



THE IMPORTANCE OF STUPIDITY IN SCIENTIFIC RESEARCH: A CLASS DISCUSSION

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Bio 580: COURSE & CURRICULUM

- Allegheny’s curriculum focuses on writing & speaking
- Students must take seminars each year for this purpose.
- For biology majors:

Year	Courses	Title	Description	Focus
1	FS 101 & 102	Freshman Seminar	Seminar in variety of topics across all disciplines (discussion only)	General writing & speaking skills
2	FS Bio 201	Investigative Approaches in Biology	Students rotate among 2-3 faculty and perform their own group experiments in each rotation (lab only)	Scientific method, engaging scientific literature, writing and speaking within the discipline, experimental design
3	Bio 580	Junior Seminar	Students learn a specific sub-discipline of biology (lab & discussion)	Same as FS Bio 201, plus research ethics & writing a research proposal
4	Bio 600 & 610	Senior Seminar	Students complete the required senior thesis	All of the above, plus independent research, proposal defense, thesis defense, & thesis presentation

- Each faculty teaches a junior seminar in their own sub-discipline
- Mine is called the Evolution of Shape, which covers species delimitation & biomechanics.
- The primary objective of Bio 580 is to get students ready for their senior comprehensive project (thesis).
- Students do not have to stay with their junior seminar professor for their senior thesis.

THE PAPER: A QUICK SUMMARY



- Many of us got into science because we were good at it, and therefore felt smart.
- In grad school, you begin to feel stupid as you run into problems you and maybe nobody can solve
- That is what research is - solving a problem that nobody else has.
- We need to teach our students that:
 - Research is hard because of the unknown
 - It’s okay to say “I don’t know”
 - There’s a way to be “productively stupid”

THE LESSON

- This is done on the second day of class.
- Students are asked to read the paper before class to facilitate discussion.
- This activity takes 30-45 minutes.

Part 1: General impressions

- Students are asked:
 - How did you feel about the paper in general?
 - What did you think that the main point of the paper is?
- Students generally like the paper. It’s short and to the point.
- They get that we don’t always know the answer, but not the other points.

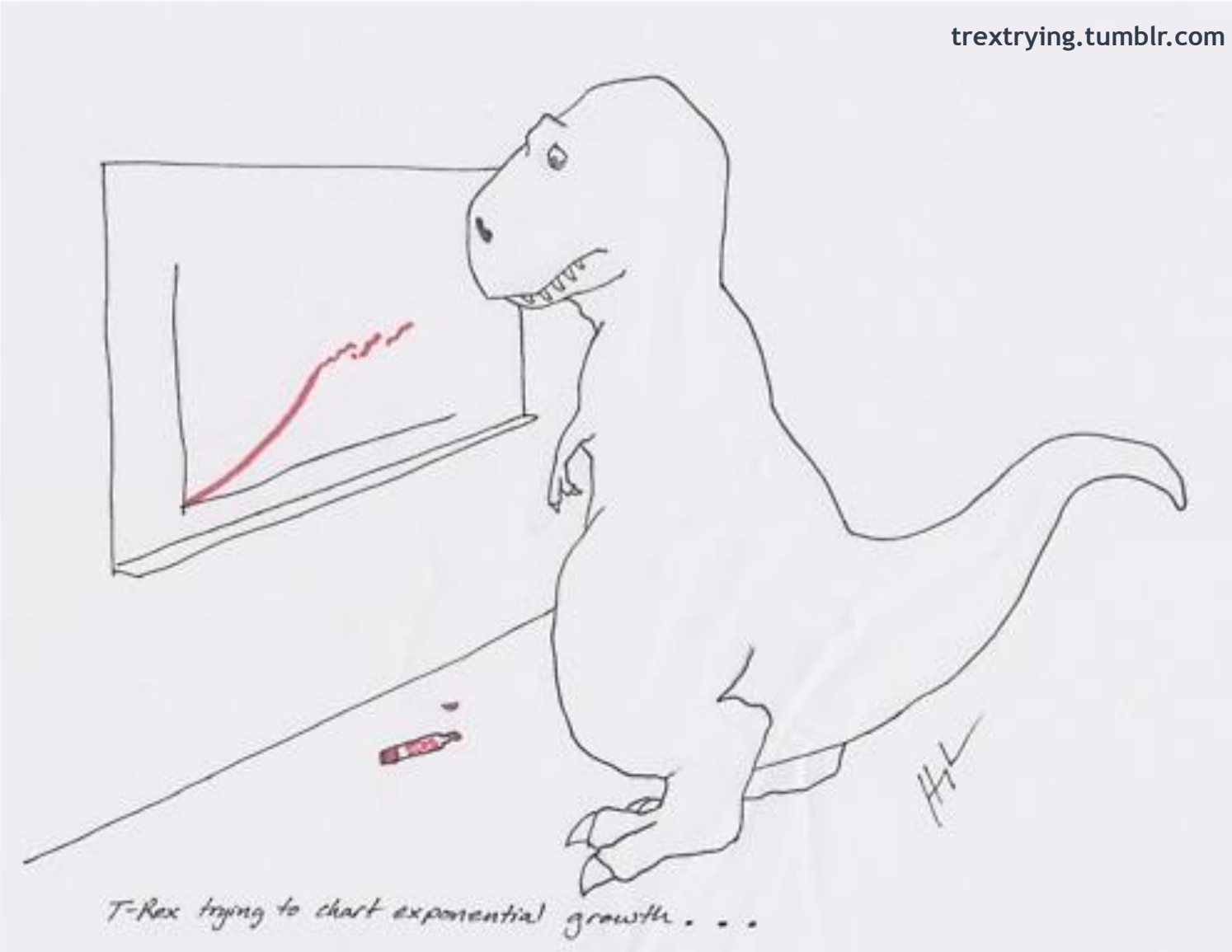
Part 2: Mini-lecture

I use a short lecture to illustrate the missed points of the paper:

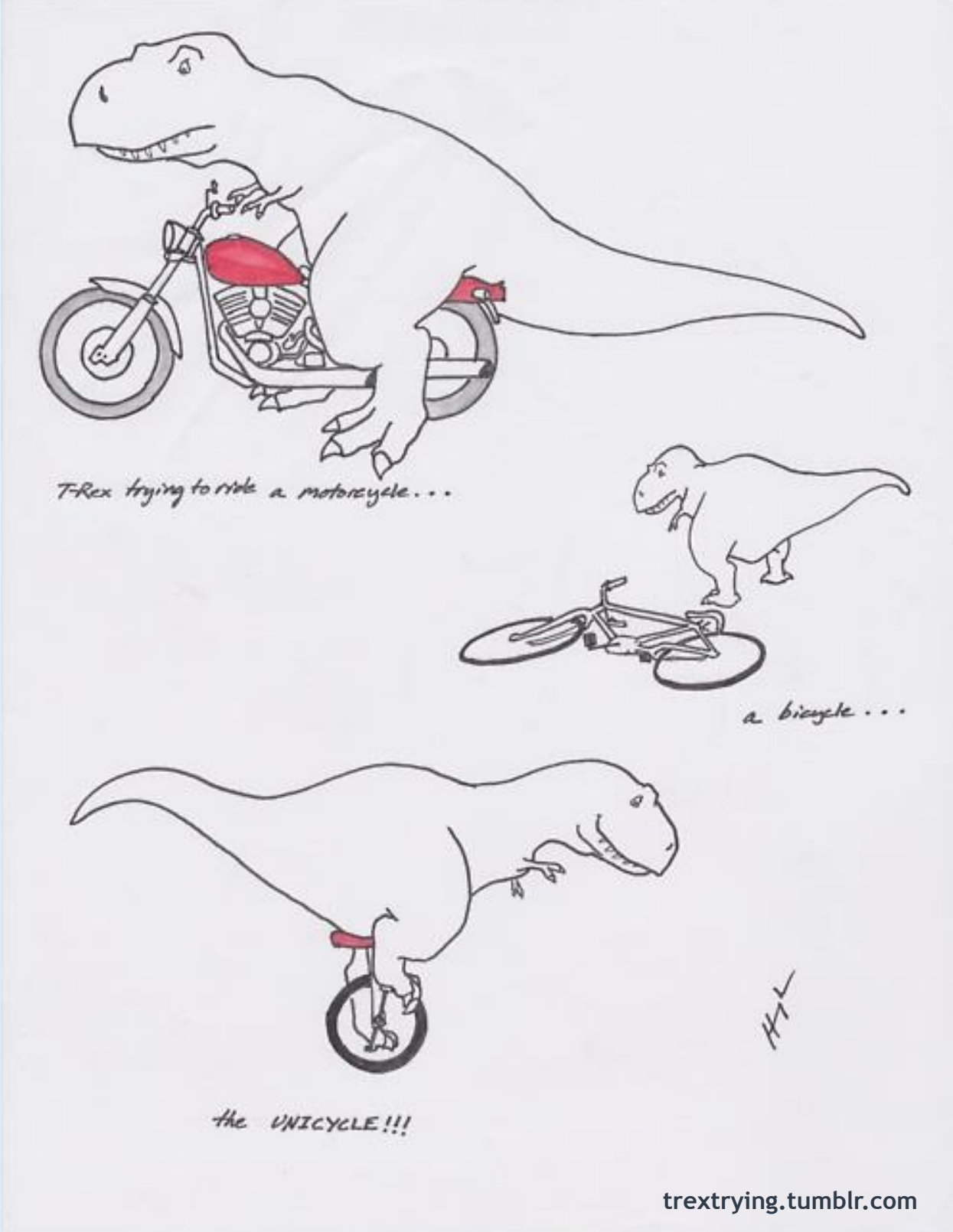
Research is hard because of the unknown:



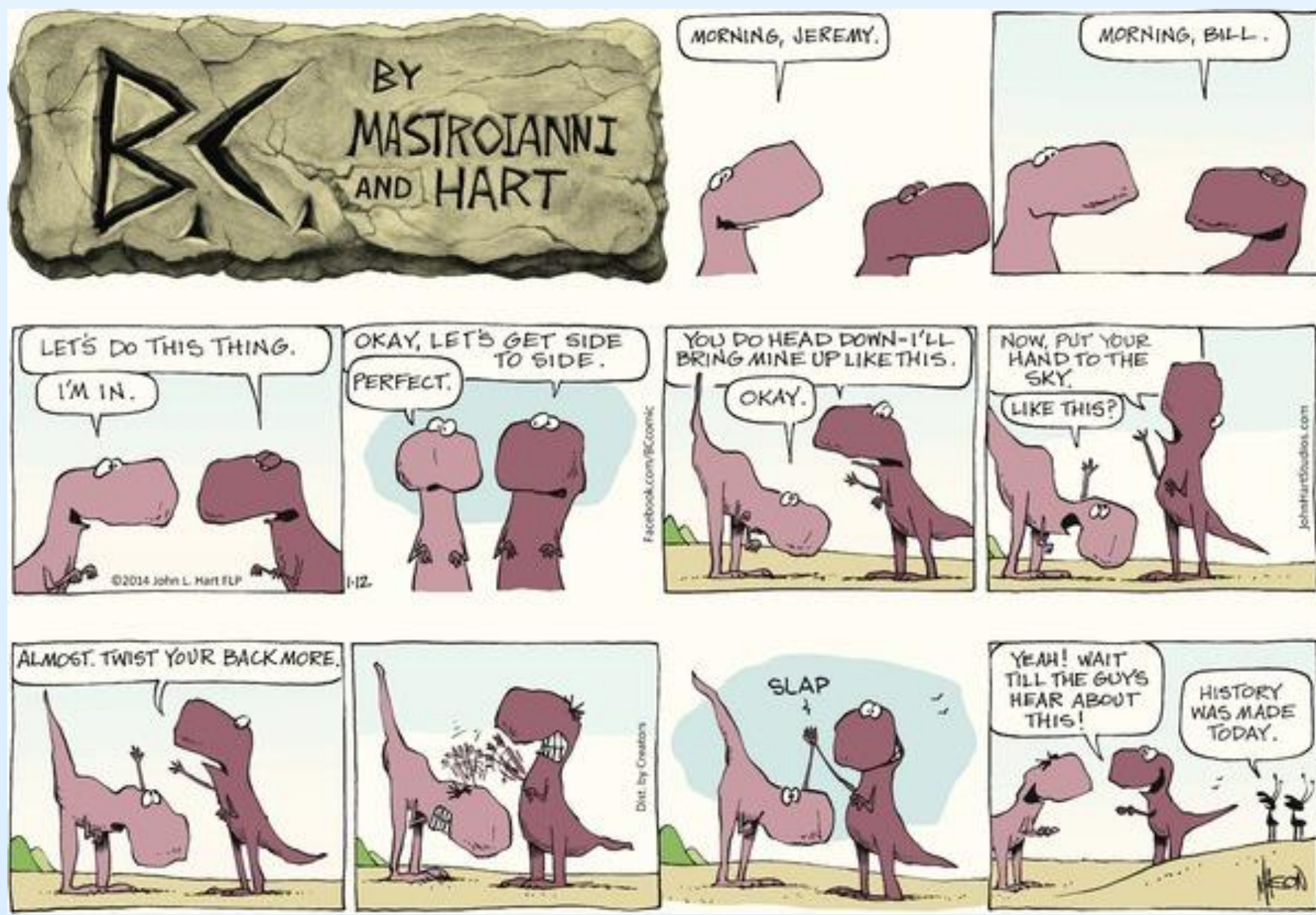
You may not be able to do things easily:



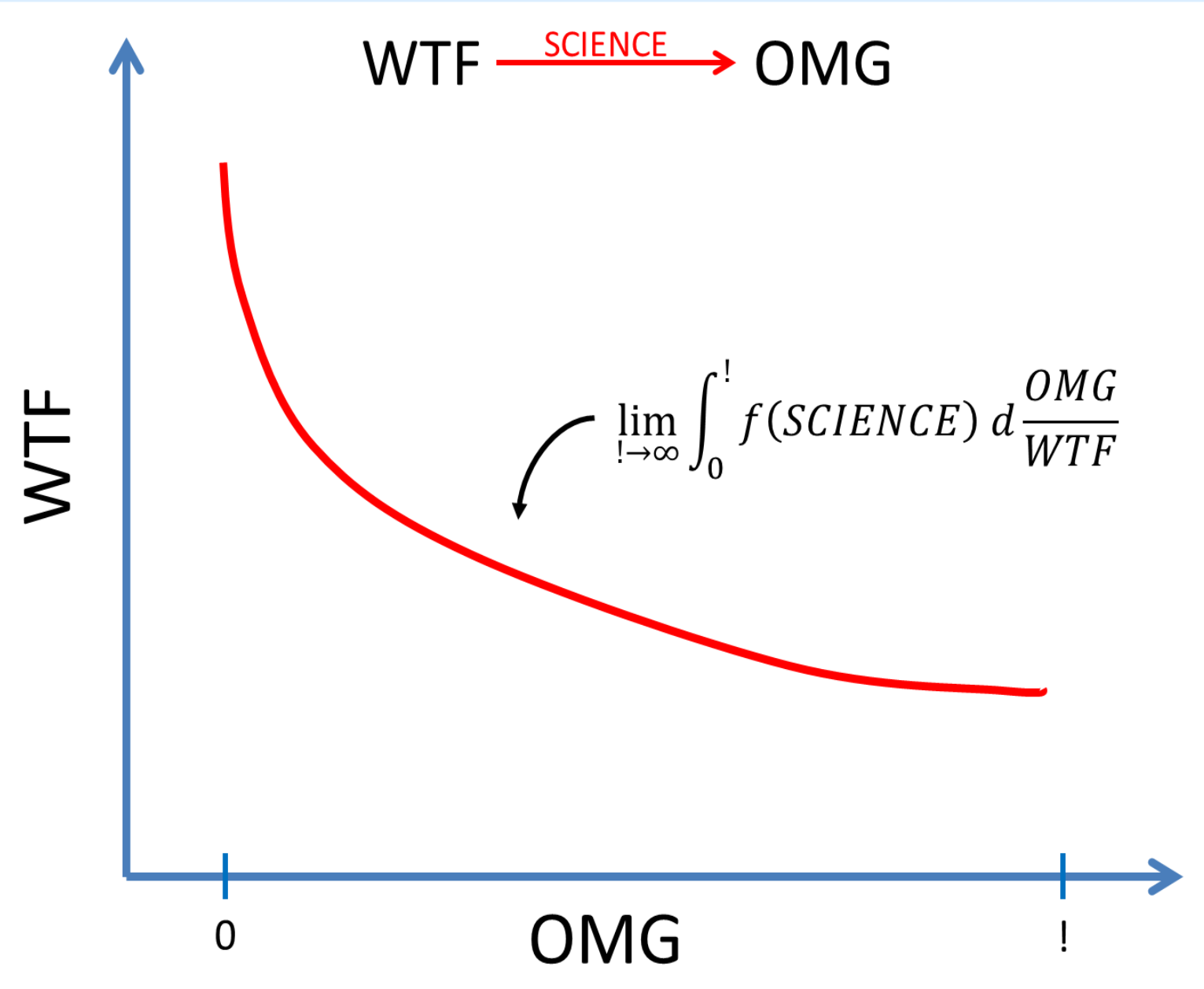
Be productively stupid:



Keep trying:

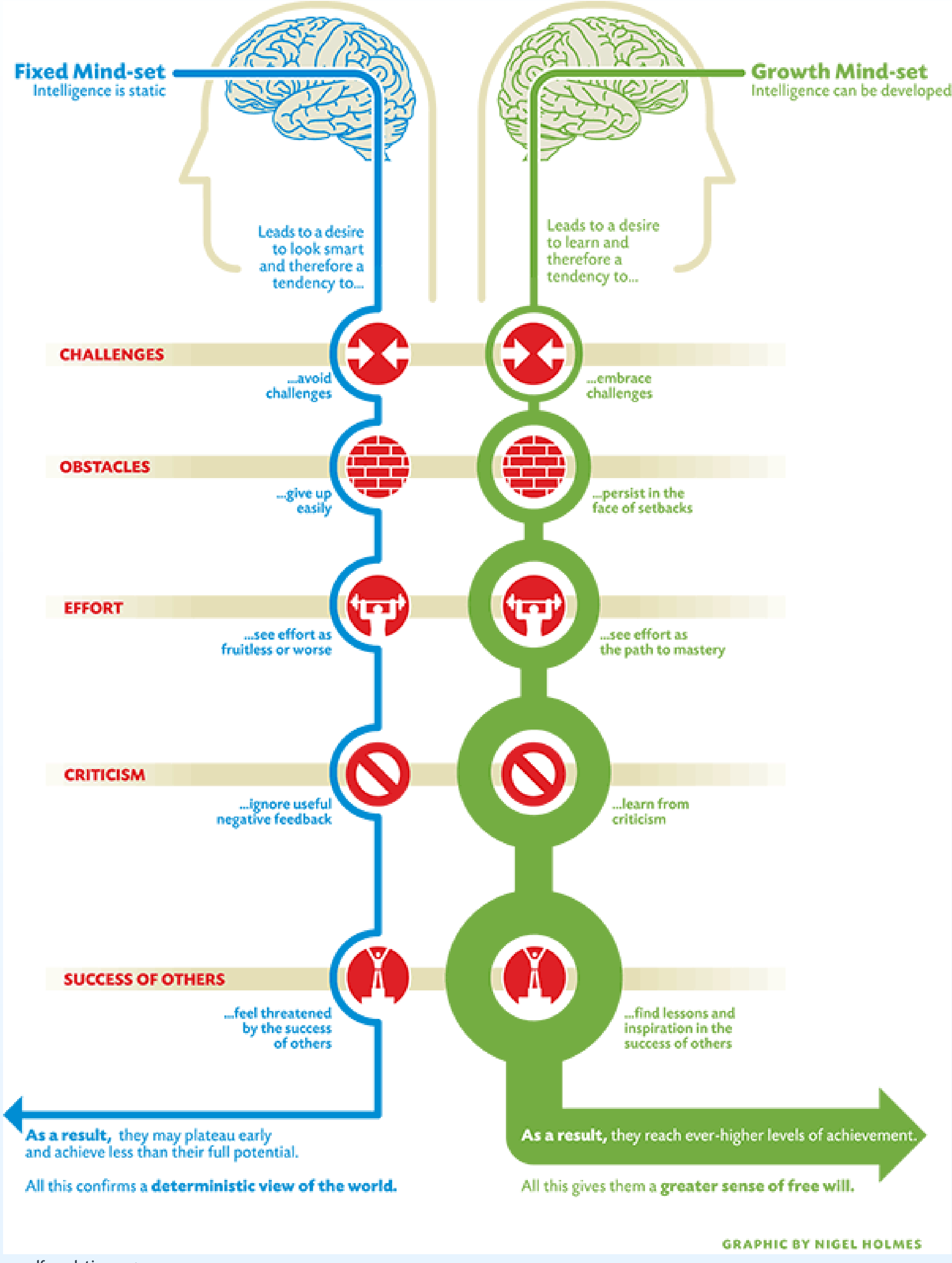


Eventually you will get here



Part 3: How to be productively stupid

Students are then shown the following infographic:



- Students are asked to then talk to their neighbor about a time in their life (not necessarily academic) that they found themselves in the fixed mindset and were able to move to the growth mindset. How did they do that?
- We then go around the group and share our stories (myself included).
- Stories told by students typically are about sports, improving grades in classes, or practicing a musical instrument.
- Students are then asked how they could apply those lessons to research and their senior thesis work.

CONCLUSIONS

The students find this discussion helpful. They are a little less frustrated in lab when things go wrong. My summer research students also requested that I do this topic for my poster instead of another activity, which I think speaks to how well this discussion went.

