

# hints on research

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6898: Advanced Topics in Software Design

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aims

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how to succeed in research?

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share some thoughts I have

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

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- › a long list of aphorisms
- › not organized
- › but still fun and thought-provoking?

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your ideas and experience?

# Sources

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Baltasar Gracian. *The Art of Worldly Wisdom: A Pocket Oracle*. Translated by Christopher Maurer. Doubleday 1992. *Worldly Jesuit priest, Spain 1601-1658*.

medawar

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- › fortune favors the prepared mind
- › to improve skills, repeat other's experiments

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young scientists

- › “the old fashioned remedy for hubris was a sharp blow on the head with an inflated pig's bladder”
- › don't suck up



medawar

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talks

- › use a blackboard, not 'lantern slides'

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## talks

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## language

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

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- › any writer will do; essayists especially

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audience

- › make up your mind whom you’re addressing

# cajal

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## beginner's traps

- › undue admiration of authority
- › ‘the most important problems are solved’
- › preoccupation with applied science
- › perceived lack of ability vs. power of determination
- › ‘discoveries are not the fruit of outstanding talent’ (p23)

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## passion for reputation

- › The die is cast 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 find in me a beholder and interpreter of his works?’ *Kepler*



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intellectual qualities

- › independent judgment
- › concentration

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diseases of the will

- › contemplators
- “love the study ... only for its aesthetic qualities...”
- › bibliophiles and polyglots
- › megalomaniacs

want to start career with extraordinary achievement

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theorists

- › “when faced with a difficult problem, they feel an irresistible urge to formulate a theory”

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on women

› not repeatable in 2002

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on writing

- › “have something to say; say it; stop once it is said; and give the article a suitable title and order of presentation”

oliver: *why he wrote the book*



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... I have grown more and more aware that success in science  
... comes not so much to the most gifted, nor the most skillful,  
nor the most knowledgeable, but rather to the superior  
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What makes discovery precious is not recognition, honor or advancement but unparalleled private joy...

# oliver: strategy

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don't follow the crowd

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

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- › avoid science eddies
- › avoid side tracking to trivia
- › go with intuition

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argue by analogy

- › eg, earth's interior as pot of soup



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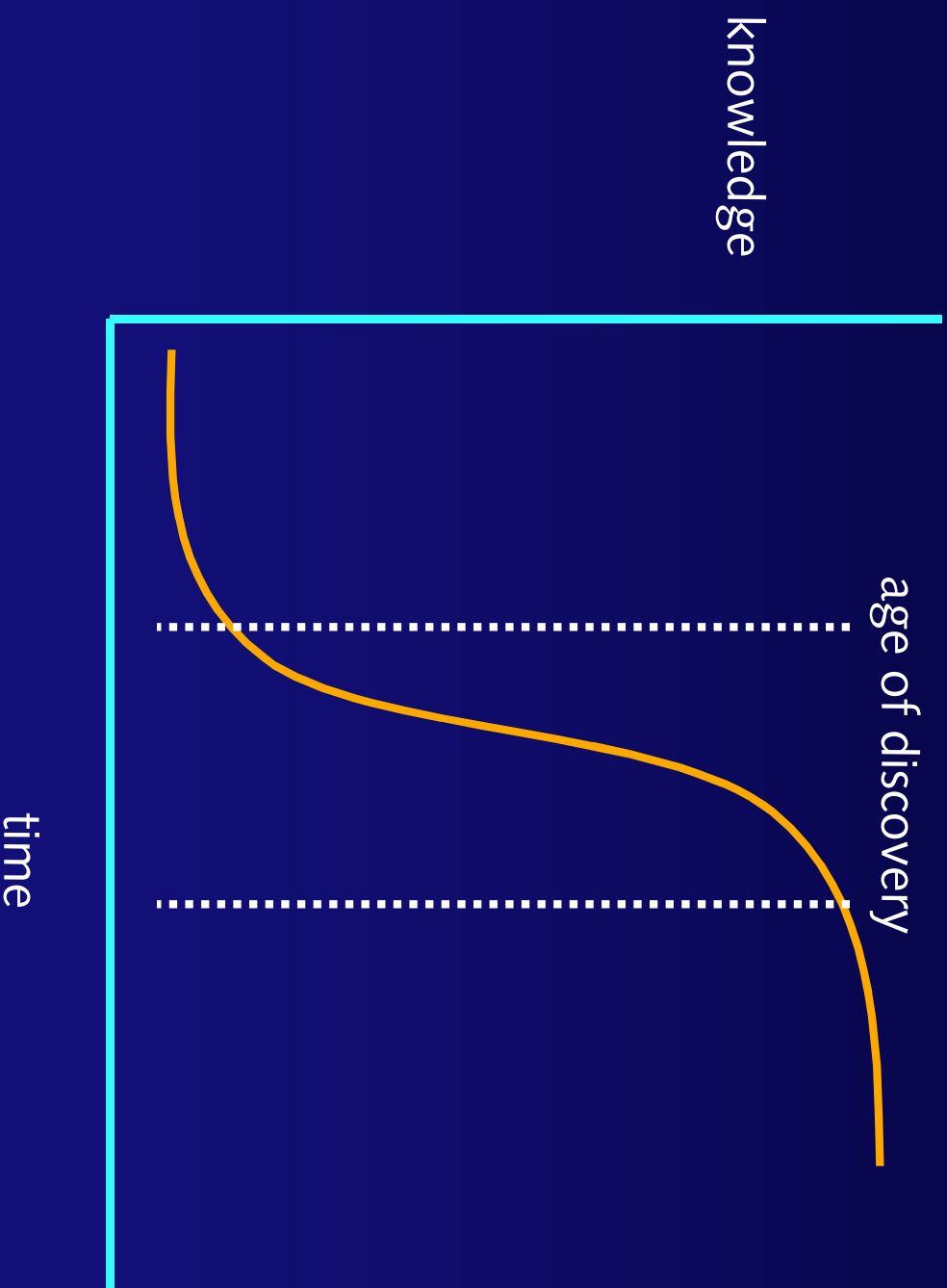
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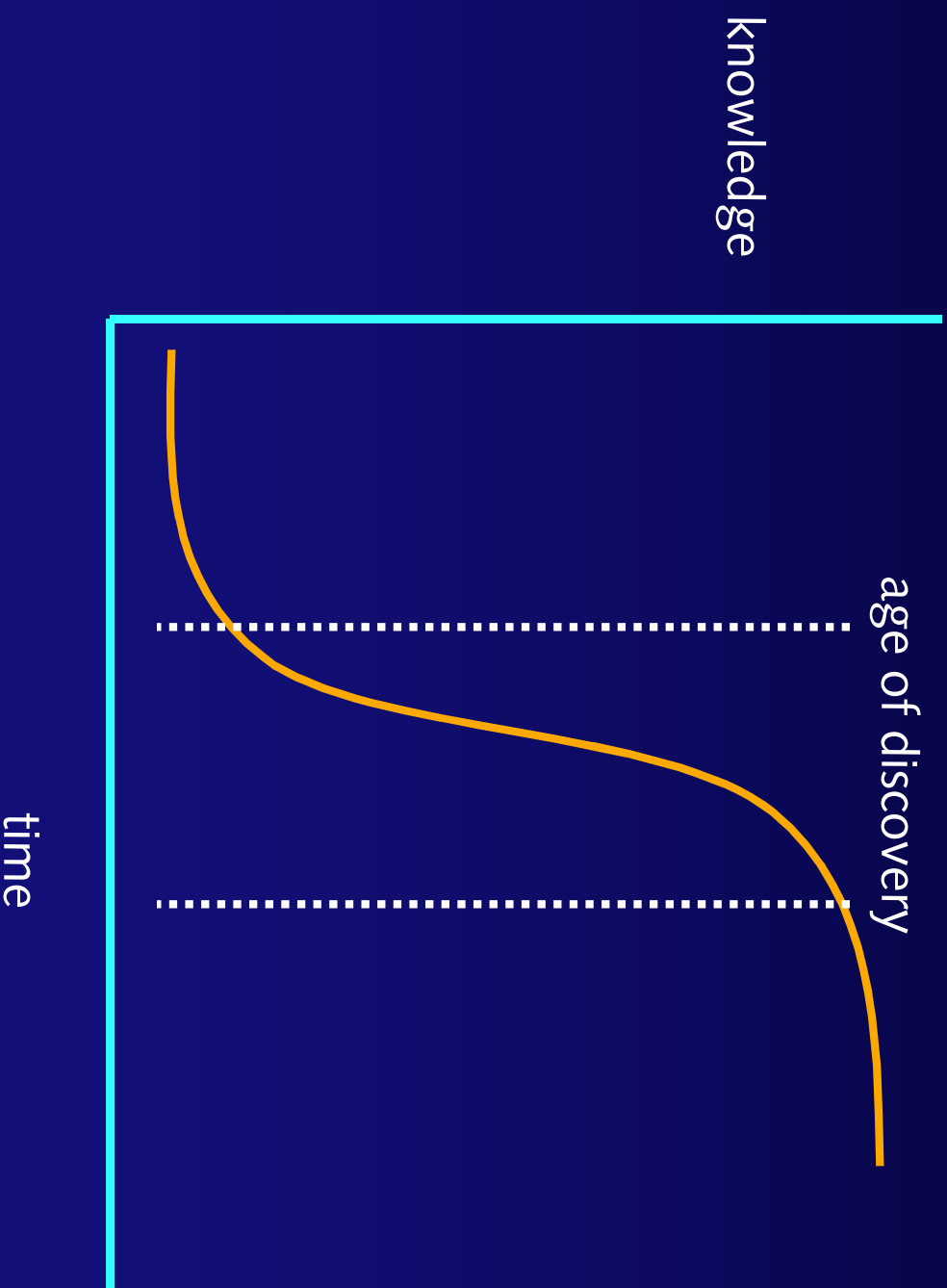
choose your problem very carefully

# oliver: curve of discovery



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know where you are on the discovery curve





# oliver: personality traits

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- › beware of Occam's razor

# gracian: relationships

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- › plumb your depths, weigh your resources
- › know what piece you are missing
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- › associate with those you can learn from
  - › find something to praise
  - › know the great men of your age

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- › don't be overly clever; common sense is safer

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  - › make people depend on you
  - › make others understand
  - › express yourself clearly
- how will others understand what they are hearing if we have no idea what we are saying?



gracian

# gracian

don't outshine your boss

- › “When you counsel someone, appear to be reminding him of something he's forgotten, not of the light he's unable to see”

some thoughts of my own...

*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*

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- › deconstruct the style & structure
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- › deconstruct the style & structure
- › if you don't understand, figure out *why*

## listen carefully, understand deeply

- › a good argument: when you can reformulate your opponent's viewpoint to their satisfaction



explain your ideas

- › to yourself, to others whenever you can
- › polish your elevator pitch



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- › a privilege, not a burden
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## examples

- › work hard on generating good examples
  - › very difficult, very productive
  - › convey essence of a real problem
  - › don't wait until you write the paper
- construct examples as you go along



strategize, often

- › evaluate progress
- › learn to recognize progress
- › recognize & conquer research avoidance
- › record your ideas in a bound notebook

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- › write the abstract at least twice
- › take slide titles very seriously (hmm...)

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disappointments

- › “never attribute to malice that which can be explained by sheer incompetence”
- › analyze what went wrong, keep trying



but ultimately ...  
› find your own way