WELCOME TO AUSTIN

# FAST 500:

## UNDERSTANDING RESEARCH

JOSH FEDER MD.


I.E.C.D. RESEARCH INCUBATOR
PERSISTENCE PRODUCES PROGRESS

# PART I

## TRUST THE UNIVERSE


NEW!
IT WORKS!
DO IT!
MY UNIQUE IDEA!
HMM
Dr Awesome Famous
I GOT BETTER!
A SATISFIED CUSTOMER

SIDE EFFECTS:

# WHAT WENT WRONG?

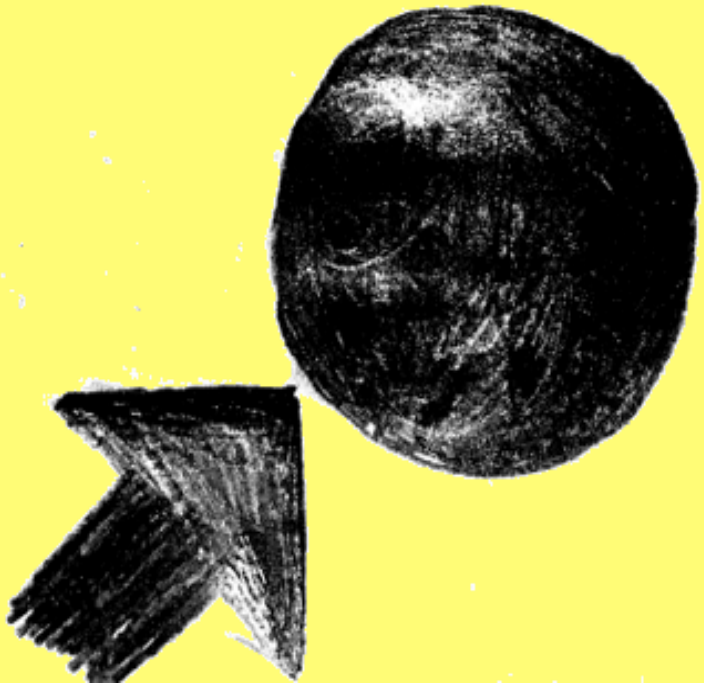
(let's make a list)

-
-
-
-
-

common mistakes in doing science

A POSITIVE REPORT

IS A GOOD START...



BUT IT'S ONLY,
LITERALLY,
A STARTING POINT...

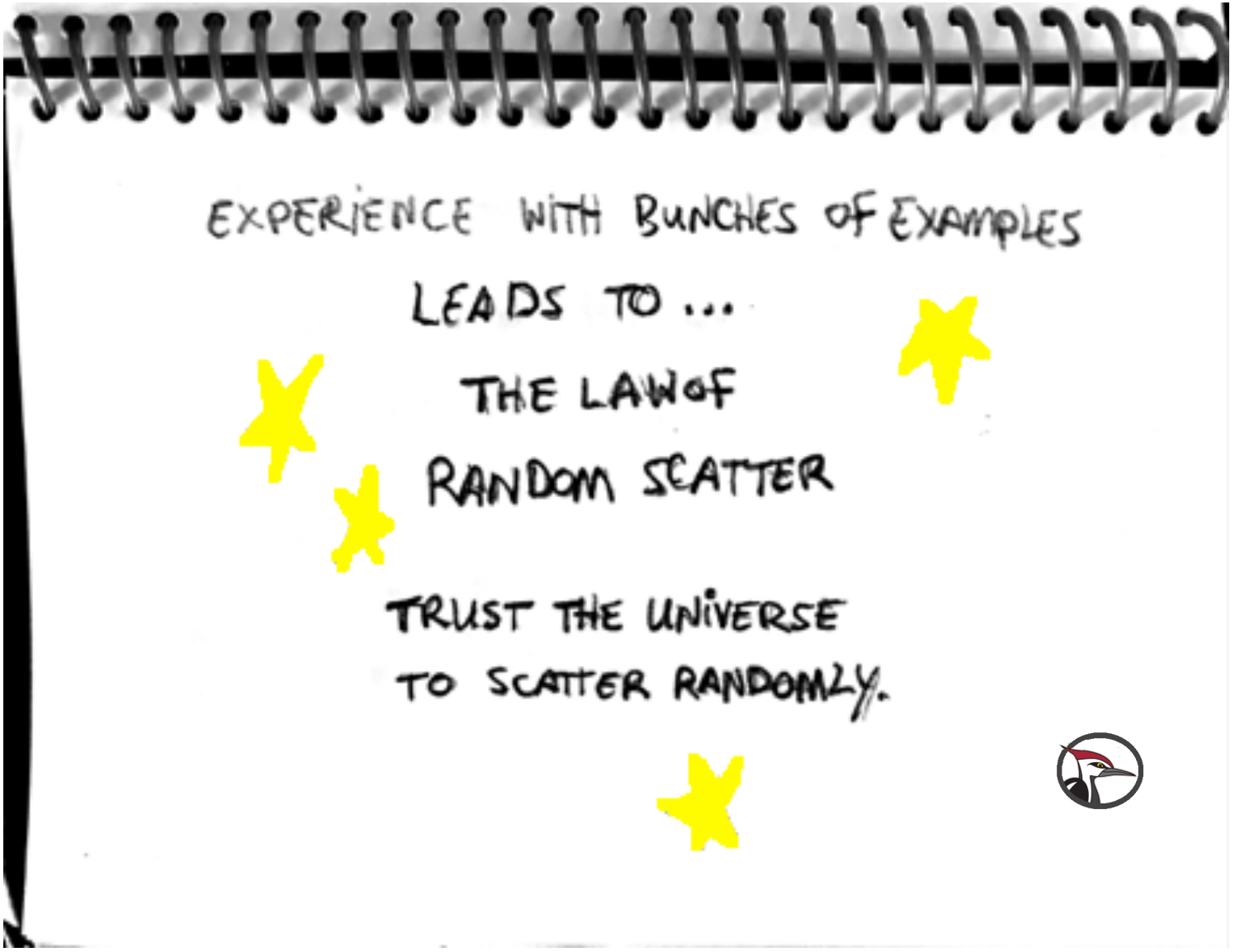
# How Do We Know What's 'True?'

- ☐ It works 
- ☐ It doesn't work 
- ☑ There's a chance...

How much of a chance?

WE NEED A BUNCH OF EXAMPLES TO HELP US PREDICT HOW WELL IT WORKS:

ACTIVITY 1:
A BUNCH OF EXAMPLES


EXPERIENCE WITH BUNCHES OF EXAMPLES
LEADS TO ...
THE LAW OF
RANDOM SCATTER
TRUST THE UNIVERSE
TO SCATTER RANDOMLY.

Q: HOW DO WE DO THIS IN OUR OWN RESEARCH?

A: FIND WHERE THERE SHOULD BE RANDOM SCATTER, AND IF ITS NOT THERE, THEN SOMETHING MAY BE CHANGING THE NATURAL ORDER OF THE UNIVERSE

is it random? maybe, but maybe not

UNUSUAL CLUSTER

SCIENCE LIVES BY THIS IDEA

# THE NULL HYPOTHESIS:

'MY TREATMENT DOESN'T WORK'

PROVE THIS. AND IF YOU CAN'T,

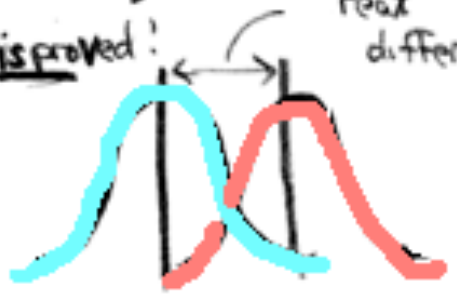
THEN MAYBE IT DOES WORK

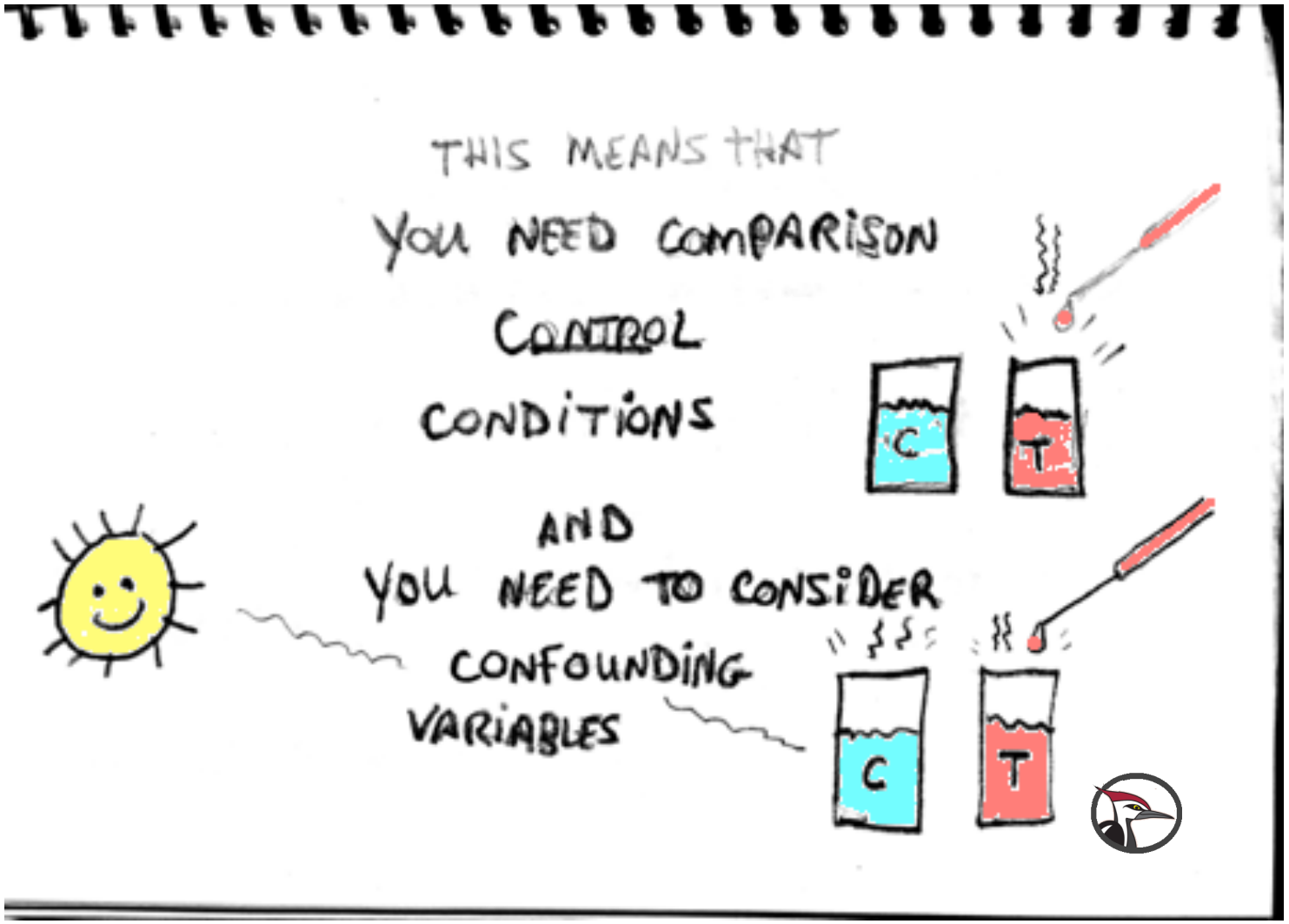
(SOMETIMES)

ALL RESEARCH SHOULD CONSIDER THIS

Ho:


Ho Disproved!




THIS MEANS THAT
YOU NEED COMPARISON
CONTROL
CONDITIONS
AND
YOU NEED TO CONSIDER
CONFOUNDING
VARIABLES
C
T
C
T

# EXAMPLES: DIR RESEARCH

← 200 CASES OF KIDS WHO IMPROVED

VS

quasi experimental pilot study

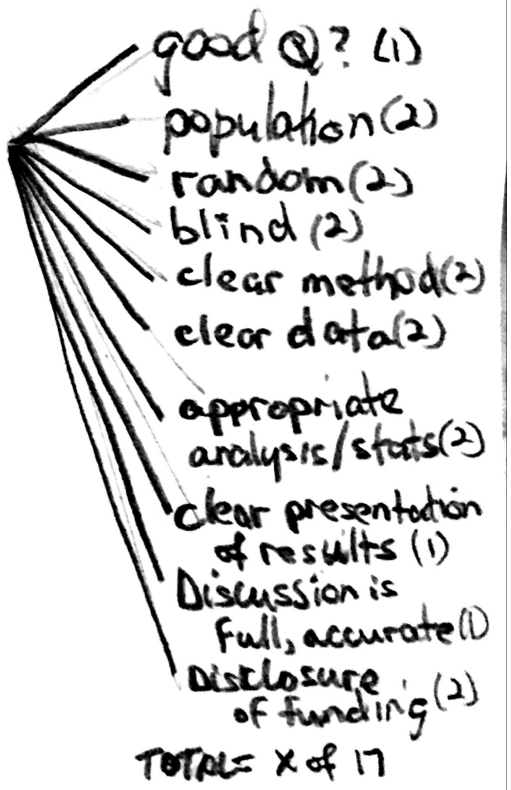
VS

randomized controlled trial (RCT)



HOW MUCH CHANGE OCCURRED IN EACH GROUP?

- RCT RATINGS
- THE 5% SOLUTION
- HOW MANY RCTS DOES IT TAKE TO BE CONFIDENT?
- META ANALYSIS



# BEYOND RCTS:

# EVIDENCE BASED PRACTICE

HAVE YOU HEARD THE STORY OF THE GUY WHO WAS SEARCHING FOR HIS LOST WALLET?


IF AN RCT SAYS YOU CAN TRAIN EVERYONE TO POINT TO A GREEN SQUARE AND POINTING TO GREEN SQUARES IS PART OF AN IQ TEST, SHOULD YOU TRAIN EVERYONE TO POINT TO A GREEN SQUARE?

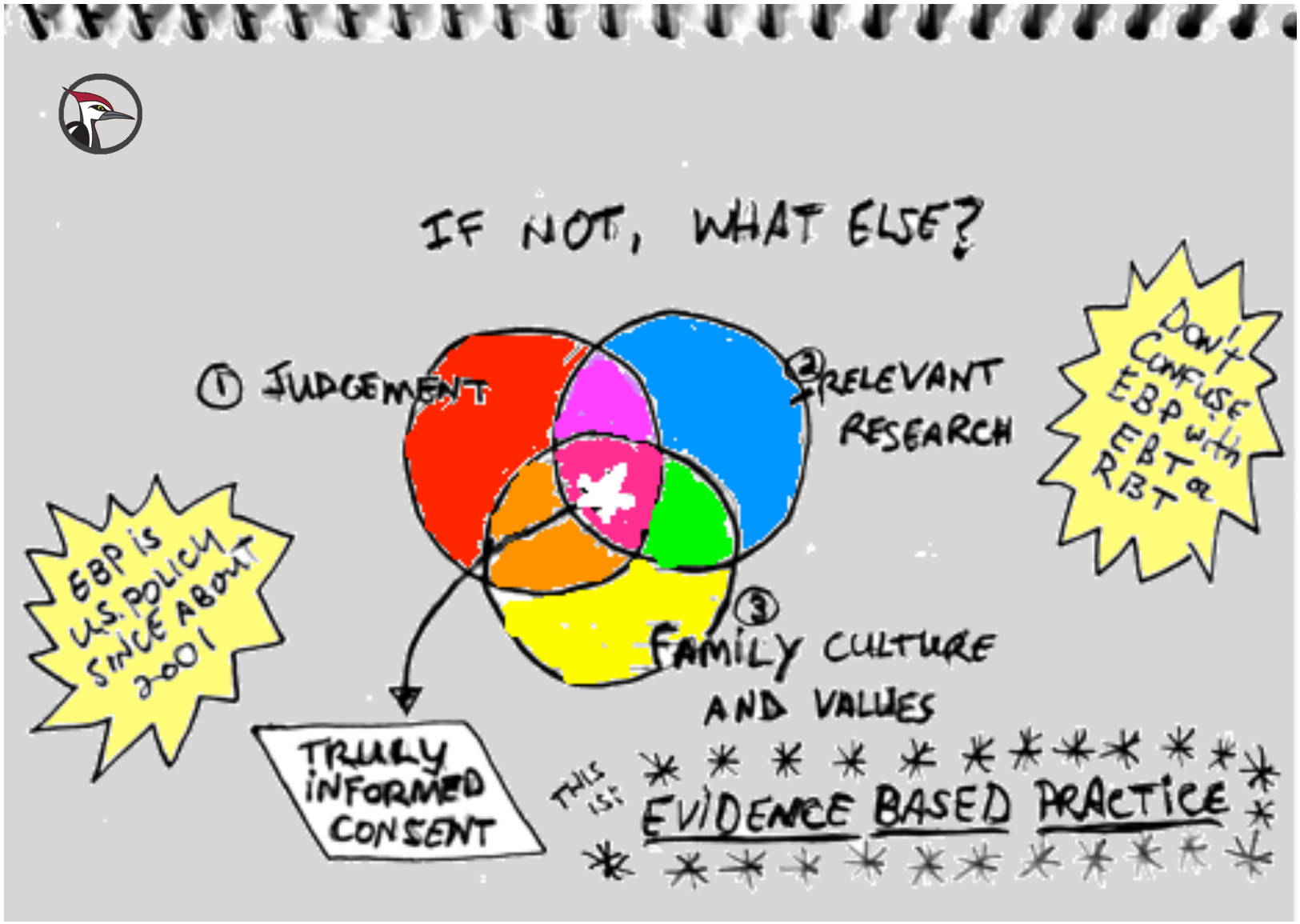
# WHY NOT?

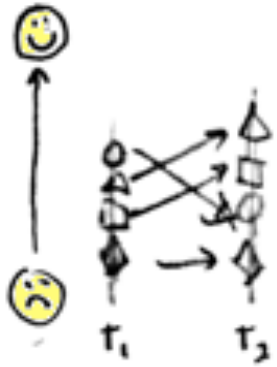
AGE 12 AGE 20

FUNCTIONAL UTILITY ↗


← COMPLIANCE/VULNERABILITY

RESPECT FOR THE PERSON/FAMILY


IF NOT, WHAT ELSE?
① JUDGEMENT
② RELEVANT RESEARCH
③ FAMILY CULTURE AND VALUES
EBP is U.S. POLICY SINCE ABOUT 2001
Don't CONFUSE EBP with EBT or RBT
TRULY INFORMED CONSENT
THIS IS: EVIDENCE BASED PRACTICE




# OTHER KINDS OF RELEVANT RESEARCH

MULTIPLE BASELINE →


← SINGLE SUBJECT DESIGN

LONG TERM FOLLOWUP (SURVIVAL STUDIES) →


EX: THE 'DEMISE' OF THE DSM
(OR: WHEN USUAL SCIENCE DOESN'T DESCRIBE USUAL PEOPLE)

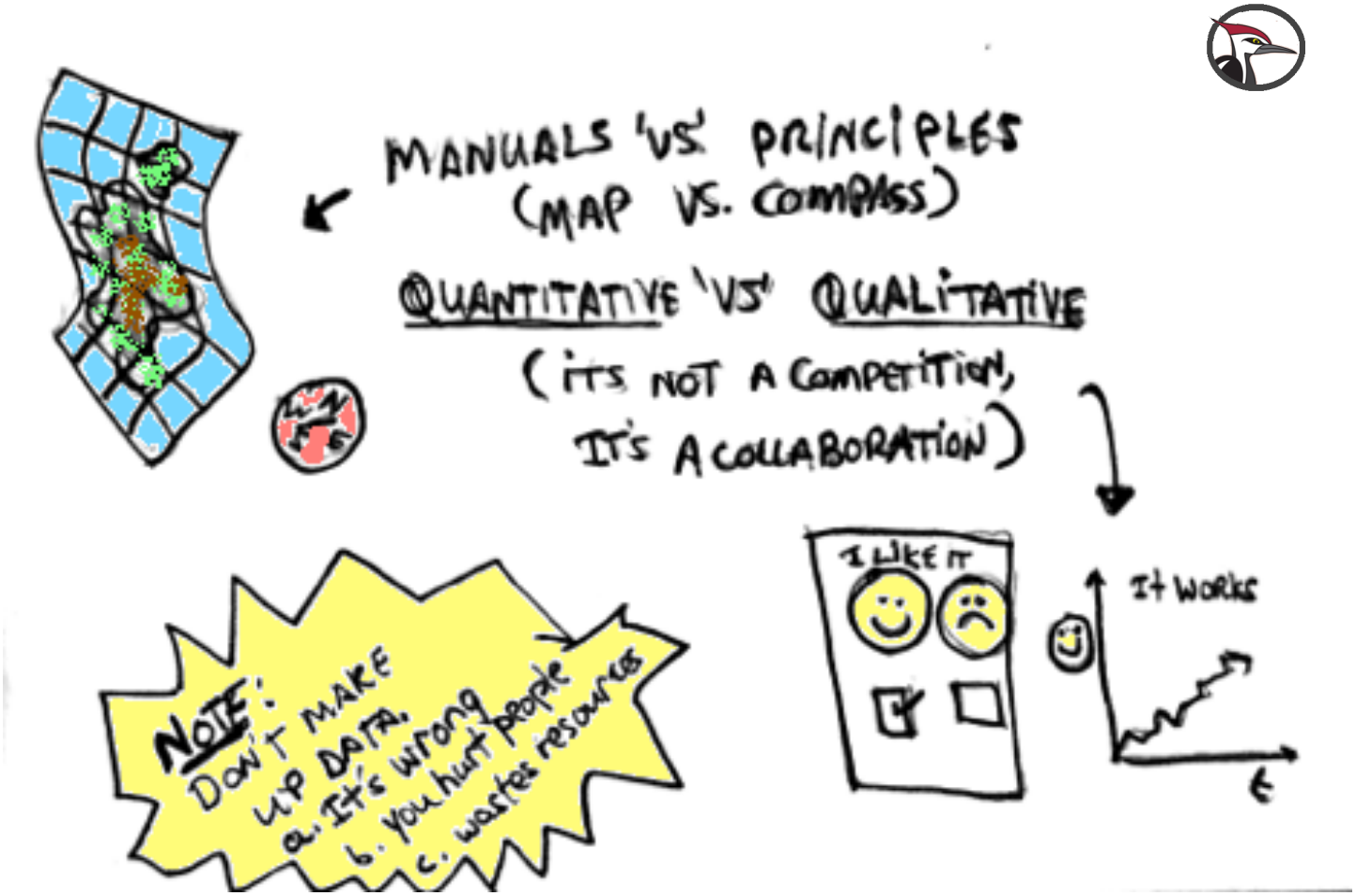
Part II

# NAVIGATING THE PATH

# WELCOME TO THE (CLINICAL) WORLD

- all comers
- MULTIPLE TREATMENTS
- CONTEXT MATTERS
  MULTIPLE REALITIES
- CHANGING COURSE AS YOU GO


ACTIVITY 2a
FOUR CORNERS
(MULTIPLE REALITIES)
ACTIVITY 2b
Baysian thinking
(a mindful walk)
i
Journal what you see, smell, etc. (data)
ii
Journal what you feel/think (analysis)
iii
INTEGRATE QUANTITATIVE & QUALITATIVE


MANUALS 'VS' PRINCIPLES
(MAP VS. COMPASS)
QUANTITATIVE 'VS' QUALITATIVE
(ITS NOT A COMPETITION,
IT'S A COLLABORATION)
I LIKE IT
It works
$
NOTE:
DON'T MAKE
UP DATA.
a. IT'S WRONG
b. YOU HURT PEOPLE
c. WASTES RESOURCES


FAILURE IS USUAL

FAILURE IS NECESSARY
(USE IT TO GUIDE NEXT STEPS!)

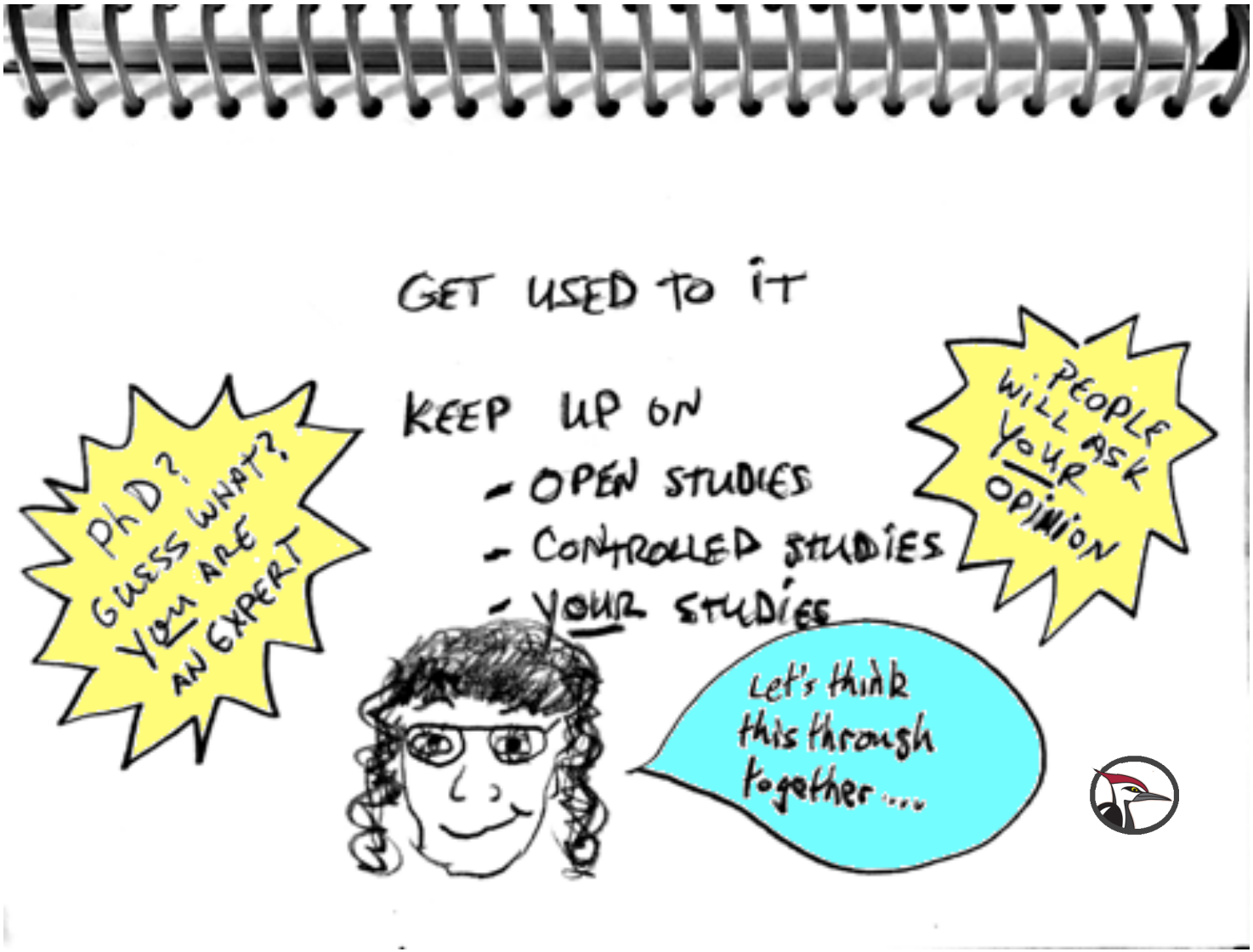
FAILURE TO REPORT FAILURE
IS FOOLISH
DISHONEST
WASTEFUL
AND HARMFUL


SCIENCE IS LITTERED WITH SULLIED DISHONESTY

Part III

# BEING AN EXPERT

Q: WHAT DO CALL THE GUY WHO GRADUATES LAST IN HIS CLASS IN MEDICAL SCHOOL?


GET USED TO IT
KEEP UP ON
- OPEN STUDIES
- CONTROLLED STUDIES
- YOUR STUDIES
PhD? GUESS WHAT? YOU ARE AN EXPERT
PEOPLE WILL ASK YOUR OPINION
Let's think this through together ....

ALL RESEARCH CAN

HURT PEOPLE

FIND OUT HOW!

PLAN TO REDUCE HARM!

The I.R.B.* is your friend.
Be grateful -
bring them cookies

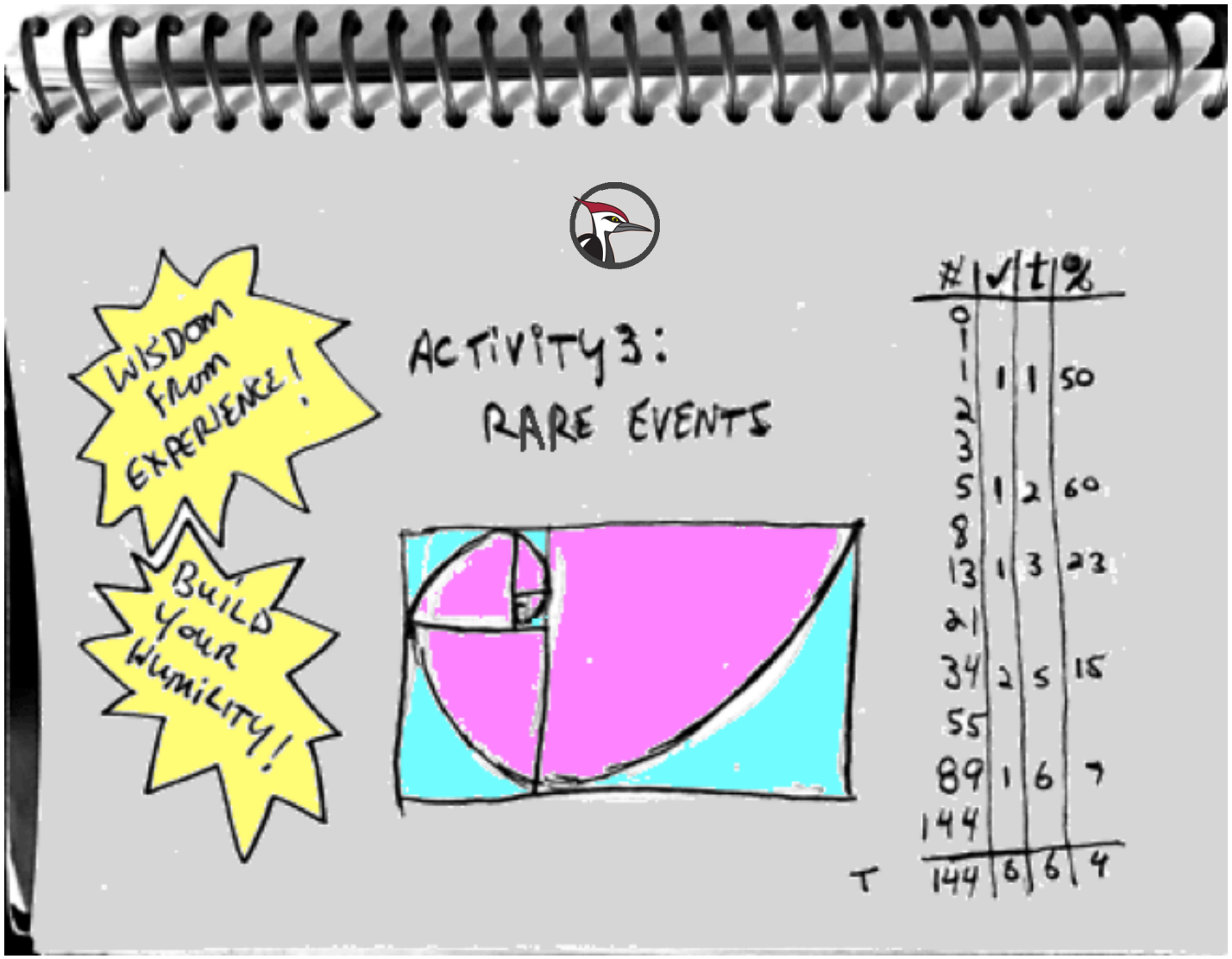
* Institutional Review Board for the Protection of Human (and other) Subjects

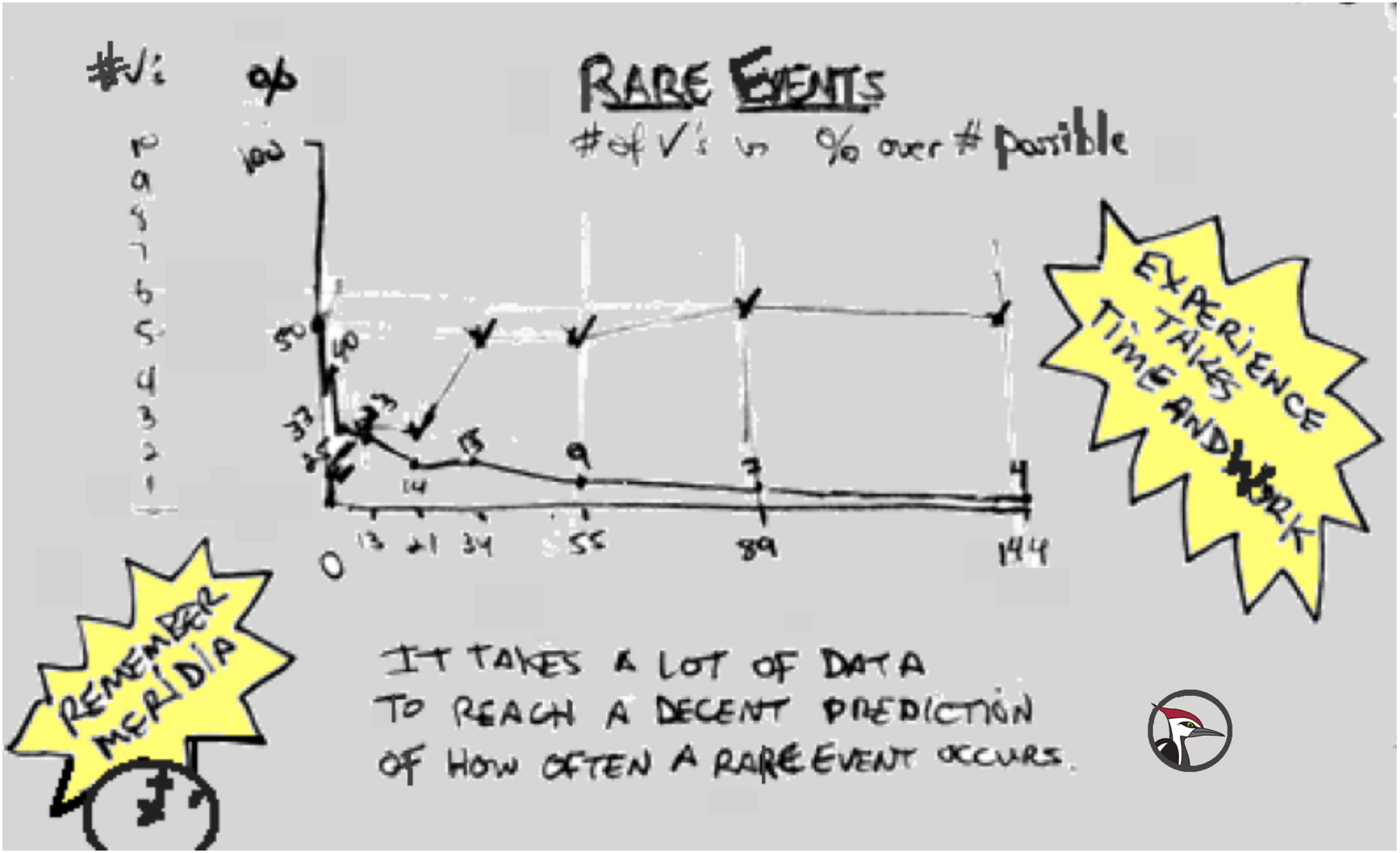
# LETS THINK ABOUT HARM!

- DRUG STUDIES
- THERAPY STUDIES
- SURVEY STUDIES
- SECONDARY ANALYSIS
- OTHER?

## SOME KINDS of HARM

- death
- disability
- upset
- release of private information
- inactive treatment or placebo arm
- loss of precious time
- financial impact
  - direct cost
  - indirect (gas, time off work)


WISDOM FROM EXPERIENCE!
BUILD YOUR HUMILITY!
ACTIVITY 3:
RARE EVENTS
# | ✓ | t | %
0
1 | 1 | 1 | 50
2
3
5 | 1 | 2 | 60
8
13 | 1 | 3 | 23
21
34 | 2 | 5 | 18
55
89 | 1 | 6 | 7
144
T | 144 | 6 | 6 | 4


#V's
%
RARE EVENTS
# of V's vs % over # possible
100
50
37
14
9
3
4
0
13
21
34
55
89
144
EXPERIENCE TAKES TIME AND WORK
REMEMBER MERIDIA
IT TAKES A LOT OF DATA
TO REACH A DECENT PREDICTION
OF HOW OFTEN A RARE EVENT OCCURS.

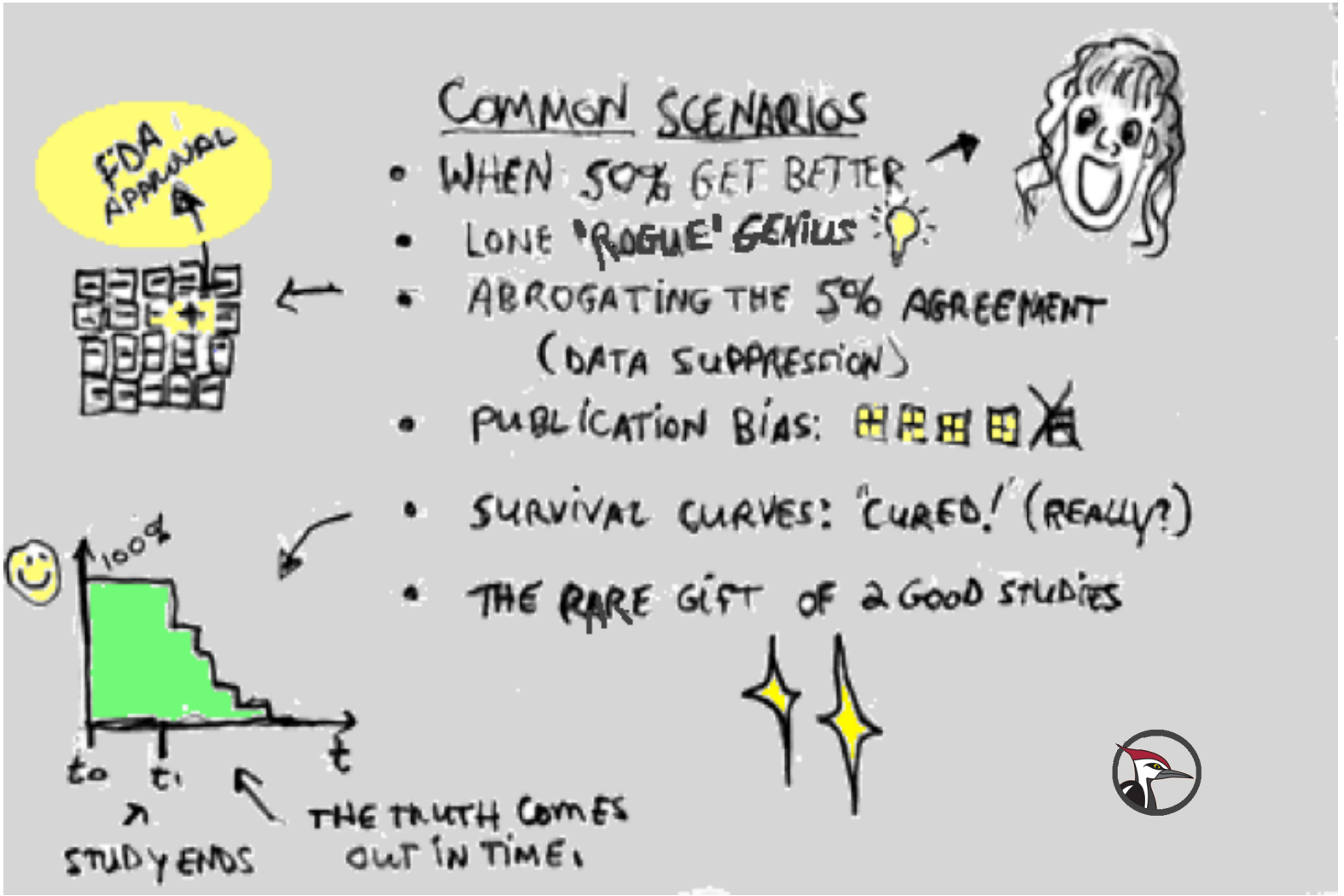
EXPLAIN THIS:

1990 AUTISM RATES : 4/10,000

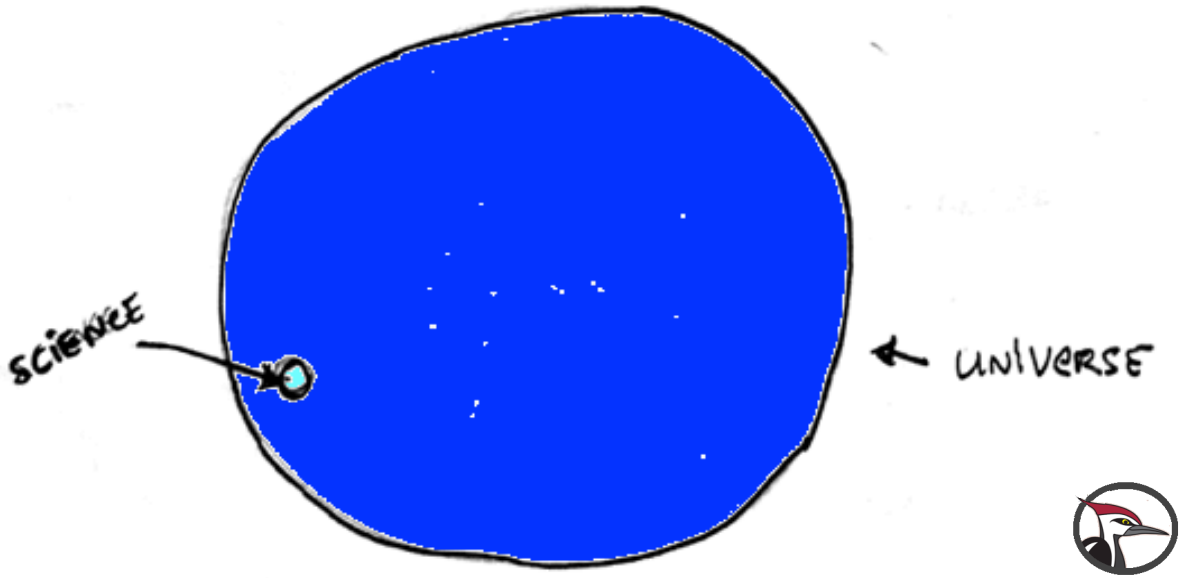
2017 AUTISM RATES : 1/65

BECAUSE: YOU'RE THE EXPERT!

- 
- 
- 
- 


FDA APPROVAL
COMMON SCENARIOS
• WHEN 50% GET BETTER
• LONE 'ROGUE' GENIUS
• ABROGATING THE 5% AGREEMENT (DATA SUPPRESSION)
• PUBLICATION BIAS:
• SURVIVAL CURVES: "CURED!" (REALLY?)
• THE RARE GIFT OF 2 GOOD STUDIES
100%
t
to
t1
STUDY ENDS
THE TRUTH COMES OUT IN TIME.

REMEMBER THIS:



# FINDING YOUR TRUTH

- OPEN FEASIBILITY STUDIES
- CONTROLLED TRIALS
- SINGLE SUBJECT DESIGN
- QUANTITATIVE + QUALITATIVE
- GOAL: 2 GOOD STUDIES INCLUDING OUTSIDERS
- EVIDENCE BASED PRACTICE
- HUMILITY
- HONESTY

# Quiz

1. 3 ELEMENTS OF EVIDENCE BASED PRACTICE (DRAW AND LABEL IT!)
2. WHAT'S WRONG WITH BASING TREATMENT ON 'THE LATEST NEW RESEARCH'?
3. TRUST THE UNIVERSE TO _____
4. WHAT'S THE '5% AGREEMENT'?
5. THE TRUTH COMES OUT IN TIME. DISCUSS.

IECD? BECOME A WOODPECKER!

## ADDITIONAL TOPICS

- GRANT RANTS
- IRB BLUES
- HOW TO CONNECT
- Kim, TEARFUL
- LOVE & POTIONS
- WOODPECKER LORE

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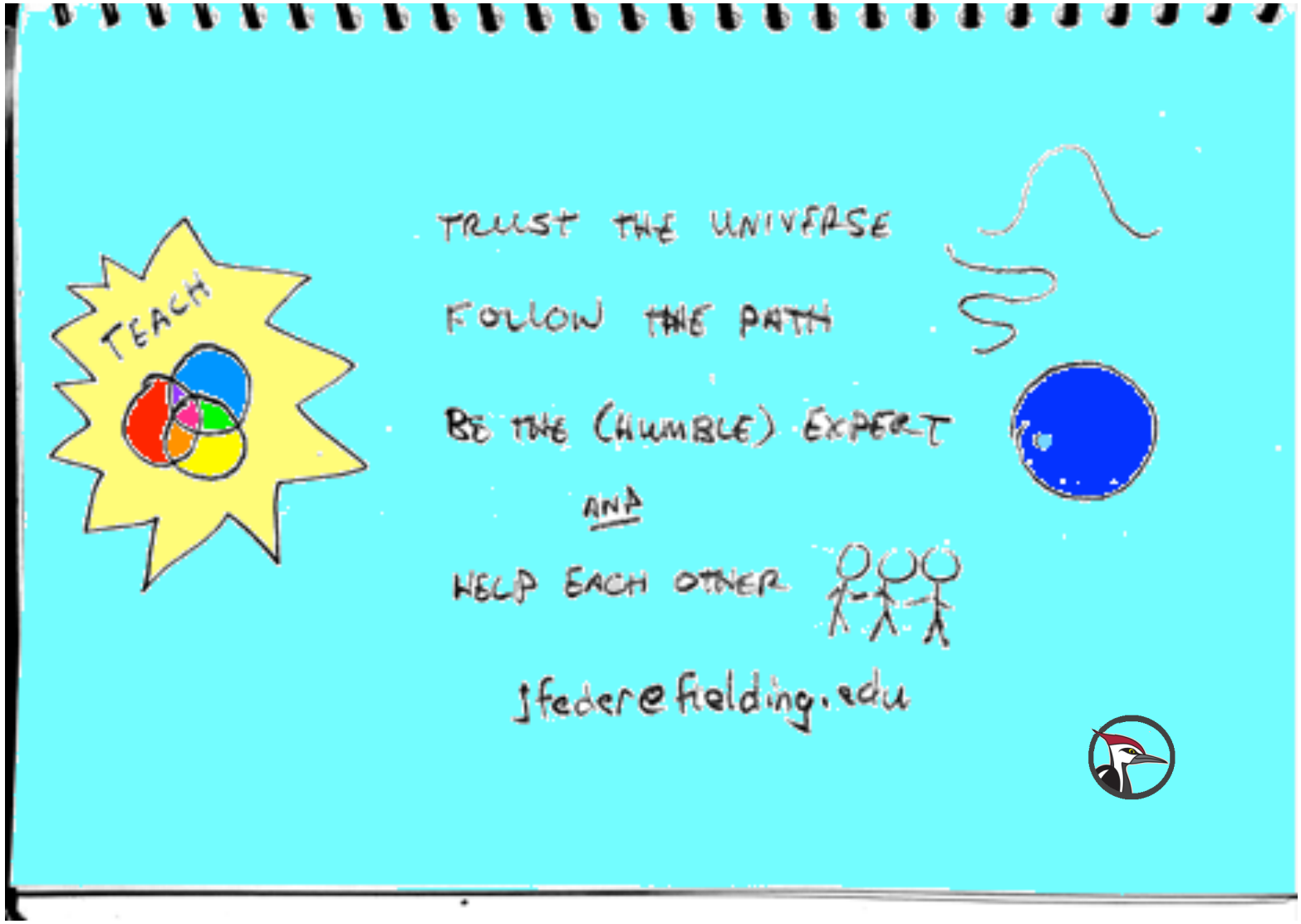

TEACH
TRUST THE UNIVERSE
FOLLOW THE PATH
BE THE (HUMBLE) EXPERT
AND
HELP EACH OTHER
jfeder@fielding.edu

## BONUS:

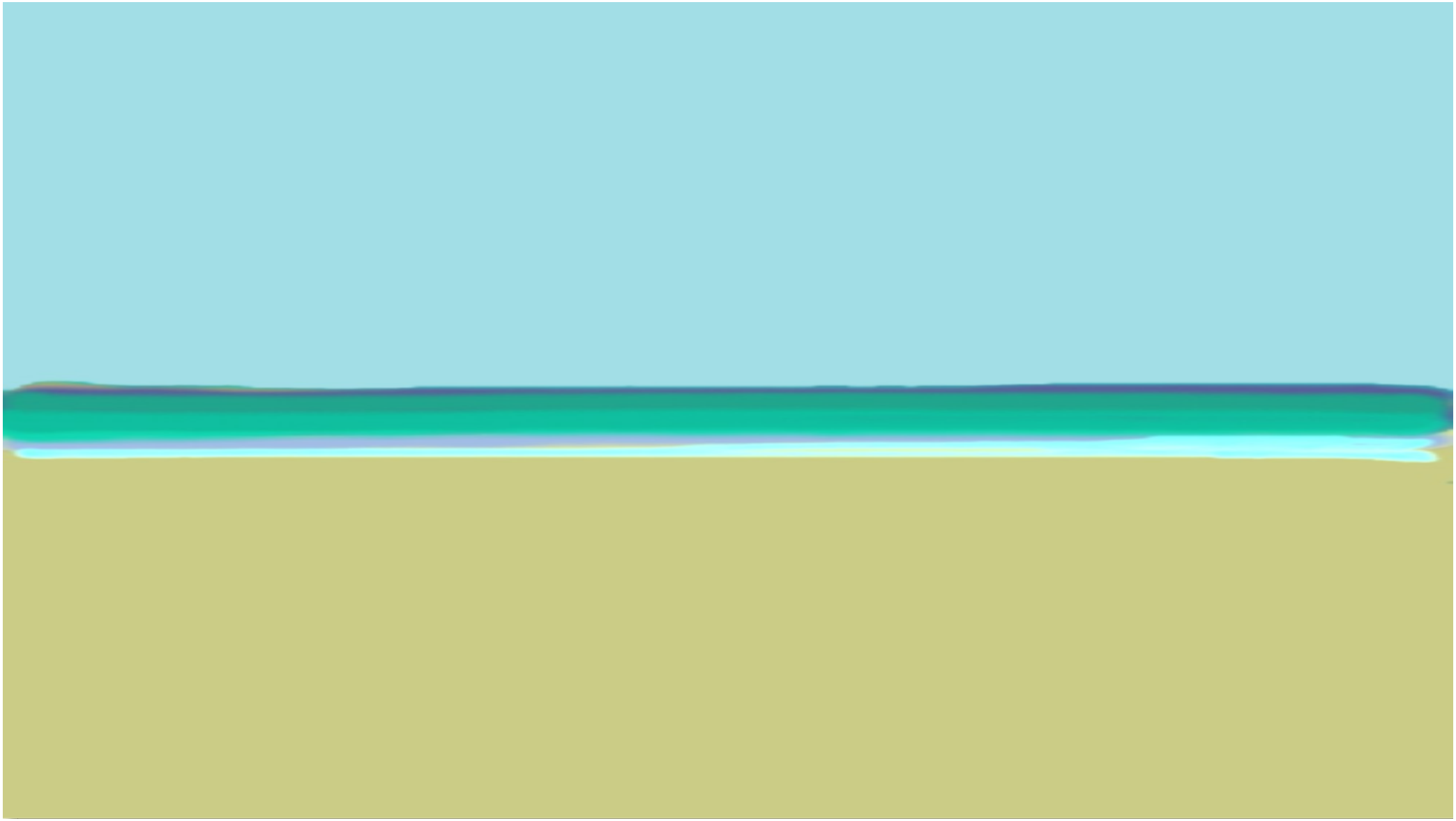
a. draw the relationship between science and the universe

b. give me your feedback:

c. suggestions for improvement:


I.E.C.D. RESEARCH INCUBATOR
PERSISTENCE PRODUCES PROGRESS


graphic medicine
IMAGE COPYRIGHT THOM FERRIER 2011

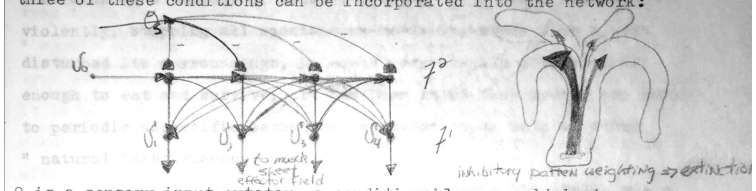


after a " few " contacts with the air.

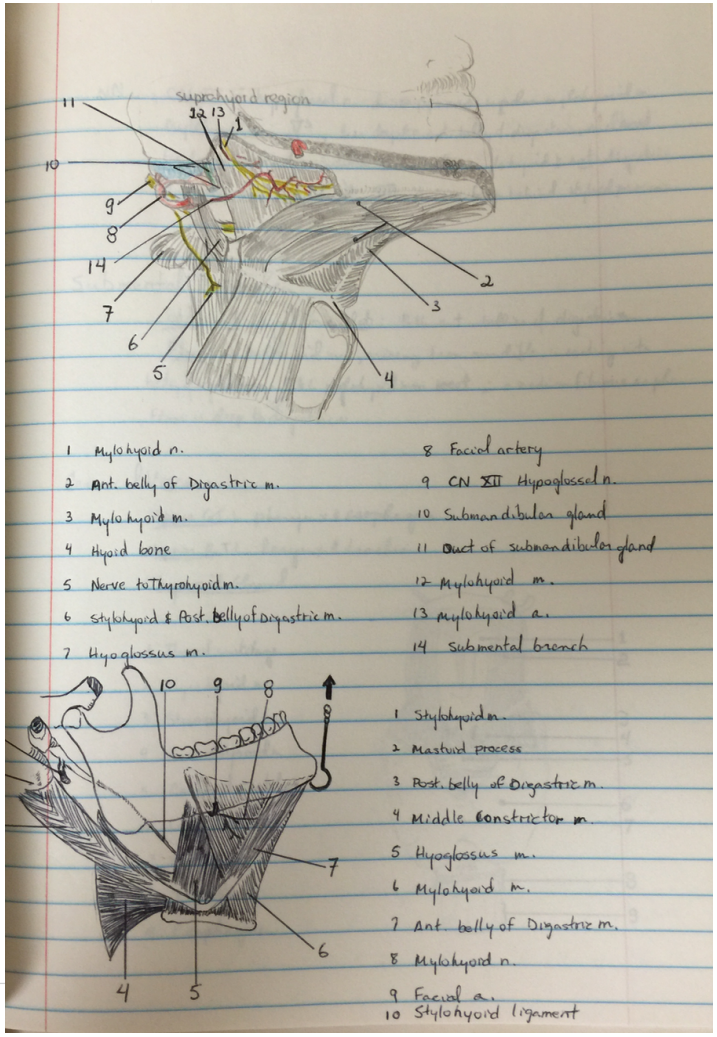
(b) It must concurrently tell $O^1$ to " fire " more often.

(c) The animal must eventually fall back into a "normal " pattern when the environmental conditions no longer warrent the extinction.

If the $CS^+$ feeds into the RP system via another outstar, then all three of these conditions can be incorporated into the network:




$O_S$ is a sensory input outstar, a conditionable one, which changes its pattern weighting, $\Theta_S$, when new data is fed into it. Still, if the hydra learned to avoid the surface of the water, it could never regain the old pattern. Therefore, c in the LTM signal equation must be large, so that without new stimulation the network forgets the avoidance pattern. In other words, if the UCS is strong enough to trigger the behavior, then the " added " $CS^+$ must be inhibitory. When the tentacle hits air, the $O_{CS}$ can learn to inhibit that extension, and in doing this puts more weight on other extensions. This implies that there is competition between the vertices of the outstars in $F^2$. $O^1$ benefits by the loss of $O^3$ because some inhibition aimed at it is shut off. To keep up the inhibition going toward the effector field the sensory input segment must reverberate. All these additions suggest an unwieldy, highly complex network. This cannot be physiologically shown to exist in any form; it must be carved out of the nerve net by setting appropriate thresholds and association strength parameters.


suprahyoid region
11
12 13
1
10
9
8
14
7
6
5
4
3
2
1 Mylohyoid n.
2 Ant. belly of Digastric m.
3 Mylohyoid m.
4 Hyoid bone
5 Nerve to Thyrohyoid m.
6 Stylohyoid & Post. belly of Digastric m.
7 Hyoglossus m.
8 Facial artery
9 CN XII Hypoglossal n.
10 Submandibular gland
11 Duct of submandibular gland
12 Mylohyoid m.
13 Mylohyoid a.
14 Submental branch
10
9
8
8
7
6
4
5
1 Stylohyoid m.
2 Mastoid process
3 Post. belly of Digastric m.
4 Middle Constrictor m.
5 Hypoglossus m.
6 Mylohyoid m.
7 Ant. belly of Digastric m.
8 Mylohyoid n.
9 Facial a.
10 Stylohyoid ligament

# If it gets better, did the treatment work?