

# Lecture 15: Measurement

Friday, October 20, 2023

Your Teaching Fellows:

003/004:	Zahra Abolghasem	Bronwen Grocott
	Vasileia Karasavva	Ni An
010:	Thalia Lang	Malina Lemmons
	Ruoning Li	Irene Wen

Lectures: MWF 12:00 PM – 1:00 PM (003); 1:00 PM – 2:00 PM (004); 2:00 PM – 3:00 PM (010)

Office hours: Tuesdays 2:00 PM – 4:00 PM

## Note:

- Please complete the survey at this link for discussions next week:  
<http://bit.ly/217scale>

# Justice

- Justice: Fairness and sound rationale in participant recruitment
  - One population should not bear all the risks of research
  - Especially to protect disempowered and socially vulnerable populations



## Justice

- 1940's – 1950's: Residential school (mal)nutrition experiment
  - <https://www.cbc.ca/news/canada/thunder-bay/residential-school-nutrition-experiments-explained-to-kenora-survivors-1.3171557>
  - Created severe health problems including:
    - Denied dental care to observe dental caries and gingivitis
    - Contributed to more deaths due to exacerbated anemia

**No consent/assent**

**No awareness of study**

**No voice for the vulnerable**

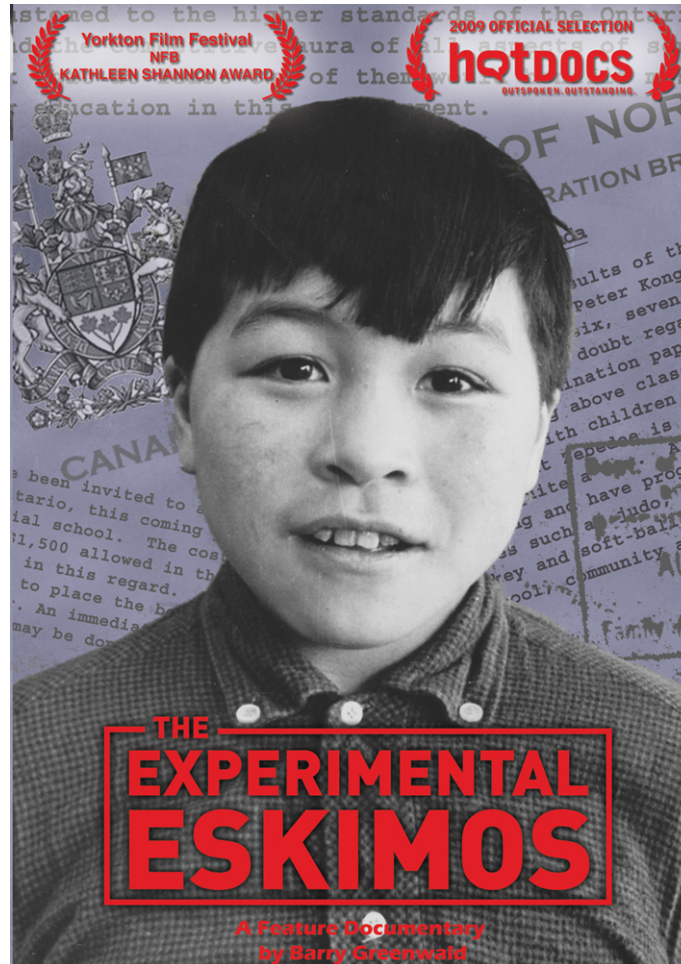
# Justice

- 1960's – Sixties scoop
  - Canadian government forcibly removed Indigenous children from communities, transplanted into adoption/foster homes
  - Did not start as scientific study, but viewed as social experiment on assimilation
  - Led to trauma and destruction of cultural systems



# Justice

- 1960's



*"I don't regret the experience; but I have never recovered from it."*  
- Zebedee Nungak

## Research with Indigenous Populations

- Indigenous populations often bear disproportionate costs of research
  - Exploitation by researchers taking advantage of Indigenous people
    - Take credit caring about Indigenous people; but
    - Researchers give little, take a lot; Indigenous collaborators give a lot, get little back
- Special process for ethical clearance for research





# Animal Research





# Animal Research

- Benefits of animal research:
  - Allows researchers to control genetic makeup of “participants” being studied
  - Allows researchers to more easily study physiological, neurological, and genetic foundations of behaviour

# Animal Research

- Ethics of animal research

- 3 R's

- Replacement

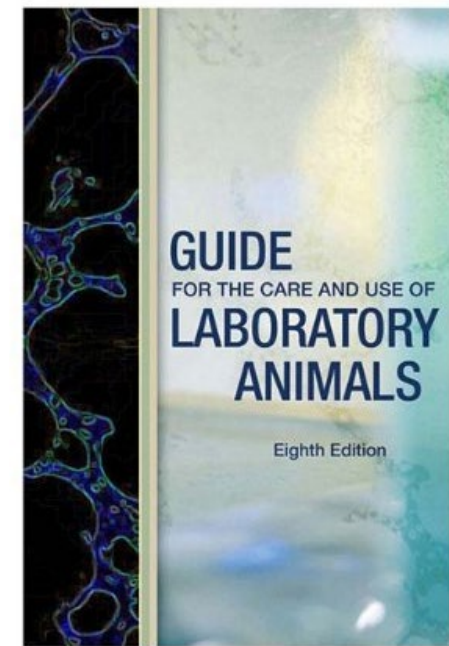
- Only do studies with animals if alternatives do not exist (e.g. computer simulations?)

- Refinement

- Minimise or eliminate animal distress by modifying experimental procedures

- Reduction

- Adopt experimental designs that require the fewest animal subjects possible



## Animal Research

- Question: The 2<sup>nd</sup> R (Refinement): Minimise or eliminate animal distress by modifying experimental procedures
  - Which of the 3 ethical principles we discussed earlier is this demonstrating?

## Animal Research

- Animal rights groups tend to believe that:
  - Animals are just as likely as humans to experience suffering
    - Animal research is allowed, only if human subjects are also allowed to be used
  - Animals have inherent value and rights, equal to those of humans
    - Animals should not bear burden of research to benefit another species
  
- Question: Which of the 3 ethical principles we discussed earlier do these views demonstrate?

## Other ethical issues...

### Faking/Manipulating data



Marc Hauser



Diederik Stapel



Lawrence Sanna



Dirk Smeesters

# Studied morality



## Other ethical issues...

### Retraction Watch

Tracking retractions as a window into the scientific process

#### A new record: Major publisher retracting more than 100 studies from cancer journal over fake peer reviews

with 16 comments

Springer is [retracting 107 papers](#) from one journal after discovering they had been accepted with fake peer reviews. Yes, 107.

To submit a fake review, someone (often the author of a paper) either makes up an outside expert to review the paper, or suggests a real researcher — and in both cases, provides a fake email address that comes back to someone who will invariably give the paper a glowing review. In this case, Springer, the publisher of *Tumor Biology* through 2016, told us that an investigation produced “clear evidence” the reviews were submitted under the names of real researchers with faked emails. Some of the authors may have used a third-party editing service, which may have supplied the reviews. The [journal is now published by SAGE](#).



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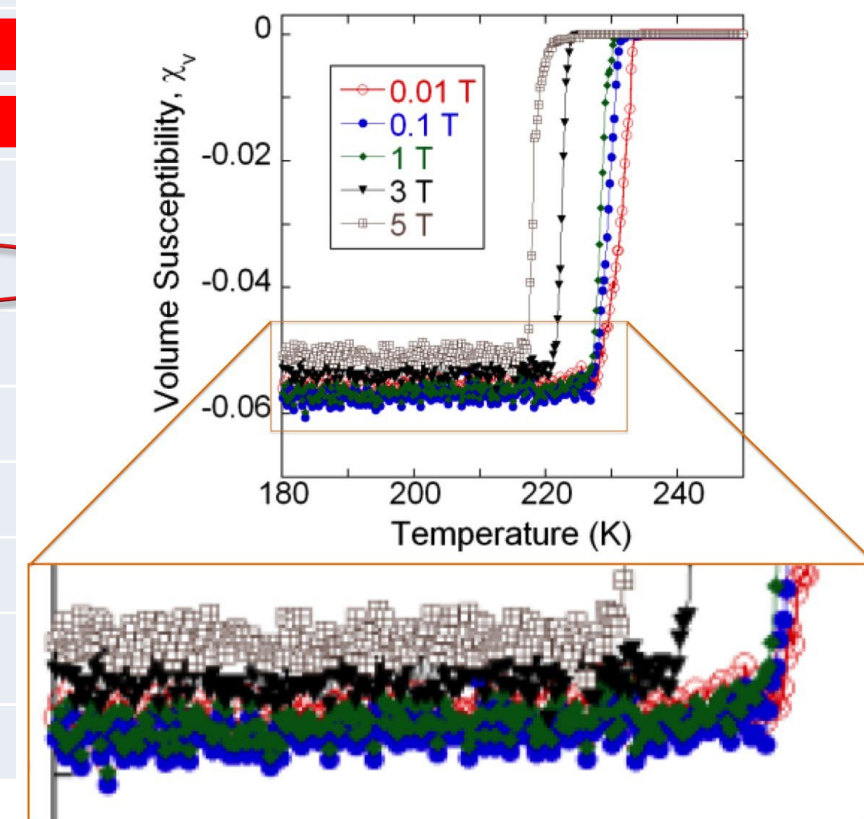
[Help us: Here's some of what we're working on](#)

[How you can support Retraction Watch](#)

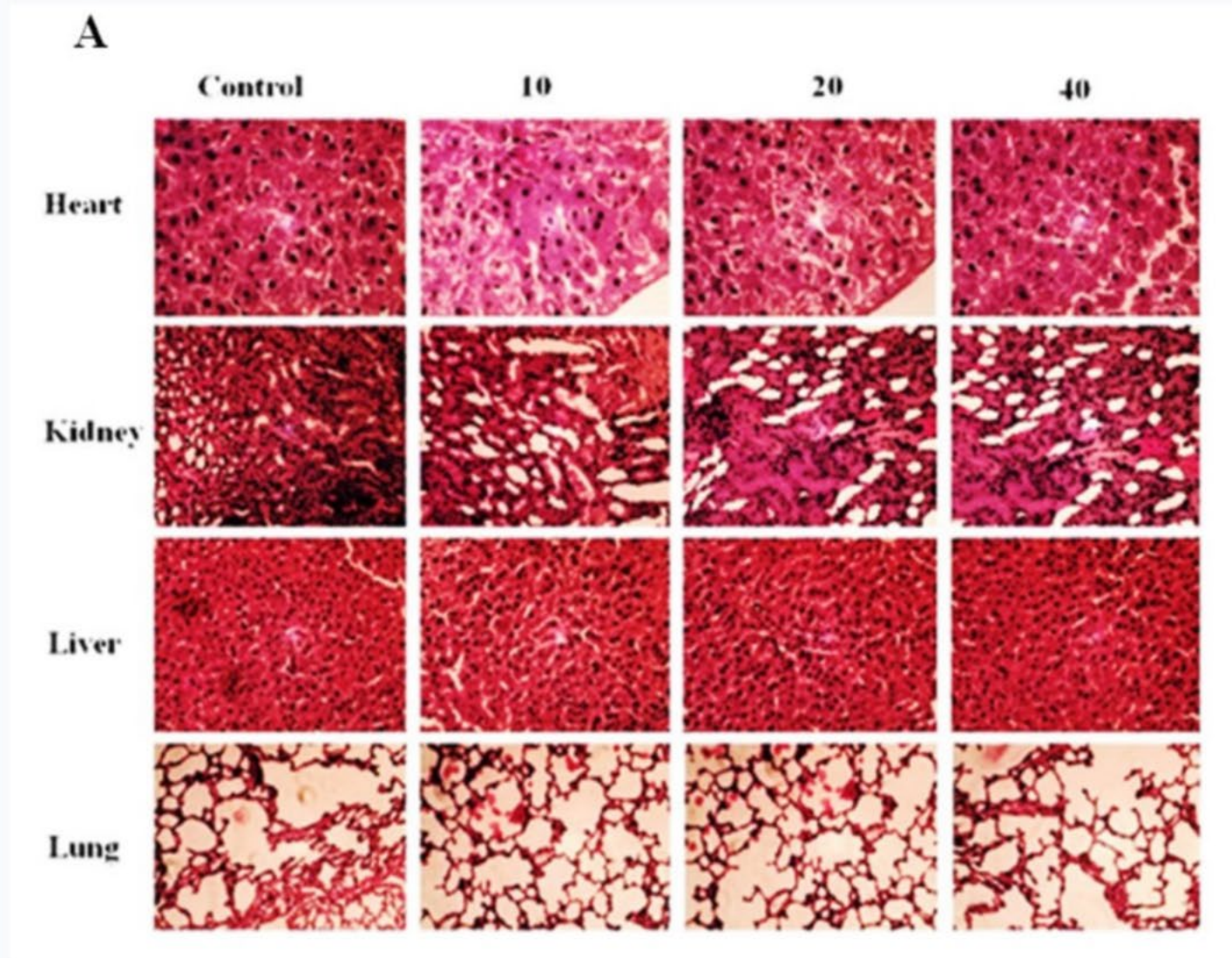
[Meet the Retraction Watch staff](#)

1	Yoshitaka Fujii	Biomedicine	183	
2	Joachim Bolt	Biomedicine	156	
3	Yoshihiro Sato	Biomedicine	106	
4	Jun Iwamoto	Biomedicine	82	
5	Ali Nazari	Engineering	75	
6	Diederik Stapel	Psychology	58	
7	Yuhji Saitoh	Biomedicine	53	
8	Adrian Maxim	Engineering	48	
9	Chen-Yuan Chen	Comp Sci	43	
10	Fazlul Sarkar	Biomedicine	41	
11	Shahaboddin Shamshirband	Comp Sci	41	
12	Hua Zhong	Chemistry	41	

Credits: <https://retractionwatch.com/>



**Click on parts of the image that you can see are duplicated.**

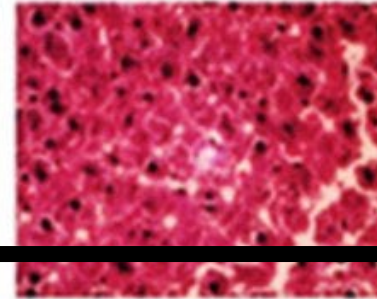
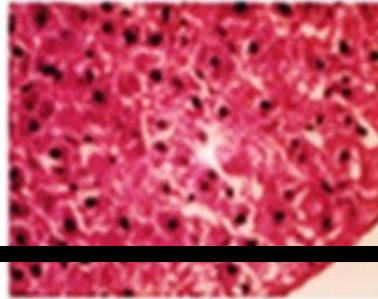
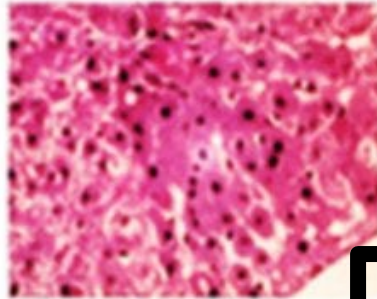
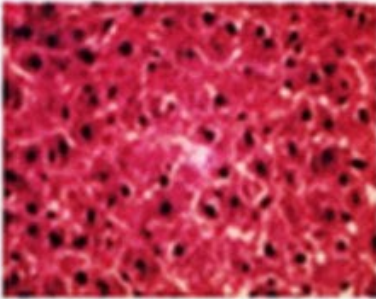
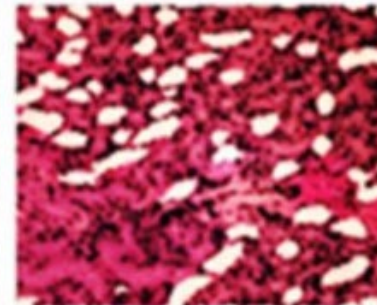
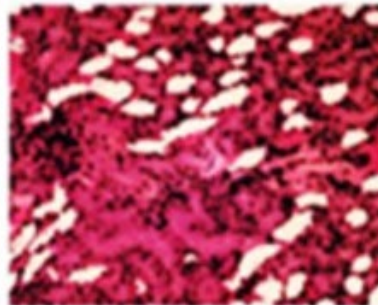
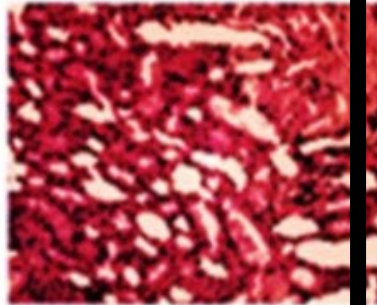
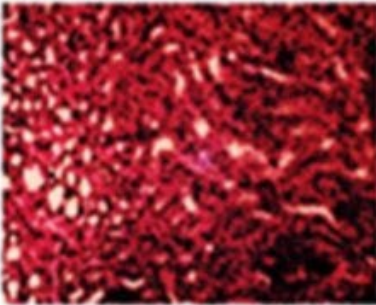
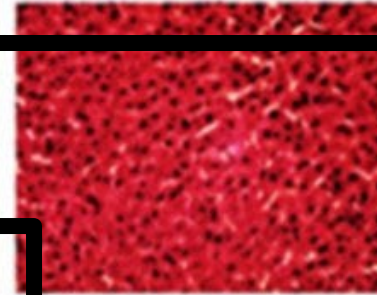
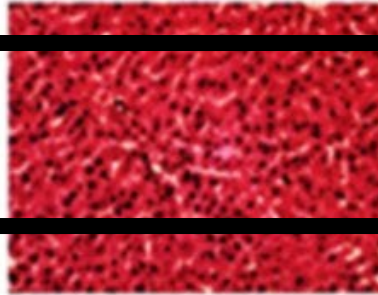
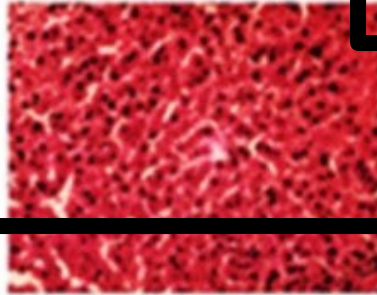
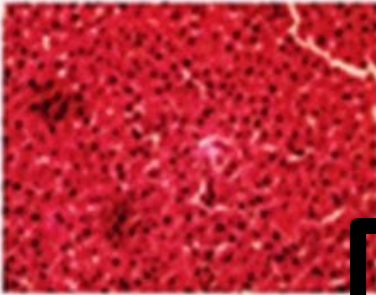
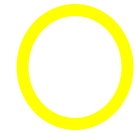
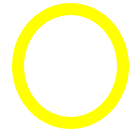
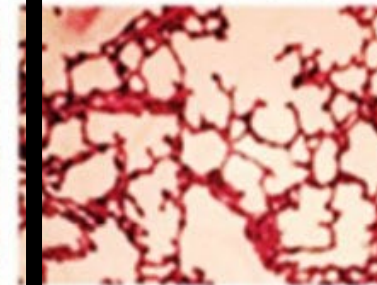
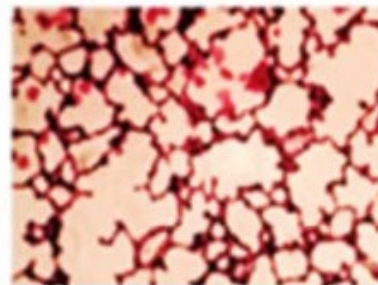
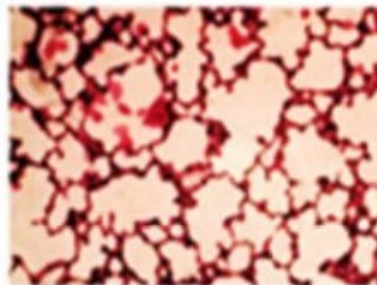
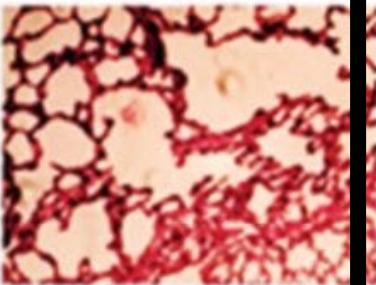




**A**

Credit: Dr. Elisabeth Bik (@MicrobiomDigest)

16

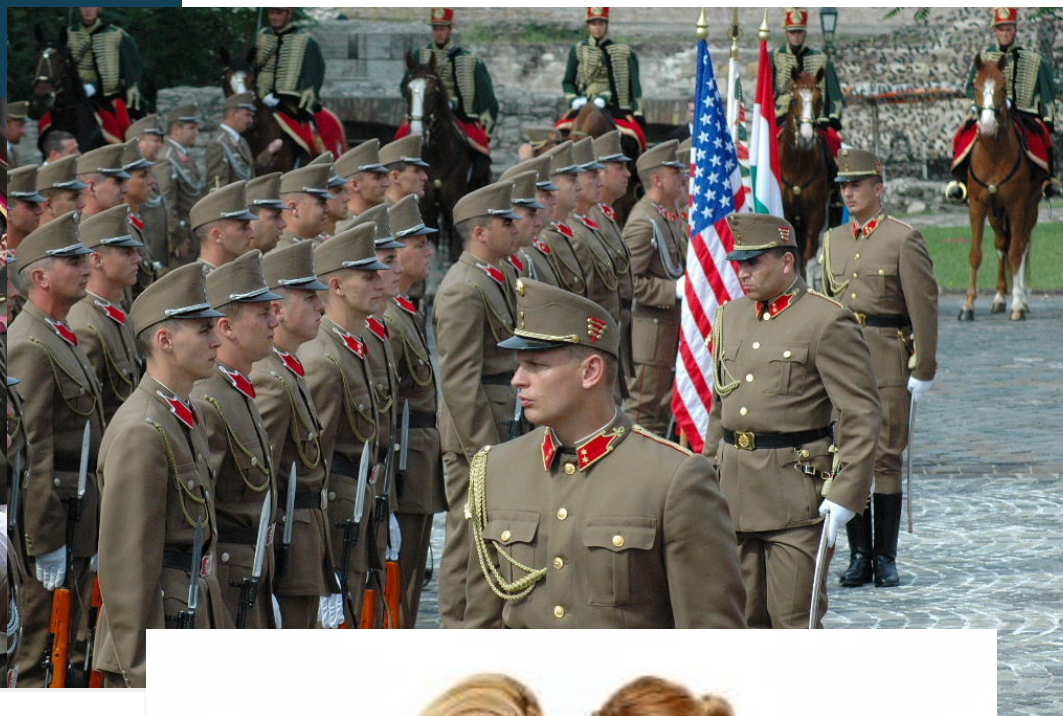
**Control****10****20****40****Heart****Kidney****Liver****Lung**

## Learning objectives

- By the end of next class, you should be able to:
  - State the key questions used to evaluate a measure
  - Define reliability & its types
  - Define construct validity & its types
  - Identify examples of each type of reliability and validity
  - Explain the role reliability and validity play in research



# Principles of Measurement

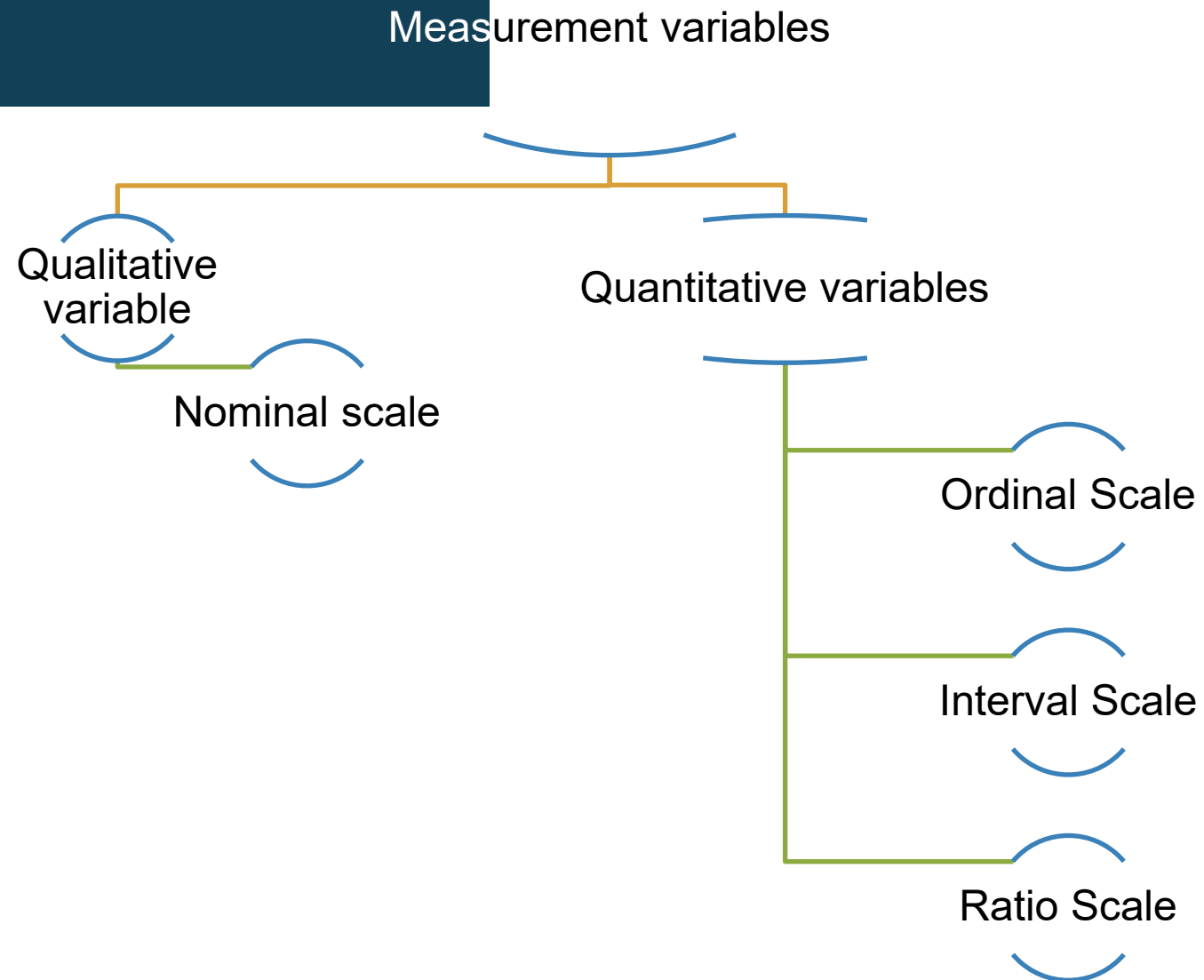




## What to look for in different designs

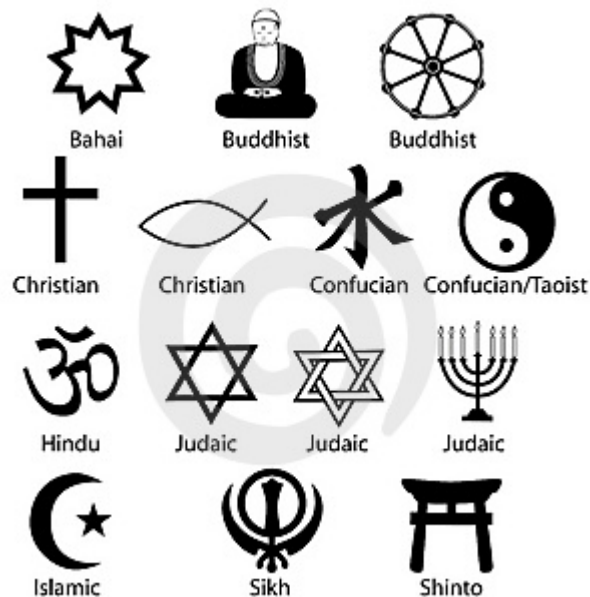
- Non-experimental designs:
  - ALL variables are measured
- Experimental designs:
  - DV is measured

# Scales



# Nominal scale

- Assigned numerical values are meaningless



CITY OF VANCOUVER GENERAL LOCAL ELECTIONS  
**SATURDAY NOVEMBER 20, 1993**

TO VOTE, COMPLETE THE ARROW(S) POINTING TO YOUR CHOICE(S), LIKE THIS: ☐ PLEASE CLERK

**USE ONLY SPECIAL PEN PROVIDED**

Candidates for MAYOR For a 3 year term commencing December 6, 1993	Candidates for PARK COMMISSIONER For a 3 year term commencing December 6, 1993	Candidates for COUNCILLOR For a 3 year term commencing December 6, 1993
<b>ONE 1 TO BE ELECTED</b>	<b>SEVEN 7 TO BE ELECTED</b>	<b>TEN 10 TO BE ELECTED</b>
Jonathan G. HILLISWORTH	Dick SEATON	ANDY TELFER
Philip OWEN	Kewal S. PABLA	Jenny Wai Ching KWAN
Dr. Ian Goddard SALMI	Doug HARRIS	David J. GARDINER
The CAPTAIN	Malcolm ASHFORD	Tom TSANG
Jeremy PRICE	Tim LOUIS	James Kickback FARADAY
Marion DRAKOS	Gary G. CRANE	Kenneth Stephen DOUGHIE
Roger Moxie STREETS	Fred JAY	Kent LINDSAY
Sandy BEACH	Robert James BLACKWELL	Sam SULLIVAN
Bob SEEMAN	Wesley JANG	Jennifer P. CLARKE
Terry K. DUNNE	Helen DUNBAR	Don BELLAMY
Libby DAVIES	Larry M. MUSCATT	Lynne KENNEDY
Heider J. FERNANDES	Bob CHORUSH	Cowboy ELLIS
Arne HANSEN	David S. FERREIRA	Tim SHEN
Mike CHIVLO	Allan DE GENOVA	Merrilee ROBSON
Sean Patrick VELEY	Stan BENNETT	Richard NANTEL
Evan OZIRNY	Donna MORGAN	Anne BEER
Ari Y. BENBASAT	David O. CHESMAN	Jim O'DEA
Matthew A. MARTIN	Adam S. BARBOLET	Richard WOOD
Jonathan HAGEY	Dermot FOLEY	Malta SANTIAGO
Wretched ETHYL	Susan LEE	Alan C. CLAPP
Stu CAMPBELL	James PETRIE	Hardev S. BAL
Angus Ian MACDONALD	Anita ROMANIUK	Sadie KUEHN
Shane McCUNE	Michael ROBSON	Frank BATTISTA
END OF CANDIDATES FOR MAYOR	Nicole KOHNERT	Phil DUREAU
<b>Candidates for SCHOOL TRUSTEE SCHOOL DISTRICT NO. 39 For a 3 year term commencing December 6, 1993</b>	David ATHERTON	*Kentish STEELE
<b>NINE 9 TO BE ELECTED</b>	Gregg SIMPSON	Craig HEMER
Doug RAGAN	Doug BJORKMAN	Gordon H. PRICE
Eduardo ARAGON	Alan P. FETHERSTONHAUGH	George J. PULI
Sandy McCORMICK	Daniel Allan BURNS	Vincent WONG
Jean McCUTCHEON	Walter EINARSON	Rod RAGLIN
David A. GREEN	David MOIR	Ken WALKER
Yvonne BROWN	Michael C. TUSA	John H. JEFFERY
Carol A. MCRAE	Eleanor HADLEY	Joan ROWNTREE
Jennifer MOREAU	Jeremy BRAMWELL	Elisa S. LAY
Marillette Catherine EINARSON	Judith HODGINS	Sage D. GOUNDER
Ken DENIKE	Cindy LADNER	Graham LESLIE
Paul S. GILL	Rolly SKOV	Don WEST
John CHENG	Babur BANSAL	Jacqui UNDERWOOD
Philip S. YUNG	Duncan R. WILSON	Nancy A. CHIAVARIO
Ruth HERMAN	Harvey R. PUDWELL	Dan DOHERTY
Ighal SARA	David STEWART	Dalib S. SIDHU
Richard KWAN	END OF CANDIDATES FOR PARK COMMISSIONER	Maggie IP
John R. ROBERTSON		John R. TAYLOR
Aaron EDWARDS		Frances WASSERLEIN
Paul ALEXANDER		Ragini RANKIN
Alayne KEOUGH		Mai LEHAN
Ellen WONG		END OF CANDIDATES FOR COUNCILLOR
Gary ONSTAD		
Ted HUNT		
Anne ROBERTS		
Michael Charles SAVAGE		
Steve HOPKINS		
Dawn HENDERSON		
Laurie THRONNESS		
Bill BROWN		
END OF CANDIDATES FOR SCHOOL TRUSTEE		

**SAMPLE BALLOT**

TURN CARD OVER AND CONTINUE VOTING



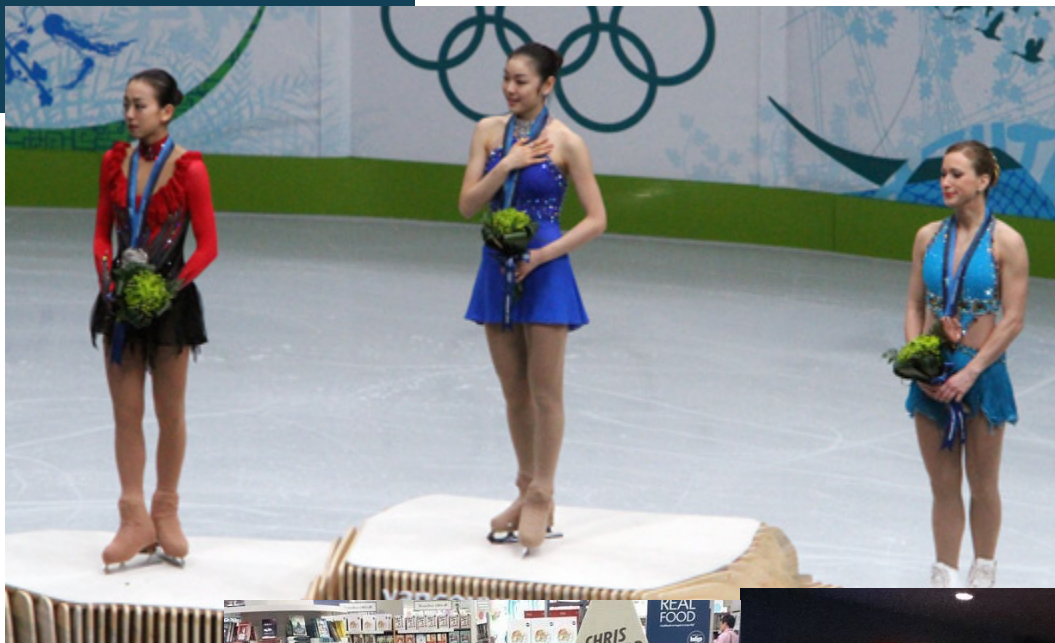
# Ordinal scale

Where do you stand?

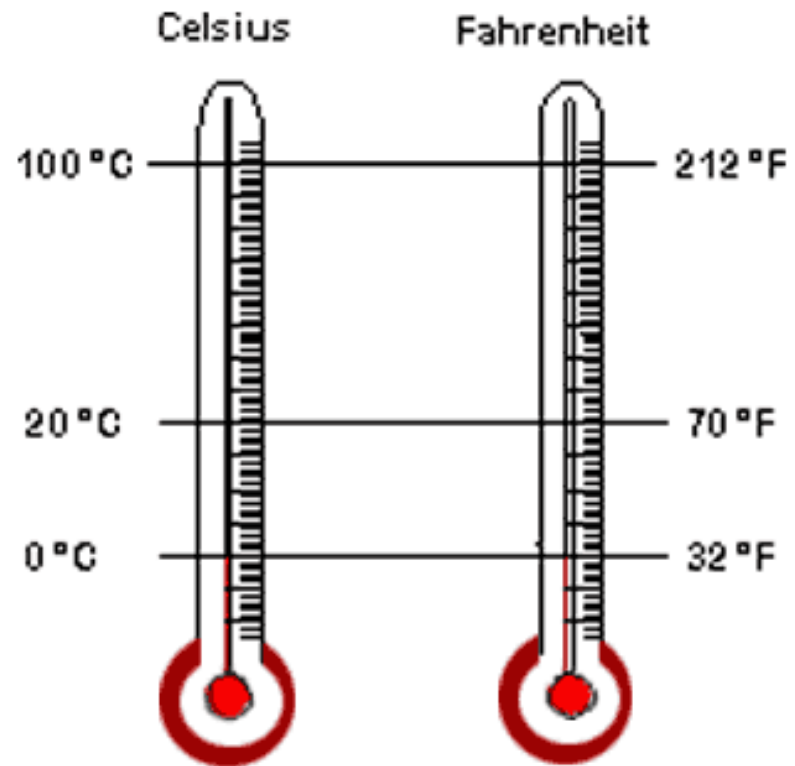
“Best Off” >



“Worst Off” >



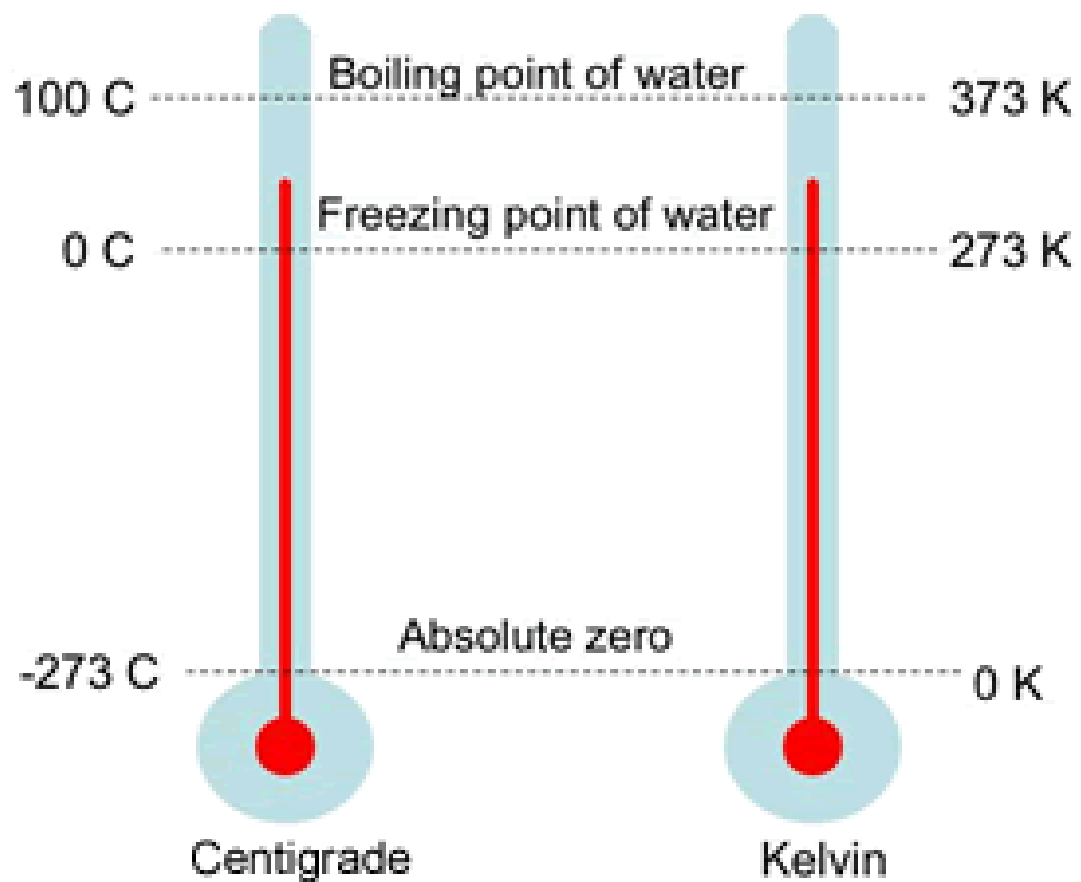
## Interval Scale



Looking at this face, on a scale of 1-5, how much would you like to put on the same LUSH product?



## Ratio Scale



How much LUSH product is there on this face?