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The Role of the Journal Editor in Assuring the Integrity of Research Data

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Overview of main points

Journal editors must protect the published record by applying standards of data integrity to all papers.

- Set simple, practical, enforceable guidelines derived from research community standards.

- Use simple methods to monitor compliance with those guidelines.

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The journal's role

- The journal's traditional role has been to vet research papers via peer review. Editors rely on experts:

  Do the data presented support the conclusions drawn?

- Journal editors can extend and enhance traditional peer review by vetting data based on standards devised by the academic community for data acquisition and presentation.

  Are the data presented accurate representations of what was actually observed?

- Developing standards for the integrity of research data should NOT be the job of the journal editor.

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Sources of standards

- Some simple standards have been developed by the research community, and many of these are already enforced by journals.
- Other complex standards have been developed by the research community, but they need to be simplified or made practical for use by journals.
- Other standards do not yet exist.

Existing Standards

- The research community will come up with standards for data acquisition and presentation if they have a need for them.

e.g., need to share large data sets

e.g., sequence data: Genbank, GO, PDB

structural data: PDB

microarray data: MIAME (MGED)

proteomics data: MIAPE (HPO)

- Standards for reporting

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Existing Standards

- The research community will come up with standards for data acquisition and presentation if they have a need for them.

  e.g., need to repeat experiments – development of minimum information standards for less-data-intensive experiments.

  e.g., RNAi: MIARE

  Immunohistochemistry: MIS-FISHIE

Incentive to comply with standards

- The community can be provided with a strong incentive to comply with standards if compliance is a requirement for publication.
- Easy for large data sets, where journals simply have to require deposition in a compliant database.

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Application of complex standards by journals is more difficult

- For some types of data the community has devised complex standards.

  e.g., flow cytometry data

  International Society for Analytical Cytology

  The National Flow Cytometry Resource

- Journal editor can distill complex standards into a set of simple, practical, enforceable guidelines.

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The Journal of Experimental Medicine:

- Devise and enforce simple guidelines for flow cytometry
– derived in consultation with active research scientists.

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What if there are no standards?

- In some cases the community has not yet devised any standards.

- Journal editors can collaborate with the communities they serve to develop guidelines that are simple and practical for both researchers and journals.

Case study: digital image data, 2002.

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Journal editors have access to more information than before

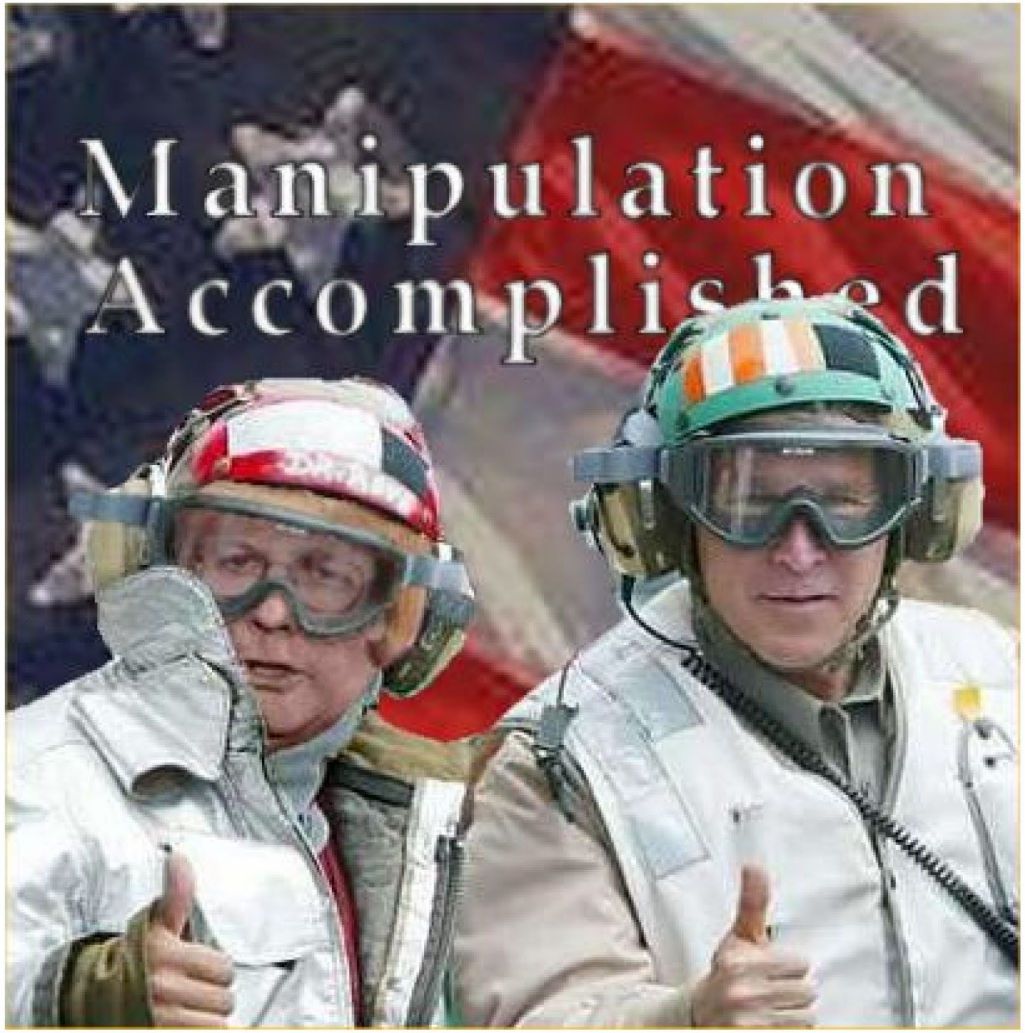
Electronic workflow:

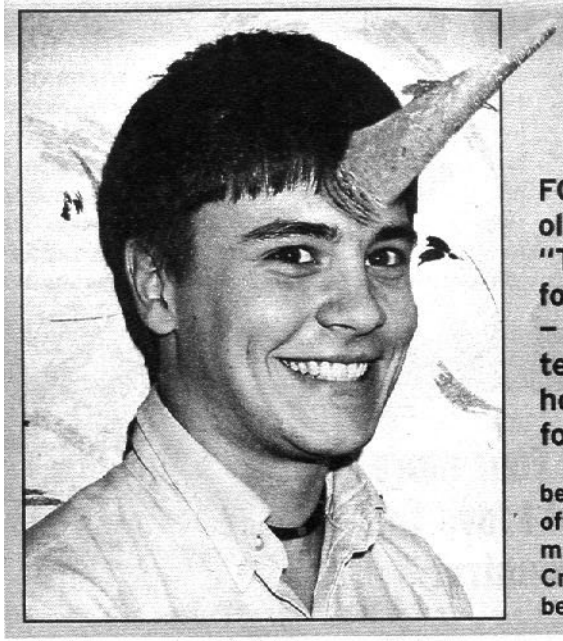
- Submission of all figures as electronic image files.
- Allows the detection of manipulations in digital images that would not have been visible on a printout.
- Response to the amount of manipulation: all figure files in all accepted manuscripts are examined for evidence of manipulation.
- Simple adjustments to brightness and contrast can reveal inconsistencies in background, which are clues to manipulation.

Frequency of manipulation indicated a misunderstanding of the line between acceptable and unacceptable manipulation.

Factors:

- Image manipulation is part of our everyday culture.


Manipulation
Accomplished



TENNESSEE GOAT BOY HAS HORN GROWING OUT OF HIS HEAD!

FOLKS CALL 16-year-old Ned Creighton the "Tennessee Goat Boy" for a darn good reason – the otherwise normal teenager has a 12-inch horn growing out of his forehead!

And even though doctors believe they can cut the thing off "without causing too much" brain damage, Creighton won't let them because he likes the boney appendage.

"I used to hate it, but as I've grown older, I've gotten attached to it," says the tenth-grader from Johnson City, Tennessee.

"It has its bad points – like poking holes in my pillow and tearing the headliner out of my mom's car.

"But it has good points, too. I'm the fullback on my high school football team and I get to wear a special helmet with a hole in the top for my horn to poke through.

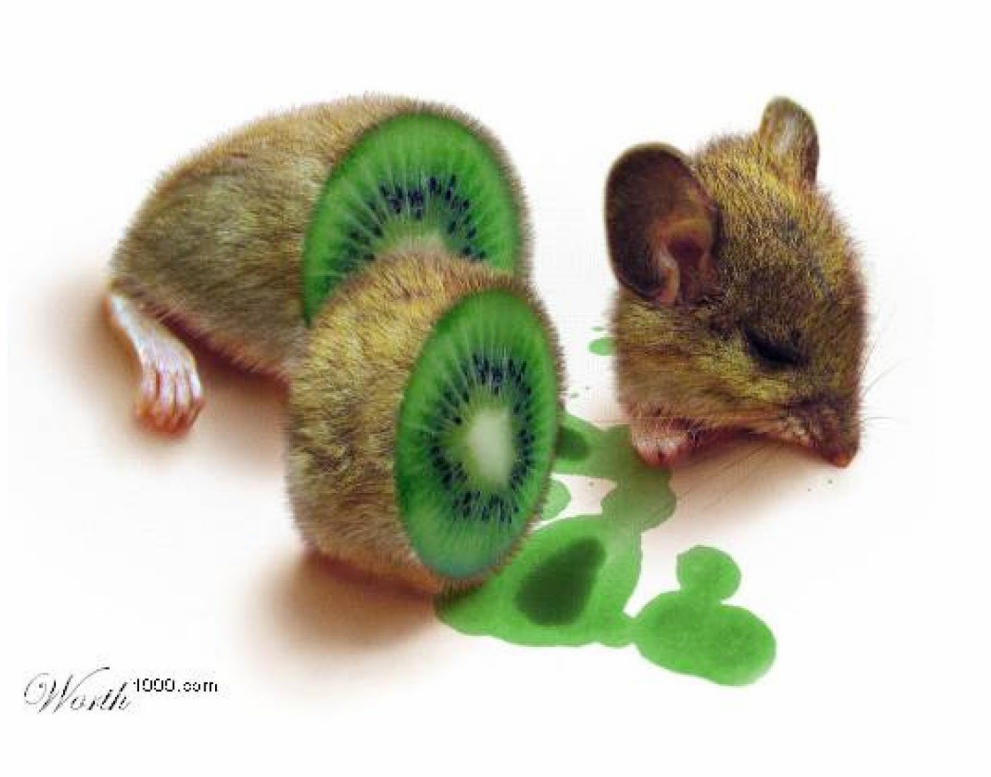
"Once I put my head down, nobody can stop me. I rushed for over 1,000 yards this year and if I keep it up, I'm sure I'll get a scholarship to a big college."

The congenital defect that causes horn growth in humans isn't as rare as some might think. According to the National Institutes of Health, in Bethesda, Maryland, there are an estimated 7,000 "goat children" and "goat adults" living in the United States today.

wunder_bar


mosha.com

www.worth1000.com



www.worth1000.com

Frequency of manipulation indicated a misunderstanding of the line between acceptable and unacceptable manipulation.

Factors:

- Culture of image manipulation
- Ease of image manipulation
- Lack of guidelines

Hayden, J.E. (2000). The Ethics of digital manipulation of scientific images. *J. Biocommunications* 27:11.

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Guidelines for handling digital images

- Developed in collaboration with active research scientists (our academic editors).

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Guidelines for handling digital images

"No specific feature within an image may be enhanced, obscured, moved, removed, or introduced. The grouping of images from different parts of the same gel, or from different gels, fields, or exposures must be made explicit by the arrangement of the figure (i.e., using dividing lines) and in the text of the figure legend. If dividing lines are not included, they will be added by our production department, and may result in production delays. Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and as long as they do not obscure, eliminate, or misrepresent any information present in the original. Non-linear adjustments (e.g., changes to gamma settings) must be disclosed in the figure legend. All digital images in manuscripts accepted for publication will be scrutinized by our production department for any indication of improper manipulation. Questions raised by the production department will be referred to the Editors, who will request the original data from the authors for comparison to the prepared figures. If the original data cannot be produced, the acceptance of the manuscript may be revoked. Cases of deliberate misrepresentation of data will result in revocation of acceptance and will be reported to the corresponding author's home institution or funding agency."

The Journal of Cell Biology, Instructions to Authors, http://www.jcb.org/misc/ifora.shtml

Guidelines for handling 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 if they are applied to the whole image and as long as they do not obscure, eliminate, or misrepresent any information present in the original.

Guidelines for handling digital images

- The grouping of images from different parts of the same gel, or from different gels, fields, or exposures is acceptable but must be made explicit by the arrangement of the figure (i.e., using dividing lines) and in the text of the figure legend.

- If the original data cannot be produced when requested by an editor, the acceptance of the manuscript may be revoked.

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Investigating Image Manipulation

Enforcing guidelines with routine screening of all images!

Investigating Image Manipulation

If we suspect guidelines have been violated, we conduct an initial investigation.

- Obtain the original data:
  - *Does it match the prepared figure?*
  - *Is the manipulation acceptable or does it constitute misconduct?*

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Defining Misconduct

- Inappropriate manipulation
  - *Manipulation does not affect the interpretation of the data.*
  - *Author is asked to remake figures with the original data.*
- Fraudulent manipulation
  - *Fabrication or falsification that affects the interpretation of the data. Not legal elements of intent or damage to 3rd party.*
  - *Acceptance of the paper is revoked.*
  - *Do we report the misconduct?*

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Defining Misconduct

- Inappropriate manipulation
  - *Manipulation does not affect the interpretation of the data.*
  - *Author is asked to remake figures with the original data.*

>25% of all accepted manuscripts have at least one figure that has to be remade.

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Defining Misconduct

1% of all accepted manuscripts at the JCB.

Lower for our journals that publish fewer images.

- Fraudulent manipulation
  - *Fabrication or falsification that affects the interpretation of the data. Not legal elements of intent or damage to 3rd party.*
  - *Acceptance of the paper is revoked.*
  - *Do we report the misconduct?*

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Reporting Misconduct

USA:

- Dean of Research
- Ombudsman for Allegations of Research Misconduct
- Office of Research Integrity

Europe:

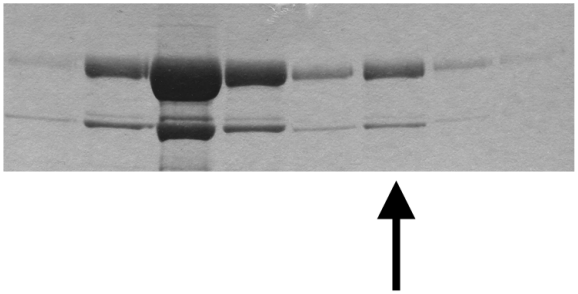
???

Manipulation Examples

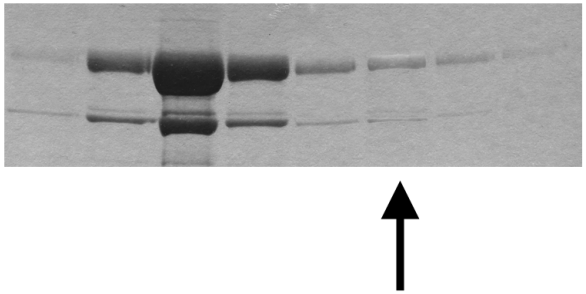
Inappropriate Manipulation Examples

- Adjustment of specific feature: altering intensity

Original Data



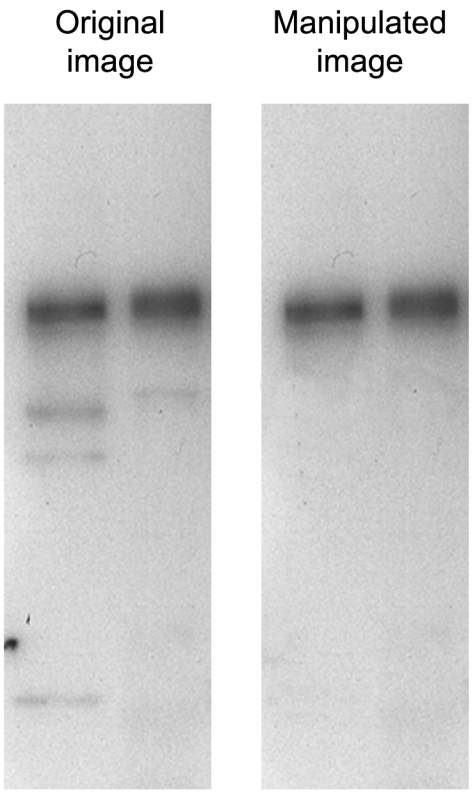
Manipulated Image



"No specific feature within an image may be enhanced, obscured, moved, removed, or introduced."

Inappropriate Manipulation Examples

- Cleaning up background – adjustment of a specific feature



Inappropriate Manipulation Examples

- Cleaning up background – adjustment of a specific feature

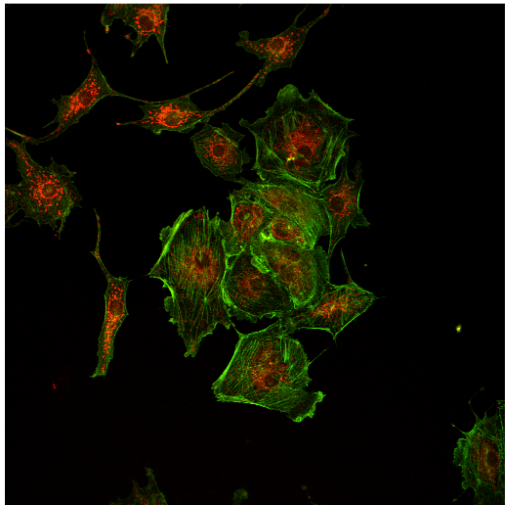
Student to P.I.

"Stamp means you can use stamp function to remove some background. Everybody does it."

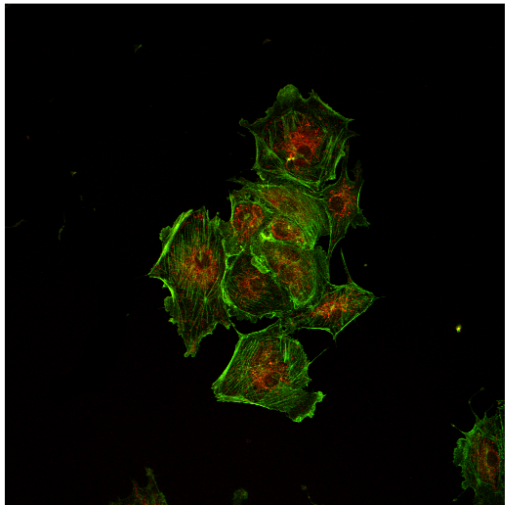
Inappropriate Manipulation Examples

- Cleaning up background – adjustment of a specific feature

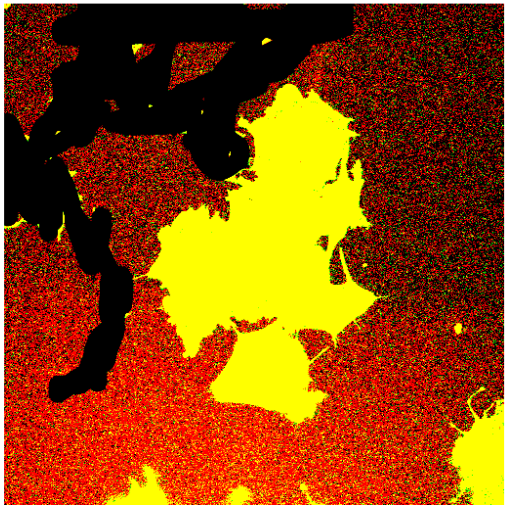
Original image



Manipulated Image

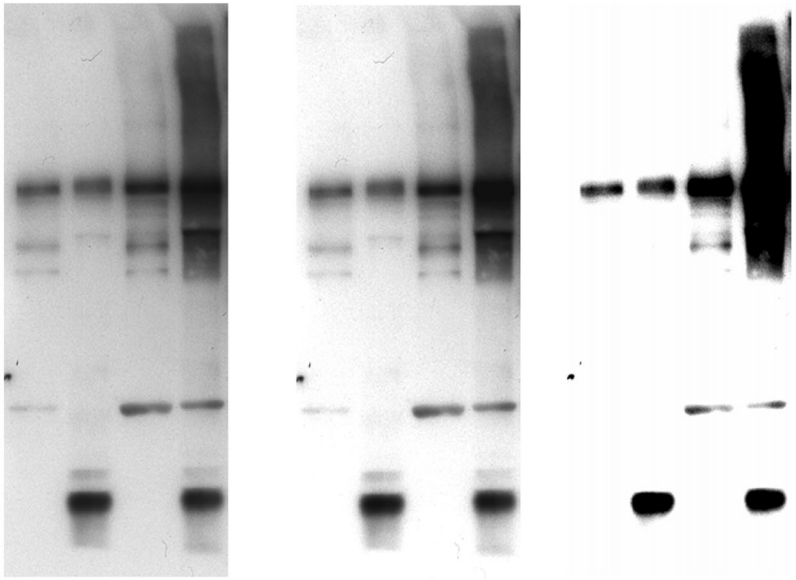


Manipulation revealed by contrast adjustment



Inappropriate Manipulation Examples

- Adjustment of contrast: elimination of data

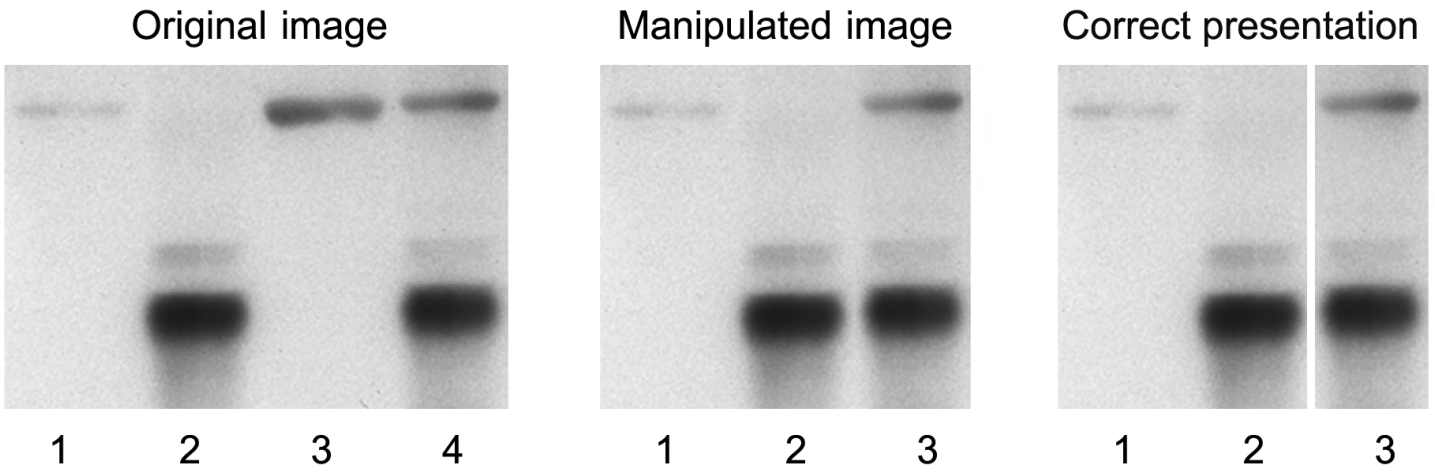


1 2 3

"Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and as long as they do not obscure, eliminate, or misrepresent any information present in the original."

Inappropriate Manipulation Examples

- Splicing:

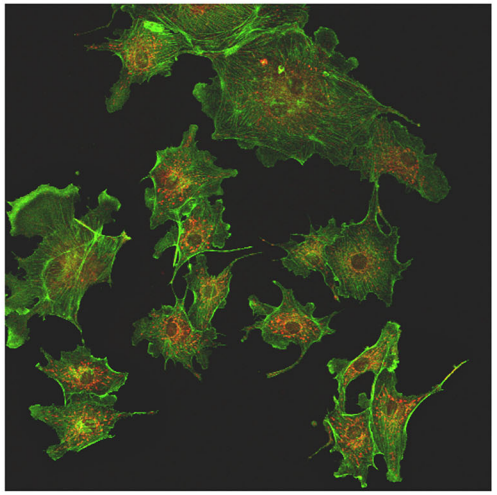


"The grouping of images from different parts of the same gel, or from different gels, fields, or exposures must be made explicit by the arrangement of the figure."

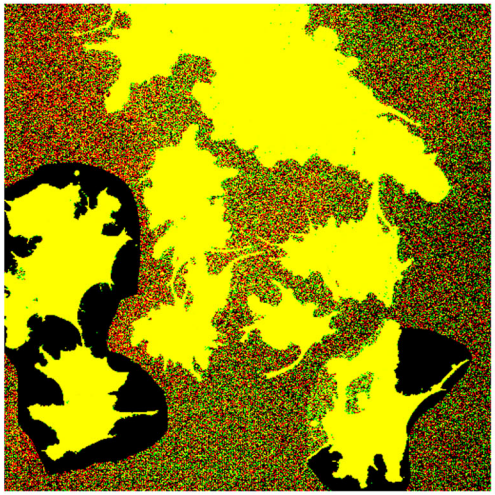
Inappropriate Manipulation Examples

- Splicing:

Manipulated Image



Manipulation Revealed by Contrast Adjustment



Inappropriate Manipulation Examples

- Splicing:

From P.I.s whose spliced images were questioned:

“The pictures for the wild type were done as a collage of cells… We have left the pictures like that, because we think it looks nicer.”

“We combined cells from several fields into a single image to make this image more representative of the phenotype we have observed.”

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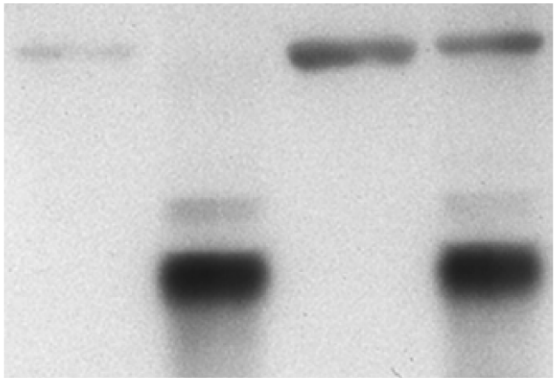
Fraudulent Manipulation Examples

Fraudulent Manipulation Examples

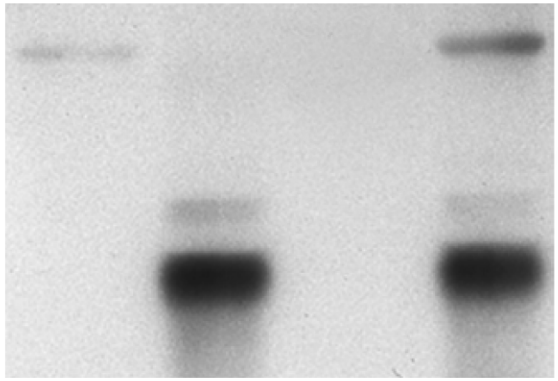
- Deleting a band:

Original image



1 2 3 4

Manipulated image

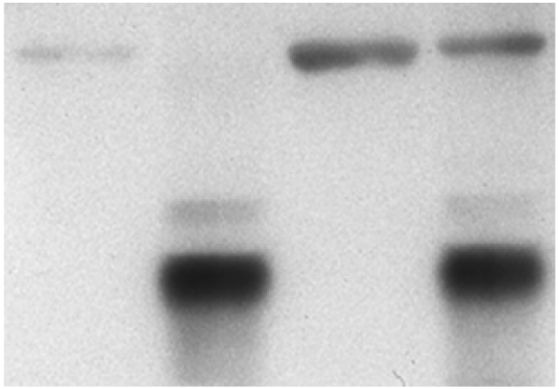


1 2 3 4

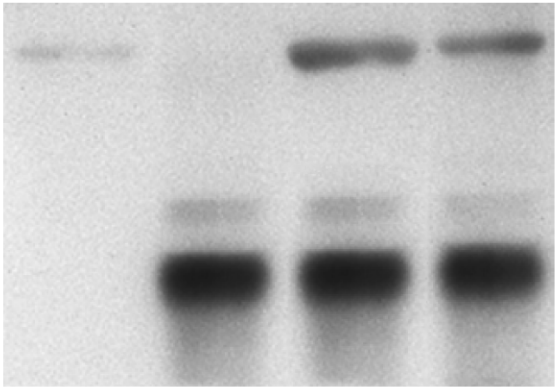
Fraudulent Manipulation Examples

- Adding a band:

Original image

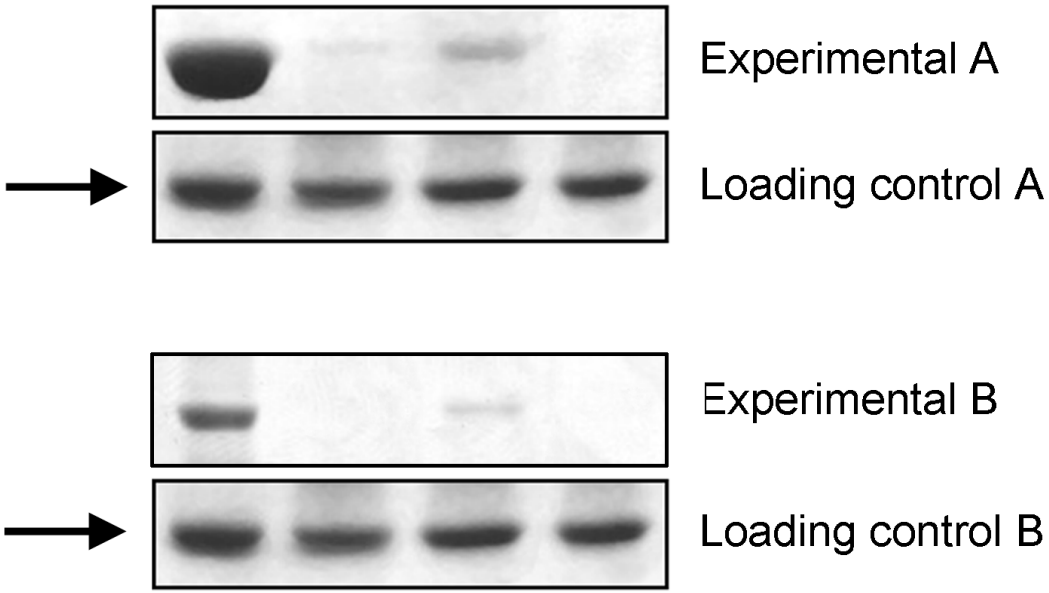


Manipulated image



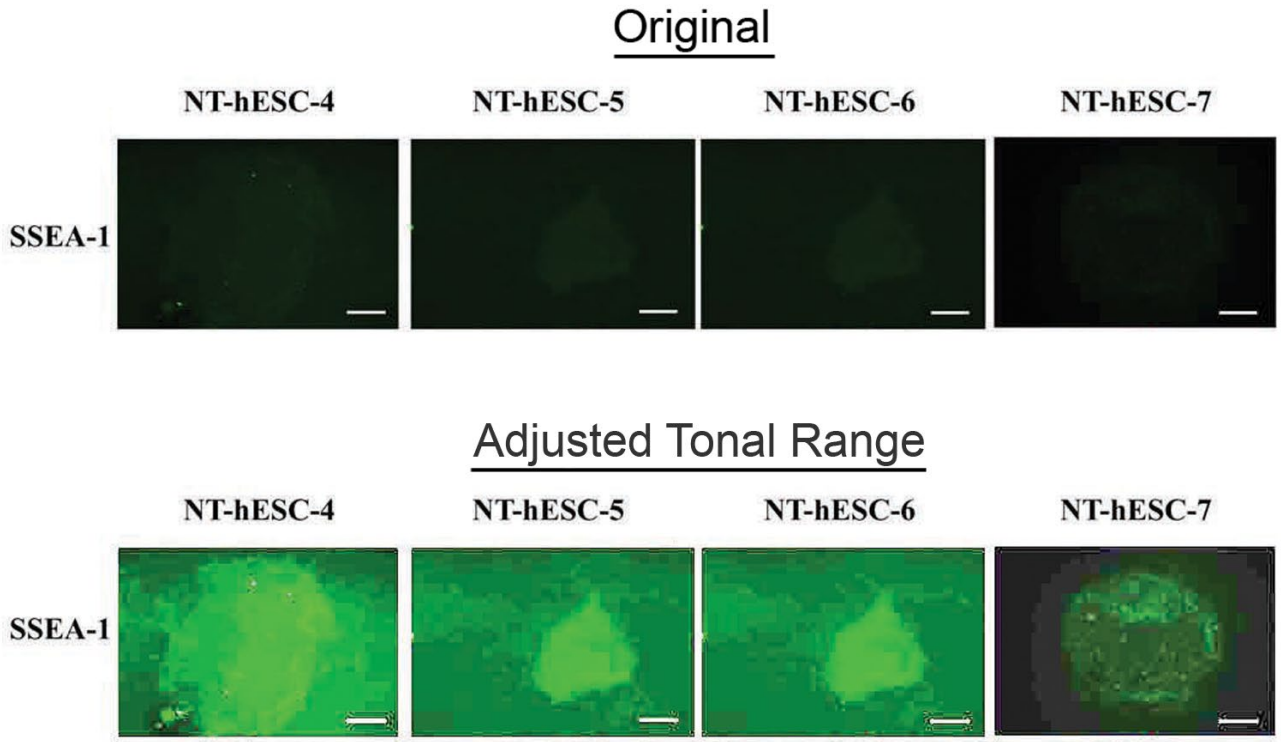
Fraudulent Manipulation Examples

- Duplicating Data:



Fraudulent Manipulation Examples

- Duplicating Data:



Hwang, W.S., et al. 2005. Patient-Specific Embryonic Stem Cells Derived from Human SCNT Blastocysts. *Science* **308**:1777-1783.

Assuring the integrity of image data. Future developments:

- Routine image screening by more journals.
- Open Microscope Environment: standardized database for storing and sharing image data.
- Software for detecting image manipulation.

A digital technique for art authentication

Siwei Lyu*, Daniel Rockmore*†, and Hany Farid*‡

Departments of *Computer Science and †Mathematics, Dartmouth College, Hanover, NH 03755

Communicated by David L. Donoho, Stanford University, Stanford, CA, September 1, 2004 (received for review May 13, 2004)

We describe a computational technique for authenticating works of art, specifically paintings and drawings, from high-resolution digital scans of the original works. This approach builds a statistical model of an artist from the scans of a set of authenticated works against which new works then are compared. The statistical model consists of first- and higher-order wavelet statistics. We show preliminary results from our analysis of 13 drawings that at various times have been attributed to Pieter Bruegel the Elder; these results confirm expert authentications. We also apply these techniques to the problem of determining the number of artists that may have contributed to a painting attributed to Pietro Perugino and again achieve an analysis agreeing with expert opinion.

17006–17010 | PNAS | **December 7, 2004** | vol. 101 | no. 49

www.pnas.org/cgi/doi/10.1073/pnas.0406398101

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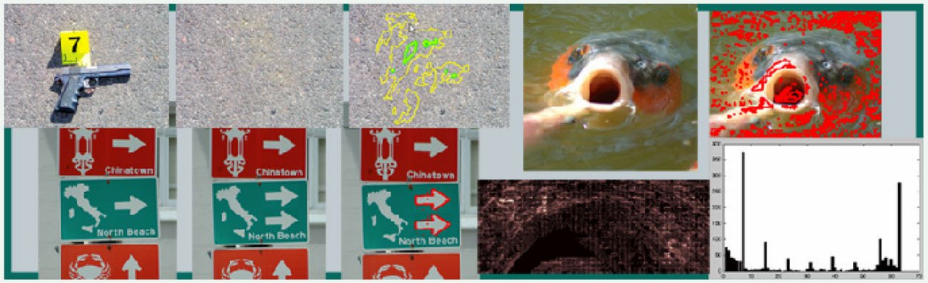
Rigour Search

Rigour 1.0™ is a user friendly software package providing intelligent image manipulation analysis techniques for detecting alterations to digital art. The scope of image alterations can range from harmless beautification to the purposeful concealment of critical information. Many of these alterations cannot be found by visual observation. Often, experienced image editors will search for alteration by adjusting contrasts, luminosity, and color ranges. However, with the proliferation of potent image editing techniques, human detection has become insufficient.



Rigour 1.0 is available in a standalone, desktop format that runs on Windows O/S PCs. Additionally, Rigour 1.0 can be placed on-line as an in-process automation for bulk processing jobs. To find out more, download a comprehensive brochure, or download a demo video.

Internet

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Conclusions

Journal editors must protect the published record by applying standards of data integrity to all papers.

- Set simple, practical, enforceable guidelines derived from research community standards.

- Use simple methods to monitor compliance with those guidelines.