

CS 428

"THE FIVE ORDERS OF  
IGNORANCE" (ARMOUR)

Fall 2019

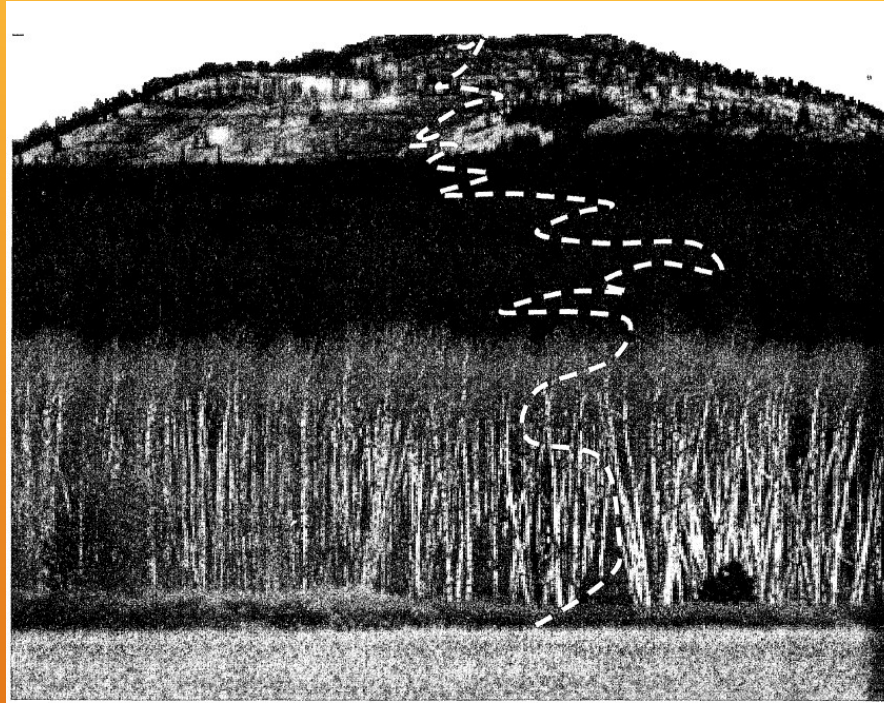
Bruce F. Webster

- ▶ Software is a knowledge-storage medium
- ▶ Developing software is a knowledge-acquiring activity
- ▶ We seldom have perfect knowledge ahead of time
  - ▶ If we do, then why are we doing this? The problem has already been solved.
- ▶ Therefore, software development is an inherently inefficient exploration and discovery process
  - ▶ We determine what works
  - ▶ We determine what does not work (for this particular system)
- ▶ Observations and experiences?

# THE TRUE NATURE OF SOFTWARE

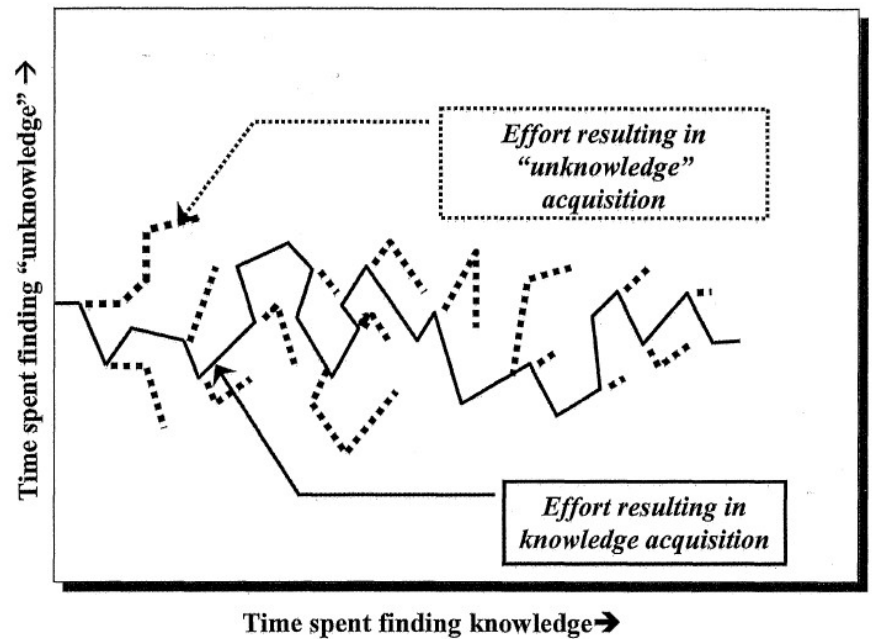
- ▶ The problem of late discovery
  - ▶ Blind alleys, significant backtracking
  - ▶ Webster: Do not Defer the Difficult in IT Projects (2013)
- ▶ Two kinds of knowledge
  - ▶ Again, what doesn't work and what does
  - ▶ Sometimes, what doesn't work is just as valuable, but is often discarded
- ▶ "Corrupted" knowledge
  - ▶ The code often contains artifacts or remnants of our knowledge exploration during development – these may be misleading or obscuring
- ▶ Observations/experiences?

## WHAT CAN HAPPEN ALONG THE WAY



**Exhibit 6. A path through the woods.**

# WHAT THE DISCOVERY PROCESS LOOKS LIKE



**Exhibit 4. Hacking project: Full build.**

# WHAT THE DISCOVERY PROCESS YIELDS

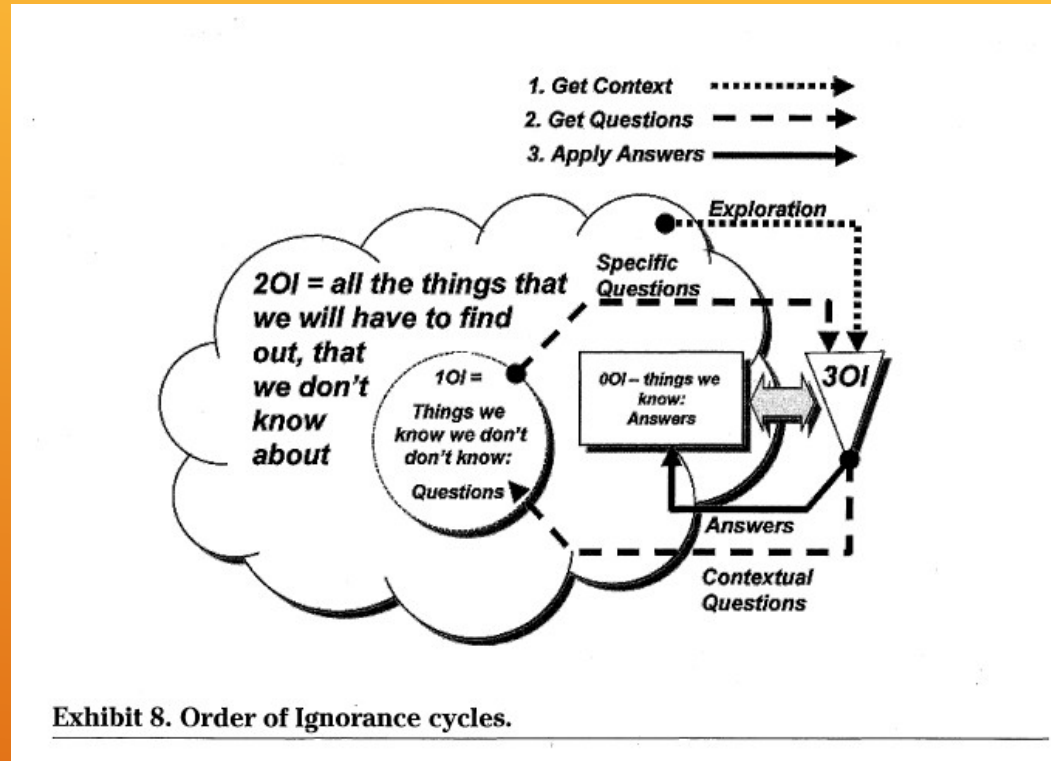
- ▶ Zeroth Order: Lack of Ignorance
  - ▶ I know something, I know that I know it, and I can demonstrate I know it
- ▶ First Order: Lack of Knowledge
  - ▶ I don't know something, and I know I don't know it
- ▶ Second Order: Lack of Awareness
  - ▶ I don't know something, and I don't know that I don't know it
- ▶ Third Order: Lack of Process
  - ▶ I lack a process by which I can discover that I don't know that I don't know something
- ▶ Fourth Order: Meta Ignorance
  - ▶ I don't know about the Five Orders of Ignorance

# THE FIVE ORDERS OF IGNORANCE

- ▶ 0<sup>th</sup> Order: I know how to complete the system
- ▶ 1<sup>st</sup> Order: I know what I need to know to complete the system
- ▶ 2<sup>nd</sup> Order: I don't know yet what I will need to know to complete the system
- ▶ 3<sup>rd</sup> Order: I don't know how to discover what I need to know to complete the system
- ▶ 4<sup>th</sup> Order: I have no clue about any of the issues above

# APPLIED TO SOFTWARE DEVELOPMENT





# ORDER OF IGNORANCE CYCLES



- ▶ To identify whether there are areas where we have ignorance (need to acquire knowledge)
- ▶ To identify what questions we would need to ask to resolve ignorance in these areas
- ▶ To obtain the answers to these questions in a form that we can usefully integrate into the system
- ▶ Key problems
  - ▶ Acquiring knowledge also illuminates more areas of lack of knowledge
  - ▶ Humans have not found a way to empirically measure knowledge
  - ▶ The critical measure of knowledge in software is that of the knowledge *not* in the software
- ▶ Observations/thoughts?

# NATURE OF THE PROCESS

- ▶ **CRITICAL:** if you don't have a GitHub idea already, got to GitHub.com and register for one. Then send me ([bwebster@bfwa.com](mailto:bwebster@bfwa.com)) either your GitHub ID or your email associated with your GitHub ID
- ▶ Log into the class Github (<https://github.com/cs428TAs/f2019/wiki>)
  - ▶ Sometime this week: create a proposed project and/or endorse an existing one
  - ▶ By start of class next week (9/16): vote on at least three (3) projects
  - ▶ We will finalize project set next week in class
- ▶ Join CS428-F19.slack.com if you haven't already
- ▶ Read Armour ([PDF on the website](#)) if you haven't already
- ▶ Readings for next week (9/16):
  - ▶ *Mythical Man-Month*, chapter 1
  - ▶ *Peopleware*, chapter 1
  - ▶ *Accelerate*, chapters 1-2

## TO DO FOR NEXT WEEK (9/16)