Biomedical research is beset with troubles; do these contribute to unreproducible experimental results?

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Topics:

US biomedical research: Present problems raise fears about the future
— What problems? What fears?
— Causes & effects
— Remedies?

Relation of such problems to unreproducible results?

So, what can/should we do?
Biomedical scientists’ lives have changed!

“New” symptoms—that is, compared to (say) 1970

- PIs compete more fiercely
- Trainees more anxious, training slow, inefficient
- PIs worried (about jobs, publications, salaries, grants)
- Troubled NIH: stagnant budgets, arbitrary peer review, muddled priorities
- Graying research professoriate (& hard times for young faculty)
- Too few (sufficiently) prestigious journals
- Weaker public support for science
Responses to symptoms

- What, me worry?
- Full steam ahead!
- Let them eat cake!
- Gimme more $, like you used to do!
Primary cause: unremitting expansion*

NIH budgets grew 10% per year over 45 years

Addiction to growth, rampant expansionism

PIs, labs, research institutions, NIH, & even Congress adapted to abundance, and

Adaptations produce consequences . . .

*D Korn et al., Science 296:1401, 2002
Super-sized expansion . . .

Depended on early Faustian bargains (1970s)

- Grant system (ICR): incentives to increase . . .
  - soft-money PI salaries
  - new lab construction
- Equation: Trainees = Lab Workforce

Expansion fostered more bargains, so universities increasingly . . .

- Judge faculty in terms of ICR (Indirect Cost Recovery) on grants
- Prefer older researchers (reliable grant-recipients) over young ones
- Trust a few journals & arbitrary, over-burdened NIH peer review to determine whether individual scientists are worth supporting
Super-sized expansion created our present unsustainable state . . .

- Stronger positive feedbacks & weak negative feedbacks foster continued growth & prevent adaptation to straitened circumstances
- PIs compete more ferociously
- Trainees anxious, training less efficient
- Troubled NIH: stagnant budgets, arbitrary peer review, muddled priorities
- Graying research professoriate (& extra-hard knocks for young faculty)

Note: these effects are not due to flat-lined NIH budgets after the “doubling”; already evident in the 1990s, they were only exacerbated by the doubling
What has this to do with unreplicable experimental results?

- **Short answer:** we can’t be sure

- **Long answer:** anxiety, competition for a shrinking pie, & haste foster mistakes, almost sure. So . . .
  - worse conditions for research may make some experimental results less reliable/reproducible
  - but convincing evidence not available, hard to gather, & even harder to translate into useful action

- Moreover: to correct reproducibility of results, other kinds of evidence will certainly prove more useful
The obvious alternative

1. Identify the questions, experiments, measurements, & conditions that tend to produce unreproducible results
2. Use that information to target & guide reform

In other words . . .
Behave like scientists!

- The milk is sour. Why?
  Identify cause(s)
- Pasteurize it
  Treat cause(s)