



## Guide to *Pushing the Limits*

### *A Bi-lingual Book and Video Discussion Program Series for Adults and Teens*

*Pushing the Limits* consists of 60- to 90-minute adult library programs; something of a community get-together/science café hybrid. The program series is built around the overarching idea that the story of humankind is a story of people pushing their own limits every day, and STEM plays an important role – in both obvious and less than obvious ways.

The programs are designed to be co-hosted by a librarian and a science partner. A science partner is someone from your community who looks at the world through a lens of science, technology, engineering or math (STEM). They may be a teacher at your high school, a park ranger, or a retired engineer. What’s important is that they love engaging adults in discussions, rather than trying to “teach” science.

Each *Pushing the Limits* event is organized around a different theme. The themes are basic and touch all of our lives, and STEM-related ideas and achievements are a part of them. These themes are purposely broad, so that the program can be customized to your own community’s needs and interests.

The theme threads through all aspects of its individual program. Each program begins with a book, which is announced several weeks in advance. Suggested books are provided on the *Pushing the Limits* website, and each book has a slightly different perspective or message about the theme. As a participating librarian or science partner, you can work together as a team to select a book that you think will resonate with your community.

While the provided discussion questions (on the website) are meant to expose STEM ideas, the books are not “science books” per se, but with the help of gently guidance by the moderator, can be seen as having science embedded in them, and this is brought out in the conversation.

After reading the book, participants come to the library and watch 1-2 short videos to spur discussion. Each Themed Kit has multiple books and media which can be paired as you like. The videos can be helpful to engage those who have not read the book, and/or support offering the series with no reading expected which can be useful to some communities.



The science in everyday life videos are what one might call “real people with real stories using real science”. They provide a look at an individual or family using scientific ideas, principles, or technologies to push limits in their own lives. Each video has a “human” side to the theme, showing how the theme also serves as a metaphor for the hero of the video, thereby subtly illustrating and the reinforcing the idea that science is a part of everyday lives. These stories have been chosen for their general appeal and potential relevance to rural adult audiences and, unlike a NOVA-style documentary, the science mainly comes out in the conversations of the people for whom the ideas and technologies are making a difference. Intentional efforts have been taken to integrate the science into part of a larger human story rather than make it the sole focus.

The book and videos come at the theme of the event from different perspectives. Part of the facilitation of the event will show how the theme is expressed in the different media, even if in different ways. The local science partner at these events, working with the librarian, can guide the conversations in such a way that the scientific ideas are discussed in a thoughtful, interactive, and non-threatening environment.

We hope that after watching the videos and reading the books, that with a little bit of prompting, you and your audience will engage in rich discussions and a fun evening in which you talk about science as it occurs (perhaps surprisingly) in your own everyday lives. In the process, your community will increasingly recognize the library as an essential gateway to science.

We want to inspire your audience and encourage them to express their curiosity and ideas, with the hope that they leave the event ready to further explore and deepen their understanding of STEM in everyday life. To draw in participants who might be intimidated or unaccustomed to talking about STEM, we have created marketing tools that appeal to the general public.

*Pushing the Limits* is aiming to pique the interests of your audiences, and then encourage them to express their curiosity, with the hope that they leave the event engaged and open to explore further and possibly deeper science stories and ideas. To draw in participants other than the already “science converted” we have created marketing tools that appeal to the general public. They describe engaging reading, entertaining videos and lively discussions with others in their community. These topics may hint at science, but in truth they could be (and are) about much more. (Note: recommended books, marketing materials and starting discussion questions are on each Themed Kits page at [www.pushingthelimits.org](http://www.pushingthelimits.org))



## *Pushing the Limits of Connection*

Connecting with each other and our histories is an important part of being human. How do we connect with one another and with our past? How do we build bridges so that we can continue to connect in the future? What are the common threads of family connection and societal connection? How have our human interactions changed over time as a result of our ever-expanding ability to remain connected? Why is remaining connected across time and across place so important to us as humans?

### **Science in Everyday Life: Roxanne Swentzell**

Roxanne was born with a speech impediment that made it hard to communicate with the world around her—until she began to work in clay. She is now a prominent sculptor, whose works are represented in museums around the world, and she is also a founder of the Flowering Tree Permaculture Institute in New Mexico. We see in the video how she is the teacher and holder of the information for how to build adobe homes and beautiful clay pots—things her culture has done for thousands of years. She and her grown children, Rose and Porter, constantly endeavor to learn from and preserve their history as a source of important messages for the future, building connections across time.

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “connection” include:

Technologies: ancient and modern

Chemistry: molding and firing clay

Environment: water use and shortages

Earth Science: clays with different characteristics

## *Pushing the Limits of Survival*

This program theme explores the fundamental urge to survive and how it has manifested in society in the past, compared to today. What are we willing to do in a life and death situation? What about saving our family’s way of life? What drives us to compete in a sport and “survive” as the winner? Survival on the scale of the planet, the family, and the individual is considered and the ways that science comes into play.

### **Science in Everyday Life: Julie and Cory Shrum**

As husband and wife Cory and Julie work hard and play hard. Farming is in their blood, having grown up as multigenerational cattle, wheat, and alfalfa farmers. As is the case for many family farmers, survival is much on their minds – survival of a business, a family, and even a way of life. But survival for this newlywed couple also has a lighter side. They apply their practical engineering knowledge to other pursuits, like crafting cast-off farm equipment parts into full scale, working “Frankenstein” combines. Once finished, they travel to compete in an annual combine demolition derby, where “only the strong survive.”



### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “survival” include:

Engineering: building and tinkering

Physics: impact and inertia

Material Science: brittle or resilient

Environment: water table and regional drought

### *Pushing the Limits of Persistence*

To persist is to endure. To last over time - even against the odds. Examples are everywhere: A persistent person weathers physical, emotional, or environmental setbacks and keeps trying. Elements that persist in the world around us connect us to a certain place, to an event, or to our past. Where does persistence come from? Is it something we are born with?

### **Science in Everyday Life: Ricardo Peña**

Being really good isn't ever quite good enough for Ricardo. He sets an ambitious goal for himself. Then he trains relentlessly and pushes through obstacles, persisting until he makes the improbable happen. One day, high up on a mountain while pursuing a dream he's harbored since childhood, Ricardo finds something that will change the course of his life.

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “persistence” include:

Engineering: high tech climbing gear uses; musical instrument features

Geology: different rock characteristics

Physics: leverage and force

Environment: climate change

### *Pushing the Limits of Nature*

In our environments or within ourselves, the idea of “natural” is complicated. What does it mean for something to be “natural” – whether in the environment or in ourselves? If the environment changes – or we change – when is that change no longer part of what is “natural”? Is there such a thing as “human nature” and can we escape it, or even shape it?

### **Science in Everyday Life: Cameron Clapp**

In this video, we see through the life of a courageous young man, Cameron, how new technologies are pushing the limits of what it means to be human. Cameron is a triple amputee, but with the aid of new prostheses, he is continuing to thrive athletically, socially, and emotionally. The story touches on how



his nature may have been a contributing factor to the accident that caused him to lose his limbs, but it is also a factor that helps him to adapt to this new life. With these prostheses, Cameron and others in similar situations are pushing the boundaries of what we typically see as “human” and what we may consider “natural.”

Over time, can our conception of what is “human” change? What of less “obvious” kinds of “assists”? Did Cameron and his twin brother grow to both become risk-takers, or were they born that way naturally? How much does the environment contribute to how people or other species progress? What is our threshold for an engineering of life that still seems “natural”?

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “nature” include:

Psychology: the nature/nuture argument

Physics: how prosthetics move us differently than flesh and bone

Material Science: new materials and uses

Physiology: how we walk, stand, sit

### ***Pushing the Limits of Knowledge***

What is knowledge and is it the same as information? Is “learning” the same as “knowing”? Or are there multiple ways to know things? What makes different types of knowledge important over time?

### **Science in Everyday Life: Sean Brock**

Sean is a successful chef who has two Charleston restaurants and two James Beard awards to his credit, but he’s not satisfied. His restaurants are a means to pursue his ambition of revitalizing the culinary knowledge of the golden age of Southern Cuisine by reviving heirloom crops and recovering heritage-breed livestock – curating their genetic information for the future. Sean makes use of his own received and experiential knowledge in an extraordinarily broad range of contexts, such as work with local experts, kitchen experiments with molecular gastronomy, and in books, to create amazing Southern cuisine. He advances the notion that we are all scientists in our kitchens.

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “knowledge” include:

Genetics: seed saving and genes holding “knowledge” across generations

Technologies: traditional and new for growing and cooking

Chemistry: cooking, flavors, reactions



## *Pushing the Limits of Motion*

Motion is one of the signature characteristics of living things. What could be more natural than moving? We mostly take for granted the ability to walk around, stop and start, run or walk. For those of us who do physical labor, motion takes on a very different meaning.

### **Science in Everyday Life: Darrell Petry**

Darrell is an African-American cowboy from the small town of Cheek, Texas. After a successful career as a bulldogger, his recent injury has moved him into a new role as a professional hazer, a teacher, and a full time father. As Darrell has moved through time and space in his life, he has had change his life to accommodate his injuries and age, but with age comes wisdom about how to use and care for his body through an intuitive understanding of physics and physiology.

Do you need to take into account how you move in your work? Are there aspects of your life where you had to learn how to move? Have you ever been injured and had to relearn or change the way in which you move? How does motion change with age and with context? How do we move through life's stages, and change our purpose?

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of "motion" include:

Physiology: lean muscle mass, rehab

Physics: stopping and twisting the steer

Animal Behavior: horse training

Psychology: parenting, the "adolescent brain"

## *Pushing the Limits of Tradition*

What is tradition? On the surface, it's the repetition of ritual over time. What is the purpose of tradition? What makes a tradition possible? What kinds of actions take hold as traditions? This program theme explores the idea of tradition – traditions in culture, tradition as a form of teaching, tradition in the guise of repetition that is then hard-wired either into behaviors or thoughts? Where do our traditions come from? What do we get from tradition that transcends the actions? In what sense is training tradition? Are traditions important in your life? Do you have any?

### **Science in Everyday Life: Bob Boyer**

Bob is the football coach at Beaverton High School in Beaverton, Oregon. He is following in his dad's footsteps as a coach and has created many new traditions around the game and activity of football,. From the tradition of the first day run and barbecue to the practice of studying game films and running drills, Bob's life is about using repetitive practice as a way to win football games and to change lives. These are traditions that build memories and character, but also traditions that build muscle memory



and instinct. In the steady cycle of life and football, we see STEM in the conscious and unconscious learning of the sport, affecting a change in the rituals and thus traditions that make football more than just a game. What are your traditions? Has STEM affected the way in which you go about them or given you a new appreciation for their importance? Do you play sports? Has STEM changed the way you engage in athletic activities?

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “tradition” include:

Neuroscience: repeating information and encoded learning

Psychology: Motivation

Physiology: reflexes, hand/eye coordination, survival strategies

Sociology: healthy societies and teamwork

Mathematics: Pattern recognition

### *Pushing the Limits of Transformation*

“Transformation” is a universal experience – the child becomes the adult, we meet people and they change our lives and sometimes we change theirs. We work, which for some of us is purposeful transformation of materials or words. What is the process of “transformation”?

### **Science in Everyday Life: Heather Doyle**

In this video we meet Heather: who grew up in a “DIY family” in rural Wisconsin. She has become an artist, teacher, and social activist, who has found a way to use her love of blacksmithing - to transform metal but also to transform her own life as well as the lives of all kinds of people around her. Her life is one of continual transformation and her seamless moving among identities has transformed her into the person she is today. Heather clearly learns by doing and teaches in a learning-by-doing fashion.

What kinds of things influence our personal transformations? How have you transformed others? How and who and what have been the important processes and events and people who have transformed you? Is transformation related to problem-solving? How, why, or why not? Does problem-solving distinguish art from engineering? Are art and engineering related? Is transformation always towards a positive end? Can societies be “engineered”? Were you brought up to “do-it-yourself”? Why is the “DIY” ethos seeing a revival today? Are there ways you use STEM to transform things in your hobbies or art (quilting, scrapbooking, soldering)? Are artists also engineers?

### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “transformation” include:

Material science: mixing metals

Chemistry: ceramic painting



Physiology: what your body is doing when working with metal

Physics: tool working

### *Pushing the Limits of Heritage*

We all benefit from the people and things that have come before us. What does “heritage” mean to you? What did you inherit from your ancestors? How does conserving or restoring native species play into our future heritage?

#### **Science in Everyday Life: Joe and Kristen Souza**

Joe and Kristen live in Hawai’i, he’s a native and she’s what is called a kama’aina - a lifelong resident of the islands. They are ukulele makers, and their love of history and knowledge of acoustics enable them to make sweet sounding and innovative instruments. The ukulele derives its characteristic beauty from the endemic koa tree—which Joe and Kristen have committed to restoring to the islands. They and their three sons work tirelessly to remove invasives, grow new seedlings and plant trees on their parcel on the Big Island. They carefully harvest seeds from the best trees, and tend them in their greenhouse, to return them to the land. Joe and Kristin look forward to passing on their business and future generations of native forest to their children, and their children’s children.

STEM ideas purposefully inform the Souza’s legacy, in acoustics and plant science – does STEM come to bear on your thoughts of legacy, either purposely or not? How and what will you pass on and will STEM play a part in it? Do you work with the earth – and if so, will that be a part of something that future generations do? Is that important to you?

#### **Related STEM Topics**

Some STEM topics that are explored around the metaphor of “heritage” include:

Genetics: Selecting for best trees

Biology: Plant growth

Ecology: Healthy forests and ecosystems

Material Science: Different qualities of woods

Engineering: Computer-driven tools

Archeology: Why we preserve

### *Pushing the Limits of Community*

How can communities that face rising threats from climate change come together to prepare? How are rising temperatures and amplifying drought conditions affecting the frequency and volatility of fires? What is the geographic scope of these effects? What are ways in which families on the ground are banding their communities together to build resiliency and adapt to a new climate?





### **Science in Everyday Life: Bert and Johnnie Hyde**

Bert and Johnnie love living close to the Boundary Waters Canoe Area Wilderness, near the town of Ely, Minnesota. They have an unwavering commitment to doing whatever it takes to support and protect their community. Over the last couple decades, Bert and Johnnie have observed alarming changes in their environment. The most explosive change has been the dramatic increase in intense, unpredictable forest fires, exacerbated by hotter, dryer weather and destructive storms. To help preserve their community, Bert and Johnnie responded to this rising threat by signing up as volunteer EMTs, and they taught canoe basics to fire fighters to help them battle flames in remote areas. The couple also recognizes the importance of preventing and preparing for disaster, so Bert conducts house inspections to help homeowners develop fire awareness and implement fire resistant tactics. He also helps them to apply for federal funds supportive of this work. Alongside their neighbors, the community is adapting to the “new normal”, and becoming resilient in the face of crisis.

### **Related STEM Topics**

Some STEM topics that are explored in “community” include:

Climate Change: fire danger, storms and lightning

Material Science: different ignition and burn rates

### ***Pushing the Limits of Change***

How does extreme weather affect our local economy, and how can we strengthen the intersection of our environment and our jobs? How can we adjust our approach to the future to include seeking jobs that will remain as climate changes? What are practical, solution oriented ideas for resiliency-building?

### **Science in Everyday Life: Bren Smith**

Since he was a teenager, Bren knew he would spend his life at sea. After working for years as a commercial fisherman, he realized the industry wasn’t sustainable and he had to switch gears. He tried his hand at oyster farming, but after two hurricanes wiped out his business, it was time to change tactics and build a new solution for the future. So, he developed a 3D kelp farm. Now, Bren grows seaweed in hurricane-proof columns. The vertical farm model is storm resistant, spatially efficient, and even helps protect coastal communities. Bren and his wife teamed up with local chefs to introduce kelp into restaurants, and he mentors farm interns about how to compost and fertilize with kelp. Bren also started a nonprofit organization to help set up 3D farms in every coastal state in the U.S, and in 40 countries around the world. He’s helping people adapt to a changing environment by thinking creatively about jobs and bringing a new food source to the table.

### **Related STEM Topics**

Some STEM topics that are explored in “change” include:



Climate Change: extreme weather  
Environment: overfishing, extinction

### *Pushing the Limits of Strategy*

What are viable opportunities for managing environmental challenges like extreme heat and water scarcity? What are ways in which communities can strategize long term health and environmental improvements? What kinds of local or regional partnerships can we build to help us access resources? How can we draw on cultural and social networks through our schools, churches, clubs and other organizations in our own local communities to build resiliency? How can we grow resiliency in our very own backyards?

#### **Science in Everyday Life:** Flor Morales

Ambitious and committed to her community's health, Flor likes to get her hands dirty. Inspired by her mother and her neighbors, she's constantly seeking opportunities to improve her life and the lives of others around her. In the intensifying heat of southern Arizona, Flor is focused on building cooler, healthier futures for Tucson families. Through a nonprofit organization, she organizes volunteer health workers called promotoras to support and educate residents in underserved neighborhoods about environmental health. Flor and the promotoras are helping families adapt to the extreme heat by planting desert trees to offset rising temperatures, and constructing rainwater harvesting systems to store water. Flor's organization - the Sonora Environmental Research Institute - has partnered with local energy companies and the city of Tucson, to provide additional resources to meet these the challenges, and to get federal grant assistance. With this forward-thinking strategy, a Tucson yard flourishes and shades the house for an adapted, healthy, and resilient desert oasis.

Some STEM topics that are explored in "strategy" include:

- Environment: water saving
- Technology: low tech vs high tech
- Climate Change: drought and heat, heat islands