Why teaching “Ethics”

- mistakes in data handling lead to incorrect knowledge,

  paper retractions and scientific misconduct investigations

- tackling the problem of fraud in science

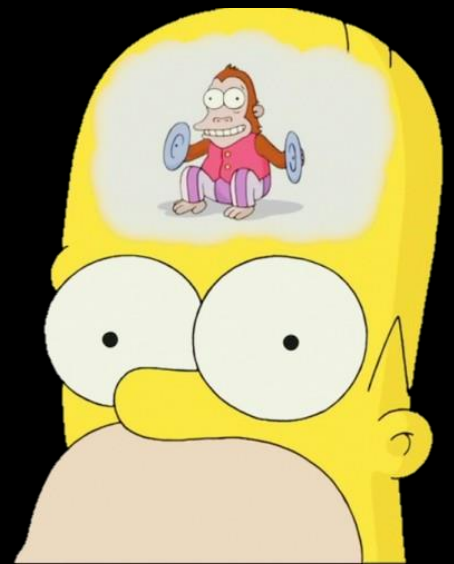
- putting an end to a “data beautification” culture

- the topic is largely neglected during postgraduate studies causing

  many researchers to unknowingly engage in unethical practices

How to teach “Ethics”

lack of education on basic understanding of digital images → unethical practices → incorrect knowledge, scientific misconduct

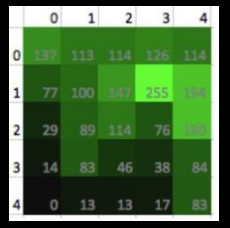


Example workshop on “Ethics in bioimage data handling”

Day 1 (theory)

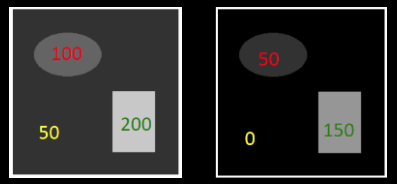
Understanding the Digital Image

- why images are important in biomedical research
- images aa matrix of numbers
- LUT, histogram, bit depth, colours



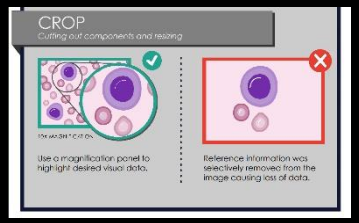
Bioimage analysis fundamentals

- what can be quantified in bioimage data
- how good are “raw images”
- linear and non linear operations
- background subtraction
- contrast adjustment



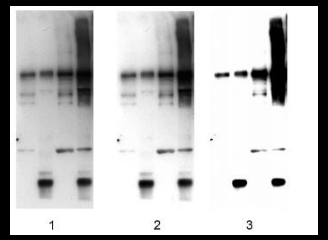
Handling the bioimage data - Ethical guidelines

- historical perspective on image manipulation
- image manipulation in scientific literature
- common mistakes
- ethical guidelines



Preparing bioimage data for publication and presentation

- how to present microscopy data
- saving, cropping, composing, contrast adjustment, use of colours
- image annotation
- resizing and resolution (the “dpi” thing)



Data manipulation – Publisher/journal perspective

Day 2 (practical)

Basics of digital image processing

Forensic tools to inspect digital image integrity

From the raw image to data presentation

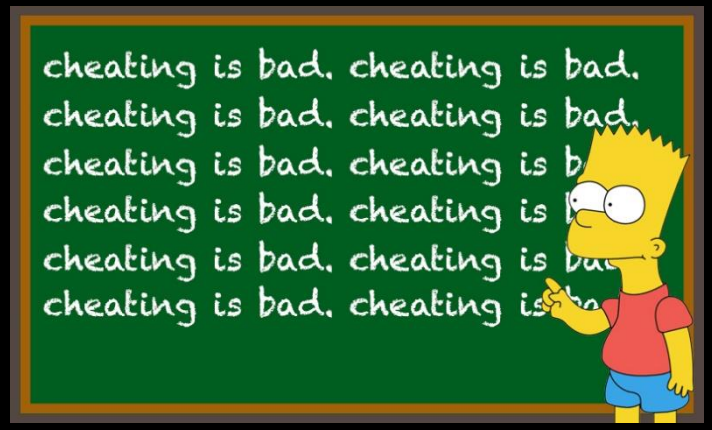
What is the goal?

lack of education on basic understanding of digital images

unethical practices

incorrect knowledge, scientific misconduct

“cheaters”



Slippery slope of bioimage data handling

"images as data"
pseudocolors (LUTs)
contrast adjustment
background subtraction

editing part of the image e.g. "cleaning dirt"

removing "inconvenient" pixels e.g. "deleting a dead cell in the corner or weird band at 130kDa"

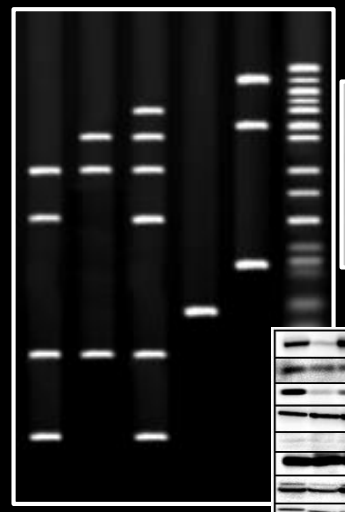
splicing different images/gels together to make a phenotype "more obvious"

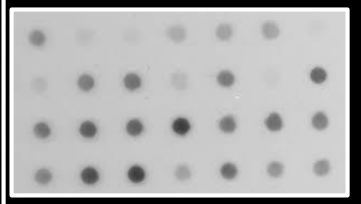
fabricating data, deliberately m[illegible]elling images, "drawing" bands, copy/pasting pixels between different experiments…

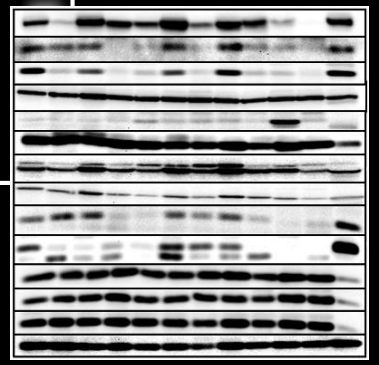
state of the mind:
"everybody is doing it anyway!"

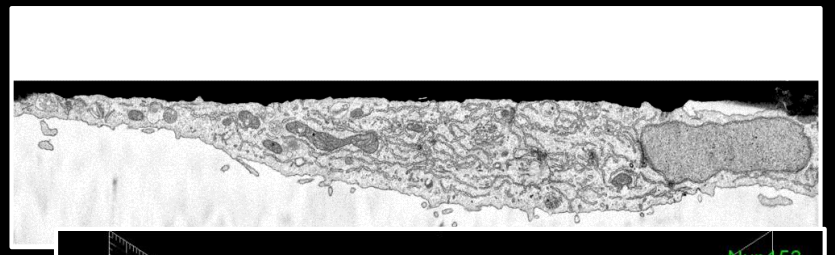
"what the hell" effect

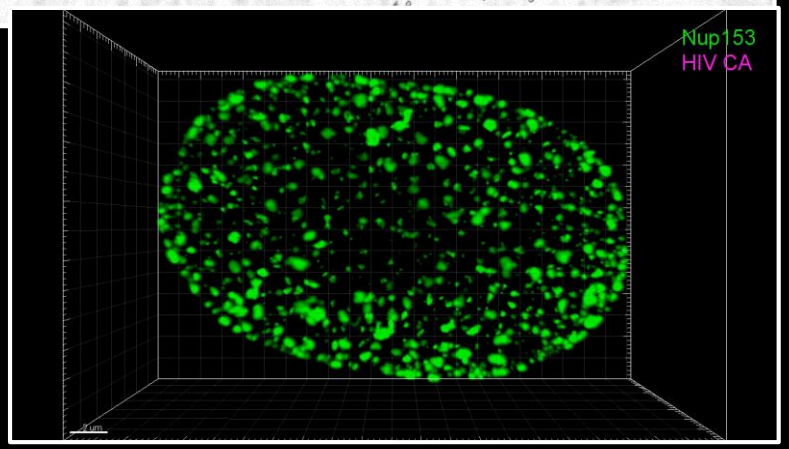
“Understanding digital images” as core competence in biomedical research?

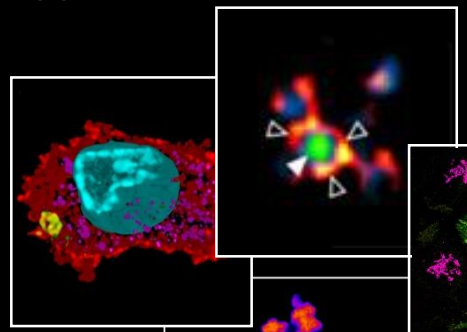


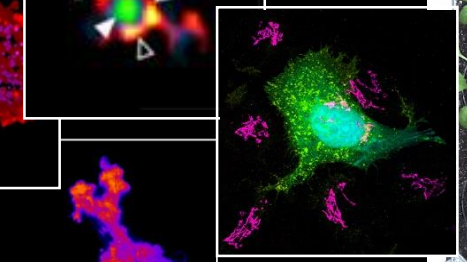


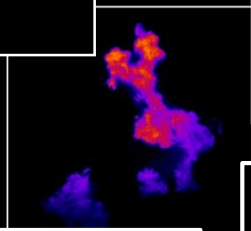


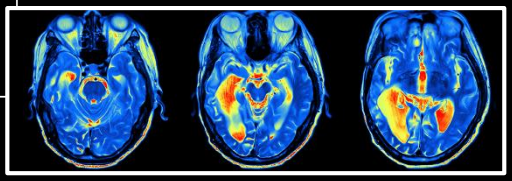


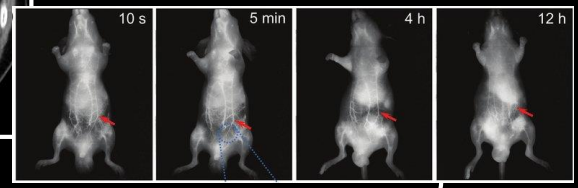


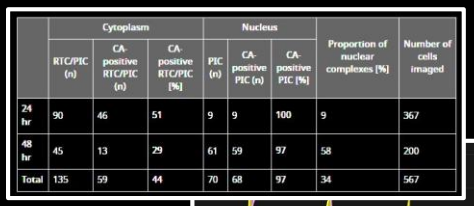












	Cytoplasm			Nucleus			Proportion of nuclear complexes [%]	Number of cells imaged
	RTC/PIC (n)	CA-positive RTC/PIC (n)	CA-positive RTC/PIC [%]	PIC (n)	CA-positive PIC (n)	CA-positive PIC [%]		
24 hr	90	46	51	9	9	100	9	367
48 hr	45	13	29	61	59	97	58	200
Total	135	59	44	70	68	97	34	567