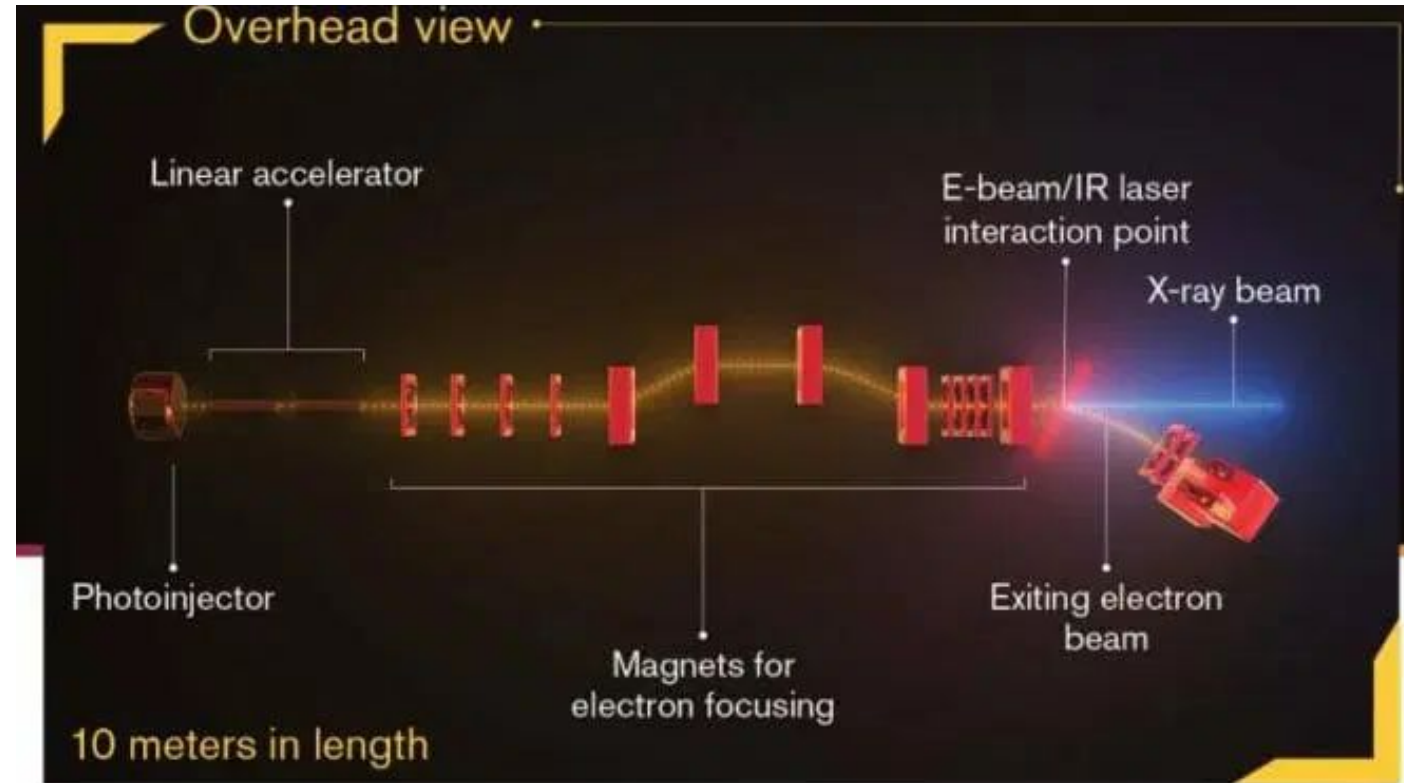# "If I knew then what I know now, I would have never designed it this way: Approaches to CI conceptualization and design"

Sabine Botha

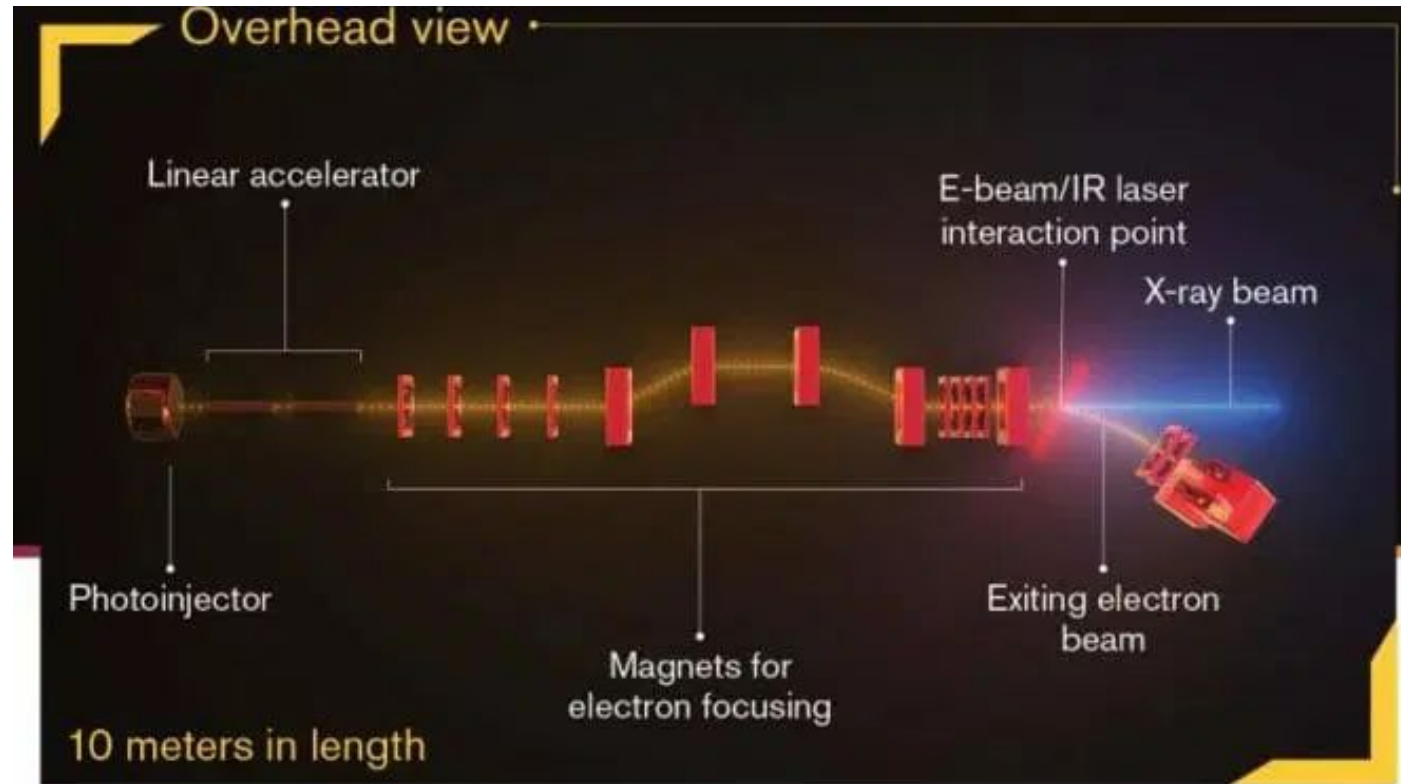# Compact X-ray Free Electron Lasers (CXFEL)

Scientific Applications:

- Medical Imaging
- Biomolecular Movies
- Photosynthesis
- Chemical Catalysis
- Attosecond Physics
- Laser Science
- Condensed matter and quantum materials

-> Users are used to MF CI infrastructure

Compact X-ray Free electron Lasers (CXFEL)

- Concluding Year 1
- 1kHz data collection rate
- TBytes of data per Week
- Multiple detectors need to be catalogued, recorded and cross-referenced correctly at 1KHz
- AI-guided real-time optimized data collections

Overhead view

Linear accelerator

E-beam/IR laser interaction point

X-ray beam

Photoinjector

Magnets for electron focusing

Exiting electron beam

10 meters in length

BioXFEL Science and Technology Center

- Collaborate across 8 US research institutions to strategically develop Biology with X-ray Lasers

- facilitated by Giant Leap at Arizona State University in February 2014, and covers the period 2013 – 2023 (NCE 2024)

- I have served as the dedicated data support scientist for the past 4 years

- Supported experiments at major facilities including LCLS in Stanford (USA), European XFEL GmbH and DESY (Germany), PAL-XFEL (Korea), SACLA (Japan), PSI (Switzerland), NSLS-II (USA), ESRF Grenoble (France)….

BioXFEL Science and Technology Center

- Collabora... ...velop Biology w...

- facilitated... ...y 2014, and cover...

- I have se... ...st 4 years

- Supporte... ...ford (USA), European XFEL GmbH and DESY (Germany), LCLS XFEL... SACLA (Japan), PSI (Switzerland), NSLS-II (USA), ESRF Greno... (France)....

Cyberinfrastructure gives users a sense of anonymity and unaccountability

*"Just do it and see what happens. **It's easier to ask for forgiveness than permission**."*

-Sabine Botha, on various occasions as a user

Lessons Learnt from Facility perspective:

- Redundancy in personnel knowledge and documentation
- Don't overpromise (Scientists remember the good and ignore the bad)
- Scope and document CI and data retention policy
  - Differ by research field
  - Expectations vary; "I don't do data"
- Find a solution to a problem and not a problem for a solution
- Give credit where credit is due!

Lessons Learnt from User perspective:

- Passwords and accounts are shared across user groups
- The harder the safety training the more memorable; Efficacy in difficulty not frequency!
- Safe-guard against user software memory leaks 😊
- **The road to hell is paved with good intentions:**
    Users *WILL* abuse resources if they can access them
    Users *WILL* break the unbreakable
    Users *WILL* inadvertently delete things
- Users wreak vengeance on facilities for cyber issu

Take-home message:

"Unteachable from infancy to tomb – There are the first and main characteristic of mankind"

-Winston Churchill, 1928