allowing computer analysts how to simulate ‘agents’ build ‘living’ structures.
  - How this information is being used to generate human colonies other planets using with swarm robots.

Thank-you

Freeform

Engineering