

Quality versus *Sexiness*

The rival qualities of papers in the competition for academics' attention

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Outline

- I. Warren Thorngate's Malthusian crisis of science
 - The increasing competition for attention space, and possible responses to it
- II. A model of academic publication with preference for *quality over sexiness*
- III. Some initial findings
- IV. Questions for discussion

Part I

WARREN THORNGATE'S MALTHUSIAN CRISIS OF SCIENCE

The increasing competition for attention space

- Science increases exponentially over time (Price, 1963)
 - In numbers of papers, pages, journals, topics...
- But researchers' time for reading it is limited: 24-7 or (much) less
 - Attention space is a limited resource
- Thorngate et al. (2011)
 - This implies increasing competition for academics' attention
 - Papers and authors who fail to win this, fail to be acted on or responded to
 - What consequences are there from this "Malthusian crisis"?

Possible consequences

- An escalation of methods of attracting interest
 - Raid Sales & Marketing for ideas
- A rise in cheating and fabricating results
 - Authors try to capture more attention (and citations)
 - Editors and peer reviewers have less time to spend on evaluating submissions
- Fragmentation into subspecialities
 - Readers and editors find reasons for ignoring papers
- Boredom
 - Science becomes extinct, not because it has answered all the questions, but because it has addressed too many questions to sustain anyone's interest

Sexing up your paper to grab attention

- Authors will be tempted to “sex their papers up” by giving them attention-grabbing attributes:
 - AMAZING TITLES: With more serious, second titles that contain the actual contents
 - Colourful, artistic or high-tech diagrams and photographs
- These gimmicks require work, and therefore time, but they do not add to the epistemic quality of the paper
- Sexy contents may also make little scientific return on time invested
 - Fashionable topics
 - Controversial, contentious or emotive subjects (e.g. sex, politics and/or religion)
 - Highly desirable, but still unattained, goals (e.g. “Curing Cancer: The effects of feeding 10Kg of burnt toast to a mouse, with recommendations for nutrition in humans.”)

The dilemma for scientists

- To **survive**, scientists must **publish**
- To **get published**, the **quality** of a draft paper should **be worked on**
- To **get cited**, a paper must **be read**
- To **be read**, a paper should **be "sexy"**
- To **be "sexy"**, the **sexiness** must **be worked on** at the expense of quality

Part II

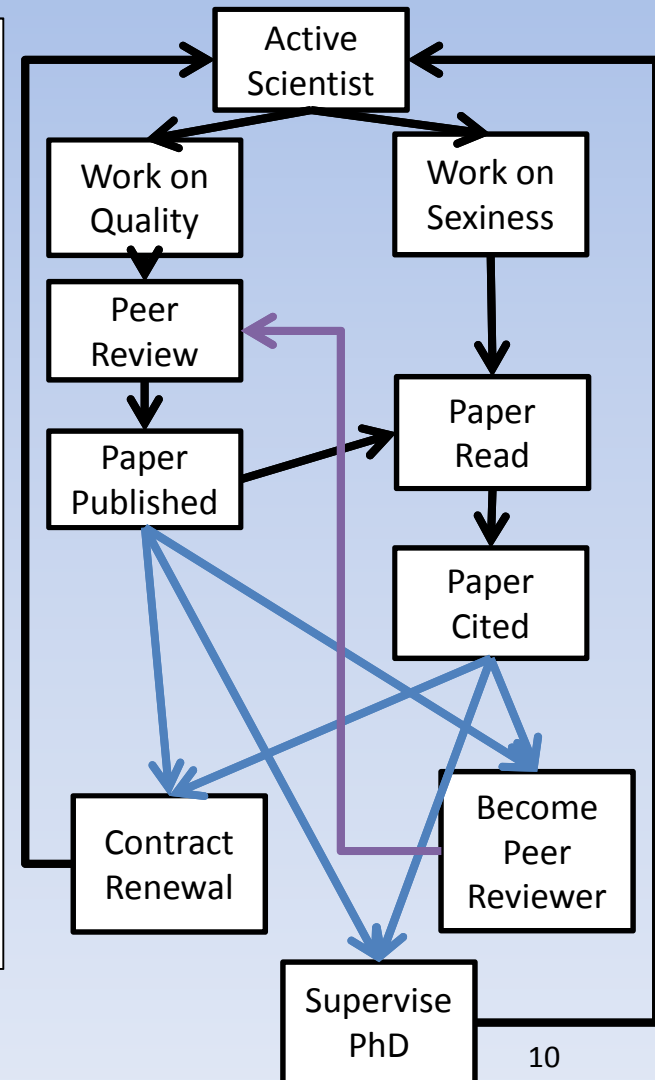
**A MODEL OF ACADEMIC
PUBLICATION WITH PREFERENCE
FOR QUALITY OVER SEXINESS**

The proposal

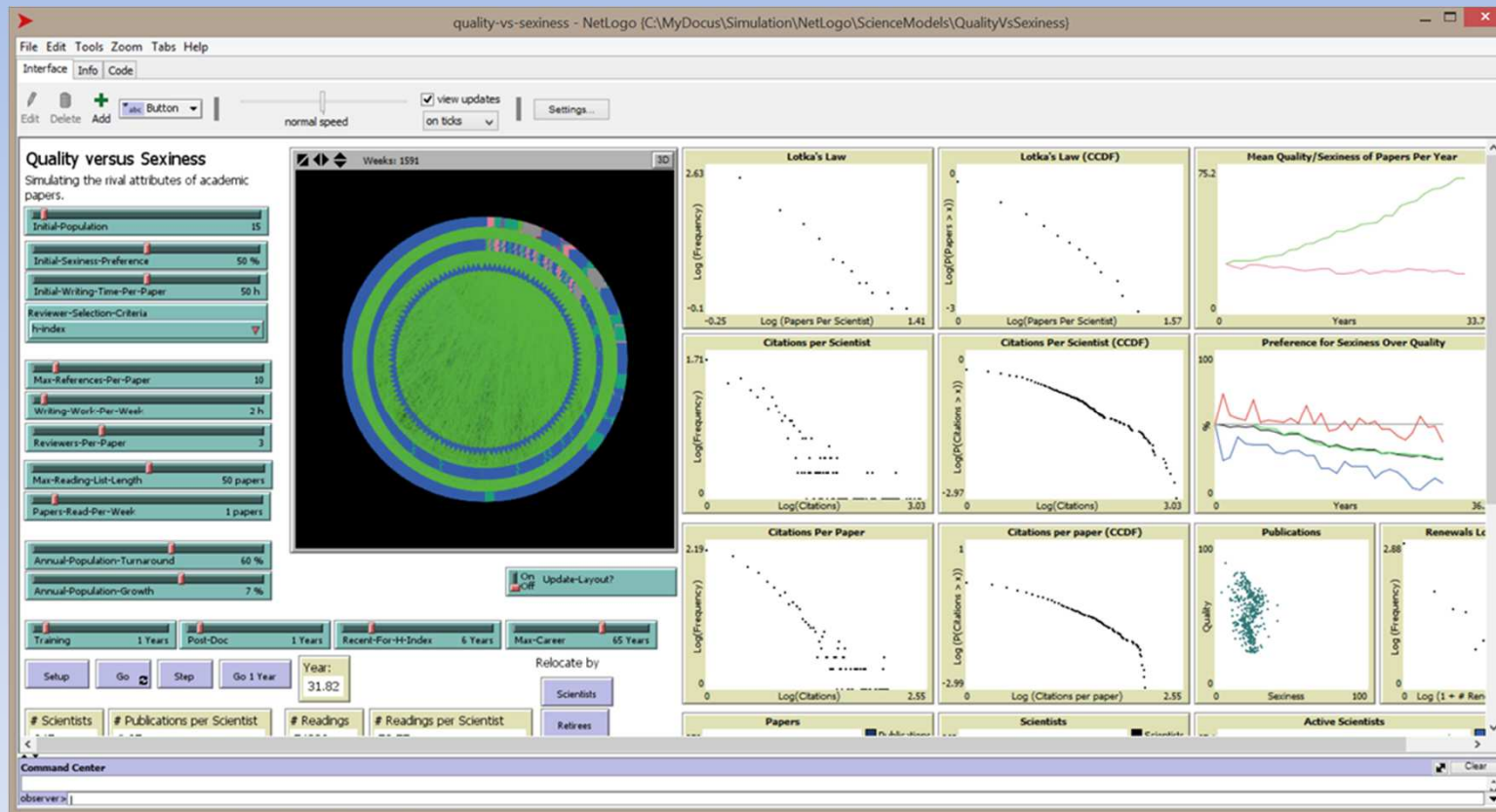
- Model agents who write papers for publication and do work on both
 - The epistemic **quality** of a paper
 - Its original contribution to knowledge
 - Something peer reviewers can look for when deciding whether to accept a submission for publication
 - The **sexiness** of a paper
 - Our term for all the gimmicks intended to the grab the attention of readers

Interesting dynamics?

- **Sexiness** leads to **more readers**
- **Being read** leads to **more citations**
- **Citations** bring advantages to the author and their topic
- **Quality** leads to a better chance of **being accepted** and **published**
- Evolutionary algorithm:
 - **Renewal of employment** contract depends on **publishing papers** / **being cited**
 - **Becoming a supervisor** to PhDs depends on **publishing papers** / **being cited**
 - Scientist agents can be heterogeneous in their preference for working on quality rather than sexiness ("**Q-Preference**")
 - PhDs **copy the preference** of their supervisor, with some random variation

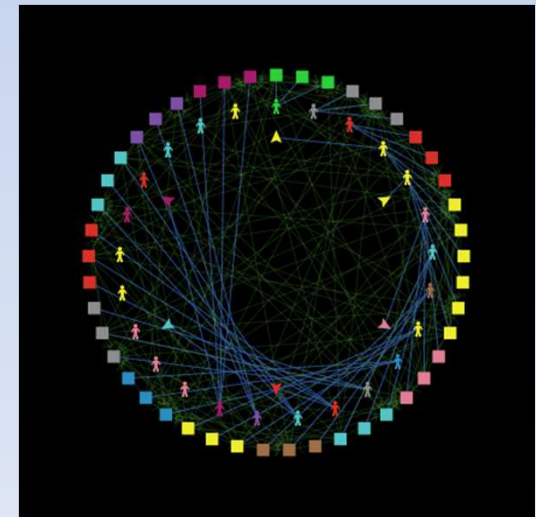
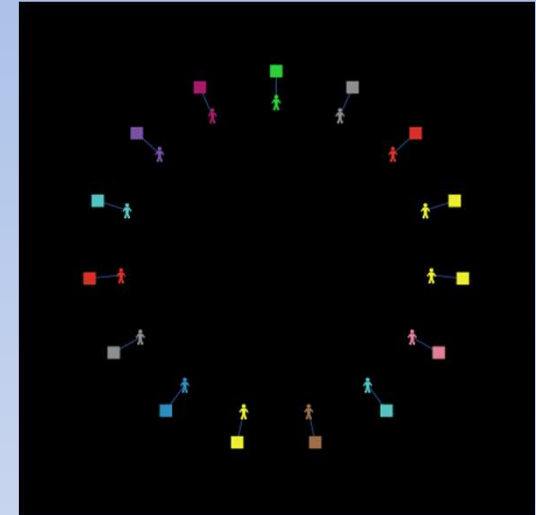


Our model in NetLogo



Entities and relations

- An initial population of **scientists**
 - Each has written one “foundational paper”
 - Homogenous in their preference for working on quality in their papers (“Q-Preference”)
- Scientists work on **drafts** they are authoring
- Drafts can become published **papers**
- Papers can be **read** by other scientists
- Papers can be **cited** by other papers
- Drafts submitted must be **reviewed** by peer scientists
- Scientists compete for contract **renewal** and PhD **trainees**
- Mature scientists with no renewal **retire**



Career stages

- Scientists can be *active* or *inactive*
 - Only active scientists do reading, writing and reviewing
- Actives
 - **Trainees**: PhD students who work, but do not need contract renewal
 - **Graduates**: Finished PhD, compete for contract renewals, and chance to peer review, but can not supervise a PhD
 - **Supervisors**: Compete for renewals, peer review and train PhD students
- Inactives / **Retirees**
 - Retirees due to old age,
 - Retirees due to failure to win contract renewal

Time steps

- Each week, each active scientist
 - Does some reading of past papers
 - Works on one of their draft papers
 - Drafts are given references, based on the papers read by the author
 - If a draft is satisfactory to its author, it is submitted for peer review
 - If it is accepted, it becomes a published paper, available to be read
- Each year the population changes
 - Experienced scientists retire
 - Jobs (renewals) are allocated to qualified scientists
 - Qualified scientists lacking a renewal retire
 - New recruits join and are allocated a supervisor

Selection methods

- Options for choosing:
 - Readings, references, peer reviewers, contract renewals and PhD supervisors
- Stratified sampling using
 - "count my-papers"
 - "nb-citations"
 - "h-index"
 - "age-in-years"
 - " $1 / (\text{age-in-years} + 1)$ "
 - "mean-or-zero [quality] of my-papers"
 - "mean-or-zero [sexiness] of my-papers"

Writing work and the decision to submit a draft

- Agents have an idea of how much writing time is required for a finished paper
 - Initially homogeneous, may vary in trainees

```
let quality-work (q-preference / 100)
let sexiness-work ((100 - q-preference) / 100)
repeat Writing-Work-Per-Week [
  ask my-draft [
    set quality quality + quality-work
    set sexiness sexiness + sexiness-work
  ]
  ; if good enough for my standards, submit
  if [ quality + sexiness ] of my-draft >= writing-time-per-paper [
    ask my-draft [
      submit
    ]
  ]
]
```

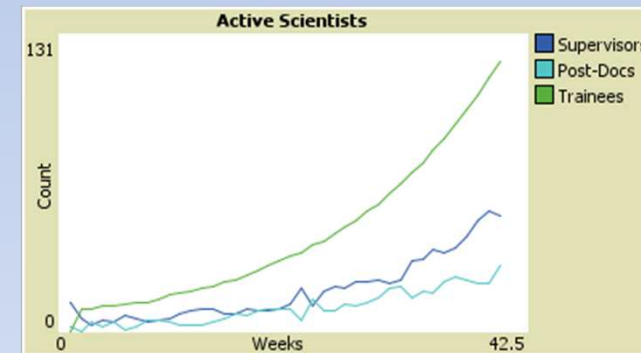
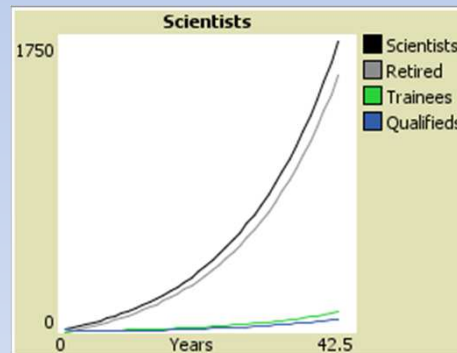
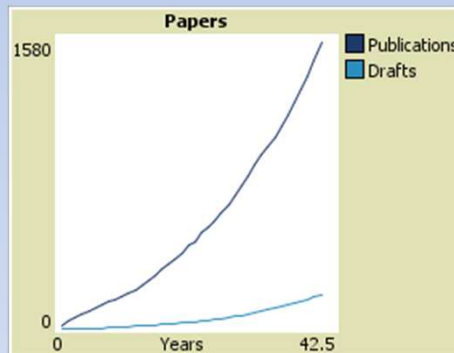
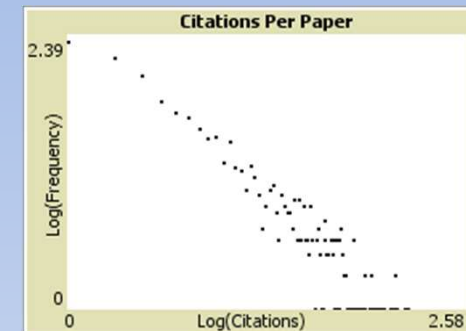
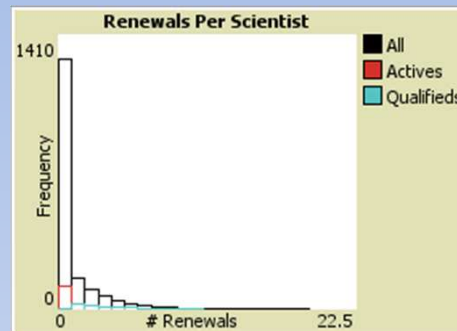
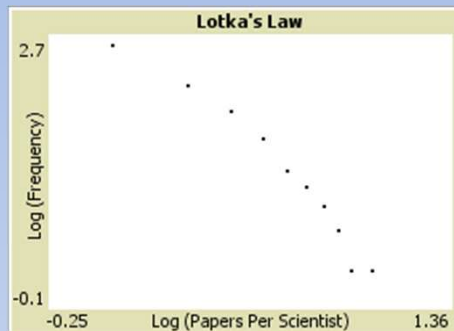

When do peer reviewers accept a paper?

- If the paper is passed by the majority of peer reviewers, it is published
- A scientist's view on writing time per paper and Q-Preference determines their quality threshold when a peer reviewer

```
to-report accepted? ; paper reporter
  if 0 = Reviewers-Per-Paper [report true]
    report modes [ [ quality ] of myself >= quality-threshold ] of
    reviewers = [ true ]
end
```

```
to-report quality-threshold ; scientist procedure
  report Writing-Time-Per-Paper * (q-preference / 100)
end
```

Model validation



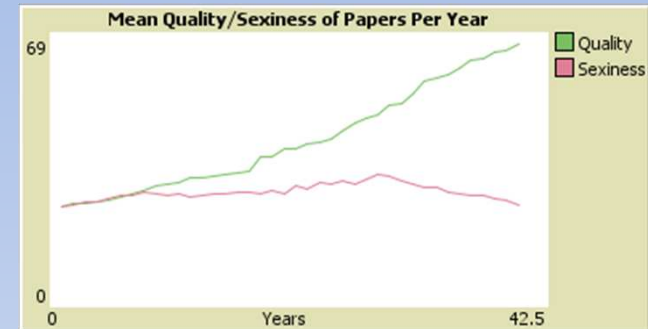
- Plausible outputs from plausible inputs?
 - Using numbers for a single journal (Management Science) from Watts & Gilbert (2011)
- Generate the common stylized facts (Meyer, 2011)
 - Exponential growth, scale-free frequency distributions
 - But these concern successes (publications), not failures or the effort that produced them

Part III

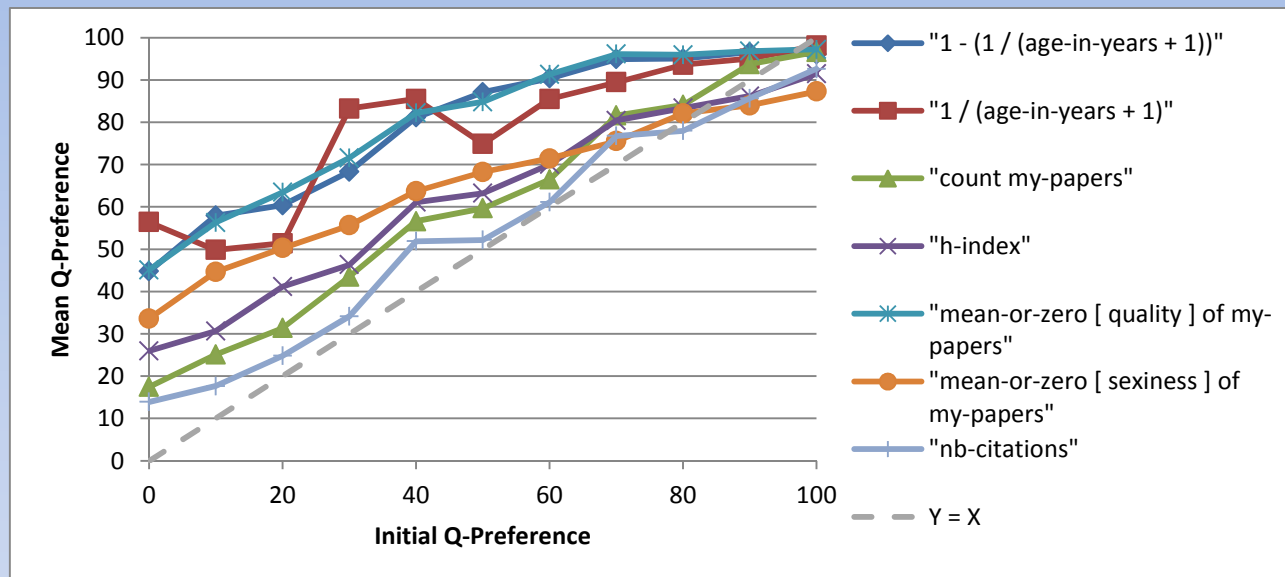
SOME INITIAL FINDINGS

Experiments

- Standard settings
 - 15 foundational authors and papers
 - Field grows 7% (in jobs) per year
 - Run for 50 years (or 40 years)
 - 60% jobs are renewals
 - Active scientists read 1 paper and write for 2 hours each week
 - Initial-Writing-Time-Per-Paper = 50 hours
 - Max 10 references per paper
 - 3 reviewers per submission
- Record mean paper quality and active scientists' attributes at end
- 10 simulation replications per parameter combination

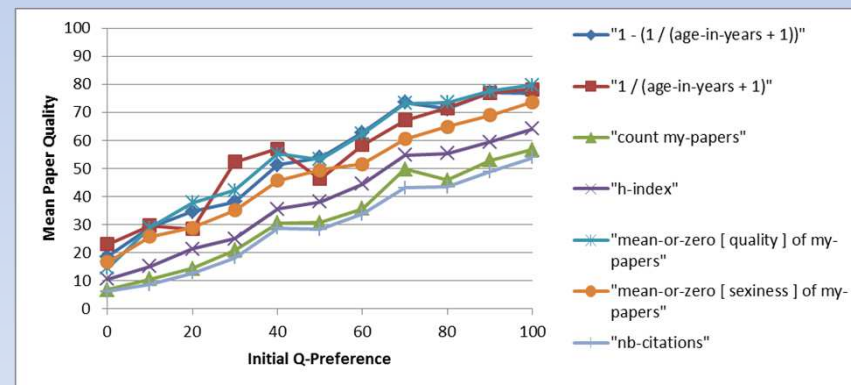
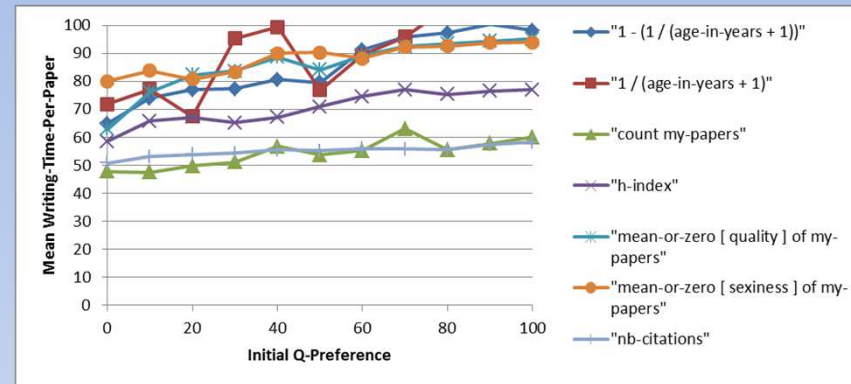
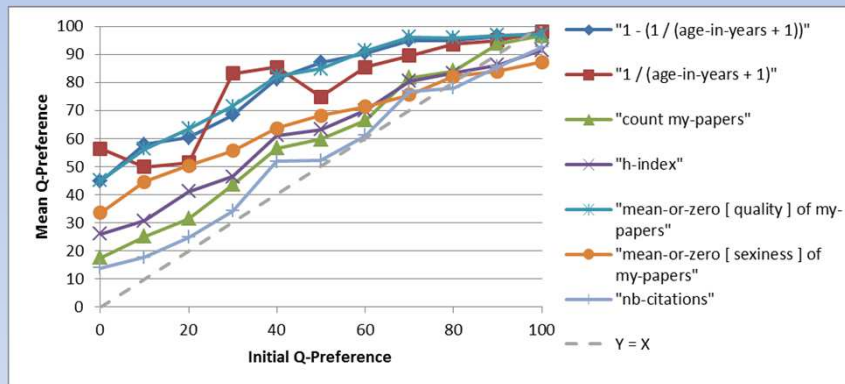


Evolution in Q-Preference



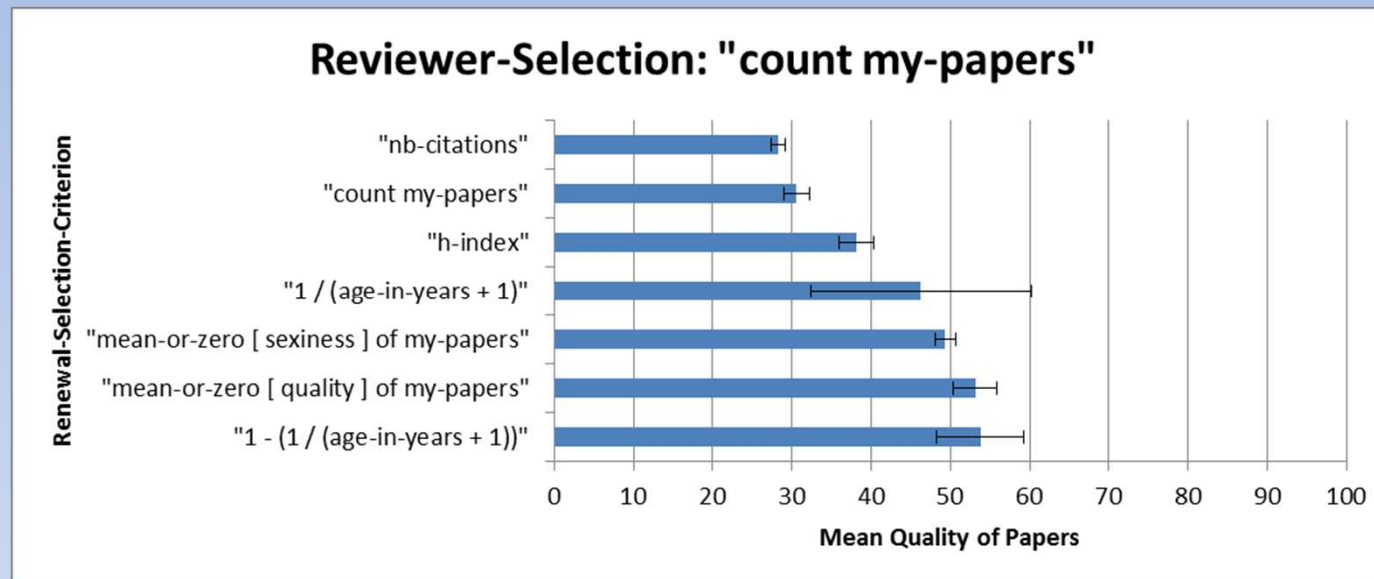
- Population evolves to increase preference for quality over sexiness
- Renewal allocation method determines how high Q-Preference evolves
 - Using Reviewer-Selection = "Count My-Papers"

What's going on?



- Higher Q-Preference goes with more writing time per paper and higher quality attained

Selecting Reviewers and Renewals



- Allocating renewals with preference for citations and papers leads to worse papers!
 - 95% confidence intervals are shown
- Better to allocate without preference?
- This result seems robust for all methods of selecting reviewers and most values of Initial-Q-Preference

Part IV

QUESTIONS FOR DISCUSSION

Questions the model may help with:

1. Could a trend towards more gimmicks and less quality be counteracted by increasing resources, namely more scientists and more time?
2. Would the encouragement of new time-allocation practices, and practices for reviewing these, be a smarter, as well as cheaper, way to go?
3. Would changing policy on peer review (the number of reviewers required, their relevance to the topic, their thresholds for quality and originality) have an impact?

Questions for this audience:

1. Do we have plausible selection processes?
 - Reading, references, submitting, reviewers, accepting, allocating renewals, allocating PhDs
2. What data could validate the model?
 - Publication data reports on successes, but what about resources and failures?
3. What's missing from the model (that could make a difference)?
 - Coauthors, Topics / Contents, Literature pre- and external to that modelled
4. What do you make of the concept of paper *sexiness*?
5. What do you make of the concept of paper epistemic *quality*?

Bibliography

- Warren Thorngate, Jing Liu and Wahida Chowdhury (2011) "The Competition for Attention and the Evolution of Science." *Journal of Artificial Societies and Social Simulation* 14(4) 17 <<http://jasss.soc.surrey.ac.uk/14/4/17.html>> DOI: 10.18564/jasss.1868
- Meyer, M. (2011). Bibliometrics, Stylized Facts and the Way Ahead: How to Build Good Social Simulation Models of Science? *Journal of Artificial Societies and Social Simulation*, 14(4).
- Payette, N. (2012) Agent-based models of science. In *Models of Science Dynamics: Encounters between Complexity Theory and Information Sciences* (Scharnhorst, A., Boerner, K. & Besselaar, P. eds.), Understanding Complex Systems. Springer, pp. 127-157.
- Price, D. J. d. S. (1963). *Little science, big science*. New York,: Columbia University Press.
- Thorngate, W. (1990a). The economy of attention and the development of psychology. *Canadian Psychology*, 21, 62-70.
- Thorngate, W. (1990b). Got a minute? Attentional limits revisited. *Canadian Psychology*, 21, 97-101.
- Watts, C., & Gilbert, N. (2011). Does cumulative advantage affect collective learning in science? An agent-based simulation. *Scientometrics*, 89(1), 437-463. doi: 10.1007/s11192-011-0432-8
- Watts, C., & Gilbert, N. (2014). *Simulating innovation: Computer-based tools for rethinking innovation*. Cheltenham, UK: Edward Elgar Publishing.