

STEM.

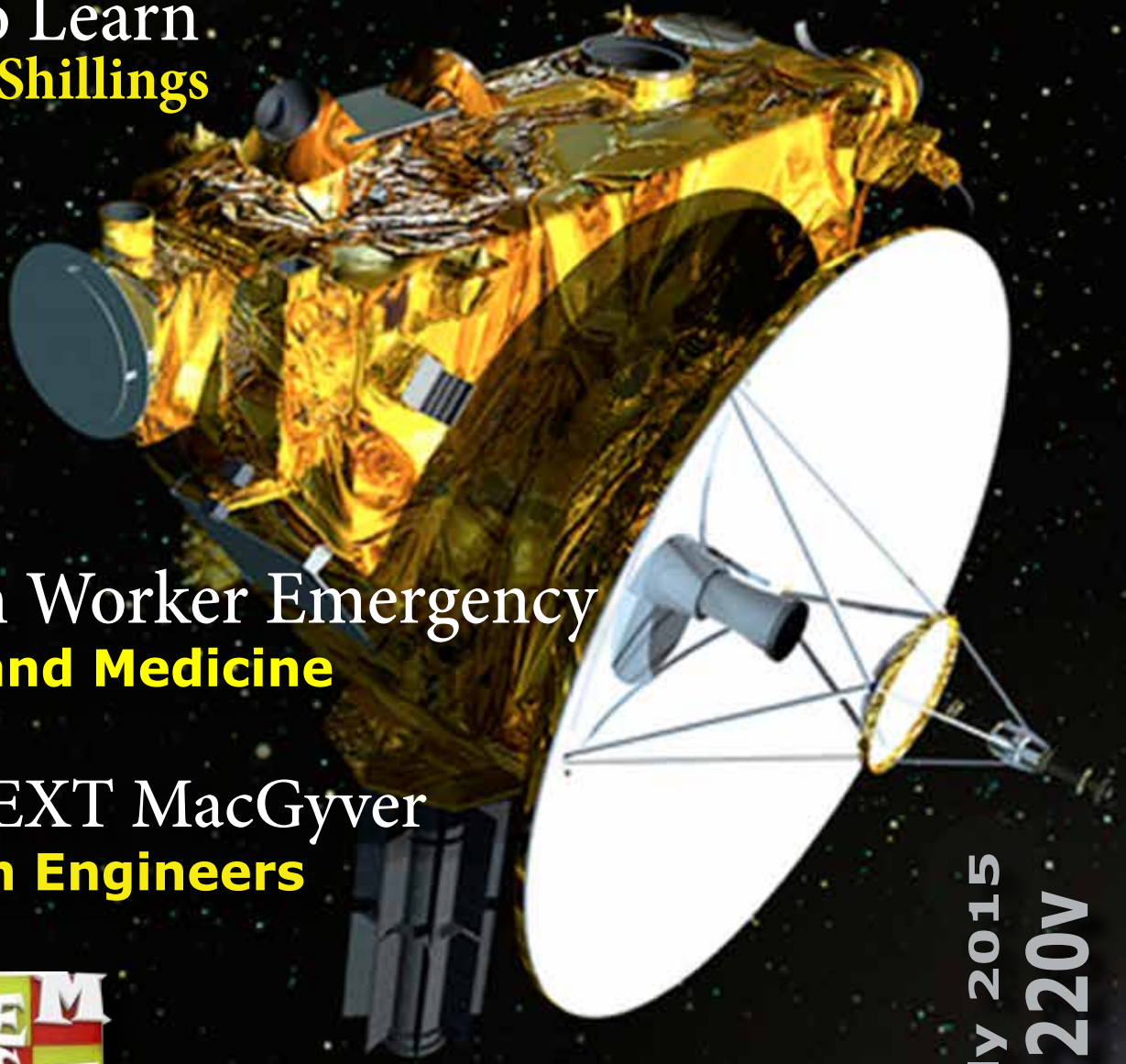
M A G A Z I N E

New Horizons to Pluto this Month
History in the making

Play to Learn
Russell Shillings

Health Worker Emergency
STEM and Medicine

The NEXT MacGyver
Women Engineers



July 2015
|| 220v



2nd International Festival of Science,
Technology, Engineering & Mathematics
September 27 to October 3rd 2015 in Saskatoon, Canada

The World's STEM community is coming
together....

1200 delegates
55 countries
28 events
1 week
13 International Conferences
1 venue

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CLASS STEM LESSON

Engineering I use everyday.

I'm playing soccer today. I have the ball.

- Who shall I kick it to?
- How hard should I kick it?
- Is there someone in the way?
- Do I kick it over their head or dribble around them first?
- Should I stop, or should I go?
- What's the best angle to reach my player?

● *Decide now!*

Yes, you will use engineering method (a decision making process) everyday. *Don't be afraid of it.* Your brain is actually wired for it.

July 2015

Dale

Desperate Health Career
Needs

Kerbishian

CEO of HealthWorks Academies

The NEXT MacGyver

University of Southern C.A.
Engineering Department

Dr. James A.
Lab Safety

Kaufman

The Laboratory Safety Institute

Dr. Tamara
Changing STEM Stereotypes

Franz-Odendaal

Halifax, Nova Scotia, Canada

Russell
Play to Learn
Initiatives, U.S.

Shilling

Executive Director of STEM
Department of Education

Wayne
The Physics of Soccer

Carley



S.T.E.M. Magazine is excited to announce a partnership with - **Global STEM STATES** - for the remainder of 2015. To learn more about Global STEM States visit:

www.stemstates.org



STEM Magazine is a non-profit monthly education publication for teachers, students, their parents and anyone interested in STEM education, career development, work-force development and the global economy. CEO Wayne Carley is the publisher and senior editor for all content in S.T.E.M. Magazine.

S.T.E.M. Magazine believes that the key to success in seeing higher graduation rates, improved testing results, student inspiration and a strong work-force rests in the hands of the teacher. The example and inspiration of individual educators carries tremendous weight on a daily basis, greatly impacting the quality and effectiveness of the classroom environment.

Curiosity is the beginning of all things STEM.

Wayne Carley
Publisher

wayne@stemmagazine.com

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**A Must Read for every teacher, regardless of subject,
even if it's the only one you read.**

Every career is a STEM career

STEM skills are needed in every career on a daily basis

As important as STEM careers are, the notable dropout rate in STEM focused college programs and the growing segregation of students into STEM versus non-stem categories shows our broad misunderstanding of what STEM really is at its core.

Every career is a STEM career. The only difference is the amount of education required for a specific field and the financial compensation received.

From bug exterminator to aerospace engineer, STEM skills are required on a daily basis. This can only call into question our approach to filling career field shortages and how STEM is understood and incorporated into every curriculum skill set become very clear.

A corrected understanding of STEM in our daily lives can only provide less resistance to STEM discussions and career considerations from an early age as well as clarify the hardwired STEM characteristics inherent in our brains from birth.

When teachers and students are aware of their use of science, technology, the engineering method and mathematics in their personal, non-professional lives, the application to careers and their required skill set become very clear.

The Engineering method

By definition, we all use the engineering method (a decision making process) several times per day without realizing it. The same can be said when defining science,

which is the “intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experimentation”. When we truly understand our daily use of “systematic study” and “decision making” we quickly see that we are engineers and scientists in practice well before a career choice is made.

Regarding math and technology use, those two are fairly easy to see, from cooking recipes and simple measurements (math) to smart phone and computer use (tech).

The creation of STEM schools, degrees and specialized pathways could make one question our STEM understanding and solution planning in light of a one third college STEM degree dropout rate, not to say they don't have an important role to play.

Out of Focus?

Could we be focused in the wrong direction regarding STEM in America and world-wide? It wouldn't be the first time we made

an education miscalculation.

The incorporation of STEM understanding in grades K-12 is easily accomplished without increasing the budget or creating a new curriculum, both of which the typical school is unwilling to embrace to say nothing of the teachers already overwhelming time constraints.

An early start to a clear and comprehensive knowledge of STEM use in our daily lives can only increase our curiosity and interest in career possibilities that would have otherwise been ignored or deemed unattainable by many if not most students and their families. That simple curiosity is the foundation of all student exploration into fields of interest. When clearly understood, no career choice is unreachable, and its STEM applications no longer scary and unattainable.

“I use STEM every day, no matter my future career choice,” are the words we should be hearing from students in all grades.

For those who drop out of college level STEM paths, they will soon discover that they still need and will use STEM skills anyway, everyday.

We need to redefine our misconception of STEM by definition, career category, and curriculum development. A 60 second STEM activity a few times per week in every subject is the foundation of a corrected understanding of how we think, what we can accomplish, a new encouragement to be curious and a welcome embrace of all things STEM without fear or discouragement.

CONSUMERAFFAIRS

<http://www.consumeraffairs.com/news/op-ed-every-career-is-a-stem-career-052815.html>

CLICK TO READ

Young man or women....all are born hard wired for STEM and destined to use STEM daily as a plumber, teacher, auto mechanic, politician, aerospace engineer or geochemist.



“Community Invitation”

September 27th to October 1st 2015
Prairieland Park, Saskatoon, Canada

- ✓ 10,000 students already registered!
- ✓ Hundreds of teachers and educators.
- ✓ 185 Exhibition Booths.
- ✓ Streamed online to schools.
- ✓ Careers Day for grades 10+
- ✓ Fun activities for students like Robot Rumble, Game Jam, Aboriginal Science, Agriculture Alley and over 50 more!
- ✓ World leading demonstrations from UNESCO, Space Agencies, Lego, Google, Discovery, Harvard University, New York Film Academy, International Game Developers Association, Calgary Spark Science Centre, Saskatchewan Science Centre, and many more...

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www.stemstates.org/stemfest-2015

25 Expert Presentations, including:



From Toronto's "The Dr Joe Show"



Explore the World



What's hot with Lego!



Let the Cameras Roll with New York Film Academy



Around the world in a flying car



The **NEXT**



MacGyver

Thirty years ago, the original MacGyver created enormous interest around engineering with the exploits of Angus MacGyver, a spy who used his powers of engineering in every episode to solve problems.

According to **Lee Zlotoff**, the show's creator: *"I literally could not tell you how many times people have come up to me and said, I became an engineer, or I went into the sciences because of MacGyver."*

In the spirit of that show, in 2015, we are looking for TV ideas that will feature female engineers or female protagonists who will use their powers of engineering to

solve problems.

We're not looking to reboot the MacGyver franchise or bring back guys with mullets. We are asking:

"Can you out-MacGyver MacGyver?"

Can you imagine that next female hero that will inspire a generation of young women to see themselves as engineers?

The U.S. National Academy of Engineering (NAE) is an elected group of our nation's (and the world's) most accomplished engineers. Its mission is to "promote the technological welfare of the nation by marshaling the knowledge and insights of eminent

members of the engineering profession.”

The NAE is part of the National Academies (along with the National Academy of Sciences, the Institute of Medicine, and the National Research Council), an independent non-profit organization chartered by the U.S. Congress to provide objective analysis and advice to the nation on matters of science and technology.

Engineering Studies began at the University of Southern California in 1905.

Nearly a century later, the ***Viterbi School of Engineering*** received a naming gift in 2004 from alumnus Andrew J. Viterbi, inventor of the Viterbi algorithm now key to cell phone technology and numerous data applications. Consistently ranked among the top graduate programs in the world, the school enrolls more than 6,500 undergraduate and graduate students, taught by 180 tenured and tenure-track faculty, with 73 endowed chairs and professorships.



The MacGyver name is synonymous with innovation, ingenuity and the ability to solve complex problems using only the resources at hand, particularly in the face of a crisis.

The MacGyver Foundation aims to encourage and support individuals and organizations throughout the world that utilize self-reliance, non-violence and sustainability to improve people’s lives.



Lee Zlotoff is an award-winning writer, producer and director of film and television. Among his more than one hundred hours of television credits, he was the creator of the hit series MacGyver as well as the writer/director of the indie hit film Spitfire Grill, which won the coveted Audience Award at the Sundance film festival.

Mr. Zlotoff looks to further STEM education through MacGyver based curricula and initiatives to help create the next generation of problem-solvers.

Find out more and follow the announcements at:

<http://thenextmacgyver.com>



Opportunities in Asia

What does the rise of Asia's STEM sector mean for North American Universities and education suppliers and how can you be part of it. This is just one of the hot topics being explored as part of the 2nd International Festival of Science, Technology, Engineering and mathematics.

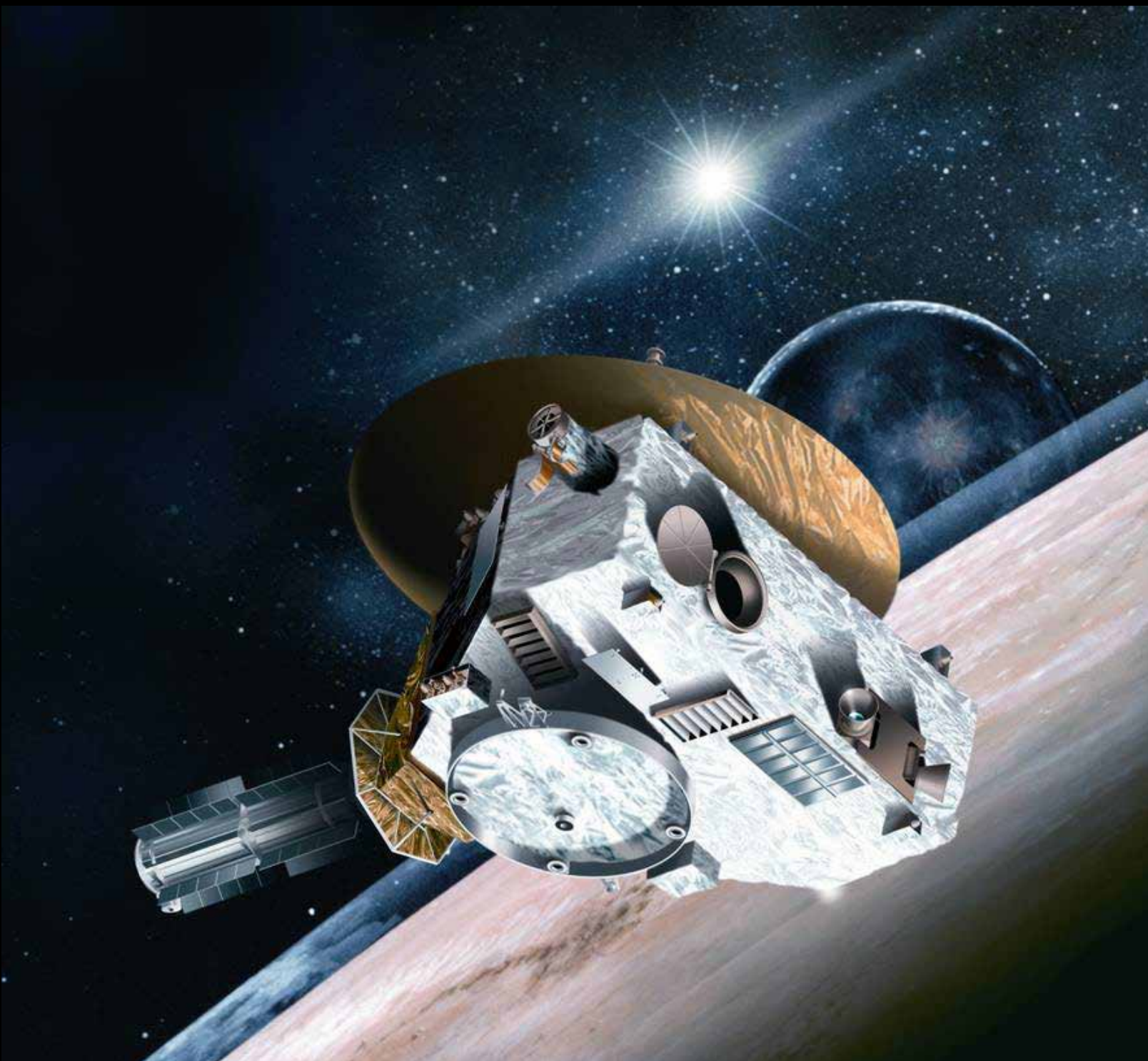


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September 27th to October 3rd 2015
Saskatoon, Canada

The Journey to Pluto

Watch history in the making July 14



New Horizons launched on Jan. 19, 2006; it swung past Jupiter for a gravity boost and scientific studies in February 2007, and will conduct a five-month-long reconnaissance flyby study of Pluto and its moons in summer 2015.

Pluto closest approach is scheduled for July 14, 2015. As part of an extended mission, the spacecraft is expected to head farther into the Kuiper Belt to examine one or two of the ancient, icy mini-worlds in that vast region, at least a billion miles beyond Neptune's orbit.

where Pluto and its moons "fit in" with the other objects in the solar system, such as the inner rocky planets (Earth, Mars, Venus and Mercury) and the outer gas giants (Jupiter, Saturn, Uranus and Neptune).

Pluto and its largest moon, Charon, belong to a third category known as "ice dwarfs." They have solid surfaces but, unlike the terrestrial planets, a significant portion of their mass is icy material.

Using Hubble Space Telescope images, New Horizons team

CLICK

https://www.nasa.gov/mission_pages/newhorizons/main/index.html

Sending a spacecraft on this long journey will help us answer basic questions about the surface properties, geology, interior makeup and atmospheres on these bodies.

The National Academy of Sciences has ranked the exploration of the Kuiper Belt – including Pluto – of the highest priority for solar system exploration. Generally, New Horizons seeks to understand

members have discovered four previously unknown moons of Pluto: **Nix, Hydra, Styx and Kerberos.**

A close-up look at these worlds from a spacecraft promises to tell an incredible story about the origins and outskirts of our solar system. New Horizons also will explore – **for the first time** – how ice dwarf planets like Pluto and Kuiper Belt bodies have evolved over time.



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These hot topics and much more...

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Sept 27th to
Oct 3rd 2015

Canada’s Science
City, Saskatoon,
Saskatchewan.

25 Expert
Presentations,
including:



Dr Joe Schwarcz
McGill University



Mr Etienne Clement
UNESCO



Dr Suhaidah Tahir
South East Asian
Ministers of
Education Organisation



Dr Tony Wagner
Harvard University



Mrs Cindy Moss
Discovery Education

Laboratory Safety

James A. Kaufman, Ph.D.

The Laboratory Safety Institute (LSI)

One of the most exciting parts of chemistry class, biology or physics is the participation in experimentation. The hands-on experience of making chemical reactions and noting the results is fascinating... but also dangerous. The following are simple but necessary precautions to have in place in every lab from elementary school through a career field.

#1. HAVE A WRITTEN SAFETY POLICY

This is the cornerstone of a good safety program. It's a statement endorsed and supported by the administration that speaks to the fundamental responsibilities for health and safety in the academic institution or company.

Your department may want to draft a sample policy statement for recommendation to your administration or board of education. It is virtually impossible to have an excellent safety program without their support. Your written safety



policy will provide the foundation of your safety program. Policy statements of this type need to be signed by the highest ranking official of the organization, dated, laminated, and mounted in the entrance of every building.

When I was EH&S coordinator at Curry College, I got our president to sign a policy statement not unlike the one above. I made up seven framed copies. I took them with a hammer and nails to the offices of the president and his

direct reports. I ask them where they wanted the colleges new EH&S policy statement (not if ... where). I hung them prominently so both the senior administrator and his/her visitors could see it every day.

#2. ORGANIZE A SAFETY COMMITTEE

Your department should have a safety committee. Academic institutions and companies should all have safety committees.

The committees should consist of employees, supervisors, faculty, staff, administration, and students.

The committees should meet regularly to discuss safety, health and environmental concerns/problems and to seek solutions to them. The committee should help to see that the safety policy is implemented. The committee can help to promote an interest and concern for health and safety issues.

They might be the group responsible for conducting regular inspections, reviewing accident reports, and developing recommended safety procedures. Better is to be a coordinating group that engages all the other employees in the organization in these activities.

#3. DEVELOP A SAFETY ORIENTATION PROGRAM

All new employees, students, faculty, and staff should receive a specially designed indoctrination to your safety program.

This orientation should cover the

philosophy, policies, and procedures. It should explain how to deal with emergencies and how to handle emergency equipment. The new person should receive a set of rules or operating manual for the academic institution or company and be expected to sign a statement (rules agreement) indicating that they have read, understand, agree to follow, and realize the failure to do so can result in termination.

When I started working for the Dow Chemical Company, my orientation took eight hours. I learned more about health and safety on that first day at Dow than I had in my prior 25 years in school.

I've asked over 50,000 scientists and science educators whether they received a New Employee Safety Orientation from their immediate supervisor on day one, **only five percent** say: "yes".

I believe that pound for pound and dollar for dollar, the new employee safety orientation is one of the most important components in

a safety program. And, you can't argue that it costs too much ... no purchase order or requisition required.



If you are involved in lab safety practices, consider asking students the following question:

“What is there in your background that suggests that you are both concerned and knowledgeable about issues of laboratory safety?”

#4. ENCOURAGE CARING ABOUT ONE'S HEALTH AND SAFETY

Employees, faculty, staff, and students need to be encouraged to develop a genuine concern about their own health and safety. It's too easy to care less and become careless.

One of the most important ways to do this is through education into the nature and seriousness of particular hazards and their potential consequences. I read of a hypothetical case where someone placed a rattlesnake in someone's mailbox. If asked if it were dangerous to reach into his mailbox, the owner would say, “of course not.” Others who knew of the snake's presence might think differently.



A good way to make your point is through the use of examples where others have in fact been seriously injured or killed doing exactly the same activity. This is why it's so very important for us to share our knowledge of these experiences.



Another good way to encourage others to care about their health and safety is to enforce the rules. If EH&S is going to be truly important in your organization, the rules need to be enforced. Otherwise, they are just lip service.

As a final example of a way to get others to care ... lead by example. People pay a hundred times more attention to what you do than to what you say. Set the gold standard. Be the poster child for best safety practices.

As a teacher or supervisor, when you show a genuine concern for the health and safety of those that you supervise or teach, it encourages the development of their own concern. My first supervisor at Dow, Don Dix, was particularly effective in this respect and that contributed significantly to increasing my concern and interest in health and safety.

#5. INVOLVE EVERY STAFF MEMBER IN SOME ASPECT OF THE SAFETY PROGRAM AND GIVE EACH SPECIFIC RESPONSIBILITIES

You really need to find ways to get people involved. Students are people too, so don't forget them.

*For a **complete list** and PDF print out of the comprehensive Lab Safety Guidelines, along with ordering information about a variety of *videos, publications and safety products*, simply click below.

Lab Guidelines #1

Lab Guidelines #2

CLICK

Dr. James Kaufman is President of the Laboratory Safety Institute, President of Kaufman & Associates and former Professor of Chemistry at Curry College. He received his bachelor degree in chemistry from Tufts University and his doctorate in organic chemistry from Worcester Polytechnic Institute.

Dr. Kaufman is the founder and president of The Laboratory Safety Institute, a national, non-profit center for safety in science and science education. LSI's lectures and training programs, AV lending library, and publications help academic institutions throughout the world. LSI is supported by grants from individuals, foundations, companies and professional societies.

It is time to change the

STEM stereotype

Dr. Tamara Franz-Oodendaal

Professor, Department of Biology, Mount Saint Vincent University &

NSERC Atlantic Chair for Women in Science and Engineering

Halifax, Nova Scotia, Canada

Most people imagine a scientist as someone who works in a lab and wears a white lab coat. Probably this person is a man. Probably in his mid-50's or older with some grey hair. This male lab-coat-clad stereotype of a scientist is so ingrained in society that it is no wonder that the percentage of girls entering STEM programs sits at around 37% in Canada despite more girls going to university than boys (Natural Science and Engineering Research Council of Canada, 2010).

It's a huge misconception to think of scientists in this way. Not only are there a myriad of careers that are STEM-based but many scientists don't even wear lab coats on a daily basis. Many do field work in exciting places.

All work in a team. This is not an

isolated work-alone profession for men only. The other STEM professions are the same. All help communities in different ways.

These aspects of the STEM sector need to be realized, acknowledged and shared, particularly with girls.

Currently only 29% of the STEM workforce in Canada is women, only 5% of skilled trades persons are women and only 15% of our full time professors in the life sciences are female. Yet, these women are critical role models for girls.

Supporting women in the STEM sector is good for business. Research by the Harvard Business Review (2011) shows that having a diverse team brainstorming a problem increases the collective intelligence and will lead to greater innovation. This is good for Canada's industries and our economy.



Jane Goodall; Scientist, World famous primatologist

Women represent an untapped resource that can fulfill the STEM labor market shortages across Canada (WinSETT Centre). This is good news for Canada's industries and our economy. So the next time your child asks what a scientist does, tell them about the successful women in STEM of our past – Marie Curie, Jane Goodall or Rosalind Franklin. Twelve Nobel Prizes have been awarded to women in the science disciplines in the last fifteen years – these include Ada Yonath (chemistry, for her work on the cellular structure that reads genetic codes), May-

Britt Moser (physiology/medicine, for her work in understanding how cells find their positions in the brain), and Elizabeth Blackburn (physiology/medicine, for her work in figuring out how chromosomes are protected from damage inside cells).

Women should not have to fit into the stereotypical mold of STEM, rather the STEM mold itself needs to change. This includes having policies in place that ensure that there aren't any negative repercussions on careers when maternity leaves are taken.



Play to Learn: Solving a Billion STEM P

Russell Shilling

Executive Director of STEM Initiatives, U.S. Department of Education



This June, I joined leaders in video game development, education, industry, and government at the 2014 Clinton Global Initiative America Meeting in Colorado.

It was the third year I've had the opportunity to attend the conference, and my first year attending in my new role as the Executive Director of STEM Initiatives at the U.S. Department of Education.

Problems through Educational Gaming

Participating in the Science, Technology, Engineering, and Math (STEM) Education Working Group, our subgroup was committed to fostering the development of entertaining professional-quality educational video games to engage diverse groups of students in the pursuit of lifelong learning and STEM careers. I came away energized by the group's enthusiasm and the shared support for developing exciting new games that are both fun and help kids learn.

Our STEM video game subgroup proposed a two-fold commitment idea. First, we're aiming to foster the development of high-quality, high-engagement educational video games that adapt to the student and are able to evaluate learning. Second, we want to support games that engage students on a national level to solve a billion STEM problems using these games.

The team was comprised of a wide variety of public and private participants, including game-development experts from Rovio (the creator of Angry Birds),

BrainPOP, GlassLab, and the Entertainment Software Association (ESA). We recognized that many promising educational games end up stranded in the so-called "Valley of Death," where games reach the prototype or proof-of-concept phase, but fail to transition to learning environments due to a lack of funds or expertise to produce and market a professional quality final product. Thus, many promising games never reach the student or the classroom.

To cross this "valley" and develop games that engage large numbers of students, the group proposed a competition to select highly promising game prototypes across math, science, and computer programming. The subgroup would then help pair the selected prototypes with private funding, consulting with industry professionals, and potentially strategic partnerships to support the game's final development.

Public and private groups would sponsor awards for specific themes and types of games that are relevant to them. The selected game



prototypes might be developed privately or may have already been successfully used in research studies. Once the winning games achieve professional quality, as adjudicated by a panel of experts, they could be used in national classroom competitions to engage students in various STEM topics and reach the goal of solving one billion STEM problems.

We've already seen exciting early proof of concept for the classroom competition model both here in the United States and abroad. In 2013 and 2014, the popular algebra

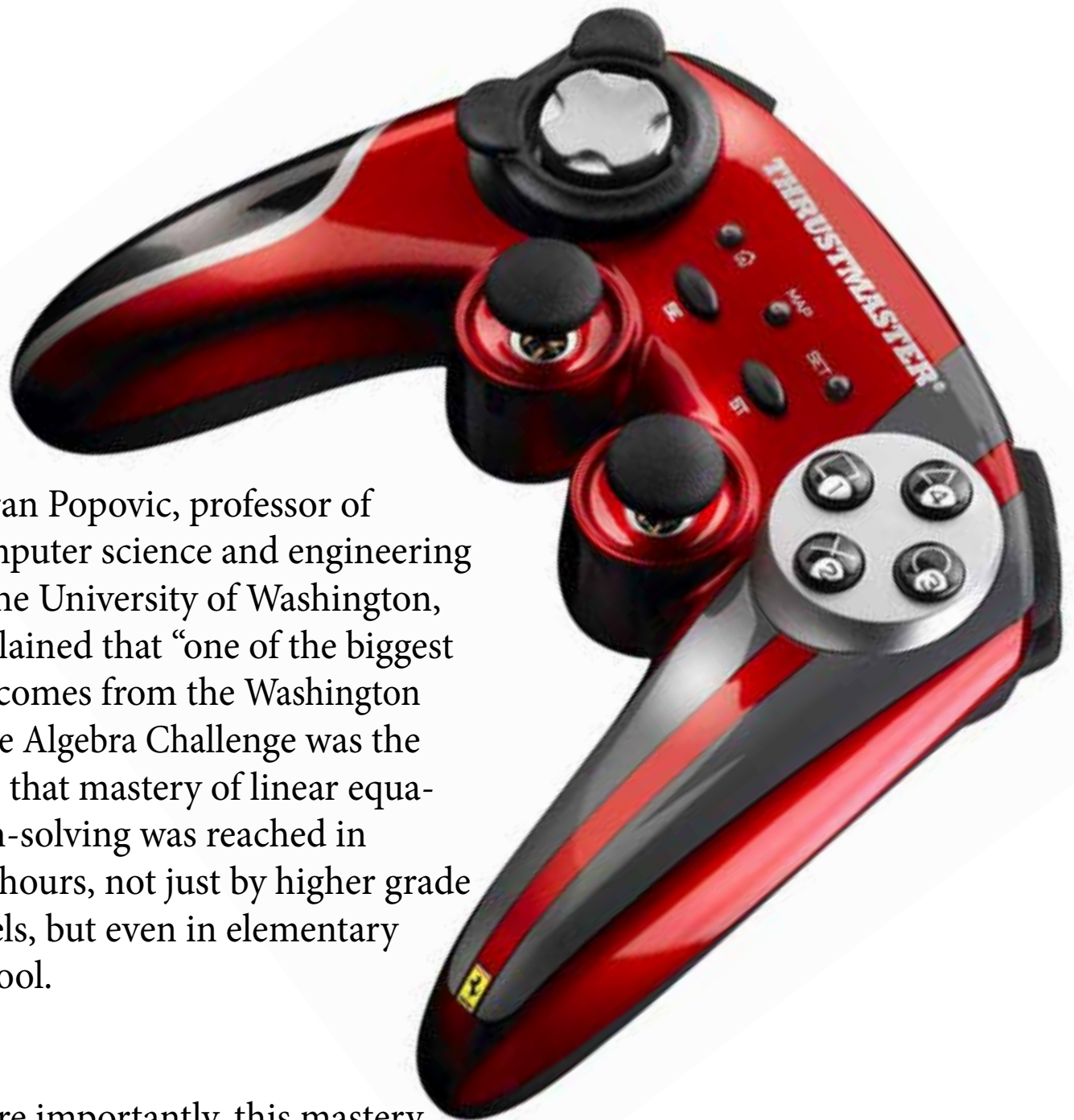
game, DragonBox, was adapted by researchers at the University of Washington and used in algebra challenges in Washington, Minnesota, and across Norway.

The competition engaged over 40,000 students in Norway and 10,000 students in the United States, and demonstrated that basic algebra concepts (representing roughly a month's worth of 7th grade algebra) could be taught to K-12 students in approximately 1.5 hours.

Zoran Popovic, professor of computer science and engineering at the University of Washington, explained that “one of the biggest outcomes from the Washington State Algebra Challenge was the fact that mastery of linear equation-solving was reached in 1.5 hours, not just by higher grade levels, but even in elementary school.

More importantly, this mastery was achieved by practically the entire classroom, as opposed to just a few students.” This is just one of many examples where entertaining and educational games can have a real impact on students and engage them in

meaningful learning. I’m looking forward to continuing to support exciting games as the Working Group builds on this commitment idea.





*“Health Career Opportunities in **Desperate** Need”*

By Dale Keshishian
Founder and CEO of HealthWorks Academies

We are at a pivotal time in our history: the rise of homeless men, women and children, the whirlwind of climate change, and thousands of people waiting in lines for their healthcare and benefits... it's those stark images that truly embody the medical desperation that defines this decade.

Consider these concerning statistics. By the year 2020, 74 million people will be over the age of 65. Furthermore, 33 percent of the nation's physicians will reach retirement age by then.

Those who once provided healthcare will become those who need it most. There is a huge potential for our next generation to address this STEM need as well as receive a rewarding and well paying career.

Although it's not the solution for this looming issue, there has been a series of rapid progressive transformations in the healthcare industry over the past few years, which is a very positive thing. Technology has had a monumental



“...huge potential for c

influence on the way that patients are diagnosed, receive treatment and manage chronic conditions.

Americans live in a world of constant connectivity, with smart phones, laptops, clouds and apps; and this has extended into the healthcare industry. It has opened the gates to achieve clear and



our next generation...."

consistent communication between patients and healthcare professionals. Most notable is the conversion to electronic medical records, or EHRs, that modernize the way that information is kept and shared for all patients. Software engineers will be needed in great quantities.

One astounding fact related to new government healthcare policies is that, by 2020, 10 million people will have new health insurance and need care from professionals.

Before that time arrives, we may be looking at a huge shortage of talent prepared to fill the urgent need for jobs in this industry.

How can this shortage be prevented? Talent development through curiosity and exposure to careers in the form of doctors, nurses, X-ray technicians, lab techs, researchers, physical therapists, mental health professionals, child medicine experts...the list goes on and on. *Your interest and imagination are the only limits.*

The healthcare industry is ready for sustainable growth, but a change in the inner structure of healthcare is necessary. In order to meet the needs of this significantly larger patient population, job descriptions for healthcare professionals must develop to include more primary care professionals with a broad range of knowledge.



Comprehensive career development for the healthcare and life sciences industries begins in high school, when students are discovering their innermost passions and exploring potential career options. Every day, students at HealthWorks Academies ask themselves, **“What do I want to be when I’m older?”**

The HealthWorks Academies’ model was reverse engineered from 2020, taking into account changes in the nation’s aging population and demographics, an unsustainable healthcare cost trajectory together with *aging and the attrition of the current healthcare workforce.*

It's important that students in middle and high school are currently asking themselves this question and considering an answer prior to graduating and moving on to college.

By educating students and providing experiential career awareness in our schools' curricula, our country will have the opportunity to develop new competencies for our current workforce and fast track a pipeline for emerging careers.

Implementing the technological and structural changes in the system requires not only a strong educational foundation, but also a set of proficient skills in leadership and communication. It requires comprehensive STEM education that incorporates problem-based learning and social and emotional learning into the curriculum. It needs longitudinal tracking to ensure that enrolled students develop the competencies that follow the transformation of the industry and successfully enter the workforce.



It is vital that students are encouraged and prepared to enter these career fields that will be left open by the retirement of the baby boomer generation. These careers will be in greater demand with the growth of the nation's senior population, an increased incidence of

With education requirements ranging from simple certificates in a specialized program, to community college, technical schools, four-year degrees and beyond make it possible for anyone with interest and curiosity to enter the medical profession on some level.



obesity, cardiovascular disease and Diabetes, and an unsustainable cost associated with healthcare.

Real action is needed today to make sure we are prepared for the future. Introduce your students in all grades to the vast array of interesting, challenging and attainable careers in the medical profession.

Top 7 STEM YouTube Channels for Kids

It's exam time and our tweens and teens are battling it out with chemistry equations, math problems, physics theories and biology experiments. However, who says that science can't be fun for our kids.

Well, if you ever thought science was all about boring and complicated stuff, these 7 Youtube channels will prove otherwise. These Youtube science videos are not only showing you how to have fun with science but they are also making science geeks look cool.

1. Sick Science

<https://www.youtube.com/user/SteveSpanglerScience>

Steve Spangler demonstrates cool and simple science projects for kids that you can do at home with household things. Whether it is teaching about density using sugar rainbows or making your own magnetic slime, these short experiments will make your teen scientist curious and innovative.

2. Coma Niddy

<http://www.themomviews.com/top-7-science-you-tube-channels-for-kids/>

What can make science cooler than it already is? Combine it with rapping, rants, skits and parodies on topics like black holes,

astronomy, anti matter etc. Armed with glasses and braces, Coma Niddy loves explaining difficult science concepts like nanotechnology to kids in a way they enjoy.

3. Minute Physics

<https://www.youtube.com/user/minutephysics>

Using illustrations and voice overs, minute physics explains concepts like the big bang theory, parallel universes, quantum mechanics and more, in a simple way. Don't miss the 9.9999 second videos in which concepts like radar, rainbows, one-way mirrors etc. are explained in well, less than 10 seconds.

4. The Brain Scoop

<https://www.youtube.com/user/thebrainscoop>

Who says girls can be geeks? Emily Graslie is the chief curiosity correspondent of the Chicago field museum and takes kids for behind the scene glimpses of a natural history museum. Whether it is talking about mummification or investigating the bird calls of Amazonia, Emily is always entertaining

and educational. The channel also has a “grossometer” rating so that you can choose whether to watch that video or not.

5. Periodic Videos

<https://www.youtube.com/user/periodicvideos>

The ultimate channel about chemistry where each periodic table element has its own video. The channel stars professor Martyn Poliakoff of the University of Nottingham, who is famous for his humor and Einstein like hair.

Some of the experiments are too dangerous to be performed in classrooms but nevertheless intriguing, example being the demonstration of flesh-eating hydrofluoric acid.

6. Sci Show

<https://www.youtube.com/user/scishow>

With a tag-line like : You make curiosity contagious, this channel is just perfect for our curious kids. With equal parts of skepticism and enthusiasm, Scishow explores many puzzling concepts like why koalas hug trees or when you burn

fat where does it go?

Don't miss their latest video about explaining the science behind “the dress”, the phenomenon that almost broke the Internet.

7. Smarter Everyday

<https://www.youtube.com/user/destinws2>

Destin is a man on a mission. He is trying to make the world smarter, one YouTube science video at a time. Destin has such a cool introduction on his channel. He decided that he would not save for his kids' college fund but instead use the money to educate as many people he can through his videos. Now, his millions of viewers are funding his kids' education instead!

Each of his video has an astounding amount of research and his videos are also different from other channels. Some of the topics include, secret of snapping spaghetti in slow motion, jellyfish stinging in microscopic slow motion and my favorite, how to pick a cologne!



The STEM of Soccer (*Futbol*)

Soccer is a STEM sport and very heavy in physics. Once again we see the human brain is already wired for the physics of soccer and other sports, therefore we don't actually have to "learn" it.

Aside from rules and guidelines of the sport, participation is a ballet of science, technology, engineering and math.....lots of math.

The purpose of this article is to simply make you aware of what you're already doing in a practical application, and reverse educate you about the math that is used.

The Engineering of Soccer

As a decision making process, we are constantly choosing from a variety of choices as to where to kick the ball, how hard to kick it, how high, to whom and what are

all of the possible outcomes of those choices....then we choose in an instant. Sometimes it's a good choice, other times it's not. You win some, you lose some!

The Science of Soccer

Newton's Laws of Physics surround the soccer ball and all play. As a reminder, let's take a quick look at them.

Law 1

The first law of motion is called the Law of Inertia. It states that "any object at rest, will tend to stay at rest, and any object in motion, will tend to stay in motion unless acted on by an unbalanced force."

In soccer however, this unbalance force is usually **the soccer player's foot**. He or she will use muscle in the body to create a force to move the leg and kick the ball. Because

the ball is at rest, it will continue to stay at rest.

But once kicked, it will keep moving without any intent of stopping. The reason the ball will stop is because of friction with air resistance and Earth's gravitational pull.

Law 2

“The change in velocity (acceleration) with which an object moves is directly proportional to the magnitude of the force applied to the object and inversely proportional to the mass of the object.”

This can be explained by the equation $F=ma$. The acceleration of the ball (a) is determined by the force applied (F) divided by the mass of the object that is being moved (m). This simply means that if the ball has a lot of mass, it will require more force to accelerate. If the ball has little mass, it will require little force.

In soccer, it is important to know this law because if you want the ball to be moving fast, you must apply more force. If you want the

ball to move just a little bit, then just apply less force.

$$F = ma$$





Law 3

Newton's final law of motion states that -

“..for every action, there is an equal and opposite reaction.”

This literally means that if you kick the soccer ball, it will kick back at you just as hard. You usually don't realize this because your leg doesn't seem to move, but this is because your leg has more mass, meaning it has more inertia, which is the resistance to move.

This isn't a law, but we need to mention *momentum*. When a soccer player kicks a ball, they transfer their momentum to the ball. Momentum is the velocity of an object times its mass. Also when players pass the ball to each other, they use their feet to slow the momentum of the ball by moving with the ball and resisting it slowly. This way, they can have more control over the ball. This is also an engineering method application.



The application of scientific and m

The Math of Soccer

Physics uses a lot of math of course, but consider your decision making (engineering method) about how hard and high to kick the ball to reach its target, the angle needed to get by the opponent, or the spin you want to “shape” your shot.

Geometry (angles), basic multiplication, trigonometry, calculus..... did you have any idea? You are so much smarter that you know and whether you like it or not, you actually enjoy math in a very practical application.

Say it.... *”I enjoy using math”*.



mathematical principles to practical ends such as playing ***Soccer***.

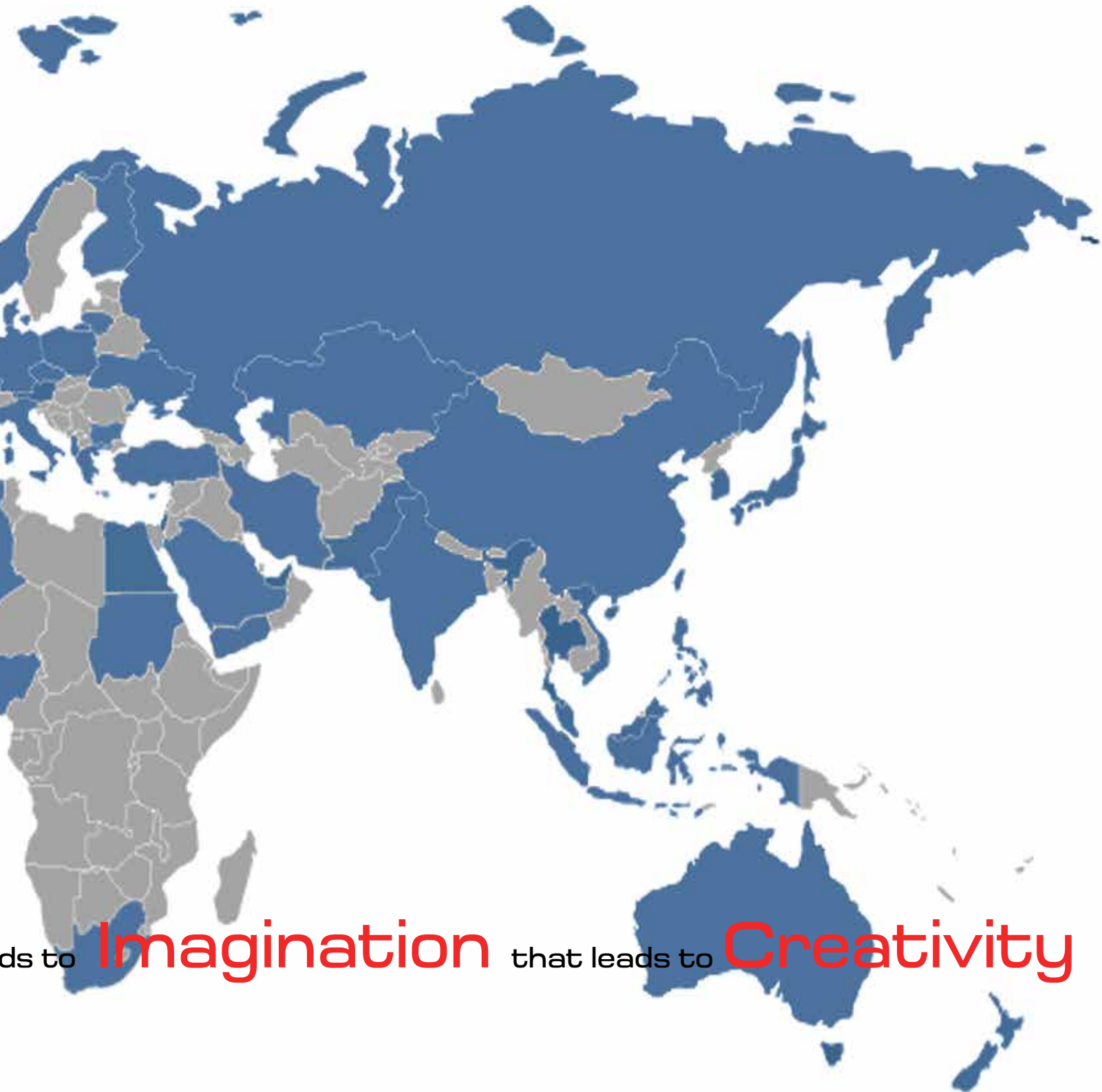
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