Images are typically assumed to be accurate representations of reality

- 1. The ORIGINAL image = data
- 2. APPROPRIATE image manipulation
- 3. SCALE BARS

Professor R. Lee Penn Pronouns: they/them https://www.name-coach.com/rleepenn University of Minnesota - Department of Chemistry 207 Pleasant Street SE Minneapolis, MN 55455 rleepenn@umn.edu Original Raw Data versus Image ready for publication/presentation



Ethics Questions

Photo coverage of the war in Lebanon



http://zombietime.com/reuters_photo_fraud/ Was this toy positioned AFTER the explotion?



North Korean Military

- What types of distortion of data can occur at the time of image acquisition?
- Where is the line between acceptable enhancements and misconduct?
 - Digital photography and imagemanipulation software allow difficult to detect manipulations.
- What is meant by "**Representative**"?

Scientific digital images = data

DATA can be compromised by inappropriate manipulations.

SAVE **raw** data Work on <u>A COPY</u>!!! ALWAYS!

Record and report what you do to each image

BE CONSISTENT – apply changes to all images in a **series** (e.g., controls and samples alike)

Ethics and Digital Imaging Microscopy Today 2006

J. M. Mackenzie, M. G. Burke, T. Carvalho and A. Eades *MSA Subcommittee on the Ethics of Digital Imaging*



Unacceptable

(Must Document) Unsharp mask Everything else

https://en.wikipedia.org/wiki/Gamma_correction

https://en.wikipedia.org/wiki/Normalization _(image_processing) Normalization is sometimes called contrast **stretching** or **histogram stretching**.





Elizabeth Bik Twitter microbiomdigest

27.07.2022 Patrick Dax Das Wiener Start-up ImageTwin macht Bildplagiate und gefälschte Bilder in wissenschaftlichen Arbeiten ausfindig. futurezone Newsletter Email*

Plagiarism detection software is COMMON What is available for images? IMAGETWIN, a Viennese start-up, finds plagiarized and forged images in academic papers.

Chopstick Nanorods: Tuning the Angle between Pairs with High Yield

Rajasekhar Anumolu,*,* Benjamin J. Robinson,* and Leonard F. Pease III*,*,§,||

[†]Department of Chemical Engineering, [‡]Department of Internal Medicine, [§]Department of Pharmaceutics and Pharmaceutical Chemistry, and ^{||}The Nano Institute of Utah, University of Utah, Salt Lake City, Utah 84112, United States

Supporting Information

ABSTRACT: The alignment of rodlike donor pigment molecules within the three-dimensional light-harvesting complexes of photosynthetic plants is very precise; yet, tuning the orientation of nanorod assemblies to mimic these and other intricate structures remains challenging. Here we continuously generate nanorod clusters with precise control over their configuration using an electrospray differential mobility analyzer (ES-DMA). We demonstrate the ability to selectively deposit quantum dot and gold nanorod dimers in parallel, perpendicular, and intermediate configurations onto substrates with variation in the angle between nanorods <3.2° in excellent agreement with model predictions. This method, generally



applicable to all nanorod compositions from metallic to polymeric, holds the potential for molecular biology and nanophotonics applications.

KEYWORDS: Quantum dots, gold nanorods, gas-phase electrophoretic mobility molecular analysis (GEMMA), nanorod assemblies, nanorod orientation, angle control

What do you notice?





Patterns

Volume 3, Issue 5, 13 May 2022, 100509

Opinion

Deepfakes: A new threat to image fabrication in scientific publications?

Liansheng Wang ¹, Lianyu Zhou ¹, Wenxian Yang ², Rongshan Yu ^{1 2 3} 🝳 🖂

Al generated images: Scientific image manipulation using generative adversarial network (GAN)



(a) Real images







Patterns

Volume 3, Issue 5, 13 May 2022, 100509

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In the 2020 Deepfake Detection Challenge (<u>https://www.kaggle.com/c/deepfake-detection-</u> <u>challenge</u>), the champion algorithm only achieved a score of 0.42798, evaluated by log loss, indicating that a significant portion of synthetic images could not be detected.



What about YOUR POSSIBLE BIAS?

https://liubolinstudio.com/

BALLARAT INTERNATIONAL FOTO BIENNALE

LIU BOLIN 24 AUG – 20 OCT 2019 TICKETS ON SALE



Image Credit: Liu Bolin, Balloon No. 1, 2012

Liu Bolin's images depict meticulously painted human bodies – often his own – hiding in the surroundings of everyday spaces and places.

https://liubolinstudio.com/



Liu Bolin's images depict meticulously painted human bodies – often his own – hiding in the surroundings of everyday spaces and places.

Liu Bolin: Can you spot the 'invisible man'?



What about YOUR POSSIBLE BIAS?

Identifying reactive surfaces



Strehlau, J.H.; Stemig, M.S.; Penn, R.L.; Arnold, W.A. 2016.

What about YOUR POSSIBLE BIAS?

If I think the crystals should be LONGER and NOT WIDER, how might I **unintentionally** bias my results?

How might I prevent unintentionally biasing my results?



Dr. Strehlau was concerned about her own BIAS during particle size measurements.



Hypothesis: changes in solution conditions will result in different growth rates on different crystal surfaces.





Image files were assigned random filenames by someone uninvolved in the project

Measurements were recorded.



"CODE" was provided so that measurements could be matched with experimental conditions

RESULT: Growth was dramatically affected by solution conditions.



RESULTS: VISUAL SUMMARY

100 nm

b) G₃₂₅Fe pH



Facet-Dependent Oxidative Goethite Growth As a Function of Aqueous Solution Conditions, Strehlau, J.H., M.S. Stemig, R.L. Penn, and W.A. Arnold, Environmental Science & Technology, (2016) 50, 10406-10412.

ALWAYS SAVE YOUR IMAGE IN THE ORIGINAL FORMAT

Camera Phone Colorimetry: The Raw Data are never lost!



BSA Concentration (mg/mL)

and R.L. Penn, "Quantifying Gold Nanoparticle Concentration in a Dietary Supplement Using Smartphone Colorimetry and Google Applications," Journal of Chemical Education, 93, 318-321 (2016). SUMMARY:

Journal of Cell Biology on Manipulation of Digital Images:

- No specific feature within an image may be enhanced, obscured, moved, removed, or introduced.
- Adjustments of brightness, contrast, or color balance are acceptable.
- Nonlinear adjustments (e.g., gamma settings) must be disclosed.
- The grouping of images from different parts must be clear in the figure (e.g., using dividing lines) and in the caption.



SCALE BARS!

Always use scale bars!

Journal or beamer may change magnification.

STEPS:

1.Open your file in your image software.2.SAVE AS new file name

3.AUTO contrast and brightness WITHOUT scale bar

4 200 nm

SCALE BARS!

Always use scale bars!

Journal or beamer may change magnification.

1.Open your file in your image software. 2.SAVE AS new file name 3.AUTO contrast and brightness WITHOUT scale bar 4.MEASURE how many pixels comprise your scale bar. 5. Prepare new scale bar using pixels per nm from step 4. 6.Crop and resize the image as the FINAL step.

STEPS:

<u>4 200 nm</u>

 Original Raw Data versus Image ready for publication/presentation







Bei näherer Betrachtung erweisen sich einige der Luftkissenfahrzeuge als Klone mit ungenauen Heckwellen, möglicherweise um die Streitkräfte einschüchternder erscheinen zu lassen.

Upon closer inspection, some of the hovercraft turn out to be clones with imprecise wakes, possibly to make the forces appear more intimidating.