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How to have big ideas

William H. Yeaton
Florida State University

Ideas are the primary currency of academic success. They can be elaborated upon to yield publications and grants, and high-quality ideas can result in tenure. Unfortunately, mechanisms for producing high quality ideas are underexplored, and ways of generating and maintaining good ideas are seldom a direct goal of university instruction.

Key words: big ideas, identification of big ideas, creation of big ideas, maintenance of big ideas, social dimensions of big ideas

The elements of my title will serve as an outline. This organizing structure leads me to first characterize big ideas. I begin by providing examples.

"The earth is round" is a big idea. It forever changed the ways we explored our world. "Planets orbit in elliptical patterns." Positing circular paths led to mistakes in interstellar predictions that were rectified when elliptical paths were substituted. "The shape of DNA is helictical." This correct configuration greatly facilitated subsequent genetic research. Big ideas are novel, demanding reexamination of past research and reorientation of future directions.

A big idea often disrupts current thinking. John Garcia (Garcia, Hankins, & Rusiniak, 1974) found that when wild animals ate poisonous meat, they learned to avoid the tainted meat long after their earlier, carnivorous meal. These avoidance behaviors were replicated within a laboratory context when saccharin-flavored water was paired with x-rays whose noxious effects occurred after a considerable delay (Garcia, Kimeldorf, & Koelling, 1955). Together, these findings flew in the face of conventional, classical conditioning theories that presumed, under specific properties of the CS (flavor in mammals) and consequences of the UCS (sickness), multiple trials and a short, one half to one second latency between the conditioned and unconditioned stimulus were necessary (Garcia, Kovner, & Green, 1970). In business, artificial intelligence technology such as ChatGPT has become a major, disruptive force upon the dominant role that Google has had on Internet search over the last few decades (Grant, 2023).

In the social sciences, Daniel Kahneman won the Nobel Prize in economics for his research with Amos Tversky that altered current, economic beliefs. Kahneman demonstrated that potential risks and losses have greater emotional impact than gains of the same amount (Kahneman & Tversky, 1979). Decisions are weighted more by expected loss than by expected gain. For example, medical patients are much less likely to reject

an intervention when it is leads to an expected mortality of 10% than to accept that same intervention when it has an expected survival of 90% (Freedman, Pisani, & Purves, 2007).

Characterizing big ideas.

Perhaps, a big idea emerges from a "what if…?" speculation. If you change one element of a theory or principle, then interesting insights emerge. In the movie, "A beautiful mind" (Howard, 2001), John Nash and his academic friends visit a bar for "happy hour." Each man considers his chances of successfully pairing with the most attractive woman. However, in this scenario, those women not approached will see themselves as less desirable and reject subsequent male overtures. All but the "winning" male are left unpaired. Nash realized that the ideal strategy was not to maximize success for one individual (corresponding to current economic thought). Instead, the superior plan was to do what was best for the individual *and* for the group. In this revised scenario, each man would pair with one woman. Nash immediately left the bar, headed home, and revised the theoretical model in his dissertation. (See also Sylvia Nasar's (1998) biography of Nash.)

Big ideas can be seminal; they can lead to subsequent big ideas. Nisbett (1990) noted that geometry made possible the science of optics, which made possible the invention of the microscope, which made possible the germ theory of disease. This last domino led to the development of drugs that killed germs and saved millions of lives.

In some circumstances, one learns that a given phenomenon of "apparently different things were different aspects of the same thing." Studies in the field of electricity were enhanced by knowing that chemical changes could be used to create electrical forces (Feynman, 1998, p. 14). In other instances, a big idea may emerge from a novel connection between two areas of study. One uses the existing framework in one discipline to better explore a second discipline. Donald Campbell (1969) used the "fish scale model of omniscience" to describe the intersection between disciplines that create new fields, areas such as behavioral economics (psychology and economics), bioinformatics (molecular biology and computer science), and population genetics (demography and heredity). Campbell chided researchers who attended the same conventions as colleagues and who read only what peer researchers read. The famous novelist and poet Alice Fulton, a MacArthur fellow, reportedly read the National Enquirer as a source of novel ideas.

Major contribution to a discipline may come from "academic immigrants." B.F. Skinner was an English major while an undergraduate. John Nash won a Nobel Prize in Economics, though his formal academic training was in mathematics. Methods used to answer research questions in apparently unrelated disciplines such as public health might be skillfully applied to answer relevant social science questions. For example,

interventions that use text messages as reminders aimed to stop cigarette smoking (Free, Knight, Robertson, et al., 2011) could be applied to social science efforts aimed to reduce symptoms of depression. Outcome measures such as risk ratios, odds ratios, and prevalence or incidence, seldom used in the social sciences, could be successfully utilized in many non-health disciplines.

Recognition of big ideas

Journals and internet repositories can sometimes play an important role in acknowledging big ideas as they establish forums where unconventional ideas can be published (e.g., *Medical Hypotheses*). Preprint servers such as arXiv are online archives that allow researchers to quickly share their findings with colleagues, thereby correctly allocating credit for big ideas.

Despite the importance of big ideas, they may not be readily recognized. Publications that report big ideas may be published only after many resubmissions and revisions, since reviewers and editors may not initially acknowledge their importance. Study submissions that subvert the status quo (so-called "normal science;" see Kuhn, 1962) are likely to be sent to journal reviewers who are the holders of current tradition. In this instance, acceptance of competing thoughts would pose a loss of credit. These reviewers would be disinclined to accept revisions of commonly accepted ideas on which their reputations were based.

In contrast, a big idea can sometimes be quickly recognized. Early in his academic career, Paul Krugman presented several ideas to his Ph.D. advisor, who found interesting his notion of a monopolistically competitive trade model (Krugman, 2008). Encouraged, Krugman worked diligently on the topic and later wrote, "I knew within a few hours that I had the key to my whole career in my hand."

Ironically, the designation of ideas as big is not the responsibility of their authors. The lens by which individual researchers view the importance of their ideas appears to be distorted. Absent more objective perspectives, the modest quality of ideas incorporated by most researchers would quickly lead to a preponderance of ideas incorrectly termed to be big. That said, a mechanism that identified features that reliably predict subsequent big ideas would allow granting organizations to more efficiently fund future research.

A big idea story

A former student, Amy Krentzman, launched a critical trajectory of her career soon after noting connections between positive psychology and Alcoholics Anonymous (Krentzman, 2013). In an email, I asked Amy to recollect the conditions surrounding this important recognition (Krentzman, personal communication, May 12, 2015).

> *Question*: Can you search way back in memory and articulate the circumstances when you first saw the connection between positive psychology and AA?
> *Answer*: I was attending a lecture for undergrads. As I recall, my mentor was presenting on spirituality and alcohol recovery. Coincidentally, there was a new book about what positive psychologists call "flourishing." I made a mental note to check out the new book.
> Later, I am sitting at my desk reading the flourishing book. Every chapter is ringing bells with connections to AA and 12-step recovery. I find no one else is approaching the question in quite this way. I discover the path is clear for me to put my flag in this sandbox. I read everything I can on it; I write a grant; the grant gets funded.

"How to": big ideas

One prerequisite contender that foreshadows possible ways in which one may create big ideas is the existence of a good research question. According to lore, at his acceptance for the Nobel Prize in Physics, Paul Dirac gave credit to his mother. She never asked "What did you learn in school, today?" Instead, she asked "What new questions did you learn to ask, today?"

In some instances, the path to a big idea is not under the control of the researcher. For example, the altered direction of a career might occur after the loss of a child from a rare disease. This very personal event may change the life course of a student to a creative lane in medicine.

One or many big ideas, per researcher?

One might first wonder "How many big ideas are produced during a researcher's lifetime?" Without a formal definition of what constitutes a big idea, it is not possible to reliably answer this question. However, my impression is that the usual answer to the "how many" question is typically one or very few. That said, young, academic researchers are expected to have a logical progression of studies in which initial ideas spawn a host of later ideas… a program of research. For example, questions that lead to descriptions of the frequency and kinds of daily activities of normal weight and obese adolescents could inform later, intervention research.

To illustrate my claim of "one big idea per career," a provocative study of the ability of psychologists to discriminate sane from insane persons was reported by Rosenhan (1973). Very briefly, non-institutionalized (read "sane") graduate students briefly gained entrance to a mental health hospital. Institutional staff did not question their entry; in stark contrast, institutionalized persons wondered why normal people were receiving special care. Published in the prestigious journal *Science*, Rosenhan's career was greatly enhanced. I do not know of other big ideas that Rosenhan

published, but many more than one, big-idea needles may exist in a haystack of idea needles of which I am unaware.

Unfortunately, the data quality on which Rosenhan's conclusions were based has been called into serious question (Scull, 2023), and a book-length version of his "successful scientific fraud" has been published (Cahalan, 2019). As Scull notes, Rosenhan's big idea called attention to serious shortcomings of psychiatry and, despite the tenuousness of its findings, ironically led to positive changes that advanced the field (e.g., revision of the third edition of the American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*, 1980).

Harry Harlow's research program provides a compelling counterexample to the claim of one big idea per career. While Harlow is best known for his research on the importance of contact comfort during infancy, he also provided compelling evidence against the drive reduction theory of reinforcement, in this case, that attachment to the mother was due to reduction of the hunger drive (LeRoy & Kimble, 2003). Young monkeys prefer to spend time with a wire "mother" covered with cloth rather than with a surrogate, wire mother that allowed access to a food bottle.

Another exception to the one-big-idea-per-researcher claim also occurred in a very small number of instances; only five individuals have received more than one Nobel Prize. In this case, two prizes were awarded (Nobel Prize, 2024). Interestingly, in only one of these five instances was the Nobel given for contributions within different fields; Marie Curie won prizes in physics (for her research on radiation) and in chemistry (for her discovery of polonium and radium).

Identifying big ideas

Claims exist virtually everywhere but are typically unexamined. Interesting conjectures can be constructed by attending to everyday events. What changes occur in the family of the husband and in the family of his wife after a marriage? What are the positive and negative impacts of flunking out of school or of learning that you have a new, medical issue? These everyday events provide fodder for the creation of potentially big ideas.

Beginning at an early age, implicit and explicit claims are present in the nursery rhymes we read to children (e.g., build your house of stone and you can avoid the big bad wolf) and in the famous sayings (e.g., "a stitch in time saves nine") that convey conventional wisdom (here, build your life on a solid foundation and avoid delay as it's an inefficient life strategy). Newspapers routinely conjecture on the course of future events after a political election, a mass shooting, or the passage of a law. Assumptions regarding the nature of interpersonal relationships are a byproduct underlying the construction of the characters in every movie. Magazines directly assert the unproven health benefits of supplements, television programs illustrate ways that parents interact with children that lead to

successful or unsuccessful outcomes, and the Internet describes many inferred advantages of belonging to a particular political party. The curious researcher can ask "*How* might these claims be countered or better confirmed?" Ruminations of this kind may be the source of a big idea.

Researchers differ in their stance of where to begin the process of identifying a high-quality research idea. A standard approach is to first read the current literature and to look for theoretical gaps or unexplored implications within published studies. A contrasting alternative is to first focus on problems that exist, to imagine research approaches that inform these problems, and only then to read the literature. A prominent disadvantage of the second approach is that relevant, published studies may currently exist; your idea has already been explored. A prominent advantage is that one may discover a niche upon which a career can be built.

Assuming a quality research question and a viable means of identifying ideas, one can imagine two fundamental ways that big ideas emerge. First, over considerable time, researchers cogitate until a single, big idea emerges. Second, researchers generate a long list of ideas, then work to discriminate the big ideas from the not-so-big ideas.

Holding onto big ideas

Along with Dr. Drew Weissman, Dr. Katelin Kariko won the 2023 Nobel Prize in medicine or physiology for research with messenger RNA. Her steadfast efforts spanned several decades during which Dr. Kariko struggled to maintain a position within academia. But she held fast to the promise of the utility of mRNA which became integral to the development of a vaccination to protect against Covid.

I provide a personal anecdote to illustrate an instance in which the lack of positive feedback might have led to abandonment of a potentially big idea. As a newly minted graduate student, I was in search of an idea for my Master's thesis. I was painfully aware that other students in my department had identified thesis ideas. To make matters worse, I had zero history of creating my own research ideas. Fortunately, I was vigilant, realizing that a real-world problem in my own life might be of universal concern.

The babysitter for my young son reported that he sometimes entered the street when an automobile was in proximity. I looked for published evidence of successful pedestrian safety programs for young children; I found nothing. I reflected upon my own, early experiences and asked friends how they learned to cross the street. The typical report was modeling from older siblings, while parental involvement was only occasional. At dinner, I shared these preliminary explorations with my wife, a Ph.D. student in the same department. Her response to the promise of this unexplored area of inquiry is best described as "Ho hum." However, I persevered.

My thesis evaluated an intervention conducted on actual street corners where pedestrian safety skills were taught to first graders and then scored, immediately and during a one-year follow-up. Street crossing skills were

recorded both on a training street and on a generalization street where unobtrusive videos were taken, and street-crossing skills again scored. That study provided empirical evidence of successful, in-vivo training and led to a grant from the Florida Governor's Highway Safety Commission that funded my dissertation. Two publications (Yeaton & Bailey, 1979; Yeaton & Bailey, 1983) proved seminal as "behavioral safety" studies followed (e.g., highway safety; Geller, Berry, Ludwig, et al., 1990; occupational safety; Grindle, Dickinson, & Boettcher, 2000); and safety in the home; Senthilkumaran, Nazari, MacDermid, et al., 2019). My pedestrian safety research efforts dramatically improved my career trajectory.

The social dimension for creation and maintenance of big ideas

The dinner table anecdote with my graduate-student wife prompts consideration of the importance of social elements in the creation and maintenance of big ideas. Nisbett, in a playful rendition of *The Screwtape Letters* (C. S. Lewis, 1942), provides examples in which the senior devil encourages his junior-devil nephew to foster relationships that *decrease* the emergence of big ideas. In Garcia's revelation (as noted above) that classical conditioning does not require a short duration between the conditioned and unconditioned stimulus, Nisbett notes:

> I don't mean to slight the great Bilgegardner. He kept a whole generation of learning theorists busy as beavers with utter trivia. But only a few more colleagues snickering about anecdotes and introspections at the right time could have held the line for us with Garcia."

Academics can join listservs or participate in blogs as ways to gather useful feedback for their evolving ideas. In psychology, a compendium of "rising stars" attribute their success to relationships with mentors and to their idiosyncratic, positive, educational experiences (http://www.psychologicalscience.org/index.php/publications/observer/2011/september-11/rising-stars-5.html). A rising star named Jane Gruber asked the unorthodox questions: How might feeling good be bad for us? What are some possible negative effects of positive emotions?

The so-called "invisible college" of former students and graduate school professors is often relied upon to enhance idea development. Students may "happen upon" potential collaborators at conventions, though it may be more efficient to identify and then plan to talk with potential connections in advance of attending academic gatherings. Naturally, one asks "Which conventions?" The usual answer is a convention in one's discipline. However, "out of field" conventions may be surprisingly useful. I recall being enthralled by a medical convention focused on clinical trial research and by a science fiction convention coincidentally held in the same city, at the same time, as the social sciences convention for which I had signed up.

During the course of working on the development of a big idea, one might ask "What are the relevant time points when one seeks feedback from others?" Perhaps the most opportune time to listen to peers is when you become "stuck," unable to move to a next step (any next step) in your

thinking. Listening to peers is not likely to be efficient, however, since you have been thinking about a particular idea for months. But if one attends carefully, noting what kinds of evidence is brought to bear in such collegial feedback, new insights can occur.

Care should be taken to choose wisely those colleagues one asks for direction. Most persons in most academic networks are far too skillful as editors of current thinking. These are not the associates best chosen at this stage of idea development. Instead, it is better to choose peers who can work in concert with your imperfect brainstorms, embellish current directions, and imagine new ones. Explicit stipulations of the kind of feedback one seeks can be helpful. ("John, I am looking for new ways to measure the important relationship I have considered.") There will be times to ask for help from "edit mode" colleagues, just not now.

"Have": big ideas

Big ideas may be portrayed as new concepts that "happen to you," as when the apple fell on Newton's head while he was in deep repose. Unfortunately, this passive portrayal can easily deter researchers from the active, instrumental toils needed to create big ideas.

B.F. Skinner had a novel way of thinking about the emergence of ideas. For him, the task was not to create novel ideas; instead, the task was to create situations in which they were likely to occur (Skinner, 1981). New ideas can appear when on a beach walk, during a vacation. They can pop into one's head when taking a morning shower or while napping, midday. One cannot will big ideas, but knowledge of facilitating contexts allows one to better orchestrate their occurrence.

I remember a particularly productive series of mid-dream ideas when I was being "forced" to come up with new study designs to address a collaborative research project with a German colleague. I then began to ruminate upon research methods immediately before bedtime. Given the lack of control over when good ideas occur, it is best to establish ways to record them. Researchers can keep a log on a nightstand or maintain a small note pad (and pen) in the driver's side of the car door. A pocket or purse is a convenient repository of new ideas.

Practice as a means of creating big ideas

For many years in my research methods classes, I lectured on big ideas. I gave extra credit for a one-page paper describing a big idea. Most students appreciated the opportunity to provide alternative thinking as it clearly contrasted with usual academic requirements.

During one class, I remember it well, a student who sat in the back of the room noted that her major professor, William McGuire, also addressed idea development and asked if I would like to have a two-page paper that he

provided to his students. While a greatly expanded publication exists (McGuire, 1997), the short version was full of pithy suggestions.

For example, McGuire recommended that students use a metaphorical fishbowl in which they placed the names of potential independent and dependent variables on slips of paper. Soon, students became skilled in linking pairs of variables picked from the fishbowl, sometimes changing the independent and dependent status of variables. Then, for each practice pairing, McGuire suggested introducing a third variable from the fishbowl, one that might be used as a moderator. In this open-ended way, new, rich connections between variables were considered.

Other McGuire recommendations were comparably compelling. He suggested that researchers identify a similar problem in another research domain where the problem had an existing literature. That "other" template could be used to inform study methods in the developing area of inquiry. Another provocative suggestion was to contemplate "juxtaposing opposite problems to suggest reciprocal solutions." How would you motivate a student to study *less* or encourage a person to smoke *more* cigarettes. The "reverse" of these speculations would logically inform your planned interventions.

Big ideas and state of mind

Paul Erdos, the famous number theorist, consumed prodigious amounts of stimulants (Benzedrine or Ritalin, strong espresso, and caffeine tablets) each day (Hoffman, 1998). Erdos reportedly once said "A mathematician is a machine for turning coffee into theorems." In this hypervigilant state, Erdos was able to author or co-author around 1,500 mathematical articles. Other authors have noted the substantial impact that coffee consumption can have on producing multiple solutions when one is stuck in problem solving. Lightman (2021, p. 113) reports the revelations of the mathematician Henri Poincare during a "coffee state."

> I was then very ignorant; every day I seated myself at my work table, stayed an hour or two, tried a great number of combinations and reached no results. One evening, contrary to my custom, I drank black coffee and could not sleep. Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination.

In the novel Good Benito, Alan Lightman (1994, p. 145) describes the mechanism by which a physics graduate student became "unstuck" after grappling to solve a problem for multiple months. That revelation did not stem from a logical process. The student never understood how he had found his mistake, but it wasn't by going from one equation to the next. Somehow, his unconscious mind had been studying the problem in its own idiosyncratic way, spotted an error, then danced to an answer.

Exposure to multiple ways of thinking

Anders Ericsson, the preeminent expert in the process of developing expertise across disciplines, argued strongly for the role of a mentor (2015). Teacher-guided activities (deliberate practice) enabled "successive refinement" of performance and provided an efficient sequence of steps to attain expertise (1994). My primary mentor in graduate school, Lee Sechrest, frequently went against prevailing wisdom to heretically suggest that students conduct research under the guidance of multiple faculty both within and outside our own department. He asked us to think about the great literature. Surely, Shakespeare addressed universal problems and described likely consequences of confronting them. These examples could inform the problems and research questions chosen for theses and dissertations.

My mentor wanted students to read related research literatures and to take graduate school courses that informed our interests, perhaps in fields such as health, medicine, and economics. Data analytic methods in these disciplines were often the same as those in the social sciences, and their problems frequently overlapped ours. For example, clinical psychologists sought to encourage appropriate behaviors and to discourage inappropriate behaviors in ways similar to how economists regard taxes as ways in which governments encourage productive behaviors and discourage unproductive behaviors.

Role of metaphor in understanding and generating big ideas

The birth metaphor is particularly relevant for idea generation. Birth is followed by developmental categories (infants, toddlers, etc.), and these stages can inform the evolution of ideas. Since infants and toddlers don't adhere to the logic of adults, learning to think like a young child may be a means to enhance idea development.

In a book chapter entitled "Metaphor in science," Alan Lightman (2005, p. 52) reflects upon the wave theory of light developed by Thomas Young. "One cannot imagine how Young would have interpreted his observations without having seen overlapping ripples in a pond." Lightman (2005, p. 117) also notes that different mental pictures are particularly valuable, even when equivalent mathematically, as "psychologically they are different because they are completely inequivalent when you are trying to guess new laws."

Wicker (1985) used metaphorical thinking as a means to facilitate idea development. He urged researchers to get out of their "conceptual ruts" (as if ideas were physical) and to tinker and play with their ideas (as if ideas were toys that one could manually manipulate). Neuroscience methods that use electrical probes to study the human brain have been successfully emulated to better understand the layer structure of artificial intelligence

(Musser, 2023). Thus, metaphorical thinking matters both in understanding phenomena and in guiding further study.

A summary of recommendations for big idea creation

I conclude with a bulleted list of recommended guidelines to enhance big idea creation.

- Search related literatures as you begin the process of idea creation.
- Search for relevant ideas both within and outside your own discipline.
- Make explicit connections between your ideas and those in other disciplines.
- Look for ways to disrupt current thinking rather than to identify gaps in the literature.
- Use informal evidence to first generate new ideas.
- Be skeptical of the veracity of media claims.
- Be vigilant of important questions embedded in everyday experience.
- Ask open-minded colleagues for feedback on your ideas, especially early in the process.
- Attend conventions that are different than those attended by colleagues.
- Read journals that are different than those that colleagues read.
- Use your past big ideas to help discover new, big ideas.
- Hold tight to your emerging ideas when feedback is absent or not positive.
- Think both logically and intuitively about your ideas.
- Read great novelists and poets; their insights are especially valuable in idea generation.
- Think both hard and loosely about generating novel ideas.
- Write down promising ideas as they are often not recalled when needed.
- Practice the skills of idea generation.
- Drink beverages such as coffee as one way to think more expansively.

Author Notes: Inquiries can be sent to bill.yeaton@yahoo.com. I am grateful to Amy Krentzman for comments on an earlier draft of the paper.

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