Your Summer Research Program at FOMD

Think Boldly  Dream Big  Be Responsible
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Why would you spend your summer doing research?

I did it last year and I loved it!!!

I need a job

I need a letter of recommendation for my future school application

I envision pursuing a career in research

I want to know how scientific research really works
What Can You Expect from Your Summer Research?

I have no idea what's going to happen.
What can you get from a Summer Research at FoMD?

Learn how science really works
The Scientific Method

Scientific Method (1 serving)

1. Ask a question.
2. Formulate a hypothesis.
3. Perform experiment.
4. Collect data.
5. Draw conclusions.

Bake until thoroughly cooked.
Garnish with additional observations.
Is this how science really works?

http://undsci.berkeley.edu/article/howscienceworks_01
The Real Process of Science

http://www.understandingscience.org
Making observations and forming questions are key to the process of science
• Testing hypotheses and theories is at the core of the process of science
• We use data to evaluate possible explanations, keeping only those that are supported by evidence
Community Analysis and Feedback

- Community interactions are essential to the process of science
- Scientists must share their research for it to be evaluated and built upon by other scientists
- The scientific community helps ensure science’s accuracy
The process of science influences society and is influenced by society
The Process of Science is not pre-determined
The summer research program offers you opportunities to:
BECOME COMPETENT AT PERFORMING EXPERIMENTS
INCREASE YOUR TEAMWORK SKILLS
IMPROVE YOUR ORGANIZATION AND COMMUNICATION SKILLS
What can you get from a Summer Research at FoMD?

Find out if scientific research is your way to change the world

Learn how science really works
Think Boldly
“Research is to see what everybody else has seen, and to think what nobody else has thought.”

— Albert Szent-Gyorgyi (1893 – 1986)
Physiologist and Nobel Prize recipient
Will I ever have my own research ideas?

In time you would develop original research ideas.
You would become a critical thinker

- are curious
- reserve judging until they have all the facts
- formulate well-reasoned arguments
- ask relevant and pertinent questions
- are aware of their own biases
- are open to changing their opinions based on new information
Dream Big
You are trying to answer an important scientific question
Your work represents an important piece of the puzzle
Be Responsible

https://www.the-scientist.com
Scientific responsibility includes the responsibilities of scientists towards science, their fellow scientists and society.

Scientists are responsible for conducting and communicating scientific work with:

- integrity
- respect
- fairness
- reliability
- transparency
Number 1 Responsibility: HONESTY
Be Responsible when...

- Planning and performing experiments
  - Working with animals
    - the three Rs
      - Replace the use of animals with alternative techniques, or avoid the use of animals altogether
      - Reduce the number of animals used to a minimum
      - Refine make sure animals suffer as little as possible
  - Working with human patients, human samples or manage data from patients
    - Confidentiality
Be Responsible when....

- Communicating your results
  - To scientists
    - Be accurate and thorough
  - To the general public
    - Be mindful of the knowledge gap between the general public and scientists
    - Be mindful of the gap between public expectations and the reality of scientific progress toward clinical application
What can you get from a Summer Research at FoMD?

- Enrich your perspective on scientific medical research
- Find out if scientific research is your way to change the world
- Realize that scientific research is not for you
- Learn how science really works
Understand the inherent uncertainty of Science

Science is founded on uncertainty. Each time we learn something new and surprising, the astonishment comes with the realization that we were wrong before.

*Lewis Thomas*

American physician, researcher, author, and teacher best known for his essays, which contain reflections on a wide range of topics in biology.
Realize the complexity of scientific research
Appreciate the importance of perseverance in scientific research
What can you get from a Summer Research at FoMD?

- Enrich your perspective on scientific medical research
- Find out if scientific research is your way to change the world
- Realize that scientific research is not for you
- Learn how science really works
- Become an advocate for science
Why is Important to be Science Advocates?

Public trust in scientists seems to be decreasing and this is shaping the attitude of policy makers towards the negative
Majorities say the public doesn’t know enough about science to understand research findings covered in the news

% who say each of the following is a problem with news reports of scientific research findings

<table>
<thead>
<tr>
<th>Country</th>
<th>The public doesn’t know enough about science to really understand research findings covered in the news</th>
<th>The news media oversimplify scientific research findings</th>
<th>Science researchers overstate the implications of their research findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>82</td>
<td>66</td>
<td>33</td>
</tr>
<tr>
<td>Sweden</td>
<td>81</td>
<td>47</td>
<td>46</td>
</tr>
<tr>
<td>Italy</td>
<td>80</td>
<td>47</td>
<td>43</td>
</tr>
<tr>
<td>Taiwan</td>
<td>78</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>Canada</td>
<td>77</td>
<td>53</td>
<td>41</td>
</tr>
<tr>
<td>U.S.</td>
<td>77</td>
<td>59</td>
<td>49</td>
</tr>
<tr>
<td>Australia</td>
<td>76</td>
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<td>France</td>
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<td>Germany</td>
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<td>Netherlands</td>
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<tr>
<td>UK</td>
<td>73</td>
<td>51</td>
<td>43</td>
</tr>
</tbody>
</table>

“Science and Scientists Held in High Esteem Across Global Publics”

PEW RESEARCH CENTER
Why is Important to be Science Advocates?

Public trust in scientists seems to be decreasing and this is shaping the attitude of policy makers towards the negative.

The majority of policy makers and people in positions of power are not scientists.

Transparency between scientists and non-scientists prevent policy makers to follow the will of misinformed members of the public.

Research is funded with money from the taxpayer.
The general population has notably different views from those of the scientific community on key science-related issues.
An Opinion Gap Exists Between the General Public and Scientists on Science and Technology Topics

Opinion Differences Between Public and Scientists
% of U.S. adults and AAAS scientists saying each of the following

<table>
<thead>
<tr>
<th>Biomedical sciences</th>
<th>U.S. adults</th>
<th>AAAS scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe to eat genetically modified foods</td>
<td>37%</td>
<td>88%</td>
</tr>
<tr>
<td>Favor use of animals in research</td>
<td>47%</td>
<td>89%</td>
</tr>
<tr>
<td>Safe to eat foods grown with pesticides</td>
<td>28%</td>
<td>68%</td>
</tr>
<tr>
<td>Humans have evolved over time</td>
<td>65%</td>
<td>98%</td>
</tr>
</tbody>
</table>

Antibiotic resistance

Knowledge and understanding of antibiotic resistance

91% say they have heard of the term “antibiotic resistance”

56% say they have a good understanding of what the term means

What do people understand by the term “antibiotic resistance”?

- 31% say it’s the body becoming resistant to antibiotics
- 28% say it’s antibiotics being less effective
- 20% say it’s about overuse of antibiotics

https://blog.wellcome.ac.uk/2016/04/12/how-do-the-public-really-feel-about-science-and-research/
In an age of such rapid scientific and technological advancement we risk widening the gap between scientists and the public.

“Speaking up for the importance of science to society is our only hope…”

What can you get from a Summer Research at FoMD?

Whatever path you follow, you will have a learning experience that will make a true and lasting impact in your future.