

7

CURIOSITY AND ENDLESS EDUCATION

On a hot September afternoon, four hundred students crushed into a small auditorium, looking for seats on the long rows that curved around like giant horseshoes. As the room filled with chattering voices, each one grew louder to compete with the clamor around them.

After a few minutes, a tall, thin man wearing white running shoes, brown trousers, and a blue shirt entered and stood at a podium in the front of the room. From their seats, most of the students could look down at the top of his head. He clipped on a lavalier microphone and cleared his throat.

"I know it's hot in here," he said, almost shouting over the chatter. "But we've got work to do." As the students stopped talking, he continued. "This is History 112, and I suppose most of you are here because you think you're required to take this class. Well, you are not," he said as he moved from behind the podium and looked toward the back row.

A soft murmur rippled across the room as students turned from side to side and whispered expressions of disbelief. "But wait," he quickly added, thrusting his hands in the air as if to stop an oncoming locomotive. "This course is by definition a part of getting a liberal education at this institution, but nobody in the world is requiring you to pursue such broad learning. You will not be whipped in

the public square if you don't. No one will imprison or fine you. You are in charge of your own education."

As students listened, he continued. "I want you to think about whether you really want to get this kind of education. I want you to understand both its beauty and utility, then you can decide if it is for you." The room grew still now, and a soft breeze floated around the space as the air conditioning finally kicked in.

Within a few minutes, he had unfurled a brief history of liberal education, and told them that "liberal" came from the Latin for "free" (*liber*), and it was the kind of schooling that free (as opposed to slave) children received in the ancient world. In the modern version, students explored a host of disciplines from the sciences to the humanities, taking a deep approach to important issues that those disciplines could help them address.

When the professor finished, he asked the students to do something rather strange. "This evening, when you go home or to your dorm room," he said, "I want you to decide whether you really want to pursue such an education. Run everybody out of the room, sit in the dark for at least thirty minutes, and ask yourself, 'do I really want to get a liberal education?'" If you do, he concluded, "come back on Wednesday, and prepare for the ride of a lifetime." But if you don't, "you also know what to do. You don't really want to attend this college. You should pursue something else." No one dropped the course.

Many students would now reject that appeal. They believe that if you want to do well in an increasingly specialized world, you must concentrate on a single area and become an expert in that field, forsaking all other subjects. Students study to become doctors, plumbers, business executives, lawn specialists, account managers, computer technicians, and other professionals. They often see no reason

for the large number of “general education” requirements they face in most traditional colleges and universities, and “liberal arts” sounds to them like something you pursue if you don’t have a real major. They speak of courses one must “get out of the way,” and their advisors help them “check off” those requirements. In the most extreme version of this thinking, students believe that schools exist merely to get you the right certificate or degree, not to help you develop as a creative, critically intelligent, compassionate, and concerned human being.

If truth be known, many professors and deans also don’t understand and appreciate why anyone would need to take all those general education requirements.¹ They have few notions about what the whole tradition of liberal education entails, except for some vague sense that it’s “good for the students to be well-rounded.”² But this is an old metaphor that has little appeal anymore. Who wants to be a ball in a world that seems to require a Swiss army knife, someone with multiple specialized tools to address increasingly complex problems?

I met recently with a group of influential policy-makers in Washington, D.C., and they too had difficulty understanding anything of value about education other than preparation for a job. They dismissed as meaningless anything about higher learning that didn’t center on training someone to do a task that would make them money.

Our most creative and productive subjects, however, bucked the trend. They found great value in general and liberal education, yet they didn’t become jacks of all trades and masters of none. They didn’t just flit about from subject to subject forever, never landing anywhere long enough to make a difference. “You see so many kids coming to Harvard,” one professor in that Ivy League school noted

recently, “who are involved in too many activities.” Our highly creative and productive subjects, in contrast, learned to make some tough choices. But here’s the point: their broad educations helped them to make those choices as they learned to see connections between liberal education and the specialty they would pursue. We saw that ability in Reyna Grande and others, and we’ll see it again here. If we are to understand and use what our subjects did that enabled them to fashion such highly productive and creative lives, we must appreciate why they valued a broad education before specializing in one or two fields.

Liberal Arts and Creativity

An important part of the creative process is the ability to recognize good ideas when you encounter them. The implications of that notion are profound. To grow on the ideas and creations of others, we must encounter them, and to do so, we must explore the great works of the mind found in the arts, sciences, mathematics, philosophies, and historical perspectives. We have to get excited about probing a vast array of subjects and disciplines. The world of ideas and scholarship becomes our oyster, and the possibilities become almost unlimited, at least as large as all of human endeavor and achievement throughout history.

I could make an argument that such creativity benefits society, but that wasn’t the only reason given for the diverse interests of the highly accomplished people I interviewed. They valued creativity because it helped fulfill a basic human need. It could make their lives richer and more robust. The American philosopher Richard Taylor echoes similar ideas in his classic work *Virtue Ethics*: He argues that humans, because they have a special intelligence, can live the good

life only if they become creative. It is, Taylor wrote, “what distinguishes us from all other living things.”³ Taylor believed that original work could occur in any domain. “When we think of creativity,” the philosopher wrote, “we are apt to construe it narrowly, as the creation of things, sometimes even limiting it to things belonging to the arts.” But that is too thin, he concluded. “Creative intelligence is exhibited by a dancer, by athletes, by a chess player, and indeed in virtually any activity guided by intelligence.” It can occur in gardening and farming or in “the rearing of a beautiful family.” In his own quest for an innovative and good life, Taylor became both an internationally renowned beekeeper and a philosopher.⁴

The subjects in our study didn’t just sit around expounding on the value of creativity. They found something that fascinated them. They became interested in problems they could solve, in work that they could do. They became creative because they became lost in something other than themselves. Our subjects realized that their growth as creative individuals needed food, and that they would find that nourishment both in an increasing appreciation for the creative work of others and in the special perspectives that they could bring to any situation, problem, or project. They had to understand how their brains worked best, how ideas came up in their own minds, how they thought, and where they got those thoughts. Fundamentally, they had to understand themselves as a product of history and society, and that required deep comprehension and extensive study of both the past and their own world. Driven by their desires to fulfill that human capacity and need for originality, our best students explored the rich world of the liberal arts, mining the humanities, arts, and social and natural sciences for the concepts and information that fed their minds.

Curiosity and the fun they experienced in learning more played a

huge role in shaping their focus. A liberal arts education afforded them the chance to enjoy a richer life because they could get more out of every moment and every experience. What is life, after all? It is experiencing reality over time, but if you can take any moment and enhance it, know it in historical context, explore its social context, dissect it and all its many voices, and integrate it into your experience, you can derive far more out of any one time and place. You can extend your life. As Andrew Abbott, a sociologist at the University of Chicago, told some students a few years ago, “given the opportunity, you are a fool not to avail yourself of every means to extend your experience in the now. The quality of education is our central means for doing that.”⁵

History, for example, is the broadest of disciplines because it encompasses all of human affairs—from the arts to the sciences and everything in between. Imagine that you are trying to see different shades of a color. You can see the difference most clearly if you put them next to each other. So it is with understanding yourself and your own times. Until you have other historical points of reference, you can’t really say much about your own society or yourself. You might think that certain attitudes—such as racism—are quite natural until you learn that those feelings and concepts have a history and have not always existed. You might think certain people and regions tend toward violence until you explore the long history of those same groups and compare them with other societies. You might think that the people in your society have some superior gene because of their enhanced ability to build indoor toilets and other technologies until you study the lengthy historical forces that shaped their prosperity, and realize that in earlier times your ancestors had little to brag about.

Engaging with History and Justice

Long before he became one of the few economists to predict the economic collapse in 2008 and a leading advocate for economic justice, Dean Baker built a summer seminar with his older brother. Like two siblings constructing a tree house, the Baker brothers hammered together their own line of study; Dean had just finished his freshman year at Swarthmore College, outside Philadelphia, and his brother had completed his junior year at Reed College, in Portland. The Baker brothers had grown up on the north side of Chicago, living with their mother and grandparents, and they returned home that summer to the old Lakeview neighborhood full of ideas and questions. The older brother had studied history at Reed and had encountered a school of American historians who questioned many of the popular assumptions about the country's past.

"I didn't do that well my freshman year," Dean recalled, "especially in language. I think it was because I didn't try hard enough." But he had always taken an interest in politics, spurred in part by the struggles he saw around him in Chicago, and when his brother came home with new research and ideas, the boys found a topic that would change Dean's whole approach to learning. "I spent a lot of time with my brother that summer," the economist remembered, "and it changed my motivation in school."

As summer temperatures edged upward, the boys debated and discussed, shared books and perspectives, challenged arguments, and examined evidence. The older brother had been reading books by, among other historians, Gabriel Kolko and William Appleman Williams, scholars who disputed the conventional historical narrative, and he shared those books with Dean. In them, they found

ideas that lit a fire, questioned much of the orthodox interpretation, and introduced them to narratives they had never encountered before. The boys pored over the texts, interrogating ideas and evidence, exchanging passages, debating the implications, and pursuing more information.

Chicago temperatures along the shores of Lake Michigan floated between the seventies and nineties that summer, as they do in most years, and on the hottest days the sandy beaches lining the edges of Lake Michigan filled with bathers. On the coolest days, a refreshing and brisk breeze swept across the lake. Not far from where the boys conducted their running conversations, the Chicago Cubs played baseball at Wrigley Field on those magic days of cool weather and in the heat of an afternoon game on the fourth of July. Even on the hottest days, however, the nights usually turned cool enough to sleep without an air conditioner.

One historical development in particular piqued Dean's interest that summer and for years to come. Years later when he sat in a jury pool waiting to join the panel that would decide someone's fate, he remembered those stories. "It was about Mosaddegh," he explained, "the prime minister of Iran," who had been elected to that position in 1951, long before the boys were born.

Mohammad Mosaddegh, the sixtieth and sixty-second parliamentary leader of modern Iran, came from an aristocratic family but carried out economic reforms that benefited workers and peasants. He gave them unemployment benefits and pay when they were sick or injured. Peasants won freedom from forced labor, and Mosaddegh taxed landlords to build public projects to benefit common folks. In Iran at the time, what later became BP (British Petroleum) controlled much of the economy through its ownership of the oil reserves in the country. The prime minister ran a foul of both

the U.S. and British governments when he said the wells should belong to the Iranian people, and on August 19, 1953, the American Central Intelligence Agency organized a coup to oust him from power.

Even though it happened before the Baker brothers were born, the violent overthrow of a democratically elected government in another country shocked and disturbed both of the boys as they read the historical account. Every childhood mental model they had constructed about U.S. foreign policy came into question, rocking their most cherished beliefs and raising new curiosities about how the international system really worked. “We’d been told that the overthrow of Mosaddegh was part of the Cold War struggle against tyranny,” he remembered, “but that didn’t make sense in light of the historical record. Mosaddegh wasn’t a Soviet agent, just a progressive reformer seeking justice for his own people, and he wasn’t a tyrant. The coup against him protected the financial interest of a large oil company.” The Baker boys’ seminar explored those issues all summer, driven by curiosity and their own sense of justice. They read what intrigued them. They understood and remembered what seemed important. As July trailed into the warm days of early August, the boys debated and discussed, picking their own path through material that the older brother brought to the table, and the younger now adopted as his own.

The fall after that magic summer with his brother, Dean didn’t return to school but took off to travel around Europe. When he came back to campus a year later, he applied for and won admission to the honors program at Swarthmore, which had produced many creative and critical thinkers. In an environment of small seminars meeting weekly, students engaged in dialogue and often led the discussion with their own work. Dean learned to question everything.

He looked for the assumptions behind arguments and the concepts they employed. He thought about their implications and applications, and asked for evidence, questioning the source and nature of that supporting information. He analyzed the reasoning employed by his classmates and in the source material, noting in particular the way/language is sometimes used to distort thought and enflame passions.

Even before joining the honors program, he took a multidisciplinary course on behaviorism and explored one central question: What controls human actions? “You had to understand before you could critique,” Dean explained, “and the professor didn’t tolerate a bunch of stupid criticism.” The next year, he took a course in U.S. economic history, in which some of the questions of that sophomore class once more came into play.

In the honors program at Swarthmore, professors became primarily coaches and mentors, helping students to prepare, rather than judges making final assessments of students’ work. Dean and his classmates spent two years preparing for two days at the end of their senior year when outside examiners—experts in the field—would come to campus to evaluate their work, engage them in conversations, exchange ideas, challenge their thinking, and decide whether they received honors for their work.

Dean came to understand his own learning style and knew that he worked best when he had more freedom, when he could help design his own education. “That’s why I went to Swarthmore,” he explained. “I chose it also,” he said, “because they had an emphasis on undergraduate education and good teaching.” The quality of instruction made a difference to him, but his growing fascination with and concern for the world carried the day. “Most of the teach-

ers I had were quite good," he noted, "but even if they weren't, I could usually find something interesting to read in the course."⁵

Increasingly, Dean became fascinated with how economic forces shape people's lives and how economics work. As he plunged into a wide variety of disciplines, he could tap the wisdom of those fields while thinking constantly about what he believed and why, integrating and questioning. "I was always looking for arguments in something I read," he explained, "and then pinpointing the evidence to see how it was used."⁶ His deep empathy with other people bolstered his quest, but so did his ability to chuckle at himself and the absurdities around him. With laughter and seriousness, he learned to solve problems and ask questions that no one else bothered to raise. By bringing his own, broad perspective reasoned from the evidence and from the insights of others, he could sift critically through a rich array of arguments and keep only those that met his highest standards of reasoning and evidence. Years later, after he had acquired a doctorate in economics from the University of Michigan, he used those critical habits to see through the faulty arguments of economists who wanted to roll back social security payments and later to see a looming economic collapse when few others saw it coming. Grades, however, never played a large role in his education. "I just didn't care about them," he explained. "They were decent enough, and that's all that mattered. I was more interested in what fascinated me."

The philosopher Andrew Churcky could have been describing the kind of education Dean received when he wrote that liberal education helps people find just ways to resolve conflict. "Liberal education should," he wrote, "empower individuals to try to reach agreements . . . on what is economically and politically advantageous to

everyone."⁷ Such an outcome stems from dialogue, he argued, from struggles with moral problems drawn out of "history, anthropology, sociology, economics, and politics."⁸ In that kind of liberal education, students learn to engage in those exchanges as they come to understand the nature of discussion "through a study of rhetoric and logic" and as they discover how to express themselves in writing and speaking. They engage in discussions in which they challenge one another's arguments, pointing out any problems with evidence or reasoning. They reject or accept arguments not out of personal whim but because they have engaged in the highest rational judgments. A liberal education helps them develop the ability to do that reflective thinking.

Our best students generally crafted that kind of education for themselves, engaging in dialogues that brought their own perspectives to bear yet tested them against the values and concepts of others and against the rules of reason and the standards of evidence. They told us about long discussions with friends in the dormitory and library; the sometimes fierce debates that erupted; the personal struggles they had with questions of morality, justice, and other issues; the sometimes all-night mental battles they joined with an author they had read. They pinpointed the differences between agreeing (or disagreeing) with someone's facts, or agreeing (or disagreeing) with their attitudes.

Stephen Colbert, who made his fame and fortune in comedy, struggled with Robert Bolt's essay on values. Jeff Hawkins, the computing pioneer, pondered the work of philosophers, using the thinking of John Searle to distinguish in his own mind between what computers and human thought can do. Journalist David Protess engaged in those running seminars with professors and other students. Duncan Campbell looked for justice, entered law school

hoping to find it there, but eventually discovered it in his own project to help disadvantaged youth. Mary Ann Hopkins explored the performing arts, humanities, and the sciences, searching for examples of justice for war-torn and poverty-ridden worlds, but ultimately finding the answers in her own actions. Repeatedly, we heard stories of multidisciplinary expeditions: of conversations late into the night, of lifetimes of reading absolutely everything, of explorations for those insights, ideas, and facts that could feed their brains. We heard in all of that a thirst for knowledge, a quest for originality, and a pervasive concern for justice.

The Freedom to Choose

Emma Murphy majored in political and social thought, studied Russian literature, and had never taken the standard pre-med courses or the MCAT examination that usually determines who gets into medical school. Yet during her junior year at the University of Virginia, she won admission to Mount Sinai School of Medicine. If she accepts the appointment, she will join a long line of students with humanities and social science backgrounds who have attended medical school.

Mount Sinai School of Medicine began the program to attract students with broad liberal arts educations into a profession that doesn't always encourage that kind of educational depth. How have these students performed in comparison with students who had more traditional preparations that focused almost exclusively on the sciences?

Researchers at the school recently compared the two groups and found that on a wide variety of measures the liberal arts students did just as well or better than students who didn't necessarily pur-

sue that broad undergraduate education.⁷ They performed with distinction in the clinic, in clerkships, and in the classroom, and were more likely to do scholarly research and "graduate with Distinction in Research." Furthermore, they more frequently chose primary care specialties. Emma believes that her experiences have made her more compassionate and empathetic, able to understand better the plight of her future patients. "These students," noted Dennis Charney, dean of the medical school, "help to diversify our student body" and create a "vibrant educational community and a more stimulating training experience."

Much of Emma's schooling and family life had nurtured deep approaches to learning and a concern for big issues in life. When she was growing up in suburban Maryland, her parents, both physicians, encouraged her curiosity. "My father would sit down and discuss anything with me," she recalled. Emma came from a home with rich religious roots where values, purpose, and faith filtered into nearly everything she did. "Religion was always a structure in our weekly routine," she related. "In high school, personal faith became a very important aspect of my life." From the first through the twelfth grade, she attended a "wonderful independent private school" that offered small classes and an emphasis on the liberal arts. "My classes were no bigger than ten or twelve people," she recalled, and in those surroundings, she explored major questions and learned to read critically and to write well. Her teachers shared their passion "for what they were doing," and their devotion had a strong influence on the young girl. "I was encouraged," she emphasized, "to ask questions."

But Emma lived in a world that also fostered strategic concerns and buffered her with powerful extrinsic motivations. Her parents wanted their three daughters to do well in school academically, and

her society took pride in the students who won admission to the most prestigious private colleges. Her older sister went to Princeton University, and she saw herself going to an Ivy League school as well. In class, she faced subtle pressures to make the grade. "I had been trained in high school to measure my studies by what the teacher said, as if I was quantitatively mapped on some graph," she confessed. Like many young girls of her social class, she took up ballet, in which she also excelled. But in this activity, as in her schoolwork, she felt pressured to follow a certain path in life. "In that pre-professional environment, I developed anorexia and had to enter a treatment center for a month," she explained. Confined to a hospital, Emma felt isolated and abandoned but never hopeless. The incident had a profound influence on her thinking and values, and later encouraged a deep empathy for anyone facing incarceration. It was perhaps the beginning of a transformation that extended into her work at the University of Virginia.

When Emma went off to college, she stood between two worlds, one ready to intensify those extrinsic pressures and drive her toward a concern for strategic considerations, the other appealing to life's purpose, its values and personal development. The first might have promised a fast trip to academic honors, glory, and a fat paycheck, but the second raised questions about the meaning of life. She came to Virginia almost by accident, with an application for the Jefferson Scholarship program submitted at the last minute. She visited the campus before she entered and found "passionate and creative" students. "It was an easy decision to make," she decided.

Her curriculum allowed the Maryland native "to chart her own course of study" around politics and society, and that freedom sparked deep intentions and broad interests. Early in her studies, she took several classes from Bill Wilson in the religion department

that helped shape the direction she would take. "When you were grappling with a text," she explained, "he never took the attitude that he was the expert and if our interpretation didn't match his we were somehow failing." Emma remembered that her professor valued the questions she raised and how she tackled them in her writing and thinking. "Grades became irrelevant to that discussion," she concluded.

In her junior year, Emma took an unusual class that cemented her commitments to a broad and deep liberal education. Students in a Russian literature class conducted regular seminars for residents of a juvenile detention center. "We weren't reading to write papers just to sit on some professor's desk," Emma explained, "but to search for key meanings and personal connections. We had to explore the Russian classics from the perspective of the child who had been marginalized by the justice system." Emma's life had little in common with the boys she met at the detention center. Yet she could pull from her own experience as she struggled to comprehend their plight. "I could remember," she explained, "when I was confined to the hospital and wanting to get back to a healthier place." The experience sparked a larger concern for justice, and for the issues of purpose and the values that the literature raised. She emerged from the class conscious of the common humanity we share, and with a strong sense of control over her own education.

Emma isn't sure if she will take the offer to attend medical school. She wants primarily to pursue a career that brings her into contact with other people and allows her to be creative. Among the people we studied, we saw the same pattern repeatedly of wanting more than a rote challenge or prestige from their careers. They sought an education that didn't leave out contemplation or a sense of wonder, even if they had to blaze their own trail.

Selecting a Path

On a crisp spring day in northern California, young Dudley Herschbach walked along a creek bed looking at everything around him. He took such walks often, marveling at the trees and rocks, ripples of water that stood in small pools and flowed gently to some other spot, and the little creatures that populated these miniature worlds. He noticed the birds, the incredible array of flying feathered species that sometimes perched on a limb or swooped in for a meal. Many years later, long after he had gone to Stanford University to play football, turned down an invitation to try out for the Rams professional football team, won a Nobel Prize in Chemistry, and done a voiceover for the Simpsons, he remembered those birds and the walks he took. They were like good teachers, raising questions, sparking imagination, and invoking awe with his world. "I had a lot of time to myself just to daydream," he remembered.

Dudley was the oldest of three boys and three girls, children of parents who struggled during tough economic times. His father built houses to make a living and took pride in the details of his work. "My father would tell stories about his craft and how important it was to do a job right," the scientist recalled. "He always said, someday someone will take this house apart and realize how well it has been built. Doing it right requires a little longer."

Stories became a big part of his young life. When he was four and five, his house often filled with aunts and uncles—his father's brothers and their families mostly—who gathered to tell tales of their adventures in the world. His grandfather could spin a yarn about encounters with bears that were bigger than a garage, which would both scare and beguile the young children gathered around him. Soon Dudley learned to read his own stories. "When I was three and

four," he reported, "I kept wondering what was in those balloons that pointed at the heads of the cartoon characters in the funny paper." Like an archaeologist deciphering an ancient Mayan code, Dudley painstakingly uncovered the secrets of all those letters in the comic balloons. "I remember once," he said, "going through the newspaper with a red pencil and underlining all the words I knew." His mother helped him with some, but he read others in context and decoded their meaning.

After he learned to read, his family bought him a three-volume set of the history of the world that had been written for children, and Dudley raced through all of them before he started the first grade. "We didn't have an intellectual household," he stated. "Before that encyclopedia we only had copies of the Bible, Ellery Queen mystery novels, and Reader's Digest." When he was nine or ten, those books perished when his house burned to the ground early one morning. After the fire, Dudley became dependent on the library and a librarian who recommended books. "She played a large role in my education," he recognized.

He read history, science, and some literature. His parents often gave him books for Christmas or for his birthday, and he explored *Treasure Island* and traveled with *Robinson Crusoe*. When he was eleven, he picked up an issue of *National Geographic* that focused on planets and constellations and fell in love with the mysteries of nature. He searched for other books on the heavens and made star maps. It was his first major scientific exploration, and while science and math increasingly became his focus, he continued to explore literature, history, and biography. "I realized," he explained, "that you are only one person in one period of time. Reading allows you to expand, to live other lives in other times. You learn to write from what you read." In high school, he discovered the rich tapestry of

Shakespeare's plays and eventually loved the music of mathematics and probability.

Such exploration produced an extraordinary imagination. He learned to hop easily from one perspective to another, to make connections that few had imagined, and to ask questions that no one had framed before. "Because I had a lot of time as a kid to daydream without any adult telling me what to do," Dudley observed, "I learned to think like a hound dog sniffing out its prey. My thinking bounces around a lot rather than following a linear path."

Dudley Herschbach fell in love with life—its mysteries, intrigues, beauties, problems, challenges, and even its tragedies. Like so many of our other subjects, he pursued a broad education, dipping into a variety of disciplines, yet ultimately concentrated deeply on the world of chemical science. He enjoyed the thrill of conquest and the fascination of an unsolved problem, and took that joy into playing right end on the football field, but he also took it into the classroom. Dudley has a strong sense of his uniqueness, born both out of his personal history and from the learning he achieved. In his mind his intelligence and personality are not frozen in place but constantly evolving, permanently changed by everything he learns. "You think of yourself differently," he said, "if you have mastered something. You realize that you are separate, you are different. You have been empowered in a special way."

Like so many of our subjects, Dudley discovered early in life the power of teaching. In high school, he began to tutor his football buddies who struggled with history, math, chemistry, and a variety of subjects. In their conversations, Dudley and his teammates built their understanding, socially constructing the ideas that emerged. It offered the budding scientist a chance to make sense of complex concepts and to explain them to others in ways that made sense to

him. He once took a math class in high school from a retund fellow fresh from the war who lacked deep insight into his subject but expected each student to "explain why you calculated the problem the way you did." In more than one class, teachers insisted that their students take the lead and explain matters to one another. "I think this might be called peer instruction today," Dudley surmised many years later.

Dudley loved sports and keeping physically fit. The games he played—football and basketball—came from a twentieth-century corporate culture and trafficked in time, space, and lines. Unlike the nineteenth-century game of baseball, in which every individual stands alone at the plate exercising an individual opportunity to hit the ball, these competitions emphasized coordination and cooperation, and in that sense bore a resemblance to the world of scientific research, where he would eventually land. When he entered Stanford, the university had offered him both an academic and athletic scholarship, but Dudley chose to accept only the former, giving him the freedom to make a fateful choice. When his football coach told him he couldn't take any science labs because they would interfere with practice, he quit football. Even when the Los Angeles Rams later tried to entice him into a tryout for their team, he "wasn't even tempted." He'd made one of those tough choices that distinguished many of our subjects.

Although he pursued a broad education, he recognized that he would not excel in all areas. "I always have to remind myself that Yo Yo Ma once said, 'I can't sing, but I can play the cello.' You can explore the world, but you don't have to be superior in everything." He remembered a colleague, a distinguished scientist, who never felt comfortable solving quadratic equations, but he did world-class work in organic chemistry. Dudley, like so many of our subjects, didn't beat himself up over what he couldn't do best but instead

found those areas that appealed to him. He constantly looked for new associations that could broaden his perspective rather than narrow his vision to a single focus. He wasn't afraid to try new areas simply because he might not shine. Instead, he looked for ways to connect, to see something from a new perspective. Years later, after Dudley received his Nobel Prize for work on colliding molecules in chemistry, he mused that maybe his interest came from those collisions on the sports field.

At Stanford, Dudley felt both the freedom to do as he pleased and the responsibility to become organized. He found a little nook in the library where he did most of his studying, and in that quiet place with no distractions, every morning from nine to twelve, he studied history, science, math, and other intellectual subjects. He could lose himself in ideas and stories, problems and solutions. Because he took a deep approach to these, he became absorbed with every subject, making outlines of what he was learning, connecting dots in one area to the circles and squares in another, and losing track of time. "Some of my friends thought I never studied," he recalled, "but I was just well organized and concentrated intensely."

Within each subject, he learned to ask new kinds of questions that other fields didn't necessarily explore, and he acquired a diverse capacity to solve problems that, in turn, helped him learn deeply in any one field. "Some authorities," he would write many years later, "object to allowing students to sample almost willy-nilly the smorgasbord of courses." But for Dudley, the great virtue of such an education came in learning to question in different kinds of ways. "In such sampling, [we] meet different kinds of questions and wildly diverse criteria for evaluating answers," he explained. With that liberal arts experience, "we learn to challenge evidence and patiently puzzle out our own answers." The liberal art of questioning and measuring answers with "various yardsticks," the scientist con-

cluded, became "essential for scholarly work" and for "meaningful participation in a democratic society."

No one explanation can capture why our subjects developed such broad interests and pursued vigorously that liberal education for the free person. Ability and success alone cannot explain the choices they made. Although curiosity played a central role, so did a sense of purpose, a devotion to some greater cause, and a concern for a just society. They loved beauty in all its forms, often learned as children the power of stories and the excitement of solving puzzles, and they used their college experience to engage and stimulate their minds. They understood education as a developmental process in which they sought to grow the power of their minds, and that too influenced the kind of learning they attempted.

Some pursued that broad and integrated study earlier and more vigorously than did others, and those in our group who pursued it most consistently and extensively exhibited the most impressive accomplishments. Furthermore, while our best students developed broad interests and the capacity to integrate abilities and insights from a wide variety of domains, they ultimately chose a stage upon which to play out their lives and careers. For some, that venue changed from time to time, and for most, it combined activities in unusual ways, but they knew when to focus, to perfect their talents. The decision to specialize didn't mean turning off all those other interests. Rather it meant using everything they had learned to create in one or two primary areas. Most important, they didn't define themselves in terms of the profession they pursued, the contraption they invented, or the song they sang, but instead as creative, curious, compassionate, concerned, and caring human beings, citizens of the world.