Symposium on Proteins & Other Macromolecules: Design and Assessment of Outreach Program

**ACS Spring 2020 National Meeting
Division of Chemical Education
Oral Paper CHED 120 - B. Ameer, R.A. Weintraub**

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ACS Symposium theme “Protein Chemistry for Life”

- **Community Outreach at Princeton University**
- **Grants awarded:**
 - **Innovative Project Grant, American Chemical Society**
 - **Small Meeting Grant, The Company of Biologists**

Grants written by

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ACS Symposium theme “Protein Chemistry for Life”

- **Objective**
- **Program Design**
- **Execution**
- **Assessment**

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Princeton ACS Symposium: Objective

- **Feature chemistry research tools that enlighten study of biology**
- **Augment educational offerings of ACS Local Section**
- **Utilize local talent of graduate students and trainees to convey knowledge and excitement about protein chemistry to novices and non-experts**

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Planning: Presenters and Topics

- **Identify researchers at graduate student and post-doctoral levels**
 - Select topic of personal interest related to protein science
- **Identify keynote speaker(s) from academia**
 - Excellent at communicating principles of protein science
 - Willing and motivated to tailor presentation to a general science audience with basic chemistry and biology knowledge

Planning: Assessment

Select/create tools to assess the educational program

- **Literature review**
 - Determine whether a suitable (validated) survey is available
- **Design tool**
 - Create written attendee surveys for adult & student learners, to be completed onsite
 - Plan with intent to inform future activities
 - Evaluate survey instruments prior to implementation

Planning: Potential Audiences

- **Advertise to community via campus radio station**
- **Invite local high school chemistry & biology educators and their students**

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Participants

- **Collectively over 100 students, teachers, community members attended one or more programs offered**
- **Several local high school chemistry teachers and one biology teacher engaged their students**
- **Community members were predominately parents of students**

Symposium Presenters

- **PhD expert researchers in protein chemistry delivered keynotes on:**
 - Protein structure and computational design
 - Protein Data Bank (PDB)
- **Short talks were delivered by graduate student and post-doctoral trainees conducting protein science investigations**

Selection of Content: Survey Feedback

- **68%** were interested or strongly interested in topics

Some Topics of Short Talks

- **Design of proteins with new, useful functions**
- **Protein structure and function**
- **Protein and RNA crosstalk**
- **Protein crystallography**
- **Quantitative proteomic techniques**
- **Proteins and drug resistance**
- **Enzymes for organic synthesis**
- **Metals in protein biology**
- **Amyloid in Alzheimer's disease**

Example Content: Protein Folding & Misfolding

“Protein folding is the final step in the information transfer from gene to functional protein, and . . . is of fundamental biological importance.”
-Franz-Ulrich Hartl

Keynote Content and Learning: PDB

Memorable learnings, according to student surveys re: worldwide Protein Data Bank (wwPDB)

- Archived 3D structures of >140,000 nucleic acids, proteins, macromolecular machines
- An international, collaborative effort
- Freely and globally available
- Database >200 million data file downloads per day worldwide
- Among top 100 scientific sources cited

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Survey: Qualitative Comments

- **Surveys, verbal feedback (n = 100)**
showed attendees had strong interest in
protein science and journey to grad school
 - *“It was very interesting to see the different scientists’ journey into science and their journey in the lab.”*
 - *“Great experience. We can see what we are interested in studying in the future.”*

Survey: Main Quantitative Metric

Willingness to Engage

63% of participants strongly agreed or agreed with the statement,

“I am now more likely to be involved in a project or activity involving proteins”

Assessment of Outcomes: Presenters

PhD candidate or post-doc presenters

- Two symposium events per year (2018 – 2019)
collectively afforded speaking opportunities to more than 15 individuals
- Highest active participation to date from
Princeton Chemistry or Molecular Biology Depts in
PACS activity, achieved Local Section goal

Assessment of Outcomes: Qualitative

- **Section Chair, a volunteer at first event, viewed it as an operational success**
 - Resources (people and space) well-utilized
 - Attendance met expectations
- **Educator, a former industry PhD biologist, appreciated update on chemistry connections to life science**
 - Feedback suggests an audience to target in the future

Princeton ACS Symposium: Accomplishments

- **Informed students, educators & community members** about exciting developments in techniques that advance our understanding of macromolecules important to chemical biology
- **Nat'l ACS recognition: *Innovative New Program***
 - ChemLuminary Local Section semi-finalist, 2019

ACS Spring 2020 National Meeting

Protein

Contact Information

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