How to write compelling research summaries

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NIH National Institutes of Health
ORIP
Office of Research Infrastructure Programs

What you are trying to accomplish

After reading a research summary a reviewer should understand:

- Why that project **needs:**
  - the requested instrument
  - special features or accessories

Tips

- "*Do not copy the Specific Aims section from a funded application*" (verbatim from the RFA)
- Shorter is better: 1 page or less.
- Explain the science only enough to understand why the instrument is **needed**
- Have a consistent structure
- Have a consistent writer: the S10 PI

An example research summary

Administrivia: Name, grants, expected usage

P1: Big picture - what does the lab do?

P2: What is the workflow for this instrument?

P3: Why do they **need** this instrument?

P4: Why do they **need** special features?

Figure: Data supporting **need** for instrument

C.1.1 [redacted]

Grants: [redacted] IBIS-iPSC: Organoid modeling of cortical surface area hyperexpansion in autism spectrum disorder, 04/01/23-03/31/28; [redacted] Quantifying the developmental trajectory of autism-associated brain overgrowth using 3D cellular resolution imaging, 09/23/19–06/30/25; [redacted] Discovery and validation of genetic variation impacting the gene regulatory landscape during human cortical development, 8/01/21–04/30/26.

Anticipated annual usage (hours): 150

The [redacted] studies how genetic variation alters brain development and brain structure, leading to a higher risk for psychiatric disorders. They are particularly interested in the mechanisms underlying macrocephaly (increase in brain size).

The general workflow used in their projects is to scan cleared and immunolabeled (using the iDISCO+ technique) whole brains from young mice or embryos with relevant mutations, at cellular resolution. The numbers of different types of glial and neuronal cells in various cortical layers are counted and analyzed with a custom computational pipeline[4,5].

The [redacted] is limited by the UM-II in multiple ways. First, they are **severely constrained by the speed of the UM-II microscope**. For example, to image one P14 brain across 3 channels at a voxel size of 0.75 x 0.75 x 4 μm^3 requires 16 hours on the UM-II. The same sample was imaged with slightly better resolution (0.65 x 0.65 x 4 μm^3) in just 52 minutes on the Blaze (Fig. 5). **This 18-fold increase in speed will dramatically accelerate research in the Stein lab**. Second, **they cannot stain for more than 3 markers,** limiting their ability to identify specific subpopulations of neurons and glia in a single sample. On MSL's UM-II, the Stein lab uses the 488 nm laser to image autofluorescence, which they use to obtain brain morphology, while 561 nm, 647 nm and 785 nm are used for staining independent channels. Third, **when more than one marker is necessary to identify a type of cell, the significant chromatic aberrations of the UM-II compromise measurements**:

- If using the full field of view of the camera, determining whether cells on the edges of the field are double-stained is not reliable (Fig. 3).
- If cropping to the region where chromatic aberrations are acceptable, this increases the number of tiles needed to image the entire brain, and increases imaging time on the UM-II even further.

The [redacted] requires multiple optional components to fulfill their research needs and address the limitations of the UM-II. First, **they need Lightspeed mode,** to speed up acquisition of datasets. Second, **they need the custom 685 nm laser, to provide an additional channel for fluorophore staining**. Finally, **they need all three objectives and associated organic dipping caps** to find samples quickly (1.1X), and image at appropriate magnifications in young (4X) and embryonic brains (12X is needed, as cells are more closely packed together).

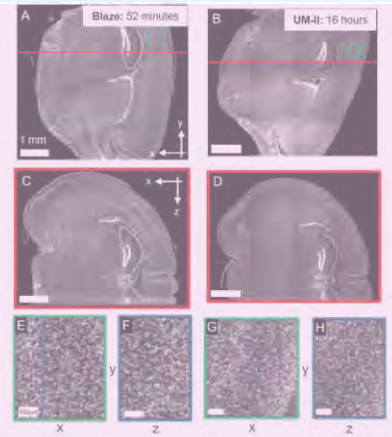
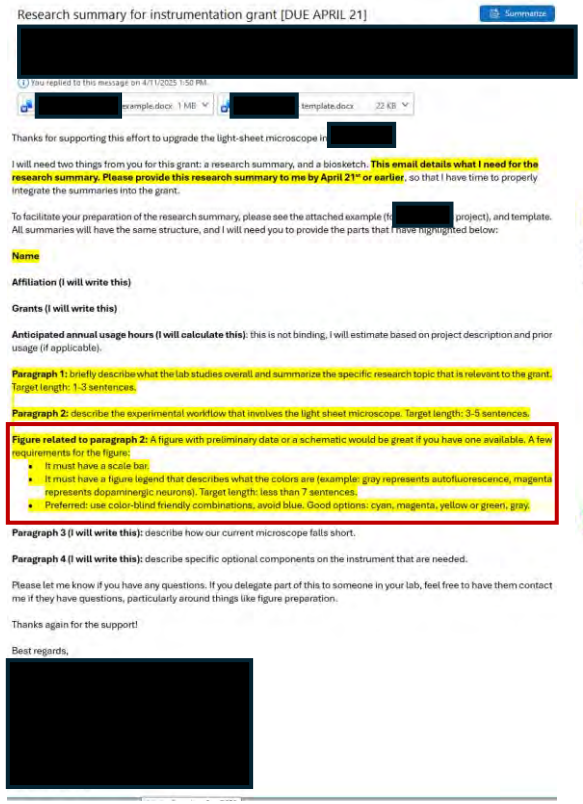


Figure 5. **The Blaze microscope can acquire high quality data much faster than MSL's UM-II: 52 min for entire hemi-brain vs 16 hours**. A,B) Single, fully stitched, XY plane. Improved optics on the Blaze allow better tiling, evenness of illumination and lack of bleaching. An intensity gradient from bottom to top (due to bleaching) and tiling and stitching artifacts are visible in the UM-II dataset (B). C,D) Interpolated XZ plane at the position of the red line in A & B. E,G) Full resolution in the XY plane from the corresponding green boxes in A & B. F,H) An interpolated YZ plane, at the position of the blue vertical line in E,G.

How to get the info you need

- Make things easy for the (non-S10) PIs
  - Email with key dates in subject line and deliverables highlighted
  - Provide a template
  - Provide an example
  - Clear instructions for figures



Research summary for instruction grant [DUE APRIL 21]

[redacted]

Thanks for supporting this effort to upgrade the light-sheet microscope in [redacted]

I will need two things from you for this grant: a research summary, and a biosketch. **This email details what I need for the research summary. Please provide this research summary to me by April 21st or earlier**, so that I have time to properly integrate the summaries into the grant.

To facilitate your preparation of the research summary, please see the attached example ([redacted] project), and template. All summaries will have the same structure, and I will need you to provide the parts that I have highlighted below:

Name

Affiliation (I will write this)

Grants (I will write this)

Anticipated annual usage hours (I will calculate this): this is not binding, I will estimate based on project description and prior usage (if applicable).

Paragraph 1: briefly describe what the lab studies overall and summarize the specific research topic that is relevant to the grant. Target length: 1-3 sentences.

Paragraph 2: describe the experimental workflow that involves the light sheet microscope. Target length: 3-5 sentences.

Figure related to paragraph 2: A figure with preliminary data or a schematic would be great if you have one available. A few requirements for the figure:

- It must have a scale bar.
- It must have a figure legend that describes what the colors are (example: gray represents autofluorescence, magenta represents dopaminergic neurons). Target length: less than 7 sentences.
- Preferred: use color-blind friendly combinations, avoid blue. Good options: cyan, magenta, yellow or green, gray.

Paragraph 3 (I will write this): describe how our current microscope falls short.

Paragraph 4 (I will write this): describe specific optional components on the instrument that are needed.

Please let me know if you have any questions. If you delegate part of this to someone in your lab, feel free to have them contact me if they have questions, particularly around things like figure preparation.

Thanks again for the support!

Best regards,

[redacted]

[YOUR NAME]
Affiliation [redacted] will write this.
Grants: [redacted] will write this.
Anticipated annual usage (hours): [redacted] will calculate this

PASTE ANY FIGURES HERE and modify size of box as needed

Figure X. **Title for figure legend**. Text of figure legend

The **[Your last name] lab** studies [1-3 sentence description of your research].

The general workflow used in their projects is [1-5 sentence description of your specific experimental workflow].

[Limitations of the [redacted] or the lab's projects — [redacted] will write this].

[Specific optional components requested — [redacted] will write this].

- Make your deadline for other PIs 2-3 weeks earlier than your actual deadline.

Own your grant

As the S10 PI:

- Rewrite everything as needed to improve readability for the reviewer
- Make final decisions about estimating future usage

Questions?