ASM INTERNATIONAL®

100th ANNIVERSARY 1913-2013

Celebrating Excellence in Emerging Materials Engineers of ASM's Next Century

Presented by:

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Emerging Materials Professionals – Career Opportunities and Experiences

The Red Queen Syndrome

The Red Queen Syndrome

- "Alice's Adventures in Wonderland",
    - Lewis Carroll (1865)
- Alice and the Red Queen running fast hand in hand. **Queen: "faster"**
- **Curious Part:** Trees never changed places at all.
- Faster they went, they did not pass anything!
- Queen: "…Takes all the running you can do, to keep in the same place. You must run twice as fast as that if you want to get somewhere."
- True, you have to "keep running faster and faster" in today's technology-driven world to keep up-to-date with more innovation and revolutionary ideas.

"It takes as much courage to have tried and failed as it does to have tried and succeeded."

-**Anne Morrow Lindbergh**

American Aviator and Author

"Make no little plans, they have no magic to stir one's blood. Make big plans, aim high in hope and work, remembering that a noble, logical dream once recorded will never die."

- **William Hunt Eisenman**

ASM National Secretary for 40 years

Materials Engineers Develop Products that Improve Lives

- Bring advances in:

  Automotive, aerospace, construction, manufacturing, electronics, computer and telecom industries through

  Improved or new metals, plastics, ceramics, semiconductors and composites

- Select the best material, improve properties, lower processing cost and increase durability

Career Tracks

- **Begin**: Technical areas such as manufacturing, research and development
- **Move to**: Management, sales, marketing or a consulting role

Team Work and Environment

- **Manufacturing**: cross-functional teams
- **Materials Engineers**: integral support group for various functions
  - Design concept to manufacturing process

Skills for Career Success

- **Soft skills**: supplement technical and problem-solving skills
- Communication skills
- Flexibility
- Goal orientation
- Capacity of organization

Four General Sectors Employing Materials Engineers

- **Primary Materials**
  - Relatively large organizations (e.g. steel, glass, polymer)

- **Manufacturing**
  - Components of end products using primary materials (e.g. transportation, electrical/electronics, machinery, computers, biomaterials)

Four General Sectors Employing Materials Engineers

- **Service**
  - Provide support (e.g. consulting firms, R&D organizations, construction, utilities, engineering services, communication companies, research groups
- **Other**
  - Education, government, legal services, healthcare, business services, finance, insurance, wholesale/retail

Professional Development

- **Lifelong Learning Expands Abilities & Career Options**
  - Advances in technology are perpetually changing
  - Maintaining technical competence
  - Continuous development of communication skills
  - Actively pursuing professional development opportunities
- **Making Yourself Marketable**
  - Technical competence
  - Communication skills
  - Networking
  - Mentoring

Registration

- **Vital for areas of direct public impact**
  - e.g. consulting firms
  - Law and ethics as part of final year undergraduate engineering
  - Engineer in training (**EIT**)
  - Principles and practices examination (**PPE**)
  - Professional engineer (**P.Eng**)

Value of Networking

- Meet and discuss materials successes and challenges
- Professional and personal success
- Sharing information
- Celebrating success of others

HALLMARKS OF A SUCCESSFUL ENGINEER!!

Professional Organizations

- **Offer a wide range of resources**
  - Planning and navigating a career in materials science and engineering
  - Key role in your development
  - Keeping abreast of developments in industry
- **Promote interests of their members**
  - Provide a network of contacts
  - Help find jobs
  - Advance your career

Professional Organizations

- **Variety of services**
  - Job referral
  - Continuing education
  - Insurance, travel benefits, periodicals, meeting and conference opportunities

Professional Societies

ASM International

- **Mission**: gather, process and disseminate
- **Fosters**: understanding an application of engineered materials, research, design, manufacturing, use and economic and social benefits
- **Global Information Sharing Network (29,000 members)**: forums and meetings, education programs, publications and current electronic media

ASM ACTIVELY COLLABORATES AND LEADS IN THE MATERIALS COMMUNITY!

Professional Societies

The American Ceramics Society (ACerS)

- **Mission**: informational, education and professional needs of the international ceramics community
- **Reach**: 7,500 members plus

The Materials Research Society (MRS)

- **Mission**: promotion of communication for the advancement of interdisciplinary materials research

Professional Societies

The Minerals, Metals and Materials Society (TMS)

- **Mission**: encompasses entire range of materials and engineering from minerals processing and primary metals production to basic research and the advanced application of materials
- **Reach**: 10,000 members plus

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Professional Societies

- American Institute of Mining, Metallurgy and Petroleum Engineers
- ASTM
- AWS
- AISE
- IMS
- ISS
- NACE International
- SAE International
- CIM MetSoc
- The Electrochemical Society
- Society for Mining, Metallurgy and Exploration
- Society of Petroleum Engineers

Engineer of the 21st Century

- **Knows Everything:**
  - Finds info about anything quickly, evaluates and uses
  - The entrepreneurial engineer transforms information into usable knowledge

- **Can Do Anything:**
  - Understands engineering basics so he/she can quickly assess what needs to be done and acquires relevant tools

Diran Apelian, "The Engineering Profession in the 21st Century", *International Journal of Metalcasting*, Fall 2007.

Engineer of the 21st Century

- **Can Work With Anybody, Anywhere:**
  - Has the communication skills, team skills and understanding of current global issues to effectively work with others

- **Makes Imagination a Reality:**
  - Entrepreneurial spirit, imagination and managerial skills to come up with solutions and execute them

Diran Apelian, "The Engineering Profession in the 21st Century", *International Journal of Metalcasting*, Fall 2007.

Engineer of the 21st Century

Important Resource: Academies of Engineering

- **Phenomenal Transformation in the Engineering Profession**
  - Globalization
  - Impact of culture, history and politics
  - Business Ethics
  - Accreditation issues

International Academies

International Council of Academies of Engineering and Technological Sciences (CAETS, 26 Academies Worldwide)

- **Australian Academy of Technological Science and Engineering (www.atse.org.au)**
- **Chinese Academy of Engineering (www.cae.cn/english/index.jsp)**
- **Canadian Academy of Engineering (www.acad-eng-gen.ca)**

International Academies

International Council of Academies of Engineering and Technological Sciences (CAETS, 26 Academies Worldwide)

- **Indian National Academy of Engineering (www.inae.org)**
- **The National Academy of Engineering-United States (www.nae.edu)**
- **Royal Academy of Engineering of the United Kingdom (www.raeng.org.uk)**

ASM Celebrates Excellence

- **Networking**
- **Conferences**
- **Journals**
- **Committees**
- **Councils**
- **Leadership Days**

- **Awards Include**
  - Young Authors
  - Excellence in Metallography
  - Young Teachers
  - International Lectureships

Computational Materials Data Network:

Materials Data Solutions to Support ICME

Courtesy: Scott Henry, ASM International

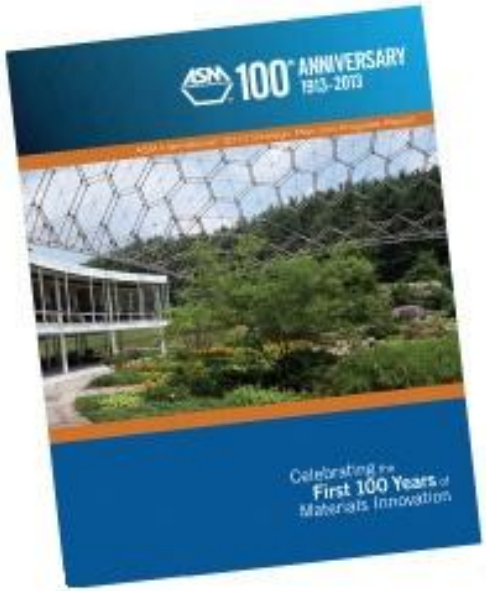
The ASM Data Legacy

Alloy Center Databases	Alloy Phase Diagram Database	Pearson's Crystal Data
Micrograph Database	Computational Materials	Failure Analysis Database
Medical Materials Database	Corrosion Analysis Network	ASM Handbook Data

Courtesy: Scott Henry, ASM International

ICME and ASM's Role

- **ICME = Integrated Computational Materials Engineering**
  - *Integrated:* combines the use of statistical or physics-based mathematical models of complex materials processes with product design and optimization



- **ASM International is a leader**
  - Aggregator and publisher of materials data
  - Materials Properties Database Committee
  - Partnership with Granta Design
  - Material Data Management Consortium

- **Alignment with ASM Strategic Plan**

Courtesy: Scott Henry, ASM International

The Materials Genome Initiative (MGI)

"[A] new, multi-stakeholder effort to develop an infrastructure to accelerate advanced materials discovery and deployment in the United States…***Data, data management, and data sharing are key to the success of ICME and the broader Genome Initiatives.***"

– *EXECUTIVE OFFICE OF THE PRESIDENT, NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, June 24, 2011*

www.cmdnetwork.org

Courtesy: Scott Henry, ASM International

Objectives & Guiding Principles

Overall Objective: Serve as the main center for information collection and dissemination for materials data to support ICME and to realize the goals of the U.S. Materials Genome Initiative

- Reduce time and cost of materials process innovation

Guiding Principles

- "Initiatives" approach – implement projects as building blocks to larger goal
- Work with purpose toward sustainable models
- Collaboration and partnerships will be key
- Granta software as enabling technology within the CMD Network Materials Data Laboratory

Courtesy: Scott Henry, ASM International

Final Thoughts

"Excellence is the result of caring more than others think wise, risking more than others think safe, dreaming more than others think practical, and expecting more than others think possible." **(unknown)**

"Be careful of your thoughts, for your thoughts become your words.

Be careful of your words, for your words become your actions.

Be careful of your actions, for your actions become your habits.

Be careful of your habits, for your habits become your character.

Be careful of your character, for your character become your destiny." **(Leo Tzu)**

Final Thoughts

"Don't merely embrace the challenges, go out and look for the most meaningful and valuable ones. Choose to do the hard stuff, finding delight in the efforts you're able to make. And you'll enjoy the richest, longest-lasting, most fulfilling rewards." **(Ralph Marston)**

Choosing the hard stuff can start early when you are an engineering student.

Final Thoughts

Finally, your foundation for solving problems and developing processes is solidly in your scientific intellect imbibed by your **highly accomplished mentors**. Science and engineering go together. They are symbiotic.

For your thought:

"Engineering without science has no root.

Science without engineering has no fruit.

Nature is indeed a combination of the two.

Uniting these, we perceive the whole."

(Ravi Ravindran)

Epilogue

We are here to celebrate the excellence imbibed in each and everyone of you.

ASM strives to enhance the professional excellence in you.

With education and the early years of professional experience as basis, set forth, develop, innovate and invent new products and processes to enhance the quality of life for the mankind.

AS A RESULT, YOU WILL SECURE YOUR PROFESSIONAL SUCCESS AND ADVANCEMENT!

Epilogue

Do not forget

the Red Queen Syndrome !

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