

Comp/Phys/Mtsc 715

“To the Pain”  
Interviewing a Scientist

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Example Videos

- [Reformatting volume along streamlines](#)
- [Interactive display of molecular dynamics](#)
- [Time and streak surfaces](#)

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Administrative

- Cool ParaView tricks!
  - Pressing Ctrl-Space brings up a filter-search tool. Type a subset of the filter’s name and then select and press enter.
  - Custom Filters (Tools/Create Custom Filter) to make a macro filter with parameters that can be applied
    - [http://www.vtk.org/Wiki/ParaView/Custom\\_Filters](http://www.vtk.org/Wiki/ParaView/Custom_Filters)

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### Choice of Visualization Technique

- The technique chosen limits the questions that can be answered
- Therefore, choose the technique based on the goals
- This is hard to appreciate without having been through the pain yourself...

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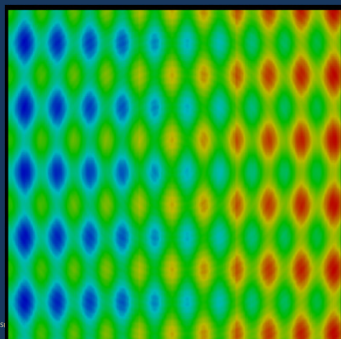
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### Explore: What are the five features?



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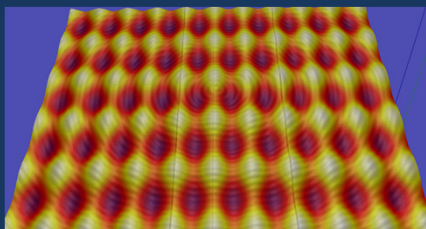
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### ...easing the pain



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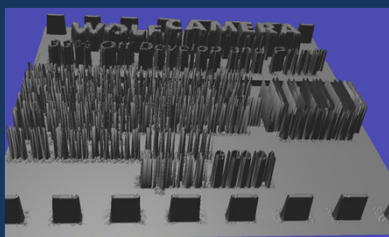
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### Shape of small regions?



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### ...easing the pain



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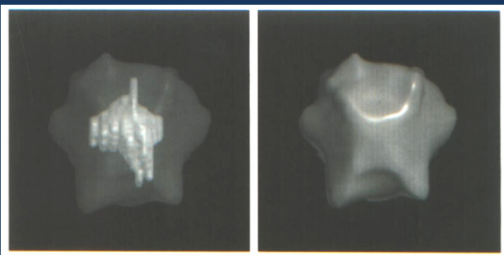
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### Distance between two surfaces?



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...starting to ease the pain



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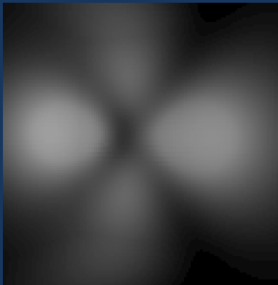
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Is volume density symmetric?  
How does it vary near 17?



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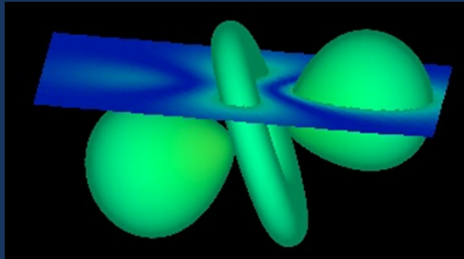
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...easing the pain (outside, at least)  
Where is the maximum?



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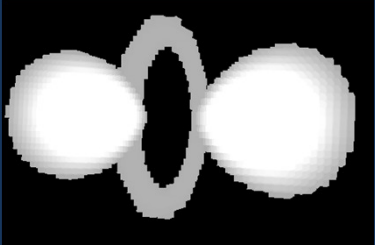
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...easing the "maximum" pain



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What microstructure inside organs?



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...easing the pain



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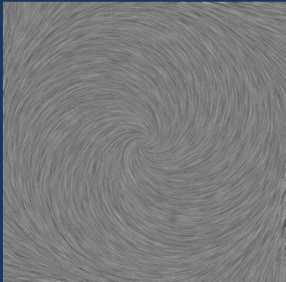
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Which way does flow go?  
...click to ease the pain



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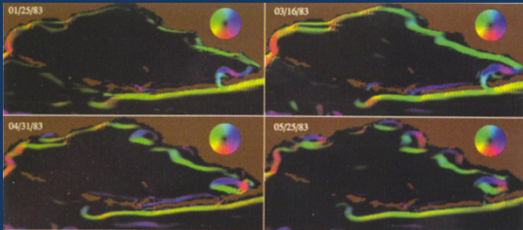
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Where would my balloon land?



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Where would my balloon land?

- Turk & Banks, 1996



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### ...easing the pain

- Turk and Banks, SIGGRAPH 1996



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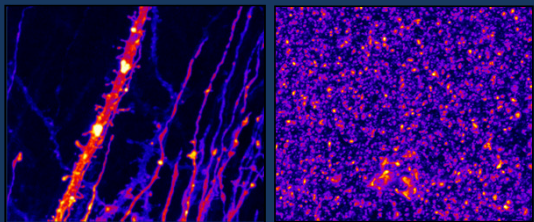
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### How is the concentration of PMCA distributed along a dendrite?

DiO PMCA



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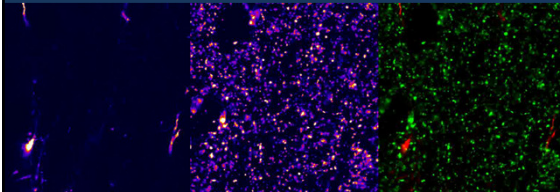
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### Looking through the stacks...



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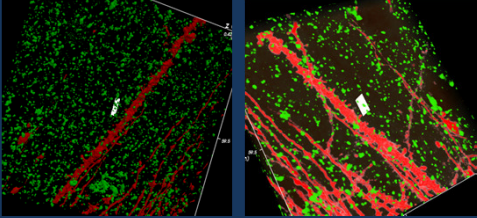
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How is the concentration of PMCA distributed along a dendrite?

- Occlusion vs. Confusion



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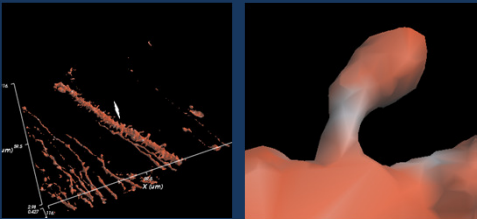
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...easing the pain

In a given spine, where is the greatest concentration of PMCA?



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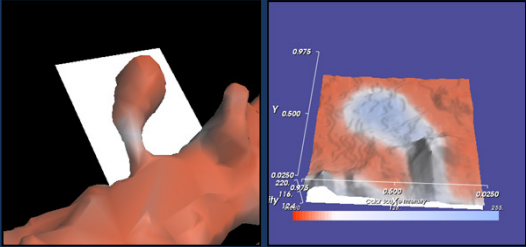
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... easing the pain



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... adding analysis

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Choice of Visualization Technique Matters!

- Some things jump out
  - Unexpected things, even
- Some found if you look
  - Perhaps secondary question
- Some had only with hard digging
  - No single technique to avoid this
- Some cannot be seen at all (or all together)
  - Add multiple displays and techniques for multiple ???'s
- Some false things may be seen
  - Rainbow color map shows banding

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## Interviewing a Scientist

- First Outcome: Determine what scientific question they are trying to answer (their goals)
  - What do they hope to learn from the visualization?
  - What are they trying to do scientifically?
  - *Specific questions they want answers to!*
  - This guides task selection which guides visualization design
- Second Outcome: Get a description and copy of data
  - How it is collected, number of sets, type of each
  - Lets you start trying to load into visualization code

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## What makes a scientific question good?

- It describes a goal that the scientist has in understanding the data better
  - Either in the scientist's domain language or in generic task language
  - Not focused on possible techniques
- It is specific enough to guide selection of which technique is appropriate from a given set of techniques

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## Interviewing: Example Scientific Questions

- Better questions
  - "Compare the surface predicted by our tumor detection algorithm to five MRI volume scalar fields, where does it overestimate and where does it underestimate?"
  - "Understand the relationship between five hand-selected tumor surfaces drawn by different radiologists: where are they the same, and how different are they where they differ?"
- Poorer questions
  - "Using volume rendering techniques to visualize tumor tissues" (vague and focuses on the technique)
  - "Evaluating tumor location algorithms in 2D MRI images" (vague)
  - "Use multiple-variable display techniques and Marching Squares algorithm to visualize areas with abnormal gray scale values in 2D MR slices" (focuses on the techniques, not the questions)

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### Interviewing: Potential Problems

- Learning the language
  - Science they are doing (need to understand at least an overview)
    - Keep asking questions until you understand
  - Lots of strange nouns and acronyms (may only need to remember)
  - Data, geometry, and tasks may be a common language
- Fear of non-shared goals
  - They will likely worry that your goal is to provide pretty pictures, not aid their science
  - Help allay these fears by your questions
  - Make these fears unfounded by your actions

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### Interviewing: Potential Problems 2

- They may have unreasonable expectations
  - Too low
  - Too high
  - Different than visualization
- They may have ideas about techniques: listen, but don't treat as the end of the story
  - They are smart people and know what they seek
  - Out of their field, they often think conservatively (incrementally)
  - This course will help explore the best-fit visualization

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### Look for a common task language

- Understanding the spatial overlap between two or more volume scalar fields
- Understanding the shape and size of a feature present in a 2D scalar field
- Understanding the relationships between a volume scalar field and a volume vector field

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Talking with the clients and Iterating the design really matters!

- Lynda Chin: BioVis Keynote 2011
  - You can't just lob data sets and questions to the vis teams to work on – you need to sit down together and iterate on solutions!
- HitSEE Vis tool for High-Throughput Screening
  - Most of our findings came about by sitting right next to the biologist and watching them use the tool

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Talking with the clients and iterating the design really matters!

- RuleBender: Biochemical rule-based modeling
  - Tight interactive prototyping with biologists was critical to a successful design
- Visualizing Embryonic Development
  - It would be difficult to determine the needs by looking at the literature – you need to sit down with actual biologists "behind the scenes"

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## Interviewing Example

- Russ plays both parts
  - MR-Spect visualization
  - Galaxy formation?
  - Particle collisions?

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