

**Thinking and Acting Anew**  
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PBK Alpha of Wyoming Induction Ceremony  
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Congratulations, Phi Beta Kappa inductees!

As we have heard, Phi Beta Kappa is America's most highly regarded scholarly honors society. Your membership recognizes and honors your exceptional, academic achievements and your love of learning. Today, we also honor the families and friends of our inductees. Their love, nurturing, guidance and support played a critical role in the incredible young men and women you have become. Great job families and friends!

Let me begin by stating that I'm a rather rare breed—I am mathematician! In particular, I'm much more comfortable having my back to the audience and scribbling on a blackboard. However, I've been told that I am an extroverted mathematician. This means that I talk to your shoes rather than mine, when having a conversation with you.

We live in disruptive times. Agreed? And I am not talking just about Wyoming's spring weather!

- Smart tractors, sensors, drones and robots have changed the face of agriculture.
- Health care is being slammed by pandemics, yet shows great promise in personalized medicine and robotic surgery. I read that there will DNA markers to track one's aging process in real time. Oh, joy, as if looking in a mirror every morning isn't enough!
- Blockchain and related distributed technologies are changing financial markets and potentially our day-to-day transactions.
- Robots and sensing devices equipped with artificial intelligence are used to automate manufacturing, transportation and delivery systems.
- Search engines, and ChatGPT are increasing our ease at gathering information.
- Nextgen Nuclear Reactors (in Wyoming!) hold the promise of transforming our entire energy system; and
- Quantum information Science promises as much new technology and change over the next 70 years as the introduction of the transistor in 1950's did.

How are we to handle these disruptions? How do we cope? Even though the phrase "disruptive technology" didn't come on to the scene until the mid 1990's, every age has faced disruptive innovation and events.

Take a look back at the disruptions of at the 1400 and 1500s:

- The printing press shook the very foundations of the religious, government and educational systems and ignited the first information age.
- The introduction of coffee houses, liquor and eye-glasses came shortly after.
- The wheelbarrow and heavy plow disrupted agriculture.
- The innovative use of tidal waters to run mills transformed the manufacturing sectors.

- Astrolabes, which are hand-held models of the universe, were early analog computers that allowed for explorers to sail the seas.

Another historical era that we can learn from is the Civil War era. This represented a disruptive, tumultuous socio-economic time for America. One month before the release of the Emancipation Proclamation, Abraham Lincoln wrote a letter to Congress encouraging them to think deeply about the issues facing America.

A portion of his letter appears at the base of the Lincoln monument, just east of here off of I-80. The words are:

“The dogmas of the quiet past are inadequate for the stormy present. The occasion is piled high with difficulty and we must rise with the occasion. As our case is new, we must think anew and act anew. We must disenthrall ourselves, and then we shall save our country.”

I really like the phrase: We must think anew and act anew.

Let me share some thoughts on how Lincoln's words apply to disruptive technologies and events.

### **1. We must rise with the occasion!**

Disruptive technologies, by definition, lead to drastic changes, but with those changes come numerous opportunities. The notion of some sort of braking system was undoubtedly born shortly after the invention of the wheel. For a more recent example, think of the phrase “there’s an app for that.” The disruption caused by smart phones catalyzed a tech boom around the development of apps.

### **2. In times of disruption old ways/principles may be inadequate.**

Failure to rise and to evolve isn’t an option---think of companies like Blockbuster or Polaroid. If universities don’t rise and give students the needed experience with new disruptive technologies, then they will go the way of such companies. Simply put, many of our old ways/principles about learning and education are inadequate in today’s world.

Let me illustrate with a story. In April of 2015, my late wife and I went to visit our daughter in Boston. Unwittingly this was the weekend of the Boston Marathon. As I checked into the hotel, the receptionist said, “Oh, you must be here to run the Boston Marathon.” My families’ laughter, dispelled that misperception before I even had a second to enjoy it! Being in Boston that weekend, didn’t make me a marathoner. Nor did being around other marathoners.

Today, more than ever before, information is readily available. With a few words placed in ChatGPT, information about virtually any subject (in essay form, as a limerick, a rap song, or even in the style of Ernest Hemingway) is brought to our computer screen. At one point in history the familiarity and recollection of basic facts and quotes from books and articles was what made one knowledgeable. Possessing this type of book sense was a virtue. But with these new technologies, our value system must change! Being close to knowledge doesn’t make us a scholar; just like being in Boston didn’t make me a marathoner.

What do I as a university professor value? What do I want to instill in my students? The answer must be something deeper than memorizing facts; or producing an essay loaded with the other's thoughts.

One of my favorite movies is Apollo 13. In one scene a room full of NASA scientists are first confronted with the catastrophe at hand. The blackboard and air are filled with facts, opinions, and excuses. One man, Flight controller John Aaron blurts out "Whoa, whoa, guys. Power is everything. Power is everything."

In the midst of the noise, John had quietly been analyzing the facts, and data, and generalized his experience with an event with Apollo 12 to identify the crux of the issue at hand, and to craft a solution. Oh, I so desire to equip students with such valuable skills. They are more important than ever.

Disruptive technologies like ChatGPT have forced me to think anew and act anew and focus on the most important aspects of learning: Deep understanding; the abilities to evaluate, to create, and synthesize ideas.

### **3. Coping with disruptive technologies/issues requires one to free their minds to the possibilities.**

How can I use ChatGPT to my advantage? How can I help my students more deeply understand mathematical concepts? How can I use ChatGPT to have students better experience Phi Beta Kappa's motto: "Love of learning is the guide of life?"

I like to have students see that the question is often more important than the answer. I learned this at a young age. As my family was on a summer vacation, my brother and I were in the back seat of the car arguing about how to pronounce the upcoming city. Was it "Way-co", or "Whacko?" After several miles of this banter, my father stopped the car, grabbed our hands and marched us up to the first person he saw. He asked the person "Excuse me sir, how do you pronounce this place?" The person looked a bit puzzled, and then slowly said "Mc—Don—alds."

On a serious note, back to the principle: the question is often more important than the answer. I've been trying to bring this out more in my classrooms. How can I use AI to experience this principle? Here's one thing that I am trying. I ask ChatGPT to prove a theorem and have students analyze, and ask is it correct, can it be fixed, where is the creative part of the proof, why would one think of a theorem like this, What question was the original mathematician trying to answer, when they thought of this theorem, what's the use of this result, what are some natural extensions of this?

### **4. As our case is new, we must think anew and act anew.**

C.S. Lewis (of Narnia fame and much more) said "The future is something which everyone reaches at the rate of 60 minutes an hour, whatever he/she does, whoever he/she is."

Recognize that throughout our lives, we will encounter grand challenges and disruptive events or technologies. A prescription for handling this is:

- Be prepared by constantly learning;
- Embrace these disruptions and view them as opportunities for your learning and high-level thinking skills to shine,
- Free yourself to think anew about these opportunities, and
- Put your thoughts into action.

**5. As our case is new, we must think anew and act anew.**

I think that this statement by President Lincoln fits very well with Phi Beta Kappa's motto: "Love of learning is the guide of life." Indeed, learning should result in some tangible outcome, some improvement to our lives, to those around us, and to society writ large.

I am confident that your parents, your friends, your family, UW, and your hard work and efforts have prepared you for a life guided by a love of learning, and for a life-time of thinking anew, and acting anew in the disruptive times you will undoubtedly face.

Let me conclude, by once again congratulating each of the students for this honor. The honor is well-deserved. Make sure to thank your family and friends. Keep learning, infect those around you with a joy of learning. Keep in touch—we enjoy hearing about the great things happening in your lives.

Go Pokes!