hints on research

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6898: Advanced Topics in Software Design
May 1, 2002
Aims: how to succeed in research?
Aims

- share some thoughts I have
- extracts from some books I've liked
- comments most relevant to CS
- also a few observations of my own

How to succeed in research?
how to succeed in research?

share some thoughts I have

extracts from some books I’ve liked

comments most relevant to CS

also a few observations of my own

but still fun and thought-provoking?

not organized

a long list of aphorisms

caveat

Aims
Aims

Your ideas and experience?

but still fun and thought-provoking?
not organized
a long list of aphorisms
caveat
also a few observations of my own
comments most relevant to CS
extracts from some books I've liked
share some thoughts I have

how to succeed in research?
1979. British Nobel Laureate in Medical Science
Peter B. Medawar. Advice to a Young Scientist. Basic Books,
Sources


British Nobel Laureate in Medical Science, 1979.

British Nobel Laureate in Medical Science, 1979.
Sources


British Nobel Laureate in Medical Science 1979.
Sources


Baltasar Gracian. The Art of Worldly Wisdom: A Pocket Contributor to the theory of tectonic plates.


Santiago Ramon y Cajal. Advice for a Young Investigator. 1979. British Nobel Laureate in Medical Science

Peter B. Medawar. Advice to a Young Scientist. Basic Books,
am I brainy enough?

The El Greco test

medawar
To make important discovery, study important problem.

What should I do research on?

> The EL Greco test

> Am I brainy enough?

Medawar
to improve skills, repeat others' experiments
fortune favors the prepared mind
scientific process: how to discover

what should I do research on?

the El Greco test

am I brainy enough?
medawar

"don’t suck up"

the head with an inflated pig’s bladder
the old fashioned remedy for hubris was a sharp blow on

young scientists

don’t suck up

fortune favors the prepared mind
scientific process: how to discover

to improve skills, repeat other’s experiments

to make important discoveries, study important problems

What should I do research on?

the El Greco test

am I brainy enough?

medawar
medawar

use a blackboard, not lantern slides

medawar
specifically…

Ah, but what into? the cry goes up:

“Mice, rats and other lab animals should never be injected…

Language

use a blackboard, not lantern slides.

talks

medawar
any writer will do; essayists especially

study exemplars

... specifically...

Ah, but what into? the cry goes up: “Mice, rats and other lab animals should never be injected...” Language

use a blackboard, not lantern slides.

talks

medawar
> make up your mind whom you’re addressing

audience

any writer will do; especially essayists especially study examples

specifically...

Ah, but what into? the cry goes up: “Mice, rats and other lab animals should never be injected...” language

use a blackboard, not lantern slides’

talks

medawar
discoveries are not the fruit of outstanding talent (p.23)
perceived lack of ability vs. power of determination
preoccupation with applied science
the most important problems are solved
undue admiration of authority
beginner’s traps
find in me a beholder and interpreter of his works? Kepler

I have cast the die and with this I finish my book, caring little whether it is read today or by posterity. Some day there will be readers. After all, did God not wait six thousand years to disclose his works? Did He not wait six thousand years to find in me a beholder and interpreter of his works? Kepler

Passion for reputation,

Discoveries are not the fruit of outstanding talent, percieved lack of ability vs. power of determination, preoccupation with applied science, the most important problems are solved, undue admiration of authority, beginners traps
intellectual qualities

concentration

independent judgment
cajal

intellectual qualities › independent judgment › concentration
diseases of the will › contemplators › bibliophiles and polyglots 

"love the study … only for its aesthetic qualities…"

want to start career with extraordinary achievement

megalomanias
urge to formulate a theory
when faced with a difficult problem, they feel an irresistible
theorists
want to start career with extraordinary achievement
megalomaniacs
philosophers and polyglots
"love the study ... only for its aesthetic qualities..."
contemplators
diseases of the will
concentration
independent judgment
intellectual qualities
Cajal
on women

not repeatable in 2002

Cajal
on writing

on writing

on women

on women

on women

not replicable in 2002

not replicable in 2002

not replicable in 2002

Cajal

Cajal

Cajal
oliver: why he wrote the book
I have grown more and more aware that success in science comes not so much to the most gifted, nor the most skilled, but rather to the superior strategist and tactician.
...others as they direct their careers.

Consequently, I have long sought to observe the experiences and personal styles of successful scientists and to identify common traits that might be acquired and used profitably by superior strategist and tactician.

...I have grown more and more aware that success in science comes not so much to the most gifted, nor the most skilled, but rather to the superior strategist and tactician, nor the most knowledgeable, but rather to the superior strategist and tactician.
advancement but unparalleled private joy.

What makes discovery precious is not recognition, honor or

...others as they direct their careers.

common traits that might be acquired and used profitably by

and personal styles of successful scientists and to identity

...Consequently, I have long sought to observe the experiences

strategist and tactician,

nor the most knowledgeable, but rather to the superior

...comes not so much to the most gifted, nor the most skilled,

...I have grown more and more aware that success in science

Oliver: Why he wrote the book
Oliver: Strategy
oliver: strategy

> rebel but wisely: don’t jump to every radical cause
> seek the non-questions, questions ignored or forgotten
> see your era in long term perspective
> what’s everyone else doing collectively?
> don’t follow the crowd
strive to enhance serendipity

> rebel but wisely: don’t jump to every radical cause
> seek the non-questions, questions ignored or forgotten
> see your era in long term perspective
> what’s everyone else doing collectively?
> don’t follow the crowd

Oliver: Strategy
Go with intuition
Avoid side tracking to trivia
Avoid science eddies
Taste in research

Strive to enhance serendipity

Rebel but wisely: don’t jump to every radical cause
Seek the non-questions, questions ignored or forgotten
See your era in long term perspective
What’s everyone else doing collectively?

Don’t follow the crowd
oliver: strategy

- don’t follow the crowd
- what’s everyone else doing collectively?

- see your era in long term perspective
- see the non-questions, questions ignored or forgotten

- argue by analogy
  - eg., earth’s interior as pot of soup
  - argue by analogy

- go with intuition
- avoid side tracking to trivia
- avoid science eddies
- taste in research

- strive to enhance serendipity
- rebel but wisely: don’t jump to every radical cause

- don’t follow the crowd
skim the cream

oliver: tactics
oliver: tactics

minimize jargon

skim the cream
oliver: tactics

skim the rest of the volume, any volume

minimize jargon

skim the cream

skim the cream

skim the cream

skim the cream

oliver: tactics
Do it yourself

Skim the rest of the volume, any volume

Minimize jargon

Skim the cream

Oliver: tactics
Choose your problem very carefully.

Do it yourself.

Skim the rest of the volume, any volume.

Minimize jargon.

Skim the cream.

Oliver: Tactics.
oliver: curve of discovery

knowledge

time

age of discovery
Know where you are on the discovery curve.

Oliver: Curve of Discovery
oliver: personality traits
enjoy the struggle not the spoils

Oliver: Personality traits
OLIVER: PERSONALITY TRAITS

- Enjoy the struggle, not the spoils
- Never fully accept any theory, hypothesis, law or doctrine
Oliver: Personality traits

- Enjoy the struggle not the spoils
- Never fully accept any theory, hypothesis, law or doctrine
- Respect not reverence
› be optimistic, at least secretly
› respect not reverence
› never fully accept any theory, hypothesis, law or doctrine
› enjoy the struggle, not the spoils

Oliver: Personality Traits
Avoid all pretence

Be optimistic, at least secretly

Respect not reverence

Never fully accept any theory, hypothesis, law or doctrine

Enjoy the struggle, not the spoils

Oliver: Personality traits
oliver: personality traits

› remember scientists’ debt to society
› avoid all pretense
› be optimistic, at least secretly
› respect, not reverence
› never fully accept any theory, hypothesis, law or doctrine
› enjoy the struggle, not the spoils
Oliver: Personality traits

- occasionally think like a child
- respect not reverence
- avoid all pretence
- remember scientists debt to society
- be optimistic, at least secretly
- never fully accept any theory, hypothesis, law or doctrine
- enjoy the struggle not the spoils
oliver: personality traits

› enjoy the struggle not the spoils
› never fully accept any theory, hypothesis, law or doctrine
› respect not reverence
› be optimistic, at least secretly
› avoid all pretence
› remember scientists debt to society
› occasionally think like a child
› beware of Occam’s razor
gracian: relationships
gracian: relationships

› know yourself
› plumb your depths, weigh your resources
› know what piece you are missing
› know your best quality
› avoid the defects of your country
gracian: relationships

› know the great men of your age
› find something to praise
› associate with those you can learn from

› avoid the defects of your country
› know your best quality
› know what piece you are missing
› plummet your depths, weigh your resources
› know yourself
gracian: decisions
gracian: decisions

Know how to choose
gracian: decisions

how to take advantage of them

• Know when things are at their acme, when they are ripe, and
• Know how to choose
Gracian: decisions

• Weight matters carefully and think hardest about those that matter most
• How to take advantage of them
• Know when things are at their acme, when they are ripe, and
• Know how to choose
Gracian: Decisions

- Know when to put something aside
- Know when to choose
- How to take advantage of them
- Weight matters carefully and think hardest about those that matter most
- Know when things are at their acme, when they are ripe, and
Gracian: decisions

- don't persist in folly
- know when to put something aside
- weight matters, carefully and think hardest about those that matter most
- how to take advantage of them
- know when things are at their acme, when they are ripe, and
- know how to choose

Gracian: decisions
Gracian: decisions

- don't be obsessed with the latest
- don't persist in folly
- know when to put something aside
- weight matters most
- think hardest about those that matter most
- weight matters carefully and think hardest about them
- how to take advantage of them
- know when things are at their acme, when they are ripe, and
- know how to choose
gracian: decisions

• free yourself from common foolishness
• don’t be obsessed with the latest
• don’t persist in folly
• weigh matters carefully and think hardest about those that matter most
• how to take advantage of them
• know when things are at their acme, when they are ripe, and
• know how to choose
Gracian: decisions

• don’t be the only one to condemn what is popular
• free yourself from common foolishness
• don’t be obsessed with the latest
• don’t persist in folly
• know when to put something aside

weight matters most
• weigh matters carefully and think hardest about those that
• how to use something to their advantage
• know when things are at their acme, when they are ripe, and
• know how to choose
Gracian: Decisions

- Don’t surrender to first impressions
- Don’t be the only one to condemn what is popular
- Free yourself from common foolishness
- Don’t be obsessed with the latest
- Don’t persist in folly
- Know when to put something aside
- Matter most
- Weight matters carefully and think hardest about those that
- How to take advantage of them
- Know when things are at their acme, when they are ripe, and
- Know how to choose
Gracian: Decisions

• Don't be overly clever; common sense is safer
• Don't surrender to first impressions

• Don't be the only one to condemn what is popular
• Free yourself from common foolishness
• Don't be obsessed with the latest
• Don't persist in folly

• Don't be overly clever; common sense is safer
• Don't surrender to first impressions

• Free yourself from common foolishness
• Don't be obsessed with the latest
• Don't persist in folly

• Weight matters carefully and think hardest about those that matter most
• Know when to put something aside

• Know how to choose
• Know how to act
• Know when things are at their acme; when they are ripe, and

• How to take advantage of them
Graceful temperament
don't be tiresome, don't have one theme, one obsession

Gracian: temperament
Gracian: temperament

› Know your unlucky days, for they exist
› Don’t be tiresome, don’t have one theme, one obsession
Don’t be tiresome. Don’t have one theme, one obsession.

Know your unlucky days, for they exist.

In all matters keep something in reserve.

Gracian: temperament
Gracian: temperament

› don’t live in a hurry
› in all matters keep something in reserve
› know your unlucky days, for they exist
› don’t be tiresome. don’t have one theme, one obsession
Gracian: Temperament

- Temperament
- Don't be tiresome. Don't have one theme, one obsession
- Know your unlucky days, for they exist
- In all matters keep something in reserve
- Don't live in a hurry
- When you start something, don't raise other people's expectations
- In all matters keep something in reserve
- Know your unlucky days, for they exist
- Don't be tiresome. Don't have one theme, one obsession
Gracian: Temperament

› don’t be tiresome. don’t have one theme, one obsession
› don’t live in a hurry
› when you start something, don’t raise other people’s expectations
› in all matters keep something in reserve
› know your unlucky days, for they exist
› make people depend on you
Gracian: temperament

\[ \text{make others understand} \]
\[ \text{make people depend on you} \]
\[ \text{expectations} \]
\[ \text{when you start something, don't raise other people's} \]
\[ \text{don't live in a hurry} \]
\[ \text{in all matters keep something in reserve} \]
\[ \text{know your unlucky days, for they exist} \]
\[ \text{don't be tiresome, don't have one theme, one obsession} \]
Gracian: temperament

- Have no idea what we are saying?
- How will others understand what they are hearing if we have no idea what we are saying?
- Express yourself clearly
- Make others understand
- Make people depend on you
- Expectations

- When you start something, don’t raise other people’s expectations
- Don’t live in a hurry
- In all matters keep something in reserve
- Know your unlucky days, for they exist
- Don’t be tiresome, don’t have one theme, one obsession
When you counsel someone, appear to be reminding him of something he’s forgotten, not of the light he’s unable to see. When you outshine your boss, don’t outshine your boss.
some thoughts of my own...
some thoughts of my own…

• spend most of your time on the best material
• study how they write and present
• figure out why they are successful
• in any field, in any aspect of work

find exemplars
some thoughts of my own...

find exemplars in any field, in any aspect of work
figure out why they are successful
study how they write and present
spend most of your time on the best material

other people's work
analyze the paradigm
deconstruct the style & structure
if you don't understand, figure out why
some thoughts of my own…

- Listen carefully, understand deeply
- If you don’t understand, figure out why
- Deconstruct the style & structure
- Analyze the paradigm
- Other people’s work
- Spend most of your time on the best material
- Study how they write and present
- Figure out why they are successful
- In any field, in any aspect of work

Find exemplars
· explain your ideas
· to yourself, to others whenever you can
· polish your elevator pitch
Few ideas are as simple as they seem. Teach:
- a privilege, not a burden
- polish your elevator pitch
- to yourself, to others whenever you can
- explain your ideas
construct examples as you go along

don’t wait until you write the paper

convey essence of a real problem

very difficult, very productive

work hard on generating good examples

everything training examples

few ideas are as simple as they seem

a privilege, not a burden

Teach!

polish your elevator pitch

to yourself, to others whenever you can

explain your ideas
strategize, often›evaluate progress›learn to recognize progress›record your ideas in a bound notebook

› recognize & conquer research avoidance

› Learn to recognize progress

› evaluate progress

› strategize, often
take slide titles very seriously
write the abstract at least twice
It's never too simple
Presentations

record your ideas in a bound notebook
recognize & conquer research avoidance
Learn to recognize progress
Evaluate progress
strategize, often
strategize, often evaluate progress, keep trying

analyze what went wrong, keep trying.

“sheer incompetence”
disappointments

“never attribute to malice that which can be explained by

disappointments

never too simple

write the abstract at least twice

It’s never too simple

Presentations

record your ideas in a bound notebook

recognize & conquer research avoidance

learn to recognize progress

evaluate progress

strategize, often
but ultimately ...

Find your own way