

Building a Home for the BSF-CoP (Biomolecular Structure and Function Community-of-Practice)

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Abstract

“Structure and Function” is recognized as a **core concept** in Vision and Change in Undergraduate Biology Education, the American Society for Biochemistry and Molecular Biology (ASBMB)’s Concept Driven Teaching, the threshold concepts in biochemistry, and American Chemical Society (ACS)-approved chemistry programs. Educators across biology, chemistry, and biochemistry have independently developed lessons, worksheets, case studies, and assessments that teach through a structure–function lens. Several initiatives have also produced engaging resources and assessments that leverage the wealth of publicly available data and tools related to biomolecular structures and their functions.

While these **materials are often** created with enthusiasm to meet specific curricular needs and project goals, many remain unpublished or **inaccessible** as open educational resources. Additionally, the experiences and insights gained during their development and implementation are typically confined to the creators’ immediate networks.

To address this gap, we have curated a collection of resources developed by members of Molecular CaseNet—including lessons, tutorials, and discussions on relevant tools—and initiated conversations with like-minded educators and scholars. This effort has led to the **formation of the Biomolecular Structure and Function Community of Practice (BSF-CoP)**. The BSF-CoP offers a collaborative space to share educational materials, exchange ideas, and co-create new resources in response to rapidly evolving tools and technologies.

We invite you—and educators, researchers, and practitioners in your network with an interest in biomolecular structure and function—to join the BSF-CoP, contribute your insights, and help grow this vibrant, collaborative community.

Our Story so far ...

2018	Molecular Casenet created to <ul style="list-style-type: none">- bring together an interdisciplinary team of scientists and researchers to develop an exemplar for molecular case studies- create two model case studies focused on specific biological processes/events with input from diverse participants to ensure curricular relevance- share the model cases in community workshops and professional society meetings to recruit new members to the network and gather feedback on usability, clarity, and relevance.
2020	Expansion of Molecular CaseNet to <ul style="list-style-type: none">- train undergraduate biology, chemistry, and biochemistry educators to develop molecular case studies at the interface of biology and chemistry (completed in collaboration with BioQuest, using Faculty Mentoring Networks.- engage trained faculty to develop molecular case studies on topics relevant to curricula of different biology subdisciplines and at least one in chemistry.- engage educators to use the molecular case studies in various curricular contexts and assess changes in their knowledge, confidence, and experience in teaching their disciplinary materials in molecular detail
2025	Creation of BSF CoP because <ul style="list-style-type: none">- NSF funding for Molecular CaseNet ends in Sep. 2025.- We wish to keep the collaborations we have set up and community connections alive.- We need a home for sharing the open education resources being developed and a platform for discussions- Creation of the BSF CoP group

- **Overview**
 - Professional Society Learning Goals - e.g., ASBMB, BioCore, NIBLSE, BioMolViz
- **Databases**
 - Sequence, Structure, Function - e.g., PDB, GenBank, UniProt,
 - Chemical, Drugs - e.g., PubChem, DrugBank
 - Diseases, Pathways - e.g., OMIM, KEGG
- **Tools**
 - Molecular visualization, comparison, analysis - e.g., Chimera, PyMol, Mol*
 - Sequence comparison/analysis - e.g., BLAST, JALView
- **Educational Resources**
 - Case studies and More - Molecular CaseNet, PDB-101, Box of Lessons, BASIL Biochemistry

Struct-Funct-Edu-Resources

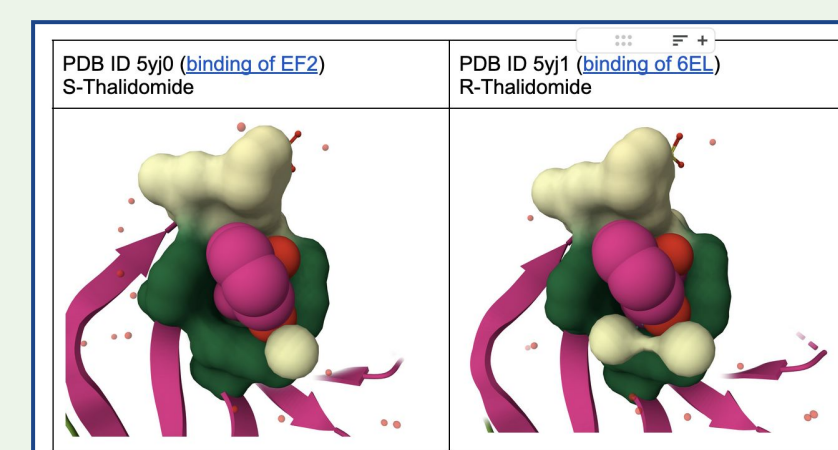


Working Spaces

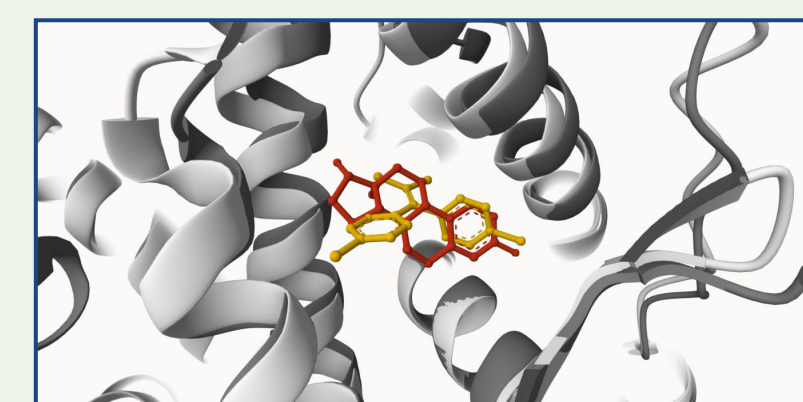
- **Building on materials collected for developing molecular case studies**

- Thalidomide

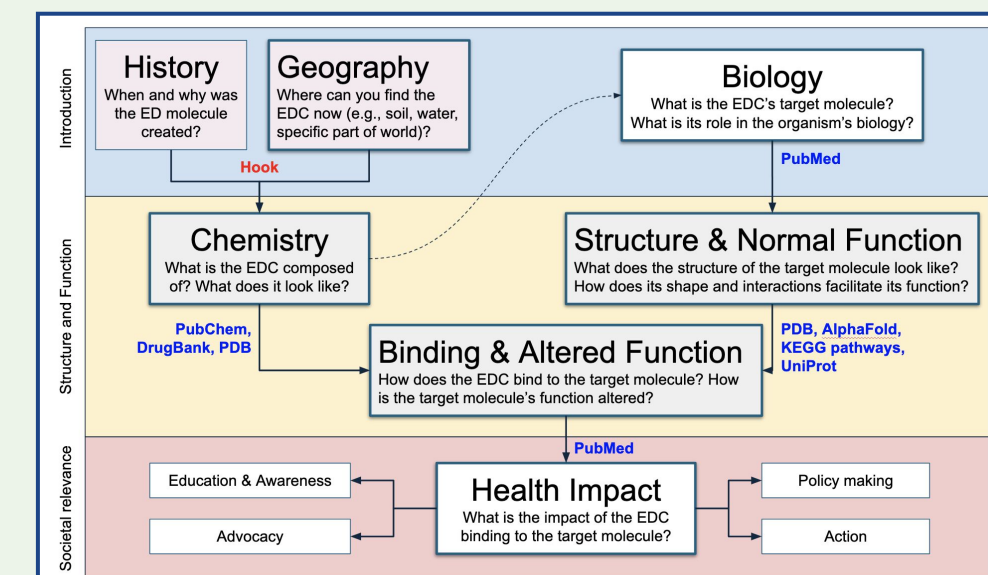
Introducing students to concepts of chirality showing how subtle differences in the binding of R- vs S-form of Thalidomide can have a drastic impact on binding to its target and health impacts. Create lessons on how understanding this system helps design a novel classes of drugs.



- Endocrine Disruptors

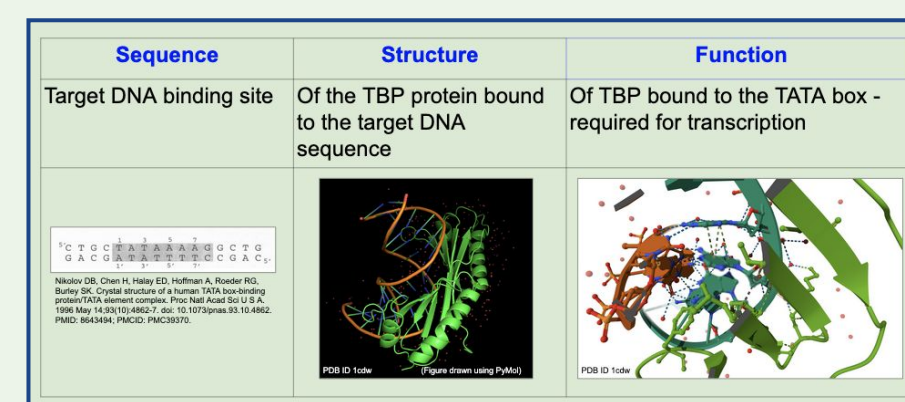


Comparing the binding of DDT and Estradiol to estrogen receptors (above). Create similar lessons for other endocrine disruptors - e.g., parabens, BPA)

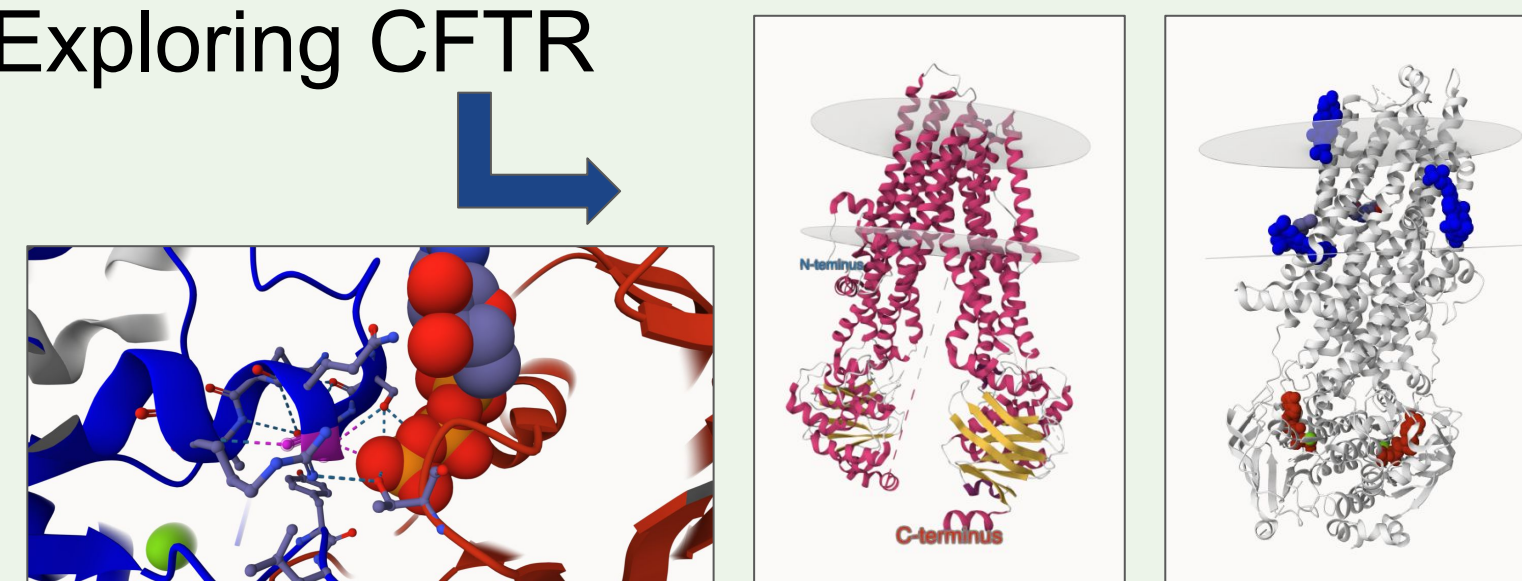


- **Novel ways of teaching and learning**

Engaging students in exploring virtual models and designing physical models of understand Protein-DNA interactions - how does the protein “See” its target DNA?



- **New materials**
 - Lessons, worksheets, activities that you have developed and wish to share as open educational resources (OERs).
 - Examples coming soon ...
 - Making your own protein (using AlphaFold)
 - Exploring CFTR
- **Adaptations**
 - Lessons and worksheets that are adaptations of previously published lessons/materials
 - Examples coming soon ...

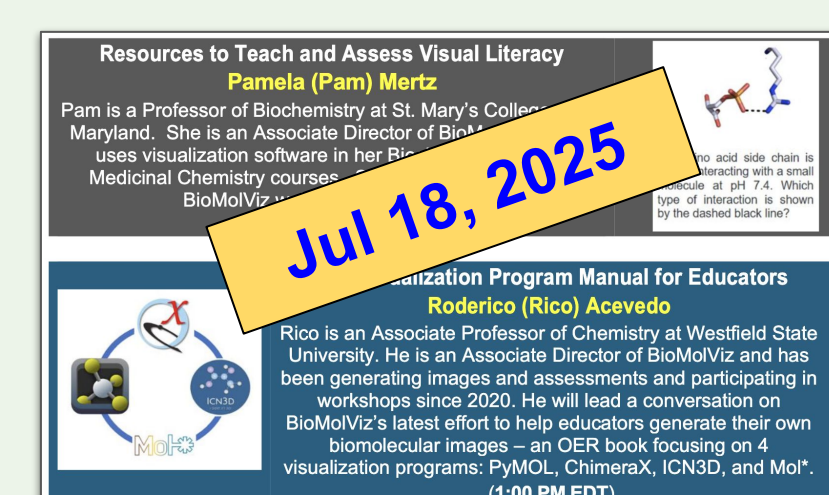
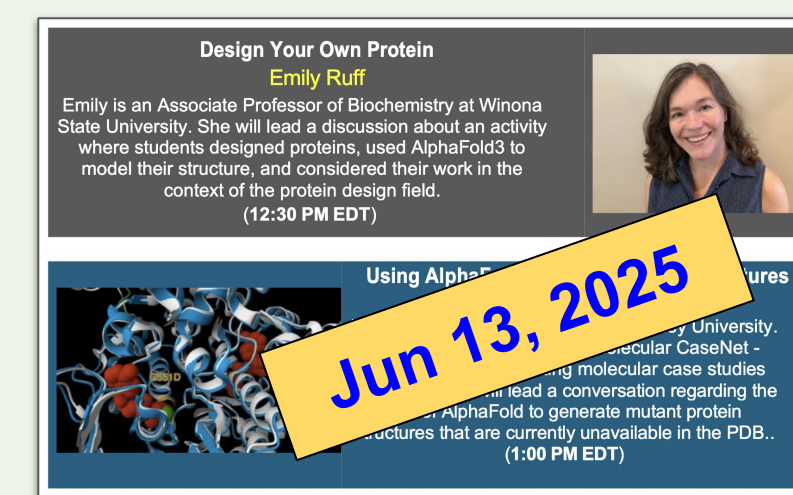
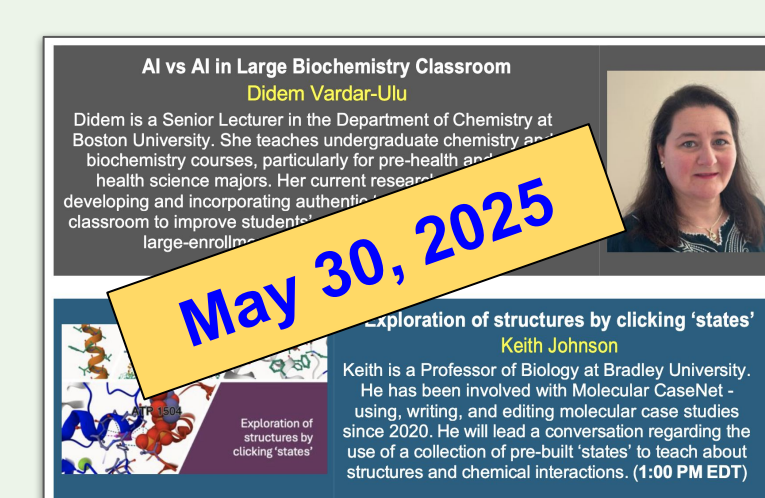
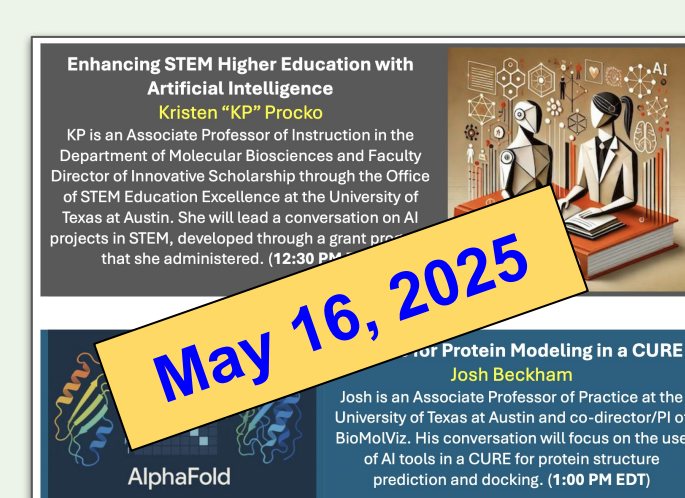


New Materials & Adaptations

Visit the website to join us:
<https://qubeshub.org/community/groups/bsf-cop>

Events

- **Meetings**
 - Biome 2025 (virtual)
 - TUEMLS 2025 (MN, USA)
 - Planned working groups in Fall 2025 (planned in collaboration with BioQuest)
- **Visualization Conversations**
 - Organized collaboratively by Molecular CaseNet and BioMolViz.



BSF CoP can host discussions about ...

- Subject related issues
 - The discussions are interdisciplinary - e.g., at the interface of biology and chemistry
 - Requires some understanding of what is being studied, how the data (structures) were derived, and what the results mean wrt the topic of study
- Teacher related issues
 - Many a times educators have not had the exposure to the data, tools, and resources needed to teach about biomolecular structure and function.
 - The teacher may not have the time to learn to use the tools, develop custom lessons, and teach with these lessons
- Tool related issues
 - The tools are continuously evolving and changing to accommodate new needs, provide better options
 - There are too many tools and limited time and resources to learn to use them effectively
- Student related issues
 - Students need some prior knowledge to learn about biomolecular structure and function
 - Students need an engaging reason/approach to willingly learn to use these tools.



Invitation

- For you:
 - We invite you to join this CoP by [responding to this survey](#).
 - We look forward to helping you find and use resources for your teaching and learning.
 - Hope you will consider contributing to this CoP’s growth by sharing educational resources that you use and by expanding its reach.
- For your project:
 - Do you lead or know about a project that is focused on teaching and learning about biomolecular structure and function? Please reach out to us to see if we can connect with the resource.

Have questions? Write to

Keith (kajohnso@bradley.edu) or Shuchi (sdutta@rcsb.rutgers.edu)

Acknowledgements:

- Molecular Casenet is supported by NSF - DBI 1827011; DBI 2018884
- We are grateful for the collaboration and support from other projects e.g., BioMolViz, BASIL.
- The CoP is being hosted on QUBES in collaborations with BioQuest/QUBES.
- The CoP forum discussions will be hosted on QUBES.
- The OERs (lessons, educational resources, etc.) shared with the CoP will be disseminated through QUBES.

