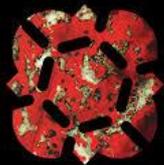


# Design considerations for 3D-printed models targeting blind and visually impaired participants

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IN SCIENCE AND ENGINEERING IN  
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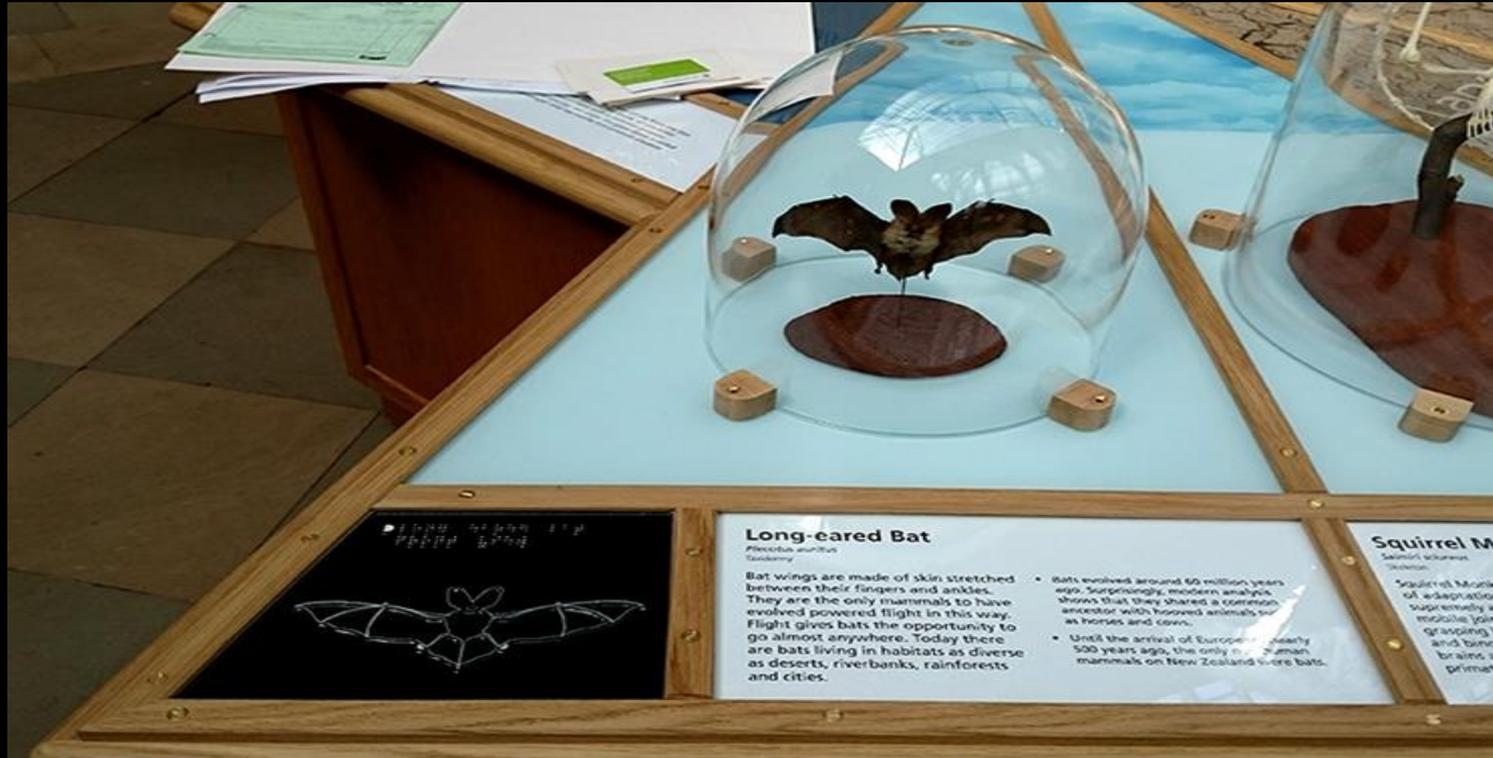


**UCL**

**ZEISS**

We make it visible.

# Accessible displays



Specimen, drawing and large-print text

3D replicas were traditionally expensive



# Desktop 3D printing



# Quality of objects presented



Do the models accurately replicate colour, weight, texture and temperature of the original object?

# Pre-existing studies with the blind and visually impaired

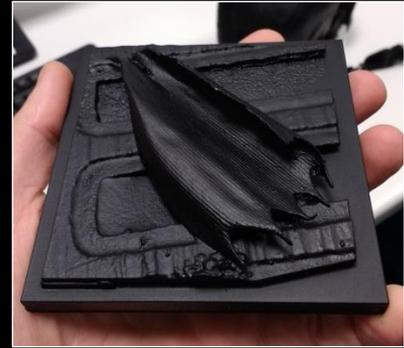
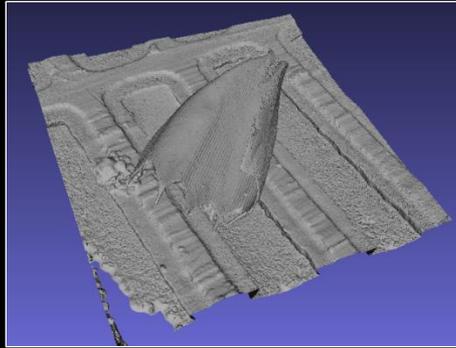
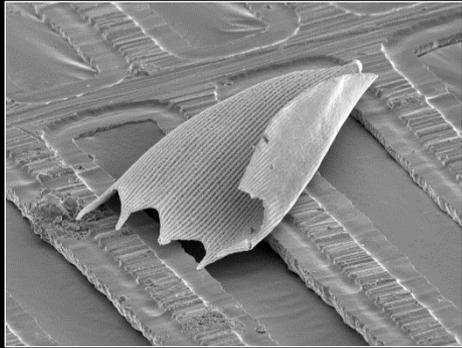
Discussions highlight a number of frustrations:

- Visually impaired people are not a homogeneous group
- Tactile models/diagrams can be overwhelming
- Handling objects not representative of the “real” object
- Events are often “dumbed down”

# The basis for our study

- Microscopic objects are effectively invisible
- Technology allows us to experience these objects
- Technology “interprets” the objects under our direction
- The aim is to provide a degree of shared experience
- We want to produce high quality design standards

# 3D prints from SEM Photogrammetry







# Design suggestions

- Use contrast to highlight features of interest
- Try to match colours to life, if possible
- Use Braille guidelines to inform minimum feature size (i.e ~ 0.5mm minimum feature)
- “Hand-size” is a good starting point (~ 5cm)
- Try to match texture - e.g. “fluffiness”, glossy surfaces

# Adding texture to models



# How do we provide scale?

- Work with familiar objects and standardised magnifications
- Reproducing familiar object (coin) at a series of fixed enlargements (e.g. 5x, 10x, 20x, 50x)
- Reproducing very small objects (e.g. sand/sugar grains) at fixed magnifications for comparison



# Expensive learning lessons



100% authenticity  
might not work for  
outreach



