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SEAS
School of Engineering and Applied Science

Teaching Information Security to Engineering Managers

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http://www.seas.gwu.edu/~infosec/

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Why Bother?

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- Lots of CS and EE programs in security
  - Excellent technical approach to the problem
  - A needed but not sufficient contribution to the problem space
- 1970 Defense Science Board Report:
  - "Providing satisfactory security controls in a computer system is in itself a system design problem [requiring a] combination of hardware, software, communication, physical, personnel, and administrative-procedural safeguards." [1]
- Condoleeza Rice, 2001:
  - "Today, the cyber economy is the economy. … Corrupt those networks and you disrupt this nation." [2]

[1] Ware, Willis H. Security Controls for Computer Systems: Report of the Defense Science Board Task Force on Computer Security. The RAND Corp: 1970.
[2] Joint Economic Committee, US Congress. Security in the Information Age: New Challenges, New Strategies. http://www.house.gov/jec/security.pdf, May 2002

The First Question

- What's an "IA Professional"?
  - The IA field is very complex
  - Analogous to "medical professional"
    - Whole range of doctors
      - Pathologists to pediatricians to brain surgeons
    - Whole range of nurses
      - LPNs, RNs, Nurse-anesthetists, etc
    - Whole range of other specialities
      - Pharmacists, lab technicians, etc
    - Medical administrators
      - From insurance claims processors to hospital managers
- Bottom line:
  - An "IA Professional" can be a lot of different people

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Given That….

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- To build an IA Workforce, must address each area
- Opportunities for education
  - Technical education
    - From electrons to data structures
  - Practical training
    - From configuring firewalls to patch management
  - Legal education
    - From law enforcement to intellectual property law
  - Engineering education
    - From systems engineering to security architectures
  - Management education
    - From policy development to resource allocation

A complete IA workforce needs all those elements

And they all need to work together

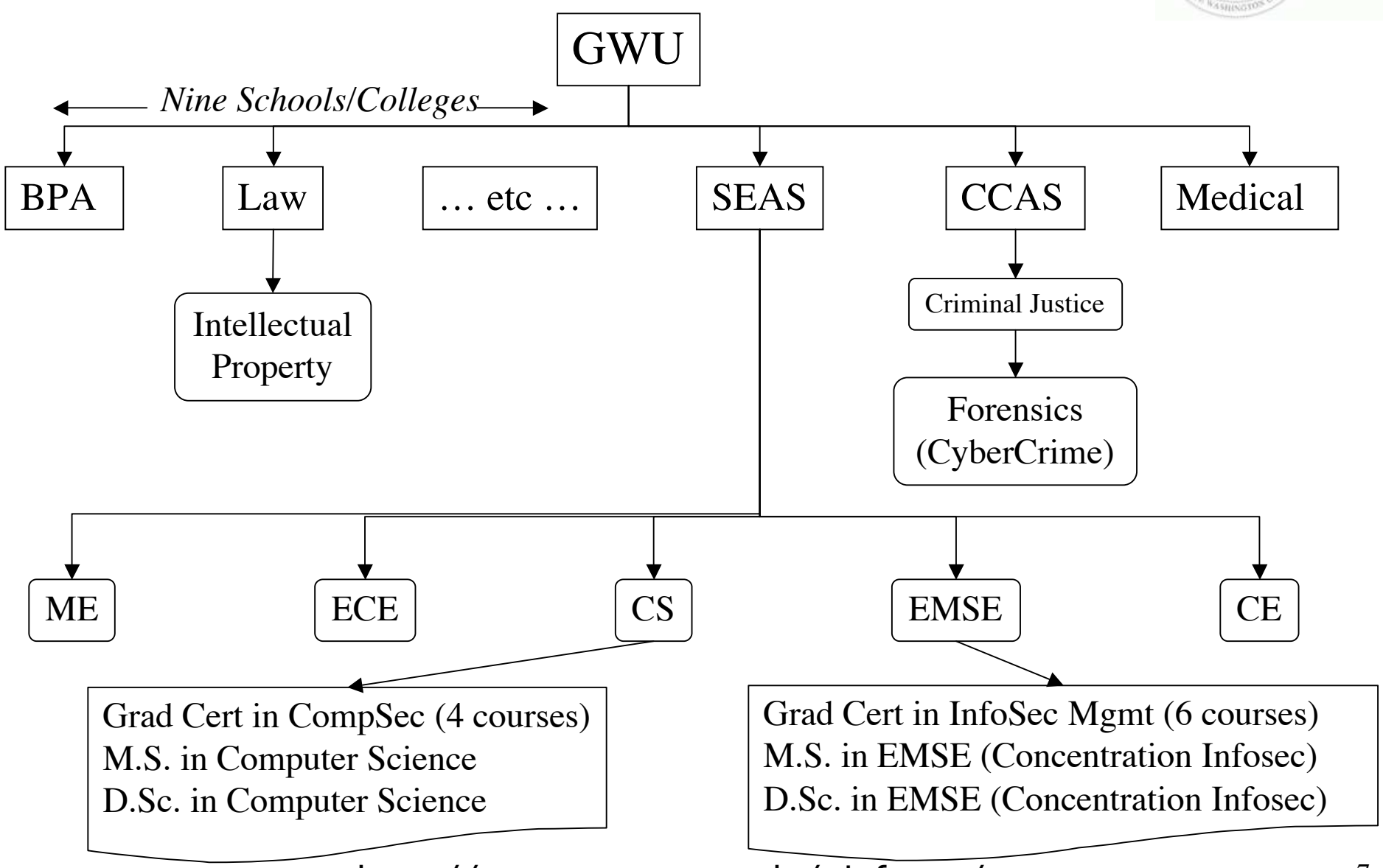
And they need to be **managed** appropriately

Challenges

- Not all employers recognize the needs
- Students are biased
  - By previous education
  - By effects of the go-go 90s
  - By perceptions about what an IA professional is
- Educational institutions are biased
  - By lack of understanding/knowledge
  - By perception that “anyone can teach security”

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Our Approach



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The EMSE Approach

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- The Graduate Education Certificate (also the MS Core)
  - EMSE 218: Intro & Overview
    - Everything at a micron deep
  - EMSE 315: Law
    - Contracts, Case law, torts, ethics, etc
  - EMSE 312: Protect (minus Crypto)
    - Personnel, Physical, Ops, Computer, Network, etc
  - EMSE 313: Crypto
    - All crypto, all the time
  - EMSE 314: Detect
    - Audit, monitor, IDS, etc
  - EMSE 316: React/Correct
    - Biz continuity, crisis mgmt, recovery
- The MS Electives (2 of…)
  - EMSE 317: Cybercrime
    - Criminal law, forensics processes
  - EMSE 318: Info Ops
    - Effect of global economy on security
  - EMSE 319: Emerging Issues
    - Wireless security
  - EMSE 320: E-Commerce
    - How to, how to secure
- The EMSE Core requirements for all MS tracks
  - EMSE 212: Mgt of Tech Orgs
  - EMSE 260: F&A for Engr Mgrs
  - EMSE 269: Decision Theory
  - EMSE 283: Systems Engineering

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Topics Covered



- The short list:
  - Threats
  - Vulnerability assessments
  - Risk management
  - Secure computing
  - Operational security
  - Admin security
  - Policy
  - Law
  - Ethics
  - Network security
  - Life cycle management
  - Personnel security
  - History of computer security
  - History of comms security
  - Crypto, crypto, crypto
- And more….
  - Common Criteria
  - Rainbow series
  - Auditing
  - Monitoring
  - Intrusion detection systems
  - Crisis management
  - Business continuity planning
  - Resource allocation
  - Security engineering
  - Malicious software
  - Trust
  - Passwords
  - Authentication
  - Access control
  - And still more

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What We Don't Teach

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- Computer Science
  - Not a single line of code generated
  - Not a single algorithm developed



Computer Science Dept does this

- Electrical Engineering
  - Not a single circuit analyzed



Electrical & Computer Engineering Dept does this

- Hands on skills
  - Not a single firewall configured
  - Not a single system administrated
- Hacking
  - Cover the theory in advanced classes but forbid them to do it
- BUT!
  - We do teach them why each and every element of those specialties is a critical component of security engineering and management

Why?

- The demand is there
  - Huge requirement for education of non-computer science types
    - Weapons acquisition managers
    - Program managers of all other sorts
    - The other engineers increasingly required to work with IT
    - Senior executives forced to deal with security issues
    - Business types in the IT workforce with no computer science background
  - Strongly believe in the systems engineering approach to security in operational environments
    - Solution in real world is not a computer science problem

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Student Outcomes

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- Who Hires Our Graduates?
  - The government
  - Defense contractors
  - Large corporations
- Demand is driven by:
  - Demographics of the DC metro area
  - Requirement for knowledge to apply to large systems

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