Lessons and Stories from My Career

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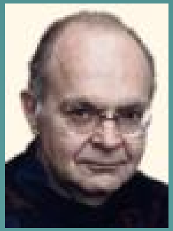
Caveat

- Your mileage may vary
- Not me:



Goal: Positive Impact

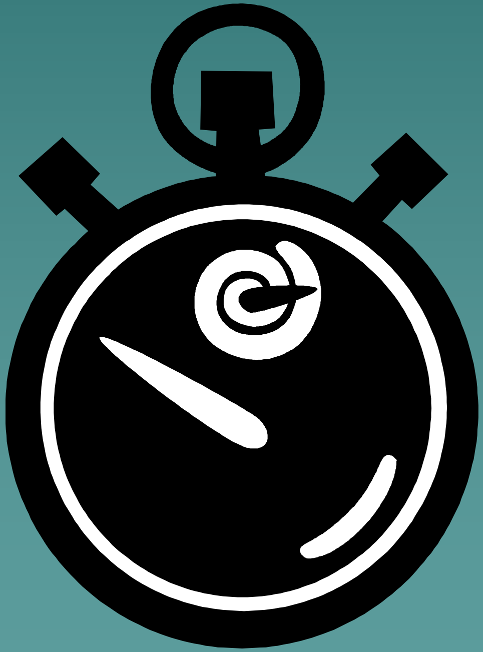
- What work of mine do you know?

Story

Being introduced at OOPSLA

Teaching Tip

- If you want interaction:
  - Get it on day 1
  - Wait for it…



Fundamental Problems for Making a Positive Impact

- Lots of prior work
- Lots of researchers

Ways to Make a Positive Impact

- Publish important work first
  - Think hard
  - Use new techniques/instruments
  - Work in underdeveloped area
  - Start new (sub-)area
- Publish clear descriptions
  - Relate to current understanding
- Be persistent

How to Improve?

- Ask a lot of questions
  - "Why?"
- Read a lot
- Develop judgment about
  - Problems
  - Solution techniques
  - Explanations

As Undergraduate

- Read books about computing
  - *Computer Lib!*
  - *Gödel, Escher, Bach: An Eternal Golden Braid*
  - *Art of Computer Programming*, …
  - *Programming Language Reference Manuals*
  - *CACM*
- Now:
  - Other (*Computer*, *CACM*, *TOPLAS*, …)
  - *Scientific American*, *Sky and Telescope*
  - Science fiction
  - Science

Lessons?

Lessons?

Reading helps with:

- English (writing), science style
- Seeing problems
- Ways of thinking
- Developing context (general understanding)
- How to explain to outsiders
- Telling a story

Reading fast helps

Reading Math

- Reading ahead in Jr. High algebra
- At MIT:
  - Math minor
  - Commutative Algebra
    - Finding examples
    - Why?
    - Finding readings for context

What does that say about <u>Learning</u>?

Lessons for Learning?

- Motivation important
- Context helps learning
- Concrete examples help
- Can’t just have examples

- Think about how you learn things…

Writing my Dissertation

- Guttag’s advice: “Keep a list”
- Hardest lesson: “Don’t core dump”
- Writing is like programming

How is Writing Like Programming? (Theory Version)

Written Text	**Program**
Definition	Declaration
Theorem statement	Procedure interface (specification)
Proof	Implementation
Lemma	Subroutine
Remark	Comment
Example	Test case

How is Writing Like Programming? (Systems Version)

Written Text	**Program**
Definition	Declaration
Goal (or problem)	Procedure specification
Description of Code	Implementation
Subproblem	Subroutine
Application/Example	Comment
Performance results	Test case

Bill Weihl’s Recommendation

- Article: “Science of Scientific Writing” (*American Scientist*, 78:550-558, 1990)
  - See *Style* by Williams (U. Chicago, 1990)

Non-linking

Sentences have 2 parts in English.

Links to previous material appear in **the first part**.

Emphasis and new information are provided by **the second part**.

Linking idea

In English

sentences have 2 parts.

The first part

links to previous material.

The second part

provides new information and emphasis.

Other Writing Ideas

- Illustrate with examples
  - Also counterexamples!
  - Especially anything initially unclear
- Honesty
  - Present facts, don't sell
  - Look for flaws
- Later:
  - Writer's workshops
  - "Pair writing" with students

Writing Related Work

- Related to *problem*
  - Not just to your solution technique
- Help reader fit your work into problem space

- Say how helps solve problem
- Say why / how doesn’t solve problem
  - Also how solution techniques differ

Getting All the Related Work

- Read other dissertations
- Ask the experts
- Read the references in good papers
  - Science Citation Index
  - Recent conferences / journal issues
- You may need to go to the library!
- Peters and jmlunit story

Good Writing is Revising

- My dissertation (1988) story
  - Revised TR (1989)
  - And main article from it (1993, published 1995)
- ECOOP 2005 article story

How I Practice Writing

- Homework, tests
- Technical reports
- Referee reports
- E-mail!
  - Write it
  - Revise it!

Why Spend Time on Email?

Why Spend Time on Email?

- Helps with peer contacts
- It’s practice
- Doing things well is rewarding (Kierkegaard)

Finding Good Ideas

- Look for problems
  - In reading, teaching
  - By using your own tools / systems
- Have lots of ideas
- Pursue ones that:
  - You are uniquely qualified to handle
  - Tackle important problem
  - Excite you
  - You make progress on

Finding My Thesis Problem

- OO programming new (Liskov)
- Talked to expert programmers
- Informal descriptions unsatisfying
- How to formalize
  - Theorems compare 2 things
  - Wanted airtight explanation
  - Lessons need experiments

Lessons?

Lessons?

- Focus on problems
- Look for what is surprising / new
- Think about the end result
  - Theorem
  - Experiment

Peer to Peer Networking

- Peers contain next generation of top computer scientists
- Get to know them
  - Conferences, workshops, etc.
  - Read papers
- Share ideas

Collaboration Stories

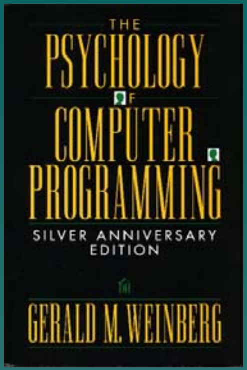
- Jeannette Wing
- William Cook
- Craig Chambers
- Todd Millstein
- Don Pigozzi
- Rustan Leino
- Peter Müller
- David Naumann

Lessons?

Lessons?

- Scientists don’t (usually) bite!
- Collaboration helps one’s career
- Easiest: collaborate with your cohort
- Mentoring is a contribution
- Helps keep you on cutting edge

Egoless



- At MIT: always someone better
- Do your best
  - With resources / time you have
  - Best ≠ perfect
- Strive for improvement
  - Mistakes – correct them
  - What new skills would help?

Liskov and Wing 94

- Liskov’s OOPSLA talk
- Liskov and Wing’s 1993-94 papers

What Mistakes?

- Grinding out technical details
- Not getting ideas / concepts published quickly enough
- Missing collaboration opportunity

Resource Management

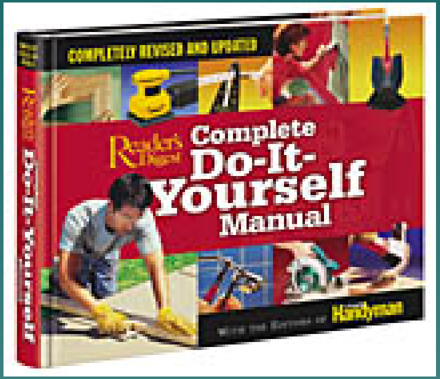
- Work steadily
- Plan for deadlines
- Have reserve for deadlines
- Learn to say “no”
- Pick few service duties
  - Do good job in them
  - You have excuse while young

If you want something done…

- Introductory course (Scheme) story

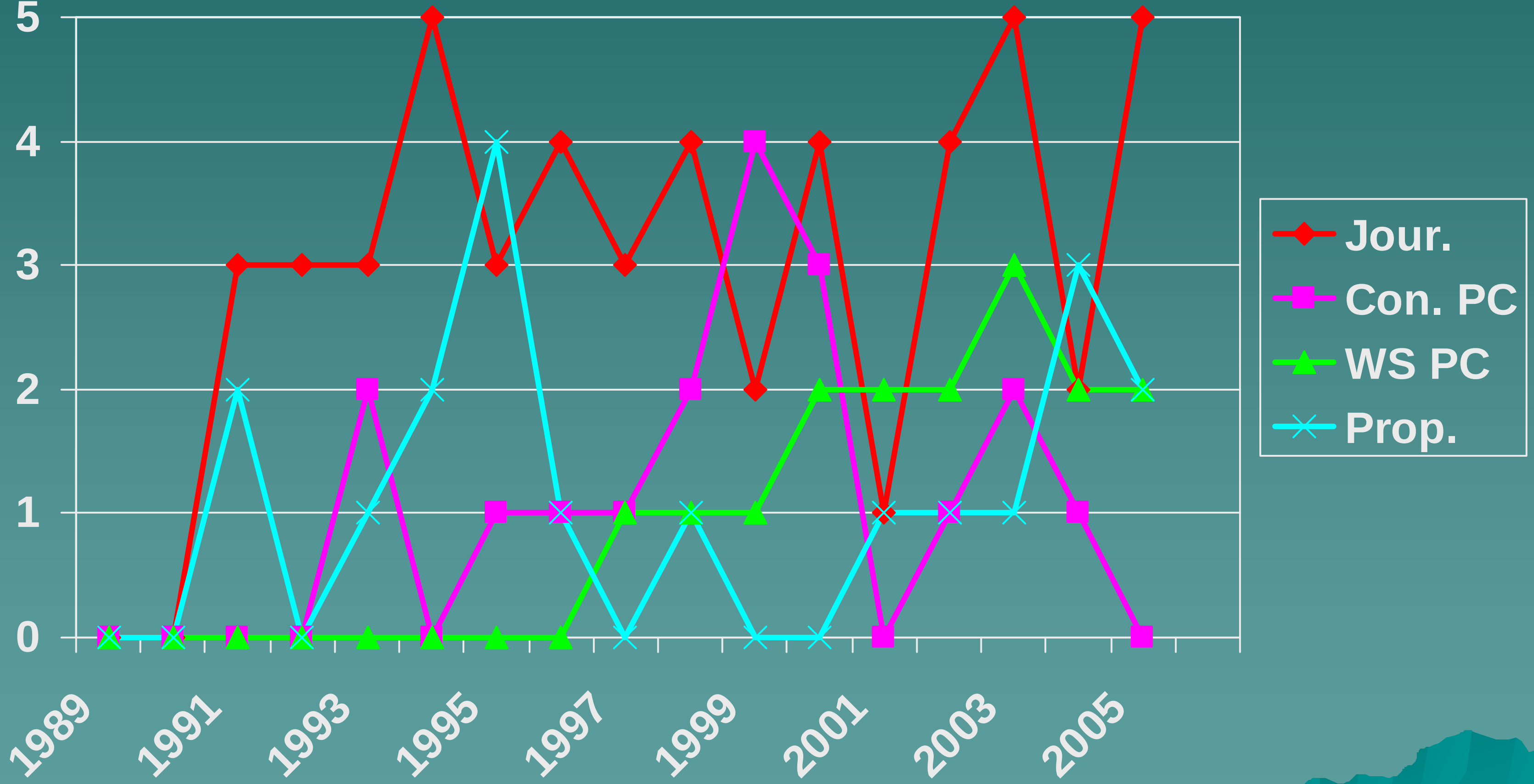
Lessons?

Lessons?


COMPLETELY REVISED AND UPDATED
Reader's Digest Complete Do-It-Yourself Manual
Handyman

- You'll have to do it
- Pick your battles
  - Important, interesting
  - Something you can learn from
- Be sure it makes an impact
- Doing a good job takes time
  - So don't do too many of them
- Eventually you may have to move on

My Refereeing and Reviewing



Lessons

- Limit to how much can / want
- Do an excellent job
- Helps make your reputation
- Contributes to community

Tips for PC Members

- Get expert help for top conferences
  - Ask quickly
  - Read the paper yourself also
  - Only for papers that may be good
- Don’t spend too much time on bad
- Look for the good
- Hard part: getting papers in
  - Make the case: contributions, evaluation
- Comments on related work need citation!

Summary

- Goal: make a positive difference
- Read widely
- Strive to improve writing
  - Writing is like programming
  - Write to explain and understand
- Generate ideas and pick best
- Network with your peers
- Do your best