

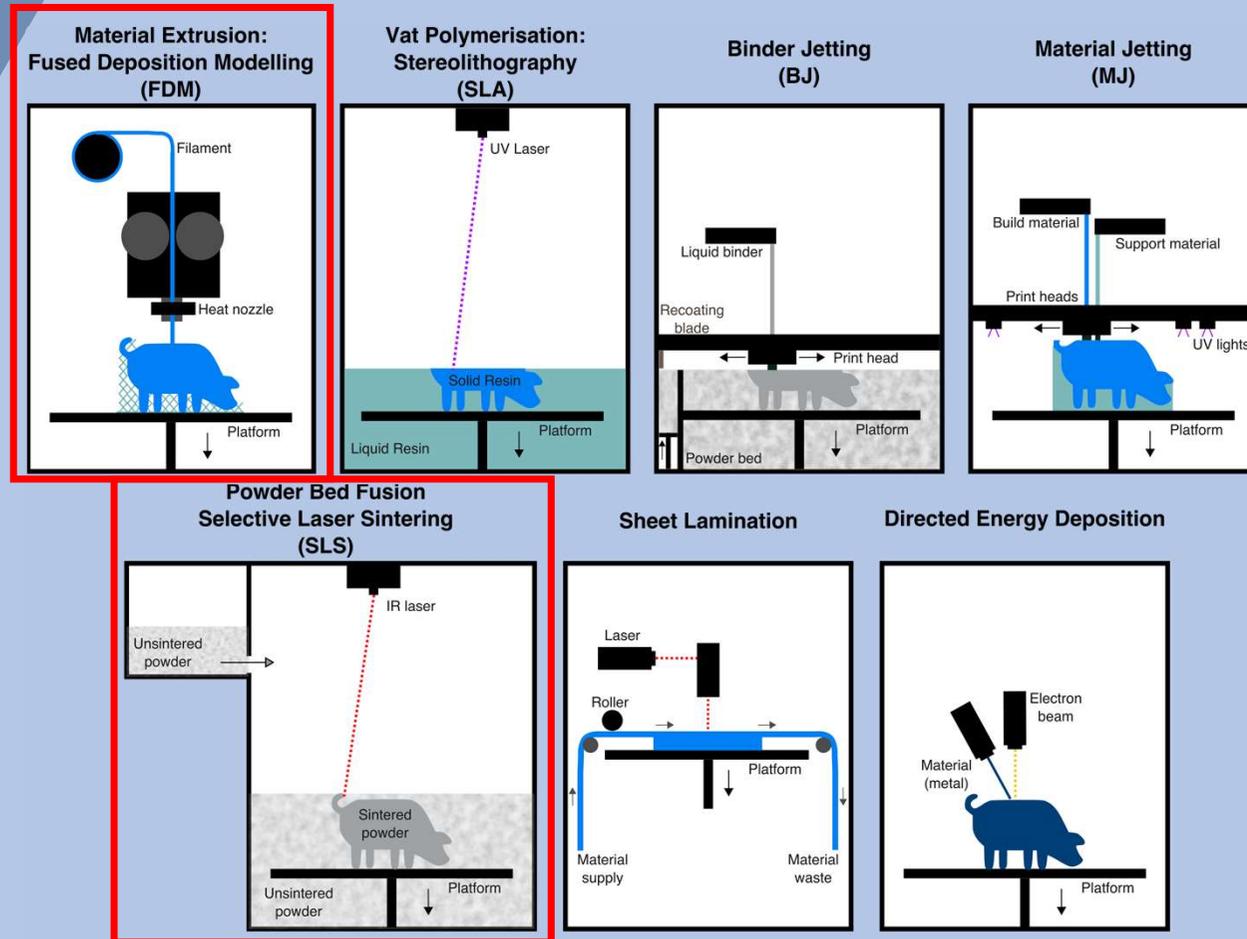
**3D imaging to
printing**

- Can show 3D model or animation or next step...

Rematerialise

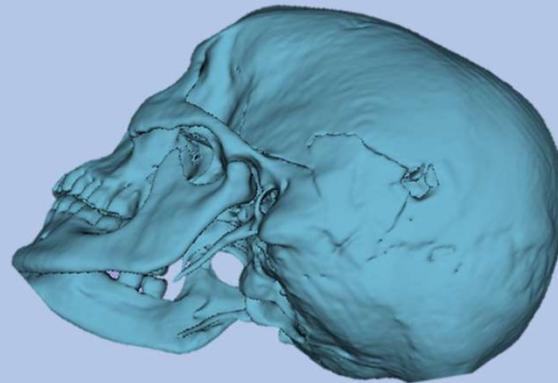
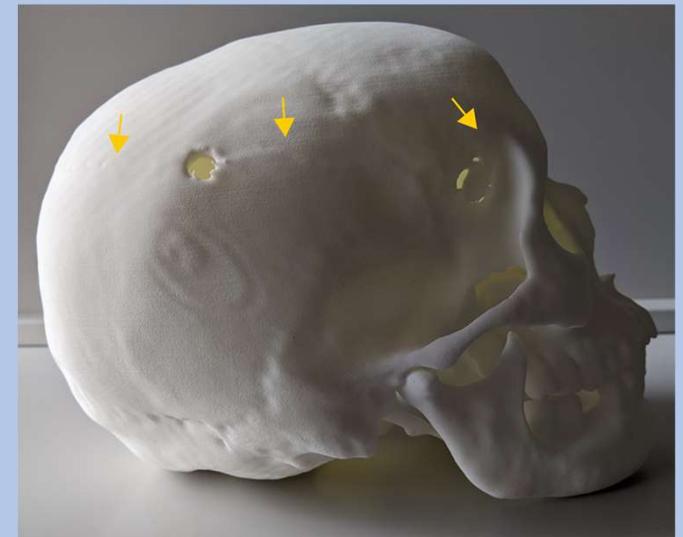
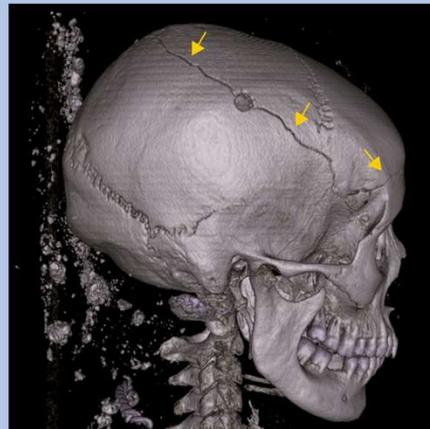
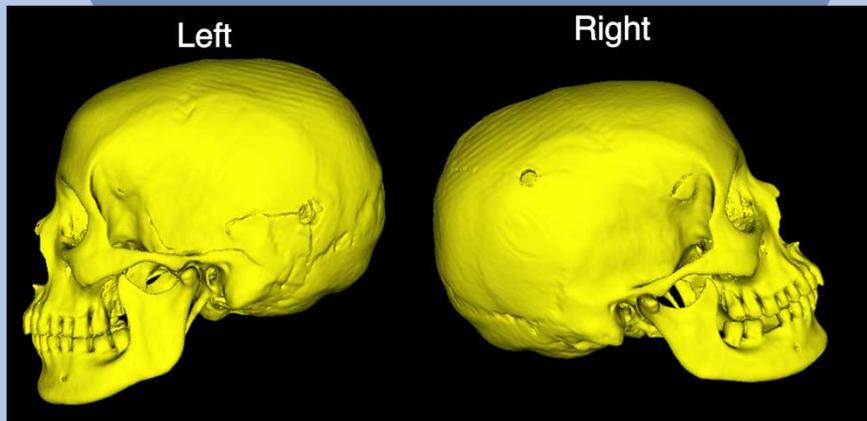
3D Printing

- Seven different types of 3D printing



3D Printing in forensic science

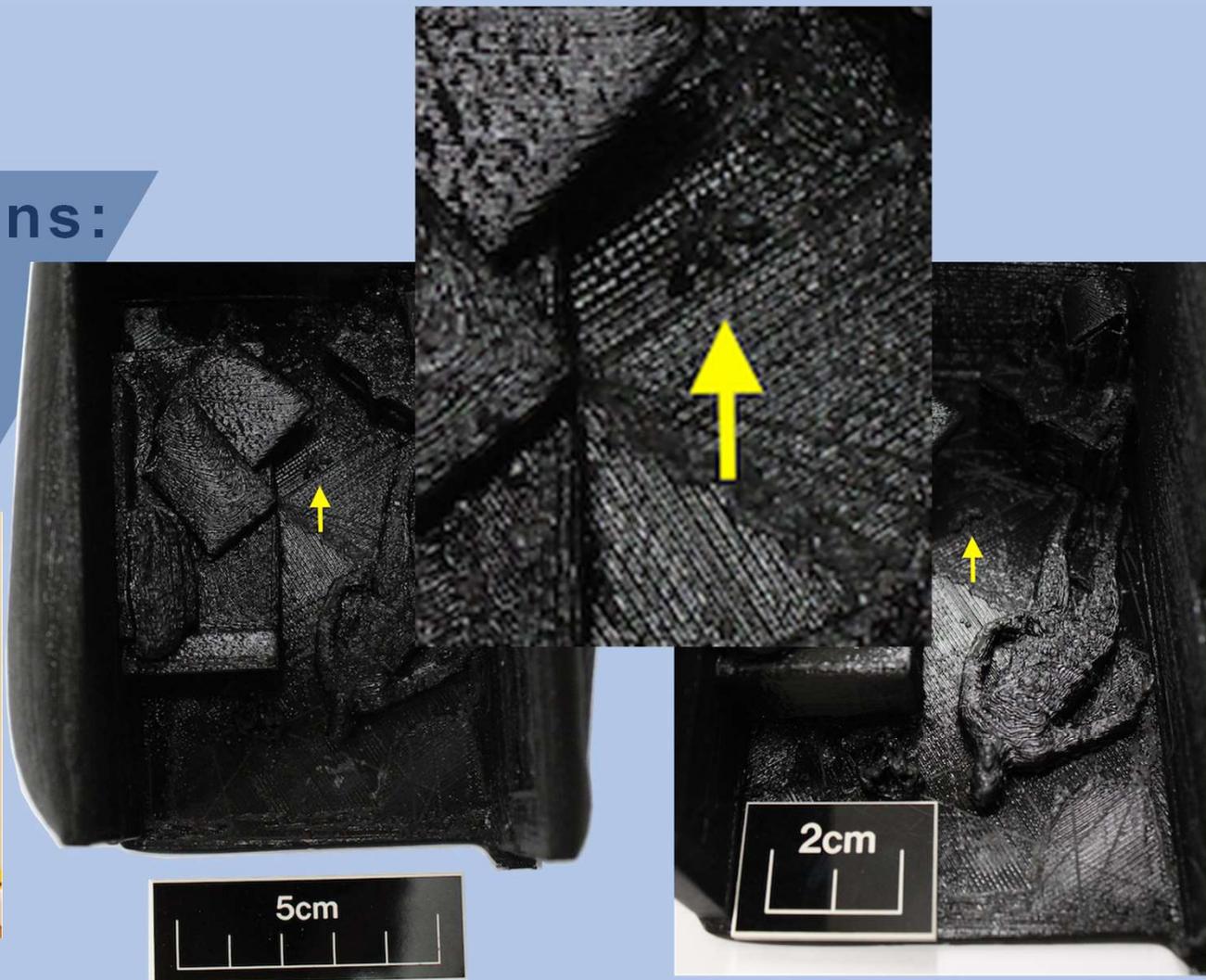
- 3D prints are physical replicas
 - = increased haptic and spatial awareness



Potential Applications:

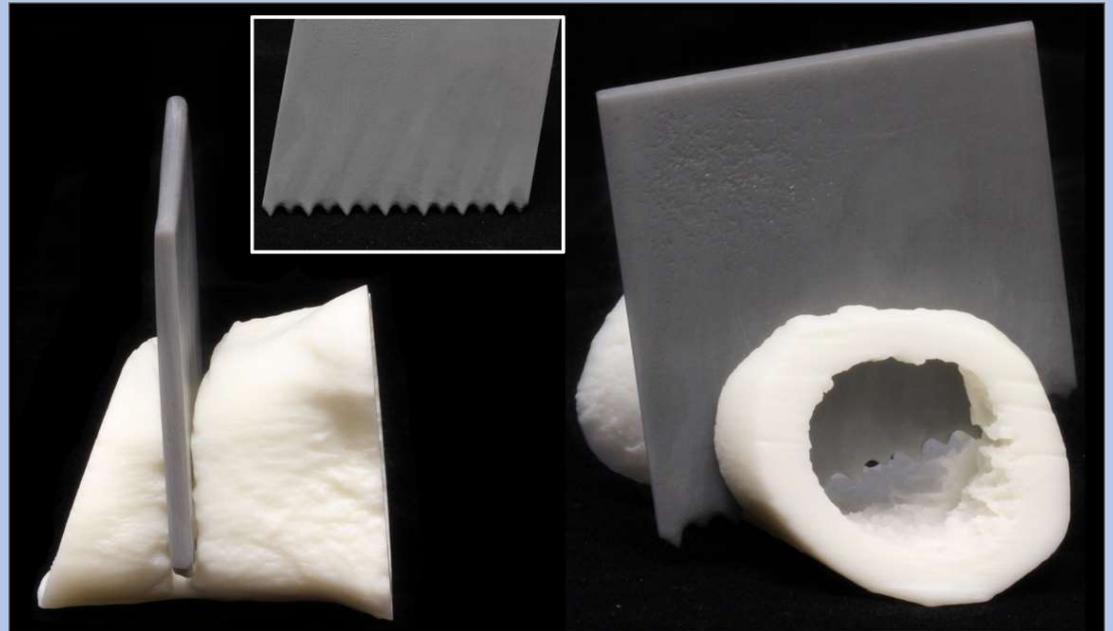
Potential Applications:

Crime Scene Reconstruction



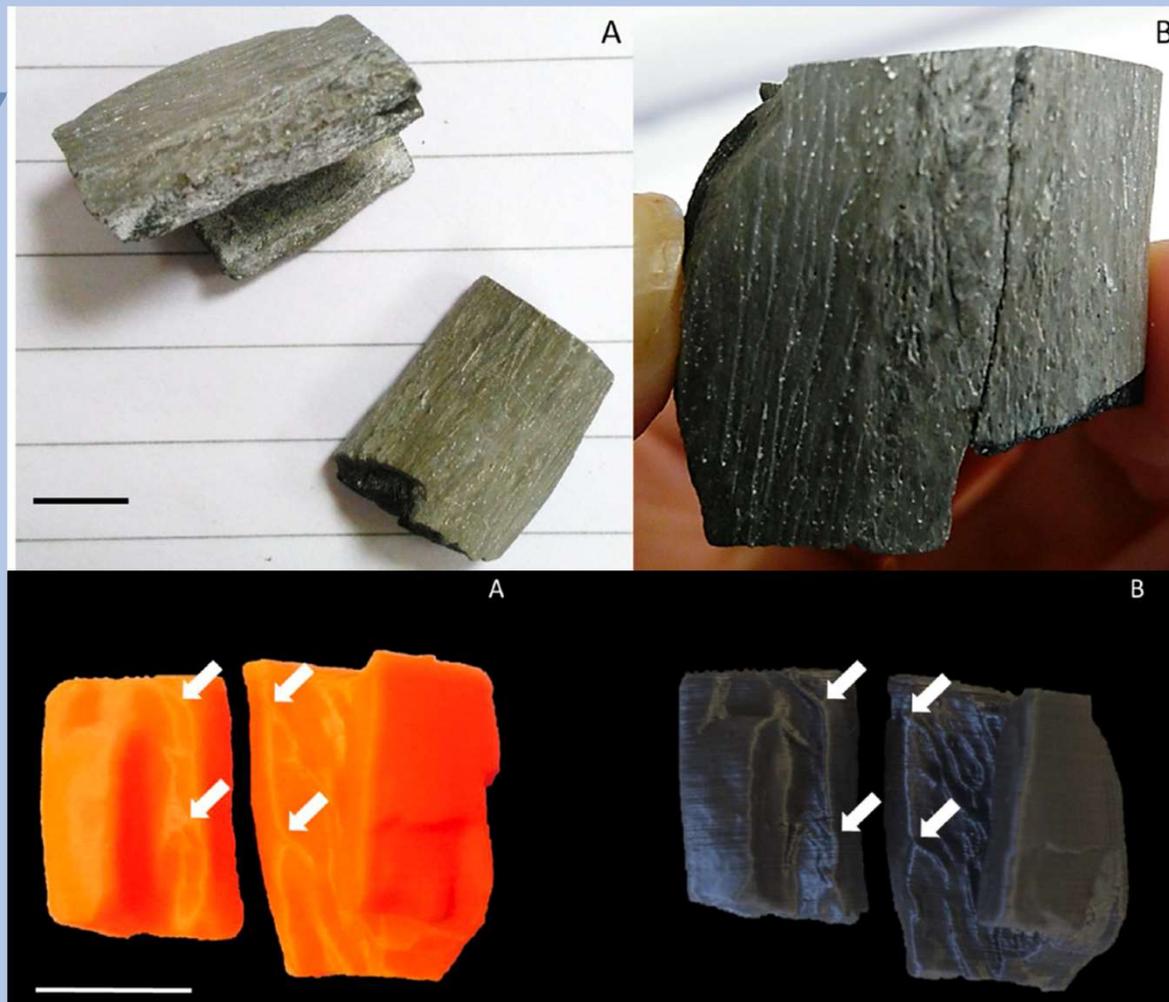
Potential Applications:

Tool / weapon
Reconstructions



Potential Applications:

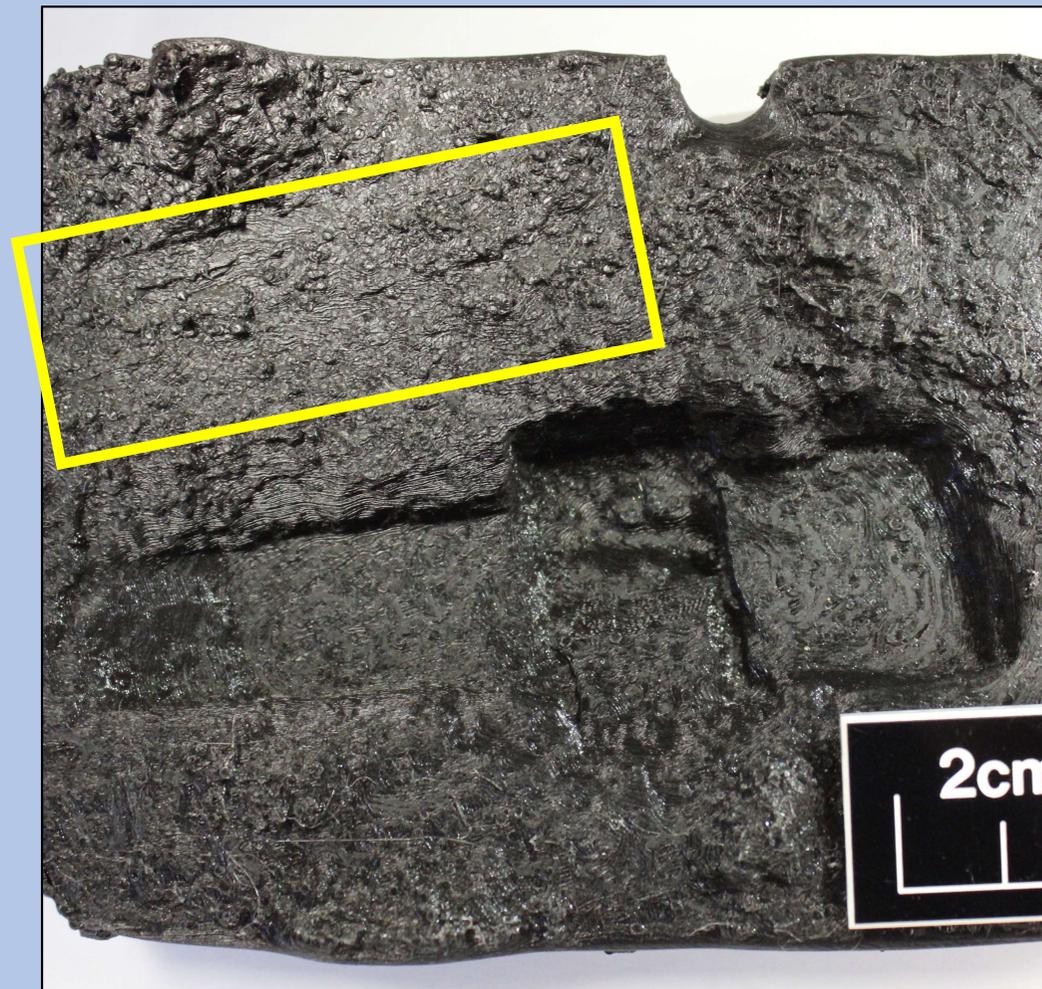
Physical fit –
bone fragments



Collings, A. J. & Brown, K. 2020. Reconstruction and physical fit analysis of fragmented skeletal remains using 3D imaging and printing. *Forensic Science International: Reports*.

Potential Applications:

Forensic
archaeology



Carew, R.M. and Errickson, D. (2020), An Overview of 3D Printing in Forensic Science: The Tangible Third-Dimension. *J Forensic Sci*, 65: 1752-1760. doi:10.1111/1556-4029.14442

Potential Applications:

Forensic medicine



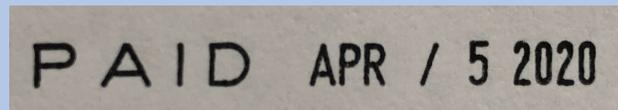
Potential Applications:

Forensic document examination

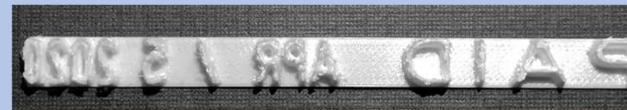
A Study Into Additive Manufacturing to Clone Stamping Device Impressions: preliminary results

Muskan Vir, Kimberly Nugent, Rachael M Carew, Liv Cadola, Cyril Muehlethaler, Mylène Falardeau, Tobin A Tanaka

Ontario Tech University; Université du Québec à Trois-Rivières ; Government of Canada – Canada Border Services Agency



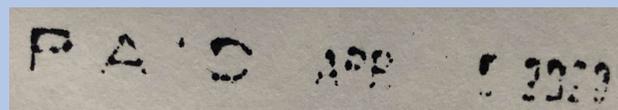
Original stamp's impression



3D printed cloned stamp



3D printed model adhered to handle



Cloned stamp's impression

Potential Applications:

Forensic
taphonomy



Adult cranial fragment with root etching



Carew, R.M, Morgan, R.M. & Rando , C (2020): Experimental assessment of the surface quality of 3D printed bones, Australian Journal of Forensic Sciences. //doi.org/10.1080/00450618.2020.1759684

Potential Applications:

Forensic
anthropology



Carew, R.M. and Errickson, D. (2020), An Overview of 3D Printing in Forensic Science: The Tangible Third-Dimension. *J Forensic Sci*, 65: 1752-1760. doi:10.1111/1556-4029.14442



Carew, R.M, Morgan, R.M. & Rando , C (2020): Experimental assessment of the surface quality of 3D printed bones, *Australian Journal of Forensic Sciences*. //doi.org/10.1080/00450618.2020.1759684

Research



Research:

Accuracy of 3D Prints

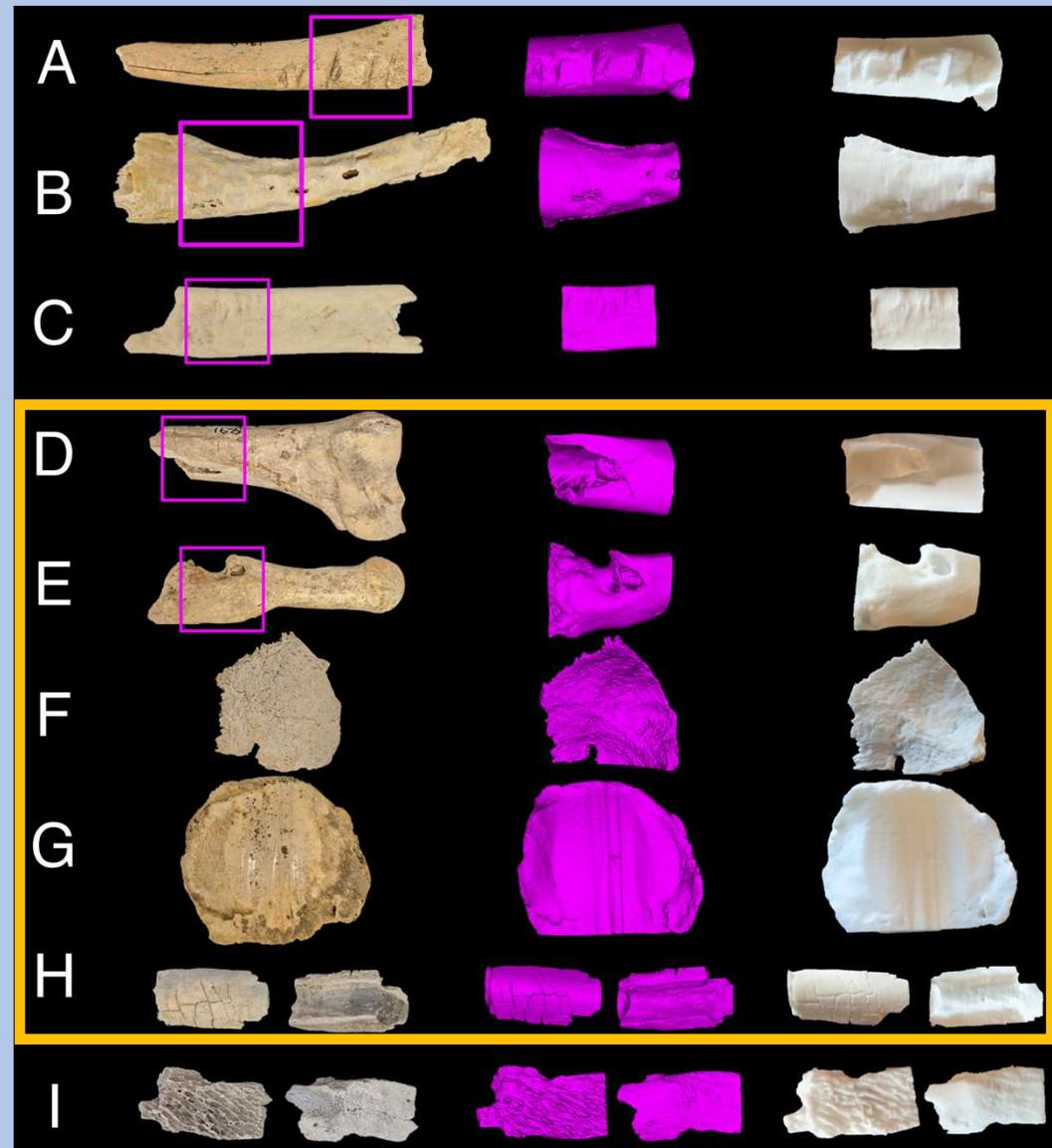


Research:
Surface Quality of
3D Prints



Research:

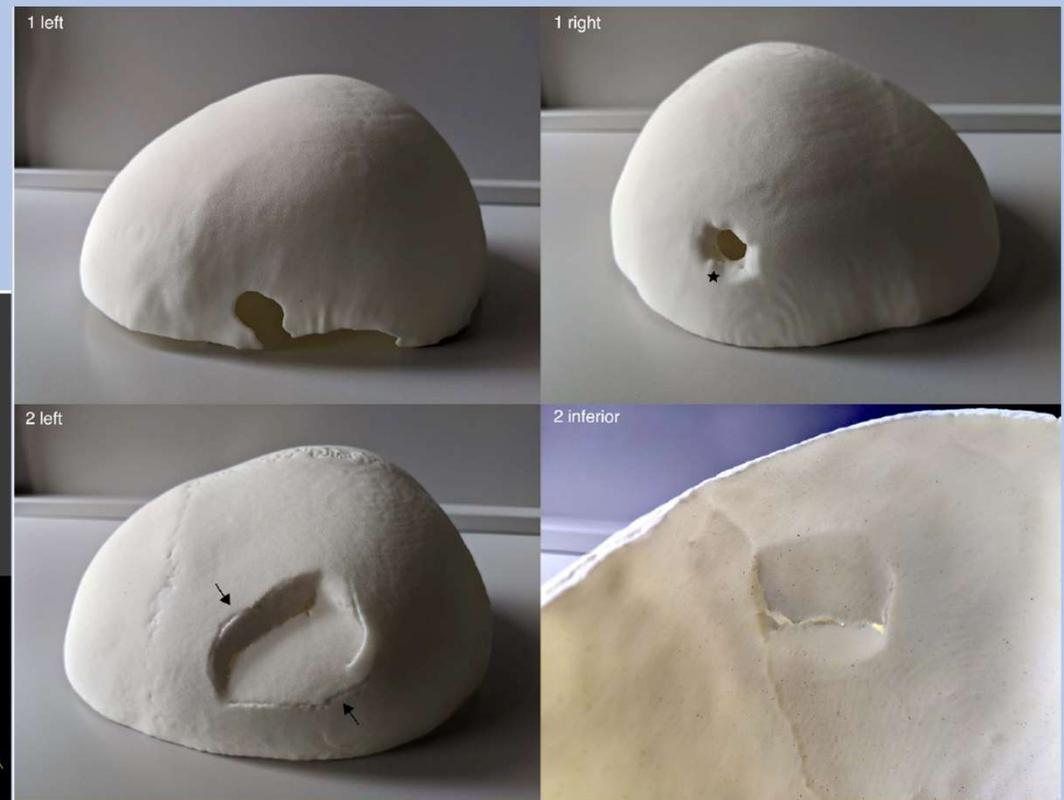
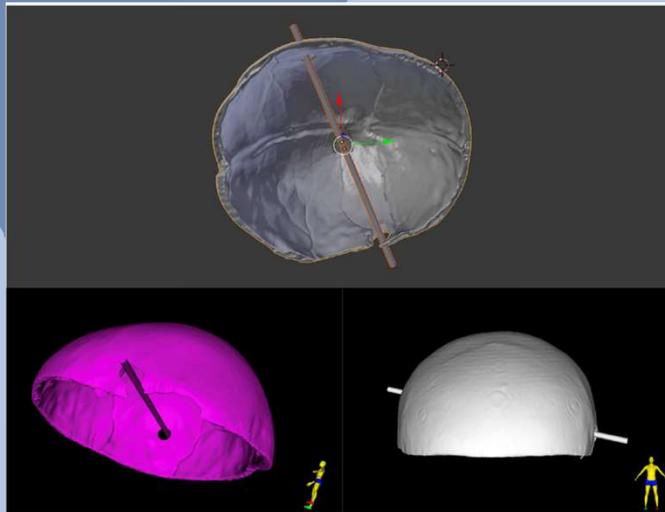
Surface Quality of 3D Prints with *fine details*



Research:

Suitability of 3D printing cranial trauma

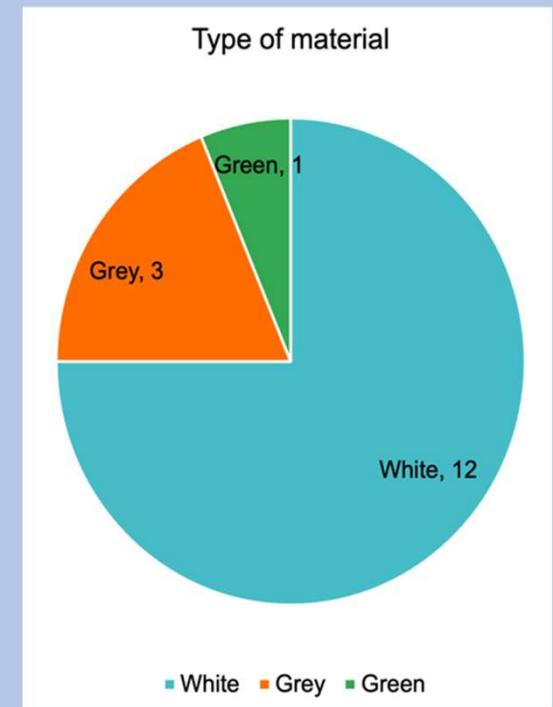
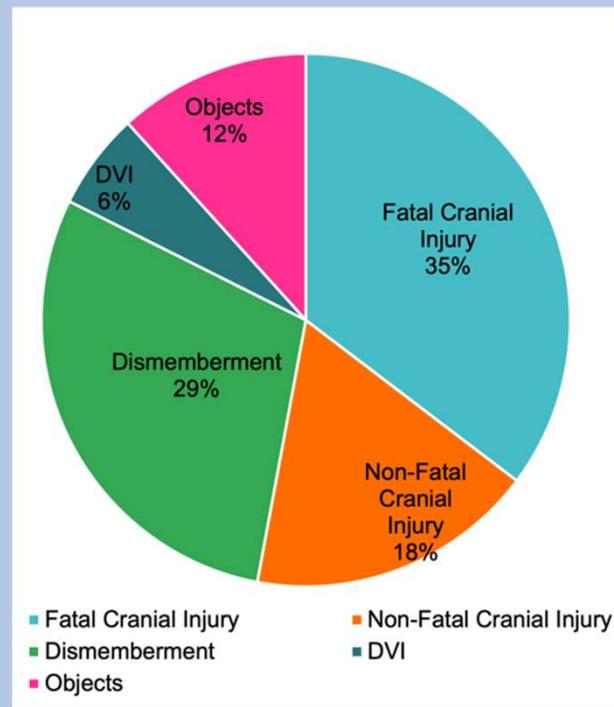
- Evaluated the suitability of three 3D printed cranial trauma examples as 3D physical reconstructions



Research:

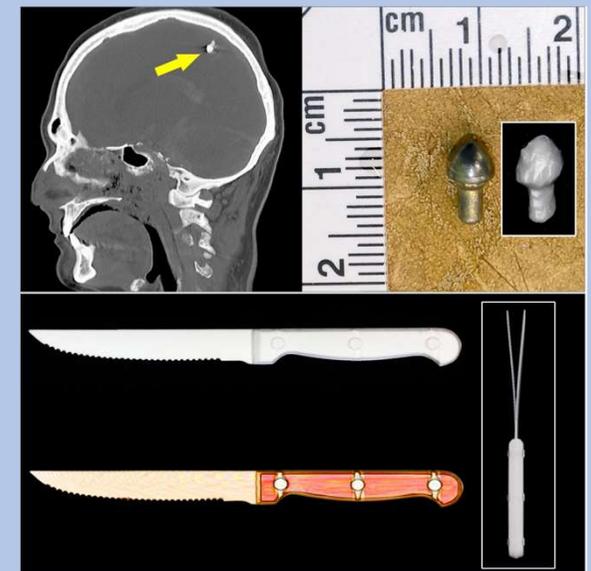
A Series of Case Studies
on the Use of Three-
Dimensional Printing
Within the Courts in
England and
Wales

Cranfield Forensic Institute; University College London; Teesside University; East Midlands Forensic Pathology Unit; South West Forensics; Metropolitan Police; Liverpool John Moores University



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Recommendations towards best practices:

- Making inferences from 3D reconstructions within areas of expertise
- Considering intellectual property rights of those involved in a 3D pipeline
- Authorisation or quality control checks from all involved in a case before a print is presented in a court of law
- Forensic 3D imaging should not be conducted in isolation from the experts that will be/have been analysing the material
- There is currently no evidence to support the use of 3D printed replicas for *analysis or interpretation purposes*
- Further collaborative research between forensic service providers and academic researchers is needed
- The evidential value of 3D prints should not be overstated

Advantages



- Cost-effective
- Non-contact, non-destructive
- Preservation of crime scene material
- Accurate replication of material
- Unlimited opportunities to share, analyse and print
- Physical 3D object that can be held and inspected
 - Haptic and spatial properties
- Ethical alternative to maceration
- Early research indicates that 3D prints improve juror comprehension of evidence
- Scale-down to fit within a 3D printer or to make an object easier to hold
- Scale-up to make small features more visible to the naked-eye or to enable tactile interaction
- Replicas may be printed using a range of materials, colours, textures and flexibility

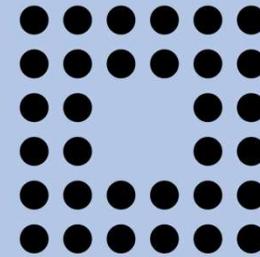
Limitations



- Limited by the initial documentation process
- Some high-cost methods
- Can have defects from modelling or printing process (step artefacts, support structures)
- Prints can be anisotropic or lack robustness, and powder-based methods such as SLS can result in a granular or brittle surface
- Need validation of the 3D printing techniques for courtroom applications
- Little exploration into the risk of bias in the courtroom with 3D printed models

Announcement!

3dipforensic.uk



3D.ip

Forensic 3D imaging and printing



Forensic 3D imaging and printing

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3D.ip provides consultants in forensic 3D imaging and printing

We provide custom 3D printing services for law enforcement and related areas, please get in touch for a free consultation.

Explore our website to learn more about our company and how we are providing 3D printing for the forensic science industry.



Acknowledgements

Thank you for listening

3dipforensic.uk

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Dr Carolyn Rando, UCL

Dr Katherine Brown, ICJS

Rachel James, MRes at ICJS

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