

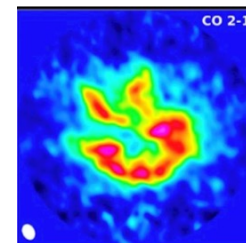
# BRIDGCE AM2024@Surrey (1/2)

- **Atomic physics!**

1. NLTE quality ingredients (**Ramsbottom**)
2. Good recipe – NSM simulations + nucleosynthesis + radiative transfer → produce KN spectra (**Collins**), Sr☺ or He☹
3. Taste of cake (**Mulholland**) Te and W mass constraints →  $Y_e=0.21(!)$

- **Nuclear astrophysics**

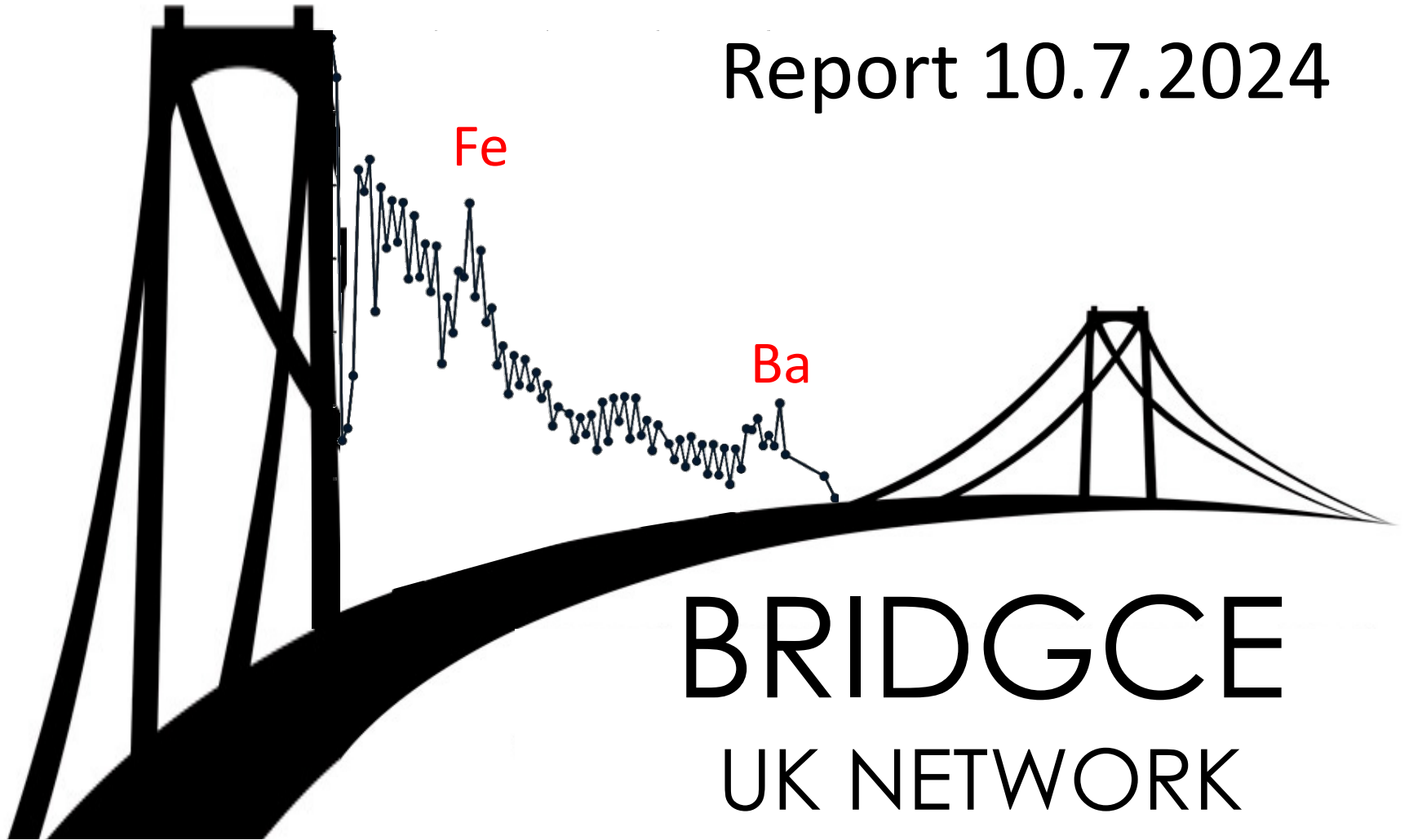
1. Nuclear reaction rates, e.g.,  $^{12}\text{C}+^{12}\text{C}$  (**Jenkins**); NEEC for r (**Walls**);  $^{60}\text{Zn}$  for rp-process in XRB (**O'Shea**);  $^{44}\text{Ti}$  in SN (**Cousins**)
2. multi-D stars/SNe + nucleosynthesis (**Varma**); NS common envelope (**Abrahamns**);  $^{44}\text{Ti}$  from TZO (**Hackett**);  $^{26}\text{Al}$  &  $^{60}\text{Fe}$  in massive stars (**Battino**)
3. Taste of Universe - elemental abundance of stars and galaxies (more next page)
  - r-process, depends on fission (**Surman**),  $^{254}\text{Cf}$  w **AMEGO**, Moon's regolith (!!), EMP stars with UV, **NASA's Habitable Worlds Observatory**;  $Y_e \sim 0.1$  w B-fields! (**Lund**)
  - fate of massive stars (**Chambers**); triples (**Guo**)
  - dust, also multi-D in 1987A w **JWST/ALMA** (**Matsuura**)





# BRIDGCE: BRIdge the Disciplines related to the Galactic Chemical Evolution

Report 10.7.2024



<http://bridgce.ac.uk>

# UKRI/STFC-funded BRIDGCE Network

- Started in 2013, by Raphael Hirschi (Keele)
- **75 researchers from 20 UK universities**; to join, **just sign up** at <http://bridgce.ac.uk>
- <https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=BRIDGCE>
- Chair: Chiaki Kobayashi (Hertfordshire), since 2019
- Research network on nuclear astrophysics, similar to EU ChETEC and US JINA
- Aim: **knowledge transfer between different disciplines**
- All BRIDGCE members are entitled to join IReNA, by agreeing its rule on <http://www.jinaweb.org>
- Possible funding to go to conferences in US, or inviting US-based speakers to conferences in UK

# Multi-discipline

## Nuclear Astrophysics

Reaction Rates: GSI-  
FAIR, CERN-nToF, Ganil

## Stellar Physics

Stellar Mass Loss  
Stellar Evolution  
Supernovae  
Nucleosynthesis  
Rotation vs Binary

## Atomic Physics

## The Milky Way

Galactic  
Archaeology (GA)  
surveys: Gaia,  
APOGEE, HERMES-  
GALAH, 4MOST,  
WEAVE, MSE...

## External Galaxies

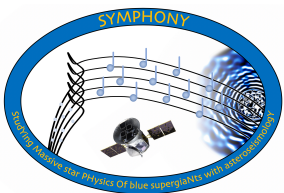
Integral Field Unit  
(IFU) surveys:  
SAURON, MaNGA,  
CALIFA, SAMI, Hector,  
KMOS, MUSE,  
NIRSpec/JWST!

## Steering committee

- Chiaki Kobayashi (Hertfordshire), chair
- Stuart Sim (Belfast) for supernovae/transients
- Raphael Hirschi (Keele) for stellar evolution
- Alison Laird (York) for nuclear physics

# BRIDGCE news

- 3 STFC Small Grant success incl. 3 PDRAs
  - Keele: **Vishnu Varma** (STFC) w Raphael/Jorick
  - Armagh: **Gautham Sabhahit** (STFC) w Jorick/Raphael
  - Belfast: **Erin Higgins** (Leverhulme Early Career Fellow)
  - Durham (new member!): **Louise Welsh** (CEA Fellow)
  - Hertfordshire: **Federico Sestito** (STFC) w CK/Rob; **Souradeep Bhattacharya**, **Darshan Kakkad** (CAR Fellows), **Rob Yates** (former CAR Fellow→faculty), **Emma Curtis Lake** (Webb Fellow & faculty)

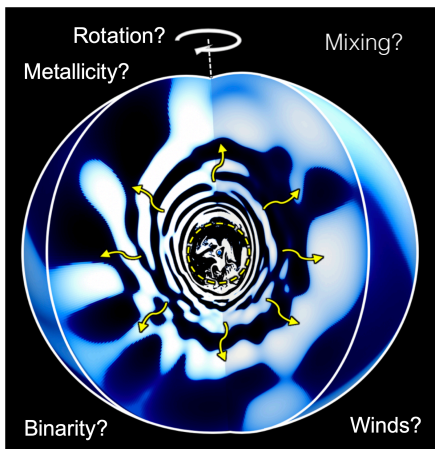


# SYMPHONY

StudYing Massive star PHysics Of blue supergiantS with asteroseismologyY

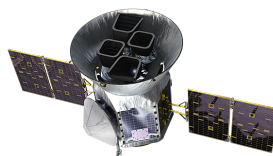
## Research goals for massive stars:

- precise **core masses**, rotation profiles and ages
- constrain **binary evolution** using pulsations
- probe impact of **variable atmospheres** on stellar evolution
- understand why *some* massive stars undergo **blue loops**

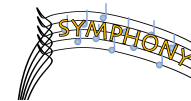
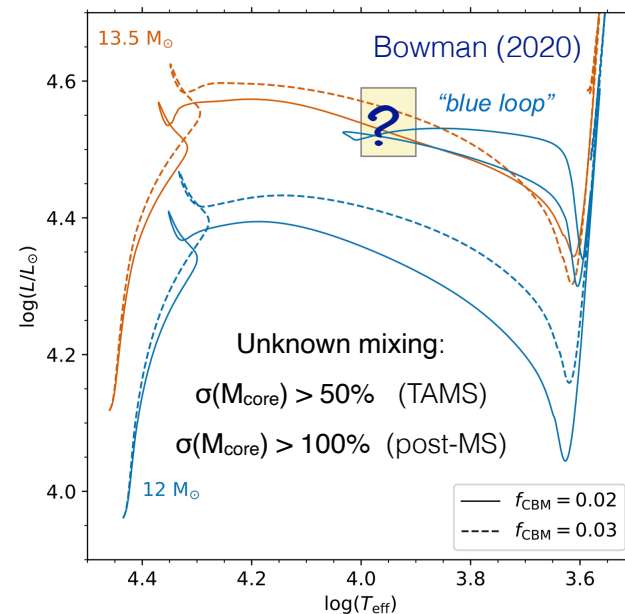


## Methods and Data:

- spectroscopy
- photometry
- binarity
- asteroseismology
- evolutionary models



See also: Burssens, Bowman et al. (2023)



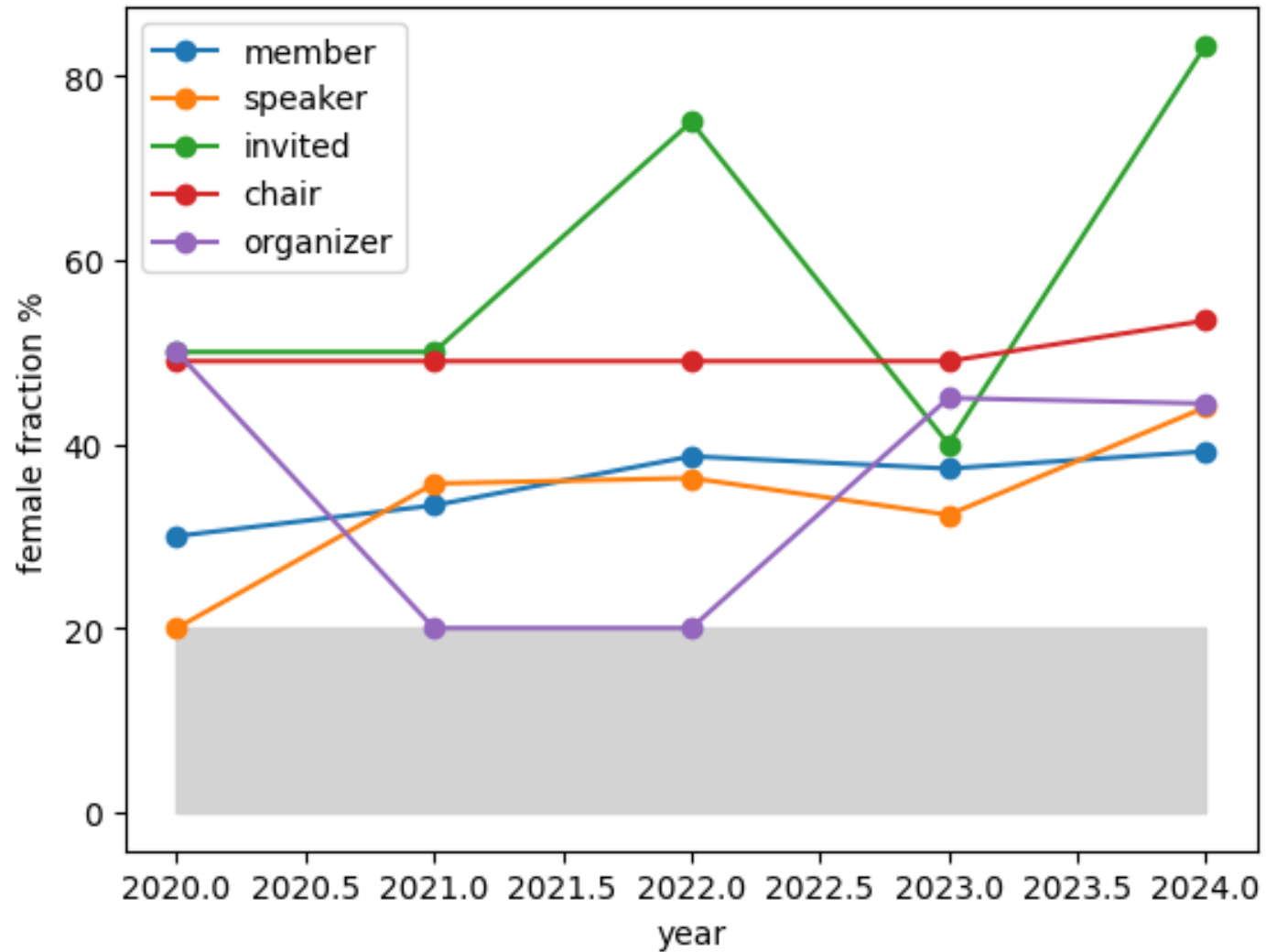
<https://research.ncl.ac.uk/symphony/>  
 PI: Dominic Bowman

See BRIDGCE e-mail from Dom Bowman  
 ERC-StG / UKRI Frontier Research grant

# BRIDGCE activities 2024/25

- EAS SS6, 5 July, Padova, Italy led by A. Cameron (Oxford) & M. Curti, ~80 abstracts for 20 slots, ~60 participants
- BRIDGCE-IReNA AM2024, 8-10 July, Surrey
- BRIDGCE-IReNA AM2025, May?, York, led by **Sophie Abrahams**😊
- EAS symposium, July?, 2025, Cork, Ireland
- IReNA seminar series, Erin Higgins (Armagh) BRIDGCE representative organizer
- Any ideas, e-mail me! Opportunities for **ECRs/students**, to participate in organizing conferences to acquire management & leadership skills.

# Gender Statistics



# Special Thanks to

- Funding bodies: IOP, RAS, STFC, IReNA, and IAS Univ. Surrey
- Admin Support: Astha
- LOC/SOC chair **Rob Izzard**  
(see program for the full list):



- Any feedback: e-mail [c.kobayashi@herts.ac.uk](mailto:c.kobayashi@herts.ac.uk)
- This slides will be available at <http://bridgce.ac.uk>