Scientific Communication: Writing and Presenting with Impact

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Agenda

Objective: Crafting Clear Abstracts, Posters, and Talks

01. Why does Scientific Communication Matter?

02. Elements of Scientific Communication.

03. Crafting a Clear Abstract.

04. Effective Poster Design.

05. Preparing Engaging Talks.

06. The Visual Appeal.

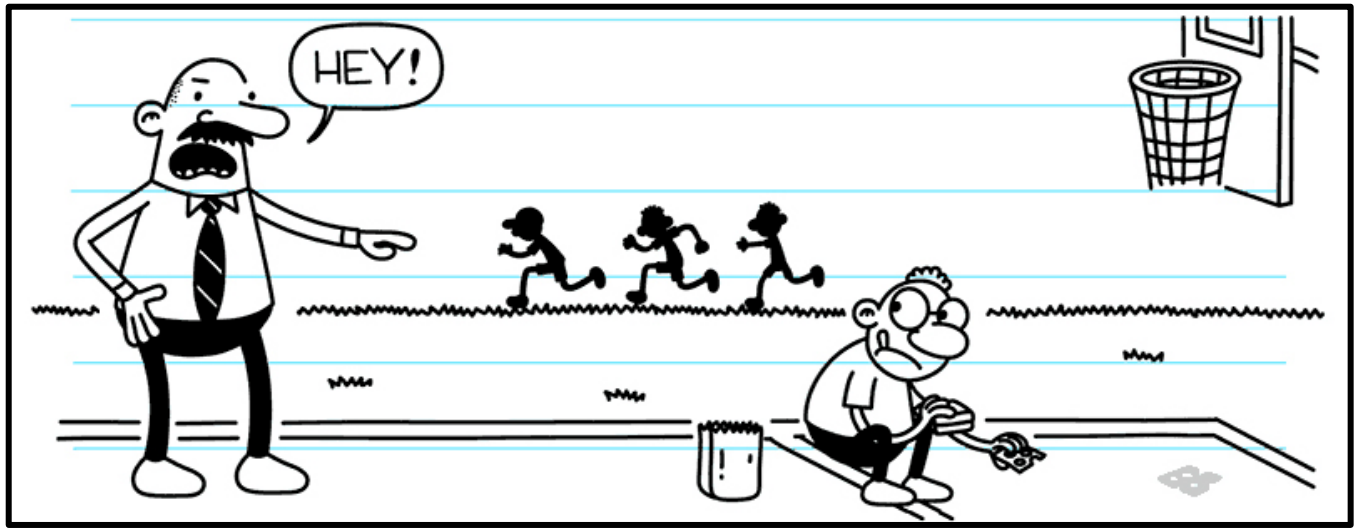
07. Common Mistakes.

08. Practice and Feedback.

09. Summary.

Research = Work + Share.

- Makes your research **understandable** and **memorable**.
- Helps share ideas with **broader** audiences.
- Essential **skill** for career success in science.

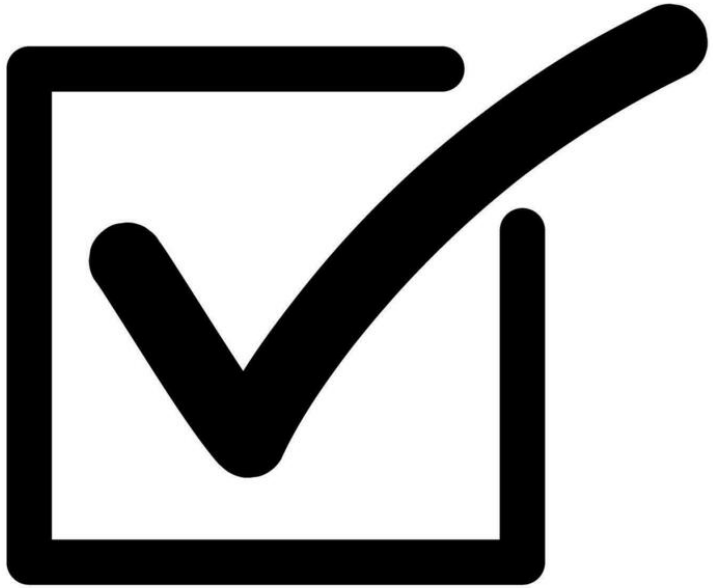


Elements of Scientific Communication.

- **Writing**: abstracts, papers, reports.
- **Visuals**: posters, slides, figures.
- **Speaking**: talks, seminars, discussions.

Crafting Clear Abstracts.

- Summarize key points briefly (background, methods, results, conclusion)
- Use simple, precise language
- Highlight significance and novelty
- Standard: 250 words!



Designing Effective Posters.

- Keep text concise, use bullet points
- Choose readable fonts and colors
- Use visuals (charts, diagrams) to tell a story
- Organize content logically with clear headings.

Plasmonic-Induced Fano Resonance in Subwavelength Nano-Cavities for Structural Coloration

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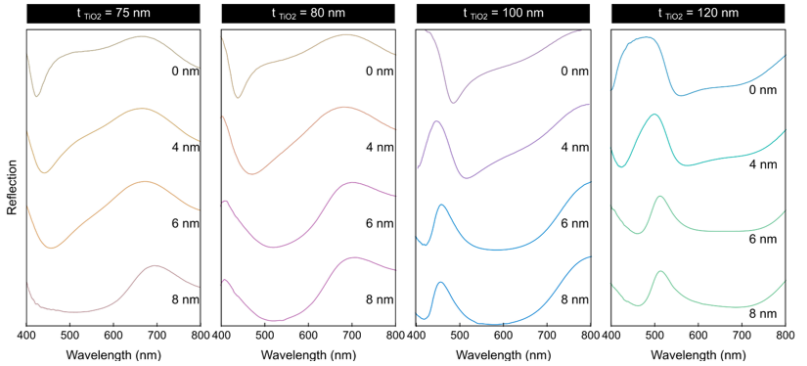
Abstract

Color plays a crucial role in perception, but traditional chemical pigments pose environmental risks. Structural colors offer eco-friendly alternatives yet face challenges. Fano Resonant Optical Coatings (FROCs) provide a scalable solution for vibrant, angle-independent colors.

We developed a nano-cavity integrating a narrowband resonator (silver, titanium dioxide) with a broadband resonator (aluminum nanoparticles). This configuration generates tunable structural colors through selective interference, enabling precise resonance tuning and additive color mixing for a full RGB palette.

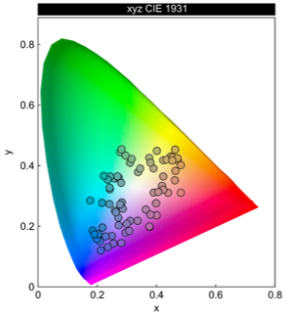
Fabrication via e-beam evaporation and atomic layer deposition ensures scalability and cost efficiency. This technology advances nanoscale color manipulation, offering sustainable solutions for displays, coatings, and sensors.

Fano Resonance



Fano resonance, characterized by its asymmetrical Gaussian-like curve, demonstrates the transition from broad to narrow peaks as more aluminum nanoparticles accumulate on the surface. This narrowing of the resonance peaks indicates enhanced color purity, vibrancy, and saturation, showcasing the critical role of localized surface plasmon resonance (LSPR) in refining structural color output.

Conclusions



Our novel Fano Resonant Optical Coating (FROC) achieves an expansive color gamut centered around RGB coordinates on the CIE diagram, crucial for high-resolution displays. By varying TiO_2 thickness (15-120 nm), we dynamically control structural colors across the visible spectrum with enhanced purity and saturation. Fano resonance and LSPR effects combine to produce sharper, more vibrant colors, with a gamut coverage of the CIE color space, including RGB representation.

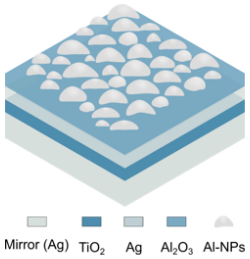
Applications

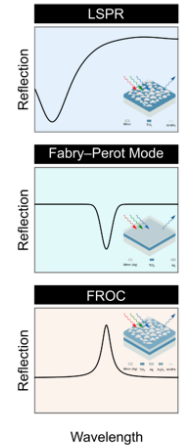
Our technology enables vibrant, non-fading plasmonic paint with:

1. **Energy Efficiency**: Reflective properties reduce heat absorption
2. **Durability**: Structural colors resist fading.
3. **Customization**: Precise control over nanoscale structures for tailored hues.
4. **Sustainability**: Eliminates toxic pigments.
5. Ideal for automotive, architectural, and artistic applications, combining aesthetics with eco-friendliness.

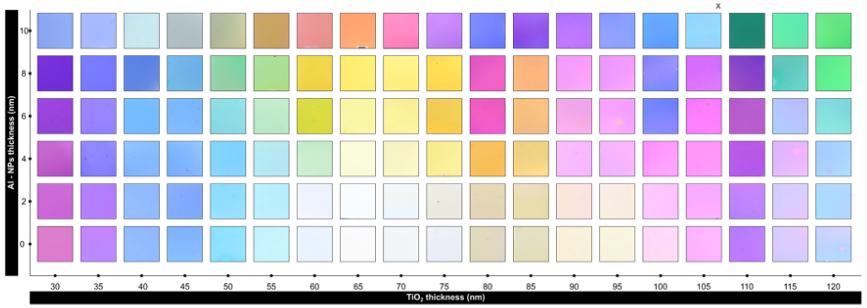
Characterization

Our novel material stack couples both broad and narrowband resonators. interaction generates Fano resonance, resulting in vibrant, tunable, and structural colors.





Gamut Coverage



By precisely controlling the thickness of the (TiO_2) dielectric layer and optimizing the distribution of aluminum nanoparticles, we fabricated 95 distinct samples, each exhibiting vibrant and highly tunable structural colors. These samples demonstrate exceptional vibrancy and brightness, achieving a full RGB palette and beyond.

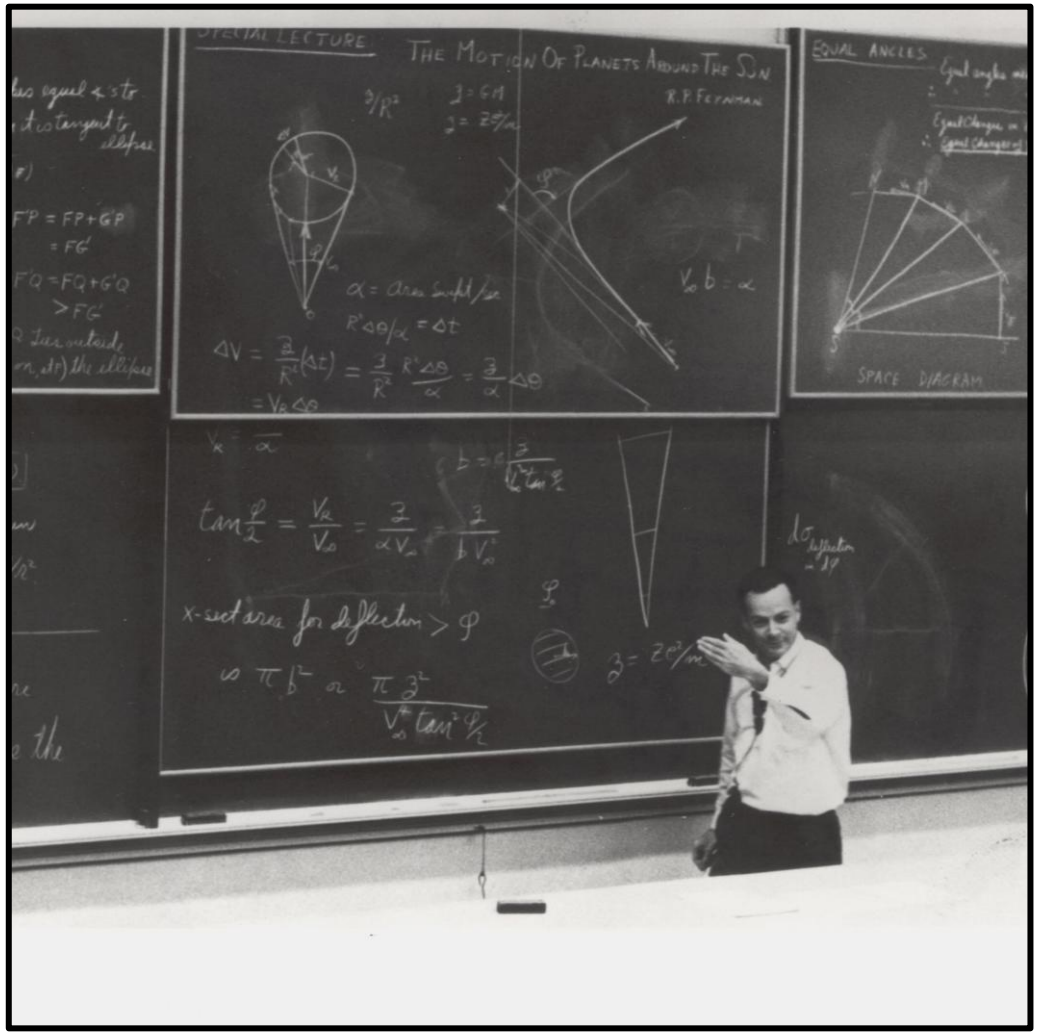
References

[1] Pablo Cencillo-Abad *et al.*, Ultralight plasmonic structural color paint.*Sci. Adv.***9**,eadf7207(2023).DOI:10.1126/sciadv.adf7207

[2] ElKabbash, M., Letsou, T., Jalil, S.A. *et al.* Fano-resonant ultrathin film optical coatings. *Nat. Nanotechnol.* **16**, 440–446 (2021). https://doi.org/10.1038/s41565-020-00841-9

Preparing Engaging Talks.

- Start with a hook or key question
- Tell a clear story—problem, approach, results, impact
- Use visuals to complement, not overwhelm
- Practice timing and voice modulation



Visual Appeal.

- Use simple, clean slides—one main idea per slide
- Use large fonts and contrasting colors
- Label graphs clearly, avoid clutter
- Use animations sparingly to focus attention

Mistakes & Pitfalls?

- Overloading slides with text
- Reading slides verbatim
- Ignoring the audience's level/background
- Poor quality images or unreadable fonts

Practice & Feedback.

- Rehearse your presentation multiple times
- Seek feedback from peers and mentors
- Record yourself to improve delivery
- Be prepared for questions

Summary.

- Scientific communication is key to sharing your research
- Keep writing clear and concise
- Design visuals to support your message
- Practice delivering talks effectively

Q&A.

- Invite questions and interaction.
- Encourage sharing communication tips or challenges.