MAKING Nuclear Magnetic Resonance RESONATE WITH STUDENTS

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The City College of New York

BACKGROUND DISCUSSION QUESTIONS

- What do you know about NMR and how did you learn it?
- What are the potential challenges to integrating NMR into the undergraduate curriculum?

WHY NMR?

IMPORTANT RESEARCH TOOL

CROSS-DISCIPLINAR
Y

NMR

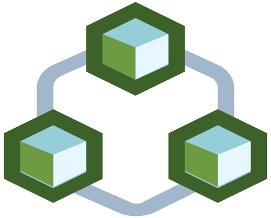
BRIDGE TO 21st CENTURY CAREERS

ACCESSIBLE

PROJECT GOALS

This project aims to fill a curricular gap by establishing an interdisciplinary and cross-institutional team to develop, assess, and disseminate curricular material that integrates NMR into the undergraduate science curriculum.

STUDENT & INSTRUCTOR MANUALS SHARED ONLINE



MODULAR MATERIALS

SUPPLEMENTAL ONLINE CONTENT

OUTCOMES

- Developed and tested curricular materials consisting of 25 1.5-hour modules, associated instructional guides and online resources
- Presentations and workshops at various physics and chemistry conferences to help faculty with implementation

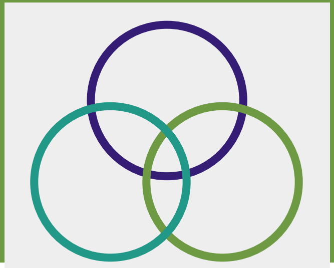
THE TEAM

Merideth Frey, Physics, Sarah Lawrence College - NMR and ISLE
Colin Abernethy, Chemistry, Sarah Lawrence College - POGIL
David Gosser, Chemistry, City College of New York - PLTL
Dedra Demaree, External Evaluator - ISLE and PER

ADVISORY BOARD

We have formed and advisory board for this project that consists of scientists from multiple disciplines and institutions with either expertise in applied NMR, science education research, or the implementation of research-based science pedagogical models.

- **Dr. Ruth Stark,** *Chemistry*, City College of New York - New York City, NY
- **Dr. Sean Barrett,** *Physics*, Yale University - New Haven, CT
- **Dr. Sissi Li**, *Chemistry*, California State University - Fullerton, CA
- **Dr. Davida Smyth**, *Biology*, Texas A&M University - San Antonio, TX



UNDERGRADUATE RESEARCHERS

The 2023 summer crew visiting the NMR facility at CCNY.

Sarah Lawrence College

Lillian Bower
Nicholas Fajardo
Leah Goodall
Jane Joncha
Skyler Kawecki-Muonio
Christina Kefela
Afia Khan
Ashley Spector-Townsend
Christian Tarrasch
Chris Torres

City College of New York

Mahisha Akhand
Bibi Zameena Alli
Sophia Jiang
Sammely Perez
Racquel Scott
Taylor Tram

WHAT WE HAVE DEVELOPED

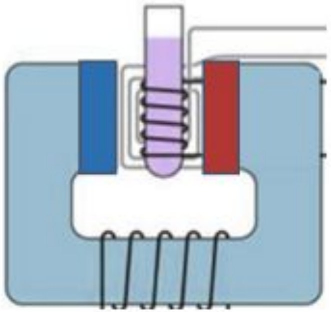
Let's check out the materials!

https://sites.google.com/view/makingnmr/home

WHAT WE HAVE DEVELOPED

Making NMR Resonate

- Home
- Physics Modules
  - Module 1
  - Module 2
  - Module 3
  - Module 4
  - Module 5
  - Module 6
  - Module 7
  - Module 8
  - Module 9
  - Module 10
- Chemistry Modules



Module 1: Why Magnetic Resonance?

Module 1 - PDF

Module 1 - Student Worksheet

Module 1 Instructional Materials

Module 1 - Instructor's Manual

Module 1 - Instructional Slides with Links to Supplemental Materials and Module Assessments

Module 1 - Student Worksheet Answers

Module 1 - Feedback Form

MODULES CONTAIN:

- Expected Learning Outcomes
- Real-world examples
- Featured scientists
- Hands-on activities, simulations, videos of experiments for those without access to equipment
- Guided inquiry questions
- Design with research-based pedagogy in mind!

THINK-PAIR-SHARE QUESTIONS

- How might you be able to use these materials?
- Would you feel comfortable implementing these materials? If not, what resources might you need to get comfortable?
- What are the challenges to implementing these materials?
- How could we make implementation of these materials easier?

INTERESTED IN USING OUR MATERIALS?

This project is designed to benefit all undergraduate science programs but will have the **most impact at primarily undergraduate institutions with limited access to research experiences and historically underserved student populations.**

Scan the QR code to be contacted when the materials are available and/or to provide suggestions of potential resources to include!