Midscale Research Infrastructure (MSRI)

Kelsey Cook, Chemical Measurement and Imaging (kcook@nsf.gov)

Colby Foss, Chemical Structure, Dynamics, and Mechanisms – A (cfoss@nsf.gov)

Carlos Murillo, Chemical Instrumentation (cmurillo@nsf.gov)

Please mute your microphone!

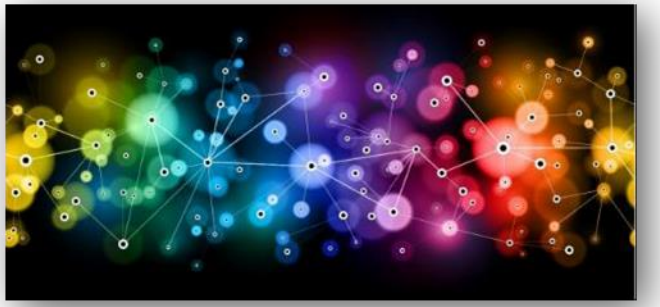
Submit questions through the Zoom Q&A feature.

National Science Foundation's 10 Big Ideas

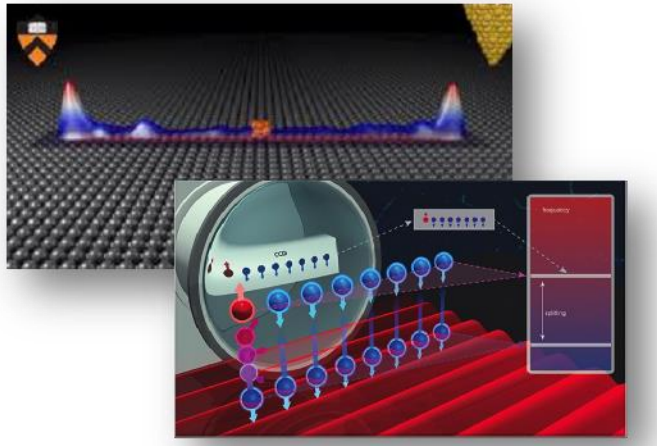
Understanding the Rules of Life

Harnessing the Data Revolution

Growing Convergence Research

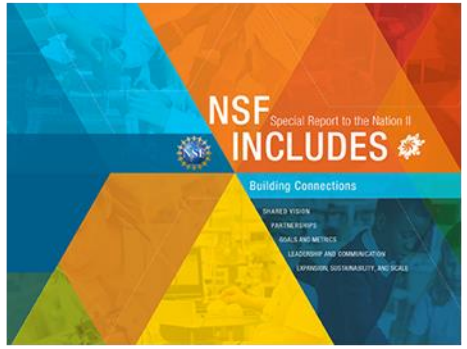


Quantum Leap



Mid-scale Research Infrastructure

NSF Includes



Where Chemistry Fits

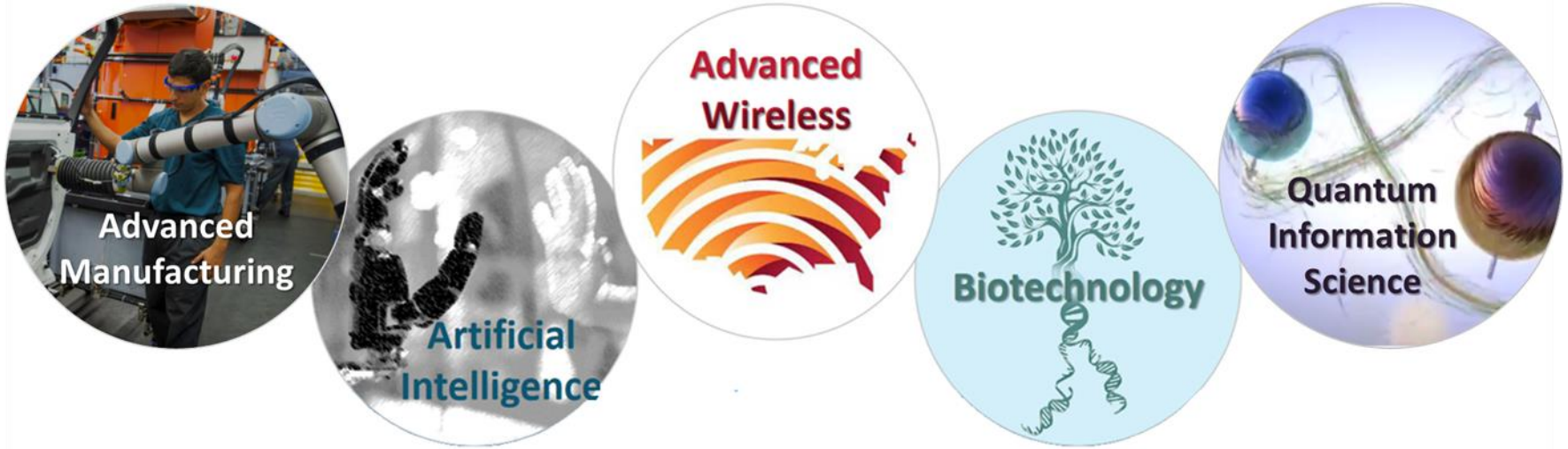
- Future of Work
- Navigating the New Arctic
- Windows on the Universe
- NSF 2026

https://www.nsf.gov/news/special_reports/big_ideas/index.jsp

Industries of the Future

"The Industries of the Future are cross-cutting, convergent, and independent fields of research that collectively offer enormous economic potential and are critical to the Nation's long-term economic and national security."

(Former) NSF Director France Córdova



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Mid-scale Research Infrastructure-1 | NSF - National Science ...
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NSF's mission is to advance the progress of science, a mission accomplished by funding proposals for research and education made by scientists, engineers, ...

Mid-scale Research Infrastructure-2 | NSF - National Science ...
https://www.nsf.gov › funding › pgm_summ
The **NSF** Mid-scale Research Infrastructure-2 Program (Mid-scale RI-2) supports implementation of projects that comprise any combination of equipment, ...

Mathematical Sciences Research Institutes | NSF - National ...
https://www.nsf.gov › funding › pgm_summ
NSF's mission is to advance the progress of science, a mission accomplished by funding proposals for research and education made by scientists, engineers, ...

Dear Colleague Letter: Mid-scale Research Infrastructure ...
https://www.nsf.gov › pubs › nsf20066 › nsf20066
Mar 25, 2020 - 7 of the **NSF** PAPPG. The title of a conference proposal should begin with **MsRI**-EW. Workshop proposals should be submitted by May 22, 2020, ...

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- What is the NSF program?
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proposals for research and education made by scientists,

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The **NSF** Mid-scale Research Infrastructure-2 Program (Mi
implementation of projects that comprise any combination

Mathematical Sciences Research Institute
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NSF's mission is to advance the progress of science, a mis
proposals for research and education made by scientists,

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Mid-scale Research Infrastructure-1 (Mid-scale RI-1) N

CONTACTS

Name	Email	Phone	Room
Randy L. Phelps	rphelps@nsf.gov	(703) 292-8040	
Robert D. Fleischmann	rfleisch@nsf.gov	(703) 292-7191	
Deepankar (Deep) Medhi	dmedhi@nsf.gov	(703) 292-8950	
R. Steven Turley	rturley@nsf.gov	703-292-2207	
Paul A. Lane	plane@nsf.gov	(703) 292-2453	
Michael E. Jackson	mejackso@nsf.gov	(703) 292-8033	
Richard E. Barvainis	rbarvai@nsf.gov	(703) 292-4891	
Joseph Whitmeyer	jwhitmey@nsf.gov	703-292-7808	
Maija M. Kukla	mkukla@nsf.gov	(703) 292-4940	

PROGRAM GUIDELINES

Solicitation 19-537

FY 21 version coming soon!

Mid-scale Research *INFRASTRUCTURE* (MSRI)

- Scope:
  - NSF-Wide. Submitted to the Office of Integrative Activities, reviewed in Divisions/Directorates.
  - Equipment (stand-alone construction or acquisition), infrastructure, computational hardware and software, and necessary commissioning. May include upgrades of existing infrastructure. Operational by the end of the award ($\leq$ 5 years).
- Scale:
  - MSRI-1: Design ($600K-$20M); Implementation ($6M-$20M).
  - MSRI-2: Implementation only ($20M-$70M).
- Mechanism (FY 21 details to be determined):
  - Mandatory preliminary proposal.
  - Full proposal by invitation only ("Strong scientific merit and response to *an identified need* of the research community").
- "Fine Print"
  - Project Execution Plan, including plans (but not MSRI funds) for Operation & Maintenance, including well-developed plans for student training and the involvement of a diverse workforce in all aspects of mid-scale activities.
  - Consult the NSF Large Facilities Manual.

Important Merit Review Criteria

- Potential to significantly advance the Nation's research capabilities;
- Relevance to any research community-established priorities, e.g., through strategic goals and/or roadmaps;
- Potential to train the next generation of leaders in technological innovation; and
- Demonstration of appropriately robust project management and cost estimation plans.

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Program Information

NSF Organization: Select one

Element Code: Any / All

Reference Code: Any / All

HINT: The "Program" box searches both program element and program reference names and codes.

Program

Program Officer

Additional Information

Keyword: "Mid-scale RI-"

HINT: The Keyword field searches on the title and abstract only.

Search Award Title Only

Award Number: Select one — From / To

Award Amount: Select one

Award Instrument: Select one

HINT: Data prior to 1976 may be less complete.

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Original Award Date: Select one — From / To

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Mid-scale RI-1 (M1:IP): The Next Generation Wyoming King Air Atmospheric Research Aircraft
Award Number:1935930; Principal Investigator:Bart Geerts; Co-Principal Investigator:Jeffrey French, Zhien Wang, Shane Murphy, Dana Caulton; Organization:University of Wyoming;NSF Organization:AGS Start Date:10/01/2019; Award Amount:$10,557,329.00; Relevance:48.54;

Mid-scale RI-1 (M1:IP): NSF National EXtreme Ultrafast Science (NEXUS) Facility
Award Number:1935885; Principal Investigator:Lawrence Baker; Co-Principal Investigator:Claudia Turro, Roland Kawakami, Louis DiMauro, Jay Gupta; Organization:Ohio State University;NSF Organization:CHE Start Date:10/01/2019; Award Amount:$8,500,000.00; Relevance:48.42;

Mid-scale RI-1 (M1:DP): Consortium Proposal for CMB-S4 Design Development
Award Number:1935892; Principal Investigator:John Carlstrom; Co-Principal Investigator:Julian Borrill, James Yeck; Organization:University of Chicago;NSF Organization:OPP Start Date:10/01/2019; Award Amount:$3,984,189.00; Relevance:47.66;

Mid-Scale RI-1 (M1:DP): Compact X-ray Free-Electron Laser Project (CXFEL)
Award Number:1935994; Principal Investigator:William Graves; Co-Principal Investigator:Onur Erten, Arvinder Sandhu, Petra Fromme, Sefaattin Tongay; Organization:Arizona State University;NSF Organization:DBI Start Date:10/01/2019; Award Amount:$3,114,964.00; Relevance:47.66;

Mid-Scale RI-1 (M1:IP): FABRIC: Adaptive Programmable Research Infrastructure for Computer Science and Science Applications
Award Number:1935966; Principal Investigator:Ilya Baldin; Co-Principal Investigator:James Griffioen, Kuang-Ching Wang, Indermohan Monga, Anita Nikolich; Organization:University of North Carolina at Chapel Hill;NSF Organization:CNS Start Date:10/01/2019; Award Amount:$13,059,716.00; Relevance:47.53;

Mid-scale RI-1 (M1:IP): Zettawatt-Equivalent Ultrashort Pulse Laser System (ZEUS)
Award Number:1935950; Principal Investigator:Karl Krushelnick; Co-Principal Investigator:Igor Jovanovic, Alexander Thomas, Carolyn Kuranz, Louise Willingale; Organization:Regents of the University of Michigan - Ann Arbor;NSF Organization:PHY Start Date:10/01/2019; Award Amount:$15,500,000.00; Relevance:47.23;

Mid-scale RI-1 (M1:DP): Next Generation Event Horizon Telescope Design
Award Number:1935980; Principal Investigator:Sheperd Doeleman; Co-Principal Investigator:Jonathan Weintroub, Michael Johnson, Lindy Blackburn; Organization:Smithsonian Institution Astrophysical Observatory;NSF Organization:AST Start Date:10/01/2019; Award Amount:$8,816,427.00; Relevance:46.93;

Mid-scale RI-1 (M1:IP): 1.2 GHz NMR Spectrometer for National Gateway Ultrahigh Field NMR Center
Award Number:1935913; Principal Investigator:Rafael Bruschweiler; Co-Principal Investigator:Philip Grandinetti, Mark Foster, Christopher Jaroniec, Blanton Tolbert; Organization:Ohio State University;NSF Organization:DBI Start Date:10/01/2019; Award Amount:$17,577,202.00; Relevance:46.93;

Mid-scale RI:1 (M1:IP): A world-class Neutron Spin Echo Spectrometer for the Nation: UD-NIST-UMD Consortium
Award Number:1935956; Principal Investigator:Norman Wagner; Co-Principal Investigator:; Organization:University of Delaware;NSF Organization:DMR Start Date:10/01/2019; Award Amount:$7,714,581.00; Relevance:46.42;

Mid-Scale RI-1: SAGE: A Software-Defined Sensor Network
Award Number:1935984; Principal Investigator:Peter Beckman; Co-Principal Investigator:Eugene Kelly, Charles Catlett, Ilkay Altintas, Scott Collis; Organization:Northwestern University;NSF Organization:OAC Start Date:10/01/2019; Award Amount:$9,026,927.00; Relevance:45.44;

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NeXUS

NSF Chemistry Virtual Office Hours

September 4, 2020

NeXUS

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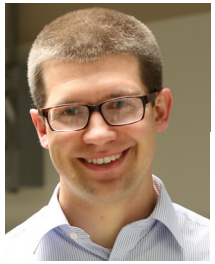
The NeXUS Team

TR-XAS/XRS



Robert Baker
Co-Director

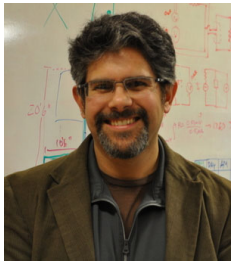
ATTO / LIED
TR-XAS/XRS

Lou DiMauro
Co-Director

TR-ARPES

Roland Kawakami

TR-STM



Jay Gupta

TR-XAS/XRS

Claudia Turro

TR-ARPES

Tom Allison

Tim Scarborough
Facility Manager

TJ Ronningen
Project Manager

Jessi Middleton
Administrative

Kelsey Cook
NSF Program Officer

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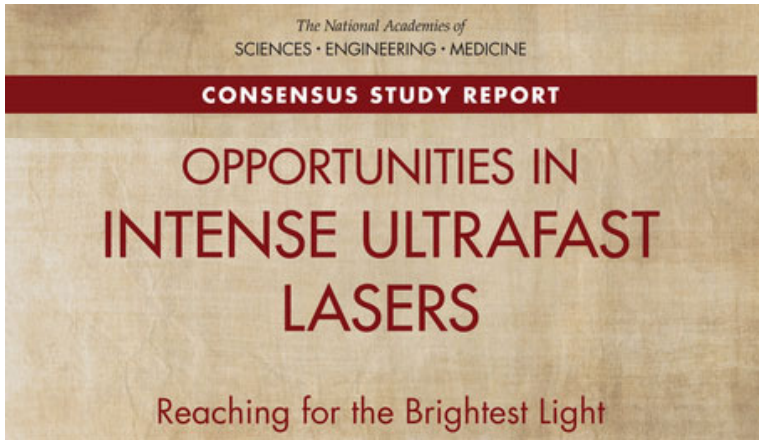
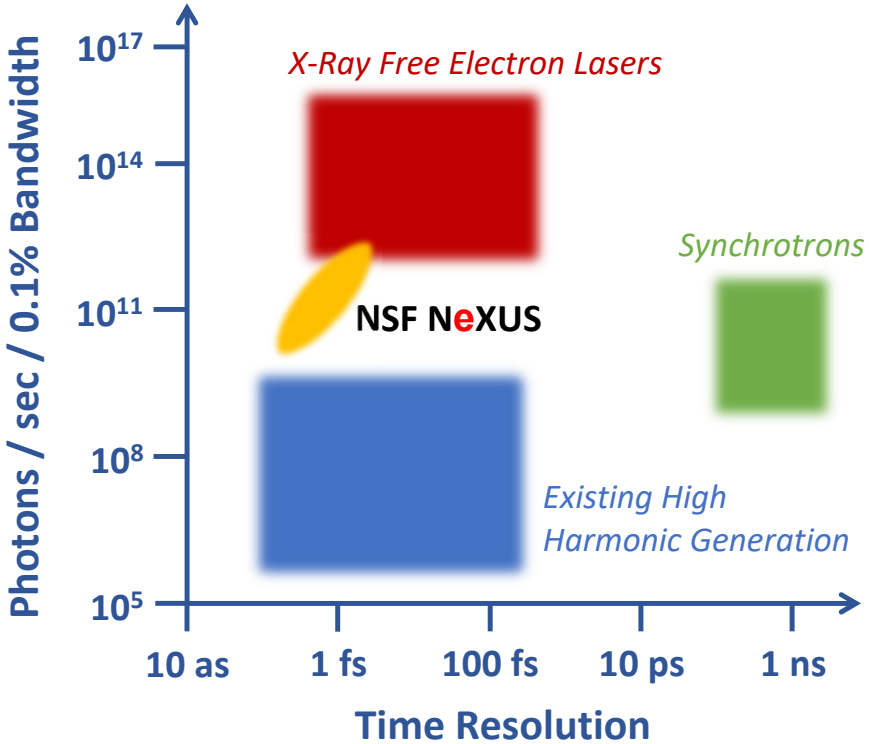
Mid-scale Program Directly Addresses NAS Recommendations for US Laser Infrastructure



"The United States was the leading innovator and dominant user of high-intensity laser technology when it was developed in the 1990s, but Europe and Asia have now grown to dominate this sector through coordinated national and regional research and infrastructure programs. In Europe, this has stimulated the emergence of the Extreme Light Infrastructure (ELI) program."

Opportunities in Intense Ultrafast Lasers: Reaching for the Brightest Light, NAS, 2018

NSF NeXUS Bridging Light Sources

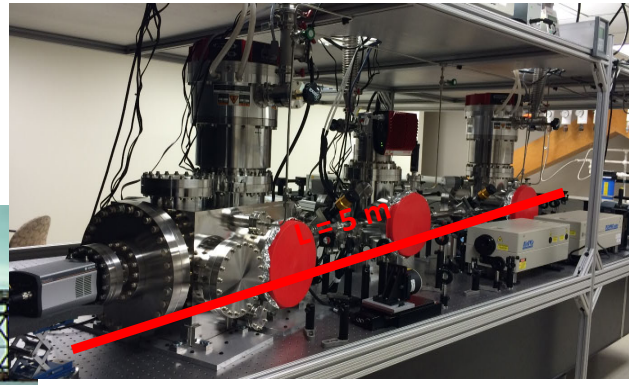


NSF NeXUS Bridging Light Sources

X-Ray Free Electron Lasers
(LCLS, SLAC Linear Accelerator Lab)

NSF NeXUS

Tabletop High Harmonic Generation
(Ohio State University)



NeXUS

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The NeXUS Facility

- kW-class Ultrafast Laser:
  8 mJ at 100 kHz or 0.8 mJ at 1 MHz, pulse duration down to 8 fs
- Drive attosecond and femtosecond XUV and soft X-ray generation
- Supply XUV light to the following experimental end-stations
  - X-ray absorption / X-ray reflection spectroscopy (TR-XAS/XRS)
  - Angle-resolved photoelectron spectroscopy (TR-ARPES)
  - Element-specific scanning tunneling microscopy (TR-STM)
  - Attosecond science / Laser induced electron diffraction (ATTO / LIED)

NeXUS

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Chemical, Physical, and Biological Science Enabled by NeXUS

- Element Specificity:
  - Bright XUV and soft x-ray pulses (e.g. Fe M-edge, Co M-edge, C K-edge)
- Ultrafast time resolution:
  - Resolve electronic (atto) and nuclear (femto) coherences
- High repetition rate:
  - Faster acquisition rates needed for dilute, solution phase samples
- Supply XUV light to following experimental end stations:
  - X-ray absorption spectroscopy
  - Angle-resolved photoemission spectroscopy
  - Scanning tunneling microscopy
  - Laser-induced electron diffraction / Attosecond science

NeXUS

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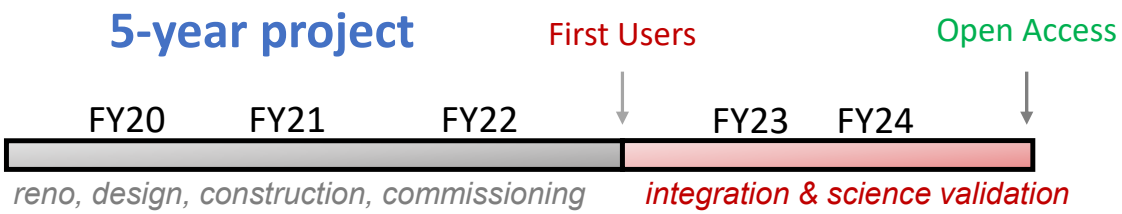
NeXUS Will Be an Open Access NSF User Facility

- Completely user accessible
- Transparent, external peer review process
- Institutional support for external users
  - Logistical support with travel and accommodations
  - Access to wet laboratory / sample preparation facilities
  - User office space
  - Control room for real time data monitoring outside of laboratory
- Our goal is that user access to facility will be free of charge
- Modeled after other US national light source facilities
- NeXUS will be the first user-accessible attosecond beamline in the US

NeXUS Project Timeline

- NeXUS is a 5-year implementation project (2019–2024)
- Years 1-3:
  - Lab renovation and site preparation
  - Acquisition of laser and other major equipment
  - Beamline and end-station design and construction
- Years 4-5:
  - System integration
  - Science validation – First users
  - Transition to operations
- Year 5 and beyond:
  - Operation and maintenance



CMI: Kelsey Cook
kcook@nsf.gov
703-292-7490

MRI: Carlos Murillo
cmurillo@nsf.gov
703-292-4970

NeXUS: L. Robert Baker
baker.2364@osu.edu
614-292-2088

Upcoming CHE Office Hours/Webinars

NSF's ChemMatCARS: Opportunities for Advanced X-Ray Diffraction and Scattering

September 18, 2020, 4:00 PM EDT
Carlos Murillo, Host
https://chemmatcars.uchicago.edu/

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