



Chapter Holiday Social—A Virtual Journey Into the Future!

Tana Lucy, Sandia National Labs

You won't want to miss this year's Chapter Holiday Social to be held on Friday, December 7, 2012. This year's event will feature guest speaker Christine Anderson, the Executive Director of the New Mexico Spaceport Authority. Her talk "Spaceport America: Where We Offer the World an Invitation to Space," will provide interesting insight into Spaceport America and its anchor tenant, Virgin Galactic. (abstract on pg. 5). To date, Virgin Galactic has sold over 530 tickets to commercial passengers on what will most likely be the first commercial passenger spaceline.

The event will be held at the Embassy Suites, 1000 Woodward Place NE and will begin with a 6:00 p.m. no-host cocktail hour. At 7:00 p.m. dinner will be served. You will have the opportunity to select from one of several delicious options: Cajun Cod, Grilled Beef Flank Steak, or a Vegetarian selection. Wine service will be provided with dinner. Dessert will be served during Christine Anderson's talk.

Cost for members and their guests will be \$25/person and the cost for non-members will be \$35/person. This will be an adults-only event. Additional information will be forthcoming in future email announcements. Please contact Chapter board members Mary Compton (505-845-9268) or Tana Lucy (505-844-9730) if you have any questions. ∞



October Tutorial—The System Concept: Bringing Order to Chaos

Ann Hodges, Sandia National Labs

A Full-Day Tutorial with Regina Griego—Friday, 26 October 2012, 8:00 a.m. to 4:30 p.m. Location: CNM Workforce Training Center, 5600 Eagle Rock Ave., NE, Albuquerque, NM 87113.

Most concurrent engineering efforts begin while the product concept is still fluid and with no defined requirements elicitation process. If engineering teams proceed to design with a fluid product concept, the uncertainty practically ensures that development will not meet stakeholder expectations. The goal of a requirements elicitation and analysis process should be a shared vision or concept of the system to be specified before concurrent engineering design efforts begin in earnest. This shared vision is often called a conceptual model and is an extremely useful communication tool at

the onset of a project. The system conceptual model becomes the initial mapping of the intangibly abstract into something more concrete that anchors the team's communication.

This tutorial shows how to use a model-based approach to go from stakeholder goals to a behavioral (use case) architecture and a high-level system architecture. This approach is particularly useful in the commercial domain and for internal products in the government domain and can be scaled for large government programs. Participants will gain understanding and practice in: 1) How to analyze stakeholders based on function, 2) How to develop a behavioral conceptual model for a system based on stakeholder goals, and 3) How to develop an initial system structural model based on stakeholder language.

The tutorial will include lecture with examples and exercises based on a case study that supports attendee development of artifacts as the tutorial progresses, e.g., problem statement,



stakeholders, stakeholder goals, use case architecture, structural diagram, etc. Example solutions for exercises are provided after each exercise. Q&A will

be an integral part of classroom interaction.

Cost for tutorial and notes (lunch not included) is \$400 (member), \$450 (non-member), and \$0 (student) as indicated on the registration form. There is also a PayPal option available at on the [Tutorial Webpage](#).

The full tutorial flyer along with the form for registration and payment can be downloaded from [HERE](#). ∞



How You Can Reap Personal Benefits as a Board Member, *Rick Dove, PSI, Inc.*

The key to multitasking is to have all tasks relevant and contributory to your single central task. As a board member you can influence what the chapter talks are about and who makes them – if there is something you need to learn for your central task or personal development you can arrange that. Especially so with choice of tutorials. Develop some useful skills, visibility and respect in your professional community. Be selfish with your time – gain personal benefit. Explore your early stage ideas in a short newsletter piece or ongoing column; or arguments you need to make meaningfully to yourself, your cohorts, and your management. This is personal professional development with a direct meaningful payoff, not indirect do gooder stuff. One 60 minute face-to-face or Live Meeting board meeting per month – where you influence chapter direction and fold in your priorities. Contact Woody Weed with your interest at jweed@sandia.gov. ∞



Missed Tutorial? Design Structure Matrix Methods & Applications

Mary Compton, Sandia National Labs
 On June 22, 2012 Tyson Browning, Associate Professor of Operations Management in the Neeley School of Business at Texas Christian University, presented a tutorial entitled “Design Structure Matrix Methods and Applications” for the INCOSE Enchantment Chapter.

The goal of the tutorial was to introduce the Design Structure Matrix (DSM) method and demonstrate its application to product, organizational, and process architecting.

DSM has been applied to many types of products and processes in the automotive, aerospace, electronics, and building construction industries. The tool has also been utilized by military organizations such as the US Air Force, US Navy and national security.

Brief Overview of DSM

A DSM is a simple, concise and visual representation tool that highlights interfaces between system elements and the implications of those interactions. The Basic DSM is a square matrix showing rela-

tionships between system elements (see Table).

Shaded diagonal squares represent the elements that comprise a system.

Read across a row to see where an element receives something (input).

Read down a column to see where an element provides something (output).

For example, in the Table:

- Element H receives inputs from elements B, C, D, and E
- Element A provides outputs to elements B, C, D, E, and I

There are two main ways to analyze a DSM. In a static architecture relationships are not time-based; all elements exist simultaneously. The static architecture is typically used for clustering analysis. In a temporal flow relationship are time-based; not all elements exist at the same time. The temporal flow is usually used for sequence analysis.

Applying DSM

DSM can be applied to product architecting to identify interactions between system elements and group those elements

into modules that perform one or a few functions. The system is decomposed into its components, interactions between elements are documented, and elements are clustered into modules. The result of this analysis is a more modular design of the system that promoting reusability for a product family.

DSM can be applied to organizational architecture. The organization is decomposed into elements (e.g., teams) with specific roles, functions, or assignments. Interactions between elements (e.g., people or teams) are documented. The elements are integrated into clusters that represent higher-level organizational elements.

DSM can be applied to process architecting to identify interactions between activities. The process is decomposed into its constituent activities and interactions between those activities are identified. This application of DSM can be used to represent and visualize process and information flow (sequencing), manage process interfaces, improve (or lean) the process, or analyze process cost, schedule, and risk.

In Summary

Dealing with complex systems requires decomposition and integration skills. By using decomposition and integration analysis we can improve our understanding of most complex systems. DSM is a tool that provides a representation platform for complex system that suggests some basic analyses such as clustering and sequencing. This tool can help identify and clarify relationships and interactions between systems elements that have not been uncovered or are not fully understood in our systems.

Table: Basic Design Structure Matrix

	A	B	C	D	E	F	G	H	I
Element A	A								
Element B	•	B	•	•		•		•	•
Element C	•	•	C		•	•		•	•
Element D	•	•		D	•		•	•	•
Element E	•		•	•	E		•	•	•
Element F		•	•			F			
Element G				•	•		G		
Element H		•	•	•	•			H	
Element I	•		•		•				I



The Dark Side: Acquisition Lessons from a Galaxy Far, Far Away

Lt. Col. Dan Ward, USAF, Defense AT&L: “After watching Return of the Jedi, my 8-year-old daughter said, ‘They shouldn’t build those Death Stars anymore. They keep getting blown up.’ The DoD shouldn’t build them either. Any enormous project that is brain-meltingly complex, ravenously consumes resources, and aims to deliver an Undefeatable Ultimate Weapon is well on its way to becoming a Death Star, and that’s not a good thing. A Death Star is an Empire weapon that aims to intimidate opponents into submission. Droids are Republic technology. They don’t intimidate anyone. Instead, they earn their keep by being useful and practical. Great read: www.dau.mil/pubscats/ATL_Docs/Sep-Oct11/Ward.pdf



WG Update: Model Based Concept Engineering

We are seeking the attention of potential members who have an interest and understanding of Concept Engineering and Model-Based Systems Engineering, who have a willingness to learn and advance the MBCE.

Researchers and practitioners with the below skills and expertise are encouraged to join:

- Stakeholder needs and requirements elicitation and definition
- Requirements analysis
- Requirements verification and validation
- Model-based systems engineering
- Project planning
- Project assessment
- Project control
- Legal and policy
- Business analysis
- Soft systems analysis
- Systems thinking
- Holistic lifecycle consideration

The Model-Based Concept Engineering Working Group (MBCE WG) advances the body of knowledge and practice of Systems Engineering (SE) through the

development and application of Model-Based Systems Engineering (MBSE) methodologies to Concept Engineering. With the MBSE process starting with the System requirements specification, there is a need to evolve the methodologies to earlier in the lifecycle stages.

Model-Based Concept Engineering is considered the application of MBSE to the Exploratory Research and Concept Stages, described by the generic life-cycle stages defined by the INCOSE SE Handbook.

While the focus of the working group is on applying MBSE methodologies to activities such as identifying and refining stakeholder needs and exploring feasible concepts, it should be noted that the working group will consider how the Concept Engineering activity influences and is influenced by other stages within the generic lifecycle defined in the SE Handbook.

The MBCE WG recently formed as a chapter sponsored WG under the INCOSE technical operations umbrella.

Current achievements focus around conference papers, conference plenary

sessions and an MBSE symposium held in Adelaide, South Australia in 2011.

Future activities of the steering group involve the development of a list of challenges facing MBCE, including the development of a road map. An activity team is currently organizing an MBSE symposium in Adelaide, South Australia, this year with the theme of Concept Engineering.

The **working group structure** includes a steering group and activity teams.

- The Steering Group is responsible for the guidance, direction and control of the working group and its activities.
- Activity Teams are responsible for tackling specific challenges and issues.
- The steering group meet quarterly with the individual activity teams meeting regularly and reporting to the steering group half-yearly.

Get Involved, contact:

Chair: kevin.robinson@incose.org

Co-chair: michael.waite@incose.org

Co-chair quoc.do@incose.org.

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WG Update: Systems Security Engineering

Current system security strategies are inadequate and cannot be fixed by security engineers alone. The reason is evident: attack communities operate as intelligent, multi-agent, self organizing, system-of-systems – with swarm intelligence, tight learning loops, fast evolution, and dedicated intent. With few exceptions, the systems being targeted are alone, senseless and defenseless – relying on outside benevolence for protection, whether this be separate security systems, laws and penalties, or perceived probabilities of being an overlooked target.

This working group believes that system engineering cannot succeed without accepting core responsibility for enabling and facilitating effective system security – partly in system requirements, partly in system trade space, but mainly in system thinking applied to concepts of operations and systems architecture. Sustaining system functionality in the face of intelligent determined attack requires self preservation capabilities that adapt and evolve with

equal intelligence, determination, and strength of community. This requires full system awareness and adaptability, and system-of-system relationships. Security engineering alone cannot accomplish this.

It is fitting for INCOSE to tackle Next Generation Security, as the issues are leading edge systems engineering issues: architecture, systems of systems, self organizing systems, human factor tradeoffs, systems thinking—high level SE issues. Participants in the working group's projects are developing vanguard critical understandings.

Accomplishments

- A declaration of responsibility, published in 2008 Q2 INSIGHT issue.
- Twelve essays on The Interplay of Architecture, Security, and Systems Engineering, 2009 Q2 INSIGHT issue.
- Nine-paper conference track, April 2011 at ITNG conference in Las Vegas.
- Panel sessions at IS10 and IS11.
- Twelve essays on Systems of Systems and Self Organizing Security, published

in the 2011 Q2 INSIGHT issue.

Current Projects

- Discovering and cataloging self-organizing system-security patterns.
- Adding appropriate security considerations to the INCOSE Handbook.
- Twelve essays on engagement between systems engineering and security engineering, for 2013 Q2 INSIGHT issue.
- Special paper track for IS13 on System Security Engineering.
- IS13 panel session: shared security risk.
- Assembling reference material for Systems Security Engineering in the SEBoK (Systems Eng. Body of Knowledge).

Future Projects

- Adding appropriate systems security considerations to the INCOSE CSEP qualifications.
- Becoming involved with the role of standards in effective system security.

Get Involved, contact:

Chair: rick.dove@parshift.com

Co-chair: paul.popick_ctr@osd.mil

Co-chair: Beth_J_Wilson@raytheon.com



Did You Know

The MIT SE Video Series?

Rick Dove, *Paradigm Shift International*

The MIT System Design and Management Program Systems Thinking Webinar Series features research conducted by SDM faculty, alumni, students, and industry partners. The series is designed to disseminate information on how to employ systems thinking to address engineering, management, and socio-political components of complex challenges.

Some of my favorites include:

Investigations of Platform Savings Reveal Systemic Management Challenges, Bruce Cameron, PhD, Lecturer, MIT Engineering Systems Division.

Companies from aerospace to white goods use platforming strategies to deliver more variety to their customers while saving internally by sharing parts and overhead. However, many firms fail to earn a return on their investment in platforms—Black & Decker famously dropped its platforming strategy one generation after a landmark tool family design. This webinar will explore whether such failures are the result of flawed strategy or execution challenges. [read & watch>>](#)

How Software Learns: What Happens after Software Is Shipped, Christine Miyachi, SDM Alumnus and Principal Systems Engineer and Architect, Xerox Corporation.

Software architecture has sometimes been compared to building architecture, but that comparison has also been faulted as inaccurate because software has a capacity for adaptive change, while buildings are permanent. Or, at least they appear to be. In fact, buildings are complex systems that change drastically over time—as noted in Stewart Brand's book, *How Buildings Learn*. Software engineers have a lot to learn from architecture, and building designers can learn a lot from modern software systems.

This webinar will examine the aspects of both systems that change—slowly and quickly—with a focus on two system properties in particular: maintainability and extensibility. Can we construct both buildings and software systems with a high degree of maintainability and extensibility? Modern agile software processes produce

systems that may be missing these two key properties, and buildings have ignored them for years. This webinar will reveal how software systems can learn and evolve just as buildings do. [read & watch>>](#)

Why Systems Thinking is Not a Natural Act, Ricardo Valerdi, Associate Professor, University of Arizona.

Competence in systems thinking is implicitly assumed among the population of engineers and managers — in fact, most technical people claim to be systems thinkers. But this competence is not as prevalent as these assertions might lead one to assume. Controlled experiments show that systems thinking performance, even among highly educated people, is poor. This presentation provides a set of systems thinking competencies and demonstrates how these are not as common as advertised. We also discuss how these competencies can be measured. [read & watch>>](#)

Anomalies or Leading Indicators? Recent System Failures in IT Security, Manufacturing, and Natural Resource Extraction, Steven J. Spear, Senior Lecturer, MIT Sloan School of Management, Senior Lecturer, MIT Engineering Systems Division.

In recent months, we've been awash in major system failures -- BP, Toyota, a host of IT security breaches at the International Monetary Fund, Apple, Sony, Citibank, and elsewhere. The purpose of this webinar is to explore two alternative explanations of why so many complex operating systems have failed so significantly in rapid succession. The webinar will also offer insight into how complex operating systems can be managed for far greater success. [read & watch>>](#)

Designing Systems for People. Todd Reily, Lead Human Factors Engineer, The MITRE Corporation.

Today's consumer technology market has evolved in complexity and interconnectedness at an ever-increasing rate. As these products and services become increasingly intertwined, the opportunity for overwhelming the people that use them has heightened tremendously. As a result of this situation, the importance of "user experience" design has risen in the eyes of most organizations. This presentation presents a systems-based, design-centric framework for producing great product or

service experiences. It will demonstrate the importance of this type of approach for understanding markets, developing concepts, providing vision, managing uncertainty, crafting requirements, creating prototypes, and testing new markets. [read & watch>>](#)

Systems Thinking and the Development of a Large-Scale, Secure Network for Comparative Effectiveness Healthcare Research. David Hartzband, D.Sc., Lecturer, MIT Engineering Systems Division.

SCANNER (SCAlable Nationwide Network for Effectiveness Research, R01 HS19913-01) is a three-year, \$8M grant from the Agency for Healthcare Research & Quality made to the Division of Biomedical Informatics at the University of California, San Diego.

In this presentation, Dr. Hartzband will describe how the design of the SCANNER network takes advantage of innovative thinking in design and deployment. The network does this by enabling edge nodes that own resources (data &/or function) to specify security and usage policies that are separate from application or database logic and that are resolved by specialized servers distributed on the network. The network also makes use of a syndication model for identity correlation that provides a mechanism for very high probability correlation of a user identity with a set of known attributes. The combination of these mechanisms allows for easy sharing of data, analytic function & results across sites. [read & watch>>](#)

Systems Thinking and Software Architecture. Christine Miyachi, SDM Alumnus and Principle Systems Engineer and Architect, Xerox Corporation.

Software architecture is an elusive topic -- even to professionals who work with software day in and day out. Although software architecture is often deemed required, it's frequently dropped when the schedule gets tight (and the schedule always gets tight). However, software architecture will occur by default by daily decisions made by a project team. This webinar highlights specific tools proven to work in real project situations. [read & watch>>](#)

Many more for future newsletters. See <http://sdm.mit.edu/voices/webinars.html> for 36 webinars posted November 8, 2010 through September 17, 2012. ∞



Recent Meetings

Heather Kraemer, Sandia National Labs

July 2012—On July 11th, John Bernardin, LANL's Lead SE on the Mars Rover Project presented "Mechanical Design, Fabrication, Assembly, Test, Integration, and Launch of the ChemCam Instrument for the NASA Mars Science Laboratory Rover." In this presentation John summarized the Mechanical Engineering Process used to design and build a Laser Induced Breakdown Spectroscopy Instrument for use aboard the NASA Mars Rover Curiosity that was recently launched to Mars for a 3 year mission to the red planet to study its geology and search for signs of life. It was a very well attended talk and was greatly enjoyed by all! Download the presentation from the Enchantment Chapter website: www.incose.org/enchantment/library.aspx.

August 2012—On August 8th Regina Griego, a respected leader in the areas of requirements engineering and systems engineering, presented on "The Parable of the Program Baseline." In her discussion she explained how the Program Baseline, especially for government programs, is an emergent process. She showed how the

program baseline includes scope, schedule, and resources, but is paced and swayed by the timing of budget process and political maneuvering. Her discussion looked into how a program team maintains integrity of right action on behalf of the nation in the ambiguity of establishing the program baseline, and the role of requirements and the requirements process that most Systems Engineers know and love. This talk presented the story of the ambiguous nature of establishing a program baseline for a nuclear weapon program and presented the hard questions that frame the conversation about nuclear weapons at the national level. Download the presentation from : www.incose.org/enchantment/library.aspx.

September 2012—On September 12th, Rick Dove, CEO Paradigm Shift International, shared his presentation on "Something Wicked This Way Comes – Systems Engineering Responsibility for Systems Security." During this presentation Rick presents on the INCOSE recognition that system security is the responsibility of Systems Engineering and how the next version of the Handbook will make this clear in its mid-2013 publication. He

explained how this is simply a door opened and how now the real work begins. His presentation outlined areas such as: What will the Handbook say? How will the responsibility be socialized, accepted, and deployed? How is effective System Engineering and Security Engineering engagement characterized? And how will the SE-BoK (Systems Engineering Body of Knowledge) support this responsibility?

This presentation reviewed work in planning and process, including the logic and nature of SE responsibility; text to be distributed throughout the Handbook; a new System Security Engineering section 9.16; a call for INSIGHT 2013Q2 essays themed: The Buck Stops Here; a multi-session security track at IS13 call for papers; the NSA/NIST Systems Security Engineering document-in-process; the IEEE Smart Grid Vision Project cyber-security work-in-process; and a formative-stage INCOSE Agile Systems Engineering working group with implications for systems security. Download the presentation from the Enchantment Chapter website: www.incose.org/enchantment/library.aspx.

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Next Meetings—Heather Kraemer, Sandia National Labs

October 10: What You Missed at IS12 in Rome

Regina Griego, INCOSE Fellow, Sandia National Laboratories

Abstract: The INCOSE International Symposium was held in Rome this July. Regina will take us on a guided tour of what caught her ear. Of special interest in the usual suite of outstanding tutorials, was the one that covered the development and evolution of the Systems Engineering Body of Knowledge (SEBoK), reference material who's currency will be maintained by INCOSE and IEEE. Three remarkable Key Notes included two on European transportation initiatives that will make you proud to be a Systems Engineer. Two themes of special note unfolded this year: the relationships forming with the PMI community and the expanding number of papers on Systems Science. Finally, a couple of the initiatives the Fellows are engaged in will be discussed, and two remarkable young people from New Mexico that are a part of these initiatives will be introduced.

November 14: Current State of the DoD Acquisition, Test and Evaluation Enterprise

Charles E. Adolph, Independent Consultant, prior director of Test and Evaluation for OSD Acquisition, and Technology

Abstract: Most people would agree that there are serious problems with today's DOD acquisition process. The shortcomings have been addressed in numerous studies; they all boil down to a lack of discipline in implementing and enforcing existing guidance throughout the product definition, technology development, system development and test process. There is ample evidence that the management of developmental programs, with few exceptions, has deteriorated markedly in the last two decades. Numerous indicators exist, including significant increases in developmental timelines; cost overruns unprecedented in magnitude and frequency, often leading to Nunn-McCurdy breaches; and dramatic increases in suitability failures rates. The presentation will identify the primary causal factors for today's problems and as well as address the required corrective actions.

December 7: Holiday Social Featuring Spaceport America: Where We Offer the World an Invitation to Space

Christine Anderson, Executive Director of the New Mexico Spaceport Authority.

Abstract: This talk presents Spaceport America, the world's first purpose-built spaceport. Its anchor tenant, Virgin Galactic, has sold over 530 tickets to commercial passengers on what will most likely be the first commercial passenger spaceline. Spaceport America is nearing completion of the first phase of construction of an amazing infrastructure that supports the spirit to innovate, create and inspire the new commercial space industry and commercial space participants. It is a place where visitors can not only have the opportunity to experience space flight first hand but also to experience the space flight experience from the ground in the on-site Visitor Center called Mission Central that will open in December 2013 to coincide with Virgin Galactic's first flight.

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New Chapter members Francis Peter, Management Sciences

The Enchantment Chapter now has 93 members. We would like to welcome the following new INCOSE members:

Chris Braun	Army - White Sands Missile Range
Amber Cantwell	Sandia National Laboratories
Ryan Maupin	Los Alamos National Laboratory
Fredrick D. May	(affiliation not known)
Michael R. Murphy	(affiliation not known)
John D. Saugen	Saugen Electronic Solutions, LLC
Cheryl A. Schuster	Sandia National Laboratories

The Enchantment Chapter sponsored Student Chapter of the University of Texas at El Paso is doing well with 9 active members. We welcome the following new member to the UTEP Student Chapter:

George Mendez	Carlos A. Sanchez
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IS13 Call for Papers

The only place for a genuine cheese steak, Philadelphia June 24-27, 2013. November 8, 2012 is the submission deadline for papers. Up to 15 pages. Acceptance notifica-

tions will be sent out 22nd February 2013. The subject matter of the paper must be concerned with, or have a strong link to, systems engineering. Papers that are only concerned with e.g. software development or project management are not acceptable.

Security Track—Papers for a special systems security engineering track are especially solicited, with a call for security papers issued by the Systems Security Engineering WG [here](#). ∞

Connect to Your Community of Practice

Chapter meetings with a focus on systems engineering are held monthly, usually the second Wednesday starting at 4:45pm, 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 meet-

ing, and other times on a separate schedule. Chapter meetings begin at 4:45. After chapter news, announcements and introductions, the presentation and discussion generally lasts until 6:00, all carried live on Live Meeting for those 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 Live Meeting connections, 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 so selecting as you renew membership. ∞

Chapter Board

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Published quarterly by

INCOSE Enchantment Chapter,
New Mexico.

Published material does not necessarily reflect the views and opinions of the Board of Directors, or the Editor of the publication.

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