

IReNA

International Research Network for Nuclear Astrophysics

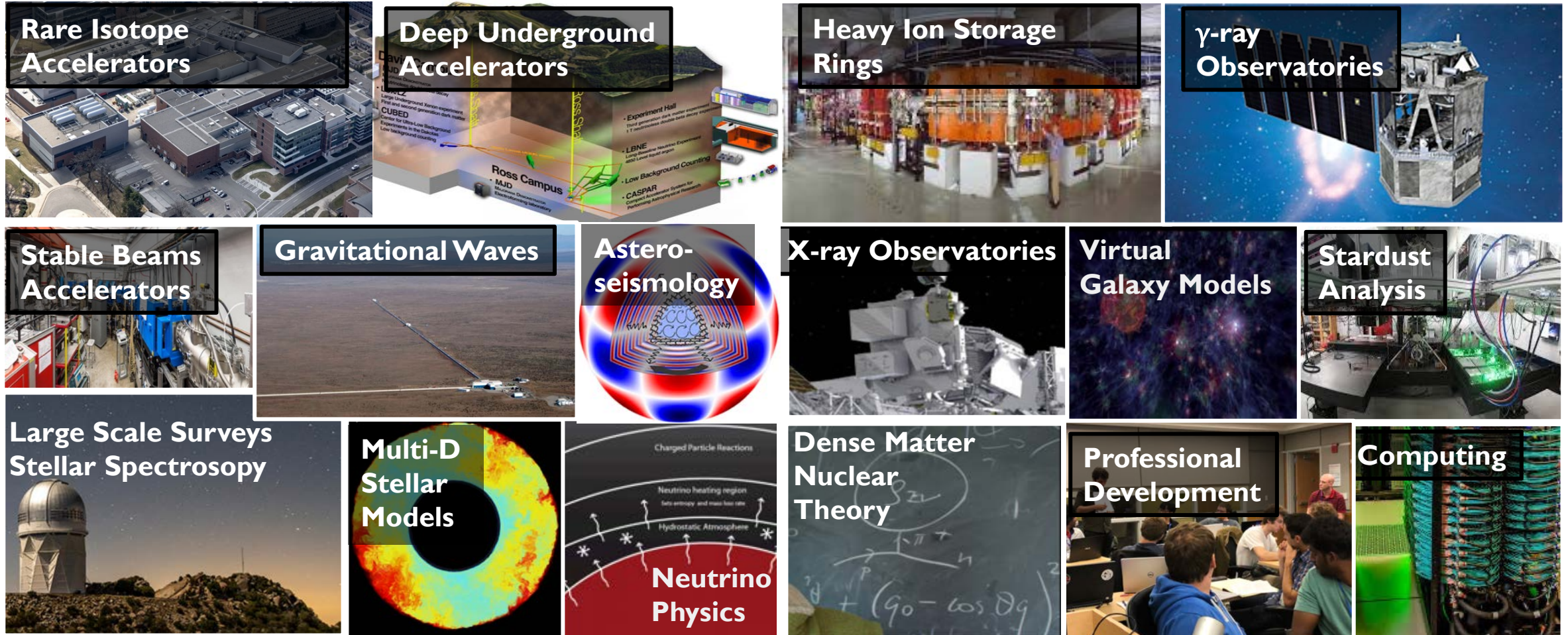
irenaweb.org

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Networks are essential in research areas with a large diversity of subfields and capabilities that need to interact



IReNA addresses this need in the field of nuclear astrophysics



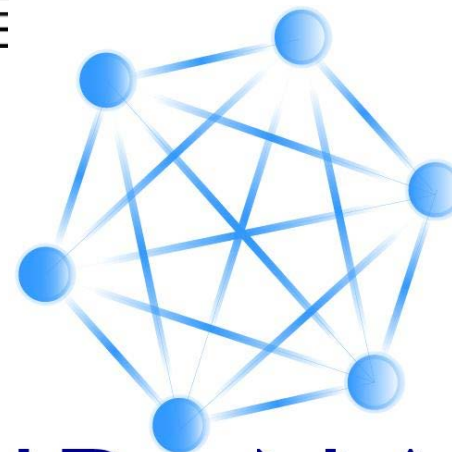
IReNA: International Research Network for Nuclear Astrophysics

IReNA: an international network of networks,
funded by the US National Science Foundation
AccelNet program.

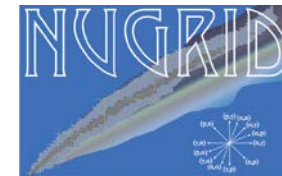
Connects 34 countries via 6+3 networks to
enhance international collaboration on research
in nuclear astrophysics.

Present networks:

- US: *JINA-CEE* [27 institutions]
- EU: *ChETEC* & *ChETEC-INFRA* [30 countries]
- Germany: *SFB-881* [5 institutions] & *EMMI* [13 institutions]
- Canada: *CaNPAN* [6 institutions]
- UK: *BRIDGECE* [19 institutions]
- Japan: *UKAKUREN* [16 institutions]
- NuGRID: *Virtual/International* [21 institutions]



IReNA



IReNA aims to promote international nuclear astrophysics research

IReNA aims to promote collaboration via workshops and scientific exchanges.

Support is available for members of a network in IReNA for:

- US persons traveling overseas
- Non-US persons traveling to the United States

IReNA efforts are organized into 8 focus areas (FA):

- *FA1*: Nuclear Reaction Rates
- *FA2*: Stellar Abundances
- *FA3*: Dense Matter in Supernovae and Neutron Star Mergers
- *FA4*: R-Process Experiments
- *FA5*: Astrophysical Computer Models
- *FA6*: Nuclear Data for Astrophysics
- *FA7*: Weak Interactions
- *FA8*: Professional Development and Broadening Participation

Each focus area has 3-5 coordinators, with US & international representation, including earlier and later career experts



IReNA activities include research stays, seminar series, ...

- **Online workshops**: 3 focused workshops this summer, + professional development workshop for young scientists at JINA Horizons Meeting December 2020
- **White paper** on direct measurements for nuclear astrophysics reactions published in Journal of Physics G
- **Virtual visitor program** successful pilot: US-Italy on R-Matrix Theory
- **Scientific exchanges** connecting several institutions across IReNA
- **Data exchange project** initiated - enables international exchange of nuclear data for astrophysical applications
- **Online seminar series** with GatherTown coffee, organized by postdoc representatives from each network
- **Young scientist organization** formed within IReNA
 - Fosters engagement of young scientists in international collaboration and networking and initiate professional development activities for young scientists
- **Calendar project** “Women Scientists Who Made Nuclear Astrophysics” – started in ChETEC, IReNA framework greatly expanded impact by going beyond Europe to international footprint

2020-2021

Online Seminar Committee



P. Gastis



M. Saxena



A. Psaltis



N. Nishimura



Z. Prudil



C. Mondal



Y. Lim



Highlights from Focus Area I: *Example of boot-strapping achievements*

- **Summer 2020 virtual workshop on stellar burning,**



which led to a **published whitepaper on stellar burning**
(25 researchers from 23 institutions based in 9 countries)

ROADMAP

The status and future of direct nuclear reaction measurements for stellar burning

Published 25 November 2021 • © 2021 IOP Publishing Ltd

[Journal of Physics G: Nuclear and Particle Physics, Volume 49, Number 1](#)

that was featured by **physicsworld**

PERSONALITIES | PODCAST

Donna Strickland on her life-changing Nobel prize, previewing #BlackInPhysics week, nuclear fusion in stars

21 Oct 2021 Hamish Johnston

and led to a spin-off **workshop on direct nuclear reaction measurements at underground laboratories,**

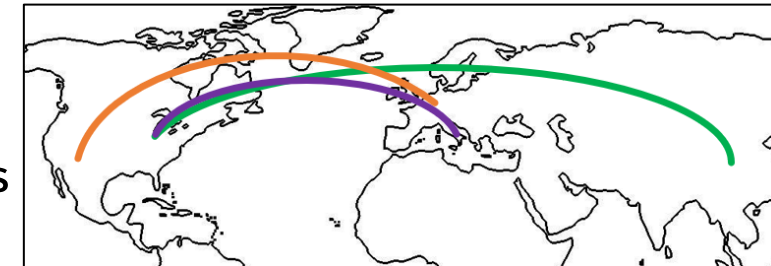
Topical meeting of IReNA - FA1 and ChETEC-INFRA
Nuclear reaction measurements in **Underground Laboratories**

April 5-8, 2022 - Rome Global Gateway, Rome, IT

which will be the foundation for an **evaluation of $^{13}\text{C}(\alpha,n)$ by the international community.**

- **Sponsored research stays in 2021:**

- connecting Frankfurt to LANL to work toward realization of a neutron target
- connecting LUNA and JUNA to UND to improve stellar burning reaction rates



IReNA has met challenges intrinsic to an international network-of-networks

Intrinsic challenges:

- **Communication** across a large number of institutions with different cultures
- **Integrating early-career researchers** who do not already have many contacts
- **Getting buy-in** from network members when benefits are somewhat diffuse

External challenges:

- The **pandemic**
- **Securing local funding** may be difficult for joint international projects

How to meet these challenges:

- **Regular informal meetings** of coordinators drives progress & builds relationships
- **Early-career led** seminar series and (satellite) workshops emphasizes strong participation. **Committee representation** gives an explicit say, as does Young Researchers Organization
- **Community led** goals and deliverables, e.g. workshops, whitepapers, scientific exchanges

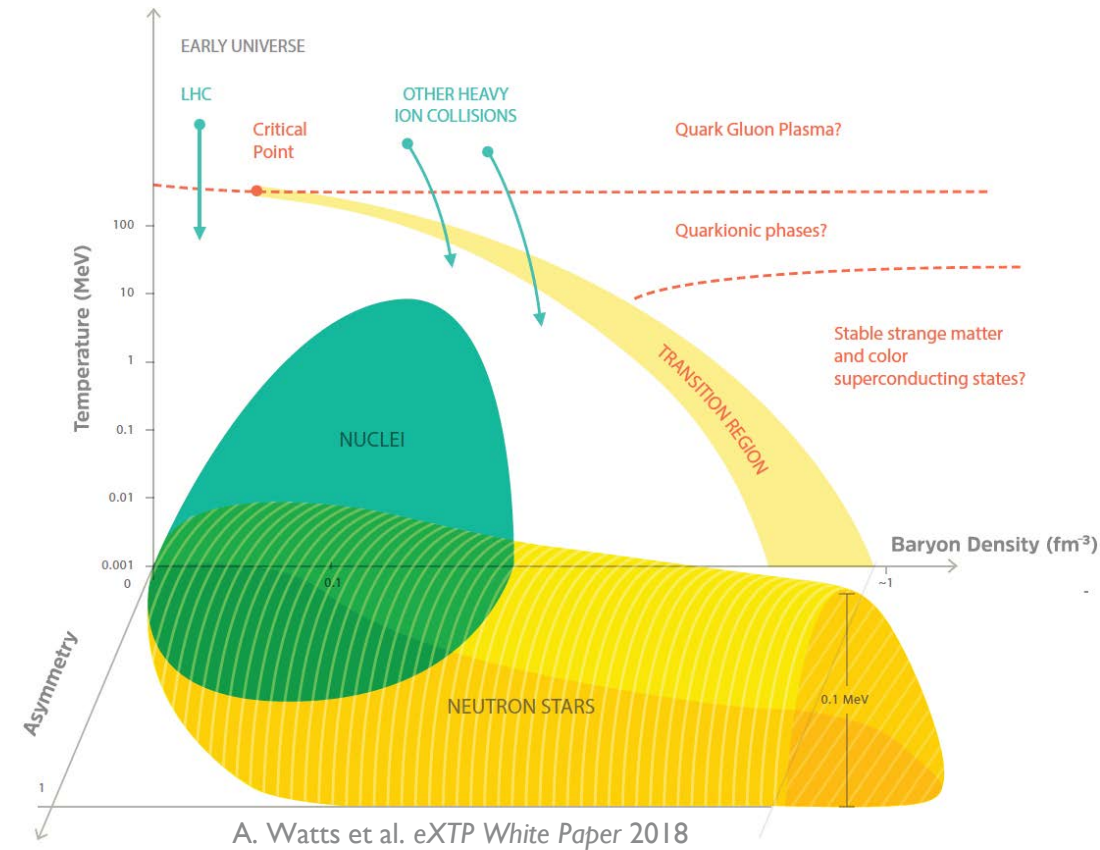
How to meet these challenges:

- **Leverage online format & be flexible**
- **Leverage funds** where possible. Aim to fill gaps, e.g. travel support for visitors/exchanges



IReNA and IANN-QCD can learn from each other

- Impact on dense matter (IReNA Focus Area 3)
- Strong connection educating the nuclear workforce across the Americas & abroad
- Strong connection advancing diversity, equity, & inclusion. Can share successes & best practices.



Summary: lessons learned thus far

- **Networks** are essential in research areas with a large diversity of subfields and capabilities that need to interact
- **Growth** of IReNA reflects the need for and benefits of this model
- **Diversity of networks** is a challenge and a strength
 - Focus on supporting synergistic activities vs collaborative research
 - Different approaches in each (formal – informal, novel – traditional, rigid-flexible)
- **Challenges** can be met with communication, flexibility, and a focus on community-led efforts
- **Sharing** experiences, successes, and best-practices between networks within a network and between networks of networks maximizes resources and boosts progress

