Visualizing the Invisible: Microscopy Techniques in Bio Art Creation

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Abstract

This study explores how microscopy techniques contribute to Bio Art, turning scientific images into artistic visuals. At the National High Magnetic Field Laboratory in Tallahassee, Florida, undergraduate students learned various microscopy methods and digital editing techniques to enhance their work.

Microscopy Techniques Used:
- Dark Field – Highlights structures against a dark background for dramatic contrast.
- Polarized Light – Enhances birefringent materials, revealing hidden textures.
- Brightfield – Uses direct light for clear specimen visualization.
- Phase Contrast – Enhances contrast in transparent samples without staining.

Artistic Enhancement:
- Software Used: Photoshop & DaVinci Resolve for refining images.
- Techniques: Adjusting contrast, color, layering, and creating dynamic compositions.

Findings & Future Directions:
- Combining microscopy with digital editing creates visually compelling images that blend science and art.
- Bi-weekly presentations showcased how scientific imagery can be reimagined artistically.
- Future work will explore fluorescence and electron microscopy for more advanced artistic interpretations.

This research highlights how microscopy can foster collaborations between science and art, making scientific imagery more engaging and accessible to the public.

Introduction/Background

- This project focuses on the different microscopy techniques and their roles in creating and visualizing BioArt, combining scientific images with artistic elements and expressions.
- This study intersects science and art, fostering diverse collaborations and promoting new ways of communicating and expressing through science.
- BioArt is a growing field that combines scientific methods, scientific images, and art to create aesthetic visualizations of microorganisms and microscopic structures.
- Different microscopy techniques are used to provide various visual effects, that contribute to both artistic expression and scientific clarity.
- Brightfield Microscopy - Most basic microscopic technique, offers clear contrast.
- Dark Field Microscopy - Emphasizes structures by creating bright images against dark backgrounds.
- Phase Contrast - Improves the visibility of transparent specimens without staining them.
- Polarized Light Microscopy - Enhances texture and patterns.

Methods

- **Microscopy Techniques**
- Brightfield
- Dark Field
- Phase Contrast
- Polarized Light

- Sample collection varied from ordering species online through Carolina, a website that offers biological samples, or students would bring samples from home, such as hair, meat, and water.

- Students trained at the National High Magnetic Field in Tallahassee, Florida, through hands-on experience with different microscopes and techniques, photographed different samples and refined their imaging process.

- In order to enhance the images, students used digital. Tools such as Photoshop and DaVinci and applied artistic techniques to transform them into BioArt.

- Data was collected through bi-weekly presentations to track the progress of the students. Images were evaluated based on artistic and scientific criteria.

Key Findings

• Brightfield microscopy allowed for clear and high-contrast images.

• Dark Field Microscopy emphasized edges, which created dramatic artistic visuals.

• Polarized Light Microscopy enhanced color and texture, transforming microscopic structures into complex visual compositions.

• Editing of the images allowed for further enhancement.

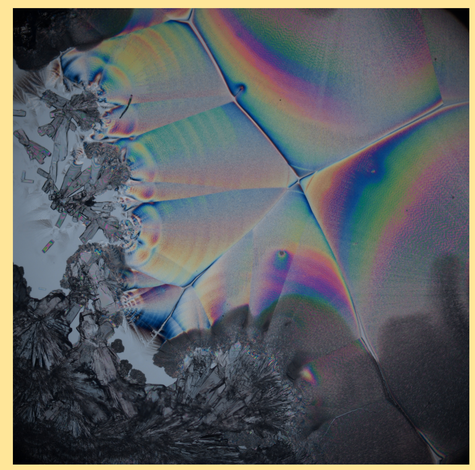
• The study shows that different microscopy techniques offer unique artistic elements in BioArt.

• The transformation of scientific images through editing can enhance the accessibility of public engagement.

• Future steps include exploring fluorescence and electron microscopy.

Results

Mammal Tendon 10x 0.3NA Dark Field



Vitamin C 4x 0.1 NA Polarized Light

Resources

- Frankel, E.; Temple, J.; Dikener, E.; Berkmen, M. Bridging the gap with bacterial art. FEMS Microbiology Letters **2023**, 370. https://doi.org/10.1093/femsle/fnad025.
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