

Industry Value of Geometry Lab Experience

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Who am I? Why am I here?

- BS US Military Academy 1999 — 2003
- US ARMY 2003 — 2008
- PhD UIUC 2008 — 2014 (Anton's cohort)
- Daniel H. Wagner Associates, 2014 — present

Wagner Associates

- founded 1963 by mathematician Dan Wagner, PhD Brown
- small (< 50) mix of Math/CS PhDs and CS professionals, often with strong math backgrounds
- optimal search : how best utilize assets so as to maximize likelihood of finding a lost item (such as your keys!)
- tracking, data fusion : use sensor information to determine position / velocity of object (e.g. RADAR, SONAR)
- optimization : find route that minimizes chance of detection by enemy

vertical integration of faculty, graduate students and undergraduates

- faculty, high level guidance → project manager / principal investigator, secures funding, ultimately responsible for project success, chooses team, interfaces with customer
- graduate student, foster deeper conceptual understanding, facilitate implementation → project case leader / project technical lead
- undergraduate students, implementation → project technical staff / software developers
- ability to work in small teams is highly valued (as is ability to work alone with minimal guidance), can't hide in a small team, weaknesses will be exposed

communicating technical facts to non-experts / outreach / engagement / visualization

- foster understanding and interest, ensure continued success of the GL program (i.e. 'please come back next semester')
- companies attend trade show events (similar to expo center at JMM), showcase technology to potential customers (majority are non-experts)
- must connect with audience for successful outreach → potential client must understand the basic principles to have confidence, but also see that you have done something non-trivial
- not every company has dedicated sales staff

communicating technical facts to non-experts / outreach / engagement / visualization (cont)

- communicating your project results in an appealing way that can be appreciated by both non-experts and learned individuals alike, requires patience and appropriate temperament
- proposal writing (reviewers are often non-experts), you can do anything you get a client to pay for
- customer demonstrations and progress briefings / meetings
- ability to function in front room or back room
- for example, customer may ask for something provably impossible, but don't tell them it's so; instead say "that sounds like an interesting problem, let my team and I have a think," then, "here's what we can do for you"

synergy

- faculty : research and teaching → project manager / principal investigator : profitable project, strengthen / enhance / augment project portfolio (company capabilities)
- graduate student : research and mentoring → technical staff : professional and technical growth
- undergraduate students : coursework → technical staff : commensurate use of skill sets
- it's not a success unless everyone wins, roles in GL team are flexible to ensure project success and growth, same flexibility is highly valued in industry (e.g. if implementation team is struggling, rather than complain and request reassignment you spend extra time with them / add more details or concrete examples to your write-up)
- willingness to work as a team

bridge gap between science and society

- between company / technology and market (potential customers)
- when society understands, they ask more questions, want more information → foster customer-driven applications, leads to more opportunities and growth
- show how math isn't magic, instill trust in your methods
- defend your work, critics (competitors) will attempt to undermine your methods

programming

- essential, indispensable part of your toolkit
- familiarity with some flavor of linux is useful, when choosing a distribution consider software repositories (i.e. how easily can you obtain relevant software)
- have one (or more) go-to languages for rapid prototyping (e.g. python, R, octave)
- understand basic object oriented software principles, thinking in OO fashion often leads you to deeper understanding of your work, additional abstractions, prototypes that are easier to transition