DOE CSGF COMMUNICATE YOUR SCIENCE & ENGINEERING CONTEST TIP SHEET

Why write a popular science essay?
The ability to popularize and broadly communicate your science opens your world and creates professional and personal opportunities for growth. It's not just that you'll be able to chat informally and clearly about what you do with friends and family at the Thanksgiving dinner table. (Oh, that's what you do!) You'll also be able to share your enthusiasm and the importance of your work with the politicians who fund your research, journalists who ask questions about it, grade school students who want to learn about it, and colleagues in different disciplines, a key issue in today's interdisciplinary research. Moreover, by translating what you do into plain language you'll better understand, and gain new angles on, your own work.

What's a “topic of personal importance”?
This is not just a cool topic. It may also have some special meaning for you, providing you with some personal insights. For example, did your family background influence your career choice? Was there a particularly dramatic personal experience that determined your direction and that provides a window on the nature of computational science and engineering? Does it help you connect to other broader themes and challenges in society? Using this approach will let readers better connect with the scientific content through you and your story.

Who's the audience?
Your essay is for a general public audience, the same one that reads a daily newspaper – or, more likely, general news websites such as The New York Times. Journalists work on the basis of the Grade Eight Rule: a junior high student must be able to understand their stories. And when it comes to science, in particular, that's the retained knowledge level for most of the population – from your Congress person to your grandparent or local grocer.

But remember: This audience doesn't have to read your essay. They’re reading for pleasure, not as a school assignment. If your readers arrive at one concept they don't understand, but they're engaged in the story, they'll keep going. But if they hit a second or third unexplained fact or concept, odds are better than even that they'll put the essay aside and pick-up the TV remote control.

What's a “popular essay”?
A popular essay is not the same as an academic essay. The goal isn't just to explain something. It's not just about being “right;” it's about your opinion. The content must be accurate, but that is not the central goal. A popular scientific essay is closer in feel to a story. It takes the reader on a journey. It relies on answering questions, dealing with challenges or resolving conflicts. Describing the action is as important as providing the outcome.

This might be the most difficult challenge for you. As a graduate student or professional in computational science or engineering you're used to basing professional communication on hard facts – equations, algorithms, graphs – presented in the formal style and language of your discipline. But in this essay, readers want to experience something of you. When we read, we want to connect with another human being. This means you must connect with readers' hearts, not just their heads. It's in this way that complex scientific topics are often made the most accessible and real.
Make it Clear

I made up my mind long ago to follow one cardinal rule in my writing – to be clear.
Isaac Asimov, one of the 20th century’s most influential science writers

In popular science communication it’s essential to be clear. Here are suggestions for making your science essay as readable and easily understood as possible.

Make a single point
A 750-1,000 word essay is only enough space to cover one theme. Some examples from previous winning essays: how brittle microstructure affects battery behavior; modeling magnetic fields to understand their impact on a planet’s habitability; and how building detectors for charged particle experiments is like art.

Show, don't tell
Provide lots of examples to help readers understand and care about your perspective. For example, rather than stating that your research is “data intensive,” describe the days you spent developing a code to manage it, the number of conventional CDs the data would fill, and the amount of time it would take to download over a standard internet connection.

Use analogies & definitions
Provide popular analogies and definitions for technical terms and concepts. For example: On my computer monitor a heart is rhythmically beating. The rhythm is driven by this digital heart's sinoatrial node, the pacemaker. It's a computer simulation – an accurate, high-tech version of computer animation – that I believe will save lives.

Edit sentence length
Long sentences, and ones with more than one idea, kill clarity. Divide long sentences, ones with more than about 25-30 words, in two. Make sure the essay has a variety of sentence lengths.

Get to the core of your work quickly
Don't bury your work at the end of the essay. Give readers at least a preview of your research high in the article, then move to it quickly. Avoid getting bogged down in background. Although readers need enough context to understand what’s going on, they want to read about your problem and your scientific contributions.

Embrace first person
Don’t be afraid to use I, me, mine, we, us and other first-person pronouns. This is a personal essay, not an academic report that requires distance. Using the first person helps connect with the reader and makes it easier to use active verbs.

Use Active Verbs
This is make or break to a successful popular essay. And it might be the hardest change in writing style for you. Scientific articles are usually written using impersonal, passive verbs and a third-person view point. This sucks the energy from the writing and makes it longer. Whatever
the topic, using active verbs makes your writing style more direct, clear and forceful. For example:

**Active:** The dog *bit* the boy. (5 words)

**Passive:** The dog *was bitten by* the boy. (7 words)

**Active:** Our computer simulations are based on surface features discovered *by scientists* on the surface of Mars. (16 words)

**Passive:** Our computer simulations are based on surface features that *have been* discovered on the surface of Mars by scientists. (19 words)

For more examples and tips on changing passive to active voice, see:

https://owl.purdue.edu/owl/general_writing/academic_writing/active_and_passive_voice/changing_passive_to_active_voice.html

**Tip:** To quickly identify passive verbs, read your essay and circle versions of the verb “to be”: *is, be, being, been, was, were.*

**Guerrilla Tips for Success**

These are proven techniques that will quickly spice up your essay, moving it from mild to fiery.

**Read popular science writing to get a feel for the tone, style and language.**
Get a copy of *Discover* or *Scientific American* magazine and read, read, read.

**Brainstorm or write your essay draft in a different environment from your usual one.**
If you're used to writing in your room or office, go to a café, library or other location that provides a different creative milieu. The idea is to tell your creative self “this is going to be different.”

**Read your draft version aloud.**
This is a powerfully instructive way to *hear* what you're writing. If you stumble over words, stop and mark the text at that point. This is an area that needs rewriting.

**Give your draft to a friend or family member with no background in your discipline.**
Have them read it and indicate any terms or ideas they don't understand, then rewrite these sections to make them clearer. Hint: Don't respond defensively to your reader’s comments. There's no right and wrong, just what they understand.

**Read just the first and last paragraph of your essay.**
Together these should stand alone as a whole story or idea. Does the closing paragraph echo the opening one?

**To delve more deeply into the art of the science essay,** check out these books:
• The Science Writers' Essay Handbook: How to Craft Compelling True Stories in Any Medium

• The Oxford Book of Modern Science Writing

• The Sense of Style: The Thinking Person’s Guide to Writing in the 21st Century