The Hixon Writing Center at Caltech

Scientific Posters

This interactive worksheet guides students step-by-step through the process of making a poster. After reading the motivation and prompts for each section, fill in the appropriate responses in the available spaces and use this information to design and build your poster. Students working with this writing genre as part of a course assignment may have guidelines or requirements that differ from those described here.

Step 1: Determine your purpose:

Posters are visual *aids* to assist an in-person conversation at a poster session. They are a window into a specific topic or line of research.

Posters are *not* comprehensive; they do not tell the whole story like a research manuscript would.

Think about why you are making a poster, beyond simply presenting your work. Poster sessions are great opportunities to: (1) look for collaborators or projects for collaboration; (2) recruit help to solve a particular problem you've run into; (3) share a method or breakthrough you think can and should change other scientists' research practices; and (4) network with other scientists, potential employers, and showcase your skills and interests.

Having a **goal** for your poster session will help guide your poster design to be more effective at achieving it.

By presenting my poster I hope to _____

_____

_____

_____ (desired outcomes).

To achieve your goal, you need to effectively communicate and emphasize different components of your project or research. To look for potential collaborators, for example, you may want to emphasize the novelties and functionality of a new method or device and highlight potential future work. For your goal, which of the following strategies will you employ? (*Check all that apply.)*

☐ *Show examples of applications such as* _____

_____.

☐ *Clearly explain the knowledge gap/need for* _____

_____.

☐ *Provide evidence for why my results/method is superior to* _____

_____ *(existing ones).*

☐ *Demonstrate the logical flow of my experimental design and assay development, from*

_____ *(motivation) to*

_____ *(outcome).*

☐ *(Other strategies important for achieving your goal)* _____

_____

_____.

Step 2: Identify your audience:

Poster sessions are usually held as part of a conference, although sometimes they are standalone events to showcase research at a specific center or from a specific funding source. As such, the specific conference or organizing body will tell you a lot about who's going to see your work. How niche is the conference, conference session, or organizing body? For example, if your research is on designing and building nature-inspired robotic traction grippers is to be presented at the IEEE International Conference on Robotics and Biomimetrics, you would expect to have significantly more biomimicry experts present than at the International Mechanical Engineering Congress and Exposition conference.

I am presenting my poster at _____

(conference or meeting), where I expect about _____ *% of people to be in my field and*

_____ *% to be in my subfield/research niche.*

Recognize that poster sessions can be attended by a very wide audience. Which of the following groups do you anticipate attending your conference? How important is it that each group visit your poster? (*Check all that apply.)*

☐	**Academic scientists**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Industry researchers**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Business executives**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Government officials**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Policy makers**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Educators**	☐ Not	☐ Somewhat	☐ Very Important
☐	**Interested public**	☐ Not	☐ Somewhat	☐ Very Important

Predicting how familiar your audience will be with the technical details of your work will allow you to tailor the necessary background information and level of detail in the results to better achieve your goal (Step 1).

If 75% of your audience will understand your subfield (e.g. biomimetrics vs. general mechanical engineering), you can consider a number of technical content considerations:

- Write a title that is more specific or uses field-specific language but not jargon. The latter is incomprehensible to even highly educated outsiders to the field and often includes "laboratory slang." (See Angelica Hofmann's *Scientific Writing and Communication*.)
- Provide less general background, beginning with more technical background information and motivations.
- Discuss in more granular detail the major findings of your work.
- Emphasize immediate technical implications of your work, not just "big picture" significance.

Keep in mind that a danger of employing these content choices is failure to put your work in context for unfamiliar readers. They may not be interested by your technical title or their understanding may be lost without general background information.

Step 3: Understand a poster's structure:

Ever wonder how the style of a poster came about? Think about the *physical environment* in which you are presenting: Posters are usually hung on perimeter walls or partitions sectioning the room or space. Your audience is milling about, *glancing around* to determine which poster they will approach and engage the presenter in conversation.

The first part(s) of my poster that I want someone to see is (are) _____

_____.

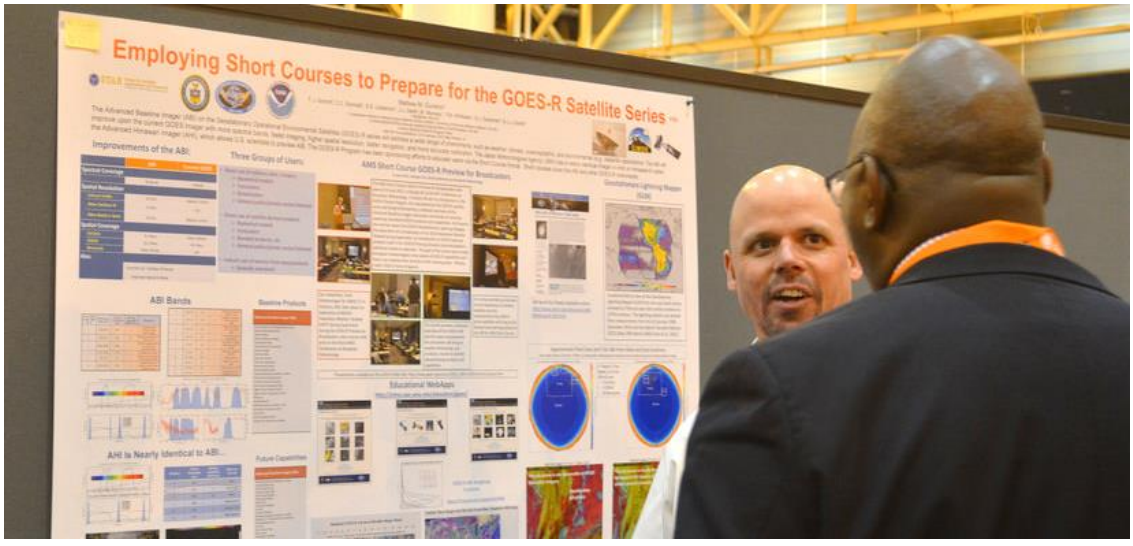

Figure 1 A researcher at a conference using his poster as a visual aid while engaged in discussion about his work.

Very likely, you first noticed either the title or large, prominent or colorful figures. This is an intentional technique to *catch the audience's attention.*

Time to engage: You have less than **5 seconds** to grab your audience's attention with a clear, engaging title. Attract them further with well organized, aesthetically pleasing figures.

Piquing a fellow attendee's curiosity with your title and figures will recruit them to move closer to read the smaller text: What do your figure captions say? What interesting applications do they see? Making your poster *easy* to engage with will allow you to begin conversations with your audience, which ultimately helps achieve your goal.

Duration of engagement: Poster conversations could be as short as **one minute** (the length of time to give a research "elevator pitch") or as long as an **hour** (a reasonable length of time for an entire poster session), depending on your goals and your audience's interests.

Step 4: Arrange your content, beginning with the highest priority elements to catch your audience's attention and moving to lower priority ones.

Must do: Prioritize the elements of the poster that will catch your audience's attention: title and figures.

1) **Begin with a powerful title**. Using the audience distribution you identified in Step 2, craft a title that the majority of your audience would understand. Make the title clear, concise, and interesting. If over 75% of your audience is familiar with research in your subfield, you can consider a more technical title, if helpful for communicating your results.

TITLE: _____

Checklist:

☐ Does your title convey your major finding?
☐ Does it indicate the defining or unique characteristic of your work?
☐ Is your title free of acronyms or jargon?
☐ Does your title fit on one line of your poster?

"Applying inertial microfluidics SELEX to var2CSA RBCs" is a poor title. It does not convey an interesting result or novel methodology, but simply recaps the research approach ("Applying…"). It also uses too much jargon, which is likely to alienate a large percentage of viewers who might otherwise find the work engaging.

"Aptamer Bioprobes that Identify Malaria-Infected Red Blood Cells" is a strong title. It would be understood by 95% of audiences at a bioengineering-related conference and does not use sub-field specific jargon like "SELEX" or "var2CSA." This title emphasizes the *application* of the work and its significance to public health.

"Microfluidic Aptamer Selections Against Malaria Targets" is also a strong title. It would be understood by a subfield audience but still avoids niche jargon. This title emphasizes the novel *methodology* of the same work being described in the titles above in order to adapt the poster to a different audience or goal.

Your title should be displayed in large (>80 point) font and centered at the top of your poster.

Below the title, you should display the **authors and contributors** of the work and their academic or institutional **affiliations**. For most disciplines, order of authorship begins with the person contributing the majority of the effort with supporting persons listed afterwards. It is a convention in many fields to list the principle investigator(s) last, with some notable exceptions (e.g. Mathematics often lists contributors' names alphabetically, while certain poster sessions may name the PI first; see Annotated Examples for JPL linked at the end of document).

*Figure 2 A poster's most important element is its title. The title for this poster is clear and concise. It is displayed in large font, centered at the top of the poster where it can easily be read from a distance**. Follow these figures as we build an example poster using the principles discussed in this handout. A final version of this poster example is available as a PowerPoint slide on the Hixon Writing Center's Resource webpage under "Posters."***

2) Select key figures. We use figures, not text, to do the bulk of our communication on a poster.

Your poster should aim to discuss one major area of work that can be relatively well contained. (If you have multiple topics you wish to present, consider creating multiple posters.)

What is most challenging about your research problem? What are the major results, methods, or findings? What is an application or future direction for your work? If you were to explain these points to a friend, what pictures would you sketch to help them understand? Your answers should identify the most important figures to make and include on your poster.

Below are possible elements you might communicate through figures on your poster. What might each of these figures convey? Write a concise figure caption explaining what could be shown for each of the following figures (*Choose those that apply)*:

☐ *Research challenge:* _____

_____

☐ *Approach or method:* _____

_____

☐ *Major result #1:* _____

_____

☐ *Major result #2:* _____

_____

☐ *Major result #3:* _____

_____

☐ *Significant application:* _____

_____

☐ *Future direction:* _____

_____

If someone approaches your poster at the session, these captions should help answer their questions, "What is this?" and "So what?" Not all of these elements may be relevant to your poster; select the ones you feel are essential to achieve your **goal** with a given **audience.**

3) Create clear figures. Communicating through non-textual media requires careful attention to what messages our graphs, images, and illustrations convey. Figures should be purposeful, not decorative; all ink should add information to the poster. Let the figure captions you wrote above guide (and limit) the content of each figure.

Guiding principles for clear figures:

- Try to include the minimum amount of data or images necessary to make your point. One way to check this is to ask, "How much of the ink in this figure can I remove and still maintain a clear message?"
- Avoid emphasizing too many parts within a figure with colors, lines, highlights, arrows, etc. This creates "noise" that draws attention away from the "signal" or the message you want to convey with your data or images. Maximize your signal-to-noise ratio.
- Include negative controls, standard curves, and/or statistical significance information, when appropriate.
- Ask, "Is this the most effective way to communicate this data?" Always return to the main message of the figure. What's the point of showing it? What do you want your audience to take away?

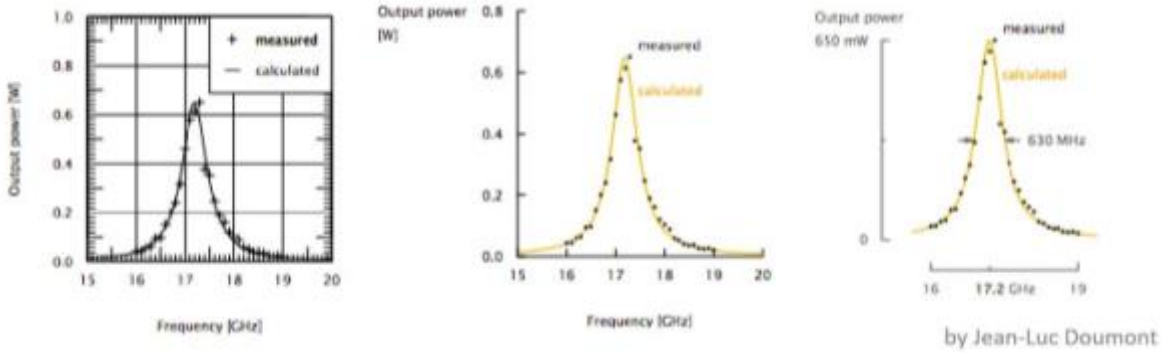

Figure 3 You can strengthen your message by reducing unnecessary "noise" in a figure. This process includes removing lines, data points, or labels (ultimately, ink or pixels) that do not directly add to the message the data are meant to convey.

4) **Arrange your figures to tell a story** in a top-to-bottom and left-to-right format.

Having a predictable flow of information is essential to creating an effective poster. When figures are not in a logical order, the viewer must search around for the next piece of information. This extra effort frustrates the viewer and they often miss the poster's message as a result. Poster viewers usually skim from **top to bottom** and **left to right,** similar to how they would read an article written in English. As such, readers will expect to find necessary background or motivating questions in the top left portion of the poster and information on the significance and future directions of the work in the bottom right portion of the poster.

Check the **conference formatting guidelines** for rules about poster dimensions, title word limits, and occasionally content requirements (e.g. must have a stated "Objectives" section). Conference posters may be horizontal, vertical, or square. Most horizontal posters easily accommodate a **three-column format** for organizing content whereas vertical or square posters lend themselves well to a **two-column format**. Text **abstracts**, if included, are by convention positioned at the top-left below the title. Commonly, important **references** or **acknowledgements** are included in the bottom-right corner of the poster. See the sample poster to examine its positioning of these key elements.

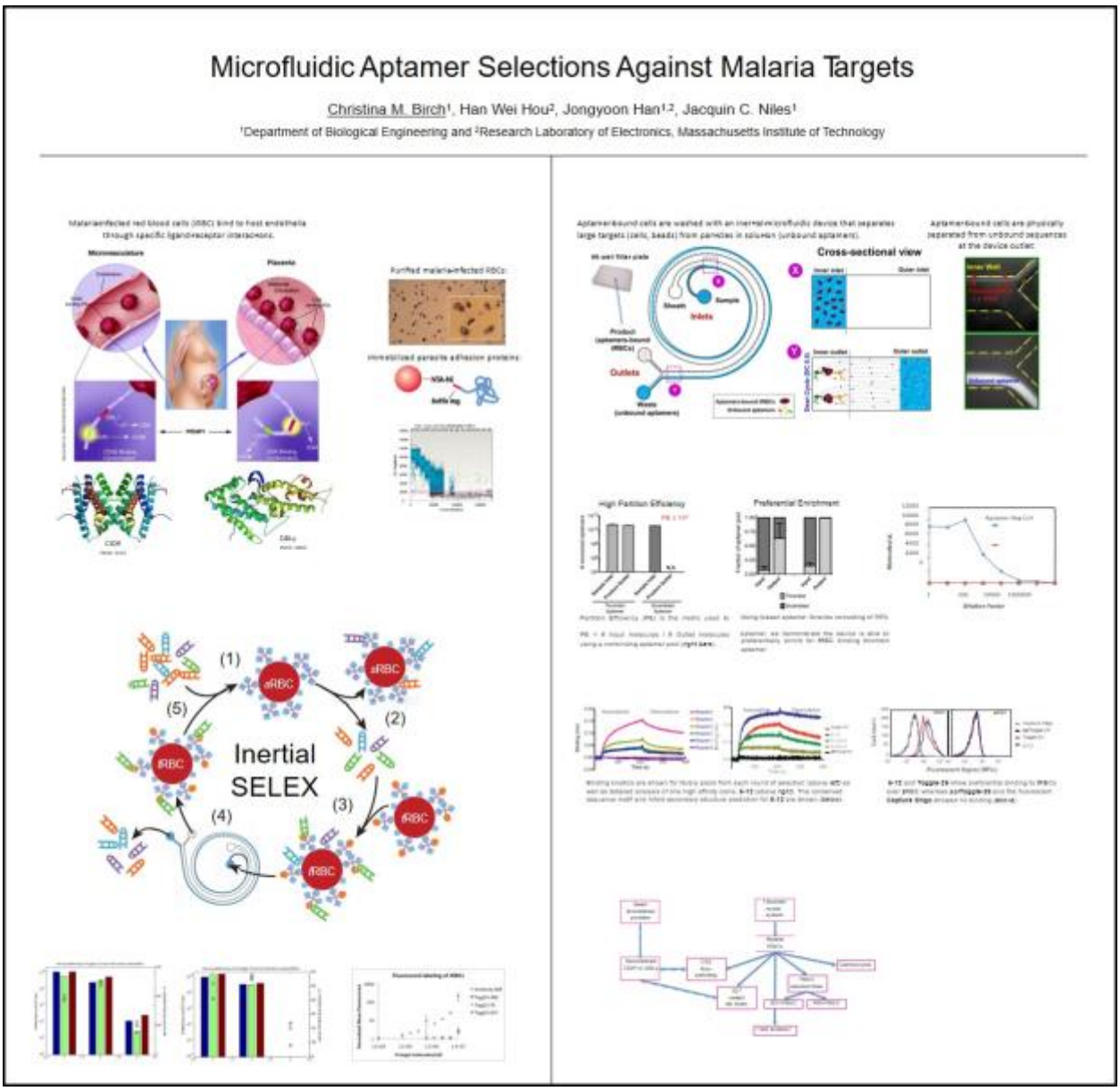

Figure 4 Build the content of your poster by first spatially organizing your major figures and their captions on your poster template. The figures should follow a logical and predictable order for your audience. Most posters lend themselves well to either a two- or three-column format; a two-column poster is being constructed above.

Should do:

1) **Add meaningful section headers**. Instead of using generic section headers, try using specific titles that convey important information. Instead of "Introduction", try stating the research problem or hypothesis. Instead of "Results", try headers that state the major finding or outcome of the experiments.
   - Introduction header: _____

     e.g. Poor approximations for many-body problems

     e.g. Challenges for malaria biomarker discovery

- Methods header: _____
- Results header 1: _____

    e.g. Accurate prediction using N degrees of freedom

    e.g. Microfluidic washing removes nonspecific probes

- Results header 2: _____
- Results header 3: _____
- Conclusions/Significance header: _____

    e.g. Ability to predict new lattice materials

    e.g. Improved malaria diagnostics and future treatments

2) Add necessary supporting information. What is the motivation for your work? What are the questions driving this inquiry? What is the objective of your project? These are questions to which your audience will want answers. You can **use text sparingly** to provide information that is critical to understanding the *why's* of your project.

Organize this information as complete sentences in **short bullet point lists** (3-5 items long). This makes it easy for your viewer to quickly read and process the information.

Motivation and Driving Questions:

- _____
- _____
- _____

Major Results/Findings:

- _____
- _____
- _____
- _____
- _____

Significance and Impact of Results:

- _____
- _____
- _____

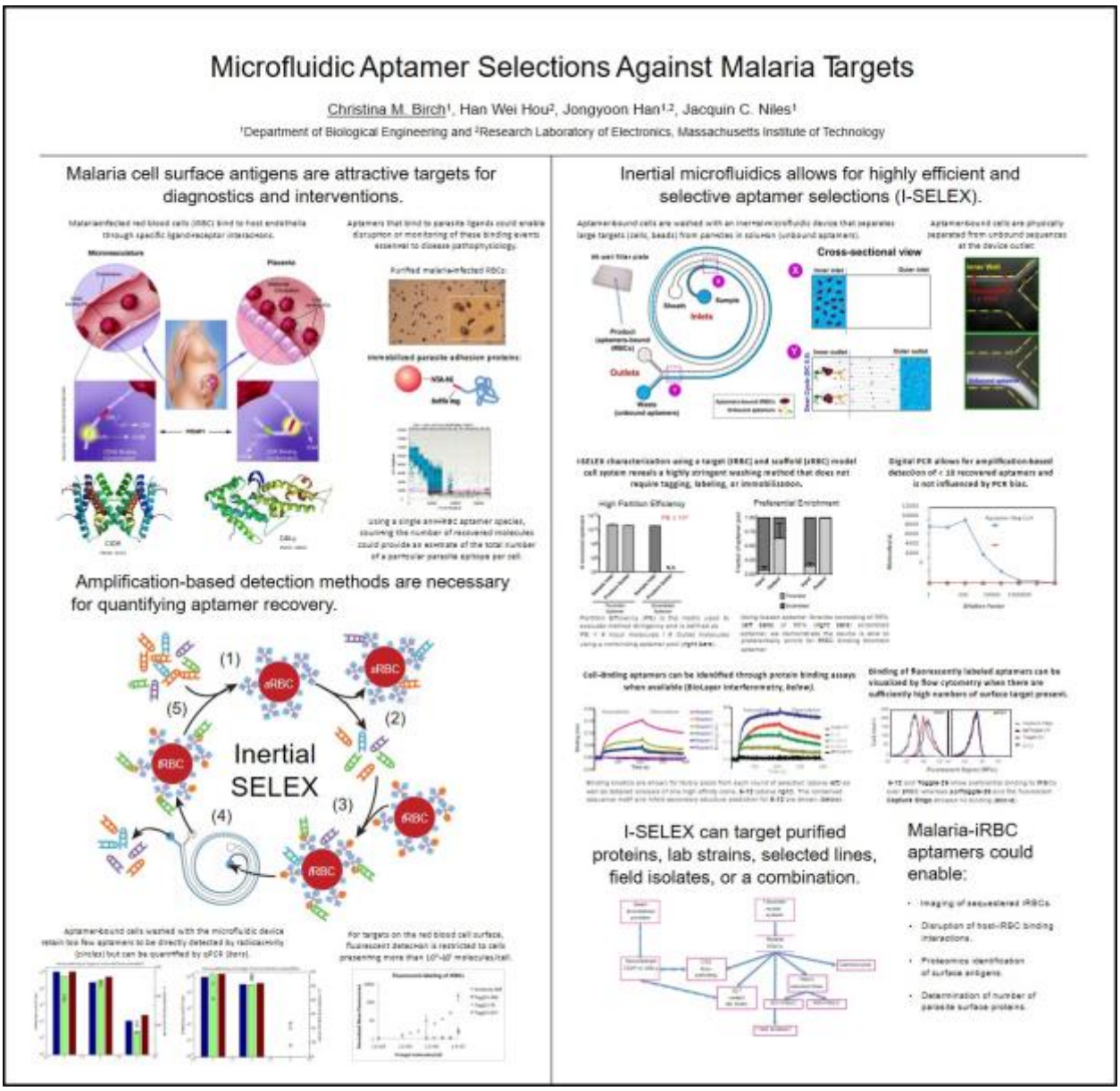

Figure 5 Next, add supporting information to your poster in the form of meaningful headers and short bullet point lists that are easy to read and quickly digest. At this stage, the content on the poster should be both necessary and sufficient to communicate the presenter's major messages and goals.

Could do:

1) **Improve overall aesthetics**
   One way to improve a poster's readability is to use whitespace effectively to delineate between sections. Be wary of adding too many additional lines or background colors as this will reduce your signal-to-noise ratio. It is also common (and occasionally required) to include the logos for institutions that fund the work.

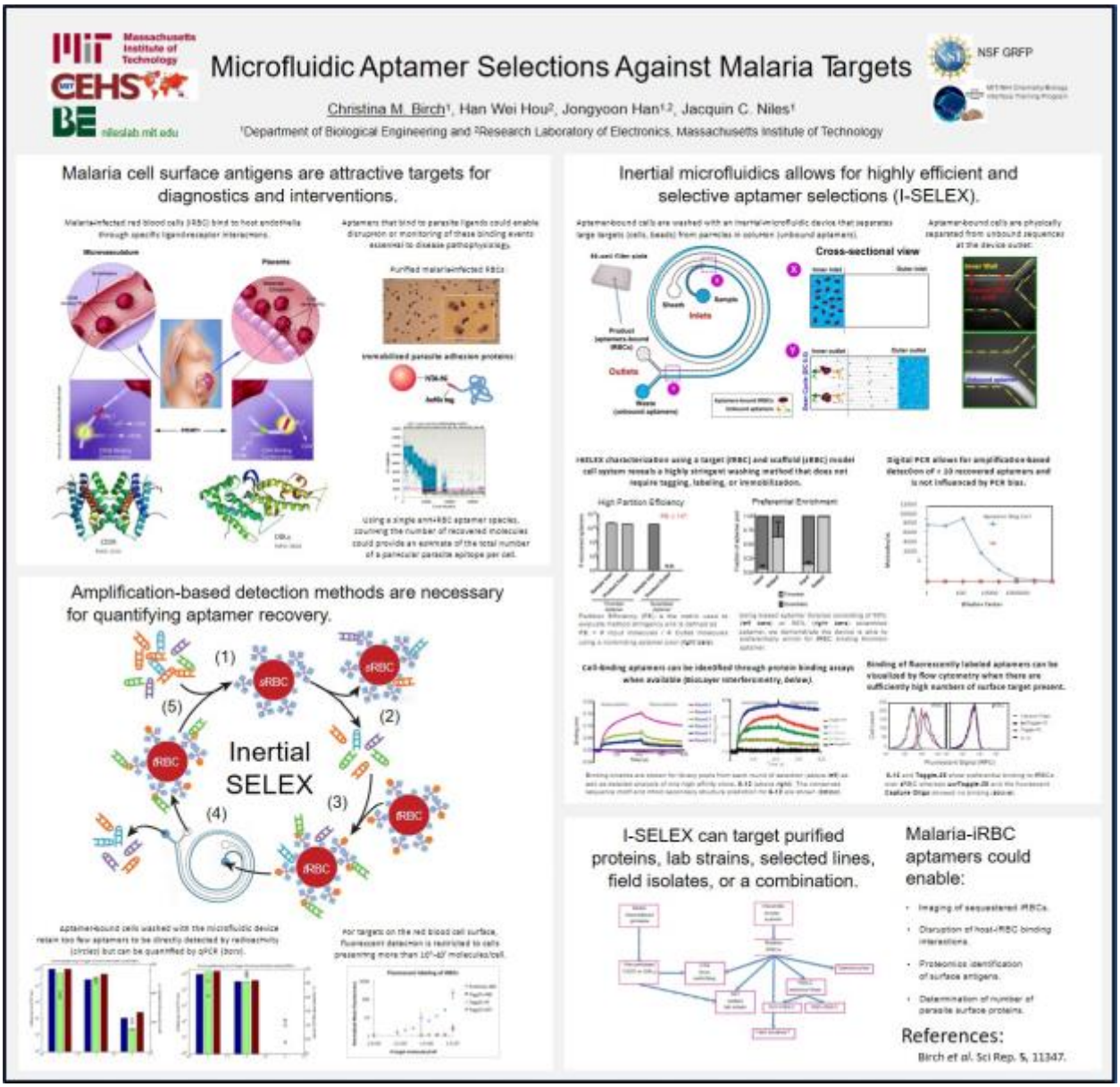

Figure 6 Finally, fine-tuning the aesthetics of the poster using whitespace, symmetry, and selective use of color will increase the overall experience for the audience. You can also include logos for funding sources on either side of the title or at the bottom of the poster next to References or Acknowledgements sections, if present. ***This poster example is available on the Hixon Writing Center's Resource webpage under "Posters" as a PowerPoint slide for you to explore in greater depth (see link at end of document).***

2) **Practice your "elevator pitch."** Once you recruit a viewer to your poster using your clear title and prominent figures, they will want to know if the rest of the content is of interest to them. You can help ensure they understand the purpose and significance of your poster by having a **one-minute** speech prepared. In many ways, the elevator pitch is akin to delivering a mini-abstract verbally while you interact with your poster.

Your elevator pitch should clearly and succinctly summarize the following:

- ☐ Motivating problem within the field or subfield of research
- ☐ Specific problem of interest
- ☐ Current limitations or knowledge gap in the field
- ☐ How your work fills that gap or provides a solution
- ☐ How significant your work or solution is to the problem and the field as a whole

Example Elevator Pitch for a general biochemistry and bioengineering audience at a nucleic acid studies conference (*Annual Meeting of the RNA Society*):

"The majority of malaria deaths occur in children under the age of five. This results from complications when malaria-infected red blood cells get stuck, or sequester, in the microvasculature of the brain. Sequestration occurs when malaria proteins on the surface of infected red blood cells bind to host proteins on endothelial cells." ***[Here, point to the background information figure of cellular sequestration.]*** "If we can identify the malaria proteins involved in these binding events, we can potentially diagnose or treat sequestration. Using a microfluidics approach, …" ***[Here, point to methods section figures of protocol and microfluidic device]*** "…we created high-affinity RNA bioprobes, or aptamers, that can identify a specific class of these sequestration proteins." ***[Here, point to results data.]*** "By characterizing more of our aptamers, we will be able to identify more of the malaria infected red cell surface proteome and potentially develop quantitative diagnostic tools and targeted therapies." ***[Point to future work flowchart.]***

Potential pitfalls and alternatives:

Too much text. Walls of text will turn away potential viewers. Instead, try to replace large blocks of text with figures, figure captions, and short bulleted lists.

Too much information. It is tempting to try to showcase the large amount of time, effort, and work put into a research project. Instead, focus on communicating the big "takeaways," the impact of the results, and the essential message you want your audience to understand.

Nonlinear or chaotic organization. Viewers often get frustrated when information is seemingly missing or out of place on a poster. Make sure that your sequence of figures and information follows a clear, logical story that makes sense to your audience. Be aware that the best scientific stories are rarely chronological.

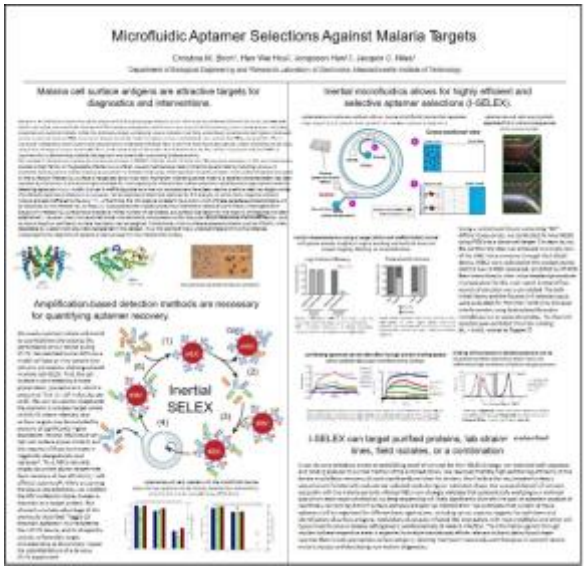

Figure 7 This poster communicates predominantly through large blocks of text that are difficult to read. Challenging posters often turn away conference attendees before they get to know what the poster is about.

Final Considerations:

Are you following instructions? Make sure to follow the guidelines set forth by the conference or organizing body. This may mean using a specific template or even including conference-specific sections on your poster (see Annotated Examples from JPL).

How long will your poster be left alone? It is common to see posters that contain a complete abstract in order to succinctly explain the purpose of the poster when the presenter is not present. Including an abstract may be useful for communicating to viewers who share your same poster session time slot or for when the poster is hung in a lab or building hallway after the conference.

Annotated examples:

The following poster examples highlight some of the successful strategies discussed above. You can find these examples on the Hixon Writing Center's Resource webpage under "Posters."
https://www.writing.caltech.edu/resources/posters

1. **Annotated poster on computation/planetary science (JPL)**
2. **Annotated poster on biosensor development (JPL)**
3. **Hixon Writing Center Interactive Worksheet Poster Example (PowerPoint)**

Want to talk to someone about the information in this handout or how to apply it to your own writing? Make an appointment to come into the HWC and talk with a professional or peer tutor: writing.caltech.edu/tutoring