The Enchanted View
— Thinking About Systems —

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www.incose.org/enchantment

Ann Hodges Ascends to Chapter Presidency

Our Chapter's President, Ricardo Pineda, has stepped down effective June 1. He has accepted a position at the Stevens Institute of Technology as Systems Program Director and has several project commitments to complete before he and his family move to Hoboken, NJ. He felt he couldn't devote the time that the Presidential position deserved. Ann Hodges, as President-Elect, has stepped up to become our President. Rick Dove, who has served as a Director-at-Large since 2005 was nominated and elected by the Chapter Board to become the interim President-Elect. Since Ann was fulfilling both the President-Elect and acting Secretary positions, the Board felt that it would be advantageous for someone to backfill her in her Secretarial duties. Jennifer (Jeni) Turgeon was nominated and elected by the Chapter Board to be our new Secretary for the remainder of the calendar year. Mary Compton, who has been an officer of the Enchantment Chapter Board for a number of years continues to be our Treasurer. Please join the Enchantment Chapter Board in congratulating Ricardo on his new opportunity and welcoming Rick and Jeni as our newest Chapter officers!

Jennifer Turgeon is a Principal Member of the Technical Staff at Sandia National Laboratories (SNL). She has worked at SNL for 8 years and previously worked at Lockheed Martin and Honeywell Federal Manufacturing & Technologies. She is a certified Capability Maturity Model Integration (CMMI) Lead Appraiser, and has experience incorporating this model into systems and software engineering environments. Jennifer is also a Six Sigma Green Belt and a certified Scrum Master and Scrum Product Owner. She holds a BS in Computer Science and an MS in Industrial Engineering. She is currently a doctoral candidate in Systems Engineering at Colorado State University. ∞

3 Student Division Projects at IS13 Student Engineering Challenge

Eric Smith, Student Division Advisor

The INCOSE Student Division from UTEP (University of Texas, El Paso) participated in the 2013 International Symposium in Philadelphia, PA, submitting three project reports to the student Engineering Challenge.

Juan Carlos Armenta and Mario Salomon submitted the project "Miner Recycling System," reporting their progress in revitalizing the UTEP recyclables collection system, which for the first time can become economically self-sustainable. Principal improvements include full multi-stream recycling and daily pick-up as part of a "no-trash" campus. The project is leveraging the student Green Fund to obtain support from UTEP Facilities Department, as well as from administratively supported financial funding.

Mario Salomon, Juan Pablo Fernandez and Aditya Akundi presented the "Bike-Share System" project, which again leveraged student Green Fund seed money to secure $500,000 of El Paso's Metropolitan Planning Organization funds to install and service B-Cycle bicycles and docks in-and-around the UTEP campus, enabling emissions-free local transportation for university students and the general public. This project will utilize information from class schedules, and traffic and parking patterns to optimize the location of B-Cycle docks.

Aditya Akundi, Sergio Luna and Mario Salomon presented "Evaluation of University Transit Systems Using a Systems Engineering Approach," reporting progress on the drive to develop student-centered busing systems modifications, designed to create a more education friendly environment, and also to increase the availability of education to low income families in the El Paso region. Students involved in this project are gaining valuable Project Practicum experience by becoming involved in local government transportation engineering and planning.

UTEP Student Division leadership is currently changing hands from Interim President Sergio Luna Fong to Interim President Juan Carlos Armenta, with full elections to occur in the Fall 2013 semester.

At the INCOSE 2013 International Symposium, Division Advisor Eric D. Smith participated in the Student Division Panel: Value Propositions and Sustainability, led by David Mason. Eric presented the University Perspective, focusing on the value proposition of student divisions for universities, noting that collective value can also be generated for students as well as for sponsoring industrial partners. ∞

LiveMeeting is Replaced with GlobalMeet—July 1st

INCOSE has upgraded the webinar platform to improve, they say, both the presenter and user experience, effective July 1st. The new web conferencing tool offered for meetings and collaborative work is GlobalMeet. You may have experienced GlobalMeet in other venues, such as recent INCOSE webinars hosted on the third Wednesday of the month. Chapter meetings that utilize GlobalMeet for remote meeting attendees should be straight forward. Unlike LiveMeeting, there is no need to download a client to your machine, and the operation is fairly intuitive. Meeting notices will include the sign-on link, and you will be expected to provide your name and email address. That's about all. Unlike LiveMeeting, however, any uploaded documents and handouts will share a common directory with "some" other GlobalMeet events, which may require some careful downloading to get only what you want. ∞

Seven Projects of the Agile Systems and Systems Engineering WG

This working group had a workshop at IS13 to review projects and accomplishments since its formation six months earlier. The working group currently has 60 members. Projects outlined below are described in 1-2 page descriptions available in the shared documents directory at https://connect.incose.org/tb/ASSE. New working group members and new project suggestions are welcome—contact rick.dove@parshift.com. New project participants are welcome—contact the project lead shown below.

Project 1 – Webinars (one completed, more ongoing).

- Agile 101 – Agile Systems and Processes: Necessary & Sufficient Fundamental Architecture. This was the INCOSE webinar for September 2012, and is in the INCOSE webinar archive as well as here: www.parshift.com/s/Webinar-FundamentalsOfAgileSystemsAndProcesses-Incose120919-60min.wmv
- Agile 102 – Agile Systems and Processes: Response Situation Analysis (agility requirements), to be made available as an INCOSE Webinar in September 2013 and as well as an Enchantment Chapter webinar.

Rick Dove (PSI/Stevens, rick.dove@parshift.com)

Project 2 – Handbook Section: Agile Systems Engineering (completed).

- Defined: Agility is a capability exhibited by systems and processes that enables them to sustain effective operation under conditions of unpredictability, uncertainty, and change.
- Framework: Leverages an identical architecture for agile systems-engineering (process), and agile-systems engineering (product). For engineering process, also leverages human productivity factors and incremental customer feedback.
- Metrics: Time/Cost/Predictability/Scope for responding to change effectively.
- Architecture: Drag-and-drop, plug-and-play, loosely coupled modularity, with additional critical aspects for sustaining agility.
- Design Principles: Ten commonly found in 100s of researched examples in all system domains.

Project 3 – Agile Collaborative Development (release 1 completed).

Develop an agile process and identify remote-collaboration tools that drive distributed, volunteer, collaborative knowledge-development projects toward high quality, in-demand, productive results. Current participants, with project lead named first: Rick Dove (PSI/Stevens, rick.dove@parshift.com), Larri Rosser (Raytheon), Ralph LeBarge (JHU/APL), Ron Lyells (Honeywell).

Project 4 – SE for Software Intensive Projects Using Agile Methods (1st draft completed, ongoing).

Identify and describe SE activities, methods, roles and rhythm that enable effective SE in an agile software-development environment. Current participants, with project lead named first: Larri Rosser (Raytheon, Larri_Rosser@raytheon.com), David Lempia (Rockwell Collins), Phyllis Marbach (Boeing), Suzette Johnson (Northrop Grumman), Gunters Osvalds (Praxis). 1st draft available for comment in shared documents at https://connect.incose.org/tb/ASSE.

Project 5 – Decision Making Guidance for Applying Agile SE (in process).

Identify agile SE management practices and technical practices, characterize project types appropriate (or not) for agile SE, frame the application of SE for appropriate project types. Current participants, with project lead named first: Mike Coughenour (LMCO, mike.coughenour@lmco.com), Rick Dove (PSI/Stevens), Greg Paytas(JHU/APL), Jim Brake (LMCO), Bob Epps (LMCO), Jon Chard (IBM), Curt Hibbs (Boeing), Robert Simmons (Boeing), Jo Ann Lane (USC), Ed Moshinsky (LMCO), Ron Lyells (Honeywell), Jimmy McEver (JHU/APL), Neil Shirk (LMCO), Rich Turner (Stevens), John Risson (Telstra), Stephen Tolle (Defense Contractor).

Project 6 – Fundamentals of Agile SE (in process).

Produce three progressively definitive reference documents for IS14 (10-15p), Systems Journal (15-20p), INCOSE technical product (40-60p) identifying fundamental design characteristics enabling system/process agility. Current participants, with project lead named first: Rick Dove (PSI/Stevens, rick.dove@parshift.com), Ralph LaBarge (JHU/APL), Rich Turner (Stevens), Mike Coughenour (LMCO), Ron Lyells (Honeywell).

Project 7 – INSIGHT 2014Q2 Theme Issue (in startup).

Theme working title: Agile Systems Engineering – It's Not Just for Software. Produce a theme overview and 11 essays. Issue a call for essays in August 2013, working abstracts due in September, first draft end of November, updated draft early January 2014, presentation and review at IW14 late January, final drafts due March. Editorial committee: Rick Dove (PSI/Stevens, rick.dove@parshift.com), Mike Coughenour (LMCO), Ron Lyells (Honeywell). ∞

Key SE Conferences with Paper/Abstract Submission Dates

SysCon 2014 – IEEE Systems Conference, March 31 – April 3 in Ottawa. Abstracts due 1 Oct 2013, http://ieeesyscon.org.

CSER 2014 – Conference on Systems Engineering Research, 21-22 Mar 2014, Redondo Beach CA. Abstracts due 6 Sep 2013. www.incose-la.org/cser2014 (but not yet active as of 1 July 2013).

IW14 – INCOSE International Workshop, January 25-28, Los Angeles, CA. Details in late October 2013.

IS14 – INCOSE International Symposium, Seoul, Korea, 21-24 July. Paper submission 10 Nov 2013. www.incose.org/symp2014.

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Recent Meetings

Ann Hodges, Sandia National Labs
Available presentation slides are posted on the Enchantment Chapter website.

April 2013—Jack Ring, INCOSE Fellow, outlined a new paradigm "Beyond Test and Evaluation" that focuses on System Readiness Assessment from Day 2 of a new project through Year N of the system usage/evolution cycle. It will motivate and develop a new workforce of systemists who are fluent in autonomy, context-sensitive systems and integrity assessment across heterogeneous system of systems, and who are capable of designing evaluation scenarios and composing responsive test systems and operations that reflect user-specific engagement scenarios.

The new paradigm will be effective in multiple domains including defense, aviation, homeland security, industry supply chains, knowledge discovery and vetting networks and human activity systems. Interestingly, the dramatic cost avoidance inherent in the new paradigm will exceed implementation expense by an order of magnitude. This opportunity is both significant and urgent.

May 2013—Ann Hodges, Distinguished Member of Technical Staff at Sandia National Laboratories, and now our Chapter President, presented Bricks for the Lean Systems Engineering Yellow Brick Road, noting that a Yellow Brick Road, the fabled path to a "promised land," where hopes and dreams are achieved is highly probable. Yellow bricks highlight the appropriate road, and destination mileage and speed limit signs support progress assessment to the chosen objective. Similarly, a common systems engineering (SE) framework, properly implemented at the appropriate level of rigor, facilitates monitoring and achievement of a quality product that supports the intended mission.

Bricks for a lean SE Yellow Brick Road include: a) using a common framework that integrates SE, project management and quality management; b) right sizing project implementation of this framework using a graded approach; c) applying the framework as early as possible; d) tailoring and waiving as needed; e) using project archetypes; and f) providing a repository that contains re-useable processes, plans, templates, examples, training and associated subject matter experts.

June 2013—Dan Sturtevant presented Technical Debt in Large Systems – Understanding the Cost of Software Complexity, the subject of his recent MIT PhD dissertation. Many modern systems are so large that no one truly understands how they work. Because these systems exceed the bounds of human understanding, different design teams must work on separate chunks, glue their work together, and hope that the whole thing behaves as expected. In this process, high-level architectural design patterns (such as hierarchies, modules, and abstraction layers) play an important role. By keeping complexity under control, they give systems the ability to scale, make them more able to evolve, and reduce the likelihood of unexpected side effects or integration problems.

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Next Meetings

Ann Hodges, Sandia National Labs

July 10: Leveraging System Science When Doing System Engineering

Richard Martin, President, Tinwisle Corp.; INCOSE Delegate: Federation of Enterprise Architecture Professional Organizations

Abstract: Every System Engineer has a bit of the scientific experimenter in them and we apply scientific knowledge to the spectrum of engineering domains that we serve. The INCOSE System Science Working Group is examining and promoting the advancement and understanding of Systems Science and its application to System Engineering through a collection of targeted projects. This webinar will report on these efforts to: encourage advancement of Systems Science principles and concepts as they apply to Systems Engineering; promote awareness of Systems Science as a foundation for Systems Engineering; and highlight linkages between Systems Science theories and empirical practices of Systems Engineering.

August 14: Meeting and Tour at Honeywell Bendix/King

David Boren, Chief Engineer, Bendix King

Abstract: Bendix King specializes in products for light aircraft owners, such as Apps and Handhelds, Displays, Communication Equipment, Flight Controls, Indicators, and various safety, terrain, and weather monitoring equipment. Bendix King is located on the lower floor of Honeywell's 9201 San Mateo facility, with entrance at the North West corner of the building. GlobalMeet (the LiveMeeting replacement) will be used for a 30 minute opening discussion on Bendix King and the systems process and tools they employ, with examples using Enterprise Architect and Contour. The final 30 minutes will be a tour of the facility with lab demos. The tour and demos will not be broadcast with GlobalMeet. Advance signup for the tour is not required, but an approximate headcount is desired for tour logistics. If you are interested in attending the tour, please send an e-mail to mike.gruer@honeywell.com who is helping to coordinate the tour. Flyer with directions will be made available closer to tour date.

September 11: Agile 102: Agile Systems and Processes—Driving Architecture with ConOps and Response Situation Analysis

Rick Dove, CEO, PSI, Inc.; Adjunct Professor, Stevens Institute of Technology; Chair, Agile Systems and SE Working Group

Abstract: Agility is enabled and maintained by a fundamentally necessary and sufficient common architecture in systems of all kinds; from agile development and deployment processes, to the agile systems and products that are deployed. This webinar will focus on tools and methods for developing a concept of (agile) operations, conducting response situation analysis, and identifying reality factors in the operational environment. These tools and methods are precursors necessary to inform the development of an agile system or process architecture, the subject of the INCOSE Agile 101 webinar that is available as slides (no audio) at www.parshift.com/s/AgileSystems-101.pdf. Examples will be drawn from agile systems and from agile engineering processes in a variety of domains.

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IS13 Tutorials

Ann Hodges, Sandia National Labs

I have just returned from the INCOSE International Symposium 2013, where I was delighted to see Enchantment Chapter members enjoying the opportunities provided by the conference: learning about advances and experiences of other systems engineers through papers and tutorials, networking with systems engineers throughout the globe, and mentoring and being mentored by other attendees. I particularly relish taking deep dives into topics through tutorials offered at International Symposia. The IS tutorials are taught by individuals with broad and deep experience in the topic. I'd like to share some of my observations concerning the IS2013 tutorials I attended.

The Systems Engineering of Interfaces, Hazel Woodcock (IBM) and Paul Davies (Thales Research & Technology). Interfaces tend to be wrought with difficulty. This tutorial offered simple tools and pragmatic approaches to wrestling down interface devils. A context diagram forces exploration of "what's inside" of the system, with "what's outside" representing interfaces that must be addressed. Interface categories were covered, and opened my understanding to other possibilities, e.g., environmental (airflow, thermal, shock/vibration), mechanical linkages/fastenings, chemical/biological exchange. *N-squared* charts are useful in representing the interfaces in subsystems, user interface, control inputs/outputs, system inputs/outputs, and other external systems ("outside" scope of concern). An ICD (Interface Control Document) outline was also shared.

Introduction to Pattern-Based Systems Engineering (PBSE): Leveraging MBSE Techniques, William Schnidel (ICTT System Sciences) and Troy Peterson (Booz Allen Hamilton). Patterns have been very useful in software system development. This tutorial presented a parameterized SysML model that can easily be used for product lines. It may be likely that the patterns presented could be applicable beyond product lines, which I will be pondering in the near future. The presenters are keen on organizing a working group on this topic, so be on the lookout!

Systems Engineering Requirements Analysis and Trade-off for Trusted Systems and Networks, Melinda Reed (Office of the Deputy Assistant Secretary of Defense for Systems Engineering) and Paul Popick (The Aerospace Corp.). The tutorial was taught by developers of Chapter 13 (Program Protections) of the Defense Acquisition University Guidebook, who shared their latest pre-published thinking in this area. A straightforward approach was described to address supply chain and malicious insertion threats, determine cost/benefit-informed countermeasures and risk-informed mitigations, and protections to incorporate early in requirements definition. ∞

Just Thinking

Connecting Systems Science, Engineering, and Thinking

Regina Griego, Sandia National Labs

The all day System Science working group meeting at IS13 got me thinking about system thinking. This working group leads the collaboration between INCOSE and ISSS (International Society for Systems Sciences), which has yielded a System Praxis Framework (see http://systemspraxis.org). The term "praxis" refers to the link between theory and practice. This framework speaks to the relationship between Systems Science, Systems Engineering, and Systems Thinking.

The emphasis of the framework is on the relationship of the practice of systems engineering to the science of systems, which got me thinking about the role of systems thinking. As I listened to the discussion I saw parallels between Spiral Dynamics and this framework of science, practice and thinking relationships. I learned about Spiral Dynamics in my Leadership Coaching Certification Course at Georgetown. It presents as a 3D spiral that widens up the axis of our development over time as leaders, or as humans in general. On the horizontal plane we learn new knowledge, practice that knowledge, and achieve a level of mastery, say in engineering or management. We can reach a state of equilibrium between our practice and theory and become very content and skilled, and spend most of our life at a particular comfort level of development. When something threatens our worldview, or we experience some disconnect in our experience and our theory, we are forced to transform our thinking, which moves us vertically up the spiral to a wider landscape.

I believe this vertical dimension relates to Systems Thinking. As you go up vertically you develop a wider viewpoint, integrating new ways of seeing new relationships between experience and explanations for experience.

A term that was used in the discussion during the working group meeting was "edge of chaos," related to what we experience when developing systems. Indeed, in the practice of Systems Engineering we experience that edge where the complexity of systems, the complexity of managing the systems engineering project, and the ability to verify and validate the results feels unmanageable at times. This is the time to step back and revise our version of the relationship between experience and science.

That act of stepping back, being willing to revise our Newtonian model of the world, is the act of Systems Thinking. Classes in Systems Thinking provide tools that support this reflection, just as a personal development coach provides tools for us to observe ourselves and make choices. But tools are only an enabler, transformation is ultimately a choice.

We are still discovering the essence of Systems Science and its relationship to the practice of Systems Engineering. Most Systems Engineers would give you a blank stare if you ask them what Systems Science underpins their work as Systems Engineers. The Systems Science working group objectives are to:

- Encourage advancement of Systems Science principles and concepts as they apply to Systems Engineering.
- Promote awareness of Systems Science as a foundation for Systems Engineering.
- Highlight linkages between Systems Science theories and empirical practices of Systems Engineering.

I believe all of these objectives are worthwhile, and that awareness might ultimately lead us to use Systems Thinking as we evolve to a new level in the practice and science of Systems. ∞

Did You Know…

Stuxnet Started New System Threat Era?

Rick Dove, Paradigm Shift International

The malware known as Stuxnet attacked Iran's Natanz Fuel Enrichment Plant (FEP), a Cyber-Physical system, starting a new era of attacks beyond information systems, with a new level of sophistication now available in open-source to anyone.

The Natanz FEP is military hardened, expecting to be a system-security target. A security fence surrounds a complex of buildings 8 meters underground, which are protected by a concrete wall 2.5 meters thick, with a second concrete wall protecting that. The complex includes two 32,000 square meter "cascade halls" for the production of enriched uranium in gas centrifuges. This facility was further hardened with a roof of several meters of reinforced concrete, and a 75-foot layer of earth on top of that.

Each of the two cascade halls is a cyber-physical system, with an industrial control system (ICS) of programmable logic controllers (PLCs), computers, an internal network with no connections to the outside world, and capacity for 5,000 centrifuges.

Though the internal network is isolated from the outside world by an "air gap," possible vulnerabilities still include malicious insider collusion, non-malicious insider insertion of memory devices brought in from the outside, visiting service technicians, and supply chain intervention. It has been suggested that all of these breech vectors may have played a role in the massive centrifuge damage that began occurring in 2009 and continued at least through 2010.

Stuxnet was introduced into the ICS of at least one of the two cascade halls, and managed to take surreptitious control of the centrifuges, causing them to spin periodically and repeatedly at rates damaging to sustained physical operation. Many characteristics of Stuxnet are unprecedented, and stand as the inflection point that ushers in a new era of system attack methodology and cyber-physical system targeting.

Comprehensive truth is only known to the perpetrators, so some is intelligent conjecture based on analysis, and some is still shrouded in mystery. But illuminating forensic analysis of the Stuxnet code was conducted by a number of qualified organizations; with detailed post-mortems well covered in two documents from the Institute for Science and International Security http://isis-online.org/uploads/isis-reports/documents/stuxnet_FEP_22Dec2010.pdf.

Knowing what to do (Intelligence)
Unpublished (for the most part) is how the perpetrators knew what specific cyber-physical devices were employed in what configuration at Natanz; but Iranian videos on the Internet inadvertently displayed configuration information specific to the Natanz FEP that matched the Stuxnet target-qualification code. Stuxnet infected many sites other than Natanz, but it would only activate if that site was configured specific to certain Natanz specifications. It is suggested that insider information may have helped the perpetrators, as well as knowledge of the supply chain relationships developed by Iran. In any event, infected machines external to the FEP gathered and relayed information back to command and control servers for subsequent code improvement and updated re-infection.

Crafting the code
A so-called zero-day exploit is one that is not yet recognized by current cyber security detection mechanisms. Stuxnet attacked Windows systems outside the FEP using four different zero-day exploits, two stolen certificates to get proper insertion into the operating system, and a multi-stage propagation mechanism that starts with USB-sticks infected outside the FEP and ends with code insertion into Siemens S7 SPS industrial control systems inside the FEP. Stuxnet requires specific frequency converter drives to be attached to the targeted Siemens system, and only attacks systems that spin between 807 Hz and 1210 Hz (the targeted centrifuge motors). The attack periodically modifies the frequency to 1410 Hz and then to 2 Hz and then to 1064 Hz, changing the rotational speed of the centrifuges – and does this for a short period of time once a month repeatedly, sufficient to eventually deform the centrifuges beyond useful operation.

Jumping the air gap
It is widely believed that Stuxnet crossed the air gap on a USB memory device, which had been originally infected on a computer outside of the FEP and carried inside, perhaps by an unwitting insider. But it is also suggested that the supply chain for PLCs may have been at least one additional infection vector. Whatever the methods, the air gap was crossed multiple times. USB removable media could have effected a bidirectional transfer of information, sending out detailed intelligence about device types connected to the FEP network subsequently relayed to the command and control servers. System intelligence gathering prior to exploit is standard attack practice, and would be reasonably expected here as well. Insider collusion was not necessary to gain intimate information about the air-gapped network.

Maintaining stealth
Just like the movies, when Stuxnet took control it also spoofed the monitoring devices into seeing recorded normal operational data rather than what was actually happening. Stealth was also employed by hiding the infection with a rootkit, and by the periodic once-a-month short duration centrifuge over-and-under spinning, so that the damage occurred over a period of time masquerading as shortened life-cycle rather than a catastrophic event that would alert staff to search for a cause.

Dynamic updating
Stuxnet is continuously updated, with new operational parameters reintroduced as new air gap crossings occur. New code updates older versions via communications with the command and control sites, and with inside FEP-network connections.

Targeting selectively
Stuxnet was clearly targeted at the Natanz FEP, and detailed configuration checking was employed to preclude collateral damage to other facilities.

Stuxnet has a place in infamy as the first example of a new class of malware, with weapons-grade performance, nearly no side-effects, and pinpoint accuracy. However, though the creation and deployment of Stuxnet were expensive undertakings, the strategy, tactical methods, and code mechanisms are now openly available for others to reuse and build-upon at much less expense, with application to cyber-physical system targets of all classes, such as vehicles (autonomous or otherwise), medical devices, manufacturing plants, energy plants, and robots. ∞

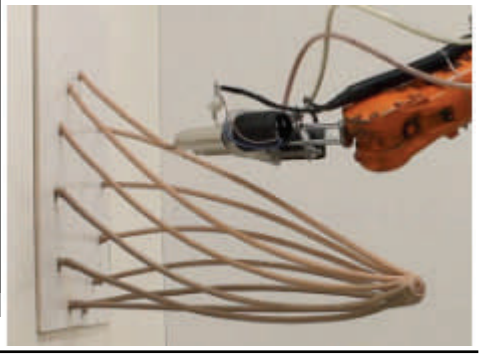
Resources

Watch TED Talk: Not money or joy, Dan Ariely presents two eye-opening experiments that reveal our unexpected and nuanced attitudes toward meaning in our work.

Watch Google's Andrew Ng explain One Algorithm: The Future of Robotics and Artificial Intelligence. "We're seeing a new revolution in artificial intelligence known as deep learning: algorithms modeled after the brain.

Watch Jeff Clune summarize his research into evolving modular, regular neural networks, which are digital models of brains. He studies evolutionary computation, a technology that harnesses natural selection to evolve, instead of engineer, artificial intelligence, robots, and physical designs.

Watch the Mataerial 3D printing system, a robotic arm that prints 3D curves on floors, walls, and ceilings. ∞



New Chapter Members

Francis Peter, Management Sciences

Enchantment Chapter now has 102 active members. We would like to welcome the following new INCOSE members to Enchantment Chapter:

Lorenzo Abeyta	Sandia National Laboratories
Todd Kustra	Sandia National Laboratories
Christopher Lujan	Sandia National Laboratories
Rosemary Monte	Sandia National Laboratories

The Enchantment sponsored Student Chapter of the University of Texas at El Paso currently has 9 active members. We welcome the following new student members:

Bharat Kulkarni
Raul Ruiz
Michael Tadros ∞

Connect to Your Community of Practice

Chapter meetings with a focus on systems engineering are held monthly on the second Wednesday, except in December. The December meeting is an annual social event, with mingling, dinner, and a speaker chosen for enjoyment by systems engineers and guests alike.

Monthly meetings feature speakers from out-of-town that are visiting the area for other reasons, and local (more or less) subject matter experts on topics of relevance.

On occasion special facility tours are arranged, sometimes as the monthly meeting, and other times on a separate schedule.

Chapter meetings begin at 4:45 pm. After chapter news, announcements and introductions, the presentation and discussion generally lasts until 6:00 pm, carried on GlobalMeet for chapter members who can't attend. Recordings are not made.

Tutorials with in-depth coverage on topics of interest are arranged approximately twice a year. Delivered by experts in the field, tutorials range from 1/2 day to day+ durations, and generally involve a tuition.

Mix with people who have the same professional interests as you do, but with a diversity of perspective beyond daily workmates. It comes in handy when you need help or answers to questions outside your accumulated experience, need a connection at another organization, or simply want some mind stretching thought.

Meeting and event notices routinely go to all INCOSE members within the Chapter's geographic territory; but GlobalMeet special notices and collaborative opportunities are generally limited to registered Chapter members. Obtain chapter membership on the INCOSE web site by changing your profile or selecting Enchantment Chapter as you renew membership.

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Chapter Board

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