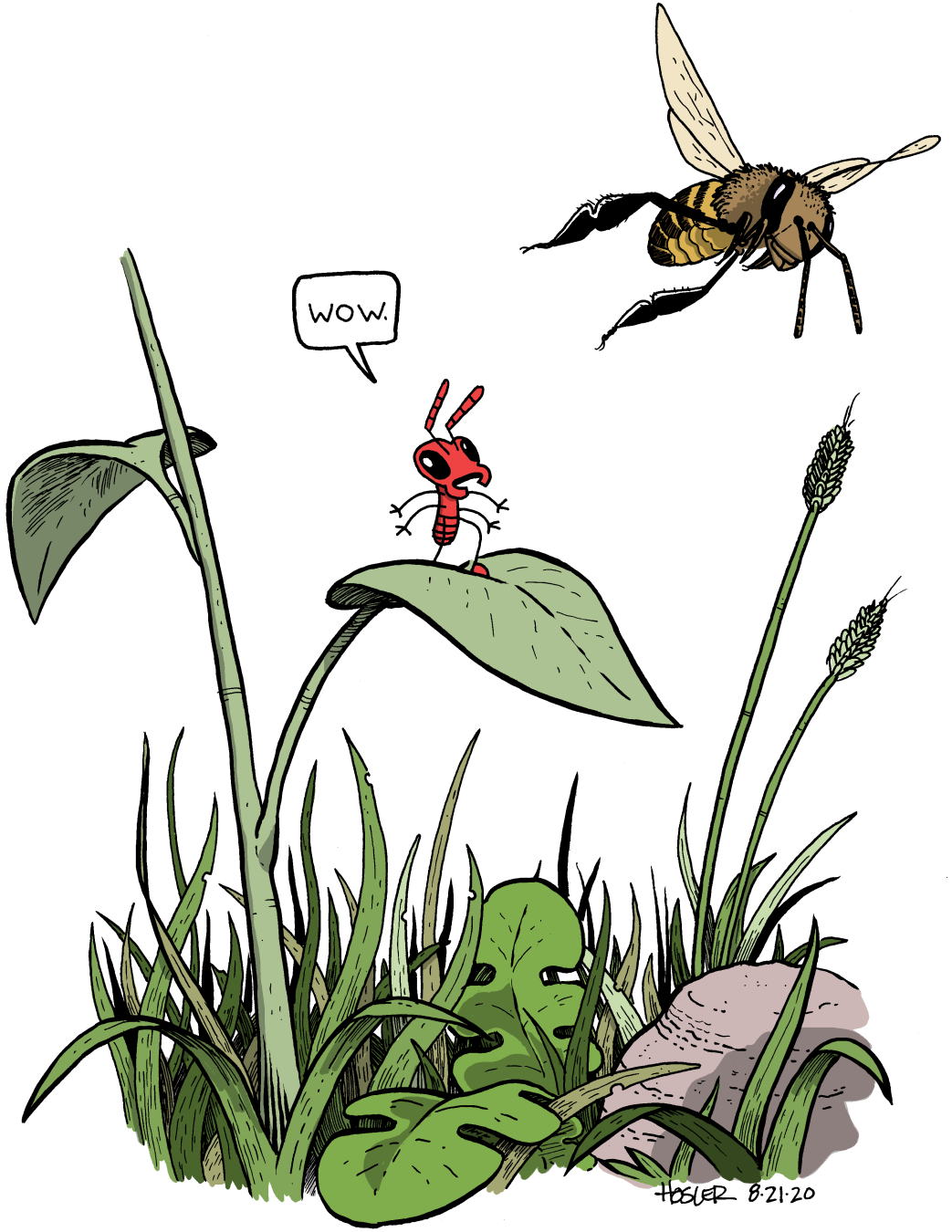
There’s science in my story:

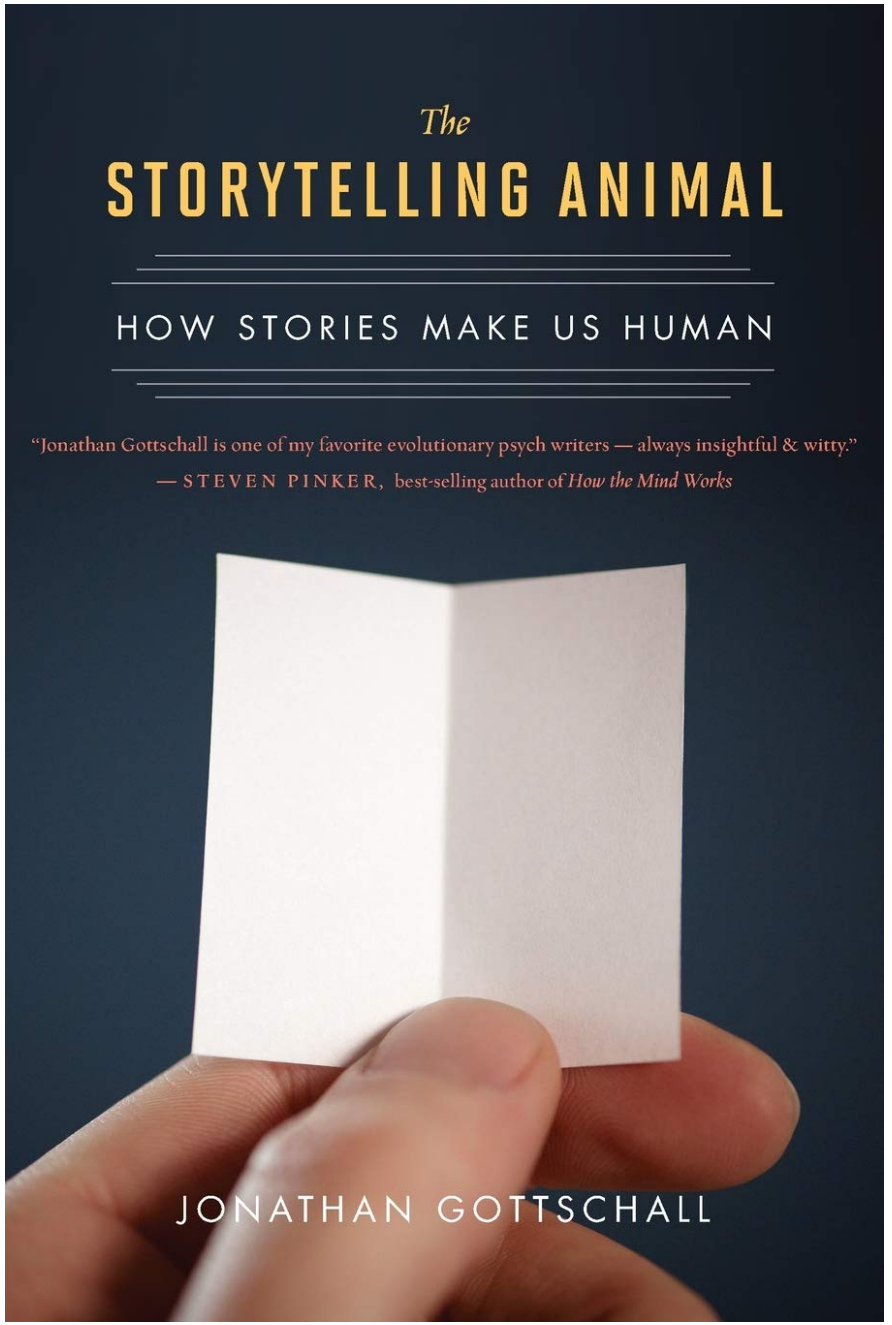
Constructing narratives for teaching science.

Jay Hosler
Juniata College Department of Biology



Evolution is ruthlessly utilitarian. How has the seeming luxury of fiction not been eliminated from human life?

-Jonathan Gottschall, The Storytelling Animal (2012).



Telling Tales: We Can’t Help Ourselves

https://www.youtube.com/watch?v=Js50Orx94iM&t=1s

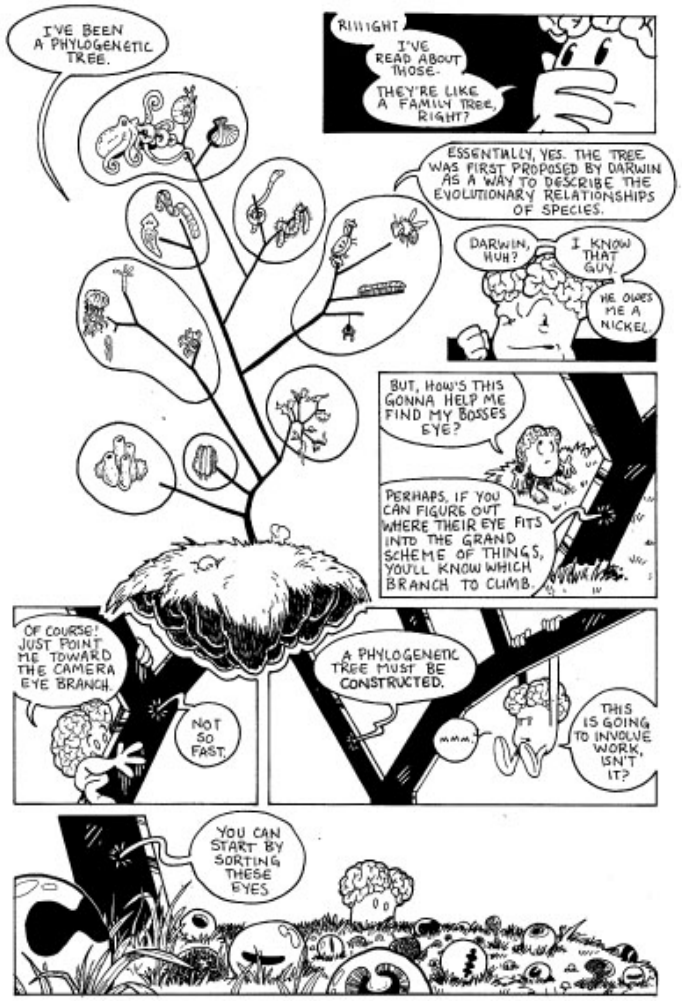
https://youtu.be/VTNmLt7QX8E

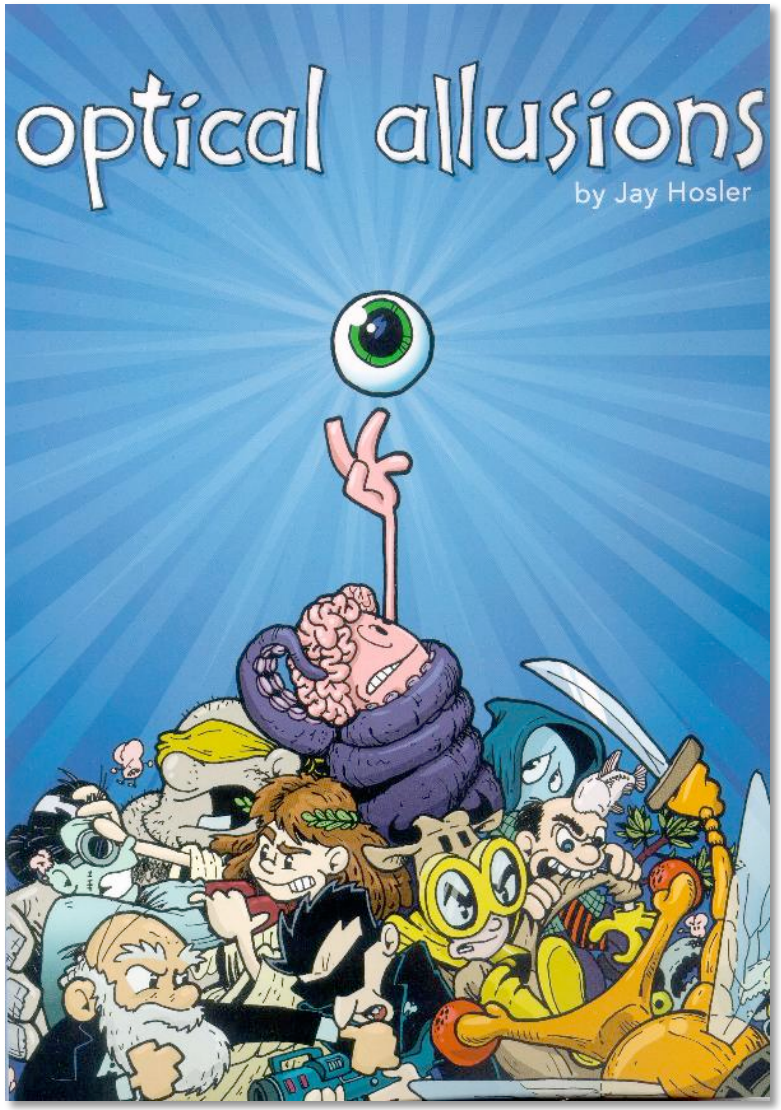
Jouvet, M. The paradox of sleep: The story of dreaming. The MIT Press,1999.

Heider, F.; Simmel, M. "An experimental study of apparent behavior." The American
Journal of Psychology, 1944, 57, 243–259.

A testable hypothesis

A

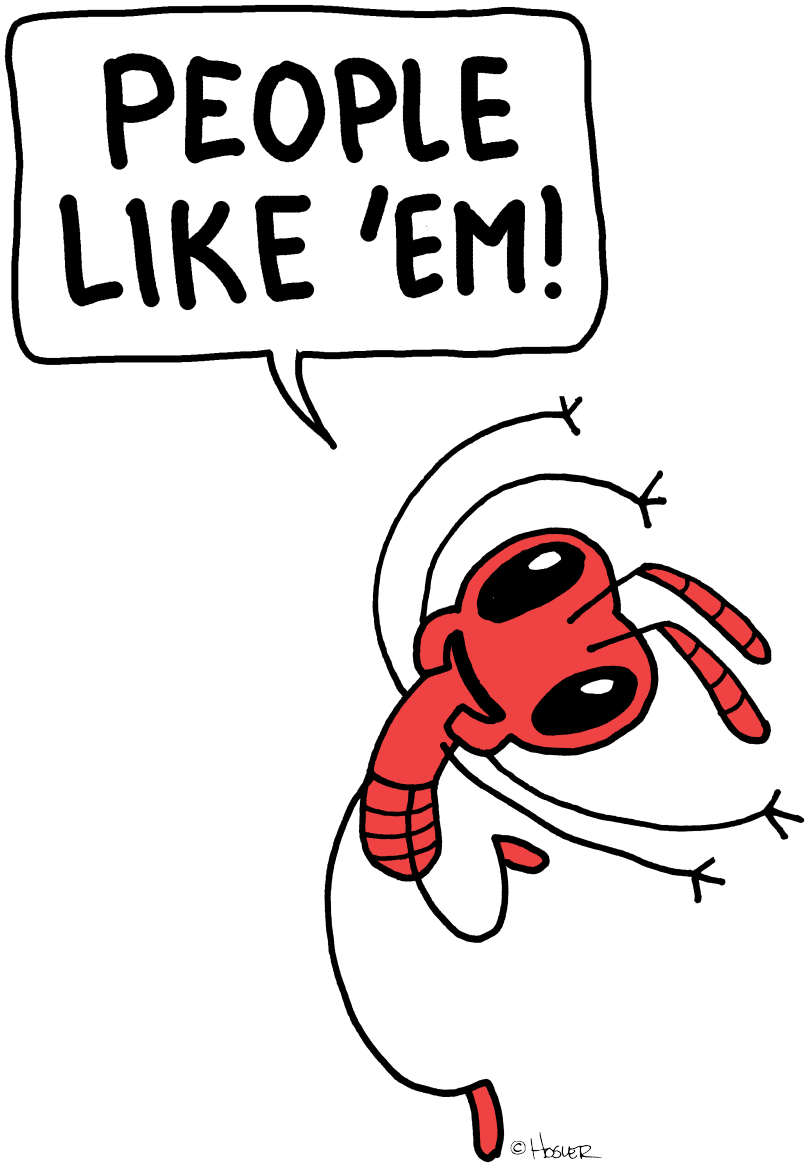




109

Are Comic Books an Effective Way to Engage Nonmajors in Learning and Appreciating Science? Jay Hosler* and K. B. Boomer† (2011) CBE—Life Sciences Education, Vol. 10, 309–317, Fall 2011

And now a summary of the academic literature on the benefits of stories...



Our approach to a story-based curriculum

Content Prioritization

Central Dogma
Natural Selection
Energy Transformation
Homeostasis
Cellular Basis of Organisms
Scientific Method
Protein folding and function
Structure and function
Phylogenetics
Ecological Networks
Genetic transmission
Life Histories

We identified the critical concepts that we wanted students to be exposed to in General Biology I

Our approach to a story-based curriculum

Then we proposed a series of very cool stories in biology.

Stories

Photosynthetic Slugs

The Evolution of Speed

The Opioid Crisis

Alligator Ecotoxicology

Cholera and Climate change

Our approach to a story-based curriculum

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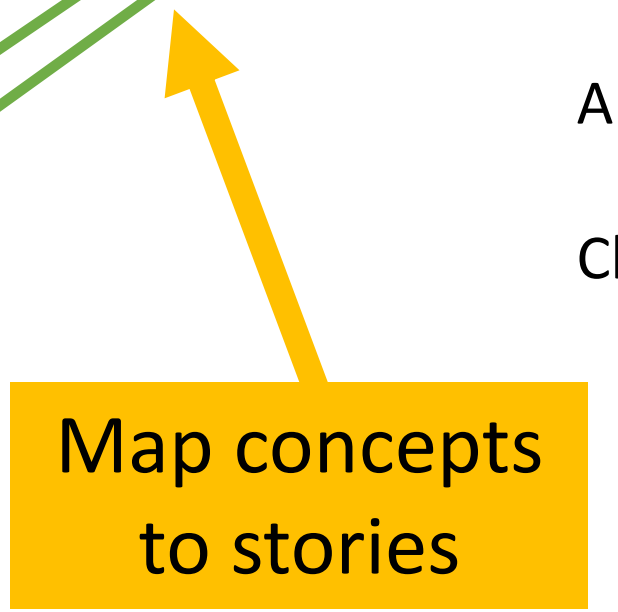
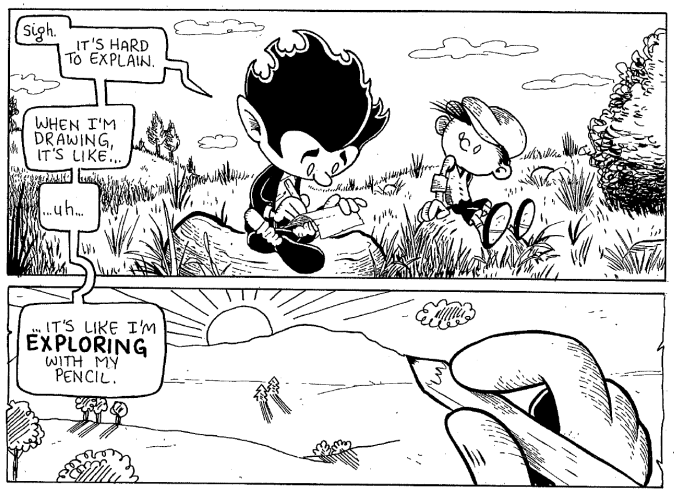


The Peculiar Case of the Photosynthetic Slugs

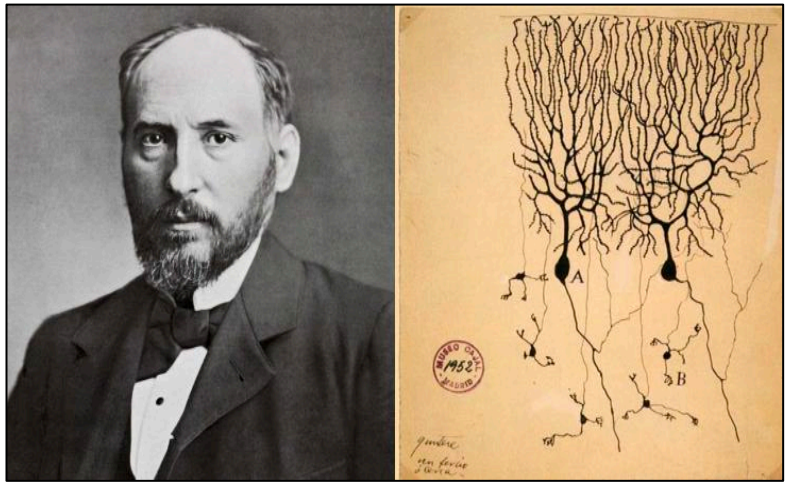
As a juvenile, the slug *Elysia chlorotica* extracts chloroplast from the algae *Vaucheria litorea* and incorporates those chloroplasts into its tissues (**symbiosis, endosymbiosis, eukaryotic and prokaryotic cells**). The slug never has to eat again because the chloroplasts continue to function (**photosynthesis, energy transformation**) until the slugs dies 10 months later. This is possible because the slug carries genes critical to chloroplast function (**horizontal genetic transmission**) that they pass on to their baby slugs (**vertical genetic transmission**). Although the chloroplasts make G3P for both slugs and algae, how that G3P is used differs between the two organisms (**life histories**). Slugs makes comparatively more glucose (**motility, determinant growth**) than the algae, which uses the G3P to make structural molecules (**sedentary, indeterminant growth**). Interestingly enough, the slugs all die simultaneously at 11 months old. There is evidence that they picked up a virus from the chloroplasts whose DNA has been incorporated into the slug's genome (**horizontal genetic transmission**). A surge in viral particles seems to correspond with the mass deaths of the slugs.

Structuring your story: The power of ABT



Once there was a little boy in Spain who loved nature **AND** wanted to be an artist.

BUT his father said he had to be a doctor.



THEREFORE he figured how to be both an artist and a doctor and won the 1906 Nobel Prize in Medicine

Structuring your story: Classes are Episodes

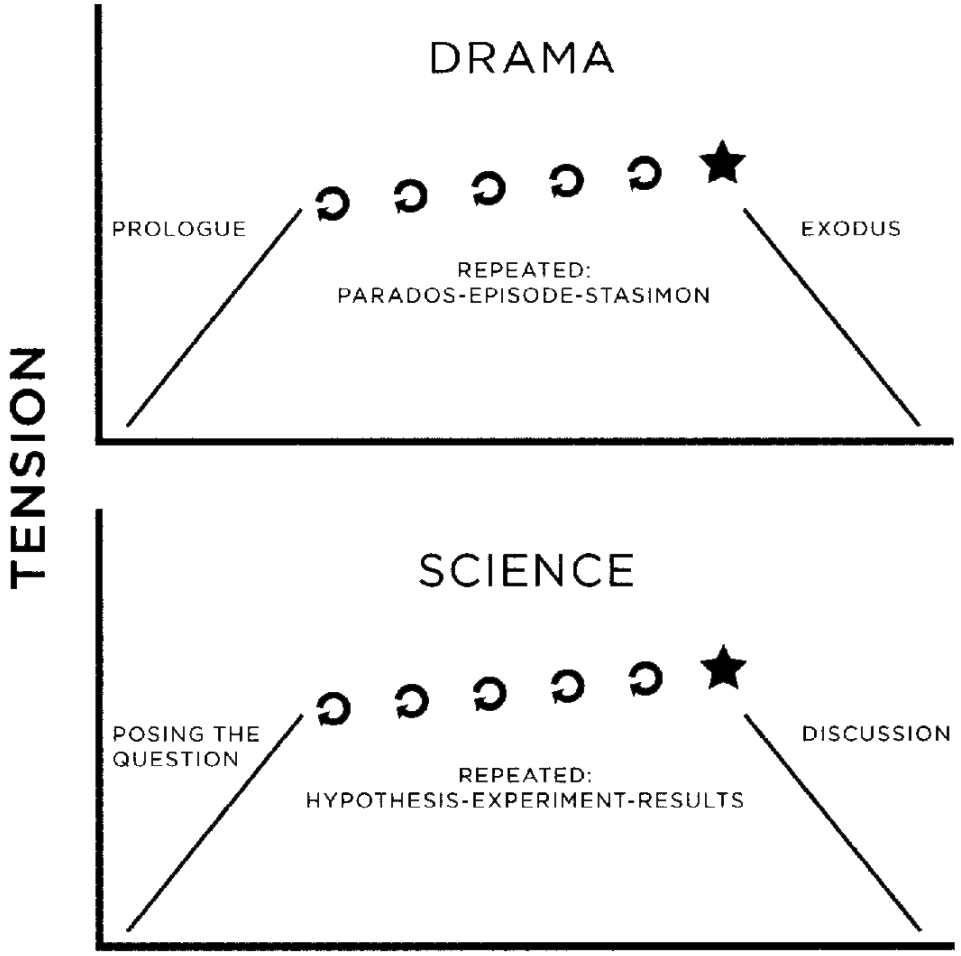
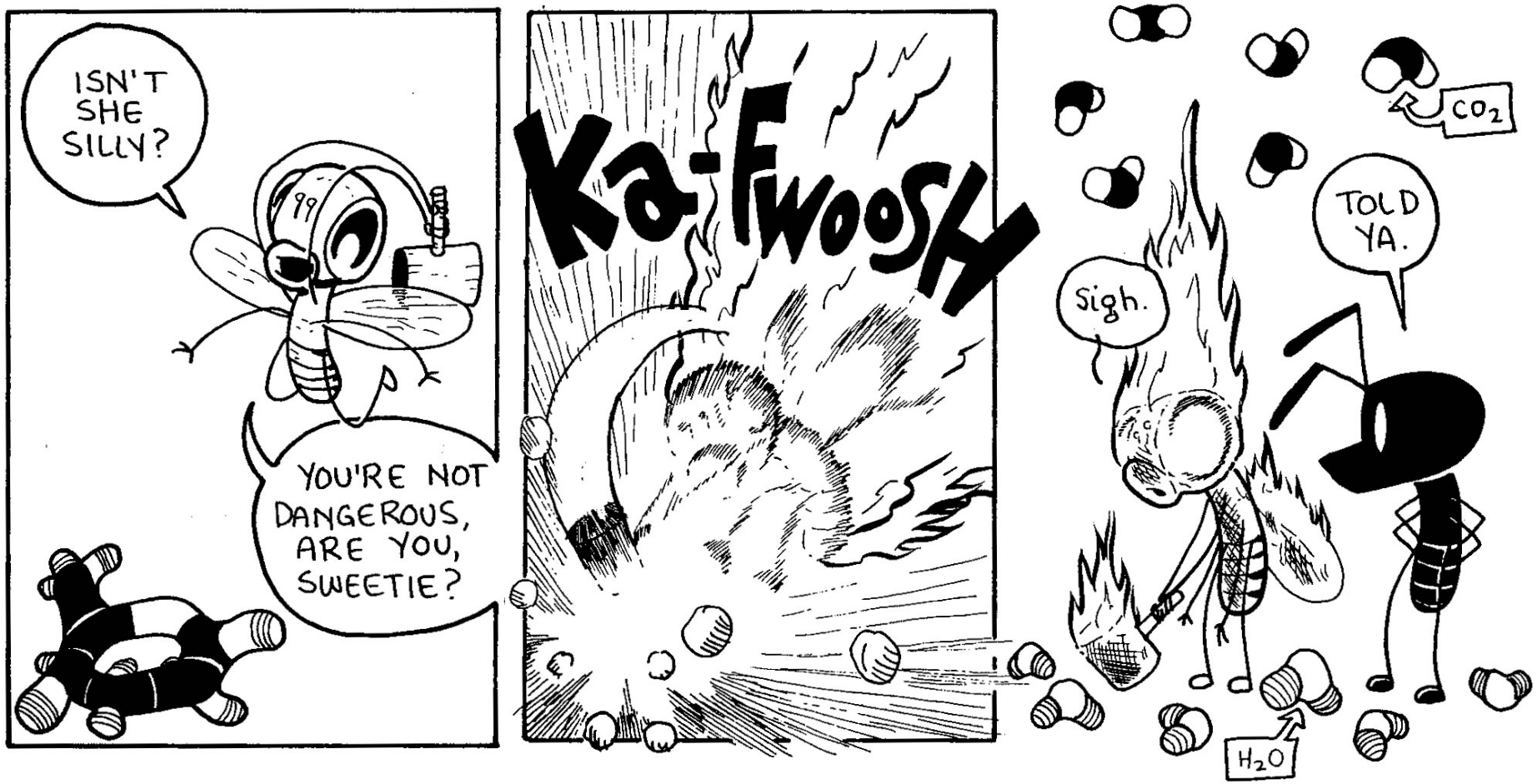


Figure 5. Dude, it's all the same story. The top diagram is how Aristotle, 2,000 years ago, described the structure of a story. The bottom diagram is how a scientist conducts a research project. See any similarity?

The Slug Story Episodes

Weeks	BI 101 dates	Week Day	Story Day	Topic	
1	Jan 23/24	S/Sun			Pre-Quiz 1
STORY ONE: PHOTOSYNTHETIC SLUGS					
	25	M	1	Photosynthetic slugs	
	26	T	2	Symbiosis and endosymbiosis	
	27	W	3	Light dependent reactions of photosynthesis	
	28	TH	4	Horizontal and vertical gene transmission	
	29	F			Friday Quiz 1
2	30/31	S/Sun			Pre-Quiz 2
Feb	1	M	5	Light independent reactions of photosynthesis	
	2	T	6	Life history differences	
	3	W	7	k and r selection	
	4	TH	8	Photosynthetic Slugs Review	
	5				Friday Quiz 2
3	6/7	S/Sun			Pre-Quiz 3
	8	M		Test 1: Photosynthetic slugs	

Less Content, More Context, Characters and Comedy



The Mirror:

The Human Connection, Social Relevance, and the Scientific Method

Slug Story Example:

Lynn Margulis and the Endosymbiosis Theory

Lynn Margulis

The Window:

A glimpse at an unexpected world to inspire wonder.

Slug Story Example:

Kleptomaniac slugs that can photosynthesize.