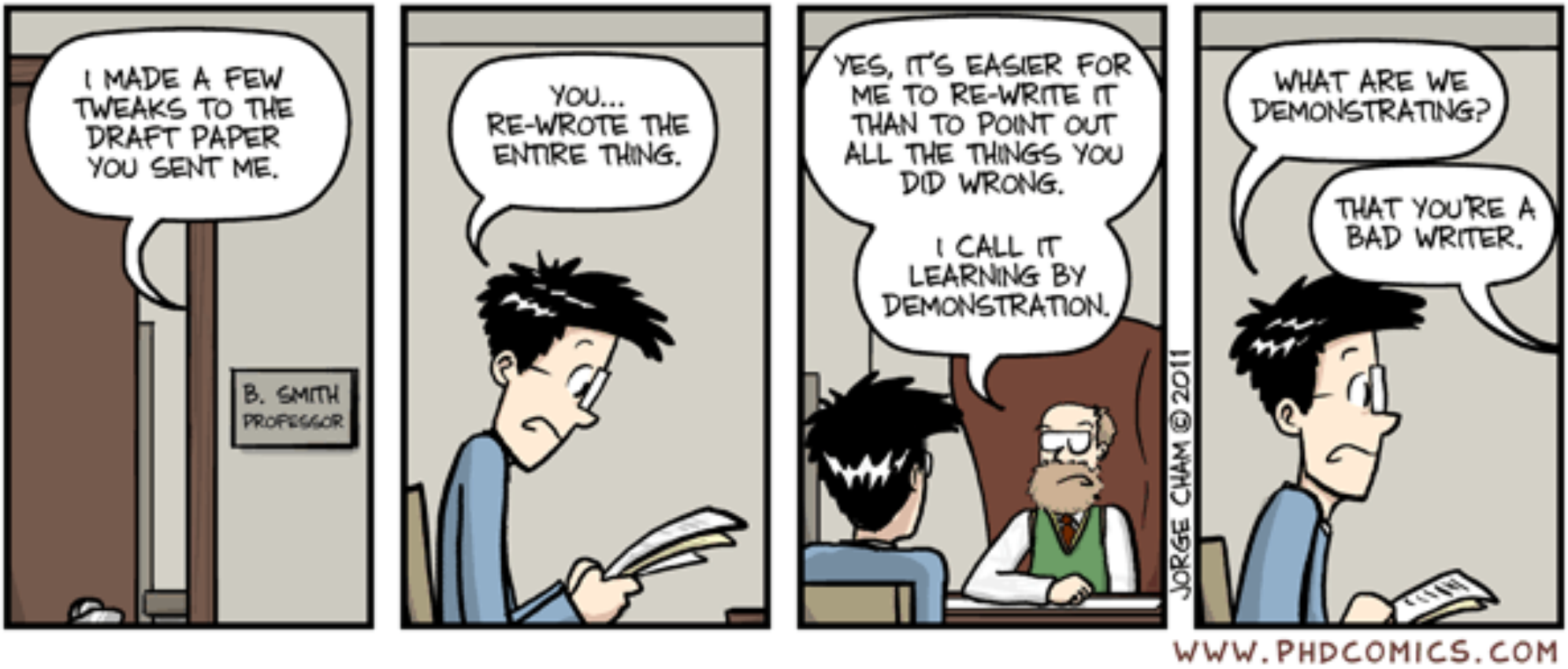
Learning to accept editing

Keep repeating:
"*It is not personal.*"

An edit is not actually a signal that the editor thinks that you, personally, are a failure.

An edit is more useful than a rewrite



http://www.phdcomics.com/comics.php?f=1439

An edit is a signal that something *in the text* is not working as intended.

This is a *completely impersonal fact.*

A thorough edit from a collaborator is *an investment in you*.

It is a message that they believe you can fix problems, and that they want the work you care about to be the best it can be.

http://www.phdcomics.com/comics/archive.php/tellafriend.php?comicid=690

3. PRINCIPLES OF PHOTOMETRIC METALLICITIES

In this section, we explain our method for deriving metallicity estimates and the sources of systematic and random uncertainty in these estimates. Isochrones model stellar color for a given age and metallicity (Section 3.1); we interpolate isochrone models at a choice of age(s) to estimate metallicities for each RGB star based on its optical color and magnitude (Section 3.2). We then take all the individual star metallicities in a spatial bin and use these to measure the median metallicity. These median metallicity determinations are the source of the primary results in this paper. Because of the large numbers of stars, the random sampling uncertainties in the median metallicity are negligible compared to systematic uncertainties. The systematic uncertainties include photometric bias and completeness, dust extinction, and isochrone model choices including age choices. Much of the following subsections focuses on these systematic uncertainties.

Photometric bias and completeness systematically bias our stellar photometry measurements and therefore affect our metallicity estimates. We measure the effects of photometric bias and completeness using artificial star tests in Section 3 and discuss their impact on our metallicity estimates in Section 3.3. These photometric systematics increase in strength as crowding increases. In our final results, we therefore exclude the central region ($R \lesssim 3.6$ kpc).

Dust extinction also systematically affects a star's observed photometry causing the star to appear dimmer and redder. This causes us to overestimate a star's metallicity. Fortunately, we have very detailed measurements of the dust thanks to Dalcanton et al. (2015) (Section 2.2). In Section 3.4, we discuss the impact the dust has on our median metallicity measurements.

Our primary results are based on the relative difference in median metallicity for different spatial positions. For example, measuring the metallicity gradient requires only the difference in metallicity at a range of radii. The absolute metallicity scale is less robust and subject to more significant systematic uncertainties (discussed in Section 3.5). To obtain more accurate results, we apply corrections to the median metallicity for the systematic effects of photometric bias, completeness and dust extinction (Section 3.6). We create two models: one for photometric bias and completeness and the other for dust extinction. These models provide the magnitude of systematic effects on the median metallicity at every spatial position.

3.1. *Isochrone Models and Age Assumptions*

The intrinsic color of an RGB star depends primarily on its age and metallicity. This is modeled by isochrones. Given photometry of a star, we can use these isochrones to estimate a star's metallicity. When estimating individual star metallicities (Section 3.2), we break the age-metallicity degeneracy using assumptions about the age of M31's disk motivated by literature estimates. In this section, we discuss our choice of isochrone models and introduce the impacts of age on our metallicity estimates; these impacts are further explored throughout the paper.

For isochrone models, we use Padova PARSEC1.2s isochrones (Bressan et al. 2012). At ages >1 Gyr, these isochrone models are available at metallicities z between 0.0001 and 0.06 ([M/H] = -2.18 and 0.6 dex using $z_\odot$=0.0152). A comparison between metallicities derived from the BaSTI (Pietrinferni et al. 2007) and PARSEC (Bressan et al. 2012) isochrones shows a typical bias in our RGB metallicity estimates of ∼0.1 dex. This bias depends on the metallicity; for bluer stars BaSTI gives lower metallicities than PARSEC, while for redder stars it yields higher metallicity estimates. Using the BaSTI isochrones changes the median metallicity of the overall sample by ∼0.2 dex. While uncertainties exist in the absolute metallicity estimates from the isochrones (Streich et al. 2014), the relative differences that are the primary focus of this paper are smaller and are based on differences in isochrones shape.

The isochrone models for the bright RGB stars have a degeneracy between age and metallicity (Worthey 1994). To break this degeneracy we use age choices motivated by literature measurements. Our age choices fall into two categories: either the age is fixed and some fiducial age is assumed or the age has a particular linear gradient as a function of radius.

Information on the age of M31's disk is relatively minimal. Spectroscopic measurements of the age by Saglia et al. (2010) show a mean age of ∼12 Gyr throughout the bulge, but this drops to ∼8 Gyr at their maximum radius of ∼2 kpc (500") where the disk light starts to contribute significantly. Other constraint on the ancient star formation history can be obtained from the PHAT data itself, but star formation history measurements suggest a mean age of ∼10 Gyr for all stellar types throughout the disk (Williams et al., *in prep*). We can also get some insight into the age and age gradient present in M31's disk by examining similar galaxies. The recent CALIFA survey (Marmol-Queralto et al. 2011) sampled nearby galaxies with mean Hubble Type, size, and central velocity dispersion is similar to Andromeda's. In a spectral synthesis study of this data, Sánchez-Blázquez et al. (2014) find mass-weighted ages at 1.5 r_{eff} (∼2.5 scale lengths) of 5 to 10 Gyr. Sánchez-Blázquez et al. (2014) also examines age gradients in their disks, which are typically found to be quite flat. Age gradients, and their impact on our metallicity gradient measurements are discussed in more detail in Section 4.1.

The average age of stars observed along the upper RGB is not equivalent to the mass-weighted average age of stars. This is due to varying RGB lifetimes and the difference in masses of RGB stars with age. The average age of stars along the upper RGB is normally *younger* than the mass-weighted average stellar age. When performing a star formation simulation using Williams et al.(*in prep*) SFH, we calculate the mean age of RGB stars to be 5.2 ± 0.4 Gyr younger than the mean SFH age.

For the primary median metallicity maps subsequent metallicity gradient results in this paper we assume a flat fiducial age of 4 Gyr for our RGB stars. In Section 4.1.1, we present the results of how changes in fiducial age affect the metallicity gradient. From these results, we learn that fiducial age changes primarily only affect the absolute scale of metallicities. In Section 4.1.2, we present the results of including an age gradient. These do show a significant impact on the median metallicity gradient which we discuss along side the results.

A thorough edit is a *teaching device*.

write

We learn to ~~do anything~~ by making mistakes, having experts point them out, and then fixing the mistakes.

When you ignore a collaborator's edit?

You are in denial.

There was something wrong with the text and they tried to help. But you essentially said "No. It's perfect. You read it wrong."

When you ignore a collaborator's edit?

You are in denial.

You may not agree with their fix, but you cannot ignore that the text was not working.

Ways to make a collaborator's edit more constructive

Try to understand what problem they're fixing.

Sometimes they'll tell you, but after this class, you may be able to deduce what's being corrected

Ways to make a collaborator's edit more constructive

Pay close attention to repeated fixes

When you find the 4th instance of splitting a long sentence, or of turning a demonstrative noun into an adjective, or of crossing out semicolons, *take the hint*!

Ways to make a collaborator's edit more constructive

Ask for what you really need

You can request help with:

Overall structure
Effectiveness of an argument
Flagging missing information
Flagging excess detail
Flagging text that's not working

Overall structure
Effectiveness of an argument
Flagging missing information
Flagging excess detail
Finding text that's not working

These are usually faster to fix than a detailed language edit.

Overall structure
Effectiveness of an argument

The first two are problems you want to know about *early*.

Don't agonize over text that may need to be restructured

Overall structure
Effectiveness of an argument

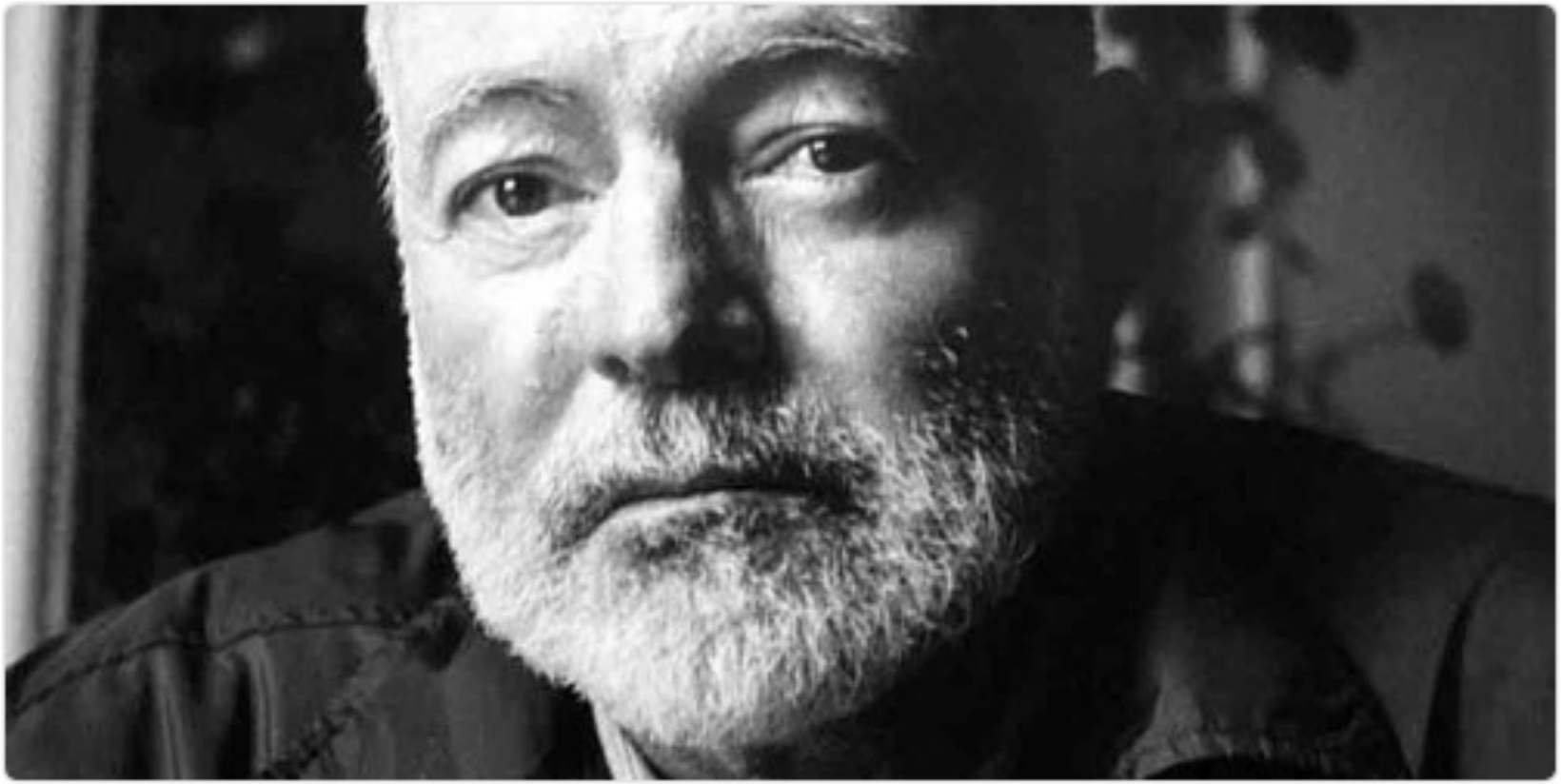
These issues are often the root cause of difficulty writing a particular document.

Don't wait to ask for input.

Jon Winokur 
@AdviceToWriters

 Following

I write one page of masterpiece to ninety one pages of shit. I try to put the shit in the waste-basket. HEMINGWAY



Structure of Papers

You've probably read >100 papers.

So, this won't be news.

Overview

- Abstract
- Introduction
- Methods
- Results
- Discussion

Sometimes merged

- Conclusion
- Appendix
- Figures
- Tables

Overview

- Abstract
- Introduction
- Methods
- Results
- Discussion
- Conclusion

Sometimes merged

- Appendix
- Figures
- Tables

Introduction

Most important issue:

Framing the story you want to tell

Detour: What's your story?

Good fiction is always rooted in a conflict.

A protagonist faces a conflict, and the nature of both makes the subsequent plot inevitable

Detour: What's your story?

Good papers are the same

There is a conflict of ideas, and your work should appear as the inevitable way to resolve the questions raised by the conflict.

Detour: What's your story?

The story *doesn't* have to be the one you set out to tell

The choice of story is often best done at the *end* of the project.

Look at your stack of results & associated plots

Which are the most important? What issue does the most important ones resolve?

That's your story*.

*even if it's not the one you thought you were telling….

How specific should your story be?

Specific enough that your work is the obvious answer

Example:

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

Possible story:
"How do stars form?"

This is *way* too general.

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

Possible story:
"What is the substructure within molecular clouds?"

Better, but not compelling.
"Substructure" is not interesting without context.

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

Possible story:
"Is the substructure within molecular clouds driven by compressive or solenoidal forcing?"

Better, because there's now a clear question to be answered (assuming that your measurement answers it!)

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

Possible story:
"What is the origin of the IMF?"

Important to a wide audience, and directly relevant to your measurements

In each case, your introduction would be wildly different

"How do stars form?"

"Is the substructure within molecular clouds driven by compressive or solenoidal forcing?"

"What is the origin of the IMF?"

In each case, your introduction would be wildly different

"How do stars form?"

This would likely become a long book report with many details about stages of star formation

In each case, your introduction would be wildly different

"Is the substructure within molecular clouds driven by compressive or solenoidal forcing?"

This would focus on issues of turbulence, magnetic fields, and gravitational collapse*

*And maybe, if you hadn't gotten a power-law with the proper IMF slope, this would have been the right story!

In each case, your introduction would be wildly different

"What is the origin of the IMF?"

This would focus on how molecular cloud properties could set stellar mass distributions, which is directly testable with your observations

If you *don't* know your story:

1. It's nearly impossible to write a compelling introduction

2. The rest of the text will lack momentum & purpose

If you *do* know your story:

You have a clear metric for deciding what goes in or out of the paper, and in what order

If you *do* know your story:

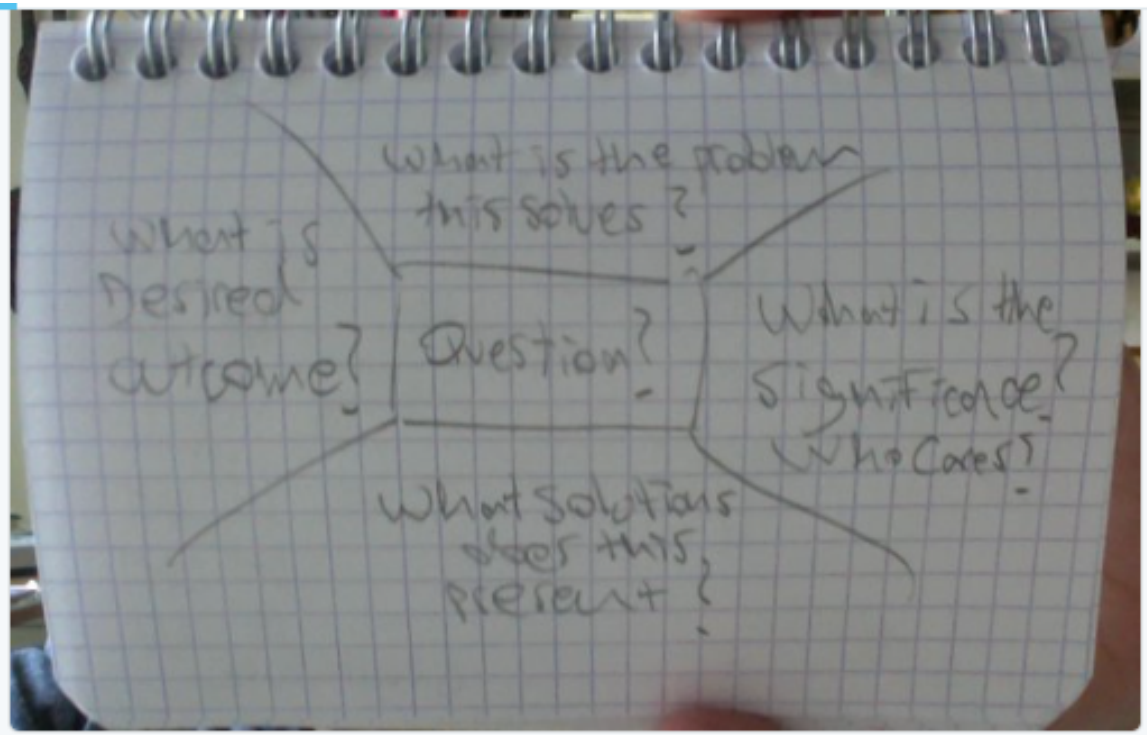
You also have a framework to guide your reader

All new material can be discussed in the context of how it supports or contradicts the story.

How do you figure out your story?

- Write down a ~2 sentence description.
- Discuss your pitch with collaborators.
- Evaluate whether your result is direct, compelling outcome of that story.
- Re-evaluate as you write & read.
- If placing your result in the story feels like a stretch, your story may be too broad, or focused on the wrong idea.

How do you figure out your story?



4

Namnezia @Namnezia · 16h

I used this diagram scheme to write my last paper, worked really well. Can't remember what it was called.

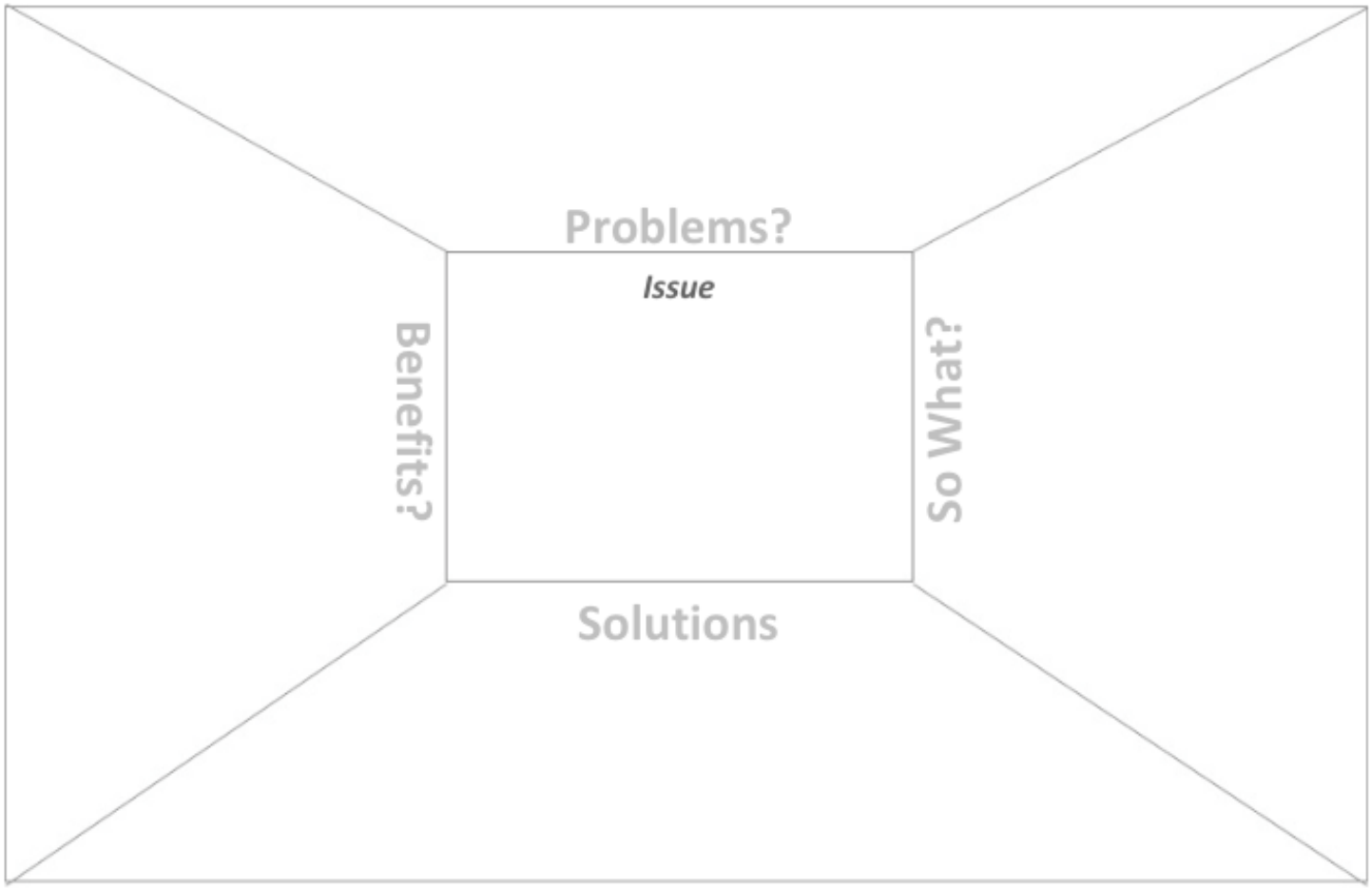
1

Namnezia @Namnezia · 17h

Anyone remember what a kind of project map is called where you state question in center, surround by 4 Q's: problem, signif, action,future?

“COMPASS Message Box”

Audience: _____



http://compassblogs.org/blog/2013/06/20/getting-to-the-so-what-of-your-science/
https://www.scribd.com/doc/139351833/The-COMPASS-Message-Box

How do you figure out your story?

Don't be afraid to sell the relevance of your work!

It's ok to be excited about your work's impact*

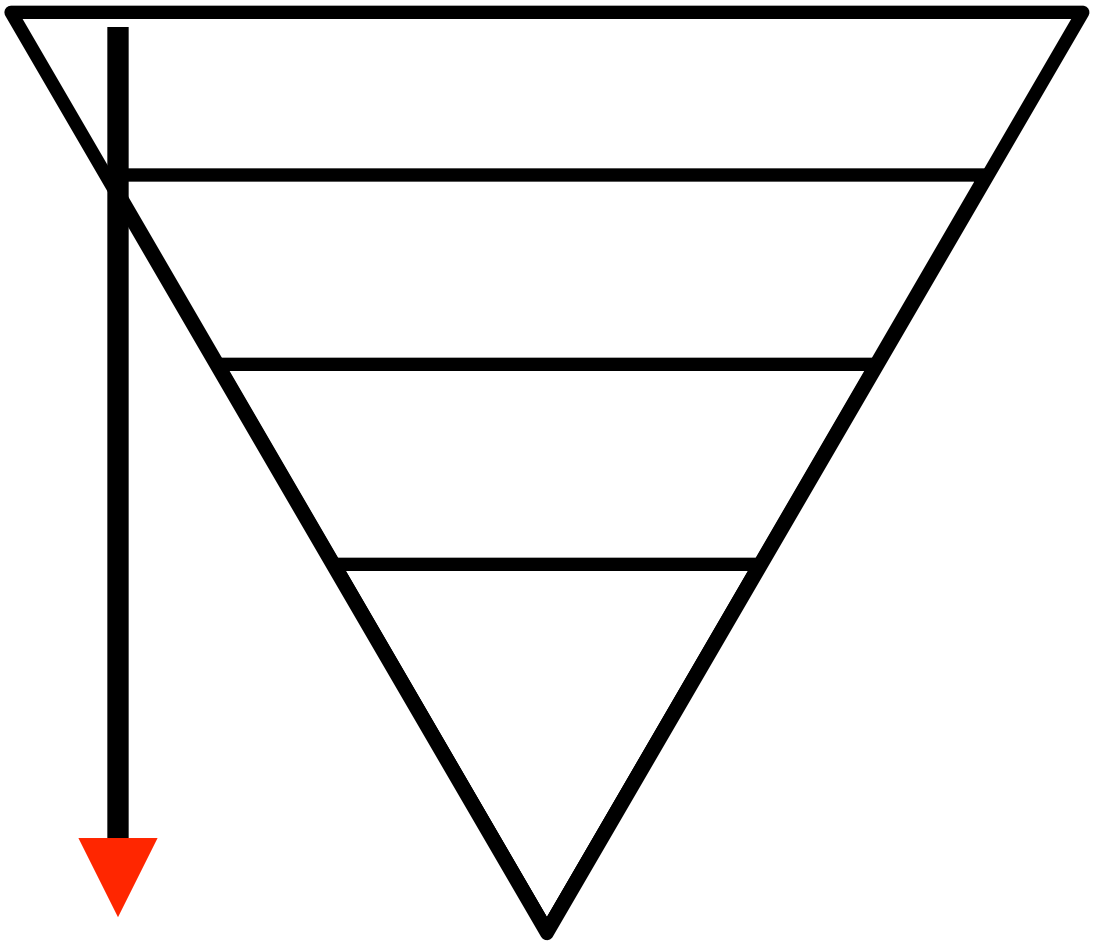
*if you're not, who will?

How do you figure out your story?

That said, don't oversell the strength of the result.

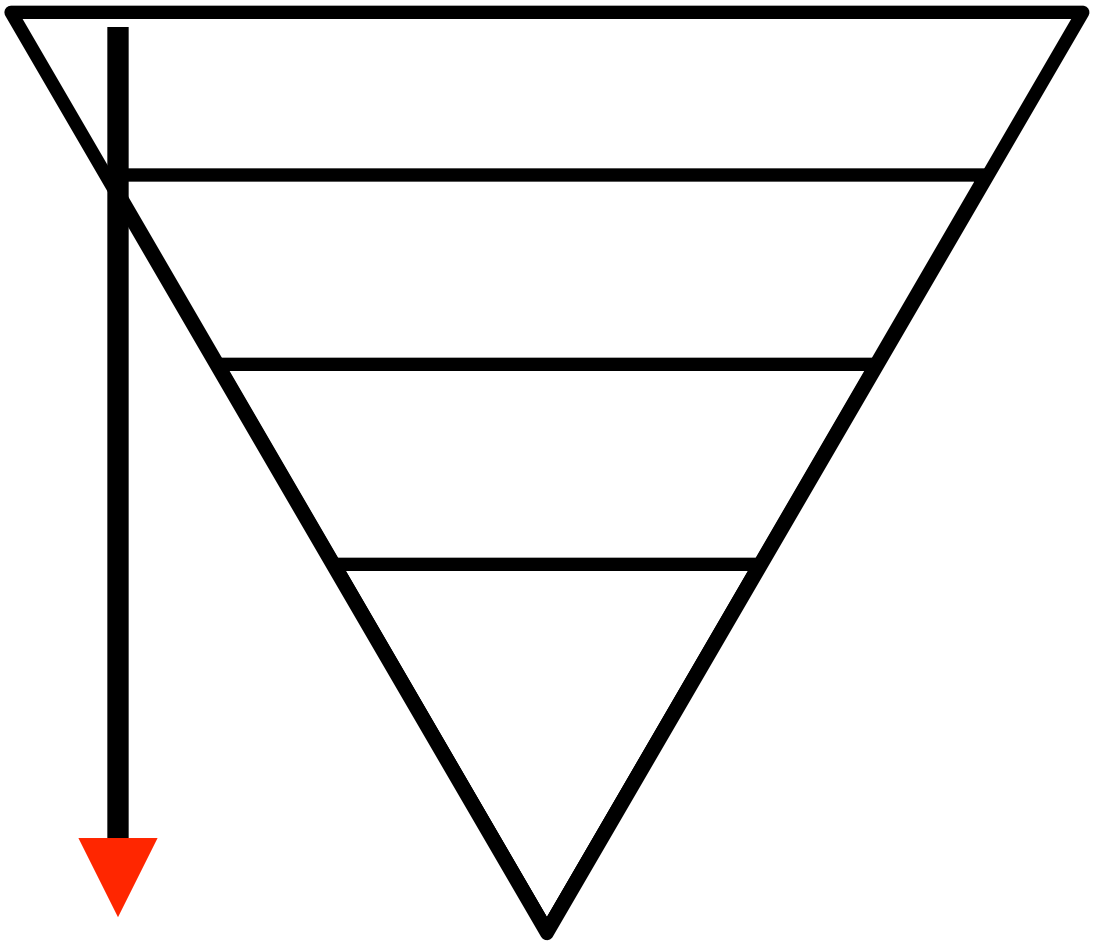
If it's only a marginal result/ correlation, it doesn't look good to overstate it.

Introduction



Move from the largest context, to the specific details of the paper

Introduction



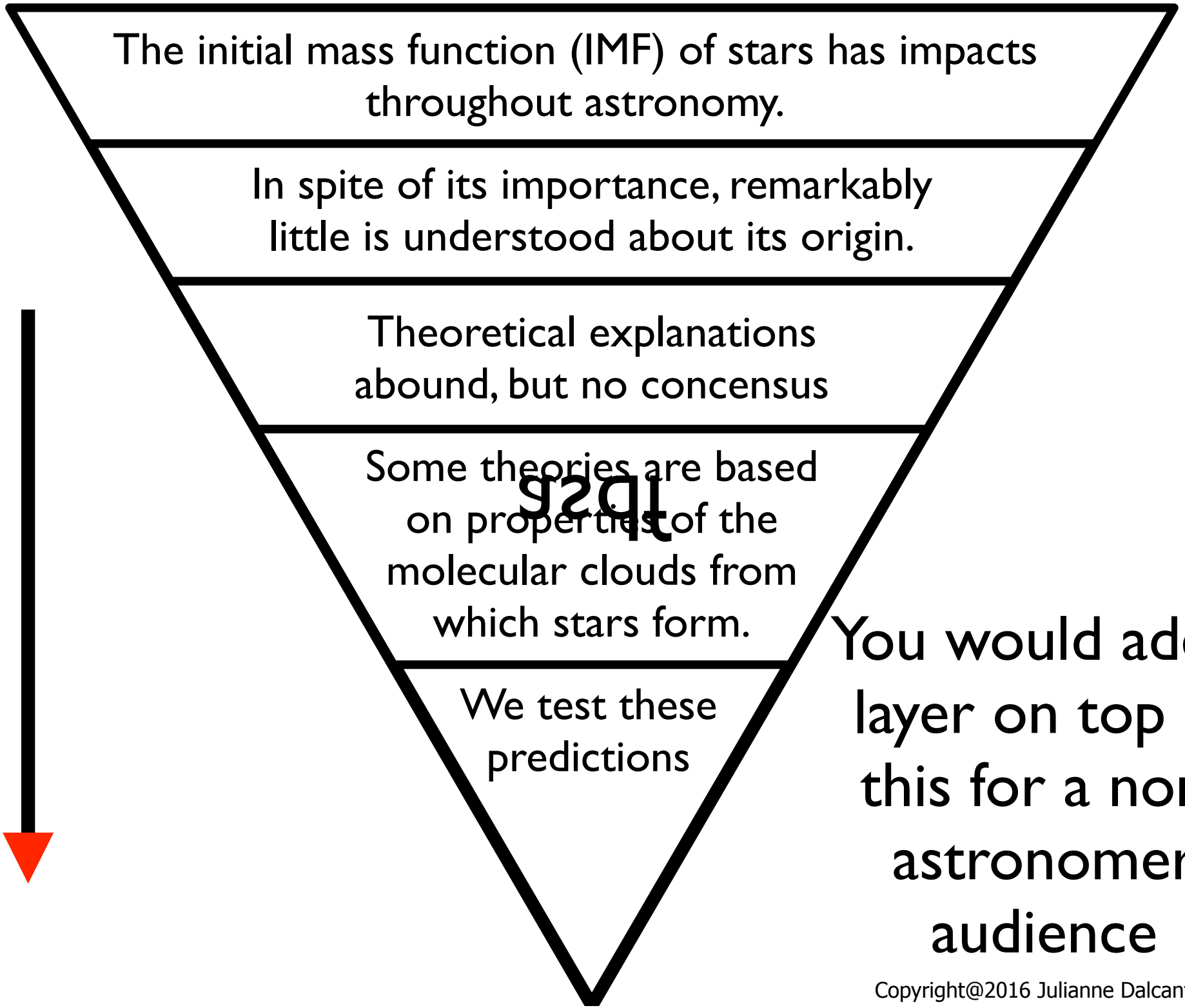
How general you start with depends on the venue

Previous example:

Your result: *Molecular cores in the Monoceros molecular cloud have a power-law mass distribution with a slope similar to the IMF.*

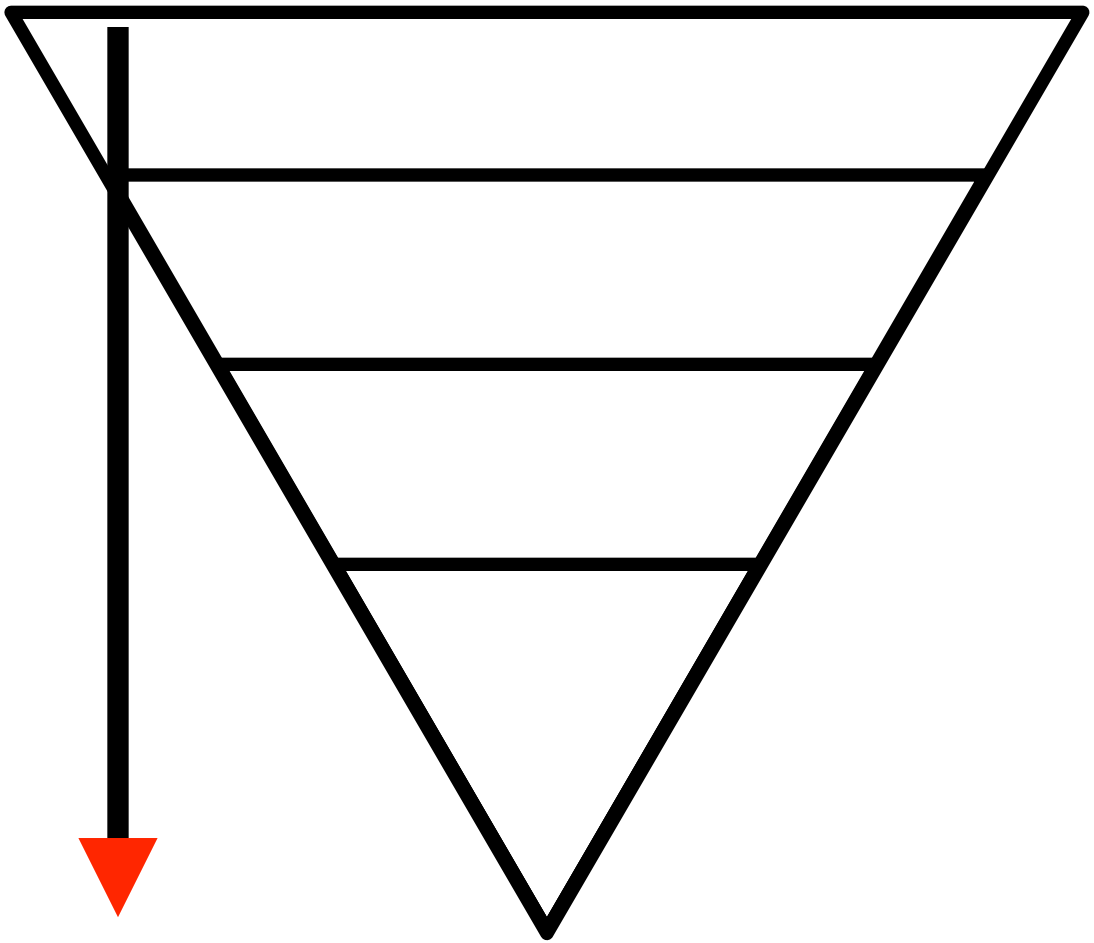
Possible story:
"What is the origin of the IMF?"

Important to a wide audience, and directly relevant to your measurements

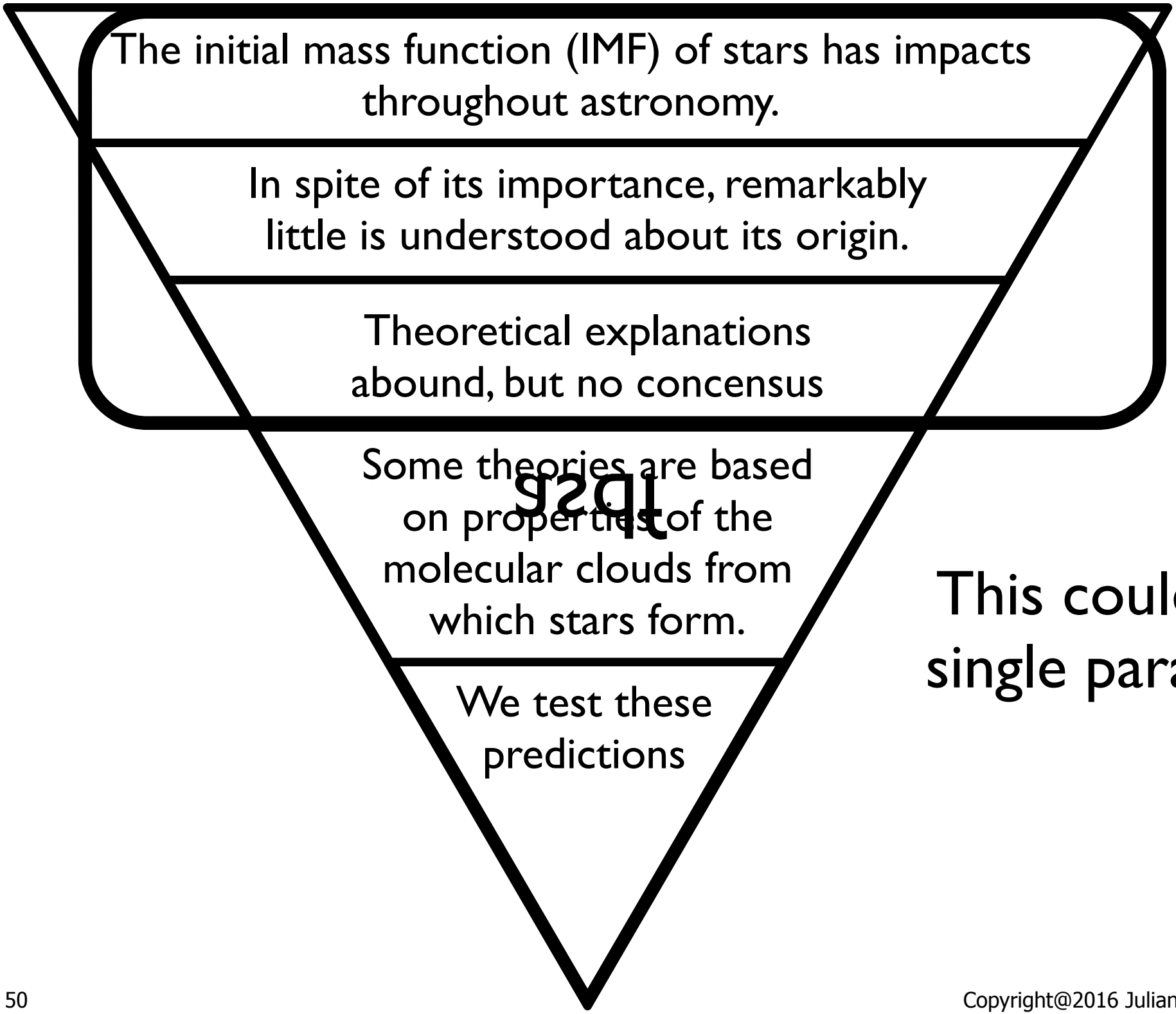


You would add a layer on top of this for a non-astronomer audience

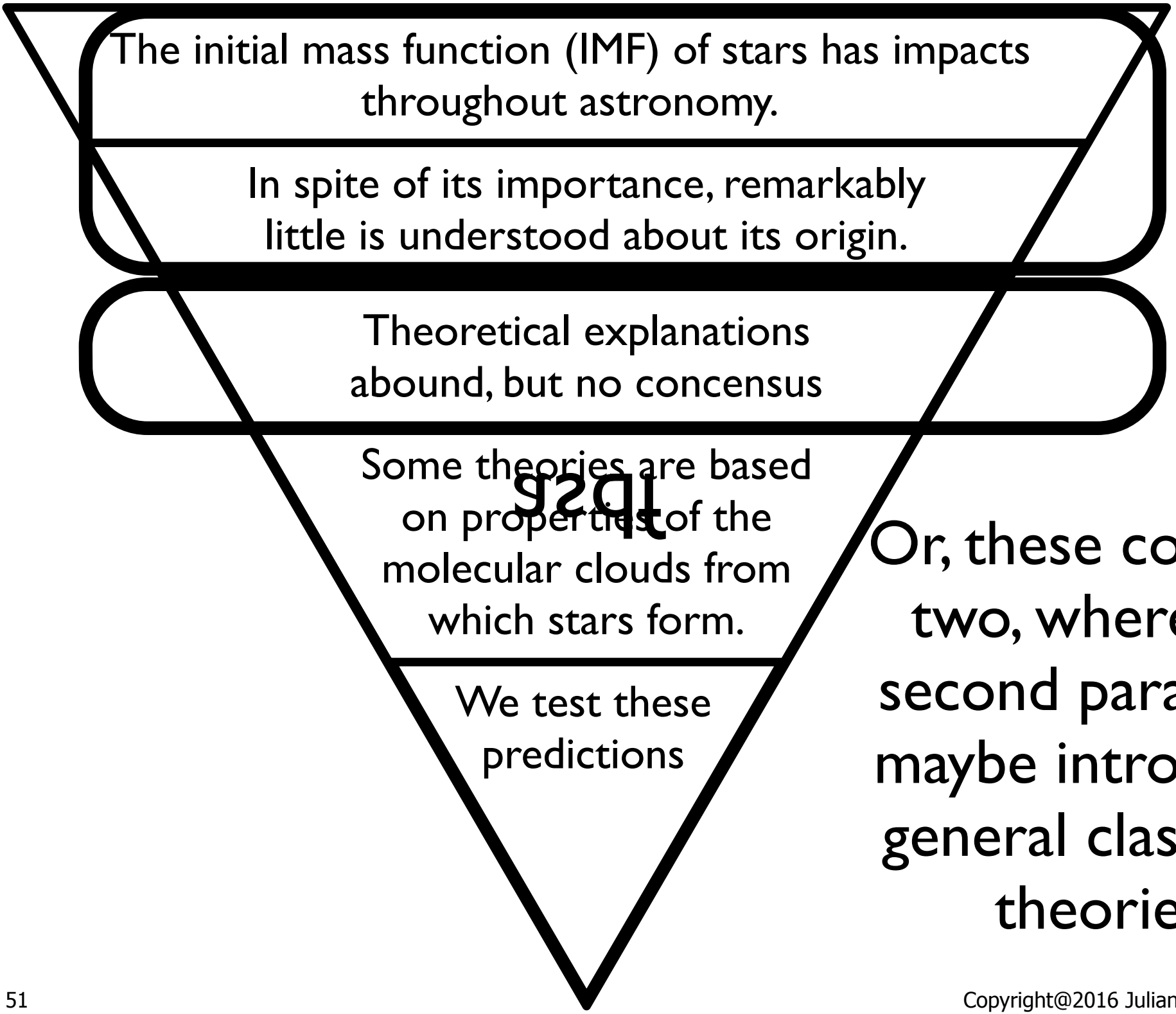
Introduction



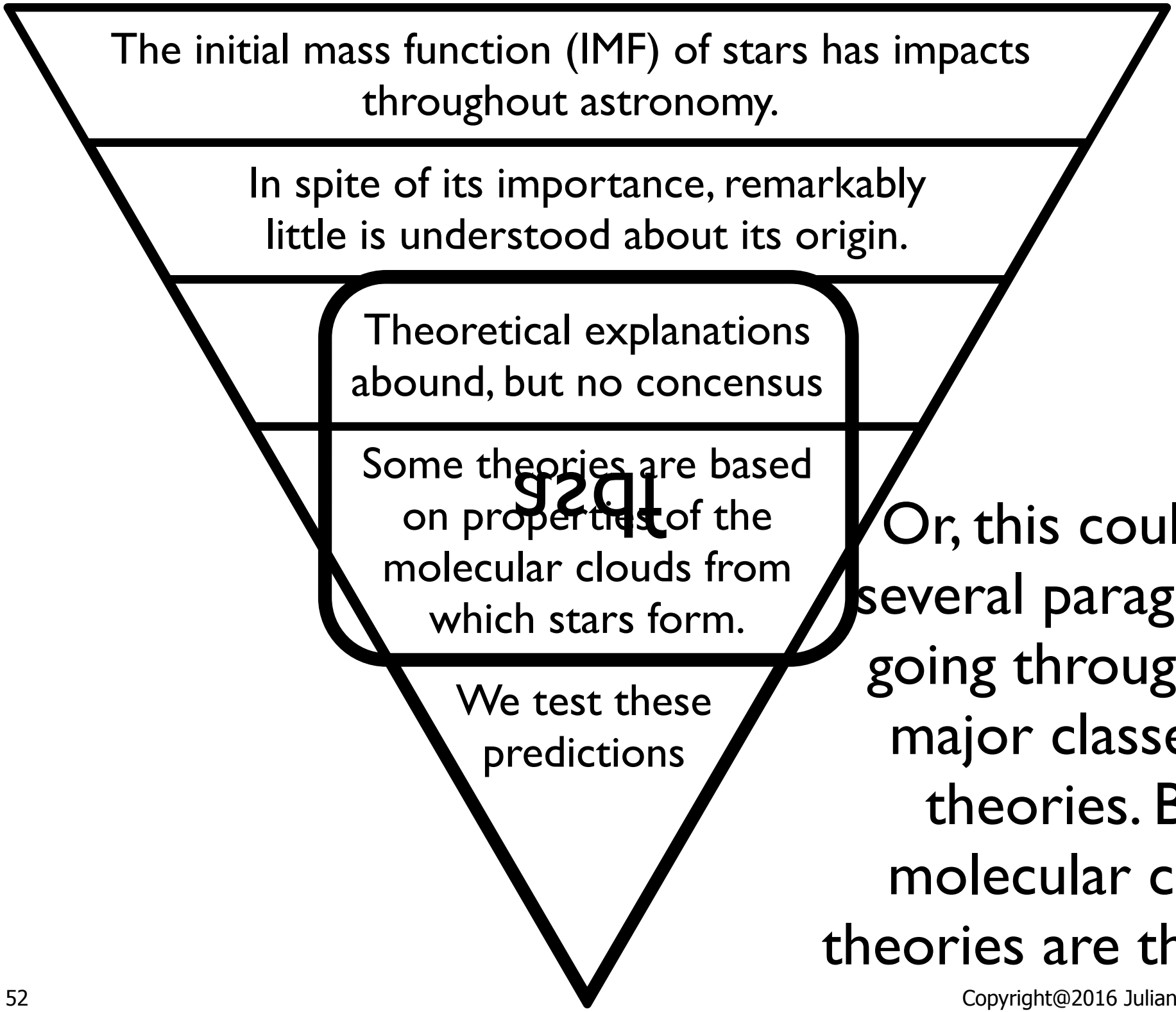
You should get through these stages fairly rapidly, to shift focus to your real story.



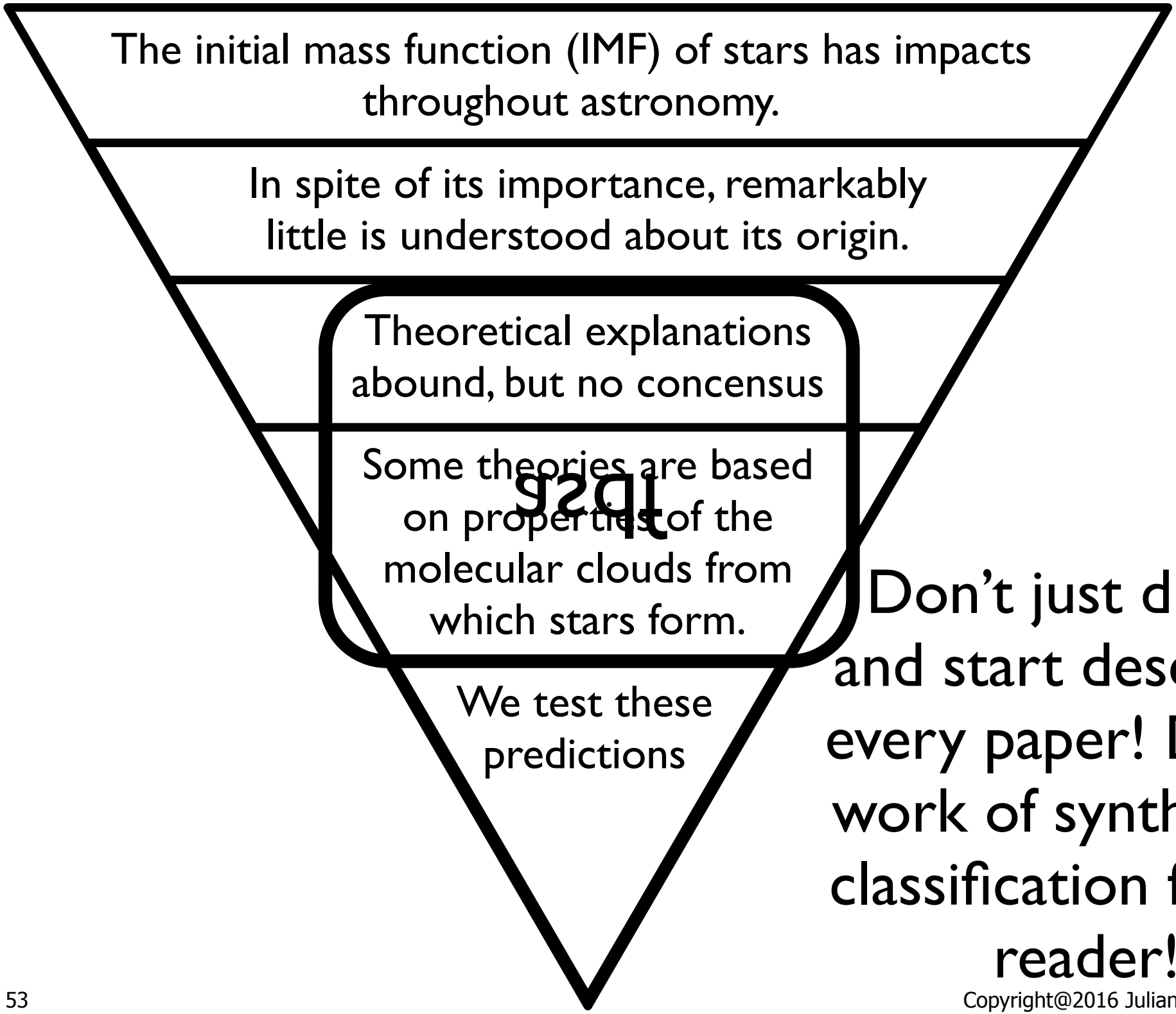
This could be a single paragraph



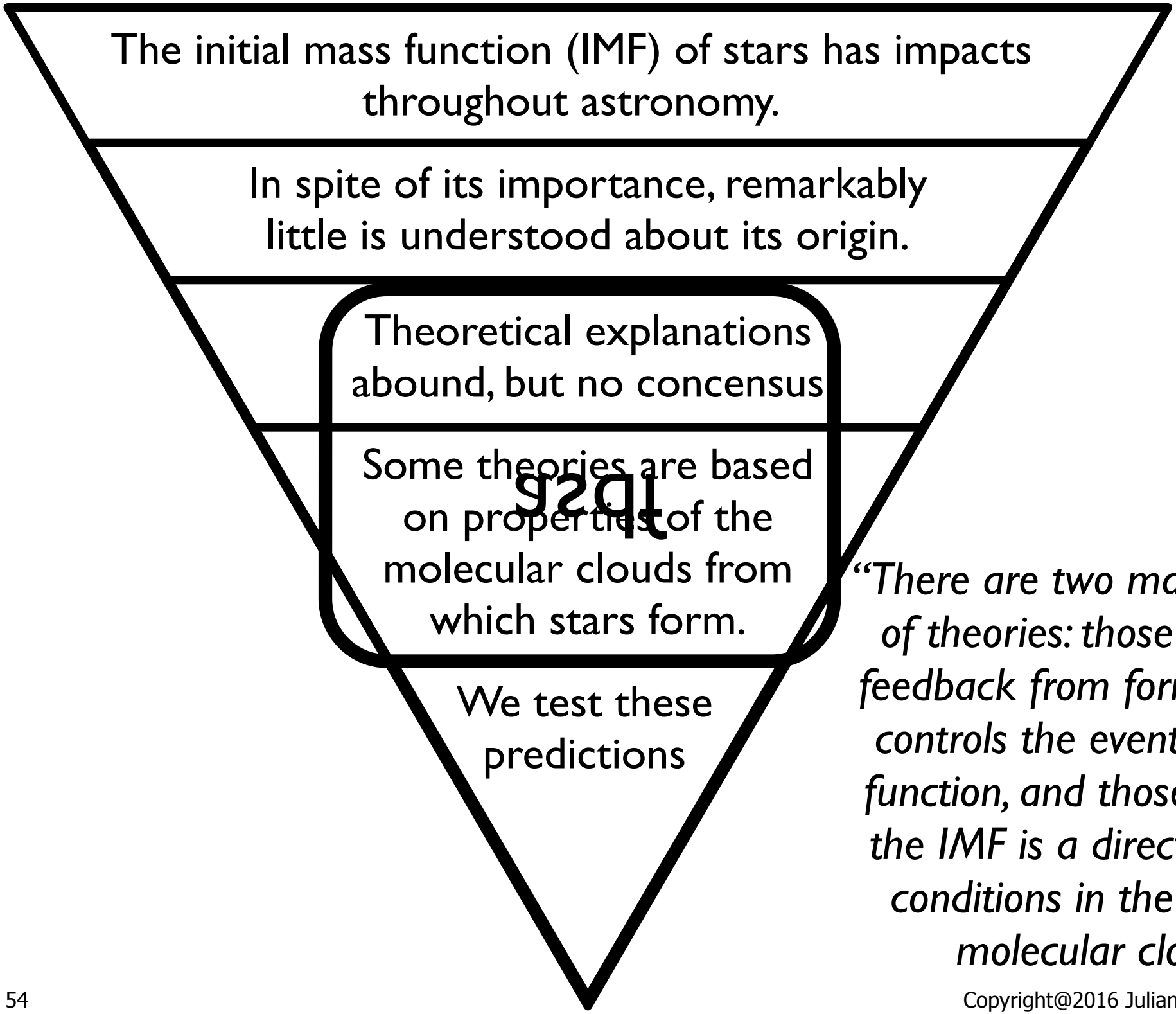
Or, these could be two, where the second paragraph maybe introduced general classes of theories.



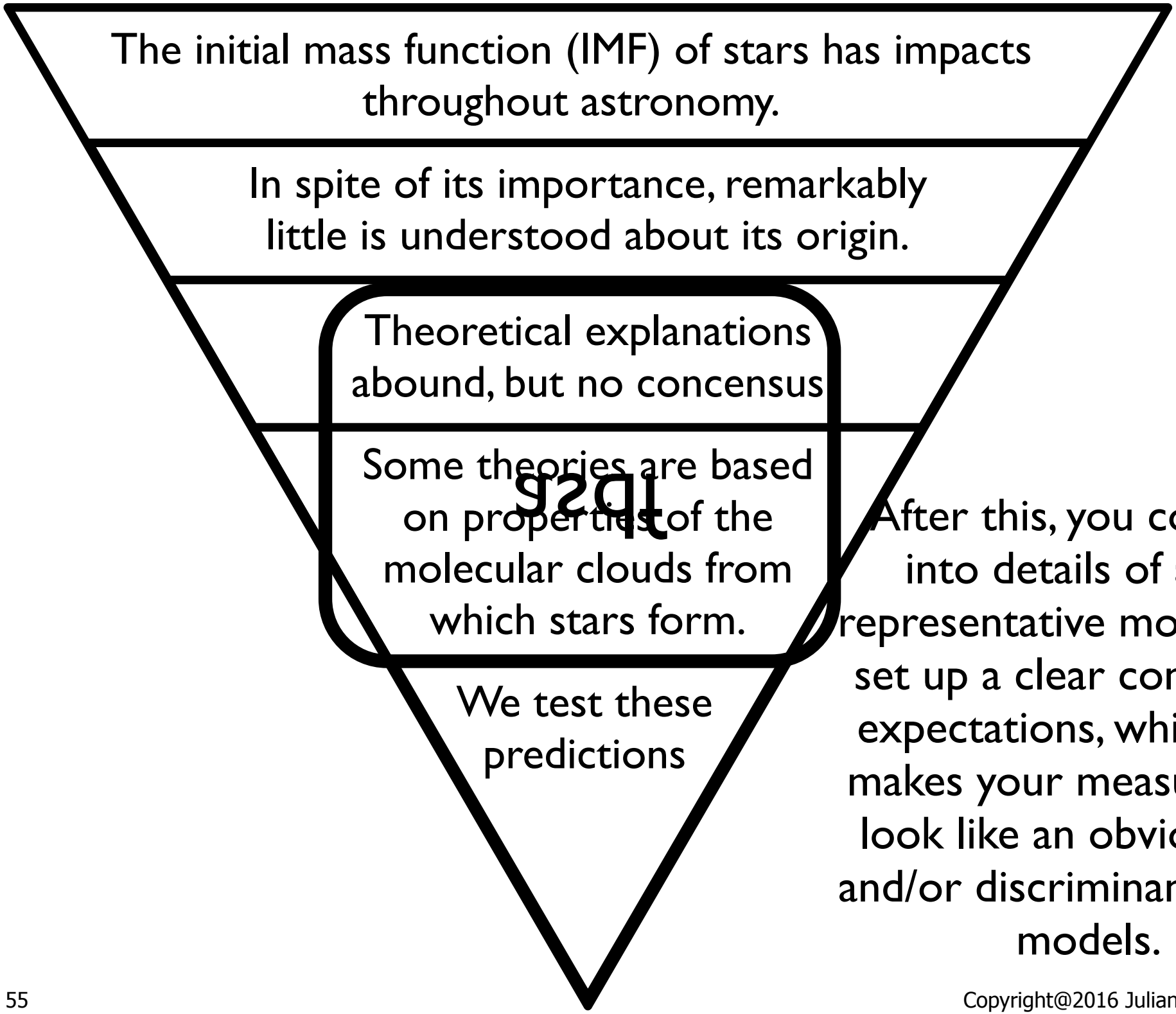
Or, this could be several paragraphs, going through the major classes of theories. But, molecular cloud theories are the goal!



Don't just dive in and start describing every paper! Do the work of synthesis & classification for the reader!

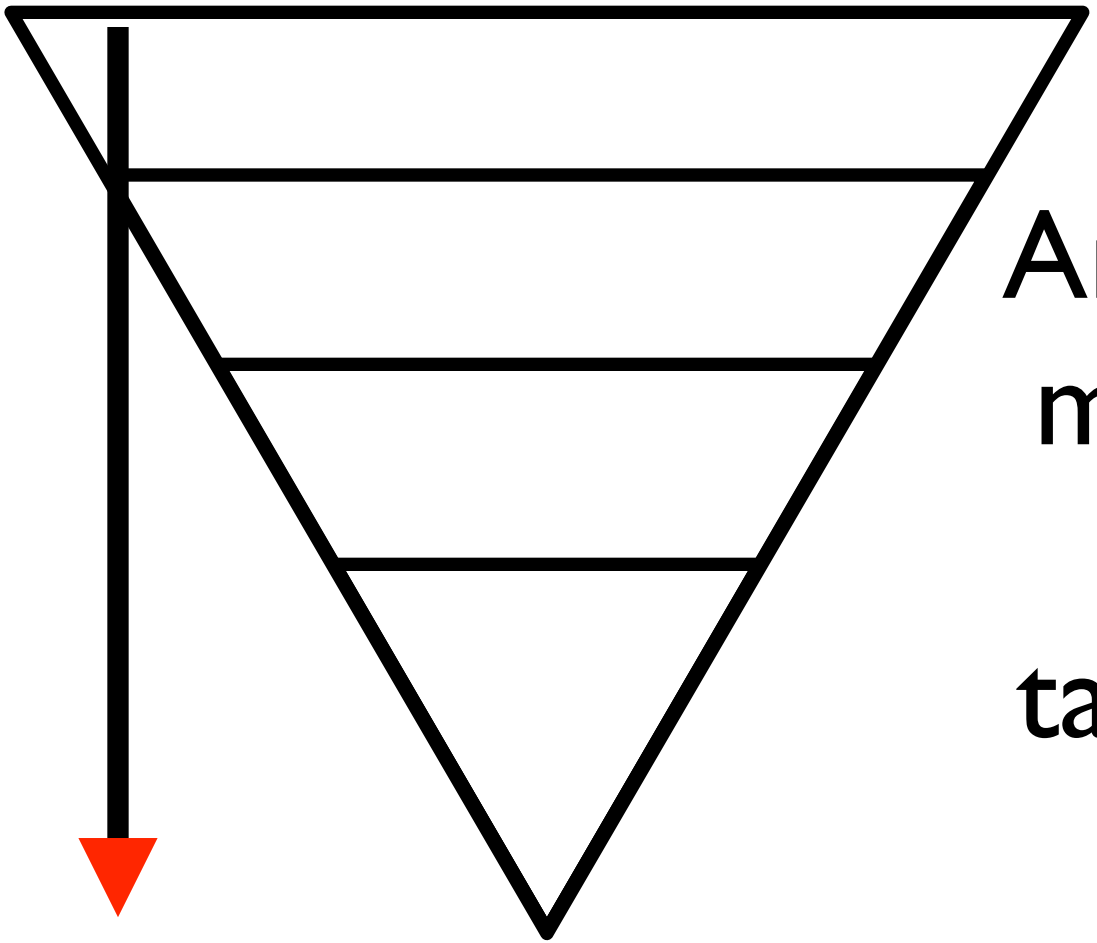


"There are two major classes of theories: those in which feedback from forming stars controls the eventual mass function, and those in which the IMF is a direct result of conditions in the nascent molecular cloud,"



After this, you could go into details of a few representative models that set up a clear contrast of expectations, which then makes your measurement look like an obvious test and/or discriminant among models.

Introduction

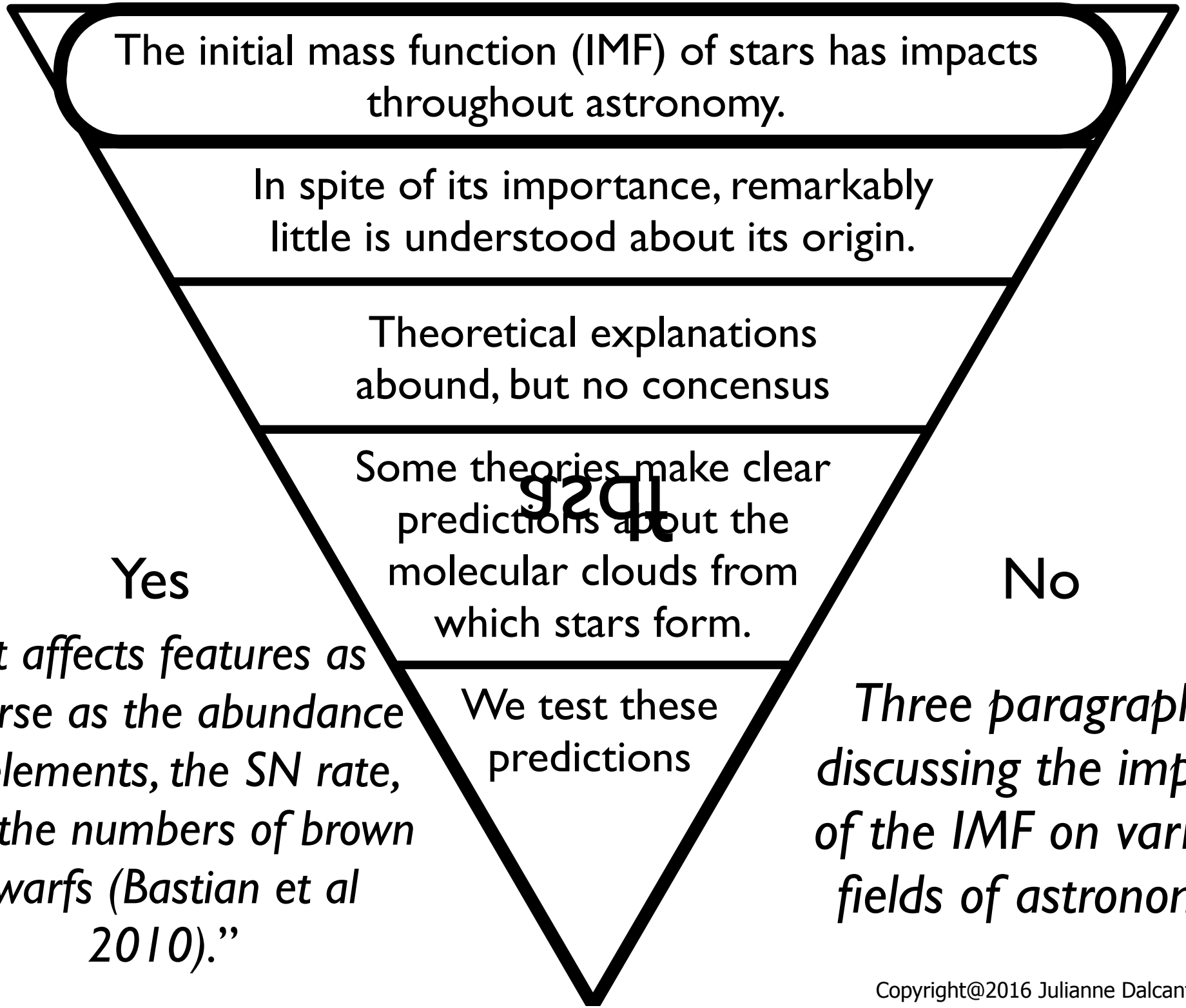


Caution:
Are you leading with multiple paragraphs that have only tangential impact on your story?

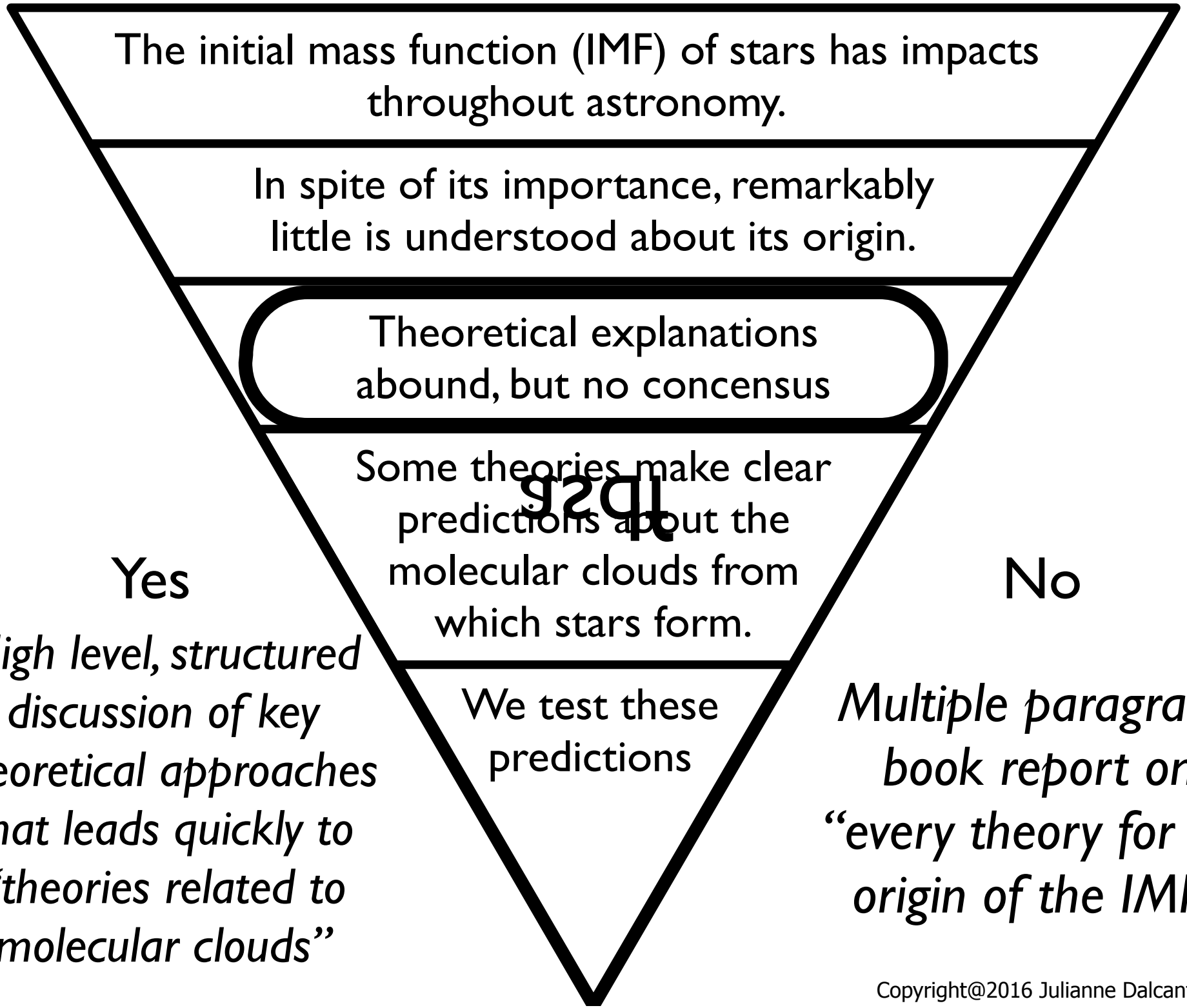
The reader will give "weight" to what you spend significant time discussing.

Don't write too much about "stepping stones" on your way to the true story.

It is ok to simply "assert" importance in a sentence or two, along with a link to a review article.



Same issue holds deeper into the introduction



Heard describes this structure as:

- Define a "research territory" (i.e., context)

  IMF

- Define a "niche" within that territory (i.e., knowledge gap)

  Does the IMF emerge from features imprinted in the host molecular cloud?

- Occupy that niche (i.e., how will you fill that gap)

  We measured the mass function of cores.

Note: Proposals are *exactly* the same.

- Define a "research territory" (i.e., context)

  IMF

- Define a "niche" within that territory (i.e., knowledge gap)

  Does the IMF emerge from features imprinted in the host molecular cloud?

- Occupy that niche (i.e., how will you fill that gap)

  We will measure the mass function of cores.

Words and Phrases I Hate

Unnecessary, imprecise, distracting, florid

Unnecessary filler

"In order to…"

This can always be replaced by "*To…*"

Unnecessary filler

"As a means to…"

This can usually be replaced by "*To…*"

Unnecessary filler

"is due to the fact…"

This can always be replaced by "*because…*"

Unnecessary filler

"as well as…"

This can usually be replaced by "*and…*"

*Yes, it can be a way of mixing up the text a bit, but if you have so many "and"'s they need mixing up, your sentence is probably too long….

Unnecessary filler

"as well as…"

But, can be used to keep sentences from reading like poorly structured lists….

"…sets the scale and temperature of X, as well as the distribution of Z."

Unnecessary filler

"It is important to note…"

Just note it.

Unnecessary filler

"It is worth mentioning that…"

Just mention it.

Unnecessary filler

"In this/our paper…"
"In this/our research…"
"In this/our sample…"

Almost always implicit in the fact that it's your paper the reader is holding…

Vague words for specific things

"systems"

"*These galaxies/stars/AGN/planets*" almost always carries more content then "*these systems*"

Vague words for specific things

"objects"

Same as for "*system*":
"*These galaxies/stars/AGN/planets*"
vs "*these objects*"

Fancy words for simple things

"utilize"

What? Are you too fancy to just "*use*" something?

Fancy words for simple things

"represent", "serve as"

e.g., "These galaxies represent the best probes of dark matter halos"

How about just "are"?

Fancy words for simple things

"*perform*"

verb

1. carry out, accomplish, or fulfill (an action, task, or function).
   "I have my duties to perform"
   synonyms: carry out, do, execute, discharge, bring about, bring off, accomplish, achieve, fulfill, complete, conduct, effect, dispatch, work, implement; More

Why say "*we performed fitting*" rather than "*we fit*"? Also, I think of clowns.

"Nounification"/"Nominalizations"

Overuse of words like "*perform*" comes from tendency to turn verbs into nouns

http://opinionator.blogs.nytimes.com/2012/07/23/zombie-nouns/
http://ed.ted.com/on/eJKYN8dx#review
See also: http://writersdiet.com

Nounification

"We performed fitting…"

"We fit…"

"is dependent on"

"depends on"

"We used X for map creation"

"We created maps with X"

Distracting Habits

Overuse of "*our*"
"*our data…*", "*our sample…*"

Fine when *contrasting* with *other's* data, sample, etc.
But, better to go with impersonal "*the*" as a default.

Frequently misused

"*which*" vs "*that*"

In american english, "*which*" is used to introduce non-essential information. If you could add "*by the way*", use "*which*"

http://www.quickanddirtytips.com/education/grammar/which-versus-that

Frequently misused

"*which*" vs "*that*"

Phrases that begin with "*which*" are usually set apart by commas.

Phrases that begin with "*that*" usually aren't, because the information is essential to meaning.

http://www.quickanddirtytips.com/education/grammar/which-versus-that

Which vs That

"*which*"

"The sample of AGN, which were selected in the optical, contained 3000 objects"

"*that*"

"The sample of AGN that were selected in the optical was incomplete due to dust obscuration"

Frequently misused

"*fewer*" vs "*less*"

"*fewer*" is used for discrete, countable objects. ("*fewer solar masses*")

"*less*" is used for continuous quantities ("*less mass*").

Frequently misused

"*farther*" vs "*further*"

"*farther*" is only used for real physical distances. ("*The farther planet…*")

"*further*" is used for metaphorical/ figurative distance ("*Further studies…*")

http://www.quickanddirtytips.com/education/grammar/further-versus-farther

Frequently misused

"*affect*" vs "*effect*"

"*affect*" is "to influence", and is usually used as a verb. ("*Gravity affects*…")

"*effect*" is the result of something, and is usually used as a noun ("*The effect of gravity*…")

http://www.quickanddirtytips.com/education/grammar/affect-versus-effect

Frequently misused

"*since*" vs "*because*"

"*because*" only means one thing.

"*since*" means "*because*" and "*in the intervening time between the time mentioned and a later time*", forcing the reader to choose one of the meanings.

Bad horrible words that must never be used.

"impactful"
"as evidenced by…"

Just…<shudder>…don't.