PsyPhilProg

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Credentials

Who is this guy?

- Principal, Neward & Associates

  ask me how I can help your project, your team or your firm
- Microsoft MVP (F#, C#, Architect); Java Expert (JSRs 175, 277)
- Author

  Professional F# 2.0 (w/Erickson, et al; Wrox, 2010)
  Effective Enterprise Java (Addison-Wesley, 2004)
  SSCLI Essentials (w/Stutz, et al; OReilly, 2003)
  Server-Based Java Programming (Manning, 2000)
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- For more, see http://www.newardassociates.com/#/about

What, exactly, are we trying to do here?

What defines the difference between these two buildings?

- goals
- scope
- complexity
- materials
- process
- ... more

More importantly, how do we know when one "style" of building is more appropriate than another?

Programming is an extremely ephemeral activity

– we cannot see it--only its side-effects

– we cannot touch it--only the machine within which it is contained

and sometimes not even then

– we cannot observe it directly

in fact, we require more software to diagnose and correct it

Given how much we rely on our understand of abstractions…

… we probably should…

Psychology

- •... **understand where those abstractions live**
- •... **understand how those abstractions come to exist**
- •... **understand the limitations of those abstractions**

Philosophy

- •... **learn what to question and why**
- •... **come to grips with what we know and don't know**
- •... **begin where all science began**

Philosophy

Where it all began: With old Greeks

Philosophy

What, exactly, is it?

What is philosophy?

- – "love of wisdom" (Ancient Greek)
- – the fundamental root of all thinking
- – the basis of all science
- – "science in one hand, and religion in the other"
- – the central question that philosophy seeks to answer

Ironically, most of us are (already) philosophers

- – what should we do?

- – what is there?

- – how do we know? if we don't know, how should we set about finding out?

Major branches of philosophy

– Metaphysics

  examining what exists, the difference between mind and matter, and so on

– Epistemology

  how do we know a thing? how do we acquire knowledge? what is the nature of knowledge?

– Logic

  Aristotelian syllogisms up through mathematical and symbolic logic

– Moral philosophy and ethics

  what is right? what is evil? what is virtue? what does it mean to live a good life?

– Political philosophy

  what are the "unassailable human rights"? what is the relationship between government and the governed?

Roger Scruton ("A Short History of Philosophy")

- two distinguishing characteristics of philosophical thought
  - **abstraction**
  - **concern for truth**
- "Problems of philosophy and the systems of design to solve them are populated in terms which tend to refer not to the realm of actuality, but to the realms of possibility and necessity: to what might be and what must be, rather than what is"

Philosophy

Philosophy is characterized by several things

- students are encouraged not to accept the conclusions of their teachers, but to discuss, argue and disbelieve
- arguments are rooted in logic and reason, not faith or belief

Most science begins as philosophy

– "It has often been remarked that when an area of inquiry begins to find its feet as a discipline, with clearly agreed methods and a clearly agreed body of knowledge, fairly soon it separates off from what has up to then been known as philosophy and goes its own way."

– such as….

- **physics**
- **chemistry**
- **astronomy**
- **psychology**

– some continue to maintain tight relationships

Heraclitus

Early thoughts on what makes up the world

Heraclitus was an Ionian philosopher

- one of the first to theorize about the composition of the world
- coined the theory that the world is a "Unity of Opposites"

Heraclitus

Unity of Opposites

– "everything is in flux" between being and non-being

- **the tension and contradiction of opposing forces is what creates reality**
- **but it is inherently unstable**

– "unchanging reality consists not of objects, but processes"

– consider a river

- **the water in it at this moment is not the same water as a moment ago**
- **but it is still the same river**

– conflict does not interfere with life, but rather is a precondition of life

Xenophanes

Early thoughts on what we know

Xenophanes

Another Ionian philosopher

- the first to actually engage in evidence-based argument
- his thoughts centered around the nature of knowledge itself

True belief

- – when we say we "know" something, that knowledge is actually only a "true belief"

  a hypothesis good enough for us to work from

- – he maintained that a "truth of reality" did exist, but will always be beyond our human understanding

  the best we can do is refine our hypotheses continually to get nearer to it

The Sorites Paradox

Exercise in philosophical thought

When do individual grains of sand become a heap?

The Sorites Paradox

When do individual grains of sand become a heap?

More importantly, why does this paradox take place?

Zeno's Paradoxes

Find the flaw in the argument

The god Apollo and a turtle ae going to race

The god Apollo and a turtle ae going to race

Apollo gives the turtle a huge head start

The god Apollo and a turtle ae going to race

Apollo gives the turtle a huge head start

But if Apollo makes up half the distance between him and the turtle every second…

The god Apollo and a turtle ae going to race

Apollo gives the turtle a huge head start

But if Apollo makes up half the distance between him and the turtle every second…

… he can never catch the turtle!

An arrow is loosed from a bow to fly through the air

Zeno's Paradoxes

An arrow is loosed from a bow to fly through the air

But in any single moment in time, the arrow is not moving

Zeno's Paradoxes

An arrow is loosed from a bow to fly through the air

But in any single moment in time, the arrow is not moving

… therefore the arrow is not really moving at all!

Sophists and sophistry

Lawyers, 1.0

Athens was a democracy

- each citizen was their own representative under the law
- but not all citizens knew the law as well as others
- enter the sophists: they who would argue on your behalf

Sophists became excellent at arguing anything

- – they were not particularly well-respected in Athenian society
- – they could frequently be found arguing for its own sake
- – they formed some of the early schools of "relativism"

Hence the modern word "sophistry"

Socrates

First of the Big Three

Athenian philosopher

- liked to start from the idea that "I only know that I know nothing"

- dismissed by many contemporaries are simply a sophist

- most of what we know is from what his student, Plato, wrote of him

    this makes it difficult to tell exactly what Socrates thought or believed

- executed for heresy by the Athenian government

- "the unexamined life is not worth living"

Most widely known for his teaching methods

- a dialectical exercise known as "the Socratic method"
    - **begin a conversation, presuming ignorance**
    - **question the conversers' knowledge and understanding**
    - **through these questions, reveal their ignorance**
    - **a negative method of hypothesis elimination**
    - **forces questioners to examine their beliefs**
- ironically, this is probably what got him killed

Plato

The founder of all Western thought

Greek philosopher (428/427 or 424/423 – 348/347 BC)

- founder of the Academy
- most of his teachings/writings have been preserved
- student to Socrates
- teacher to Aristotle
- founder of political philosophy
- in some ways, the inventor of philosophy

  "he was so self-conscious about how philosophy should be conceived, and what its scope and ambitions properly are, and he so transformed the intellectual currents with which he grappled, that the subject of philosophy, as it is often conceived—-a rigorous and systematic examination of ethical, political, metaphysical, and epistemological issues, armed with a distinctive method—-can be called his invention."

Aristotle

The first scientist in history

Greek philosopher who became the tutor to an Empire (Alexander)

- founded the practice of categorization
- deeply studied the natural sciences
- after Plato's death, became one of the first empiricists
- father of modern science

Eudaimonia

The good life

Eudaimonia

Greek; happiness, welfare, "human flourishing"

- essentially, the Greek ideal of 'the good life'
- central concept to Greek/Roman philosophy
- arete: "virtue", "excellence"
- phronesis: "practical or ethical wisdom"

Eudaimonia

Numerous "takes" on what it means to be eudaimon

- Socrates' centers around virtue (by which he meant, knowledge)

- Plato's ceneters around the virtue of justice

  "Plato argues that virtues are states of the soul, and that the just person is someone whose soul is ordered and harmonious, with all its parts functioning properly to the person's benefit. In contrast, Plato argues that the unjust man's soul, without the virtues, is chaotic and at war with itself, so that even if he were able to satisfy most of his desires, his lack of inner harmony and unity thwart any chance he has of achieving eudaimonia."

- Aristotle believed it exhibited virtue in accordance with reason

Numerous "takes" on what it means to be eudaimon

– Stoicism emphasizes states such as justice, honesty, moderation, simplicity, self-discipline, resolve, fortitude, and courage

"Moral virtue is good, and moral vice is bad, and everything else, such as health, honour and riches, are merely 'neutral'. The Stoics therefore are committed to saying that external goods such as wealth and physical beauty are not really good at all."

Modern take

"Building on Aristotelian ideals of belonging and benefiting others, flourishing, thriving and exercising excellence, she conceptualised eudaimonia as a six-factor structure:

- **Autonomy**
- **Personal growth**
- **Self-acceptance**
- **Purpose in life**
- **Environmental mastery**
- **Positive relations with others.**

"Ryff's six-factor model of eudaimonic well-being describes the six aspects of positive functioning that an individual who strives to lead a fulfilled life must endorse. She states that the pursuit and acquisition of positive relationships is an intrinsically motivated desire that is endorsed cross-culturally as a route to being void of ill-being as well as

Psychology

Where it all happens: Inside your brain

Th hmn brn s n mzng prcssng dvc; t cn mk lgcl lps t ndrstnd wht lks lk gbbrsh

The human brain is an amazing processing device; it can make logical leaps to understand what looks like gibberish

(Which explains how Bush got elected…)

Can you read this?

The brain operates by *activations*—things closely-related to the topic at hand are fired so as to minimize processing time

This happens *all the time*

Even when you're designing/architecting

The brain is a highly energy-constrained device

It operates on about 40 watts of power

To maximize its efficiency, it takes shortcuts

What do you see here?

The brain is taking shortcuts, via a form of pattern recognition

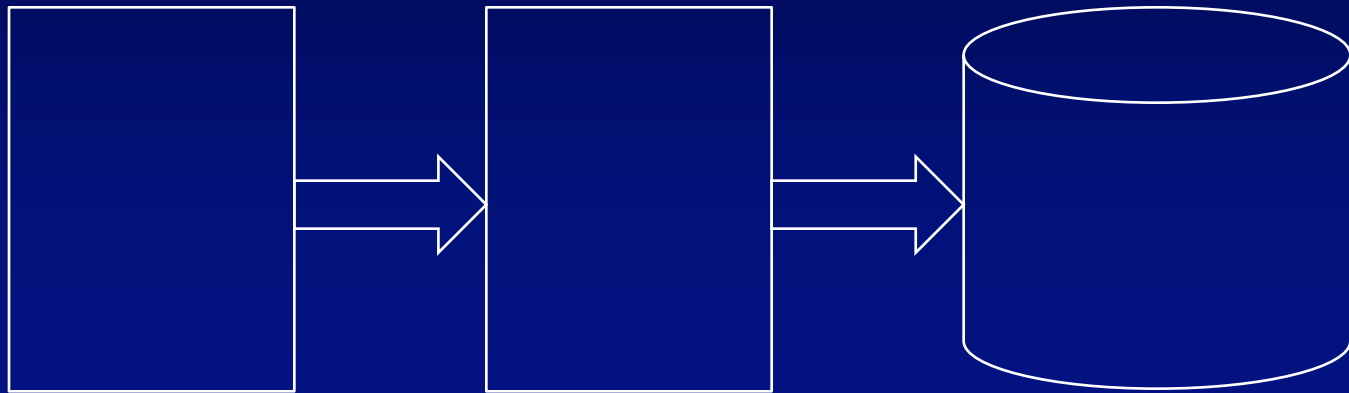*Perception is a matter of the brain, not the eyes*

What if we reverse the picture?

The most likely way we perceive something will be in a manner consistent with your past experience

In the lines diagram, the commonality of vertical perspective leads your brain to interpret it incorrectly

When I show you this picture, what do you see?

The Candle Experiment

An exercise in incentives

The Candle Experiment

- – I give you a box of nails, a candle, and a book of matches; your job is to attach the candle to the wall

  (which is an interesting "out of the box thinking" problem in of itself)

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- This experiment has been conducted repeatedly

  - **the results are remarkably consistent**
  - **even among monkeys! (which is where the data first appeared)**

Incentives Don't Work

- Experiments demonstrate, over and over again, that attempts to "incentivize" people to do things...
  - **... including "goodwill" things, like donating blood...**
  - **... or "conceptual" things, like come up with novel solutions...**
- ... actually reduce efficiency
- "Rewards, by the very nature, narrow our focus. ... As [the candle experiment] shows, the rewards narrowed people's focus and blinkered the wide view that might have allowed them to see new users for old objects." (Drive)

Psychology

The study of behavior

Five main perspectives

– Biological

the relationship of the body and the mind

– Learning

long-lasting change in the way a person/animal behaves that is attributable experience

– Cognitive

study of memory, perception, thought and other mental processes

– Sociocultural

how social environment and cultural beliefs shape our lives

– Psychodynamic

study of unconscious motives and desires

'Psychomythology'

"Common sense is not so common"

--Voltaire (1764)

"Opposites attract"

"Spare the rod, spoil the child"

"Familiarity breeds contempt"

"There's safety in numbers"

These are popular sayings/platitudes

- – most people hold them to be self-evident
- – when, in fact, science repudiates all of the above
- – many of these "facts" come from the "pop psychology" world

Some popular psychological "facts"

– "We only use 10% of our brain capacity"

– "If we are angry, it's better to express the anger directly than hold it in"

– "Most sexually-abused children grow up to become abusers themselves"

– "People with schizophrenia have 'split' personalities"

– "People tend to act strangely during a full moon"

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ALL OF THESE ARE **VERIFIABLY** FALSE

Reasons for Psychomythology

Why do we believe in falsehoods?

In some cases, we are misled by supposed experts

- "Dr Phil" likes to use the lie detector on his show

    when in fact lie detectors are not nearly as accurate as assumed

- popular authors will sometimes get the psychology wrong

    we are forced to accept their claims on faith alone

- or they will explain only parts of it

    because they want to keep our attention

- or their readers will only hold on to the simplest parts of it

    because our memory is fallible and we seek patterns

In some cases, we believe we are the experts

- or close enough, anyway--how hard can it really be?
- "if I am smart enough to do (some complicated activity), I am smart enough to understand this other stuff"

  it's what leads doctors to believe they are lawyers, and lawyers to believe they are rocket scientists, and so on
- this is hubris

  it is a difficult thing to overcome; it requires a constant self- or externally-imposed monitoring of our thoughts and actions

In some cases, the science is "close enough"

- … but not perfect
- example: 'ulcers are caused by body's reaction to stress'
  - no cure; "lower-stress lifestyle and a managed diet"
  - two Australian researchers (Barry Marshall, Robin Warren) discovered bacterium in the stomach
  - "not possible--nothing could survive human stomach acid"
  - meet "Helicobacter pylori": it does, in fact survive in the stomach
  - … and these ulcers can be treated by everyday antibiotics
  - … and they won a Nobel Prize for it
  - they weren't the first to "discover" it; it had been spotted by at least three separate teams of researchers a century earlier

In some cases, it contradicts our common sense

- – our brains are good at interpreting the world
- – our brains are terrible at interpreting our brains

  Jacob Bronowski (1966) called this "reflexivity"
- – there is not yet any kind of "debugger" for the brain

  though we may be getting closer....

Psychological Science vs "Common sense"

– Talk show host Dennis Prager:

"There are two kinds of studies in the world: those that confirm our common sense, and those that are wrong"
"Use your common sense. Whenever you hear the words 'studies show'--outside of the natural sciences--and you find that these studies show the opposite of what common sense suggests, be very skeptical. I do not recall ever coming across a valid study that contravened common sense. (Prager, 2002, p 1)"

– Malcolm Gladwell gets into this ("Blink")

And yet… science is "uncommon sense"

- "Phrenology can determine your personality"
- "X-Rays are harmless festival entertainment"
- "Emotions originate from the heart"
- "Women are less intelligent than men"
- "The body is made up of four 'humours': blood, bile, phlegm and "

    those last three were Aristotle's beliefs

And yet… science is "uncommon sense"

> "Nothing could be more obvious than that the earth is stable and unmoving, and that we are the center of the universe. Modern Western science takes its beginning from a denial of this commonsense axiom … Common sense, the foundation of everyday life, could no longer serve for the governance of world. (Borstin, 1983, p. 294)"

This doesn't mean all common sense is wrong

- happy employees get more work done than unhappy ones

But it does mean that we need to treat common sense with skepticism

- if "everybody knows", then maybe they're wrong

Psychomythology: So what?

What can it hurt?

What real damage is there to believing in a few folk tales?

– nobody ever died from believing in Greek myths, right?

Psychological myths can be harmful

- jurors who believe memories are like videotape will vote to convict a defendant on the basis of confidently-held inaccurate eyewitness testimony

- parents who believe punishing children is an effective means of changing long-term behavior will achieve the opposite

- doctors who refuse to allow their authority to be questioned will continue to kill patients

Psychological myths can cause indirect damage

- the belief that we are "rational actors" when we make economic decisions

- people waste money on "subliminal self-help tapes"

- we may make decisions based on inaccurate information (such as a political candidate's honesty or what they've said or not said

The acceptance of psychological myths can impede our critical thinking in other areas

- our failure to distinguish myth from reality in one domain of scientific knowledge can easily spill over to a failure to distinguish fact from fiction in other areas (Carl Sagan)

- as a consequence, we may find ourselves at the mercy of policy-makers who make unwise and/or dangerous decisions

- "Knowledge is power; ignorance is powerlessness"

  Sir Francis Bacon

Busting psychomythology

Clearing out the garbage

A mythbusting toolkit

– these are ten common sources of error

– compensate for them whenever used or seen

Psychomythbusting

Ten sources of error

- Word-of-Mouth ("urban myths")
- Desire for Easy Answers and Quick Fixes
- Selective Perception and Memory
- Inferring Causation from Correlation
- Post Hoc, Ergo Propter Hoc Reasoning

  "after this, therefore because of this"

Psychomythbusting

Ten sources of error

 – Exposure to a Biased Sample

 – Reasoning by Representativeness

  beware of heuristics (mental shortcuts/rules of thumb)

 – Misleading Film and Media Portrayals

 – Exaggeration of a Kernel of Truth

 – Terminological Confusion

Perception

Not quite as objective as you think

Literal visual and auditory stimuli is not the end of the story

- – rods and cones interpret colors of what we see
- – but images are easily "separated" into groups
- – the brain interprets images using a form of pattern recognition

Gestalt Psychology

- a school of thought originating in Germany in the early 1900s

- people organize visual information into patterns and forms

- this explains many optical illusions, for example

Gestalt Principles

– Figure and ground

- "figure" is what stands out
- "ground" is the backdrop in which the figure appears

– Proximity

when objects lie close together, objects are perceived as a group

– Closure

interpret familiar, incomplete forms as complete by filling in gaps

Gestalt Principles

– Similarity

- **group similar objects together**
- **then interpret the larger pattern**

– Continuity

interrupted lines/patterns are interpreted to be continuous w/gaps

– Simplicity

perceives forms as simple, symmetrical figures rather than irregular ones

Depth Perception

- – in order to perceive distance, we use binocular and monocular cues

- – binocular: cues that require both eyes

- – monocular: cues that require only one eye

Binocular cues

- Retinal disparity
  - the eyes lie a few inches apart
  - thus their retinas thus pick up slightly different images of objects
  - retinal disparity increases as the eyes get closer to an object
- Convergence
  - the eyes must turn "inward" (towards each other) to look at an object close-up
  - the closer the object, the more muscle movement
  - thus, the more muscle movement, the closer the object is

Monocular cues

– Interposition

when one object is blocking part of another, the blocked object appears further away

– Motion parallax (relative motion)

- **when the viewer is moving, stationary objects appear to move in different directions/speeds depending on their location**
- **the more distant the object, the slower it moves**
- **the closer the object, the faster it moves**

– Relative size

people see objects that make a smaller image on the retina as farther away

Monocular cues

- Relative clarity

  objects that appear charp, clear and detailed are seen as closer than hazy objects

- Texture gradient

  smaller objects that are more thickly clustered appear farther away than objects that are spread out in space

- Linear perspective

  - **parallel lines that converge appear farther away**
  - **the more the lines converge, the greater the perceived distance**

- Light and shadow

  patterns of light/shadow make objects appear three-D

Perceptual consistency

- the ability to recognize than an object remains the same even when it produces different images on the retina

- shape constancy

- size constancy

- brightness constancy

- color constancy

- location constancy

Perceptual set

– the readiness to see objects in a particular way based on expectations, experiences, emotions, and assumptions

Selective attention

– the ability to focus on some bits of sensory information and ignore others

this is what allows you to read these slides or watch this talk!

Context effects

- peoples immediate surroundings create expectations that make them see in particular ways

Memory

How you actually remember things

Different "kinds" of memory

- implicit vs explicit
  - **explicit: conscious, intentional remembering of information**
  - **implicit: unconscious, unintentional remembering**
- declarative vs procedural
  - **declarative: factual information (often explicit)**
  - **procedural: how to do things (often implicit)**
- semantic vs episodic
  - **semantic: recall of general facts**
  - **episodic: recall of personal facts**

Three-stage storage model: sensory memory

- recorded in detail

- but only for just an instant

    this is why you see a circle when you wave a flashlight in a circle?

Three-stage storage model: short-term memory

- 5-9 (7 +/- 2) items

- for about 20 seconds

- for easier storage, brain likes to "chunk" information

- short-term memory == working memory (CPU cache)

Three-stage storage model: long-term memory

- (almost) infinite capacity

- however, it's not always easily retrievable

- seems to get worse with age

    whether that's actually true is hotly debated

- we think it's organized by category

    but also by familiarity, relevance, or connection

Retrieval

- – how we obtain memories out of storage

- – retrieval cues are stimuli that help that process

- – several different kinds of cues/"activations"

Retrieval cues: Associations

– "prime" a concept by putting a similar concept in place

recalling a particular word becomes easier if another, related word is recalled first

Retrieval cues: Context

    – remember an event by placing the individual in the same context they were in when it first happened

Retrieval cues: Mood

– remember an event more easily by being in the same mood as when they were in the event

Memories are not always accurate, however

- several factors can distort memories

- obviously amnesia and dementia and other physical damage

- but we also "do it to ourselves" more often than we think

Distortions of memory: schema

- a mental model of an object/event

- includes knowledge

- as well as beliefs/expectations

Distortions of memory: source amnesia

- – we don't often accurately recall the source of information
- – so if we heard something on the news (or from other sources), we "insert" that into the memory

Distortions of memory: misinformation effect

- recollections can be distorted by information given after the fact

- this has been proven to distort/affect eyewitness testimony, for example

Distortions of memory: hindsight bias

- – a tendency to interpret the past in a way that fits the present

Distortions of memory: overconfidence effect

- people overestimate their ability to recall events correctly

Distortions of memory: confabulation

- – sometimes people will claim to remember something that didn't happen to them

- – or they will remember something happening to them when it actually happened to somebody else

Summary

Finishing up

What do we do with this?

- what makes good code? what is a good programmer?

- how do we hire the best? how do we keep them?

- does agile actually work? or was/is there something else actually at work?

- managing customer interactions/interviews