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ARMY B.O.A.R.D. Bio-Inspired Signature Management Workshop

September 16, 2019
Room 100, Keck Center
500 5th St NW, Washington, DC 20001

Chair: Andrew Alleyne Univ of Illinois

Vice-Chair: Michael Bear, BAE Systems

Outline

- Bottom Line Up Front (B.L.U.F)
- What will we accomplish
- Rules of engagement
  - Keep moving
  - All ideas are valuable
- Concepts to keep in mind
- Agenda

Bottom Line Up Front (B.L.U.F.)

- This workshop is set up to ask and answer a set of questions for our sponsor
- What can we learn from biological systems to effectively manage signature?
  - Across multiple domains
- How to use that knowledge to engineer capabilities that improve ability to minimize detectability and maximize detectability of others
- What gaps in Scientific and Technological knowledge remain and what can we do to fill them?
  - Some, not all

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Desired outcomes

- At the end of this workshop we will have:
- An understanding of the state of the art from a biology perspective
- A list of promising scientific and technological avenues to pursue in the bio-inspired signature management area
- A reference library of relevant articles
- A nascent community of scholars bridging biology and engineering/physics on this topic

Google docs for open contributions ⇨ **https://tinyurl.com/BISM2019**

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Rules of engagement

- Limited time for this effort so we need to be efficient
- Imperative we capture ideas clearly and crisply
  - Please use the microphones when speaking
- Once an idea is captured, we can move on to the next one
- Please synthesize ideas as the day goes on to enable an effective roll-up at the end of the day
- It will be a long day; thanks for your efforts, focus and ideas

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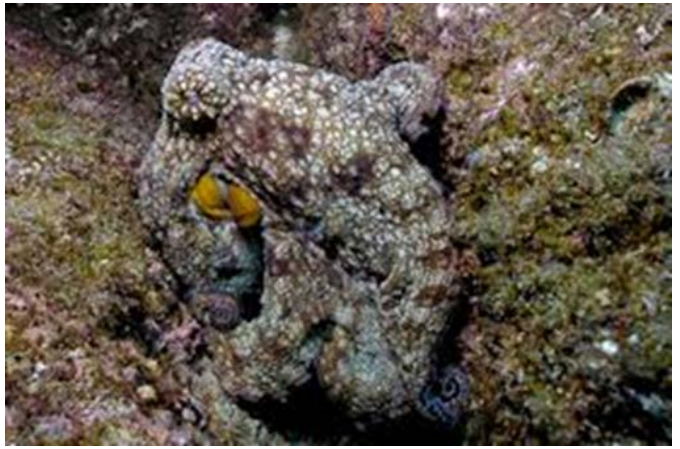
Concepts to keep in mind

- Much of the literature on biological camouflage involves stationary systems
- Additionally, there is a strong focus in the literature on hiding in one part of the electromagnetic spectrum

John Macgregor/Getty Images

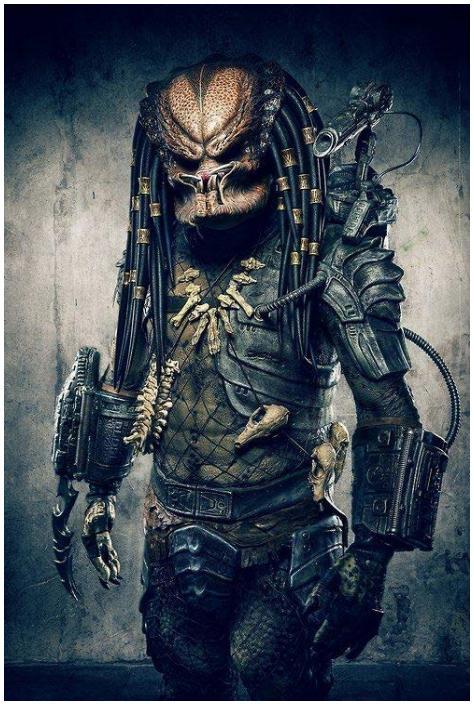
Stationary blending with background



Natural Camouflage in EO spectrum

Concepts to keep in mind

- Can we reduce signatures in both static and dynamic regimes?



Predator, (1987)

Dynamic signature reduction

Concepts to keep in mind

- Can we work across multiple spectra?
  - Visual, Infrared, Thermal
  - There are advantages and disadvantages in each spectrum
  - Corresponding preferences for some

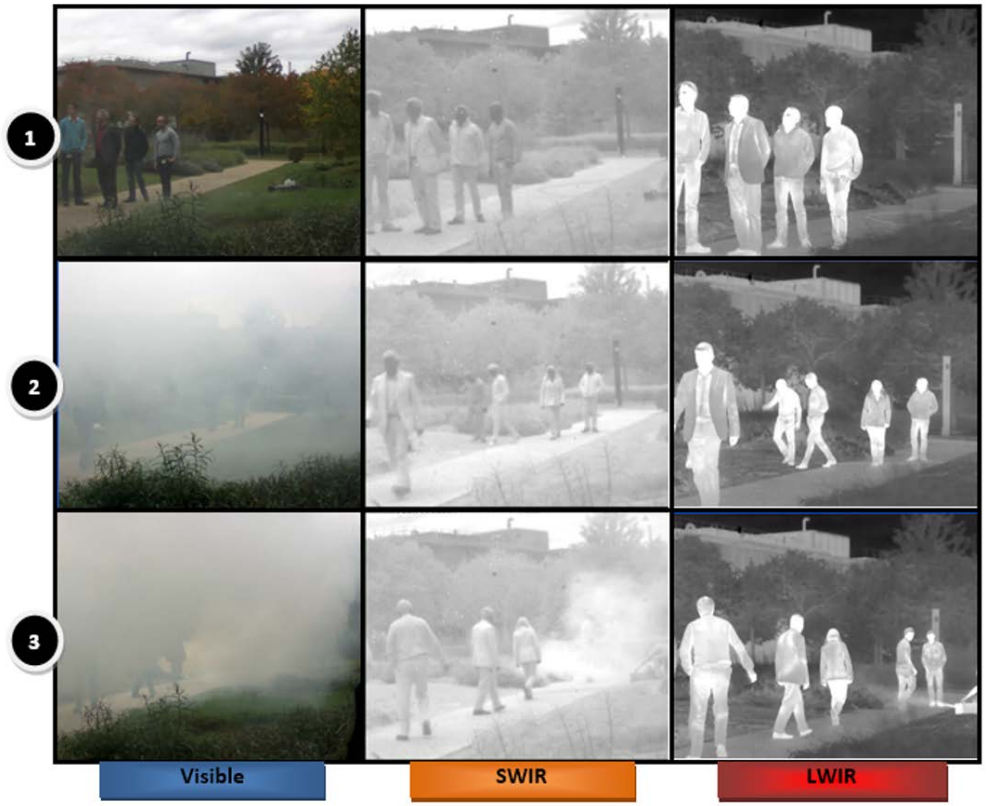
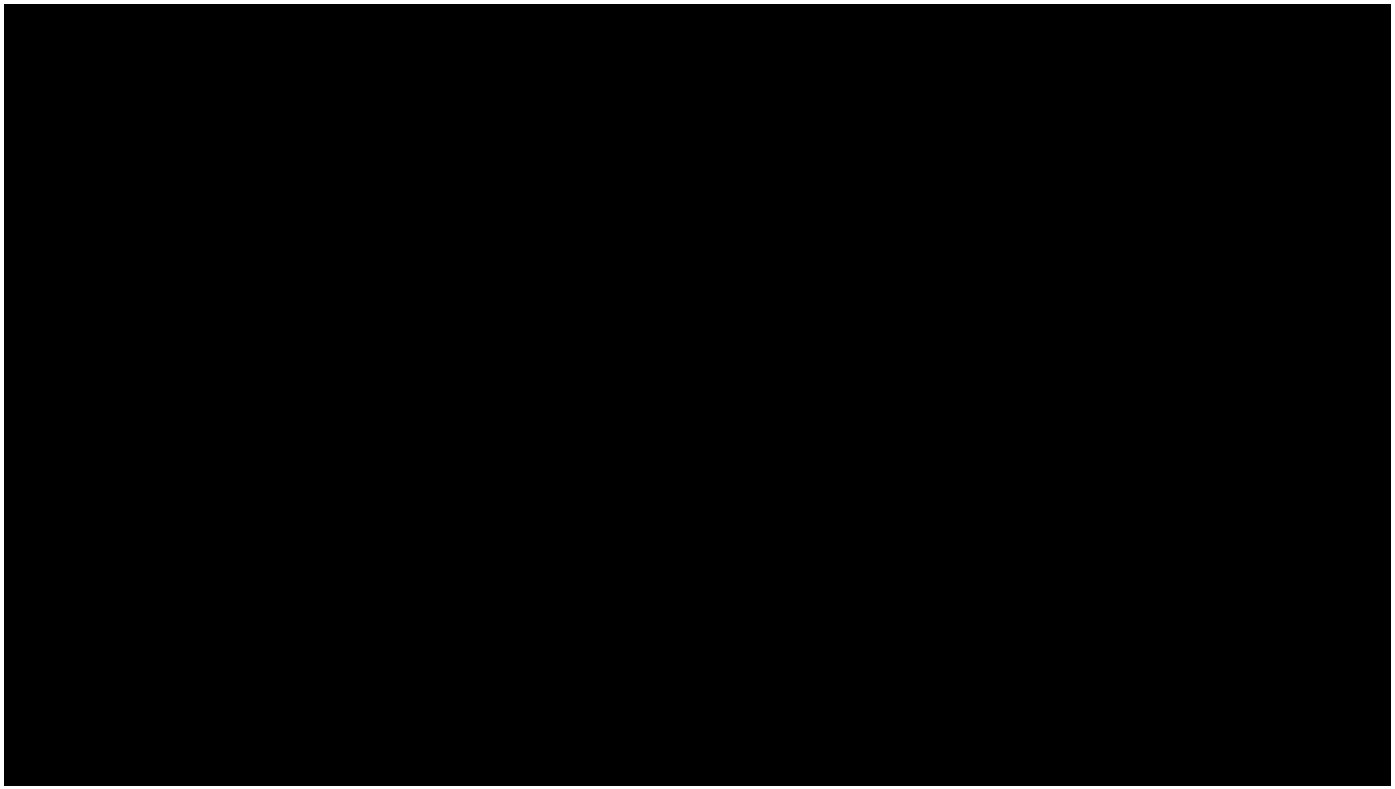


Figure 6 Test at outdoor of visibility in artificial fog

Concepts to keep in mind

- Can we work across multiple spectra?
  - Visual, Infrared, Thermal



Predator 2 (1990)

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Agenda

0800-0830	**Introductions, Continental Breakfast, and Outlining Workshop Goals** **a) Defining Tangible Outcomes and Products (Alleyne/Bear)**	
0830-0900	Title: Dynamic Materials Inspired by Cephalopods Speaker: Alon Gorodetsky, University of California, Irvine (Moderator: Roger Hanlon)	presentation
0900-0930	Title: Animal Camouflage: Evolutionary Biology Meets Vision Science Speaker: : Innes Cuthill, University of Bristol (Moderator: Roger Hanlon)	
0930-0945	Break	
0945-1100	Moderated Working Discussion to focus on Materials/Structures a) Identify bio-inspired concepts that could be relevant b) Find and classify examples of relevance (Moderator: Paul Schomber)	discussion
1100-1130	Title: Bio-Inspired Sensors: From the Ocean to the Operating Room Speaker: Viktor Gruev, University of Illinois, Urbana-Champaign (Moderator: Pamela Abshire)	presentation
1130-1200	Title: Camouflage Strategies and Vision Speaker: Martin Stevens, University of Exeter (Moderator: Pamela Abshire)	
1200-1300	Lunch (Working Lunch with additional discussion based on the morning presentations)	discussion
1300-1430	Moderated working discussion to focus on Materials/Structures and Ensembles a) Identify bio-inspired concepts that would be relevant b) Find and classify examples of relevance (Moderator: Marianne Alleyne)	
1430-1445	Break	

1430-1445	**Break**	
1445-1600	Panel Session: Roger Hanlon, Woods Hole Marine Biological Laboratory Leila Deravi, Northeastern University Michelle Povinelli, University of Southern California Naomi Halas, Rice University Evaluation of Biology to influence possible camouflage, concealment or decoy approaches; What is the art of the possible? (Moderator: TBD)	presentation
1600-1630	Break	
1630-1730	Group Discussion(s): Gaps and potential actions to reduce gaps a) Identify nature's solutions and relevant engineering/technical barriers b) Examine paths to manufacturing/fabrication, levels of achievable success, and potential resources needed (Leaders: Michael Bear, Andrew Alleyne) (Scribes: TBD)	discussion
1730-1800	Transition to Dinner	
1800-1930	Working Dinner: All participants Group Discussion(s): a) Identify promising areas for exploration with Research and Development b) Presentations of findings (Moderator: Michael Bear, Andrew Alleyne)	synthesis
1930-2000	Identify Consensus Conclusions and Minority Conclusions (Organizing Committee)	outbrief
2000	Summary and Workshop Closure (Alleyne/Bear)	