DIGITAL PRESERVATION STORAGE PARADIGMS

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SCIENCE MUSEUM GROUP

GUIDELINES

- **Chatham House Rule**
- iPres 2026 **Code of Conduct**
- Note-taker for any key **agreements/decisions/needs**
- Reporting back to **DPC Digital Forensics SIG**





"Calculex" Circular Slide Rule. 1908. https://collection.sciencemuseumgroup.org.uk/objects/co8405586/calculex-circular-slide-rule

Spiral slide-rule. 1663. https://collection.sciencemuseumgroup.org.uk/objects/co60414/spiral-slide-rule

SCIENCE MUSEUM GROUP

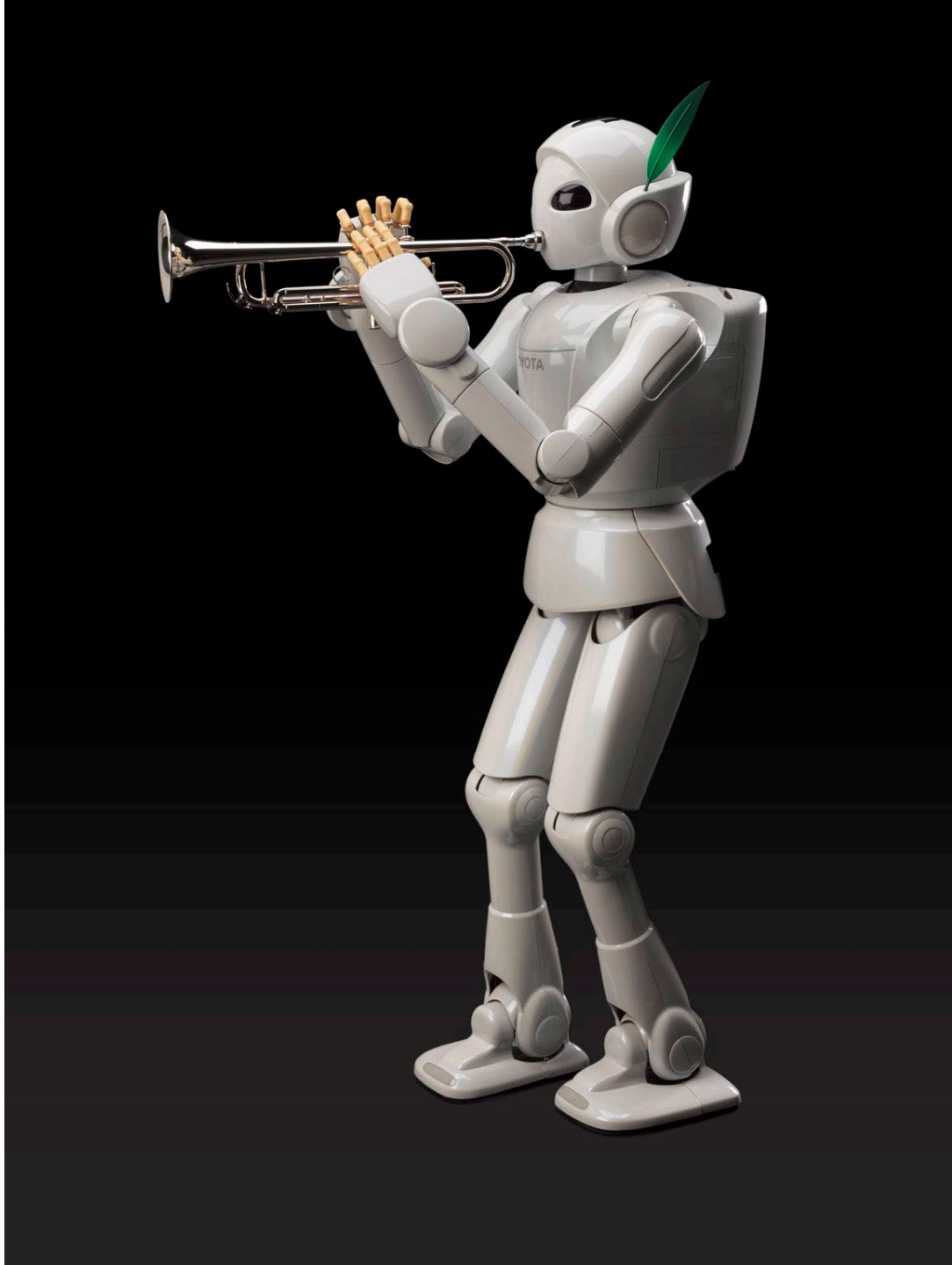
- **5 national museums** across England, plus **Science & Innovation Park**
- **90% collections** stored at Science Park
- Over **50,000 digital & audiovisual carriers**
- **106 carrier types** – floppies, tapes, cartridges etc
- **Approx 7TB** Digital Collections
- **Over 100TB** of Digital Corporate Records
- **Additional ~375TB on carriers** (digital & audiovisual) – Collections & Corporate Records
- Digital Preservation **team of 2**

Science Museum Group
https://www.sciencemuseumgroup.org.uk/



WHY AM I HERE?

- **Drafting requirements** for a Digital Preservation System and **preservation storage**
- Backups of **Working Space storage**
- **List of questions to ask vendors** during procurement
- **Many TB of digital content** (possibly scaling to PB long-term)
- SMG is **‘cloud-first’**
- **Environmental Sustainability** incl meeting **SMG net zero target by 2033**



Trumpet Player Partner Robot, with multiple additional parts. 2004-2005. https://collection.sciencemuseumgroup.org.uk/objects/co8461252/trumpet-player-partner-robot-with-multiple-additional-parts

WHY ARE YOU HERE?

- **Introduce yourself** to the group/your neighbour
- **What do you want** to get out of this session?
- **What type of preservation storage** do you have?



Replica of 'Maria' Robot from Fritz Lang's 1927 Film: ‘Metropolis’. 2016. https://collection.sciencemuseumgroup.org.uk/objects/co8564807/replica-of-maria-robot-from-fritz-langs-1927-film-metropolis

NEEDS

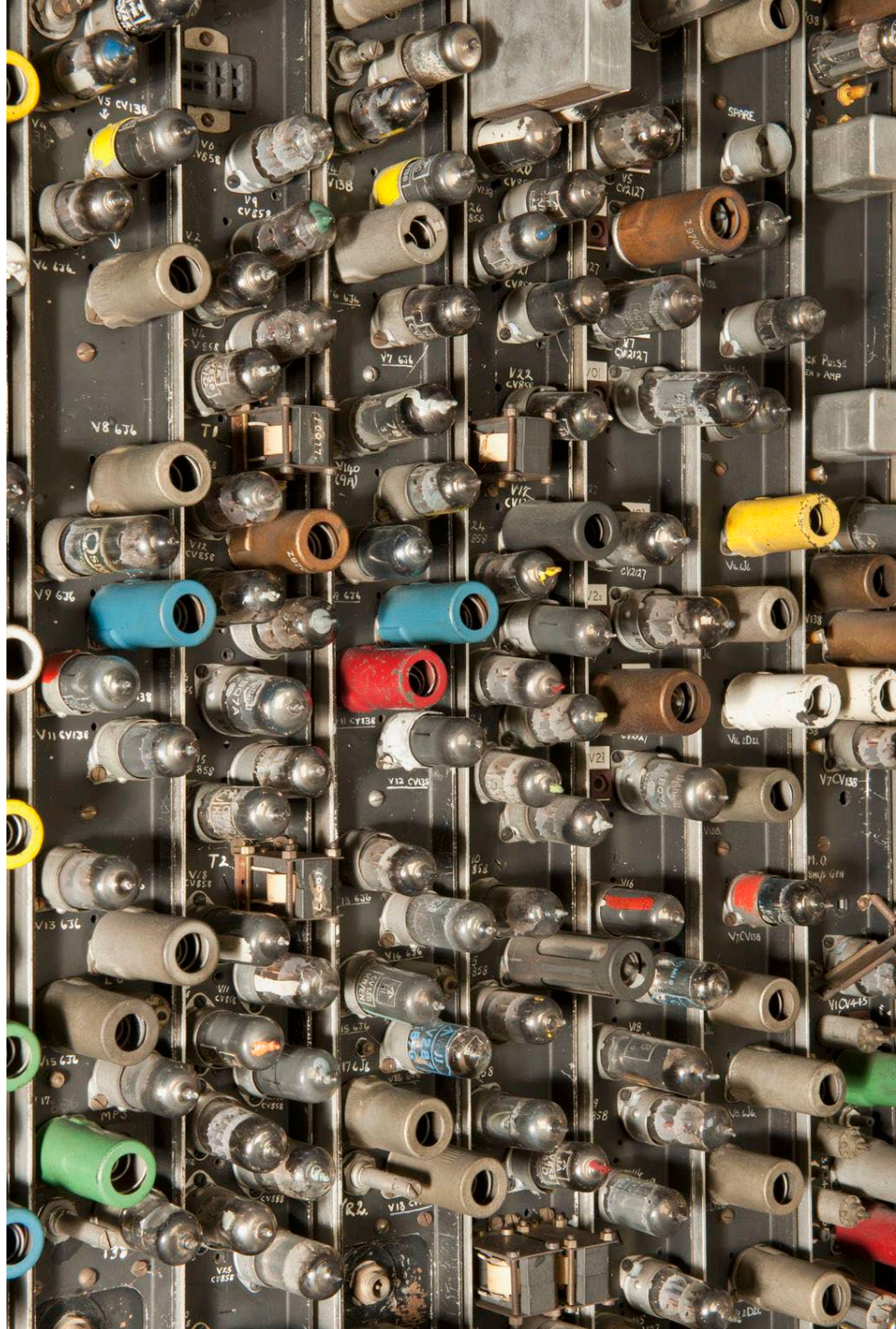
- **What are our needs** for preservation storage?
- Are there different requirements for **backup of a Digital Preservation System** versus a **digital working space?**
- Are there different preservation storage requirements for **born-digital** versus **digitised collections?**
- **Sustainability & indigenous data governance**
- What else?



Nagra SN tape recorder. 1970s.
https://collection.sciencemuseumgroup.org.uk/objects/co8610225/nagra-sn-tape-recorder

STORAGE OPTIONS

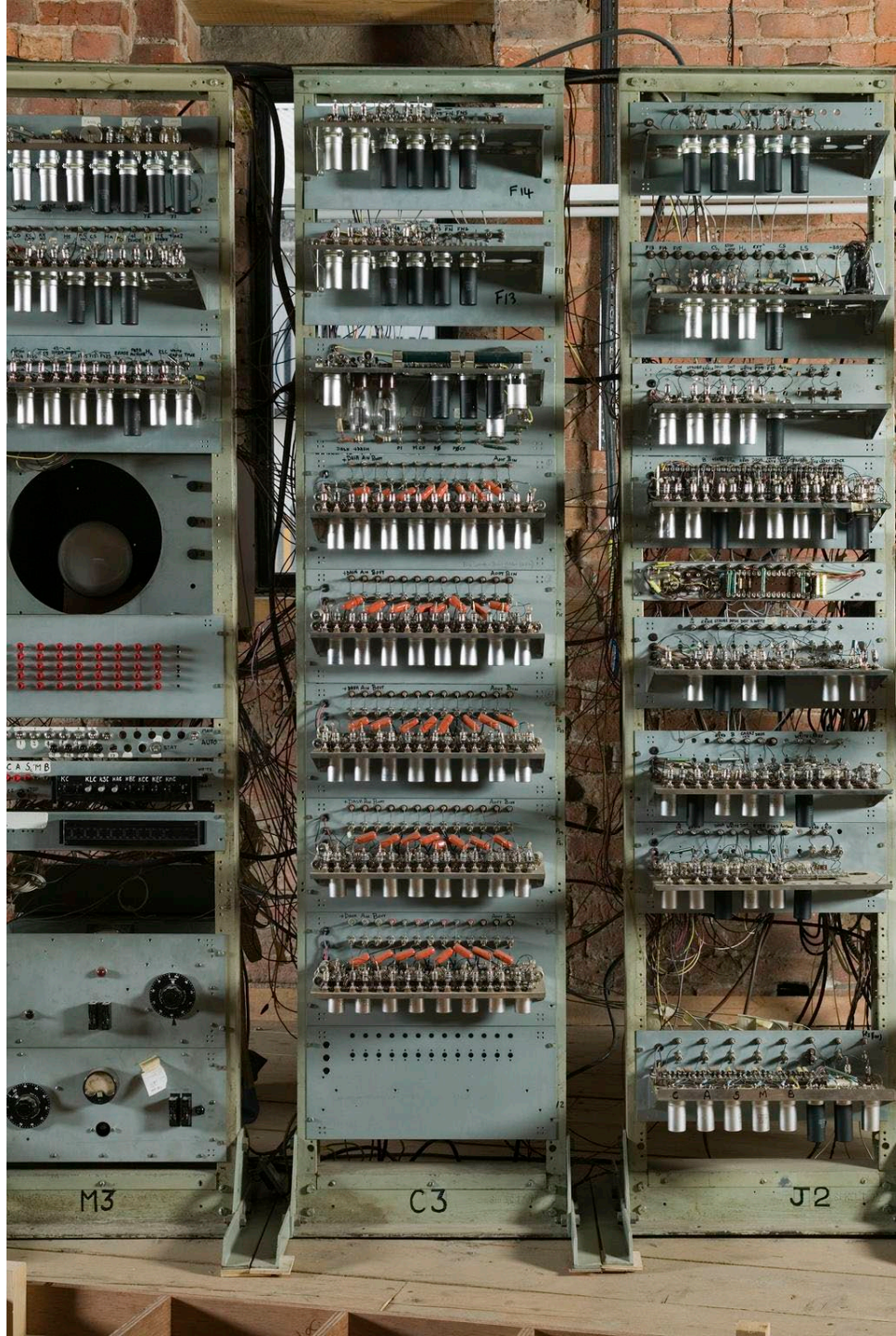
- **Linear Tape-Open** (LTO) tape library
- **On premise**
- **Cloud storage providers** (the big 3)
- Other **cloud storage provider** options
- **Local cloud**
- **NAS** (with RAID)
- Hosted by **commercial vendors**
- **Other approaches in use** (eg data on film)
- **Hybrid** combinations (of some of the above)



Automatic Computing Engine (ACE) pilot model. 1949.
https://collection.sciencemuseumgroup.org.uk/objects/co62349/automatic-computing-engine-ace-pilot-model-1949

PRESERVATION STORAGE

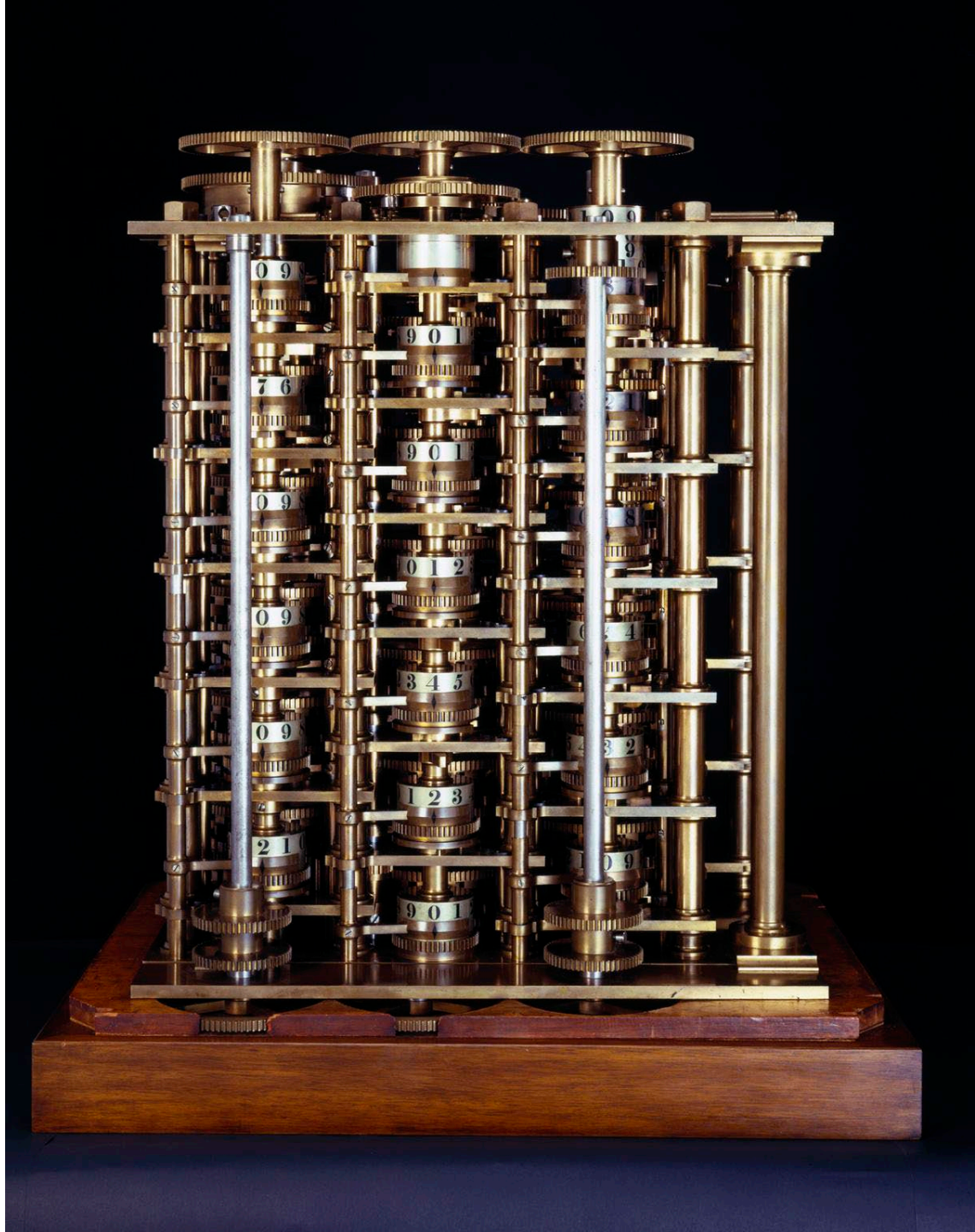
- **What assumptions** do we have about preservation storage?
- **What paradigms have we been using** that still hold up today?
- Is your data stored **online, nearline, and/or offline**?
- Do you use the **3-2-1 backup rule?** Or **3-2-1-1-0?**
- What does/should suitable **replication and redundancy for preservation** look like?
- What is **needed now** versus **in the future?**



Replica of the 'Baby' or SSEM computer. 1998.
https://collection.sciencemuseumgroup.org.uk/objects/co8418186/replica-of-the-baby-or-ssem-computer

WHAT CAN GUIDE US?

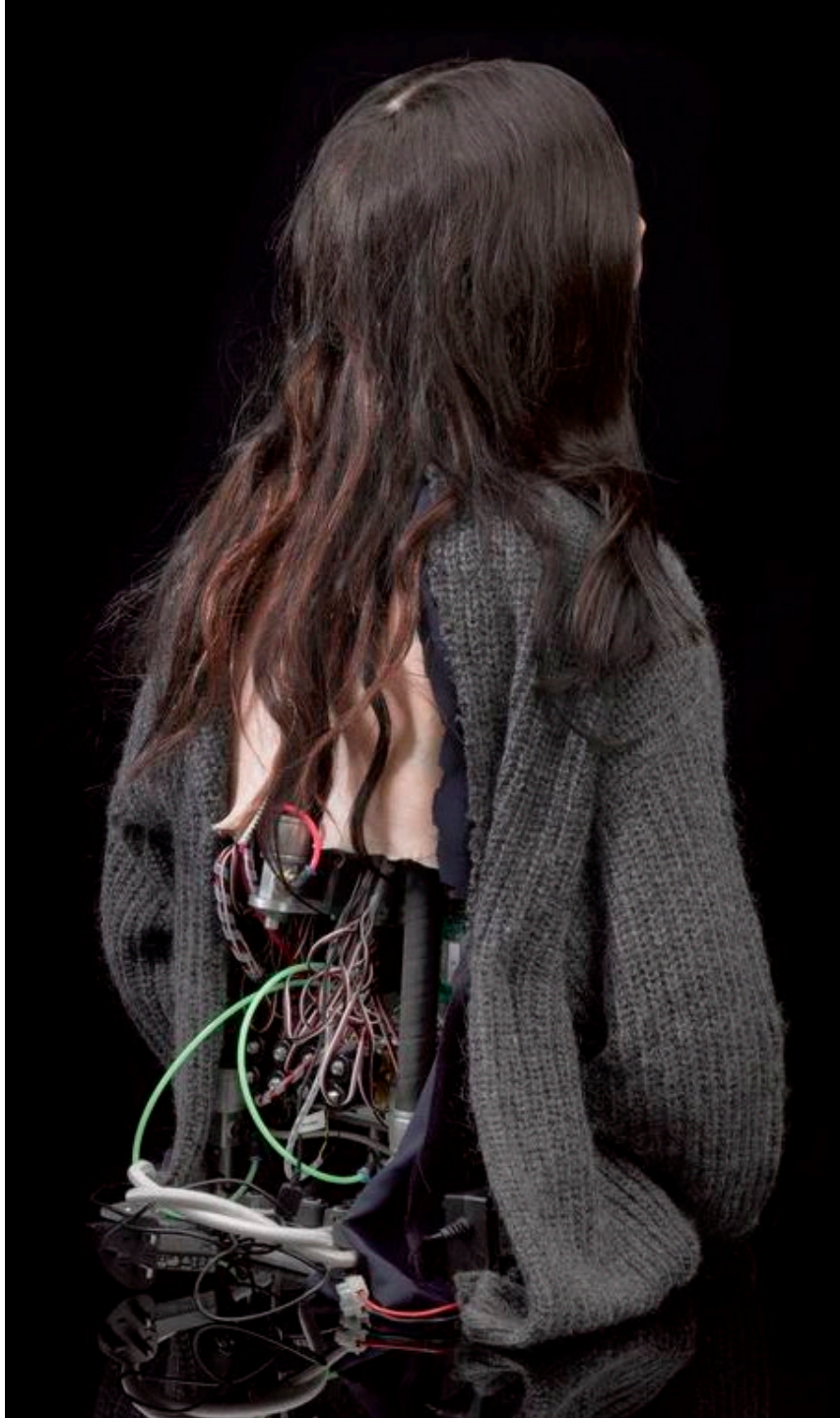
- **Preservation Storage Criteria**
- CLOCKSS **Threats & Mitigations**
- **Oxford Common File Layout** (OCFL)
- What else?



Difference Engine No. 1. circa 1832.
https://collection.sciencemuseumgroup.org.uk/objects/co62243/difference-engine-no-1

CAUTIONARY TALES & EXEMPLARS

- **LTOs on shelves** (without migration pathway)
- Second copy in the **same building** or on the **same site**
- **Failing external HDDs** (Drobos)
- **AWS Bahrain** (me-south-1)
- Cloud and air-gapped onsite copy
- Second copy in a different city



Robotic humanoid torso, built to bear a resemblance to actress Gemma Chan. 2016. https://collection.sciencemuseumgroup.org.uk/objects/co8593613/robotic-humanoid-torso-built-to-bear-a-resemblance-to-actress-gemma-chan

WHAT CAN WE AGREE ON?

- **Baseline** or **‘bare-minimum’** approach
- **Minimum Viable Product (MVP)** guideline
- What does **good practice look like?**
- Are there **different requirements** for **cloud** (public cloud)**, local cloud** (private cloud), **organisation-managed hardware,** or **hybrid** solutions?



Software and hardware for virtual interactive art installation 'Golden Calf' exhibition. 1994.
https://collection.sciencemuseumgroup.org.uk/objects/co8180380/software-and-hardware-for-golden-calf

RESOURCES

- AWS Events. 2021. ‘AWS reInvent – Data archiving and digital preservation solutions with AWS.’ https://www.youtube.com/watch?v=_XAriFVK3Ss
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RESOURCES

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- Kinnaman, A. & Munshower, A. 2022. ‘Green Goes With Anything: Decreasing Environmental Impact of Digital Libraries at Virgina Tech.’ iPres 2022 Proceedings. https://www.dpconline.org/docs/miscellaneous/events/2022-events/2791-ipres-2022-proceedings/file
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- Pusin, Yev. 2024. ‘The 3-2-1 Backup Strategy of Data Protection.’ Backblaze. https://www.backblaze.com/blog/the-3-2-1-backup-strategy/

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- Schaefer, S. et al. 2025. ‘Digital Preservation Storage Criteria.’ Version 4. https://osf.io/sjc6u/
- Storage Networking Industry Association (SNIA). 2022. ‘Multi-cloud White Paper.’ https://www.snia.org/educational-library/multi-cloud-white-paper-2022
- Wheatley, P. 2022. ‘A risk driven approach to Bitstream Preservation.’ Digital Preservation Coalition. https://www.dpconline.org/docs/technology-watch-reports/2793-bitstreampreservationrisk/file

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