JAMESCLEAR.COM

Great Talks Most People Have Never Heard

compiled by JAMES CLEAR

Table of Contents

"Solitude and Leadership"

delivered by **WILLIAM DERESIEWICZ**

William Deresiewicz is an essayist and critic. This speech was delivered to the plebe class at the United States Military Academy at West Point in October 2009, and the transcript was original published on **The American Scholar**.

My title must seem like a contradiction. What can solitude have to do with leadership? Solitude means being alone, and leadership necessitates the presence of others—the people you're leading.

When we think about leadership in American history we are likely to think of Washington, at the head of an army, or Lincoln, at the head of a nation, or King, at the head of a movement—people with multitudes behind them, looking to them for direction. And when we think of solitude, we are apt to think of Thoreau, a man alone in the woods, keeping a journal and communing with nature in silence.

Leadership is what you are here to learn—the qualities of character and mind that will make you fit to command a platoon, and beyond that, perhaps, a company, a battalion, or, if you leave the military, a corporation, a foundation, a department of government. Solitude is what you have the least of here, especially as plebes. You don't even have privacy, the opportunity simply to be physically alone, never mind solitude, the ability to be alone with your thoughts. And yet I submit to you that solitude is one of the most important necessities of true leadership. This lecture will be an attempt to explain why.

We need to begin by talking about what leadership really means. I just spent 10 years teaching

at another institution that, like West Point, liked to talk a lot about leadership, Yale University. A school that some of you might have gone to had you not come here, that some of your friends might be going to. And if not Yale, then Harvard, Stanford, MIT, and so forth. These institutions, like West Point, also see their role as the training of leaders, constantly encourage their students, like West Point, to regard themselves as leaders among their peers and future leaders of society. Indeed, when we look around at the American elite, the people in charge of government, business, academia, and all our other major institutions—senators, judges, CEOs, college presidents, and so forth—we find that they come overwhelmingly either from the Ivy League and its peer institutions or from the service academies, especially West Point.

So I began to wonder, as I taught at Yale, what leadership really consists of. My students, like you, were energetic, accomplished, smart, and often ferociously ambitious, but was that enough to make them leaders? Most of them, as much as I liked and even admired them, certainly didn't seem to me like leaders. Does being a leader, I wondered, just mean being accomplished, being successful? Does getting straight As make you a leader? I didn't think so. Great heart surgeons or great novelists or great shortstops may be terrific at what they do, but that doesn't mean they're leaders. Leadership and aptitude, leadership and achievement, leadership and even excellence have to be different things, otherwise the concept of leadership has no meaning. And it seemed to me that that had to be especially true of the kind of excellence I saw in the students around me.

See, things have changed since I went to college in the '80s. Everything has gotten much more intense. You have to do much more now to get into a top school like Yale or West Point, and you have to start a lot earlier. We didn't begin thinking about college until we were juniors, and maybe we each did a couple of extracurriculars. But I know what it's like for you guys now. It's an endless series of hoops that you have to jump through, starting from way back, maybe as early as junior high school. Classes, standardized tests, extracurriculars in school, extracurriculars outside of school. Test prep courses, admissions coaches, private tutors. I sat on the Yale College admissions committee a couple of years ago. The first thing the admissions officer would do when presenting a case to the rest of the committee was read what they call the "brag" in admissions lingo, the list of the student's extracurriculars. Well, it turned out that a student who had six or seven extracurriculars was already in trouble. Because the students who got in—in addition to perfect grades and top scores—usually had 10 or 12.

So what I saw around me were great kids who had been trained to be world-class hoop jumpers. Any goal you set them, they could achieve. Any test you gave them, they could pass with flying colors. They were, as one of them put it herself, "excellent sheep." I had no doubt that they would continue to jump through hoops and ace tests and go on to Harvard Business School, or Michigan Law School, or Johns Hopkins Medical School, or Goldman Sachs, or McKinsey consulting, or whatever. And this approach would indeed take them far in life. They would come back for their 25th reunion as a partner at White & Case, or an attending physician at Mass General, or an assistant secretary in the Department of State.

That is exactly what places like Yale mean when they talk about training leaders. Educating people who make a big name for themselves in the world, people with impressive titles, people the university can brag about. People who make it to the top. People who can climb the greasy pole of whatever hierarchy they decide to attach themselves to.

But I think there's something desperately wrong, and even dangerous, about that idea. To explain why, I want to spend a few minutes talking about a novel that many of you may have read, Heart of Darkness. If you haven't read it, you've probably seen Apocalypse Now, which is based on it. Marlow in the novel becomes Captain Willard, played by Martin Sheen. Kurtz in the novel becomes Colonel Kurtz, played by Marlon Brando. But the novel isn't about Vietnam; it's about colonialism in the Belgian Congo three generations before Vietnam. Marlow, not a military officer but a merchant marine, a civilian ship's captain, is sent by the company that's running the country under charter from the Belgian crown to sail deep upriver, up the Congo River, to retrieve a manager who's ensconced himself in the jungle and gone rogue, just like Colonel Kurtz does in the movie.

Now everyone knows that the novel is about imperialism and colonialism and race relations and the darkness that lies in the human heart, but it became clear to me at a certain point, as I taught the novel, that it is also about bureaucracy—what I called, a minute ago, hierarchy. The Company, after all, is just that: a company, with rules and procedures and ranks and people in power and people scrambling for power, just like any other bureaucracy. Just like a big law firm or a governmental department or, for that matter, a university. Just like—and here's why I'm telling you all this—just like the bureaucracy you are about to join. The word bureaucracy tends to have negative connotations, but I say this in no way as a criticism, merely a description, that the U.S. Army is a bureaucracy and one of the largest and most famously bureaucratic bureaucracies in the

world. After all, it was the Army that gave us, among other things, the indispensable bureaucratic acronym "snafu": "situation normal: all fucked up"—or "all fouled up" in the cleaned-up version. That comes from the U.S. Army in World War II.

You need to know that when you get your commission, you'll be joining a bureaucracy, and however long you stay in the Army, you'll be operating within a bureaucracy. As different as the armed forces are in so many ways from every other institution in society, in that respect they are the same. And so you need to know how bureaucracies operate, what kind of behavior—what kind of character—they reward, and what kind they punish.

So, back to the novel. Marlow proceeds upriver by stages, just like Captain Willard does in the movie. First he gets to the Outer Station. Kurtz is at the Inner Station. In between is the Central Station, where Marlow spends the most time, and where we get our best look at bureaucracy in action and the kind of people who succeed in it. This is Marlow's description of the manager of the Central Station, the big boss:

He was commonplace in complexion, in features, in manners, and in voice. He was of middle size and of ordinary build. His eyes, of the usual blue, were perhaps remarkably cold. . . . Otherwise there was only an indefinable, faint expression of his lips, something stealthy—a smile—not a smile—I remember it, but I can't explain. . . . He was a common trader, from his youth up employed in these parts—nothing more. He was obeyed, yet he inspired neither love nor fear, nor even respect. He inspired uneasiness. That was it! Uneasiness. Not a definite mistrust—just uneasiness—nothing more. You have no idea how effective such a . . . a . . . faculty can be. He had no genius for organizing, for initiative, or for order even. . . . He had no learning, and no intelligence. His position had come to him—why? . . . He originated nothing, he could keep the routine going—that's all. But he was great. He was great by this little thing that it was impossible to tell what could control such a man. He never gave that secret away. Perhaps there was nothing within him. Such a suspicion made one pause.

Note the adjectives: commonplace, ordinary, usual, common. There is nothing distinguished about this person. About the 10th time I read that passage, I realized it was a perfect description of the kind of person who tends to prosper in the bureaucratic environment. And the only reason I did is because it suddenly struck me that it was a perfect description of the head of the bureaucracy that I was part of, the chairman of my academic department—who had that exact same smile, like a shark, and that exact same ability to make you uneasy, like you were doing something wrong,

only she wasn't ever going to tell you what. Like the manager—and I'm sorry to say this, but like so many people you will meet as you negotiate the bureaucracy of the Army or for that matter of whatever institution you end up giving your talents to after the Army, whether it's Microsoft or the World Bank or whatever—the head of my department had no genius for organizing or initiative or even order, no particular learning or intelligence, no distinguishing characteristics at all. Just the ability to keep the routine going, and beyond that, as Marlow says, her position had come to her—why?

That's really the great mystery about bureaucracies. Why is it so often that the best people are stuck in the middle and the people who are running things—the leaders—are the mediocrities? Because excellence isn't usually what gets you up the greasy pole. What gets you up is a talent for maneuvering. Kissing up to the people above you, kicking down to the people below you. Pleasing your teachers, pleasing your superiors, picking a powerful mentor and riding his coattails until it's time to stab him in the back. Jumping through hoops. Getting along by going along. Being whatever other people want you to be, so that it finally comes to seem that, like the manager of the Central Station, you have nothing inside you at all. Not taking stupid risks like trying to change how things are done or question why they're done. Just keeping the routine going.

I tell you this to forewarn you, because I promise you that you will meet these people and you will find yourself in environments where what is rewarded above all is conformity. I tell you so you can decide to be a different kind of leader. And I tell you for one other reason. As I thought about these things and put all these pieces together—the kind of students I had, the kind of leadership they were being trained for, the kind of leaders I saw in my own institution—I realized that this is a national problem. We have a crisis of leadership in this country, in every institution. Not just in government. Look at what happened to American corporations in recent decades, as all the old dinosaurs like General Motors or TWA or U.S. Steel fell apart. Look at what happened to Wall Street in just the last couple of years.

Finally—and I know I'm on sensitive ground here—look at what happened during the first four years of the Iraq War. We were stuck. It wasn't the fault of the enlisted ranks or the noncoms or the junior officers. It was the fault of the senior leadership, whether military or civilian or both. We weren't just not winning, we weren't even changing direction.

We have a crisis of leadership in America because our overwhelming power and wealth, earned under earlier generations of leaders, made us complacent, and for too long we have been training

leaders who only know how to keep the routine going. Who can answer questions, but don't know how to ask them. Who can fulfill goals, but don't know how to set them. Who think about how to get things done, but not whether they're worth doing in the first place. What we have now are the greatest technocrats the world has ever seen, people who have been trained to be incredibly good at one specific thing, but who have no interest in anything beyond their area of expertise. What we don't have are leaders.

What we don't have, in other words, are thinkers. People who can think for themselves. People who can formulate a new direction: for the country, for a corporation or a college, for the Army—a new way of doing things, a new way of looking at things. People, in other words, with vision.

Now some people would say, great. Tell this to the kids at Yale, but why bother telling it to the ones at West Point? Most people, when they think of this institution, assume that it's the last place anyone would want to talk about thinking creatively or cultivating independence of mind. It's the Army, after all. It's no accident that the word regiment is the root of the word regimentation. Surely you who have come here must be the ultimate conformists. Must be people who have bought in to the way things are and have no interest in changing it. Are not the kind of young people who think about the world, who ponder the big issues, who question authority. If you were, you would have gone to Amherst or Pomona. You're at West Point to be told what to do and how to think.

But you know that's not true. I know it, too; otherwise I would never have been invited to talk to you, and I'm even more convinced of it now that I've spent a few days on campus. To quote Colonel Scott Krawczyk, your course director, in a lecture he gave last year to English 102:

From the very earliest days of this country, the model for our officers, which was built on the model of the citizenry and reflective of democratic ideals, was to be different. They were to be possessed of a democratic spirit marked by independent judgment, the freedom to measure action and to express disagreement, and the crucial responsibility never to tolerate tyranny.

All the more so now. Anyone who's been paying attention for the last few years understands that the changing nature of warfare means that officers, including junior officers, are required more than ever to be able to think independently, creatively, flexibly. To deploy a whole range of skills in a fluid and complex situation. Lieutenant colonels who are essentially functioning as provincial governors in Iraq, or captains who find themselves in charge of a remote town somewhere in

Afghanistan. People who know how to do more than follow orders and execute routines.

Look at the most successful, most acclaimed, and perhaps the finest soldier of his generation, General David Petraeus. He's one of those rare people who rises through a bureaucracy for the right reasons. He is a thinker. He is an intellectual. In fact, Prospect magazine named him Public Intellectual of the Year in 2008—that's in the world. He has a Ph.D. from Princeton, but what makes him a thinker is not that he has a Ph.D. or that he went to Princeton or even that he taught at West Point. I can assure you from personal experience that there are a lot of highly educated people who don't know how to think at all.

No, what makes him a thinker—and a leader—is precisely that he is able to think things through for himself. And because he can, he has the confidence, the courage, to argue for his ideas even when they aren't popular. Even when they don't please his superiors. Courage: there is physical courage, which you all possess in abundance, and then there is another kind of courage, moral courage, the courage to stand up for what you believe.

It wasn't always easy for him. His path to where he is now was not a straight one. When he was running Mosul in 2003 as commander of the 101st Airborne and developing the strategy he would later formulate in the Counterinsurgency Field Manual and then ultimately apply throughout Iraq, he pissed a lot of people off. He was way ahead of the leadership in Baghdad and Washington, and bureaucracies don't like that sort of thing. Here he was, just another two-star, and he was saying, implicitly but loudly, that the leadership was wrong about the way it was running the war. Indeed, he was not rewarded at first. He was put in charge of training the Iraqi army, which was considered a blow to his career, a dead-end job. But he stuck to his guns, and ultimately he was vindicated. Ironically, one of the central elements of his counterinsurgency strategy is precisely the idea that officers need to think flexibly, creatively, and independently.

That's the first half of the lecture: the idea that true leadership means being able to think for yourself and act on your convictions. But how do you learn to do that? How do you learn to think? Let's start with how you don't learn to think. A study by a team of researchers at Stanford came out a couple of months ago. The investigators wanted to figure out how today's college students were able to multitask so much more effectively than adults. How do they manage to do it, the researchers asked? The answer, they discovered—and this is by no means what they expected—is that they don't. The enhanced cognitive abilities the investigators expected to find, the mental faculties that enable people to multitask effectively, were simply not there. In other words, people

do not multitask effectively. And here's the really surprising finding: the more people multitask, the worse they are, not just at other mental abilities, but at multitasking itself.

One thing that made the study different from others is that the researchers didn't test people's cognitive functions while they were multitasking. They separated the subject group into high multitaskers and low multitaskers and used a different set of tests to measure the kinds of cognitive abilities involved in multitasking. They found that in every case the high multitaskers scored worse. They were worse at distinguishing between relevant and irrelevant information and ignoring the latter. In other words, they were more distractible. They were worse at what you might call "mental filing": keeping information in the right conceptual boxes and being able to retrieve it quickly. In other words, their minds were more disorganized. And they were even worse at the very thing that defines multitasking itself: switching between tasks.

Multitasking, in short, is not only not thinking, it impairs your ability to think. Thinking means concentrating on one thing long enough to develop an idea about it. Not learning other people's ideas, or memorizing a body of information, however much those may sometimes be useful. Developing your own ideas. In short, thinking for yourself. You simply cannot do that in bursts of 20 seconds at a time, constantly interrupted by Facebook messages or Twitter tweets, or fiddling with your iPod, or watching something on YouTube.

I find for myself that my first thought is never my best thought. My first thought is always someone else's; it's always what I've already heard about the subject, always the conventional wisdom. It's only by concentrating, sticking to the question, being patient, letting all the parts of my mind come into play, that I arrive at an original idea. By giving my brain a chance to make associations, draw connections, take me by surprise. And often even that idea doesn't turn out to be very good. I need time to think about it, too, to make mistakes and recognize them, to make false starts and correct them, to outlast my impulses, to defeat my desire to declare the job done and move on to the next thing.

I used to have students who bragged to me about how fast they wrote their papers. I would tell them that the great German novelist Thomas Mann said that a writer is someone for whom writing is more difficult than it is for other people. The best writers write much more slowly than everyone else, and the better they are, the slower they write. James Joyce wrote Ulysses, the greatest novel of the 20th century, at the rate of about a hundred words a day—half the length of the selection I read you earlier from Heart of Darkness—for seven years. T. S. Eliot, one of the

greatest poets our country has ever produced, wrote about 150 pages of poetry over the course of his entire 25-year career. That's half a page a month. So it is with any other form of thought. You do your best thinking by slowing down and concentrating.

Now that's the third time I've used that word, concentrating. Concentrating, focusing. You can just as easily consider this lecture to be about concentration as about solitude. Think about what the word means. It means gathering yourself together into a single point rather than letting yourself be dispersed everywhere into a cloud of electronic and social input. It seems to me that Facebook and Twitter and YouTube—and just so you don't think this is a generational thing, TV and radio and magazines and even newspapers, too—are all ultimately just an elaborate excuse to run away from yourself. To avoid the difficult and troubling questions that being human throws in your way. Am I doing the right thing with my life? Do I believe the things I was taught as a child? What do the words I live by—words like duty, honor, and country—really mean? Am I happy?

You and the members of the other service academies are in a unique position among college students, especially today. Not only do you know that you're going to have a job when you graduate, you even know who your employer is going to be. But what happens after you fulfill your commitment to the Army? Unless you know who you are, how will you figure out what you want to do with the rest of your life? Unless you're able to listen to yourself, to that quiet voice inside that tells you what you really care about, what you really believe in—indeed, how those things might be evolving under the pressure of your experiences. Students everywhere else agonize over these questions, and while you may not be doing so now, you are only postponing them for a few years.

Maybe some of you are agonizing over them now. Not everyone who starts here decides to finish here. It's no wonder and no cause for shame. You are being put through the most demanding training anyone can ask of people your age, and you are committing yourself to work of awesome responsibility and mortal danger. The very rigor and regimentation to which you are quite properly subject here naturally has a tendency to make you lose touch with the passion that brought you here in the first place. I saw exactly the same kind of thing at Yale. It's not that my students were robots. Quite the reverse. They were intensely idealistic, but the overwhelming weight of their practical responsibilities, all of those hoops they had to jump through, often made them lose sight of what those ideals were. Why they were doing it all in the first place.

So it's perfectly natural to have doubts, or questions, or even just difficulties. The question is, what do you do with them? Do you suppress them, do you distract yourself from them, do you pretend they don't exist? Or do you confront them directly, honestly, courageously? If you decide to do so, you will find that the answers to these dilemmas are not to be found on Twitter or Comedy Central or even in The New York Times. They can only be found within—without distractions, without peer pressure, in solitude.

But let me be clear that solitude doesn't always have to mean introspection. Let's go back to Heart of Darkness. It's the solitude of concentration that saves Marlow amidst the madness of the Central Station. When he gets there he finds out that the steamboat he's supposed to sail upriver has a giant hole in it, and no one is going to help him fix it. "I let him run on," he says, "this papier-mâché Mephistopheles"—he's talking not about the manager but his assistant, who's even worse, since he's still trying to kiss his way up the hierarchy, and who's been raving away at him. You can think of him as the Internet, the ever-present social buzz, chattering away at you 24/7:

I let him run on, this papier-mâché Mephistopheles and it seemed to me that if I tried I could poke my forefinger through him, and would find nothing inside but a little loose dirt. . . .

It was a great comfort to turn from that chap to . . . the battered, twisted, ruined, tin-pot steamboat. . . . I had expended enough hard work on her to make me love her. No influential friend would have served me better. She had given me a chance to come out a bit—to find out what I could do. No, I don't like work. I had rather laze about and think of all the fine things that can be done. I don't like work—no man does—but I like what is in the work,—the chance to find yourself. Your own reality—for yourself, not for others—what no other man can ever know.

"The chance to find yourself." Now that phrase, "finding yourself," has acquired a bad reputation. It suggests an aimless liberal-arts college graduate—an English major, no doubt, someone who went to a place like Amherst or Pomona—who's too spoiled to get a job and spends his time staring off into space. But here's Marlow, a mariner, a ship's captain. A more practical, hardheaded person you could not find. And I should say that Marlow's creator, Conrad, spent 19 years as a merchant marine, eight of them as a ship's captain, before he became a writer, so this wasn't just some artist's idea of a sailor. Marlow believes in the need to find yourself just as much as anyone does, and the way to do it, he says, is work, solitary work. Concentration. Climbing on that steamboat and spending a few uninterrupted hours hammering it into shape. Or building a house, or cooking a meal, or even writing a college paper, if you really put yourself into it.

"Your own reality—for yourself, not for others." Thinking for yourself means finding yourself, finding your own reality. Here's the other problem with Facebook and Twitter and even The New York Times. When you expose yourself to those things, especially in the constant way that people do now—older people as well as younger people—you are continuously bombarding yourself with a stream of other people's thoughts. You are marinating yourself in the conventional wisdom. In other people's reality: for others, not for yourself. You are creating a cacophony in which it is impossible to hear your own voice, whether it's yourself you're thinking about or anything else. That's what Emerson meant when he said that "he who should inspire and lead his race must be defended from travelling with the souls of other men, from living, breathing, reading, and writing in the daily, time-worn yoke of their opinions." Notice that he uses the word lead. Leadership means finding a new direction, not simply putting yourself at the front of the herd that's heading toward the cliff.

So why is reading books any better than reading tweets or wall posts? Well, sometimes it isn't. Sometimes, you need to put down your book, if only to think about what you're reading, what you think about what you're reading. But a book has two advantages over a tweet. First, the person who wrote it thought about it a lot more carefully. The book is the result of his solitude, his attempt to think for himself.

Second, most books are old. This is not a disadvantage: this is precisely what makes them valuable. They stand against the conventional wisdom of today simply because they're not from today. Even if they merely reflect the conventional wisdom of their own day, they say something different from what you hear all the time. But the great books, the ones you find on a syllabus, the ones people have continued to read, don't reflect the conventional wisdom of their day. They say things that have the permanent power to disrupt our habits of thought. They were revolutionary in their own time, and they are still revolutionary today. And when I say "revolutionary," I am deliberately evoking the American Revolution, because it was a result of precisely this kind of independent thinking. Without solitude—the solitude of Adams and Jefferson and Hamilton and Madison and Thomas Paine—there would be no America.

So solitude can mean introspection, it can mean the concentration of focused work, and it can mean sustained reading. All of these help you to know yourself better. But there's one more thing I'm going to include as a form of solitude, and it will seem counterintuitive: friendship. Of course friendship is the opposite of solitude; it means being with other people. But I'm talking

about one kind of friendship in particular, the deep friendship of intimate conversation. Long, uninterrupted talk with one other person. Not Skyping with three people and texting with two others at the same time while you hang out in a friend's room listening to music and studying. That's what Emerson meant when he said that "the soul environs itself with friends, that it may enter into a grander self-acquaintance or solitude."

Introspection means talking to yourself, and one of the best ways of talking to yourself is by talking to another person. One other person you can trust, one other person to whom you can unfold your soul. One other person you feel safe enough with to allow you to acknowledge things—to acknowledge things to yourself—that you otherwise can't. Doubts you aren't supposed to have, questions you aren't supposed to ask. Feelings or opinions that would get you laughed at by the group or reprimanded by the authorities.

This is what we call thinking out loud, discovering what you believe in the course of articulating it. But it takes just as much time and just as much patience as solitude in the strict sense. And our new electronic world has disrupted it just as violently. Instead of having one or two true friends that we can sit and talk to for three hours at a time, we have 968 "friends" that we never actually talk to; instead we just bounce one-line messages off them a hundred times a day. This is not friendship, this is distraction.

I know that none of this is easy for you. Even if you threw away your cell phones and unplugged your computers, the rigors of your training here keep you too busy to make solitude, in any of these forms, anything less than very difficult to find. But the highest reason you need to try is precisely because of what the job you are training for will demand of you.

You've probably heard about the hazing scandal at the U.S. naval base in Bahrain that was all over the news recently. Terrible, abusive stuff that involved an entire unit and was orchestrated, allegedly, by the head of the unit, a senior noncommissioned officer. What are you going to do if you're confronted with a situation like that going on in your unit? Will you have the courage to do what's right? Will you even know what the right thing is? It's easy to read a code of conduct, not so easy to put it into practice, especially if you risk losing the loyalty of the people serving under you, or the trust of your peer officers, or the approval of your superiors. What if you're not the commanding officer, but you see your superiors condoning something you think is wrong?

How will you find the strength and wisdom to challenge an unwise order or question a

wrongheaded policy? What will you do the first time you have to write a letter to the mother of a slain soldier? How will you find words of comfort that are more than just empty formulas?

These are truly formidable dilemmas, more so than most other people will ever have to face in their lives, let alone when they're 23. The time to start preparing yourself for them is now. And the way to do it is by thinking through these issues for yourself—morality, mortality, honor—so you will have the strength to deal with them when they arise. Waiting until you have to confront them in practice would be like waiting for your first firefight to learn how to shoot your weapon. Once the situation is upon you, it's too late. You have to be prepared in advance. You need to know, already, who you are and what you believe: not what the Army believes, not what your peers believe (that may be exactly the problem), but what you believe.

How can you know that unless you've taken counsel with yourself in solitude? I started by noting that solitude and leadership would seem to be contradictory things. But it seems to me that solitude is the very essence of leadership. The position of the leader is ultimately an intensely solitary, even intensely lonely one. However many people you may consult, you are the one who has to make the hard decisions. And at such moments, all you really have is yourself.

"Personal Renewal"

delivered by JOHN W. GARDNER

John W. Gardner was the Secretary of Health, Education, and Welfare under President Lyndon Johnson, an activist and author, and recipient of the 1964 Presidential Medal of Freedom. This speech was delivered to McKinsey & Company on November 10, 1990. The transcript was originally published on **PBS.org**.

I'm going to talk about "Self-Renewal." One of your most fundamental tasks is the renewal of the organizations you serve, and that usually includes persuading the top officers to accomplish a certain amount of self-renewal. But to help you think about others is not my primary mission this morning. I want to help you think about yourselves.

I take that mission very seriously, and I've written out what I have to say because I want every sentence to hit its target. I know a good deal about the kind of work you do and know how demanding it is. But I'm not going to talk about the special problems of your kind of career; I'm going to talk about some basic problems of the life cycle that will surely hit you if you're not ready for them.

I once wrote a book called "Self-Renewal" that deals with the decay and renewal of societies, organizations and individuals. I explored the question of why civilizations die and how they sometimes renew themselves, and the puzzle of why some men and women go to seed while others remain vital all of their lives. It's the latter question that I shall deal with at this time. I

know that you as an individual are not going to seed. But the person seated on your right may be in fairly serious danger.

Not long ago, I read a splendid article on barnacles. I don't want to give the wrong impression of the focus of my reading interests. Sometimes days go by without my reading about barnacles, much less remembering what I read. But this article had an unforgettable opening paragraph. "The barnacle" the author explained "is confronted with an existential decision about where it's going to live. Once it decides.. . it spends the rest of its life with its head cemented to a rock.." End of quote. For a good many of us, it comes to that.

We've all seen men and women, even ones in fortunate circumstances with responsible positions who seem to run out of steam in midcareer.

One must be compassionate in assessing the reasons. Perhaps life just presented them with tougher problems than they could solve. It happens. Perhaps something inflicted a major wound on their confidence or their self-esteem. Perhaps they were pulled down by the hidden resentments and grievances that grow in adult life, sometimes so luxuriantly that, like tangled vines, they immobilize the victim. You've known such people — feeling secretly defeated, maybe somewhat sour and cynical, or perhaps just vaguely dispirited. Or maybe they just ran so hard for so long that somewhere along the line they forgot what it was they were running for.

I'm not talking about people who fail to get to the top in achievement. We can't all get to the top, and that isn't the point of life anyway. I'm talking about people who — no matter how busy they seem to be — have stopped learning or growing. Many of them are just going through the motions. I don't deride that. Life is hard. Just to keep on keeping on is sometimes an act of courage. But I do worry about men and women functioning far below the level of their potential.

We have to face the fact that most men and women out there in the world of work are more stale than they know, more bored than they would care to admit. Boredom is the secret ailment of large-scale organizations. Someone said to me the other day "How can I be so bored when I'm so busy?" And I said "Let me count the ways." Logan Pearsall Smith said that boredom can rise to the level of a mystical experience, and if that's true I know some very busy middle level executives who are among the great mystics of all time.

We can't write off the danger of complacency, growing rigidity, imprisonment by our own comfortable habits and opinions. Look around you. How many people whom you know well

— people even younger than yourselves –are already trapped in fixed attitudes and habits. A famous French writer said "There are people whose clocks stop at a certain point in their lives." I could without any trouble name a half of a dozen national figures resident in Washington, D.C., whom you would recognize, and could tell you roughly the year their clock stopped. I won't do it because I still have to deal with them periodically.

I've watched a lot of mid-career people, and Yogi Berra says you can observe a lot just by watching. I've concluded that most people enjoy learning and growing. And many are dearly troubled by the self-assessments of mid-career.

Such self-assessments are no great problem at your age. You're young and moving up. The drama of your own rise is enough. But when you reach middle age, when your energies aren't what they used to be, then you'll begin to wonder what it all added up to; you'll begin to look for the figure in the carpet of your life. I have some simple advice for you when you begin that process. Don't be too hard on yourself. Look ahead. Someone said that "Life is the art of drawing without an eraser." And above all don't imagine that the story is over. Life has a lot of chapters.

If we are conscious of the danger of going to seed, we can resort to countervailing measures. At almost any age. You don't need to run down like an unwound clock. And if your clock is unwound, you can wind it up again. You can stay alive in every sense of the word until you fail physically. I know some pretty successful people who feel that that just isn't possible for them, that life has trapped them. But they don't really know that. Life takes unexpected turns.

I said in my book, "Self-Renewal," that we build our own prisons and serve as our own jail-keepers. I no longer completely agree with that. I still think we're our own jailkeepers, but I've concluded that our parents and the society at large have a hand in building our prisons. They create roles for us — and self images — that hold us captive for a long time. The individual intent on self-renewal will have to deal with ghosts of the past — the memory of earlier failures, the remnants of childhood dramas and rebellions, accumulated grievances and resentments that have long outlived their cause. Sometimes people cling to the ghosts with something almost approaching pleasure — but the hampering effect on growth is inescapable. As Jim Whitaker, who climbed Mount Everest, said "You never conquer the mountain, You only conquer yourself."

The more I see of human lives, the more I believe the business of growing up is much longer drawn out than we pretend. If we achieve it in our 30's, even our 40s, we're doing well. To those

of you who are parents of teenagers, I can only say “Sorry about that.”

There’s a myth that learning is for young people. But as the proverb says, “It’s what you learn after you know it all that counts.” The middle years are great, great learning years. Even the years past the middle years. I took on a new job after my 77th birthday — and I’m still learning.

Learn all your life. Learn from your failures. Learn from your successes, When you hit a spell of trouble, ask “What is it trying to teach me?” The lessons aren’t always happy ones, but they keep coming. It isn’t a bad idea to pause occasionally for an inward look. By midlife, most of us are accomplished fugitives from ourselves.

We learn from our jobs, from our friends and families. We learn by accepting the commitments of life, by playing the roles that life hands us (not necessarily the roles we would have chosen). We learn by growing older, by suffering, by loving, by bearing with the things we can’t change, by taking risks.

The things you learn in maturity aren’t simple things such as acquiring information and skills. You learn not to engage in self-destructive behavior. You leant not to burn up energy in anxiety. You discover how to manage your tensions, if you have any, which you do. You learn that self-pity and resentment are among the most toxic of drugs. You find that the world loves talent, but pays off on character.

You come to understand that most people are neither for you nor against you, they are thinking about themselves. You learn that no matter how hard you try to please, some people in this world are not going to love you, a lesson that is at first troubling and then really quite relaxing.

Those are things that are hard to learn early in life, As a rule you have to have picked up some mileage and some dents in your fenders before you understand. As Norman Douglas said “There are some things you can’t learn from others. You have to pass through the fire.’

You come to terms with yourself. You finally grasp what S. N. Behrman meant when he said “At the end of every road you meet yourself.” You may not get rid of all of your hang-ups, but you learn to control them to the point that you can function productively and not hurt others.

You learn the arts of mutual dependence, meeting the needs of loved ones and letting yourself need them. You can even be unaffected — a quality that often takes years to acquire. You can achieve the simplicity that lies beyond sophistication.

You come to understand your impact on others. It's interesting that even in the first year of life you learn the impact that a variety of others have on you, but as late as middle age many people have a very imperfect understanding of the impact they themselves have on others. The hostile person keeps asking 'Why are people so hard to get along with?" In some measure we create our own environment. You may not yet grasp the power of that truth to change your life.

Of course failures are a part of the story too. Everyone fails, Joe Louis said "Everyone has to figure to get beat some time." The question isn't did you fail but did you pick yourself up and move ahead? And there is one other little question: 'Did you collaborate in your own defeat?" A lot of people do. Learn not to.

One of the enemies of sound, lifelong motivation is a rather childish conception we have of the kind of concrete, describable goal toward which all of our efforts drive us. We want to believe that there is a point at which we can feel that we have arrived. We want a scoring system that tells us when we've piled up enough points to count ourselves successful.

So you scramble and sweat and climb to reach what you thought was the goal. When you get to the top you stand up and look around and chances are you feel a little empty. Maybe more than a little empty.

You wonder whether you climbed the wrong mountain.

But life isn't a mountain that has a summit, Nor is it — as some suppose — a riddle that has an answer. Nor a game that has a final score.

Life is an endless unfolding, and if we wish it to be, an endless process of self-discovery, an endless and unpredictable dialogue between our own potentialities and the life situations in which we find ourselves. By potentialities I mean not just intellectual gifts but the full range of one's capacities for learning, sensing, wondering, understanding, loving and aspiring.

Perhaps you imagine that by age 35 or 45 or even 33 you have explored those potentialities pretty fully. Don't kid yourself!

The thing you have to understand is that the capacities you actually develop to the full come out as the result of an interplay between you and life's challenges –and the challenges keep changing. Life pulls things out of you.

There's something I know about you that you may or may not know about yourself. You have within you more resources of energy than have ever been tapped, more talent than has ever been exploited, more strength than has ever been tested, more to give than you have ever given.

You know about some of the gifts that you have left undeveloped. Would you believe that you have gifts and possibilities you don't even know about? It's true. We are just beginning to recognize how even those who have had every advantage and opportunity unconsciously put a ceiling on their own growth, underestimate their potentialities or hide from the risk that growth involves.

Now I've discussed renewal at some length, but it isn't possible to talk about renewal without touching on the subject of motivation. Someone defined horse sense as the good judgment horses have that prevents them from betting on people. But we have to bet on people — and I place my bets more often on high motivation than on any other quality except judgment. There is no perfection of techniques that will substitute for the lift of spirit and heightened performance that comes from strong motivation, The world is moved by highly motivated people, by enthusiasts, by men and women who want something very much or believe very much.

I'm not talking about anything as narrow as ambition. After all, ambition eventually wears out and probably should. But you can keep your zest until the day you die. If I may offer you a simple maxim, "Be interesting," Everyone wants to be interesting — but the vitalizing thing is to be interested. Keep a sense of curiosity. Discover new things. Care. Risk failure. Reach out.

The nature of one's personal commitments is a powerful element in renewal, so let me say a word on that subject.

I once lived in a house where I could look out a window as I worked at my desk and observe a small herd of cattle browsing in a neighboring field. And I was struck with a thought that must have occurred to the earliest herdsmen tens of thousands of years ago. You never get the impression that a cow is about to have a nervous breakdown. Or is puzzling about the meaning of life.

Humans have never mastered that kind of complacency. We are worriers and puzzlers, and we want meaning in our lives. I'm not speaking idealistically; I'm stating a plainly observable fact about men and women. It's a rare person who can go through life like a homeless alley cat, living from day to day, taking its pleasures where it can and dying unnoticed.

That isn't to say that we haven't all known a few alley cats. But it isn't the norm. It just isn't the

way we're built.

As Robert Louis Stevenson said, "Old or young, we're on our last cruise." We want it to mean something.

For many this life is a vale of tears; for no one is it free of pain. But we are so designed that we can cope with it if we can live in some context of meaning. Given that powerful help, we can draw on the deep springs of the human spirit, to see our suffering in the framework of all human suffering, to accept the gifts of life with thanks and endure life's indignities with dignity.

In the stable periods of history, meaning was supplied in the context of a coherent communities and traditionally prescribed patterns of culture. Today you can't count on any such heritage. You have to build meaning into your life, and you build it through your commitments — whether to your religion, to an ethical order as you conceive it, to your life's work, to loved ones, to your fellow humans. Young people run around searching for identity, but it isn't handed out free any more — not in this transient, rootless, pluralistic society. Your identity is what you've committed yourself to.

It may just mean doing a better job at whatever you're doing. There are men and women who make the world better just by being the kind of people they are –and that too is a kind of commitment. They have the gift of kindness or courage or loyalty or integrity. It matters very little whether they're behind the wheel of a truck or running a country store or bringing up a family.

I must pause to say a word about my statement "There are men and women who make the world better just by being the kind of people they are." I first wrote the sentence some years ago and it has been widely quoted. One day I was looking through a mail order gift catalogue and it included some small ornamental bronze plaques with brief sayings on them, and one of the sayings was the one I just read to you, with my name as author. Well I was so overcome by the idea of a sentence of mine being cast in bronze that I ordered it, but then couldn't figure out what in the world to do with it. I finally sent it to a friend.

We tend to think of youth and the active middle years as the years of commitment. As you get a little older, you're told you've earned the right to think about yourself. But that's a deadly prescription! People of every age need commitments beyond the self, need the meaning that commitments provide. Self-preoccupation is a prison, as every self-absorbed person finally knows. Commitments to larger purposes can get you out of prison.

Another significant ingredient in motivation is one's attitude toward the future. Optimism is unfashionable today, particularly among intellectuals. Everyone makes fun of it. Someone said "Pessimists got that way by financing optimists." But I am not pessimistic and I advise you not to be. As the fellow said, "I'd be a pessimist but it would never work."

I can tell you that for renewal, a tough-minded optimism is best. The future is not shaped by people who don't really believe in the future. Men and women of vitality have always been prepared to bet their futures, even their lives, on ventures of unknown outcome. If they had all looked before they leaped, we would still be crouched in caves sketching animal pictures on the wall,

But I did say tough-minded optimism. High hopes that are dashed by the first failure are precisely what we don't need. We have to believe in ourselves, but we mustn't suppose that the path will be easy, it's tough. Life is painful, and rain falls on the just, and Mr. Churchill was not being a pessimist when he said "I have nothing to offer, but blood, toil, tears and sweat." He had a great deal more to offer, but as a good leader he was saying it wasn't going to be easy, and he was also saying something that all great leaders say constantly — that failure is simply a reason to strengthen resolve.

We cannot dream of a Utopia in which all arrangements are ideal and everyone is flawless. Life is tumultuous — an endless losing and regaining of balance, a continuous struggle, never an assured victory.

Nothing is ever finally safe. Every important battle is fought and re-fought. We need to develop a resilient, indomitable morale that enables us to face those realities and still strive with every ounce of energy to prevail. You may wonder if such a struggle — endless and of uncertain outcome — isn't more than humans can bear. But all of history suggests that the human spirit is well fitted to cope with just that kind of world.

Remember I mentioned earlier the myth that learning is for young people. I want to give you some examples, In a piece I wrote for Reader's Digest not long ago, I gave what seemed to me a particularly interesting true example of renewal. The man in question was 53 years old. Most of his adult life had been a losing struggle against debt and misfortune. In military service he received a battlefield injury that denied him the use of his left arm. And he was seized and held in captivity for five years. Later he held two government jobs, succeeding at neither. At 53 he was in prison — and not for the first time. There in prison, he decided to write a book, driven by Heaven

knows what motive — boredom, the hope of gain, emotional release, creative impulse, who can say? And the book turned out to be one of the greatest ever written, a book that has enthralled the world for ever 350 years. The prisoner was Cervantes; the book: Don Quixote.

Another example was Pope John XXIII, a serious man who found a lot to laugh about. The son of peasant farmers, he once said "In Italy there are three roads to poverty — drinking, gambling and fanning. My family chose the slowest of the three." When someone asked him how many people worked in the Vatican he said "Oh, about half." He was 76 years old when he was elected Pope. Through a lifetime in the bureaucracy, the spark of spirit and imagination had remained undimmed, and when he reached the top he launched the most vigorous renewal that the Church has known in this century.

Still another example is Winston Churchill. At age 25, as a correspondent in the Boer War he became a prisoner of war and his dramatic escape made him a national hero. Elected to Parliament at 26, he performed brilliantly, held high cabinet posts with distinction and at 37 became First Lord of the Admiralty. Then he was discredited, unjustly, I believe, by the Dardanelles expedition — the defeat at Gallipoli– and lost his admiralty post. There followed 24 years of ups and downs. All too often the verdict on him was "Brilliant but erratic…not steady, not dependable." He had only himself to blame. A friend described him as a man who jaywalked through life. He was 66 before his moment of flowering came. Someone said "It's all right to be a late bloomer if you don't miss the flower show." Churchill didn't miss it.

Well, I won't give you any more examples. From those I've given I hope it's clear to you that the door of opportunity doesn't really close as long as you're reasonably healthy. And I don't just mean opportunity for high status, but opportunity to grow and enrich your life in every dimension. You just don't know what's ahead for you. And remember the words on the bronze plaque "Some men and women make the world better just by being the kind of people they are." To be that kind of person would be worth all the years of living and learning.

Many years ago I concluded a speech with a paragraph on the meaning in life. The speech was reprinted over the years, and 15 years later that final paragraph came back to me in a rather dramatic way, really a heartbreaking way.

A man wrote to me from Colorado saying that his 20 year-old daughter had been killed in an auto accident some weeks before and that she was carrying in her billfold a paragraph from a speech

of mine. He said he was grateful because the paragraph — and the fact that she kept it close to her — told him something he might not otherwise have known about her values and concerns. I can't imagine where or how she came across the paragraph, but here it is:

"Meaning is not something you stumble across, like the answer to a riddle or the prize in a treasure hunt. Meaning is something you build into your life. You build it out of your own past, out of your affections and loyalties, out of the experience of humankind as it is passed on to you, out of your own talent and understanding, out of the things you believe in, out of the things and people you love, out of the values for which you are willing to sacrifice something. The ingredients are there. You are the only one who can put them together into that unique pattern that will be your life. Let it be a life that has dignity and meaning for you. If it does, then the particular balance of success or failure is of less account."

"Runnin' Down a Dream: How to Succeed and Thrive in a Career You Love"

delivered by **BILL GURLEY**

This speech was originally delivered at the McCombs School at the University of Texas by Bill Gurley, a venture capitalist at Benchmark Capital. You can watch the speech **here**.

Thanks for having me. Believe it or not, I've been thinking about giving this particular presentation for about a decade. I've been talking to the administration. I was inspired after studying the stories of three people that you might call luminaries. They were probably heroes of mine when I read about them, and I noticed an overlap of pattern amongst them. That's what I'm here to talk about.

Now, how many people in the room have heard of the phrase Dream Job? Raise your hand. All right, everybody has heard the phrase, so you know what it means. It means chasing a career where you just have immense passion. My partner Kevin Harvey has a phrase that I love, and he says, "Life is a use or lose it proposition." For most humans, they take one career path. If you've only got one shot, and then it's all over why not do what makes you most happy?

By the way, one of the reasons this is the audience, and I want to thank you for being here, this is the audience I wanted to do this presentation to first because I think coming to an MBA program is this amazingly unique opportunity you have. You've had your undergrad degree. You've worked a little bit, and now you have this chance to go do whatever you want. It's an amazing pivot point. For me, you're the opportune audience for this, and, obviously, I wanted to come back to Texas to do it. Thanks for having me.

What I'm going to do first is I'm going to start by telling three stories of these luminaries, and then after that I'm going to walk through five guidelines that I've inferred from what they did. Then there's some special stories at the end as well. I'm going to start in Orville, Ohio. Anyone know what company was founded in Orville in 1897? I'll give you 20 bucks if anybody knows, Smucker's. That has nothing to do with this presentation.

The first gentleman I'm talking about is a guy named Robert Montgomery that grew up in Orville. This is in 1940, and this is what the town looked like when he did. He attended Orville High School where he was a three-sport letter man, baseball, football, basketball. He was lucky enough one of his neighbors knew the coach, Fred Taylor at Ohio State, and he was able to get a spot on a really good basketball team. This is Robert, number 24. He's a point guard. That's him peering into the huddle. That's Fred Taylor, the coach of Ohio State at the time.

Robert wasn't a starter. He came off the bench, and he didn't get a ton of minutes, but this team had John Havlicek and John Cuzzie. His sophomore year they won the national championship. They played in the national championship his junior and senior year. Those two players that I mentioned went onto the NBA, and Robert went into coaching. He spent his first year as a JV coach at a high school, and then finagled his way onto the staff at Army. At 22, he was an assistant at Army, the Black Knights. They played here in Gillis Field House.

When he was 24 the head coach retired, and he begged for the job. This is him signing the contract. At 24, he became head coach of a D-1 school. Now, what ended up making Robert successful, from my point of view, isn't what happened inside the four walls of the gym where they practiced every day. It's what he did outside. In the first five years of his coaching career he befriended five of the top basketball minds on the East Coast. This is Red Auerbach, so Havlicek went to Boston, and Red was the coach at the time. He was able to build a relationship through that.

This is Joe Lapchick. Clair Bee coached at Long Island University and has the best record of any

coach in the Basketball Hall of Fame. Robert met Clair when he was 25. When he was 27, Robert drove Clair to Clair's induction into the Basketball Hall of Fame and sat next to him. The next one is Henry Iba. He coached 36 years at Oklahoma State and was, at the time, probably one of the most successful basketball coaches of all time. That's Evert Dean from Indiana, and he met all of them and became friends. Two of them Lapchick and Iba, he just went to a coaches' luncheon where he knew they were going to be, and he begged, he said,"Can I sit next to you?" That's how he met both of them. Then he kept following up and hanging out.

A year later he met Pete Newell. Pete was the greatest basketball mind on the West Coast at the time. They became fast friends. Years later Pete would induct Robert into the Basketball Hall of Fame. He didn't limit his peer network to basketball coaches. He met football coaches as well. This was the coach of the Cincinnati Bengals, Bo Schembechler, who would go on to coach at Michigan, was his assistant on the basketball team at Army. He met Bill Parcells around the same time, way before Bill became a star in the National League. Then Doc Counsilman was the long-time swimming coach at Indiana, and also someone that Robert became friends with.

Now, I'm using the name Robert to obscure things a little bit. I'm talking about Bobby Knight. At age 31 Bobby Knight became head coach at Indiana University. Five years later at 36 they went undefeated, both in the regular season and the post season, and won the national championship. That's never been repeated since in over four decades. At Indiana, he would win three national championships, four coach of the year awards, 11 Big 10 titles, and when he retired he had 902 victories, the most of any coach at the time. As I said, Pete Newell inducted Bobby into the Hall of Fame.

I'm going to move onto the next story, and then I'll circle back, and you'll see where I'm going. Now I'm going to start in Hibbing, Minnesota. This is about two or three hours north of Minnesota. Another Robert, Robert Zimmerman, grew up in Hibbing. That's what Hibbing looked like when he was young. Even though it's pretty far north in Minnesota, there's a bit of an urban environment. Robert loved music, and in this early photo he's got a drum. He got a guitar when he was 10 years old, and by high school was playing in a band regularly. They used to cover Elvis and Little Richard. His yearbook says that he's likely to join Little Richard. That didn't happen.

What happened was he went to the University of Minnesota. He didn't go to class. He was hanging out in this place called Dinky Town, which is this photo right here. At the time, and this is late 50s, early 60s, there's a lot of new stuff happening. Even though he grew up playing rock and

roll, he fell in love with folk music. Over, I would say, eight or nine months he studied every folk album he possibly could. He didn't have a lot of money. Back in the time you could walk into a record store and listen in a booth. He would do that for hours and hours and hours. He became friends with people that also liked folk music, but had money. He would go to their house and listen to their record collection. He's even accused of having "borrowed" their records and not returned them, which is a point of controversy even still today.

The next thing that happened, I think, is one of the most ambitious actions anyone that I know has taken to pursue their dream job. He hitch-hiked from Minneapolis to New York City. He had a guitar, a suitcase and $10, and it's 1,200 miles. If you ask him today why he did it, he'll talk a little bit about chasing the performers, so this is Dave Van Ronk, Peggy Seeger, the New Lost City Ramblers, these were people he was listening to in Minnesota, but these people were in New York City, and so he wanted to see them.

There was really one person he wanted to see, which is Woody Guthrie. Woody Guthrie had become his hero. If you just go to Wikipedia, once you find out who this is, if you don't know already, he went to New York to find Woody Guthrie. That was his pursuit because he had come to have this affection and love for the way Woody played, and he wanted to know everything he possibly could about it.

He went to New York. He found Woody Guthrie. He used to perform for him. Then he started hanging out at these three venues, the Café Wha?, The Gaslight Café and Gerde's Folk City. This was the epicenter of folk music at the time, and he would sit in each of these venues for hours upon hours and study what the other artists were doing. Years later Liam Clancy would say, "He could perform any one of our songs like us, including tonality, tempo, everything," so he was a mimic. He was studying, studying, studying. He got a big break. He was asked to open for John Lee Hooker at Gerde's one day, and his career got started.

This gentleman is Joe Hammond. He was the producer for Aretha Franklin, Billie Holiday, Count Basie. One day he walked in and found this gentleman, 1961. I think he's 22, 23, something like that. The next year Robert Zimmerman changes his name to Bob Dylan. John releases the first album. The album does okay. In '63 they released The Freewheelin' Bob Dylan. This album goes to number 22 in the U.S. and number one in the UK. From there everything was off and to the races. In '63 he performed at the march on Washington with Joan Baez where Martin Luther King spoke his famous speech. A year later he performed for the first time with Johnny Cash,

another one of his heroes. Johnny gave him a guitar and asked if he could record several of his song. Johnny asked Bob if he could record his songs, which he did.

The rest is history, as they say, 100 million albums sold, 11 Grammys, an Oscar, an Emmy. He was introduced into the Rock and Roll Hall of Fame, and then he took it to a whole new level, a Kennedy Center Award with Clinton, Barack Obama gave him a Medal of Freedom, and then he topped it off with something that's never been done. He won the Nobel Prize in literature. The only musician ever to be given such an award. That happened two years ago, amazing story.

All right, this one you won't know as well, but it's equally inspiring. Saint Louis, Missouri, the person this time is named Daniel. He grew up in Saint Louis. His father was an intelligence officer in the military, and moved around Europe quite a bit. After the war ended his father became a travel agent, and his mother worked with him, and so they traveled quite a bit. Now, because they were travel agents his mom told him he had to journal everything, so he was forced to go on vacation and take notes. He wasn't that interested in travel, but he loved food. When he went back and looked at all the journal notes he had always taken, they were always about the food they were eating wherever they were. He started to associate different places with the food that he went to.

He went to John Boroughs High School in Saint Louis. Ended up at Trinity College in Connecticut where he would spend every weekend in New York City eating food because that's what he was passionate about. He got a poly-sci major. He went and work on a campaign for a year, wasn't that interesting to him, so he went back to New York. Robert Zimmerman was chasing folk music, Danny was chasing food. His personal life was all about what he could do, and going to different restaurants and exploring.

He went to work for Check Point. They make those things that you attach to clothes in the store so that when you walk out the beeper goes off. This was early in Check Point's life. He did incredibly well there, and within a year was making 125K a year as a salesman, which, he spent the most of it on food in New York City. One night he was out to eat with his uncle and his aunt and his grandmother at Elio's, a restaurant that's open.

He told him that he was studying for the LSAT. He was going to take the LSAT next year and go up his career ladder again and become a lawyer, to which his uncle replied, "Will you just stop it? Why don't you go open a restaurant? You know that's what you're supposed to do." Caught him

a little off-guard, but woke him up. The next day he took the LSAT. He never sent the scores to a single school. Never applied to a single school. He quit his job as a salesman, and went to work at a restaurant called Pesca in the front office for $12,500 a year, so he took a 10x salary reduction.

The reason he chose Pesca is there was a chef there, an up-and-coming chef called Michael Romano. He wanted to be around this gentleman. He would work during the day in the front office, and then at night he'd beg to do the slop work in the kitchen just so he could get exposure to what was happening there. He was also taking a wine class at night, and he met this gentleman who happened to be the head or one of the top restaurant critics for the New York Times. They started hanging out together and going to different restaurants and talking and learning.

He did something really interesting. He made a list of 12 icons in the restaurant industry. These were new people that were doing innovative things around opening new high-end restaurants. Wolfgang Puck is the first one, but there were 12 different. A lot of these people are on celebrity chef shows today. He started studying them. He created a notebook for each and every one of them, what makes them special, what do they do unique? He started looking at their recipes.

Then he got even bolder and decided to go to Europe. He took every single one of the connections he had, both in the restaurant industry and the travel industry through his parents, plus when he was at Trinity he would go do tours in Europe for his parents, and so he had a lot of connections, and he did this. Now, I just had to look this up for the presentation. It's a stagiaire, which I think is a fancy French word for, "I'll work in a restaurant for free," because that's what he did. One of the restaurants that he worked in he had to pay $500 a month, which I ran the math, and that's equal to a negative 25 thousand K a year salary. He's gone from making 125 to 12, to now he's upside down 25.

What he does is what you think he would do. He studies, so in each and every one of these places, each and every one of these restaurants he's watching the chef. He's watching the recipes. He goes on the sourcing trips to see how they pick food out of markets or from different fish markets. He just takes tons of notes. He looks at the décor, he looks at the wine list. On the way home from this nine-month journey he said it took the entire eight and a half hour flight just to organize the notes.

When he gets back to New York he'll spend another six or seven months searching a hundred locations to find the very best location to launch his first restaurant. He's 27 years old when he

opened his Union Square Café. This is Danny Meyer for those of you that might know who he is. I love this quote. He's most proud of the studying he did on his own, not the studying that he did at Trinity College. He viewed this as the best work he had ever done as a student. Union Square Café is still open today, 11 times Zagat has said it's the very best restaurant in New York. Danny Meyer would go on to launch 16 high-end restaurants in New York City, four have won Michelin Stars. He is the undisputed king of high-end restaurants in New York City, but he wasn't done.

A lot of these restaurants, Danny would open in areas that needed re-gentrification. He had a philosophy that if he could build a restaurant it could become the bespoke place that people go, and then the community would evolve, that he would get a lift alongside that. He, typically, would look for areas that were on the rise, but needed help. One area that needed a lot of help was Madison Square Park, which wasn't far from Union Square. He and a bunch of other business people helped launch the Madison Square Conservancy that rebuilt the park. A few years after that happened they started improving the park. There was a decision made to allow there to be a restaurant in the center of the park. He applied, got the bid, and won. That was the location of the first Shake Shack.

A while later I'm going to go through something so you'll see the work that went into launching the first Shake Shack. If you go to the first Shake Shack, it doesn't look like this. If you want to eat it looks like this when it's open. There's always a line. I got to know Danny on the Open Table board. We worked together for over a decade, and he used to tell me I had to keep it a secret, but that this single venue made way-more profit than any of the white table cloth restaurants that he owned. Of course, fast-forward today. There's 190 Shake Shacks around the world. 2015 they took Shake Shack public on the NYSC, and it's now worth 2.2 billion. I think there's one here in Austin, correct?

These were the three stories. I had read them all independently, and I noticed that there was a similar strain that was running through each and every one of these stories. Now I've organized that, and I want to talk to you about it. The first one is the one that I can provide the least amount of help with you about because I don't know what your passions are. My first piece of advice would be to find your passion. Pick a profession in which you have a deep, personal interest.

There's nothing that's going to make you be more successful than if you love doing what you're doing because you're going to work harder than anybody else because it's going to feel like work. It's going to feel like fun. I think this is the most important decision you can possibly make in

a career, is to make sure you have immense passion for what you're doing. This should be your personal passion, not your parents, not your sister's, not your family generation of expectation. It needs to be something that you're doing on your own. It might be that your passionate about the same thing as your parents. You don't have to run from them, but you need to know that this is something you're doing on your own.

Then, I also mention status and compensation. There are a lot of high-profile careers that make a lot of money, and they're generally perceived to be areas where successful people go. If you run at those things and don't have a passion for them you're going to burn out eventually. It's not going to be where you want to be. The last point is just you can't fake it. Somebody else sitting in some other MBA program has a deep passion for whatever career path you're going down, and they're going to smoke you if you don't have it yourself.

This is one of my favorite quotes from Bobby Knight. He says, "Everybody has the will to win. People don't have the will to practice." I think this is the test for whether or not you're actually pursuing your dream job, which is the essence of it that would be considered studying or work or practice, do you enjoy that part? Do you enjoy the preparation? Everybody enjoys winning. Do you enjoy the preparation?

The second of the five guidelines I'd have for you is hone your craft constantly. It's extremely important to be obsessive about understanding everything you possibly can about your craft. Consider it an obligation. Hold yourself accountable. That requires you to keep learning over time. Study the history, know the pioneers. It's the bedrock foundation for what you're going to build upon, and it will help you in networking that you're able to talk the language of the people that came before you.

Strive to know more than everyone else about your particular craft. That can be in a subgroup. What do I mean by that? Let's say you love E-sports. Let's just say you've decided multiplayer gaming E-sports, like, this is it for you. You grew up gaming, "I love it." All right? Within the first six months of being in this program you should be the most knowledgeable person at McCombs in E-sports. That's doable. You should be able to do that. Then, by the end of your first year you should be top five of all MBA students, and, hopefully, when you exit your second year you're number one of any MBA student out there. It doesn't mean you're the best E-sports person in the world, but you've separated yourself from everyone else that's out there. I can't make you the smartest or the brightest, but it's quite doable to be the most knowledgeable. It's possible to gather

more information than somebody else, especially today.

Then, lastly, and this is a bit of a caveat, depending on what it is that you're chasing, you might want to go to where the epicenter is. The reason is there's just more networking available there if that's where the great people are. The next two bullet points will tie into that. This is an interesting story from Bobby Knight's biography. His second time he met with Pete Newell he walked into the room. This guy's like 32, Pete Newell is one of the most famous basketball coaches ever. He walks into the room with 74 plays diagrammed on three by five cards, sits down in the middle of the floor and says, "Hey, Pete, come go through these with me." I don't know if it's audacious or brilliant or what, but some people would consider that over-the-top, but to get the number one mentor you can possibly find and make them go through that amount of tedious work, but he did it. Pete did it. They both learned from it, which is interesting.

These quotes from the movie "No Direction Home", Martin Scorsese did against Dylan, really highlight the point that I'm trying to drive home to you. Most people would think, "Eh, Bob Dylan, folk singer. Probably just had the DNA, or got lucky or something." He was studying. He used the word, "I'm a musical expeditionary." I looked up expeditionary. An expedition is to travel for scientific research or exploration. That's what Dylan was doing. There was no one that knew more about folk music than he did when he broke out. He knew more than anybody. Another guy in Minneapolis that knew him called him a sponge. Then this, "There's a ruthlessness in the way Dylan finds sources, uses them and moves on," constantly gathering information and putting it into his own repertoire.

I'm going to read from Danny's book for you because I want to drive home this point of studying. You can see I'm a huge fan of Danny. I've got all these markers here. He's one of the most genuine humans I've ever met. He has a restaurant in New York called Blue Smoke, which is actually a barbecue place. When they were thinking about launching that he says, "In the barbecue, within the 35 mile radius of Austin and the Texas hill country lie five towns I revere. Each with a distinctly different style of barbecue. The elements of barbecue are limited, ribs, brisket, pulled pork, chop mince pork, sausage, chicken, coleslaw, beans and a handful of sides, but it's become an American culinary language with thousands of dialects and accents. I tried to understand each variation.

During one 36 hour road trip through North Carolina I tasted 14 variations on chopped pork, each defined by subtle and dramatic differences in texture, the degree and type of smoke used,

the amount of tomato or vinegar in the sauce, how much heat was applied to the meat and how well or how much or how little crackling got chopped up and tossed in." That's the level of detail he thinks about food.

I really like this one because it has to do with Shake Shack, but, "As soon as we won the bid Richard Corrine, my most enthusiastic researcher of road food, and I set off to study burger and shake stands all over the country. We started out, of course, at Ted Drew's Steak and Shake in Saint Lewis," which he grew up eating. "Continued on to Kansas City, and individually made stops in Michigan, Culver's, Los Angeles, In-N-Out Burger, Napa, Taylor's Automatic Refreshers, Chicago, Gold Coast Dogs, plus eight other establishments. Connecticut," and he names three or four. "Always in search of the best of breed." That's how they did research for Shake Shack. I think it drives home this point of like understand more than anybody else.

This is a bit of an aside. Does anybody know this painting? This is a painting called First Communion. It was painted by Pablo Picasso when he was 15 years old. Most people, I think, are brought up, and they're told about Picasso in their first art class. You look at these cubism pictures, and someone will say, "Oh, a seven year old could do that." What they don't know that Picasso was a trained classic artist and had mastered it by the time he was 15. He had spent time studying the way you would if you had set out to be the greatest painter in the world, and that's why I made this statement, "Greatness isn't random, it's earned." If you're going to research something, this is your lucky day. Information is freely available on the internet. That's the good news. The bad news is you have zero excuse for not being the most knowledgeable in any subject you want because it's right there at your fingertip, and it's free, which is excellent.

Three: Develop mentors in your field. I don't know if any of you will ever dare to be as aggressive as Dylan, hitch-hiking 1,200 miles to find your mentor, but that might be the type of attitude you want to think about in the back of your mind as you pursue mentors. Take every chance you can to find somebody who can teach you about the field you want to excel in. You can work your way up the stack. You don't have to jump straight to the top on day one. Treat them with respect. Debate things, learn from them. Document what you hear, share it with others. Try to get these mentors interested in you and your own development. How do you do this? Send them notes. Tell them when you use their advice to be successful. Send them gifts when you have accomplishments. Get them bought in. One of the reason American Idol works because you start voting or cheering for somebody, and not all of a sudden you feel like you're part of that process,

right? Get them to feel that way about your own success.

Then, on the mentor thing, never stop. You've got to keep on pursuing. I had the remarkable fortune this year in my 20th year as an investor to meet Stan Druckenmiller and Howard Marks. They're two people I've admired for a very long time. I read everything that they write any time they speak. I got to sit down with both of them for a couple of hours and talk about investing. It was awesome. The things that they pushed on changed some of the actions that I'm taking today in my work.

I'd already walked you through these examples. Every one of these three luminaries had a mentor that was important to them. Funny story, last week when I was preparing for this presentation I was rereading Danny's book, and I went back to this notion when he was 25 and he made this list of people that he considered to be icons in the industry. I texted him and I said, "Danny, how many of those 12 icons have you ended up establishing a relationship with?" He sent me this emoji back. I was thrilled that he knew how to use emojis. He went on to tell me that four of them have become close, personal friends. I think it just documents this point I'm making about how searching for mentors and leaning on mentors is a never-ending task.

Four: Embrace peers in your field. Develop a relationship with them. Have discussions. Have arguments. This is a way you learn. This is a way that ideas get shared. This is a way you hone and innovate ideas. This is one thing I wish someone had told me. When I got to MBA school everybody said, "Network, network, network," and I thought it was a social activity. I thought they were telling me, "Oh, you need to develop your social skills," and they want me to randomly talk to people that I have no similar interests with. What I've come to realize is, no, it's not about that. It's about connecting with the people that you have the most overlap with because you'll be able to help each other along the way, along the journey.

Always share best practices and don't worry about giving any proprietary knowledge. It's a good trade. It's just smart. If you get caught in worrying about it, you're going to fail to advance. The activity of sharing with mentors and peers will lead to so many positive things that help you go up, that whatever the negative costs are aren't going to come anywhere close. Celebrate your peers' accomplishments as if they were your own. Cheer them, send them notes, be happy for them. That will come back to you in spades.

Then, lastly, peers don't need to be in your exact field. Bobby Knight had sat down with a swimming

coach and got knowledge. Some of the entrepreneurs I work with and CEOs find that it's more interesting to go to a conference on a topic that's a little bit far away because they get more innovative ideas that they can bring back to their field. It doesn't have to be this close. It can be spread out.

Now, most of you know that this is the way you're supposed to network online, and you should certainly have a LinkedIn profile, and you should certainly connect with people. I'll give you one piece of advice, which is, I'd be a little stingy with who you link to. I have a rule where I only want to link to people that I would call and trust their advice because then when I'm searching for a candidate that I want a reference on or something I don't get random answers. I get people that I know I'm going to use. I think people over proliferate their LinkedIn account.

But, and for those of you who were here yesterday, I think there is a much more incredible resource, not an alternative, you should do this and Twitter. Twitter is the most amazing networking and learning network ever built. For someone that's pursuing their dream job or chasing a group of mentors or peers it's remarkable. In any given field 50% to 80% of the top experts in that field are in Twitter, and they're sharing ideas, and you can connect to them and follow them in your personal feed. If you get lucky enough and say something they find interesting they might follow you. The reason this becomes super-interesting is that unlocks direct message. Now all of a sudden you can communicate directly electronically whenever you want with that individual, very, very powerful. If you're not using Twitter you're missing out. I don't even own any shares anymore.

Last one, this should be obvious to people, but always give the majority of the credit to the other people that helped you up along the way. One, it's the right thing do to, and, two, it'll keep you from being an asshole when you're successful. I find all the greats do it. It's the right thing to do. Send letters, send gifts, anytime you accomplish something in your career take the time to send messages back to the people that helped you.

I'll tell you a personal story that's quite serious that'll help reinforce this. My favorite professor when I was here was Jim Fredrickson who, many of you know, passed away this year. Along the way along my journey three or four times I took the time to write him a letter, send him a note, send him a gift and tell him what an impact he had had on me. When he passed I didn't have all this anxiety like, "Oh, I didn't get a chance to tell him." I took the chances to tell him, and I would encourage you guys to do that type of stuff along the way.

Then, lastly, eventually you've got to pay it back. You become the mentor, people start reaching out to you. Make sure you take the time. Here are a few examples of that. This is Bobby Knight. Shortly after one of his sessions with Pete Newell and the next year Indiana's playing one of Pete's teams. They end up in a tournament together. Bobby uses the stuff that Pete taught him and beats Pete on the field. He recalled that notion in the book, and he said, "You know, if Pete was willing to do that for me, I've got to do it for everybody else."

Let me show you statistically a little bit of the impact of what Bobby did later in his career. This is from Wikipedia. These are Bobby's former players that are coaching either D-1 or NBA, and this is his former coaches that are coaching D-1 or NBA. It's an immense legacy of people that he developed that went on to be successful. If any deep, deep basketball fans in the room they know that his point guard at Army was none other Mike Krzyzewski, who is one of two people that have now passed him on career wins, 902. Krzyzewski asked Bobby Knight to induct him into the Hall of Fame, which is a moving video you can go watch on YouTube if you're interested.

This is Danny. He's probably the most wonderful human, or certainly one of the most wonderful humans I've ever met in my life. He talks here about graciousness. It's evident in every single thing that he does, how he talks to people, how he treats his staff. His book is worth reading, if you get a chance. As you can see, I'm a huge fan.

Now I'm going to tell you two more stories, if we have time. The reason, once again, that I wanted to talk to an MBA class is because an MBA degree, and when you're here, is an opportune time to chase your dream job. The next two stories I'm going to tell you are more contemporary. They both involve using an MBA program as a way to pivot into success.

Now we're in Marlow, Oklahoma. All these are in the Midwest. Sam is my next contestant. Sam grew up in Marlow. His father worked at Halliburton, which is in Duncan, a little bitty town right near. He went to Marlow High School where he also was a multi-sport athlete. Unfortunately, he was five-nine and 140, so he didn't get to keep playing in college. I'm about to show you the university he attended, and you'll know what to do. There we go. Okay, perfect. He went to the University of Oklahoma, ended up going to Bane. I think he actually worked anybody Bane Capital. He was pursuing his career path like he thought he was supposed to. They relocated in Sydney.

He's sitting in one of these high-rises overlooking the Sydney Opera House, and he hears about

this book, Money Ball by Michael Lewis. He reads it in three days. He can't get it out of his head. It's consumed him. He decides immediately, not unlike Danny, in the restaurant that this is what he has to do. He starts applying to business schools. He gets accepted at Harvard and Stanford. In deciding which one he's going to go to he goes and he asks for tons of meetings with the schools, and he tells him what he's going to do, "I'm going to get a job in sports analytics, come hell or high water." He claims Harvard looks at him like he's crazy. The Stanford staff says, "Come on. That'd be awesome. We want to introduce you to everyone that we know."

He shows up at Stanford Graduate School of Business. Lo and behold, they have a sports management class. Lo and behold, Billy Bean from the Oakland A's and the Money Ball book is speaking his first semester. He gets to know Billy Bean. Billy Bean introduces him to Michael Lewis. They start spending time together. Michael lives in Oakland. The school lets him get to know people at the Niner's organization, and at several sports organizations all over the country. He combines it with hard work. He says he sent a hundred letters out to get summer interns. He ends up with one at the Texans. When he gets back from that Michael Lewis asks him to come over and talk football because he's working on the Blindside, so he helps Michael Lewis on the Blindside.

Eventually he gets a job with the Houston Rockets. He spent two and a half hours with Lex Alexander. Lex hires him at, I believe, 27 years old. Nine months later the Rockets hired Daryl Morey, and the two of them worked together for seven years, I think, and built the best basketball sports analytics department in the country. Daryl won executive of the year last year at the Rockets.

At age 35 Sam Hinkie's named general manager of the Philadelphia 76ers. This is, what, like nine years after he read Money Ball looking over the Sydney Opera House. For those of you that know the story, there's some good and some bad. Sam and Daryl had spent a lot of time studying the ways you could turn a program around. I've had long discussions with Daryl about it. It's fascinating the way they think through it. If you're in a particularly tough spot, the only way to do it is to shed your talent, improve your salary cap room, let your young players get tons of playing time, and win through the draft. Now, that's the plan Sam took, and like any good entrepreneur or business person he told all his constituents, "It's about the long-term, not the short-term. You've got to stay with me on this." He wrote tons of letters. He's very thoughtful. He's very smart.

That strategy led to three of the worst seasons in the history of the NBA, but it also led to the

drafting of Joel Embiid, who has become a close, personal friend of Sam's. Some of you may know the rest of the story. Eventually, the ownership got tired of this strategy and cut ties with Sam. About that exact same moment in time everything started getting better, and they started winning. There were a few fans that supported him along the way, and there were signs that are way worse than this one, "Now we're stinky, but I trust Hinkie."

Today, for those of you that know, Vegas has the Sixers as the number-two team in the East right now. This is Durant. I chose the Texas jersey on purpose instead of the Warriors, talking about how they're the team to watch. Barkley goes further. He says if they stay healthy this will be a team to watch for 10 years. Three years are bad, 10 years are good. That's a pretty good trade if you're willing to make it. Not everyone was able to make it. Sam now is, especially in basketball circles, I hope he never goes back to basketball because it'll be more legendary that way. This phrase, this meme is now an internet meme that's outside of basketball, but some of the players started using this phrase when they were losing games and people were upset, "Trust the process." No one used it more than Joel, and no one's a bigger fan of Hinkie's than Joel, which frustrates the ownership to no end. They're still missing a GM right now. They're having trouble finding one.

This is the new meme, which is a little more aspirational. During the draft when they drafted Ben Simmons there's a video on the web of a sports bar in Philly where they got everyone together for the draft. Before the draft they raised a banner of Hinkie and retired it. Joel won't stop, so this last year. Hinkie, I think, in a little bit of a jab, the Astros, for those of you who don't know, was also an analytics turnaround. When the Astros won last year Hinkie wrote, "I love it when a plan comes together." Then Joel threw both memes back, "Trust the process. He died for our sins." Then someone in Philly did this. This is a little over-the-top. You've got the resurrection with the players. I think it's an amazing story. One fun part about this, Sam's now back at Stanford. He's teaching two courses there. He may play two separate dream jobs. He's hanging out with startups, venture capitalist, and he may do it all over again, which I think is really cool.

All right, last one. This one's very near and dear to my heart. There's an executive I work with named Katrina Lake. She grew up in San Francisco, but she went to high school in Minnesota. I use the map of Minnesota so they could all be from the Midwest. I like that story better. This is the high school she went to. She went to Stanford, thought she was going to be premed, ended up not liking it very much, got an economics major. Went to work at a consulting firm called Parthenon. They had a number of clients in the retail and fashion space. She noticed that she had

an affection for that and started hanging around those clients and focusing on those clients.

While she was visiting those places she kept asking herself questions like, “Why does this work this way?” She told me she was in a department store, and she’s like, “Why are these clothes out here? Why isn’t there just like one here, and you press a button and then it’s put into your dressing room because you keep all the inventory in the back where you could stack it better?” She just kept saying, “Why? Why? Why? Why is this stuff organized this way?”

Finally, she decided, “I’m going to go do something about this,” and she came up with a notion of a company that would be a personal shopper for everybody. She didn’t quite know how to launch it, so she decided to use her MBA program as a way to launch it. She told me that she planned to graduate, but not a much higher bar from a classroom perspective, but she wanted to use the platform as a way to build a company.

She ended up at Harvard. The first thing she did was scoured LinkedIn and the alumni directory to find anybody that had anything to do with fashion. She was mostly interested in sourcing and merchandising because she didn’t have any knowledge there. She found all kind of contacts in New York. She made personal trips, asked for meetings, not unlike the other people that I’ve showed you.

Next, she found two founders that had launched startups. This is Joann from Trunk Club and Craig from Shop It To Me, in a similar space, but were a little different. She got them on the phone. She wanted to hear if what she was thinking about was different and better than what they had done because she wanted it to be different and better. There was a professor at Harvard that had run, had been CEO of a retail store named José Alvarez. She started writing drafts of what she wanted to do and got him to push back. At first, he was very skeptical, but she said the back and forth helped her and modified her plan quite a bit.

In the summer she went to, actually, a company we were invested in called Polyvore, which was a social fashion site where people aggregated likes on the web. Sukhinder Singh, who had run a huge chunk of the revenue at Google, was CEO there, so she built that relationship. She also got to study how fashion websites spend time with bloggers.

After graduating, she came to San Francisco to launch her company. She did two things that are miraculous for me from a mentoring standpoint. The first one is she found Eric Colson. He ran all of data science at Netflix. You remember the million dollar prize, all that stuff. That was

under Eric. He had recently retired from Netflix and was looking for something to inspire him, and she did. He became an advisor to the company. Marka Hansen was over 20 years at GAP in merchandising, marketing, same story. Katrina found her, Marka was very exited about helping Katrina. Marka's still on the board today. Marka would spend a day a week, a day a month in the early days at the company helping her almost the way an executive chairman would.

She then found two other people, John Fleming was CEO of Walmart.com. Julie Bornstein I worked with back at Nordstrom years ago. She was CMO at Sephora and hanging out in San Francisco. She put Julie on the board. Then a feat I've never seen before, she recruited Eric and Julie off the board and into the company. They both work there. Julie as COO and Eric as head of data analytics, where he is still today. The company has 95 data scientists at a fashion company.

This is her at the very beginning. She's trying to figure out exactly what they were going to do. For those of you that don't know how it works, Katrina Lake runs a company called Stitch Fix. You fill out a 15 page profile about yourself. You give a lot of information, way more information than any other retailer has on you. Then you press a button. A stylist looks at your profile and picks five items. The stylist is sitting in front of a dashboard. There's a keep score for every single item in our inventory for every single shopper that's out there, unique to that individual shopper. As you buy more the data science studies what you like, what you don't like, and that's how the system works.

I was lucky enough to become an investor in this company, even though it has inventory, has a lot of inventory. There's five warehouses today. Along the way as it was starting to succeed this article ran, which was a nice tie to the last one. Forbes called her, "Fashionista Money Ball." There are certainly elements that would cause that correlation. In her third year she went profitable. She only consumed 20 million dollars of venture capital in the company's life. When we went public there was 100 million in cash on the balance sheet. At year five she hit a billion in revenues.

At age 34 she became the youngest founder, CEO, female founder, CEO ever last fall when we took Stitch Fix public. That's me hiding in the back. I think one thing that really differentiates Katrina, if she were here today, she'd certainly be proud of this story, but I think she's more proud of how she's been able to use the platform to speak out on social change. This was an infographic that they released about a year ago. 31% of the engineers are female, 60% of the board, 62% of the management team and 86% of the entire org. She's not afraid to speak out on topics like this. When we did the bake-off for the IPO she insisted all the investment banks put their diversity

record at the front of the pitch deck, every single one of them that came in, and they all did.

These are the five profiles that I shared with you. I would highlight a couple of things about this. First of all, in the first three if I said to you, "Hey." You say, "I'm going to MBA school. I want to do something inspiring and have a great career." You wouldn't think I would mention opening a restaurant or being a basketball coach or a folk singer. Those aren't things you would say. Yet, it didn't stop these people from being successful.

The other thing that I would highlight is all five of them, I don't think a single one of them started what they're doing for money. In each and every story they were chasing a passion and a dream that allowed them to want to study, going back to Bobby Knight saying about having the will to practice. They all did it on their own. Danny uses a phrase, "Professional research," in his book constantly, which I think is an interesting phrase because most of us think about the studying and research we do around curriculum and a teacher. You don't think about if you're in finance or marketing or accounting, do you go home at night and study for yourself, like, to improve your own skillset? Most people don't do that. I think that's interesting.

For those of you who have decided your dream job is consulting, they say you've got to tell them what you're going to tell them, tell them, and then tell them what you told them, so this is for you. Pick a career about what you're passionate. Be obsessive about the learning. Lean on mentors, lean on peers. Give the credit to someone else, and pay it forward. For those into music, that like music, you know I stole the title of this speech from Tom Petty who, unfortunately, passed away this year. He was once asked what advice he'd have for people if he were giving it. While it's not as ambitious as what I've told you, it's almost the exact same thing on the exact same vector. I'll let you read that yourself. That's it. Thank you for allowing me to do that. I really appreciate it.

"The Common Denominator of Success"

delivered by ALBERT E.N. GRAY

Albert E. N. Gray was an official of the Prudential Insurance Company of America. This speech is an adaptation of one of the most well-received of his many speeches. It was originally delivered to the National Association of Life Underwriters at their annual convention in 1940.

Several years ago I was brought face to face with the very disturbing realization that I was trying to supervise and direct the efforts of a large number of men and women who were trying to achieve success, without knowing myself what the secret of success really was. And that, naturally, brought me face to face with the further realization that regardless of what other knowledge I might have brought to my job, I was definitely lacking in the most important knowledge of all.

Of course, like most of us. I have been brought up on the popular belief that the secret of success is hard work, but I had seen so many people work hard without succeeding and so many people succeed without working hard that I had become convinced that hard work was not the real secret even though in most cases it might be one of the requirements.

And so I set out on a voyage of discovery which carried me through biographies and autobiographies and all sorts of dissertations on success and the lives of successful individuals until I finally

reached the point at which I realized that the secret I was trying to discover lay not only in what individuals did, but also in what made them do it.

I realized further that the secret for which I was searching must not only apply to every definition of success, but since it must apply to everyone to whom it was offered it must also apply to everyone who had ever been successful. In short, I was looking for the common denominator of success. And because that is exactly what I was looking for, that is exactly what I found.

But this common denominator of success is so big, so powerful, and so vitally important to your future and mine that I'm not going to make a speech about it. I'm just going to "lay it on the line" in words of one syllable, so simple that everyone can understand them.

The common denominator of success – secret of success of every individual who has ever been successful – lies in the fact that he or she formed the habit of doing things that failures don't like to do.

It's just as true as it sounds and it's just as simple as it seems. You can hold it up to the light, you can put it to the acid test, and you can kick it around until it's worn out, but when you are all through with it, it will still be the common denominator of success, whether we like it or not.

It will still explain why some individuals have come into this business of ours with every apparent qualification for success and given us our most disappointing failures, while others have come in and achieved outstanding success in spite of many obvious handicaps. And since it will also explain your future, it would seem to be a mighty good idea for you to use it in determining just what sort of a future you are going to have. In other words, let's take this big, all-embracing secret and boil it down to fit the individual you.

If the secret of success lies in forming the habit of doing things that failures don't like to do, let's start the boiling-down process by determining what are the things that failures don't like to do. The things that failures don't like to do are the very things that you and I and other human beings, including successful people, naturally don't like to do. In other words, we've got to realize right from the start that success is something which is achieved by the minority of people, and is therefore unnatural and not to be achieved by following our natural likes and dislikes nor by being guided by our natural preferences and prejudices.

The things that failures don't like to do, in general, are too many and too obvious for us to discuss them here, and so, since our success is to be achieved in the sale of life insurance, let us move on to a discussion of the things that we as life insurance agents don't like to do. Here, too, the things we don't like to do are too many to permit of specific discussion, but I think they can all be disposed of by saying that they all emanate from one basic dislike peculiar to our type of selling. We don't like to call on people who don't want to see us and talk to them about something they don't want to talk about. Any reluctance to follow a prospecting program, to use prepared sales talks, to organize time and to organize effort are all caused by this one basic dislike.

Perhaps you have wondered what is behind this peculiar lack of welcome on the pan of our prospective buyers. Isn't it due to the fact that our prospects are human too? And isn't it true that average human beings are not big enough to buy life insurance of their own accord and are therefore prone to escape our efforts to make them bigger or persuade them to do something they don't want to do by striking at the most important weakness we possess; namely, our desire to be appreciated?

Perhaps you have been discouraged by a feeling that you were born subject to certain dislikes peculiar to you, with which the successful agents in our business are not afflicted. Perhaps you have wondered why it is that our biggest producers seem to like to do the things that you don't like to do.

They don't! And I think this is the most encouraging statement I have ever offered to a group of life insurance agents.

But if they don't like to do these things, then why do they do them? Because by doing the things they don't like to do, they can accomplish the things they want to accomplish. Successful people are influenced by the desire for pleasing results. Failures are influenced by the desire for pleasing methods and are included to be satisfied with such results as can be obtained by doing things they like to do.

Why are successful people able to do things they don't like to do while failures are not? Because successful people have a purpose strong enough to make them form the habit of doing things they don't like to do in order to accomplish the purpose they want to accomplish.

Sometimes even our best producers get into a slump. When people go into a slump, it simply

means that they have reached a point at which, for the time being, the things they don't like to do have become more important than their reasons for doing them. And may I pause to suggest to you managers and agents that when one of your good producers goes into a slump, the less you talk about production and the more you talk about purpose, the sooner you will pull that agent out of that slump?

Many people with whom I have discussed this common denominator of success have said at this point, "But I have a family to support and I have to make a living for my family and myself. Isn't that enough of a purpose?"

No, it isn't. It isn't a sufficiently strong purpose to make you form the habit of doing the things you don't like to do for the very simple reason that it is easier to adjust ourselves to the hardships of a poor living than it is to adjust ourselves to the hardships of making a better one. If you doubt me, just think of all the things you are willing to go without in order to avoid doing the things you don't like to do. All of which seems to prove that the strength which holds you to your purpose is not your own strength but the strength of the purpose itself.

Now, let's see why habit belongs so importantly in this common denominator of success.

People are creatures of habit just as machines are creatures of momentum, for habit is nothing more or less than momentum translated from the concrete into the abstract. Can you picture the problem that would face our mechanical engineers if there were no such things as momentum? Speed would be impossible because the highest speed at which any vehicle could be moved would be the first speed at which it could be broken away from a standstill. Elevators could not be made to rise, airplanes could not be made to fly, and the entire world of mechanics would find itself in a total state of helplessness. Then who are you and I to think that we can do with our own human nature, what the finest engineers in the world could not do with the finest machinery that was ever built?

Every single qualification for success is acquired through habit. People form habits and habits form futures. If you do not deliberately form good habits, then unconsciously you will form bad ones.You are the kind of person you are because you have formed the habit of being that kind of person, and the only way you can change is through habit.

The success habits in life insurance selling are divided into four main groups:

1. Prospecting habits

2. Calling habits

3. Selling habits

4. Working habits

Let's discuss these habit groups in their order.

Any successful life insurance agent will tell you that it is easier to sell life insurance to people who don't want it than it is to find people who do want it, but if you have not deliberately formed the habit of prospecting for needs, regardless of wants, then unconsciously you have formed the habit of limiting your prospecting to people who want life insurance, and therein lies the one and only real reason for lack of prospects.

As to calling habits, unless you have deliberately formed the habit of calling on people who are able to buy but unwilling to listen, then unconsciously you have formed the habit of calling on people who are willing to listen but unable to buy.

As to selling habits, unless you have deliberately formed the habit of calling on prospects determined to make them see their reasons for buying life insurance, then unconsciously you have formed the habit of calling on prospects in a state of mind in which you are willing to let them make you see their reasons for not buying it.

As to working habits, if you will take care of the other three groups, the working habits will generally take care of themselves because under working habits are included study and preparation, organization of time and efforts, records, analyses, etc. Certainly you're not going to take the trouble to learn interest arousing approaches and sales talks unless you're going to use them. You're not going to plan your day's work when you know in your heart that you're not going to carry out your plans. And you're certainly not going to keep an honest record of things you haven't done or of results you haven't achieved. So let's not worry so much about the fourth group of success habits, for if you are taking care of the first three groups, most of the working habits will take care of themselves and you'll be able to afford a secretary to take care of the rest of them for you.

But before you decide to adopt these success habits, let me warn you of the importance of habit

to your decision. I have attended many sales meetings and sales congresses during the past ten years and have often wondered why, in spite of the fact that there is so much good in them, so many people seem to get so little lasting good out of them. Perhaps you have attended sales meetings in the past and have left these meetings determined to do the things that would make you successful or more successful only to find your decision or determination waning at just the time when it should be put into effect or practice.

Here's the answer. Any resolution of decision you make is simply a promise to yourself which isn't worth a tinker's damn until you have formed the habit of making it and keeping it. And you won't form the habit of making it and keeping it unless right at the start you link it with a definite purpose that can be accomplished by keeping it, in other words, any resolution or decision you make today has to be made again tomorrow, and the next day, and the next, and the next, and so on. And it not only has to be made each day, but it has to be kept each day for if you miss one day in the making or keeping of it, you've got to go back and begin all over again. But if you continue the process of making it each morning and keeping it each day, you will finally wake up some morning, a different person in a different world, and you will wonder what has happened to you and the world you used to live in.

Here's what has happened. Your resolution or decision has become a habit and you won't have to make it on this particular morning. And the reason for your seeming like a different person living in a different world lies in the fact that for the first time in your life, you have control of yourself and control of your likes and dislikes by surrendering to your purpose in life. That is why behind every success there must be a purpose and that is what makes purpose so important to your future. For in the last analysis, your future is not going to depend on economic conditions or outside influences of circumstances over which you have no control. Your future is going to depend on your purpose in life. So let's talk about purpose.

First of all, your purpose must be practical and not visionary. Some time ago, I talked with a woman who thought she had a purpose which was more important to her than income. She was interested in people's suffering and she wanted to be placed in a position to alleviate that suffering. But when we analyzed her real feelings, we discovered, and she admitted it, that what she really wanted was a real nice job dispensing charity with other people's money and being well paid for it, along with the appreciation and feeling of importance that would naturally go with such a job.

But in making your purpose practical, be careful not to make it logical. Make it a purpose of

the sentimental or emotional type. Remember needs are logical while wants and desires are sentimental and emotional. Your needs will push you just so far, but when your needs are satisfied, they will stop pushing you. If, however, your purpose is in terms of wants or desires, then your wants and desires are fulfilled.

Recently I was talking with a young man who long ago discovered the common denominator of success without identifying his discovery. He had a definite purpose in life and it was definitely a sentimental or emotional purpose.

He wanted his children to go through college without having to work their way through as he had done. And he wanted his wife, and mother of his children, to enjoy the luxuries and comforts and even necessities, which had been denied his own mother. And he was willing to form the habit of doing things he didn‘t like to do in order to accomplish this purpose.

Not to discourage him, but rather to have him encourage me, I said to him, “Aren’t you going a little too far with this thing? There’s no logical reason why your children shouldn’t be willing and able to work their way through college just as their father did. Of course they’ll miss many of the things that you missed in your college life and they’ll probably have heartaches and disappointments. But if they’re any good, they’ll come through in the end just as you did. And there’s no logical reason why you should slave in order that your wife can enjoy comforts and luxuries that your mother never had.”

He looked at me with a rather pitying look and said, “But Mr. Gray, there’s no inspiration in logic. There’s no courage in logic. There’s not even happiness in logic. There’s only satisfaction. The only place logic has in my life is in the realization that the more I am willing to do for my family, the more I shall be able to do for myself.”

I imagine, after hearing that story, you won’t have to be told how to find your purpose or how to identify it or how to surrender to it. If it’s a big purpose, you will be big in its accomplishment. If it’s an unselfish purpose, you will be unselfish in accomplishing it. And if it’s an honest purpose, you will be honest and honorable in the accomplishment of it.

But as long as you live, don’t ever forget that while you may succeed beyond your fondest hopes and your greatest expectations, you will never succeed beyond the purpose to which you are willing to surrender. Furthermore, your surrender will not be complete until you have formed the habit of doing things that failures don’t like to do.

"You and Your Research"

delivered by **RICHARD HAMMING**

For many years, Bell Labs ran an internal speaker series known as the Bell Communications Research Colloquia Series. This particular talk, given by Dr. Richard W Hamming in 1986, was focused on answering one question: "Why do so few scientists make significant contributions and so many are forgotten in the long run?" This talk was originally transcribed by J. F. Kaiser and posted **here**.

It's a pleasure to be here. The title of my talk is, "You and Your Research." It is not about managing research, it is about how you individually do your research. I could give a talk on the other subject – but it's not, it's about you. I'm not talking about ordinary run-of-the-mill research; I'm talking about great research.

And for the sake of describing great research I'll occasionally say Nobel-Prize type of work. It doesn't have to gain the Nobel Prize, but I mean those kinds of things which we perceive are significant things. Relativity, if you want, Shannon's information theory, any number of outstanding theories – that's the kind of thing I'm talking about.

Now, how did I come to do this study? At Los Alamos I was brought in to run the computing machines which other people had got going, so those scientists and physicists could get back to business. I saw I was a stooge. I saw that although physically I was the same, they were different. And to put the thing bluntly, I was envious. I wanted to know why they were so different from me. I saw Feynman up close. I saw Fermi and Teller. I saw Oppenheimer. I saw Hans Bethe: he

was my boss. I saw quite a few very capable people. I became very interested in the difference between those who do and those who might have done.

When I came to Bell Labs, I came into a very productive department. Bode was the department head at the time; Shannon was there, and there were other people. I continued examining the questions, "Why?" and "What is the difference?" I continued subsequently by reading biographies, autobiographies, asking people questions such as: "How did you come to do this?" I tried to find out what are the differences. And that's what this talk is about.

Now, why is this talk important? I think it is important because, as far as I know, each of you has one life to live. Even if you believe in reincarnation it doesn't do you any good from one life to the next! Why shouldn't you do significant things in this one life, however you define significant? I'm not going to define it – you know what I mean. I will talk mainly about science because that is what I have studied. But so far as I know, and I've been told by others, much of what I say applies to many fields. Outstanding work is characterized very much the same way in most fields, but I will confine myself to science.

In order to get at you individually, I must talk in the first person. I have to get you to drop modesty and say to yourself, "Yes, I would like to do first-class work." Our society frowns on people who set out to do really good work. You're not supposed to; luck is supposed to descend on you and you do great things by chance. Well, that's a kind of dumb thing to say. I say, why shouldn't you set out to do something significant. You don't have to tell other people, but shouldn't you say to yourself, "Yes, I would like to do something significant."

In order to get to the second stage, I have to drop modesty and talk in the first person about what I've seen, what I've done, and what I've heard. I'm going to talk about people, some of whom you know, and I trust that when we leave, you won't quote me as saying some of the things I said.

Let me start not logically, but psychologically. I find that the major objection is that people think great science is done by luck. It's all a matter of luck. Well, consider Einstein. Note how many different things he did that were good. Was it all luck? Wasn't it a little too repetitive? Consider Shannon. He didn't do just information theory. Several years before, he did some other good things and some which are still locked up in the security of cryptography. He did many good things.

You see again and again, that it is more than one thing from a good person. Once in a while a

person does only one thing in his whole life, and we'll talk about that later, but a lot of times there is repetition. I claim that luck will not cover everything. And I will cite Pasteur who said, "Luck favors the prepared mind." And I think that says it the way I believe it. There is indeed an element of luck, and no, there isn't. The prepared mind sooner or later finds something important and does it. So yes, it is luck. The particular thing you do is luck, but that you do something is not.

For example, when I came to Bell Labs, I shared an office for a while with Shannon. At the same time he was doing information theory, I was doing coding theory. It is suspicious that the two of us did it at the same place and at the same time – it was in the atmosphere. And you can say, "Yes, it was luck." On the other hand you can say, "But why of all the people in Bell Labs then were those the two who did it?" Yes, it is partly luck, and partly it is the prepared mind; but "partly" is the other thing I'm going to talk about. So, although I'll come back several more times to luck, I want to dispose of this matter of luck as being the sole criterion whether you do great work or not. I claim you have some, but not total, control over it. And I will quote, finally, Newton on the matter. Newton said, "If others would think as hard as I did, then they would get similar results."

One of the characteristics you see, and many people have it including great scientists, is that usually when they were young they had independent thoughts and had the courage to pursue them. For example, Einstein, somewhere around 12 or 14, asked himself the question, "What would a light wave look like if I went with the velocity of light to look at it?" Now he knew that electromagnetic theory says you cannot have a stationary local maximum. But if he moved along with the velocity of light, he would see a local maximum. He could see a contradiction at the age of 12, 14, or somewhere around there, that everything was not right and that the velocity of light had something peculiar. Is it luck that he finally created special relativity? Early on, he had laid down some of the pieces by thinking of the fragments. Now that's the necessary but not sufficient condition. All of these items I will talk about are both luck and not luck.

How about having lots of "brains?" It sounds good. Most of you in this room probably have more than enough brains to do first-class work. But great work is something else than mere brains. Brains are measured in various ways. In mathematics, theoretical physics, astrophysics, typically brains correlates to a great extent with the ability to manipulate symbols. And so the typical IQ test is apt to score them fairly high. On the other hand, in other fields it is something different. For example, Bill Pfann, the fellow who did zone melting, came into my office one day. He had this idea dimly in his mind about what he wanted and he had some equations. It was pretty

clear to me that this man didn't know much mathematics and he wasn't really articulate. His problem seemed interesting so I took it home and did a little work. I finally showed him how to run computers so he could compute his own answers. I gave him the power to compute. He went ahead, with negligible recognition from his own department, but ultimately he has collected all the prizes in the field. Once he got well started, his shyness, his awkwardness, his inarticulateness, fell away and he became much more productive in many other ways. Certainly he became much more articulate.

And I can cite another person in the same way. I trust he isn't in the audience, i.e. a fellow named Clogston. I met him when I was working on a problem with John Pierce's group and I didn't think he had much. I asked my friends who had been with him at school, "Was he like that in graduate school?" "Yes," they replied. Well I would have fired the fellow, but J. R. Pierce was smart and kept him on. Clogston finally did the Clogston cable. After that there was a steady stream of good ideas. One success brought him confidence and courage.

One of the characteristics of successful scientists is having courage. Once you get your courage up and believe that you can do important problems, then you can. If you think you can't, almost surely you are not going to. Courage is one of the things that Shannon had supremely. You have only to think of his major theorem. He wants to create a method of coding, but he doesn't know what to do so he makes a random code. Then he is stuck. And then he asks the impossible question, "What would the average random code do?" He then proves that the average code is arbitrarily good, and that therefore there must be at least one good code. Who but a man of infinite courage could have dared to think those thoughts? That is the characteristic of great scientists; they have courage. They will go forward under incredible circumstances; they think and continue to think.

Age is another factor which the physicists particularly worry about. They always are saying that you have got to do it when you are young or you will never do it. Einstein did things very early, and all the quantum mechanic fellows were disgustingly young when they did their best work. Most mathematicians, theoretical physicists, and astrophysicists do what we consider their best work when they are young. It is not that they don't do good work in their old age but what we value most is often what they did early. On the other hand, in music, politics and literature, often what we consider their best work was done late. I don't know how whatever field you are in fits this scale, but age has some effect.

But let me say why age seems to have the effect it does. In the first place if you do some good

work you will find yourself on all kinds of committees and unable to do any more work. You may find yourself as I saw Brattain when he got a Nobel Prize. The day the prize was announced we all assembled in Arnold Auditorium; all three winners got up and made speeches. The third one, Brattain, practically with tears in his eyes, said, "I know about this Nobel-Prize effect and I am not going to let it affect me; I am going to remain good old Walter Brattain." Well I said to myself, "That is nice." But in a few weeks I saw it was affecting him. Now he could only work on great problems.

When you are famous it is hard to work on small problems. This is what did Shannon in. After information theory, what do you do for an encore? The great scientists often make this error. They fail to continue to plant the little acorns from which the mighty oak trees grow. They try to get the big thing right off. And that isn't the way things go. So that is another reason why you find that when you get early recognition it seems to sterilize you. In fact I will give you my favorite quotation of many years. The Institute for Advanced Study in Princeton, in my opinion, has ruined more good scientists than any institution has created, judged by what they did before they came and judged by what they did after. Not that they weren't good afterwards, but they were superb before they got there and were only good afterwards.

This brings up the subject, out of order perhaps, of working conditions. What most people think are the best working conditions, are not. Very clearly they are not because people are often most productive when working conditions are bad. One of the better times of the Cambridge Physical Laboratories was when they had practically shacks – they did some of the best physics ever.

I give you a story from my own private life. Early on it became evident to me that Bell Laboratories was not going to give me the conventional acre of programming people to program computing machines in absolute binary. It was clear they weren't going to. But that was the way everybody did it. I could go to the West Coast and get a job with the airplane companies without any trouble, but the exciting people were at Bell Labs and the fellows out there in the airplane companies were not. I thought for a long while about, "Did I want to go or not?" and I wondered how I could get the best of two possible worlds. I finally said to myself, "Hamming, you think the machines can do practically everything. Why can't you make them write programs?" What appeared at first to me as a defect forced me into automatic programming very early. What appears to be a fault, often, by a change of viewpoint, turns out to be one of the greatest assets you can have. But you are not likely to think that when you first look the thing and say, "Gee, I'm never going to get

enough programmers, so how can I ever do any great programming?"

And there are many other stories of the same kind; Grace Hopper has similar ones. I think that if you look carefully you will see that often the great scientists, by turning the problem around a bit, changed a defect to an asset. For example, many scientists when they found they couldn't do a problem finally began to study why not. They then turned it around the other way and said, "But of course, this is what it is" and got an important result. So ideal working conditions are very strange. The ones you want aren't always the best ones for you.

Now for the matter of drive. You observe that most great scientists have tremendous drive. I worked for ten years with John Tukey at Bell Labs. He had tremendous drive. One day about three or four years after I joined, I discovered that John Tukey was slightly younger than I was. John was a genius and I clearly was not. Well I went storming into Bode's office and said, "How can anybody my age know as much as John Tukey does?" He leaned back in his chair, put his hands behind his head, grinned slightly, and said, "You would be surprised Hamming, how much you would know if you worked as hard as he did that many years." I simply slunk out of the office!

What Bode was saying was this: "Knowledge and productivity are like compound interest." Given two people of approximately the same ability and one person who works ten percent more than the other, the latter will more than twice outproduce the former. The more you know, the more you learn; the more you learn, the more you can do; the more you can do, the more the opportunity – it is very much like compound interest. I don't want to give you a rate, but it is a very high rate. Given two people with exactly the same ability, the one person who manages day in and day out to get in one more hour of thinking will be tremendously more productive over a lifetime. I took Bode's remark to heart; I spent a good deal more of my time for some years trying to work a bit harder and I found, in fact, I could get more work done. I don't like to say it in front of my wife, but I did sort of neglect her sometimes; I needed to study. You have to neglect things if you intend to get what you want done. There's no question about this.

On this matter of drive Edison says, "Genius is 99% perspiration and 1% inspiration." He may have been exaggerating, but the idea is that solid work, steadily applied, gets you surprisingly far. The steady application of effort with a little bit more work, intelligently applied is what does it. That's the trouble; drive, misapplied, doesn't get you anywhere. I've often wondered why so many of my good friends at Bell Labs who worked as hard or harder than I did, didn't have so much to show for it. The misapplication of effort is a very serious matter. Just hard work is not enough – it

must be applied sensibly.

There's another trait on the side which I want to talk about; that trait is ambiguity. It took me a while to discover its importance. Most people like to believe something is or is not true. Great scientists tolerate ambiguity very well. They believe the theory enough to go ahead; they doubt it enough to notice the errors and faults so they can step forward and create the new replacement theory. If you believe too much you'll never notice the flaws; if you doubt too much you won't get started. It requires a lovely balance. But most great scientists are well aware of why their theories are true and they are also well aware of some slight misfits which don't quite fit and they don't forget it. Darwin writes in his autobiography that he found it necessary to write down every piece of evidence which appeared to contradict his beliefs because otherwise they would disappear from his mind. When you find apparent flaws you've got to be sensitive and keep track of those things, and keep an eye out for how they can be explained or how the theory can be changed to fit them. Those are often the great contributions. Great contributions are rarely done by adding another decimal place. It comes down to an emotional commitment. Most great scientists are completely committed to their problem. Those who don't become committed seldom produce outstanding, first-class work.

Now again, emotional commitment is not enough. It is a necessary condition apparently. And I think I can tell you the reason why. Everybody who has studied creativity is driven finally to saying, "creativity comes out of your subconscious." Somehow, suddenly, there it is. It just appears. Well, we know very little about the subconscious; but one thing you are pretty well aware of is that your dreams also come out of your subconscious. And you're aware your dreams are, to a fair extent, a reworking of the experiences of the day. If you are deeply immersed and committed to a topic, day after day after day, your subconscious has nothing to do but work on your problem. And so you wake up one morning, or on some afternoon, and there's the answer. For those who don't get committed to their current problem, the subconscious goofs off on other things and doesn't produce the big result. So the way to manage yourself is that when you have a real important problem you don't let anything else get the center of your attention – you keep your thoughts on the problem. Keep your subconscious starved so it has to work on your problem, so you can sleep peacefully and get the answer in the morning, free.

Now Alan Chynoweth mentioned that I used to eat at the physics table. I had been eating with the mathematicians and I found out that I already knew a fair amount of mathematics; in fact, I wasn't

learning much. The physics table was, as he said, an exciting place, but I think he exaggerated on how much I contributed. It was very interesting to listen to Shockley, Brattain, Bardeen, J. B. Johnson, Ken McKay and other people, and I was learning a lot. But unfortunately a Nobel Prize came, and a promotion came, and what was left was the dregs. Nobody wanted what was left. Well, there was no use eating with them!

Over on the other side of the dining hall was a chemistry table. I had worked with one of the fellows, Dave McCall; furthermore he was courting our secretary at the time. I went over and said, "Do you mind if I join you?" They can't say no, so I started eating with them for a while. And I started asking, "What are the important problems of your field?" And after a week or so, "What important problems are you working on?" And after some more time I came in one day and said, "If what you are doing is not important, and if you don't think it is going to lead to something important, why are you at Bell Labs working on it?" I wasn't welcomed after that; I had to find somebody else to eat with! That was in the spring.

In the fall, Dave McCall stopped me in the hall and said, "Hamming, that remark of yours got underneath my skin. I thought about it all summer, i.e. what were the important problems in my field. I haven't changed my research," he says, "but I think it was well worthwhile." And I said, "Thank you Dave," and went on. I noticed a couple of months later he was made the head of the department. I noticed the other day he was a Member of the National Academy of Engineering. I noticed he has succeeded. I have never heard the names of any of the other fellows at that table mentioned in science and scientific circles. They were unable to ask themselves, "What are the important problems in my field?"

If you do not work on an important problem, it's unlikely you'll do important work. It's perfectly obvious. Great scientists have thought through, in a careful way, a number of important problems in their field, and they keep an eye on wondering how to attack them. Let me warn you, "important problem" must be phrased carefully. The three outstanding problems in physics, in a certain sense, were never worked on while I was at Bell Labs. By important I mean guaranteed a Nobel Prize and any sum of money you want to mention. We didn't work on (1) time travel, (2) teleportation, and (3) antigravity. They are not important problems because we do not have an attack. It's not the consequence that makes a problem important, it is that you have a reasonable attack. That is what makes a problem important. When I say that most scientists don't work on important problems, I mean it in that sense. The average scientist, so far as I can make out, spends almost

all his time working on problems which he believes will not be important and he also doesn't believe that they will lead to important problems.

I spoke earlier about planting acorns so that oaks will grow. You can't always know exactly where to be, but you can keep active in places where something might happen. And even if you believe that great science is a matter of luck, you can stand on a mountain top where lightning strikes; you don't have to hide in the valley where you're safe. But the average scientist does routine safe work almost all the time and so he (or she) doesn't produce much. It's that simple. If you want to do great work, you clearly must work on important problems, and you should have an idea.

Along those lines at some urging from John Tukey and others, I finally adopted what I called "Great Thoughts Time." When I went to lunch Friday noon, I would only discuss great thoughts after that. By great thoughts I mean ones like: "What will be the role of computers in all of AT&T?", "How will computers change science?" For example, I came up with the observation at that time that nine out of ten experiments were done in the lab and one in ten on the computer. I made a remark to the vice presidents one time, that it would be reversed, i.e. nine out of ten experiments would be done on the computer and one in ten in the lab. They knew I was a crazy mathematician and had no sense of reality. I knew they were wrong and they've been proved wrong while I have been proved right. They built laboratories when they didn't need them. I saw that computers were transforming science because I spent a lot of time asking "What will be the impact of computers on science and how can I change it?" I asked myself, "How is it going to change Bell Labs?" I remarked one time, in the same address, that more than one-half of the people at Bell Labs will be interacting closely with computing machines before I leave. Well, you all have terminals now. I thought hard about where was my field going, where were the opportunities, and what were the important things to do. Let me go there so there is a chance I can do important things.

Most great scientists know many important problems. They have something between 10 and 20 important problems for which they are looking for an attack. And when they see a new idea come up, one hears them say "Well that bears on this problem." They drop all the other things and get after it. Now I can tell you a horror story that was told to me but I can't vouch for the truth of it. I was sitting in an airport talking to a friend of mine from Los Alamos about how it was lucky that the fission experiment occurred over in Europe when it did because that got us working on the atomic bomb here in the US. He said "No; at Berkeley we had gathered a bunch of data; we didn't get around to reducing it because we were building some more equipment, but if we had

reduced that data we would have found fission." They had it in their hands and they didn't pursue it. They came in second!

The great scientists, when an opportunity opens up, get after it and they pursue it. They drop all other things. They get rid of other things and they get after an idea because they had already thought the thing through. Their minds are prepared; they see the opportunity and they go after it. Now of course lots of times it doesn't work out, but you don't have to hit many of them to do some great science. It's kind of easy. One of the chief tricks is to live a long time!

Another trait, it took me a while to notice. I noticed the following facts about people who work with the door open or the door closed. I notice that if you have the door to your office closed, you get more work done today and tomorrow, and you are more productive than most. But 10 years later somehow you don't know quite know what problems are worth working on; all the hard work you do is sort of tangential in importance. He who works with the door open gets all kinds of interruptions, but he also occasionally gets clues as to what the world is and what might be important. Now I cannot prove the cause and effect sequence because you might say, "The closed door is symbolic of a closed mind." I don't know. But I can say there is a pretty good correlation between those who work with the doors open and those who ultimately do important things, although people who work with doors closed often work harder. Somehow they seem to work on slightly the wrong thing – not much, but enough that they miss fame.

I want to talk on another topic. It is based on the song which I think many of you know, "It ain't what you do, it's the way that you do it." I'll start with an example of my own. I was conned into doing on a digital computer, in the absolute binary days, a problem which the best analog computers couldn't do. And I was getting an answer. When I thought carefully and said to myself, "You know, Hamming, you're going to have to file a report on this military job; after you spend a lot of money you're going to have to account for it and every analog installation is going to want the report to see if they can't find flaws in it." I was doing the required integration by a rather crummy method, to say the least, but I was getting the answer. And I realized that in truth the problem was not just to get the answer; it was to demonstrate for the first time, and beyond question, that I could beat the analog computer on its own ground with a digital machine. I reworked the method of solution, created a theory which was nice and elegant, and changed the way we computed the answer; the results were no different. The published report had an elegant method which was later known for years as "Hamming's Method of Integrating Differential

Equations." It is somewhat obsolete now, but for a while it was a very good method. By changing the problem slightly, I did important work rather than trivial work.

In the same way, when using the machine "up in the attic in the early days, I was solving one problem after another after another; a fair number were successful and there were a few failures. I went home one Friday after finishing a problem, and curiously enough I wasn't happy; I was depressed. I could see life being a long sequence of one problem after another after another. After quite a while of thinking I decided, "No, I should be in the mass production of a variable product. I should be concerned with all of next year's problems, not just the one in front of my face. By changing the question I still got the same kind of results or better, but I changed things and did important work. I attacked the major problem – How do I conquer machines and do all of next year's problems when I don't know what they are going to be? How do I prepare for it? How do I do this one so I'll be on top of it? How do I obey Newton's rule? He said, "If I have seen further than others, it is because I've stood on the shoulders of giants." These days we stand on each other's feet!

You should do your job in such a fashion that others can build on top of it, so they will indeed say, "Yes, I've stood on so and so's shoulders and I saw further." The essence of science is cumulative.

By changing a problem slightly you can often do great work rather than merely good work. Instead of attacking isolated problems, I made the resolution that I would never again solve an isolated problem except as characteristic of a class.

Now if you are much of a mathematician you know that the effort to generalize often means that the solution is simple. Often by stopping and saying, "This is the problem he wants but this is characteristic of so and so. Yes, I can attack the whole class with a far superior method than the particular one because I was earlier embedded in needless detail." The business of abstraction frequently makes things simple. Furthermore, I filed away the methods and prepared for the future problems.

To end this part, I'll remind you, "It is a poor workman who blames his tools – the good man gets on with the job, given what he's got, and gets the best answer he can." And I suggest that by altering the problem, by looking at the thing differently, you can make a great deal of difference in your final productivity because you can either do it in such a fashion that people can indeed build on what you've done, or you can do it in such a fashion that the next person has to essentially duplicate again what you've done. It isn't just a matter of the job, it's the way you write the report,

the way you write the paper, the whole attitude. It's just as easy to do a broad, general job as one very special case. And it's much more satisfying and rewarding!

I have now come down to a topic which is very distasteful; it is not sufficient to do a job, you have to sell it. "Selling" to a scientist is an awkward thing to do. It's very ugly; you shouldn't have to do it. The world is supposed to be waiting, and when you do something great, they should rush out and welcome it. But the fact is everyone is busy with their own work. You must present it so well that they will set aside what they are doing, look at what you've done, read it, and come back and say, "Yes, that was good." I suggest that when you open a journal, as you turn the pages, you ask why you read some articles and not others. You had better write your report so when it is published in the Physical Review, or wherever else you want it, as the readers are turning the pages they won't just turn your pages but they will stop and read yours. If they don't stop and read it, you won't get credit.

There are three things you have to do in selling. You have to learn to write clearly and well so that people will read it, you must learn to give reasonably formal talks, and you also must learn to give informal talks. We had a lot of so-called "back room scientists." In a conference, they would keep quiet. Three weeks later after a decision was made they filed a report saying why you should do so and so. Well, it was too late. They would not stand up right in the middle of a hot conference, in the middle of activity, and say, "We should do this for these reasons." You need to master that form of communication as well as prepared speeches.

When I first started, I got practically physically ill while giving a speech, and I was very, very nervous. I realized I either had to learn to give speeches smoothly or I would essentially partially cripple my whole career. The first time IBM asked me to give a speech in New York one evening, I decided I was going to give a really good speech, a speech that was wanted, not a technical one but a broad one, and at the end if they liked it, I'd quietly say, "Any time you want one I'll come in and give you one." As a result, I got a great deal of practice giving speeches to a limited audience and I got over being afraid. Furthermore, I could also then study what methods were effective and what were ineffective.

While going to meetings I had already been studying why some papers are remembered and most are not. The technical person wants to give a highly limited technical talk. Most of the time the audience wants a broad general talk and wants much more survey and background than the speaker is willing to give. As a result, many talks are ineffective. The speaker names a topic and

suddenly plunges into the details he's solved. Few people in the audience may follow. You should paint a general picture to say why it's important, and then slowly give a sketch of what was done. Then a larger number of people will say, "Yes, Joe has done that," or "Mary has done that; I really see where it is; yes, Mary really gave a good talk; I understand what Mary has done." The tendency is to give a highly restricted, safe talk; this is usually ineffective. Furthermore, many talks are filled with far too much information. So I say this idea of selling is obvious.

Let me summarize. You've got to work on important problems. I deny that it is all luck, but I admit there is a fair element of luck. I subscribe to Pasteur's "Luck favors the prepared mind." I favor heavily what I did. Friday afternoons for years – great thoughts only – means that I committed 10% of my time trying to understand the bigger problems in the field, i.e. what was and what was not important. I found in the early days I had believed "this" and yet had spent all week marching in "that" direction. It was kind of foolish. If I really believe the action is over there, why do I march in this direction? I either had to change my goal or change what I did. So I changed something I did and I marched in the direction I thought was important. It's that easy.

Now you might tell me you haven't got control over what you have to work on. Well, when you first begin, you may not. But once you're moderately successful, there are more people asking for results than you can deliver and you have some power of choice, but not completely. I'll tell you a story about that, and it bears on the subject of educating your boss. I had a boss named Schelkunoff; he was, and still is, a very good friend of mine. Some military person came to me and demanded some answers by Friday. Well, I had already dedicated my computing resources to reducing data on the fly for a group of scientists; I was knee deep in short, small, important problems. This military person wanted me to solve his problem by the end of the day on Friday. I said, "No, I'll give it to you Monday. I can work on it over the weekend. I'm not going to do it now." He goes down to my boss, Schelkunoff, and Schelkunoff says, "You must run this for him; he's got to have it by Friday." I tell him, "Why do I?"; he says, "You have to." I said, "Fine, Sergei, but you're sitting in your office Friday afternoon catching the late bus home to watch as this fellow walks out that door." I gave the military person the answers late Friday afternoon. I then went to Schelkunoff's office and sat down; as the man goes out I say, "You see Schelkunoff, this fellow has nothing under his arm; but I gave him the answers." On Monday morning Schelkunoff called him up and said, "Did you come in to work over the weekend?" I could hear, as it were, a pause as the fellow ran through his mind of what was going to happen; but he knew he would have had to sign in, and he'd better not say he had when he hadn't, so he said he hadn't. Ever after that

Schelkunoff said, “You set your deadlines; you can change them.”

One lesson was sufficient to educate my boss as to why I didn’t want to do big jobs that displaced exploratory research and why I was justified in not doing crash jobs which absorb all the research computing facilities. I wanted instead to use the facilities to compute a large number of small problems. Again, in the early days, I was limited in computing capacity and it was clear, in my area, that a “mathematician had no use for machines.” But I needed more machine capacity. Every time I had to tell some scientist in some other area, “No I can’t; I haven’t the machine capacity,” he complained. I said “Go tell your Vice President that Hamming needs more computing capacity.” After a while I could see what was happening up there at the top; many people said to my Vice President, “Your man needs more computing capacity.” I got it!

I also did a second thing. When I loaned what little programming power we had to help in the early days of computing, I said, “We are not getting the recognition for our programmers that they deserve. When you publish a paper you will thank that programmer or you aren’t getting any more help from me. That programmer is going to be thanked by name; she’s worked hard.” I waited a couple of years. I then went through a year of BSTJ articles and counted what fraction thanked some programmer. I took it into the boss and said, “That’s the central role computing is playing in Bell Labs; if the BSTJ is important, that’s how important computing is.” He had to give in. You can educate your bosses. It’s a hard job. In this talk I’m only viewing from the bottom up; I’m not viewing from the top down. But I am telling you how you can get what you want in spite of top management. You have to sell your ideas there also.

Well I now come down to the topic, “Is the effort to be a great scientist worth it?” To answer this, you must ask people. When you get beyond their modesty, most people will say, “Yes, doing really first-class work, and knowing it, is as good as wine, women and song put together,” or if it’s a woman she says, “It is as good as wine, men and song put together.” And if you look at the bosses, they tend to come back or ask for reports, trying to participate in those moments of discovery. They’re always in the way. So evidently those who have done it, want to do it again. But it is a limited survey. I have never dared to go out and ask those who didn’t do great work how they felt about the matter. It’s a biased sample, but I still think it is worth the struggle. I think it is very definitely worth the struggle to try and do first-class work because the truth is, the value is in the struggle more than it is in the result. The struggle to make something of yourself seems to be worthwhile in itself. The success and fame are sort of dividends, in my opinion.

I've told you how to do it. It is so easy, so why do so many people, with all their talents, fail? For example, my opinion, to this day, is that there are in the mathematics department at Bell Labs quite a few people far more able and far better endowed than I, but they didn't produce as much. Some of them did produce more than I did; Shannon produced more than I did, and some others produced a lot, but I was highly productive against a lot of other fellows who were better equipped. Why is it so? What happened to them? Why do so many of the people who have great promise, fail?

Well, one of the reasons is drive and commitment. The people who do great work with less ability but who are committed to it, get more done that those who have great skill and dabble in it, who work during the day and go home and do other things and come back and work the next day. They don't have the deep commitment that is apparently necessary for really first-class work. They turn out lots of good work, but we were talking, remember, about first-class work. There is a difference. Good people, very talented people, almost always turn out good work. We're talking about the outstanding work, the type of work that gets the Nobel Prize and gets recognition.

The second thing is, I think, the problem of personality defects. Now I'll cite a fellow whom I met out in Irvine. He had been the head of a computing center and he was temporarily on assignment as a special assistant to the president of the university. It was obvious he had a job with a great future. He took me into his office one time and showed me his method of getting letters done and how he took care of his correspondence. He pointed out how inefficient the secretary was. He kept all his letters stacked around there; he knew where everything was. And he would, on his word processor, get the letter out. He was bragging how marvelous it was and how he could get so much more work done without the secretary's interference. Well, behind his back, I talked to the secretary. The secretary said, "Of course I can't help him; I don't get his mail. He won't give me the stuff to log in; I don't know where he puts it on the floor. Of course I can't help him." So I went to him and said, "Look, if you adopt the present method and do what you can do single-handedly, you can go just that far and no farther than you can do single-handedly. If you will learn to work with the system, you can go as far as the system will support you." And, he never went any further. He had his personality defect of wanting total control and was not willing to recognize that you need the support of the system.

You find this happening again and again; good scientists will fight the system rather than learn to work with the system and take advantage of all the system has to offer. It has a lot, if you learn

how to use it. It takes patience, but you can learn how to use the system pretty well, and you can learn how to get around it. After all, if you want a decision `No', you just go to your boss and get a `No' easy. If you want to do something, don't ask, do it. Present him with an accomplished fact. Don't give him a chance to tell you `No'. But if you want a `No', it's easy to get a `No'.

Another personality defect is ego assertion and I'll speak in this case of my own experience. I came from Los Alamos and in the early days I was using a machine in New York at 590 Madison Avenue where we merely rented time. I was still dressing in western clothes, big slash pockets, a bolo and all those things. I vaguely noticed that I was not getting as good service as other people. So I set out to measure. You came in and you waited for your turn; I felt I was not getting a fair deal. I said to myself, "Why? No Vice President at IBM said, 'Give Hamming a bad time'. It is the secretaries at the bottom who are doing this. When a slot appears, they'll rush to find someone to slip in, but they go out and find somebody else. Now, why? I haven't mistreated them." Answer, I wasn't dressing the way they felt somebody in that situation should. It came down to just that – I wasn't dressing properly. I had to make the decision – was I going to assert my ego and dress the way I wanted to and have it steadily drain my effort from my professional life, or was I going to appear to conform better? I decided I would make an effort to appear to conform properly. The moment I did, I got much better service. And now, as an old colorful character, I get better service than other people.

You should dress according to the expectations of the audience spoken to. If I am going to give an address at the MIT computer center, I dress with a bolo and an old corduroy jacket or something else. I know enough not to let my clothes, my appearance, my manners get in the way of what I care about. An enormous number of scientists feel they must assert their ego and do their thing their way. They have got to be able to do this, that, or the other thing, and they pay a steady price.

John Tukey almost always dressed very casually. He would go into an important office and it would take a long time before the other fellow realized that this is a first-class man and he had better listen. For a long time John has had to overcome this kind of hostility. It's wasted effort! I didn't say you should conform; I said "The appearance of conforming gets you a long way." If you chose to assert your ego in any number of ways, "I am going to do it my way," you pay a small steady price throughout the whole of your professional career. And this, over a whole lifetime, adds up to an enormous amount of needless trouble.

By taking the trouble to tell jokes to the secretaries and being a little friendly, I got superb secretarial

help. For instance, one time for some idiot reason all the reproducing services at Murray Hill were tied up. Don't ask me how, but they were. I wanted something done. My secretary called up somebody at Holmdel, hopped the company car, made the hour-long trip down and got it reproduced, and then came back. It was a payoff for the times I had made an effort to cheer her up, tell her jokes and be friendly; it was that little extra work that later paid off for me. By realizing you have to use the system and studying how to get the system to do your work, you learn how to adapt the system to your desires. Or you can fight it steadily, as a small undeclared war, for the whole of your life.

And I think John Tukey paid a terrible price needlessly. He was a genius anyhow, but I think it would have been far better, and far simpler, had he been willing to conform a little bit instead of ego asserting. He is going to dress the way he wants all of the time. It applies not only to dress but to a thousand other things; people will continue to fight the system. Not that you shouldn't occasionally!

When they moved the library from the middle of Murray Hill to the far end, a friend of mine put in a request for a bicycle. Well, the organization was not dumb. They waited awhile and sent back a map of the grounds saying, "Will you please indicate on this map what paths you are going to take so we can get an insurance policy covering you." A few more weeks went by. They then asked, "Where are you going to store the bicycle and how will it be locked so we can do so and so." He finally realized that of course he was going to be red-taped to death so he gave in. He rose to be the President of Bell Laboratories.

Barney Oliver was a good man. He wrote a letter one time to the IEEE. At that time the official shelf space at Bell Labs was so much and the height of the IEEE Proceedings at that time was larger; and since you couldn't change the size of the official shelf space he wrote this letter to the IEEE Publication person saying, "Since so many IEEE members were at Bell Labs and since the official space was so high the journal size should be changed." He sent it for his boss's signature. Back came a carbon with his signature, but he still doesn't know whether the original was sent or not. I am not saying you shouldn't make gestures of reform. I am saying that my study of able people is that they don't get themselves committed to that kind of warfare. They play it a little bit and drop it and get on with their work.

Many a second-rate fellow gets caught up in some little twitting of the system, and carries it through to warfare. He expends his energy in a foolish project. Now you are going to tell me

that somebody has to change the system. I agree; somebody's has to. Which do you want to be? The person who changes the system or the person who does first-class science? Which person is it that you want to be? Be clear, when you fight the system and struggle with it, what you are doing, how far to go out of amusement, and how much to waste your effort fighting the system. My advice is to let somebody else do it and you get on with becoming a first-class scientist. Very few of you have the ability to both reform the system and become a first-class scientist.

On the other hand, we can't always give in. There are times when a certain amount of rebellion is sensible. I have observed almost all scientists enjoy a certain amount of twitting the system for the sheer love of it. What it comes down to basically is that you cannot be original in one area without having originality in others. Originality is being different. You can't be an original scientist without having some other original characteristics. But many a scientist has let his quirks in other places make him pay a far higher price than is necessary for the ego satisfaction he or she gets. I'm not against all ego assertion; I'm against some.

Another fault is anger. Often a scientist becomes angry, and this is no way to handle things. Amusement, yes, anger, no. Anger is misdirected. You should follow and cooperate rather than struggle against the system all the time.

Another thing you should look for is the positive side of things instead of the negative. I have already given you several examples, and there are many, many more; how, given the situation, by changing the way I looked at it, I converted what was apparently a defect to an asset. I'll give you another example. I am an egotistical person; there is no doubt about it. I knew that most people who took a sabbatical to write a book, didn't finish it on time. So before I left, I told all my friends that when I come back, that book was going to be done! Yes, I would have it done – I'd have been ashamed to come back without it! I used my ego to make myself behave the way I wanted to. I bragged about something so I'd have to perform. I found out many times, like a cornered rat in a real trap, I was surprisingly capable. I have found that it paid to say, "Oh yes, I'll get the answer for you Tuesday," not having any idea how to do it. By Sunday night I was really hard thinking on how I was going to deliver by Tuesday. I often put my pride on the line and sometimes I failed, but as I said, like a cornered rat I'm surprised how often I did a good job. I think you need to learn to use yourself. I think you need to know how to convert a situation from one view to another which would increase the chance of success.

Now self-delusion in humans is very, very common. There are enumerable ways of you changing

a thing and kidding yourself and making it look some other way. When you ask, "Why didn't you do such and such," the person has a thousand alibis. If you look at the history of science, usually these days there are 10 people right there ready, and we pay off for the person who is there first. The other nine fellows say, "Well, I had the idea but I didn't do it and so on and so on." There are so many alibis. Why weren't you first? Why didn't you do it right? Don't try an alibi. Don't try and kid yourself. You can tell other people all the alibis you want. I don't mind. But to yourself try to be honest.

If you really want to be a first-class scientist you need to know yourself, your weaknesses, your strengths, and your bad faults, like my egotism. How can you convert a fault to an asset? How can you convert a situation where you haven't got enough manpower to move into a direction when that's exactly what you need to do? I say again that I have seen, as I studied the history, the successful scientist changed the viewpoint and what was a defect became an asset.

In summary, I claim that some of the reasons why so many people who have greatness within their grasp don't succeed are: they don't work on important problems, they don't become emotionally involved, they don't try and change what is difficult to some other situation which is easily done but is still important, and they keep giving themselves alibis why they don't. They keep saying that it is a matter of luck. I've told you how easy it is; furthermore I've told you how to reform. Therefore, go forth and become great scientists!

Questions and Answers

A. G. Chynoweth: Well that was 50 minutes of concentrated wisdom and observations accumulated over a fantastic career; I lost track of all the observations that were striking home. Some of them are very very timely. One was the plea for more computer capacity; I was hearing nothing but that this morning from several people, over and over again. So that was right on the mark today even though here we are 20 – 30 years after when you were making similar remarks, Dick. I can think of all sorts of lessons that all of us can draw from your talk. And for one, as I walk around the halls in the future I hope I won't see as many closed doors in Bellcore. That was one observation I thought was very intriguing.

Thank you very, very much indeed Dick; that was a wonderful recollection. I'll now open it up for questions. I'm sure there are many people who would like to take up on some of the points that Dick was making.

Hamming: First let me respond to Alan Chynoweth about computing. I had computing in research and for 10 years I kept telling my management, "Get that !&@#% machine out of research. We are being forced to run problems all the time. We can't do research because were too busy operating and running the computing machines." Finally the message got through. They were going to move computing out of research to someplace else. I was persona non grata to say the least and I was surprised that people didn't kick my shins because everybody was having their toy taken away from them. I went in to Ed David's office and said, "Look Ed, you've got to give your researchers a machine. If you give them a great big machine, we'll be back in the same trouble we were before, so busy keeping it going we can't think. Give them the smallest machine you can because they are very able people. They will learn how to do things on a small machine instead of mass computing." As far as I'm concerned, that's how UNIX arose. We gave them a moderately small machine and they decided to make it do great things. They had to come up with a system to do it on. It is called UNIX!

A. G. Chynoweth: I just have to pick up on that one. In our present environment, Dick, while we wrestle with some of the red tape attributed to, or required by, the regulators, there is one quote that one exasperated AVP came up with and I've used it over and over again. He growled that, "UNIX was never a deliverable!"

Question: What about personal stress? Does that seem to make a difference?

Hamming: Yes, it does. If you don't get emotionally involved, it doesn't. I had incipient ulcers most of the years that I was at Bell Labs. I have since gone off to the Naval Postgraduate School and laid back somewhat, and now my health is much better. But if you want to be a great scientist you're going to have to put up with stress. You can lead a nice life; you can be a nice guy or you can be a great scientist. But nice guys end last, is what Leo Durocher said. If you want to lead a nice happy life with a lot of recreation and everything else, you'll lead a nice life.

Question: The remarks about having courage, no one could argue with; but those of us who have gray hairs or who are well established don't have to worry too much. But what I sense among the young people these days is a real concern over the risk taking in a highly competitive environment.

Do you have any words of wisdom on this?

Hamming: I'll quote Ed David more. Ed David was concerned about the general loss of nerve in our society. It does seem to me that we've gone through various periods. Coming out of the war, coming out of Los Alamos where we built the bomb, coming out of building the radars and so on, there came into the mathematics department, and the research area, a group of people with a lot of guts. They've just seen things done; they've just won a war which was fantastic. We had reasons for having courage and therefore we did a great deal. I can't arrange that situation to do it again. I cannot blame the present generation for not having it, but I agree with what you say; I just cannot attach blame to it. It doesn't seem to me they have the desire for greatness; they lack the courage to do it. But we had, because we were in a favorable circumstance to have it; we just came through a tremendously successful war. In the war we were looking very, very bad for a long while; it was a very desperate struggle as you well know. And our success, I think, gave us courage and self confidence; that's why you see, beginning in the late forties through the fifties, a tremendous productivity at the labs which was stimulated from the earlier times. Because many of us were earlier forced to learn other things – we were forced to learn the things we didn't want to learn, we were forced to have an open door – and then we could exploit those things we learned. It is true, and I can't do anything about it; I cannot blame the present generation either. It's just a fact.

Question: Is there something management could or should do?

Hamming: Management can do very little. If you want to talk about managing research, that's a totally different talk. I'd take another hour doing that. This talk is about how the individual gets very successful research done in spite of anything the management does or in spite of any other opposition. And how do you do it? Just as I observe people doing it. It's just that simple and that hard!

Question: Is brainstorming a daily process?

Hamming: Once that was a very popular thing, but it seems not to have paid off. For myself I find it desirable to talk to other people; but a session of brainstorming is seldom worthwhile. I do go in to strictly talk to somebody and say, "Look, I think there has to be something here. Here's what I think I see …" and then begin talking back and forth. But you want to pick capable people. To use another analogy, you know the idea called the 'critical mass.' If you have enough stuff you

have critical mass. There is also the idea I used to call 'sound absorbers'. When you get too many sound absorbers, you give out an idea and they merely say, "Yes, yes, yes." What you want to do is get that critical mass in action; "Yes, that reminds me of so and so," or, "Have you thought about that or this?" When you talk to other people, you want to get rid of those sound absorbers who are nice people but merely say, "Oh yes," and to find those who will stimulate you right back.

For example, you couldn't talk to John Pierce without being stimulated very quickly. There were a group of other people I used to talk with. For example there was Ed Gilbert; I used to go down to his office regularly and ask him questions and listen and come back stimulated. I picked my people carefully with whom I did or whom I didn't brainstorm because the sound absorbers are a curse. They are just nice guys; they fill the whole space and they contribute nothing except they absorb ideas and the new ideas just die away instead of echoing on. Yes, I find it necessary to talk to people. I think people with closed doors fail to do this so they fail to get their ideas sharpened, such as "Did you ever notice something over here?" I never knew anything about it – I can go over and look. Somebody points the way. On my visit here, I have already found several books that I must read when I get home. I talk to people and ask questions when I think they can answer me and give me clues that I do not know about. I go out and look!

Question: What kind of tradeoffs did you make in allocating your time for reading and writing and actually doing research?

Hamming: I believed, in my early days, that you should spend at least as much time in the polish and presentation as you did in the original research. Now at least 50% of the time must go for the presentation. It's a big, big number.

Question: How much effort should go into library work?

Hamming: It depends upon the field. I will say this about it. There was a fellow at Bell Labs, a very, very, smart guy. He was always in the library; he read everything. If you wanted references, you went to him and he gave you all kinds of references. But in the middle of forming these theories, I formed a proposition: there would be no effect named after him in the long run. He is now retired from Bell Labs and is an Adjunct Professor. He was very valuable; I'm not questioning that. He wrote some very good Physical Review articles; but there's no effect named after him because he read too much. If you read all the time what other people have done you will think the way they thought. If you want to think new thoughts that are different, then do what a lot

of creative people do – get the problem reasonably clear and then refuse to look at any answers until you've thought the problem through carefully how you would do it, how you could slightly change the problem to be the correct one. So yes, you need to keep up. You need to keep up more to find out what the problems are than to read to find the solutions. The reading is necessary to know what is going on and what is possible. But reading to get the solutions does not seem to be the way to do great research. So I'll give you two answers. You read; but it is not the amount, it is the way you read that counts.

Question: How do you get your name attached to things?

Hamming: By doing great work. I'll tell you the hamming window one. I had given Tukey a hard time, quite a few times, and I got a phone call from him from Princeton to me at Murray Hill. I knew that he was writing up power spectra and he asked me if I would mind if he called a certain window a "Hamming window." And I said to him, "Come on, John; you know perfectly well I did only a small part of the work but you also did a lot." He said, "Yes, Hamming, but you contributed a lot of small things; you're entitled to some credit." So he called it the Hamming Window. Now, let me go on. I had twitted John frequently about true greatness. I said true greatness is when your name is like ampere, watt, and fourier – when it's spelled with a lower case letter. That's how the hamming window came about.

Question: Dick, would you care to comment on the relative effectiveness between giving talks, writing papers, and writing books?

Hamming: In the short-haul, papers are very important if you want to stimulate someone tomorrow. If you want to get recognition long-haul, it seems to me writing books is more contribution because most of us need orientation. In this day of practically infinite knowledge, we need orientation to find our way. Let me tell you what infinite knowledge is. Since from the time of Newton to now, we have come close to doubling knowledge every 17 years, more or less. And we cope with that, essentially, by specialization. In the next 340 years at that rate, there will be 20 doublings, i.e. a million, and there will be a million fields of specialty for every one field now. It isn't going to happen. The present growth of knowledge will choke itself off until we get different tools. I believe that books which try to digest, coordinate, get rid of the duplication, get rid of the less fruitful methods and present the underlying ideas clearly of what we know now, will be the things the future generations will value. Public talks are necessary; private talks are necessary; written papers are necessary. But I am inclined to believe that, in the long-haul, books

which leave out what's not essential are more important than books which tell you everything because you don't want to know everything. I don't want to know that much about penguins is the usual reply. You just want to know the essence.

Question: You mentioned the problem of the Nobel Prize and the subsequent notoriety of what was done to some of the careers. Isn't that kind of a much more broad problem of fame? What can one do?

Hamming: Some things you could do are the following. Somewhere around every seven years make a significant, if not complete, shift in your field. Thus, I shifted from numerical analysis, to hardware, to software, and so on, periodically, because you tend to use up your ideas. When you go to a new field, you have to start over as a baby. You are no longer the big mukity muk and you can start back there and you can start planting those acorns which will become the giant oaks. Shannon, I believe, ruined himself. In fact when he left Bell Labs, I said, "That's the end of Shannon's scientific career." I received a lot of flak from my friends who said that Shannon was just as smart as ever. I said, "Yes, he'll be just as smart, but that's the end of his scientific career," and I truly believe it was.

You have to change. You get tired after a while; you use up your originality in one field. You need to get something nearby. I'm not saying that you shift from music to theoretical physics to English literature; I mean within your field you should shift areas so that you don't go stale. You couldn't get away with forcing a change every seven years, but if you could, I would require a condition for doing research, being that you will change your field of research every seven years with a reasonable definition of what it means, or at the end of 10 years, management has the right to compel you to change. I would insist on a change because I'm serious. What happens to the old fellows is that they get a technique going; they keep on using it. They were marching in that direction which was right then, but the world changes. There's the new direction; but the old fellows are still marching in their former direction.

You need to get into a new field to get new viewpoints, and before you use up all the old ones. You can do something about this, but it takes effort and energy. It takes courage to say, "Yes, I will give up my great reputation." For example, when error correcting codes were well launched, having these theories, I said, "Hamming, you are going to quit reading papers in the field; you are going to ignore it completely; you are going to try and do something else other than coast on that." I deliberately refused to go on in that field. I wouldn't even read papers to try to force

myself to have a chance to do something else. I managed myself, which is what I'm preaching in this whole talk. Knowing many of my own faults, I manage myself. I have a lot of faults, so I've got a lot of problems, i.e. a lot of possibilities of management.

Question: Would you compare research and management?

Hamming: If you want to be a great researcher, you won't make it being president of the company. If you want to be president of the company, that's another thing. I'm not against being president of the company. I just don't want to be. I think Ian Ross does a good job as President of Bell Labs. I'm not against it; but you have to be clear on what you want. Furthermore, when you're young, you may have picked wanting to be a great scientist, but as you live longer, you may change your mind. For instance, I went to my boss, Bode, one day and said, "Why did you ever become department head? Why didn't you just be a good scientist?" He said, "Hamming, I had a vision of what mathematics should be in Bell Laboratories. And I saw if that vision was going to be realized, I had to make it happen; I had to be department head." When your vision of what you want to do is what you can do single-handedly, then you should pursue it. The day your vision, what you think needs to be done, is bigger than what you can do single-handedly, then you have to move toward management. And the bigger the vision is, the farther in management you have to go. If you have a vision of what the whole laboratory should be, or the whole Bell System, you have to get there to make it happen. You can't make it happen from the bottom very easily. It depends upon what goals and what desires you have. And as they change in life, you have to be prepared to change. I chose to avoid management because I preferred to do what I could do single-handedly. But that's the choice that I made, and it is biased. Each person is entitled to their choice. Keep an open mind. But when you do choose a path, for heaven's sake be aware of what you have done and the choice you have made. Don't try to do both sides.

Question: How important is one's own expectation or how important is it to be in a group or surrounded by people who expect great work from you?

Hamming: At Bell Labs everyone expected good work from me – it was a big help. Everybody expects you to do a good job, so you do, if you've got pride. I think it's very valuable to have first-class people around. I sought out the best people. The moment that physics table lost the best people, I left. The moment I saw that the same was true of the chemistry table, I left. I tried to go with people who had great ability so I could learn from them and who would expect great results out of me. By deliberately managing myself, I think I did much better than laissez faire.

Question: You, at the outset of your talk, minimized or played down luck; but you seemed also to gloss over the circumstances that got you to Los Alamos, that got you to Chicago, that got you to Bell Laboratories.

Hamming: There was some luck. On the other hand I don't know the alternate branches. Until you can say that the other branches would not have been equally or more successful, I can't say. Is it luck the particular thing you do? For example, when I met Feynman at Los Alamos, I knew he was going to get a Nobel Prize. I didn't know what for. But I knew darn well he was going to do great work. No matter what directions came up in the future, this man would do great work. And sure enough, he did do great work. It isn't that you only do a little great work at this circumstance and that was luck, there are many opportunities sooner or later. There are a whole pail full of opportunities, of which, if you're in this situation, you seize one and you're great over there instead of over here. There is an element of luck, yes and no. Luck favors a prepared mind; luck favors a prepared person. It is not guaranteed; I don't guarantee success as being absolutely certain. I'd say luck changes the odds, but there is some definite control on the part of the individual.

Go forth, then, and do great work!

"The Multidisciplinary Approach to Thinking"

delivered by PETER KAUFMAN

Peter Kaufman is the CEO of Glenair and author of the book ***Poor Charlie's Almanack*** about Charlie Munger. This speech was delivered to the Cal Poly Pomona Economics Club, and the transcript and audio of the speech were originally published on **Latticework Investing**.

I was asked to talk about the multidisciplinary approach to thinking. So I'll start out with that. But if you guys get bored or something and say 'Well I thought we were supposed to have fun listening to this today.' You can raise your hand and say 'Could you talk about leadership or team building or business strategy or ethics or something else?'

I gave a talk recently at Google, in fact I've given three talks at Google. And the first talk I gave they said 'What are you going to talk about?' And I said, 'Well, what do you want to talk about?' They said, 'About whatever you want. What do you usually talk about?' Well I usually talk about leadership, culture, team building, strategy, ethics. And they said, 'We don't want to hear about that team building crap. We get that all the time. We want to hear about self-improvement.' So I will mix in with our multidisciplinary topic a little bit of self-improvement as well. Is that OK? OK.

So why is it important to be a multidisciplinary thinker? The answer comes from the Austrian philosopher Ludwig Wittgenstein who said, 'To understand is to know what to do.' Could there be

anything that sounds simpler than that? And yet it's a genius line, to understand is to know what to do. How many mistakes do you make when you understand something? You don't make any mistakes. Where do mistakes come from? They come from blind spots, a lack of understanding. Why do you need to be multidisciplinary in your thinking? Because as the Japanese proverb says, 'The frog in the well knows nothing of the mighty ocean.' You may know everything there is to know about your specialty, your silo, your "well," but how are you going to make any good decisions in life – the complex systems of life, the dynamic system of life – if all you know is one well?

So I tried to learn what Munger calls, 'the big ideas' from all the different disciplines. Right up front I want to tell you what my trick was, because if you try to do it the way he did it, you don't have enough time in your life to do it. It's impossible. Because the fields are too big and the books are too thick. So my trick to learn the big ideas of science, biology, etc., was I found this science magazine called Discover Magazine. Show of hands, anybody here ever heard of Discover magazine? A few people. OK. And I found that this magazine every month had a really good interview with somebody from some aspect of science. Every month. And it was six or seven pages long. It was all in layperson's terms. The person who was trying to get their ideas across would do so using good stories, clear language, and they would never fail to get all their big ideas into the interview. I mean if you're given the chance to be interviewed by Discover Magazine and your field is nanoparticles or something, aren't you going to try your very best to get all the good ideas into the interview with the best stories. OK. So I discovered that on the Internet there were 12 years of Discover Magazine articles available in the archives. So I printed out 12 years times 12 months of these interviews. I had 144 of these interviews. And I put them in these big three ring binders. Filled up three big binders. And for the next six months I went to the coffee shop for an hour or two every morning and I read these. And I read them index fund style, which means I read them all. I didn't pick and choose. This is the universe and I'm going to own the whole universe. I read every single one. Now I will tell you that out of 144 articles, if I'd have been selecting my reading material, I probably would have read about 14 of them. And the other 130? I would never in a million years read six pages on nanoparticles. Guess what I had at the end of six months? I had inside my head every single big idea from every single domain of science and biology. It only took me 6 months. And it wasn't that hard because it was written in layperson's terms. And really, what did I really get? Just like an index fund, I captured all the parabolic ideas that no one else has. And why doesn't anybody else have these ideas? Because who in the world

would read an interview on nanoparticles? And yet that's where I got my best ideas. I would read some arcane subject and, oh my god, I saw, 'That's exactly how this works over here in biology.' or 'That's exactly how this works over here in human nature.' You have to know all these big ideas. Or there is an alternative, find somebody who did what I did and just get all the ideas from them. Now when I was your age and I was in school I thought the asymmetry of it was very unfair because I had to do all the work. So every time I go back and meet with a group of students I change the asymmetry around. I did all the work for you…

I have (multiple examples) of models that I derived from what I call my 'three buckets'. Let's see if I've got my three buckets in here. I do. I do have my three buckets. OK. So this is how I use ideas that no one else in the world uses and yet I can be comfortable that they're right. A statistician's best friend is what? A large, relevant sample size. And why? Because a principle derived from a large relevant sample size can't be wrong can it? The only way it could be wrong is if the sample size is too small or the sample itself is not relevant. So I want to tell you what my three buckets are where I derive my models, my multidisciplinary models. Number one is 13.7 billion years. Is that a large sample? It's the largest one in the whole universe. There is no larger sample. Because what is it? It's the inorganic universe. Physics. Geology. Anything that's not living goes in my bucket number 1. 13.7 billion years.

Bucket number 2 is 3.5 billion years. It's biology on the planet Earth. Is that a big sample size? Is it relevant? We're biological creatures. Let me ask you this, inorganic, bucket number one, is it relevant? We live in it. So bucket number one we live in, 13.7 billion years. Bucket number two is what we're part of, biology. 3.5 billion years. And number three is 20,000 years of recorded human history. That's the most relevant of all. That's our story. That's who we are.

So we're going to take a couple of examples here of multidisciplinary thinking. We'll ask this question, is there a simple two word description that accurately describes how everything in the world works? That would be very useful wouldn't it if you know how everything works in just two words? So we go to bucket number one. How does everything work? We go to Newton's Third Law of Motion. We're getting very multidisciplinary here. Does anybody in the room know what Newton's Third Law of Motion says? (Answer: "For every action there will always be an equal and opposite reaction.") That's beautiful. He wins one of my pens here for answering that question correctly. I always give out rewards. It's like operant conditioning from psychology, right? So there you go.

Yes if I put this bottle of water on this table, Newton's Third Law of Motion says that if the bottle pushes down on the table with 'force x', and it also strangely says that the table pushes back with equal 'force x'. That's very strange. But you know how long that's been true? 13.7 billion years that's been true. Now what if I push down twice as hard, what does the table do? Well if I push down twenty one and a half times as hard? What does the table do? Twenty one and a half! OK. Now is there a good word, a catchall word to describe what we're talking about here when this pushes down and this thing pushes back? Yeah, it's reciprocation isn't it? But it's not mere reciprocation. It's perfectly mirrored reciprocation. The harder I push, the harder it pushes back. Does everybody buy that? That's bucket number one. That's how the world works. It's mirrored reciprocation. Everything in the inorganic universe works that way.

We go to bucket number 2. I'm going to introduce a little humor into this. Even though this is a dog, pretend it's a cat. OK? This is a cat for the time being. Mark Twain said that a man who picks up a cat by its tail will learn a lesson he can learn in no other way. What is this cat going to try to do? It's going to do what? (Answer: "Attack you.") Yeah it's going to try and scratch me with its sharp claws. And why? It doesn't find being picked up by its tail very agreeable does it? Now what if I start swinging this cat around by its tail. What does the cat do now? Now it's trying to scratch my eyes out. It said, 'You escalated on me pal, I'm going to escalate back on you.' Does that sound a lot like mirrored reciprocation? But what if instead of doing something disagreeable with this cat we do something very agreeable with this cat? And this cat's sitting here and we come over and we gently pick it up by its tummy and we put it in the crook of our elbow and we gently stroke it. Does the cat try and scratch us? What does it do? It licks our hands. And as long as I sit here and stroke it, it's going to continue to try and lick my hand. It wants to show me what? 'I like this. This is agreeable. You're a good guy. Keep it up man!' It is mirrored reciprocation isn't it? If I act in a disagreeable way to the cat, the cat acts in a disagreeable way back, and mirrored. If I act in an agreeable way, what do you think we're going to find when we go to bucket number three? It's exactly the same thing isn't it? Your entire life. Every interaction you have with another human being is merely mirrored reciprocation. Now you're going to say to yourself 'This is too simple. It can't be this simple.' It is this simple! It doesn't mean it's not sophisticated. This is a very sophisticated model we just derived isn't it? We did it in a multidisciplinary fashion didn't we? We looked into the three largest sample sizes that exist, the three most relevant, and they all said exactly the same thing. Do you think we can bank on that? 100 percent we can bank on that.

So, if you think about things being complex as being sophisticated like most people do, you think the more complex it is, the more sophisticated it is. I want you to remember, as best you can, what I'm about to say. It's very, very important. Albert Einstein once listed what he said were the five ascending levels of cognitive prowess. Now there's nobody in this room that doesn't want to be level number one. Right? That's why we're here. You don't want to be level number five. You want to be level number one. Wait until you hear what these levels are, it's going to blow your mind. So number 5 he said, at the very bottom, was smart. OK. That's the lowest level of cognitive prowess is being smart. The next level up, level 4, is intelligent. Level 3, next up, is brilliant. Next level up, level 2, he said is genius. What? What's higher than genius? He must have that backward. No he doesn't. Wait until you hear what number one is according to Albert Einstein. We just demonstrated it. Number one is simple. Simple transcends genius.

Why is simple, the right kind of simple, better than genius? Because you can understand it! I bought this book – I usually take it when I'm giving a talk like this. It's The Ethics by Spinoza. Spinoza's ethics book was written by a true genius. And guess what? You can't understand anything in it. But can you understand what I walked you through – mirrored reciprocation? OK.

Now, because this is an economics club, right, everybody here is interested in economics? So let's give an example of a model derived, multidisciplinary, same way we did before, but is just about as pure an economic model as you can find. So now we're going to ask the question, what's the most powerful force that we as human beings, both as individuals and groups, can potentially harness towards achieving our ends in life?

OK. We go to bucket number one. We ask, what's the most powerful force in bucket number one? I'm going to quote Albert Einstein again. He said, 'The most powerful force in the universe is compound interest.' But that's not all he said about compound interest. He not only said that it's the most powerful force in the universe, he said it's the greatest mathematical discovery of all time. He said it's the eighth wonder of the world. And he said that those who understand it get paid by it and those who don't pay for it. He said all these things, Albert Einstein, about compound interest. Now what's a good working definition of compound interest? I will propose one. You can have your own, but this is mine. I say compound interest is dogged incremental constant progress over a very long time frame. Is that a fair definition? Alright? I think that's the answer from bucket number 1. The most powerful force that could be potentially harnessed is dogged incremental constant progress over a very long time frame.

We go to bucket number 2. 3.5 billion years of biology. What's the most powerful force in three and a half billion years of biology? It's the machine of evolution. How does it work? Dogged incremental constant progress over a long time frame. This is the beauty of deriving things multidisciplinary. You can't be wrong! You see these things lined up there like three bars on a slot machine. Boy do you hit the jackpot.

What do you think we're going to find when we go to bucket number three? 20,000 years of human experience on earth. You want to win a gold medal in the Olympics. You want to learn a musical instrument. You want to learn a foreign language. You want to build Berkshire Hathaway. What's the formula? Dogged incremental constant progress over a very long time frame. Look how simple this is. This is above genius. It's absolutely above genius because you can understand it. This isn't somebody drawing all these formulas and things up here about, you know, how numbers multiply and amplify over time. The problem that human beings have is we don't like to be constant. Think of each one of those terms. Dogged incremental constant progress over a very long time frame. Nobody wants to be constant. We're the functional equivalent of Sisyphus pushing his boulder up the mountain. You push it up half way, and you go, 'Aw, I'll come back and do this another time.' It goes back down. 'I've got this great idea, I'm going to really work hard on it.' You push it up half way and,' Aw, you know I'll get back to this next month.' This is the human condition. In geometric terms this is called variance drain. Whenever you interrupt the constant increase above a certain level of threshold you lose compounding, you're no longer on the log curve. You fall back onto a linear curve or God forbid a step curve down. You have to be constant. How many people do you know that are constant in what they do? I know a couple. Warren Buffett and Charlie Munger. Everybody wants to be rich like Warren Buffett and Charlie Munger. I'm telling you how they got rich. They were constant. They were not intermittent.

Let me give you an example of why intermittency is perhaps the most important thing in your lives whether you realize it or not. We'll begin with the example of bringing home a puppy from the pet shop. Brand spanking new puppy from the pet shop. And the kids are so excited, they're so excited. What's your goal of bringing home this puppy to your household? I say it's to have an engaged, contributing, all-in, new member of your household. And night number one, how are we doing? It's a disaster. This thing's over in the corner shaking like a leaf. It's anything but engaged. It's anything but contributing and it's anything but all-in. It's shaking like a leaf. Human beings are really good at solving this problem. We know we need to create a calm, reassuring, secure, and safe environment.

We know that even though this puppy can't understand what we're saying, we need to communicate in soothing tones. And we also know that we need to provide food and water for this puppy. But underlying all these things, stitching them all together, we really know we have to be constant, don't we? You can't not feed the puppy one day, or what happens? Well, the puppy freaks out. The puppy becomes a neurotic puppy. It doesn't know whether it can trust you or not. This trust that this puppy needs to go all-in is dependent upon you being constant in these behaviors. Does everybody accept that? So, if we are constant, usually in about seven days more or less, if we are constant, this little puppy will trot over to our side and it will attach itself to us. And for the rest of its life it will be willing to die for us. That puppy just went all-in, didn't it? Now did it go all-in because it's our idea that we want an engaged, contributing, all-in new member of our household? It doesn't even know what our idea is, does it? Why did it just go all in? It was the puppy's idea!

Now let me tie this to your lives. I did this at Google and they really couldn't figure out what I was doing. And then afterwards they said 'You know that was really good. Your eight dollar crystal ball that's really a good trick. So I'll do my eight dollar crystal ball trick. And I told them…I had rows bigger than this one, full of the smartest people in the world. And I said guess what I'm going to do with my eight dollar crystal ball? I said, I'm going to do a psychic reading of anybody in this room. Anybody. And I said to Google, 'If you think that I've got a stooge in the room where I've got this prearranged, I don't. Go out in the corridor and bring somebody in. I'll do the psychic reading.' This eight dollars I spent on Amazon is the best money I ever spent. So I'm going to select you. What's your name? (Answer: "Emily") We're going to take Emily, we're going to do a psychic reading of Emily right in front of you. You're not going to believe this. I'm going to nail this. You're all going 'This guy's a nutcase.' Spencer's going, 'Man why did I invite this guy?' Just be patient, Spencer, this is good stuff. I'll pull it off. So I'm going to tell Emily what she's been looking for her whole life. Is there anybody here who thinks I can do this? Well, wait until you hear my answer and then for the rest of your life you're all going to go, 'I know what everybody in the world is looking for.' Emily, your entire life you've been on a quest, an odyssey, a search for that individual that you can 100 percent absolutely and completely trust. But who's not just trustworthy, but principled, and courageous, and competent, and kind, and loyal, and understanding, and forgiving, and unselfish. I'm right, aren't I? (Answer: "Dead on") You know what else my eight dollar crystal ball tells me? If you ever think you may have encountered this person, you are going to probe and probe and test and test to make sure that they are real, that you're not being fooled. And the paradox is that it looks like you're probing for weakness but

you're not. You're probing for strength. And the worst day of your life is if instead of strength, you get back weakness. And now you feel betrayed. You know why? You've got to start your search all over again. It's the worst thing in the whole world isn't it? Does everybody here agree with me on this? Look how simple this is.

Here's your 22-second course in leadership. That's all it takes. You don't have to go to business school. You don't need books. You don't need guest speakers. All you have to do is take that list that's in Emily's head, and every single other person in this room, every single other person in the whole world, has this list in their head – trustworthy, principled, courageous, competent, loyal, kind, understanding, forgiving, unselfish, and in every single one of your interactions with others, be the list! Remember how that puppy went all in? You do this with the other human beings you encounter in life. They're all going all-in and not because it's your idea. Most people spend all day long trying to get other people to like them. They do it wrong. You do this list, you won't be able to keep the people away. Everybody's going to want to attach to you. And be willing to do what? Just like the puppy, they'd be willing to die for you. Because you are what they've been looking for their whole lives. This is pretty profound, isn't it?

Look at this picture. I love this picture. Does this woman look like she's having a good time? OK. So I helped teach this high school class in Los Angeles, and the first class of each semester, a brand new group just like you guys, and I make them go through the following exercise. And believe me just like my eight dollar crystal ball, afterwards you're going to go 'I'm really glad I heard that. Because now I really understand things at a level I didn't understand them before.' And to understand is to what? To know what to do.

This will clear up all your blind spots about yourself and other human beings. I asked the group, show of hands, how many of you think all human beings are alike? Why? (Answer: 'We all have the same basic needs. We express them differently. Tremendous diversity in how we go about meeting them, but ultimately we all have the same needs.') You get two pens! That's a beautiful answer. So we're going to identify what those needs are. What's your name? (Answer: 'Craig') Craig nailed it. Show of hands. How many of you want to be paid attention to? I mean is there really anybody here who doesn't want to be paid attention to? You're a different kind of human being if you are. OK. How many of you want to be listened to? How many of you want to be respected? How many of you want meaning, satisfaction, and fulfillment in your life in the sense that you matter? And then I tell the high school kids, number five. I put it number five. Even

though it's the most important of the five, I put it last, because if I put it first, you wouldn't raise your hands because it's awkward. They're just going to think I'm weird. But then they do raise their hand because I soften them up. How many of you want to be loved? Everybody's exactly the same. The only difference is, as Craig said, the strategy that they're employing to try to get to fulfill those needs. OK.

Now I'm going to tell you the strategy that dogs use. The dog is going to be very unhappy with me for telling you this. I'm ratting them out. So when your dog is in the backyard and he goes to the fence between your house and the next house and he talks to the dog next door, I'm going to tell you what he says. No one has ever divulged this before. You're the first group to hear this. Your dog says to the dog next door, 'Can you believe how easy it is to manipulate human beings and get them to do whatever you want them to do for you?' And the dog next door goes, 'I know it's a piece of cake.' And your dog says 'Yeah. All you have to do is every single time they come home, you greet them at the door with the biggest unconditional show of attention that they've ever gotten in their whole life. And you only have to do it for like 15 seconds, and then you can go back to doing whatever you were doing before and completely ignore them for the rest of the evening.'

However, you do have to do this every single time they come home. And what will the person do? They'll take care of them. They'll do anything for this dog. OK? Now do you think that this woman feels she's being paid attention to? And listened to? And respected? Do you think she's getting meaning, satisfaction, and fulfillment? Do you think she matters to this dog? And do you think she thinks this dog loves her? And what does the dog get in return? Everything.

All you have to do, if you want everything in life from everybody else, is first pay attention, listen to them, show them respect, give them meaning, satisfaction, and fulfillment. Convey to them that they matter to you. And show you love them. But you have to go first. And what are you going to get back. Mirrored reciprocation. Right? See how we tie this all together? The world is so damn simple. It's not complicated at all! Every single person on this planet is looking for the same thing. Now why is it that we don't act on these very simple things?

So I have an example I use with the class, my elevator example. I'm famous for my elevator story. You're standing in front of an elevator. The doors open. And inside the elevator is one solitary stranger. You've never met this person before in your whole life. You walk into the elevator; you have three choices for how you're going to behave as you walk into this elevator. Choice number

one: you can smile and say good morning. And I say, at least in California, if you do that, 98 percent of the time the person will smile, say good morning back. You can test it. OK. My guess is you're going to find that 98 percent of the time that people say good morning. Choice number two: you can walk in and you can scowl and hiss at this stranger in the elevator. And they have no idea why you're scowling and hissing at them. And I say 98 percent of the time, they may not hiss back at you, but they will scowl back at you. And option number three. This is where the wisdom comes. You can walk into the elevator and you can do nothing. And what do you get 98 percent of the time if you walk into an elevator and you do nothing from that stranger in the elevator? Nothing. It's mirrored reciprocation isn't it? But what did you have to do? You have to go first. And you're going to get back whatever you put out there.

This is why these bars are full of people at 2 a.m. drowning their sorrows. Knocking down these drinks. 'When's the world going to give me something man? When am I going to get mine?' Well, what did you ever do? Did you ever get up in the morning and smile at the world? No. You either did nothing or you scowled and hissed at the world. You're getting back exactly what you would expect to get back if you understood how the world really works. Which is why we study multidisciplinary things right? We can't be wrong on this. can we? It's all mirrored reciprocation. So what do you want to do? You want to go positive, you want to go first. What's the obstacle? There's a big obstacle. This is an economics club. Certainly, you have all heard of Daniel Kahneman, Nobel Prize winner in economics. Behavioral economics. And what did he win his Nobel Prize for? For answering the question, why would people not go positive and not go first when there's a 98 percent chance you're going to benefit from it, and only a 2 percent chance the person's going to tell you to 'screw off' and you're going to feel horrible, lose face, and all the rest of that. And that's real. That's why we don't do it. He said there's huge asymmetry between the standard human desire for gain and the standard human desire to avoid loss. Which one do you think is more powerful? 98 percent versus 2!

Now I gave this same talk at Fairfax up in Toronto, Prem Watsa's outfit. It's the Berkshire Hathaway of Canada. And I said 'Of all people in the whole world, you guys should not be making this mistake.' Why? Because you're in the insurance business. How does insurance work? You're supposed to spend 2 percent to protect 98 percent, right? Look what you're doing. You're spending 98 percent to protect against the 2 percent probability that somebody makes you look foolish. Lou Brock set the Major League record for stolen bases with the St. Louis Cardinals many years ago. And he once said, 'Show me a man who is afraid of appearing foolish and I'll show you a

man who can be beat every time.' And if you're getting beat in life, chances are it's because you're afraid of appearing foolish. So what do I do with my life? I risk the two percent. I was so proud the other day, I was reading Bono on Bono. Bono's the lead singer of U2. He's the only other person I've ever encountered in my entire life, and I asked all my cronies, 'Has anybody else ever encountered this elevator model before?' 'No. No that's yours Peter.' And I said, 'You know how I said 98-2? Guess who's got the exact same model? Bono! Well he doesn't have 98-2, he's got 90-10.' Those are his numbers – 90-10. Can I be wrong on this? That guy is really squared away. I hope some day I'm as squared away as he is. It's incredible to think, he figured it out. That's why that guy's had such a great life. He goes, 'You know, I know 10 percent of people are going to screw me. That's OK. If I'm not willing to be vulnerable and expose myself to that 10%, I'm going to miss the other 90%.' Does that make sense? Now Charlie Munger one day, you know he turned my whole life upside down. I was over at his house one day and he said, 'Peter, I've been hearing about you going around giving all these talks. You don't have to go around the country telling people how to make more money.' I said, 'Well that's not what I do Charlie.' I was very nimble on my feet. I said there's a catch. I do tell how to make more money but, by the way, if you do these things that get people all-in and whatnot, you'll make all the money there is to be made. You really will. That's not why I'm here. I'm here to give you the second half of the message, which is how to be a good person! What's your name? (Answer: 'Albert'). Albert, how many lifetimes do you have Albert? (Answer: 'One'). That's correct, you get a pen. You see Albert lucked out, he got an easy question. Is your lifetime important to you Albert? (Answer: 'One of the most important. Absolutely').

Now what do we know in economics, it's an economics model, what do we know we need to use as our decision making prism whenever something is both finite, like one, and important like your life? How do we have to make decisions? You had Mankiw here right? He didn't talk about opportunity cost? Have you all heard of opportunity cost? It's the classic illustration of opportunity cost. You have a finite number of something, it's important. If you're doing 'A' with it, it means what? It means you're not doing B or C or D or E. What do you have to do? You have to evaluate all the different alternatives and pick the one that's most optimal. Is that fair? So you've got one lifetime. How do you want to spend your one lifetime? Do you want to spend your one lifetime like most people do, fighting with everybody around them? No. I just told you how to avoid that. And in exchange have what? A celebratory life. Instead of an antagonistic fighting life. All you have to do is go positive, go first, be patient enough. You know we have to be patient

for a week with this puppy. Do you know how long it usually takes for a human being to do all the probing and testing that Emily was going to do and to find out that you're for real? It takes six months. This is why nobody does it. 'Oh it takes too long.' Compared to what? Look at the plan B that everybody uses. It's terrible! It doesn't work. They spend their whole lives fighting with everybody.

The three hallmarks of a great investment are superior returns, low risk, and long duration. The whole world concentrates on Category 1. But if you're a leader of any merit at all, you should be treating these three as what? Co-priorities. How do you get low risk and long duration? Win-Win. This is the biggest blind spot in business. People are actually proud of a win-lose relationship. 'Yeah we really beat the crap out of our suppliers.' You know, 'We've got these employees for…you know, we've got them on an HB1 visa, they can't work anywhere else for three years.' They're proud of it! Total Win-Lose. You take game theory and you insert the word lose in any scenario in game theory and what do you have? A suboptimal outcome. What happens when you insert win-win in any game theory scenario, what do you get? Optimal every time. What must you necessarily do if you're interested in achieving win-win frameworks with your important counterparties in life? You must understand the basic axiom of clinical psychology, which I know because I'm multidisciplinary. I also learned psychology. The basic axiom of clinical psychology reads, 'If you could see the world the way I see it, you'd understand why I behave the way I do.' That's pretty good isn't it? Now there's two corollaries to that axiom. And I say if you buy the axiom, which you should, you must buy the two corollaries as well because they're logical extensions. They're undeniable. Corollary number one, if that axiom is true and you want to understand the way someone's behaving, you must see the world as they see it. But corollary number two, if you want to change a human being's behavior and you accept that axiom, you must necessarily, to get them to change, change how they see the world. Now this sounds impossible. It's not really that hard. You take a business. Most employees of a business see the world as employees. What if you could get them to see the world instead through the eyes of an owner? Do you think that's going to change how they behave? It totally changes how they behave. Employees don't care about waste. Owners do. Employees don't self-police our place. Owners do.

This is the secret to leadership. The secret to leadership is to see through the eyes of all six important counterparty groups and make sure that everything you do is structured in such a way to be win-win with them. So here are the six. Your customers, your suppliers, your employees, your owners, your regulators, and the communities you operate in. And if you can truly see through

the eyes of all six of these counterparty groups and understand their needs, their aspirations, their insecurities, their time horizons – how many blind spots do you have now? Zero. How many mistakes are you going to make? You're going to make zero. People don't think this is possible. It's really easy. To understand is to know what to do. So I'm going to wrap up here because I've only got two minutes. There's this great African proverb. It's the definition of win-win. 'If you want to go quickly, go alone, if you want to go far, go together.' Live your life to go far together. Don't live it to go quickly alone. Most people grow up wanting to go quickly alone. It doesn't work. You wind up like Ebenezer Scrooge in A Christmas Carol. You get to the end of your life. Yeah you're rich, you're powerful, you're famous, and you want a do-over because you realize at the end of your life, 'I didn't live my life right.' I don't have what really matters. What really matters is to have people pay attention to you, listen to you, and respect you, show you that you matter, and to love you. And to have it be genuine, not bought. Does that makes sense?

And I'll leave you my last bit of wisdom. There's another proverb, it's a Turkish Proverb. 'No road is long with good company.' The essence of life is to surround yourself, as continuously as you can, with good company. Like I have today. You're marvelous company. But how did I get that? I had to earn it, didn't I? I'm not just some guy you picked off the street. I earned the privilege of coming here and the privilege of being with you. It gives me what? It gives me meaning in my life. It makes me feel I matter. To have people listening to me. This is my strategy for getting those five thing. You can develop your own strategy and I hope it involves going positive and going first. Thank you.

"Stay Hungry, Stay Foolish"

delivered by **STEVE JOBS**

Steve Jobs was an American businessman and co-founder of Apple Inc. This speech was delivered as the **commencement address** to the graduates of Stanford University on June 12, 2005.

I am honored to be with you today at your commencement from one of the finest universities in the world. I never graduated from college. Truth be told, this is the closest I've ever gotten to a college graduation. Today I want to tell you three stories from my life. That's it. No big deal. Just three stories.

The first story is about connecting the dots.

I dropped out of Reed College after the first 6 months, but then stayed around as a drop-in for another 18 months or so before I really quit. So why did I drop out?

It started before I was born. My biological mother was a young, unwed college graduate student, and she decided to put me up for adoption. She felt very strongly that I should be adopted by college graduates, so everything was all set for me to be adopted at birth by a lawyer and his wife. Except that when I popped out they decided at the last minute that they really wanted a girl. So my parents, who were on a waiting list, got a call in the middle of the night asking: "We have an unexpected baby boy; do you want him?" They said: "Of course." My biological mother later found out that my mother had never graduated from college and that my father had never

graduated from high school. She refused to sign the final adoption papers. She only relented a few months later when my parents promised that I would someday go to college.

And 17 years later I did go to college. But I naively chose a college that was almost as expensive as Stanford, and all of my working-class parents' savings were being spent on my college tuition. After six months, I couldn't see the value in it. I had no idea what I wanted to do with my life and no idea how college was going to help me figure it out. And here I was spending all of the money my parents had saved their entire life. So I decided to drop out and trust that it would all work out OK. It was pretty scary at the time, but looking back it was one of the best decisions I ever made. The minute I dropped out I could stop taking the required classes that didn't interest me, and begin dropping in on the ones that looked interesting.

It wasn't all romantic. I didn't have a dorm room, so I slept on the floor in friends' rooms, I returned Coke bottles for the 5¢ deposits to buy food with, and I would walk the 7 miles across town every Sunday night to get one good meal a week at the Hare Krishna temple. I loved it. And much of what I stumbled into by following my curiosity and intuition turned out to be priceless later on. Let me give you one example:

Reed College at that time offered perhaps the best calligraphy instruction in the country. Throughout the campus every poster, every label on every drawer, was beautifully hand calligraphed. Because I had dropped out and didn't have to take the normal classes, I decided to take a calligraphy class to learn how to do this. I learned about serif and sans serif typefaces, about varying the amount of space between different letter combinations, about what makes great typography great. It was beautiful, historical, artistically subtle in a way that science can't capture, and I found it fascinating.

None of this had even a hope of any practical application in my life. But 10 years later, when we were designing the first Macintosh computer, it all came back to me. And we designed it all into the Mac. It was the first computer with beautiful typography. If I had never dropped in on that single course in college, the Mac would have never had multiple typefaces or proportionally spaced fonts. And since Windows just copied the Mac, it's likely that no personal computer would have them. If I had never dropped out, I would have never dropped in on this calligraphy class, and personal computers might not have the wonderful typography that they do. Of course it was impossible to connect the dots looking forward when I was in college. But it was very, very clear looking backward 10 years later.

Again, you can't connect the dots looking forward; you can only connect them looking backward. So you have to trust that the dots will somehow connect in your future. You have to trust in something — your gut, destiny, life, karma, whatever. This approach has never let me down, and it has made all the difference in my life.

My second story is about love and loss.

I was lucky — I found what I loved to do early in life. Woz and I started Apple in my parents' garage when I was 20. We worked hard, and in 10 years Apple had grown from just the two of us in a garage into a $2 billion company with over 4,000 employees. We had just released our finest creation — the Macintosh — a year earlier, and I had just turned 30. And then I got fired. How can you get fired from a company you started? Well, as Apple grew we hired someone who I thought was very talented to run the company with me, and for the first year or so things went well. But then our visions of the future began to diverge and eventually we had a falling out. When we did, our Board of Directors sided with him. So at 30 I was out. And very publicly out. What had been the focus of my entire adult life was gone, and it was devastating.

I really didn't know what to do for a few months. I felt that I had let the previous generation of entrepreneurs down — that I had dropped the baton as it was being passed to me. I met with David Packard and Bob Noyce and tried to apologize for screwing up so badly. I was a very public failure, and I even thought about running away from the valley. But something slowly began to dawn on me — I still loved what I did. The turn of events at Apple had not changed that one bit. I had been rejected, but I was still in love. And so I decided to start over.

I didn't see it then, but it turned out that getting fired from Apple was the best thing that could have ever happened to me. The heaviness of being successful was replaced by the lightness of being a beginner again, less sure about everything. It freed me to enter one of the most creative periods of my life.

During the next five years, I started a company named NeXT, another company named Pixar, and fell in love with an amazing woman who would become my wife. Pixar went on to create the world's first computer animated feature film, Toy Story, and is now the most successful animation studio in the world. In a remarkable turn of events, Apple bought NeXT, I returned to Apple, and the technology we developed at NeXT is at the heart of Apple's current renaissance. And Laurene and I have a wonderful family together.

I'm pretty sure none of this would have happened if I hadn't been fired from Apple. It was awful tasting medicine, but I guess the patient needed it. Sometimes life hits you in the head with a brick. Don't lose faith. I'm convinced that the only thing that kept me going was that I loved what I did. You've got to find what you love. And that is as true for your work as it is for your lovers. Your work is going to fill a large part of your life, and the only way to be truly satisfied is to do what you believe is great work. And the only way to do great work is to love what you do. If you haven't found it yet, keep looking. Don't settle. As with all matters of the heart, you'll know when you find it. And, like any great relationship, it just gets better and better as the years roll on. So keep looking until you find it. Don't settle.

My third story is about death.

When I was 17, I read a quote that went something like: "If you live each day as if it was your last, someday you'll most certainly be right." It made an impression on me, and since then, for the past 33 years, I have looked in the mirror every morning and asked myself: "If today were the last day of my life, would I want to do what I am about to do today?" And whenever the answer has been "No" for too many days in a row, I know I need to change something.

Remembering that I'll be dead soon is the most important tool I've ever encountered to help me make the big choices in life. Because almost everything — all external expectations, all pride, all fear of embarrassment or failure — these things just fall away in the face of death, leaving only what is truly important. Remembering that you are going to die is the best way I know to avoid the trap of thinking you have something to lose. You are already naked. There is no reason not to follow your heart.

About a year ago I was diagnosed with cancer. I had a scan at 7:30 in the morning, and it clearly showed a tumor on my pancreas. I didn't even know what a pancreas was. The doctors told me this was almost certainly a type of cancer that is incurable, and that I should expect to live no longer than three to six months. My doctor advised me to go home and get my affairs in order, which is doctor's code for prepare to die. It means to try to tell your kids everything you thought you'd have the next 10 years to tell them in just a few months. It means to make sure everything is buttoned up so that it will be as easy as possible for your family. It means to say your goodbyes.

I lived with that diagnosis all day. Later that evening I had a biopsy, where they stuck an endoscope down my throat, through my stomach and into my intestines, put a needle into my pancreas and

got a few cells from the tumor. I was sedated, but my wife, who was there, told me that when they viewed the cells under a microscope the doctors started crying because it turned out to be a very rare form of pancreatic cancer that is curable with surgery. I had the surgery and I'm fine now.

This was the closest I've been to facing death, and I hope it's the closest I get for a few more decades. Having lived through it, I can now say this to you with a bit more certainty than when death was a useful but purely intellectual concept:

No one wants to die. Even people who want to go to heaven don't want to die to get there. And yet death is the destination we all share. No one has ever escaped it. And that is as it should be, because Death is very likely the single best invention of Life. It is Life's change agent. It clears out the old to make way for the new. Right now the new is you, but someday not too long from now, you will gradually become the old and be cleared away. Sorry to be so dramatic, but it is quite true.

Your time is limited, so don't waste it living someone else's life. Don't be trapped by dogma — which is living with the results of other people's thinking. Don't let the noise of others' opinions drown out your own inner voice. And most important, have the courage to follow your heart and intuition. They somehow already know what you truly want to become. Everything else is secondary.

When I was young, there was an amazing publication called The Whole Earth Catalog, which was one of the bibles of my generation. It was created by a fellow named Stewart Brand not far from here in Menlo Park, and he brought it to life with his poetic touch. This was in the late 1960s, before personal computers and desktop publishing, so it was all made with typewriters, scissors and Polaroid cameras. It was sort of like Google in paperback form, 35 years before Google came along: It was idealistic, and overflowing with neat tools and great notions.

Stewart and his team put out several issues of The Whole Earth Catalog, and then when it had run its course, they put out a final issue. It was the mid-1970s, and I was your age. On the back cover of their final issue was a photograph of an early morning country road, the kind you might find yourself hitchhiking on if you were so adventurous. Beneath it were the words: "Stay Hungry. Stay Foolish." It was their farewell message as they signed off. Stay Hungry. Stay Foolish. And I have always wished that for myself. And now, as you graduate to begin anew, I wish that for you.

Stay Hungry. Stay Foolish.

"How to Guarantee a Life of Misery"

delivered by CHARLIE MUNGER

Charlie Munger is vice chairman of Berkshire Hathaway. This speech was originally delivered to the Harvard School on June 13, 1986. This transcript was originally published on **BizNews.com**.

Now that Headmaster Berrisford has selected one of the oldest and longest-serving trustees to make a commencement speech, it behooves the speaker to address two questions in every mind:

1) Why was such a selection made? and,

2) How long is the speech going to last?

I will answer the first question from long experience alongside Berrisford. He is seeking enhanced reputation for our school in the manner of the man who proudly displays his horse which can count to seven. The man knows that counting to seven is not much of a mathematical feat but he expects approval because doing so is creditable, considering that the performer is a horse.

The second question, regarding length of speech, I am not going to answer in advance. It would deprive your upturned faces of lively curiosity and obvious keen anticipation, which I prefer to retain, regardless of source.

But I will tell you how my consideration of speech length created the subject matter of the speech

itself. I was puffed up when invited to speak. While not having significant public-speaking experience, I do hold a black belt in chutzpah, and, I immediately considered Demosthenes and Cicero as role models and anticipated trying to earn a compliment like Cicero gave when asked which was his favourite among the orations of Demosthenes. Cicero replied: 'The longest one."

However, fortunately for this audience, I also thought of Samuel Johnson's famous comment when he addressed Milton's poem, Paradise Lost, and correctly said: "No one ever wished it longer." And that made me consider which of all the twenty Harvard School graduation speeches I had heard that I wished longer. There was only one such speech, that given by Johnny Carson, specifying Carson's prescriptions for guaranteed misery in life. I therefore decided to repeat Carson's speech but in expanded form with some added prescriptions of my own.

After all, I am much older than Carson was when he spoke and have failed and been miserable more often and in more ways than was possible for a charming humorist speaking at younger age. I am plainly well-qualified to expand on Carson's theme.

What Carson said was that he couldn't tell the graduating class how to be happy, but he could tell them from personal experience how to guarantee misery. Carson's prescriptions for sure misery included:

1) Ingesting chemicals in an effort to alter mood or perception;

2) Envy; and

3) Resentment.

I can still recall Carson's absolute conviction as he told how he had tried these things on occasion after occasion and had become miserable every time. It is easy to understand Carson's first prescription for misery -ingesting chemicals. I add my voice. The four closest friends of my youth were highly intelligent, ethical, humorous types, favoured in person and background. Two are long dead, with alcohol a contributing factor, and a third is a living alcoholic -if you call that living. While susceptibility varies, addiction can happen to any of us, through a subtle process where the bonds of degradation are too light to be felt until they are too strong to be broken. And I have yet to meet anyone, in over six decades of life, whose life was worsened by overfear and overavoidance of such a deceptive pathway to destruction.

Envy, of course, joins chemicals in winning some sort of quantity price for causing misery. It

was wreaking havoc long before it got a bad press in the laws of Moses. If you wish to retain the contribution of envy to misery, I recommend that you never read any of the biographies of that good Christian, Samuel Johnson, because his life demonstrates in an enticing way the possibility and advantage of transcending envy.

Resentment has always worked for me exactly as it worked for Carson. I cannot recommend it highly enough to you if you desire misery. Johnson spoke well when he said that life is hard enough to swallow without squeezing in the bitter rind of resentment.

For those of you who want misery, I also recommend refraining from practice of the Disraeli compromise, designed for people who find it impossible to quit resentment cold turkey. Disraeli, as he rose to become one of the greatest Prime Ministers, learned to give up vengeance as a motivation for action, but he did retain some outlet for resentment by putting the names of people who wronged him on pieces of paper in a drawer. Then, from time to time, he reviewed these names and took pleasure in noting the way the world had taken his enemies down without his assistance.

Well, so much for Carson's three prescriptions. Here are four more prescriptions from Munger:

First, be unreliable. Do not faithfully do what you have engaged to do. If you will only master this one habit you will more than counterbalance the combined effect of all your virtues, howsoever great. If you like being distrusted and excluded from the best human contribution and company, this prescription is for you. Master this one habit and you can always play the role of the hare in the fable, except that instead of being outrun by one fine turtle you will be outrun by hordes and hordes of mediocre turtles and even by some mediocre turtles on crutches.

I must warn you that if you don't follow my first prescription it may be hard to end up miserable, even if you start disadvantaged. I had a roommate in college who was and is severely dyslexic. But he is perhaps the most reliable man I have ever known. He has had a wonderful life so far, outstanding wife and children, chief executive of a multibillion dollar corporation.

If you want to avoid a conventional, main-culture, establishment result of this kind, you simply can t count on your other handicaps to hold you back if you persist in being reliable.

I cannot here pass by a reference to a life described as "wonderful so far," without reinforcing the "so far" aspects of the human condition by repeating the remark of Croesus, once the richest

king in the world. Later, in ignominious captivity, as he prepared to be burned alive, he said: "Well now do I remember the words of the historian Solon: "No man's life should be accounted a happy one until it is over."

My second prescription for misery is to learn everything you possibly can from your own personal experience, minimizing what you learn vicariously from the good and bad experience of others, living and dead. This prescription is a sure-shot producer of misery and second-rate achievement.

You can see the results of not learning from others' mistakes by simply looking about you. How little originality there is in the common disasters of mankind -drunk driving deaths, reckless driving maimings, incurable venereal diseases, conversion of bright college students into brainwashed zombies as members of destructive cults, business failures through repetition of obvious mistakes made by predecessors, various forms of crowd folly, and so on. I recommend as a memory clue to finding the way to real trouble from heedless, unoriginal error the modern saying: "If at first you don't succeed, well, so much for hang gliding."

The other aspect of avoiding vicarious wisdom is the rule for not learning from the best work done before yours. The prescription is to become as non-educated as you reasonable can.

Perhaps you will better see the type of non-miserable result you can thus avoid if I render a short historical account. There once was a man who assiduously mastered the work of his best predecessors, despite a poor start and very tough time in analytic geometry. Eventually his own original work attracted wide attention and he said of that work:

"If I have seen a little farther than other men it is because I stood on the shoulders of giants."

The bones of that man lie buried now, in Westminster Abbey, under an unusual inscription:

"Here lie the remains of all that was mortal in Sir Isaac Newton."

My third prescription for misery is to go down and stay down when you get your first, second, third severe reverse in the battle of life. Because there is so much adversity out there, even for the lucky and wise, this will guarantee that, in due course, you will be permanently mired in misery. Ignore at all cost the lesson contained in the accurate epitaph written for himself by Epictetus: "Here lies Epictetus, a slave, maimed in body, the ultimate in poverty, and favoured by Gods."

My final prescription to you for a life of fuzzy thinking and infelicity is to ignore a story they told

me when I was very young about a rustic who said: "I wish I knew where I was going to die, and then I'd never go there." Most people smile (as you did) at the rustic's ignorance and ignore his basic wisdom. If my experience is any guide, the rustic's approach is to be avoided at all cost by someone bent on misery. To help fail you should discount as mere quirk, with no useful message, the method of the rustic, which is the same one used in Carson's speech.

What Carson did was to approach the study of how to create X by turning the question backward, that is, by studying how to create non-X. The great algebraist, Jacobi, had exactly the same approach as Carson and was known for his constant repetition of one phrase: "Invert, always invert." It is in the nature of things, as Jacobi knew, that many hard problems are best solved only when they are addressed backward. For instance, when almost everyone else was trying to revise the electromagnetic laws of Maxwell to be consistent with the motion laws of Newton, Einstein discovered special relativity as he made a 180 degree turn and revised Newton's laws to fit Maxwell's. It is my opinion, as a certified biography nut, that Charles Robert Darwin would have ranked near the middle of the Harvard School graduating class of 1986. Yet he is now famous in the history of science. This is precisely the type of example you should learn nothing from if bent on minimizing your results from your own endowment. Darwin's result was due in large measure to his working method, which violated all my rules for misery and particularly emphasized a backward twist in that he always gave priority attention to evidence tending to disconfirm whatever cherished and hard-won theory he already had. In contrast, most people early achieve and later intensify a tendency to process new and disconfirming information so that any original conclusion remains intact. They become people of whom Philip Wylie observed: "You couldn't squeeze a dime between what they already know and what they will never learn."

The life of Darwin demonstrates how a turtle may outrun the hares, aided by extreme objectivity, which helps the objective person end up like the only player without blindfold in a game of pin-the-donkey. If you minimize objectivity, you ignore not only a lesson from Darwin but also one from Einstein. Einstein said that his successful theories came from: "Curiosity, concentration, perseverance and self-criticism. And by self-criticism he meant the testing and destruction of his own well-loved ideas.

Finally, minimizing objectivity will help you lessen the compromises and burdens of owning worldly goods, because objectivity does not work only for great physicists and biologists. It also adds power to the work of a plumbing contractor in Bemidji. Therefore, if you interpret being true

to yourself as requiring that you retain every notion of your youth you will be safely underway, not only toward maximizing ignorance, but also toward whatever misery can be obtained through unpleasant experiences in business.

It is fitting now that a backward sort of speech end with a backward sort of toast, inspired by Elihu Root's repeated accounts of how the dog went to Dover, "leg over leg." To the class of 1986: Gentlemen, may each of you rise high by spending each day of a long life aiming low.

"Achieving Your Childhood Dreams"

delivered by RANDY PAUSCH

Randy Pausch was an American professor of computer science at Carnegie Mellon University. This speech was originally **delivered at Carnegie Mellon University** in September 2007.

It is wonderful to be here. What [they] didn't tell you is that this lecture series used to be called The Last Lecture. If you had one last lecture to give before you died, what would it be? I thought, "Damn, I finally nailed the venue and they renamed it."

So, in case there's anybody who wandered in and doesn't know the back story, my Dad always taught me when there's an elephant in the room, introduce them. If you look at my CAT scans, there are approximately 10 tumors in my liver and the doctors told me three to six months of good health left. That was a month ago, so you can do the math. I have some of the best doctors in the world.

So, that is what it is. We can't change it and we just have to decide how we're going to respond to that. We can not change the cards we are dealt, just how we play the hand. If I don't seem as depressed or morose as I should be, sorry to disappoint you.

And I assure you, I am not in denial. It's not like I'm not aware of what's going on. My family, my

three kids, my wife, we just decamped. We bought a lovely house in Chesapeake, Virginia, near Norfolk and we're doing that because that's a better place for the family to be, down the road.

And the other thing is, I am in phenomenally good health right now. I mean, it's the greatest thing of cognitive dissonance you will ever see is the fact that I am in really good shape. In fact, I'm in better shape than most of you. So anybody who wants to cry or pity me, can come down and do a few of those and then you may pity me.

All right, so what we're not talking about today. We're not talking about cancer. Because I spend a lot of time talking about that and I'm really not interested. If you have any herbal supplements or remedies, please stay away from me.

And we're not going to talk about things that are even more important than achieving your childhood dreams. We're not going to talk about my wife, we're not gonna talk about my kids. Because I'm good, but I'm not good enough to talk about that without tearing up. So, we're just gonna take that off the table. That's much more important.

And we're not gonna talk about spirituality and religion. Although, I will tell you that I have experienced a death bed conversion. I just bought a Macintosh. Now I knew I'd get nine percent of the audience with that, but …

All right, so what is today's talk about then? It's about my childhood dreams. And how I've achieved them. I've been very fortunate that way. How I believe I've been able to enable the dreams of others. And to some degree, lessons learned. I'm a professor. There should be some lessons learned. And how you can use the stuff you hear today to achieve your dreams or enable the dreams of others. And as you get older, you may find that enable the dreams of others thing is even more fun.

So, what were my childhood dreams? Well, you know, I had a really good childhood. I mean, no kidding around. I was going back through the family archives and what was really amazing was, I couldn't find any pictures of me as a kid where I wasn't smiling. Right? And that was just a very gratifying thing. There was our dog. Awe, thank you. And there, I actually have a picture of me dreaming. And I did a lot of that, you know. There was a lot of, "Wake up!"s, you know?

And it was an easy time to dream. I was born in 1960. Right? When you're eight or nine years old and you look at the TV set and men are landing on the moon, anything is possible. And that's

something we should not lose sight of. Is that the inspiration and the permission to dream is huge.

So what were my childhood dreams? You may not agree with this list, but I was there. Being in zero gravity. Playing in the National Football League. Authoring an article in the World Book Encyclopedia. I guess you can tell the nerds early. Being Captain Kirk. Anybody here have that childhood dream? Not at CMU, no. I wanted to become one of the guys who won the big stuffed animals in the amusement park. And I wanted to be an Imagineer with Disney. These are not sorted in any particular order, although I do think they get harder, except for maybe the first one.

Okay, so being in zero gravity. Now it's important to have specific dreams. I did not dream of being an astronaut because when I was a little kid, I wore glasses. And they told me, "Oh, astronauts can't have glasses." And I was like, "Mm," I didn't really want the whole astronaut gig. I just wanted the floating. So, and as a child, prototype zero point zero. But that didn't work so well.

And it turns out that NASA has something called the "vomit comet" that they use to train the astronauts. And this thing does parabolic arcs. And at the top of each arc, you get about 245 seconds where you're ballistic and you get about a rough equivalent of weightlessness for about 25 seconds. And there is a program where college students can submit proposals. And if they win the competition, they get to fly. And I thought that was really cool and we had a team, we put a team together. And they won and they got to fly. And I was all excited 'cause I was gonna go with them. And then I hit the first brick wall because they made it very clear that under no circumstances were faculty members allowed to fly with the teams.

I know, I was heartbroken. Right. I was like, "But, I worked so hard." And so, I read the literature very carefully and it turns out that NASA, it's part of their outreach and publicity program. And it turns out that the students were allowed to bring a local media journalist from their hometown. And, Randy Pausch, web journalist. It's really easy to get a press pass.

So I call up the guys at NASA and I said, "I need to know where to fax some documents." And they said, "What documents are going to fax us?" I said, "My resignation as the faculty advisor and my application as the journalist." And he said, "That's a little transparent. Don't you think?" And I said, "Yeah, but our project is virtual reality and we're gonna bring down a whole bunch of VR headsets and all the students from all the teams are going to experience it. And all those

other real journalists, are going to get to film it."

Jim Foley's going, "Oh, you bastard. Yes." And the guy said, "Here's the fax number." So, and indeed, we kept our end of the bargain. And that's one of the themes that you'll hear later on in the talk is, "Have something to bring to the table." All right? Because that will make you more welcomed.

All right, let's talk about football. My dream was to play in the National Football League. And most of you don't know that I actually pl- No. No, I did not make it to the National Football League. But, I probably got more from that dream and not accomplishing it than I got from any of the ones that I did accomplish.

I had a coach. I was signed up when I was nine years old. I was the smallest kid in the league, by far. And I had a coach, Jim Graham, who was six foot four. He had played linebacker at Penn State. He was just this hulk of a guy and he was old school. I mean really old school. Like, he thought the forward pass was a trick play.

And he showed up for practice the first day and, you know, this big hulking guy, we were all scared to death of him. And he hadn't brought any footballs. How are we gonna have practice without any footballs? And one of the other kids said, "Excuse me, coach, cut there's no football." And Coach Graham said, "Right. How many men are on a football field at a time?" So I said, "11 on a team, 22." And Coach Graham said, "All right and how many people are touching the football at any given time?" "One of them." And he said, "Right. So we're gonna work on what those other 21 guys are doing."

And that's a really good story because it's all about fundamentals. Fundamentals, fundamentals, fundamentals. You've gotta get the fundamentals down because otherwise, the fancy stuff isn't gonna work.

And the other Jim Graham story I have is, there was one practice where he just rode me, all practice. Just, "You're doing this wrong. You're doing this wrong. Go back and do it again. You owe me. You're doing pushups after practice." And when it was all over, one of the other assistant coaches came over and said, "Yeah, Coach Graham rode you pretty hard, didn't he?" I said, "Yeah." He said, "That's a good thing." He said, "When you're screwing up and nobody's saying anything to you anymore, that means they gave up." And that's a lesson that stuck with me my whole life. Is that, when you see yourself doing something badly and nobody's bothering to tell

you anymore, that's a very bad place to be. Your critics are your ones telling you they still love you and care.

After Coach Graham, I had another coach, Coach Setliff and he taught me a lot about the power of enthusiasm. He did this one thing where only for one play at a time, he would put people in at like, the most horrifically wrong position for them. Like all the short guys would become receivers, right? It was just laughable. But we only went in for one play. Right? And boy, the other team just never knew what hit 'em. Because when you're only doing it for one play and you're just not where you're supposed to be and freedom's just another word for nothing left to lose, boy, are you gonna clean somebody's clock for that one play. And that kind of enthusiasm was great.

And to this day, I am most comfortable on a football field. I mean, it's just one of those things where, if I'm working a hard problem, people will see me wandering the halls with one of these things. And that's just because, you know, when you do something young enough and you train for it, it just becomes a part of you. And I'm very glad that football was a part of my life. And if I didn't get the dream of playing in the NFL, that's okay. I probably got stuff more valuable. Because looking at what's going on in the NFL, I'm not sure those guys are doing so great right now.

Okay, and so, one of the expressions I learned in electronic arts, which I love, which pertains to this is, "Experience is what you get when you didn't get what you wanted." And I think that's absolutely lovely.

And the other thing about football is, we send out kids out to play football or soccer or swimming or whatever it is, and it's the first example of what I'm gonna call a head fake or indirect learning. We actually don't want our kids to learn football. I mean, yeah, it's really nice that I have a wonderful three point stance and that I know how to do a chop block and all this kind of stuff. But, we send our kids out to learn much more important things. Team work, sportsmanship, perseverance, et cetera, et cetera. And these kinds of head fake learnings are absolutely important. And you should keep your eye out for them because they're everywhere.

All right, a simple one, being an author in the World Book Encyclopedia. When I was a kid, we had the World Book Encyclopedia on the shelf. For the freshman, this is paper. We used to have these things called books. And after I had become somewhat of an authority on virtual reality, but not like a really important one, so I was at the level of people at the World Book would badger.

They called me up and I wrote an article. And this is Katelyn Kellaher. There's an article, if you go to your local library where they still have copies of the World Book, look under V for virtual reality and there it is.

And all I have to say is that, having been selected to be an author in the World Book Encyclopedia, I know believe that Wikipedia is a perfectly fine source for your information because I know what the quality control is for real encyclopedias. They let me in.

All right, next one. At a certain point, you just realize there's some things you're not gonna do, so maybe you just want to stand close the people. And, I mean, my god, what a role model for young people. I mean, this is everything you want to be. And what I learned that carried me forward in leadership later is that, you know, he wasn't the smartest guy on the ship. I mean, Spock was pretty smart and McCoy was the doctor and Scottie was the engineer. And you sort of go, and what skill set did he have to get on this damn thing and run it?

And clearly there's this skill set called leadership. And whether or not you like the series, there's no doubt that there was a lot to be learned about how to lead people by watching this guy in action. And he just had the coolest damn toys. Right? I mean, my god. I just thought it was fascinating as a kid that he had this thing and he could talk to the ship with it. I just thought that was just spectacular. And of course, now I own one and it's smaller. So that's kind of cool.

So, I got to achieve this dream. James T Kirk, his alter ego, William Shatner, wrote a book. Which, I think, was actually a pretty cool book. It was with Chip Walter who's a Pittsburgh based author who's quite good. And the wrote a book on basically the science of Star Trek, what has come true. And they went around to top places around the country and looked at various things and they came here to study our virtual reality set up. And so we built a virtual reality for him. It looks something like that. We put it in, put it to red alert. He was a very good sport. It's not like he saw that one coming. And it's really cool to meet your boyhood idol. But it's even cooler when he comes to you to see what cool stuff you're doing in your lab. That was just a great moment.

All right, winning stuffed animals. This may seems mundane to you, but when you're a little kid and you see the big buff guys walking around in an amusement park and they got all these big stuffed animals, right? And this is my lovely wife. And I have a lot of pictures of stuffed animals I've won. That's my Dad, posing with one that I won. I've won a lot of these animals. There's my Dad, he did win that one, to his credit. And this was just a big part of my life and my family's life.

But you know, I can hear the cynics. You know, in this age of digitally manipulated things, maybe those bears aren't really in the picture with me. Or maybe I paid somebody five bucks to take a picture in the theme park next to the bear. And I said, "How in this age of cynicism can I convince people?" And I said, "I know. I can show them the bears." Bring them out. You can just put them right there. You can just put them back against the wall.

So here's some bears. We didn't have quite enough room in the moving truck down to Chesapeake. And anybody who'd like a little piece of me at the end of this, feel free to come up, first come, first serve.

All right, my next one. Being an Imagineer. This was the hard one. Believe me, getting to zero gravity is easier than becoming an Imagineer. When I was a kid, I was eight years old and our family took a trip cross country to see Disneyland. And if you've ever seen the movie National Lampoon's Vacation, it was a lot like that. It was a quest.

And these are real vintage photographs. And there I am, in front of the castle. And there I am. For those of you who are into foreshadowing, this is the Alice ride. And I just thought this was just the coolest environment I'd ever been in. And instead of saying, "Gee, I want to experience this," I said, "I want to make stuff like this."

And so I bided my time and then I graduated with PhD from Carnegie Mellon, thinking that meant me infinitely qualified to do anything. And I dashed off my letters of application to Walt Disney Imagineering and they sent me some of the damn nicest "go to hell" letters I've ever gotten. I mean, it was just, "We have carefully reviewed your application and presently, we do not have any positions available which require your particular qualifications."

Now think about the fact that you're getting this from a place who's famous for guys who sweep the street. So that was a bit of a set back. But remember, the brick walls are there for a reason. All right? The brick walls are not there to keep us out. The brick walls are there to give us a chance to show how badly we want something. Because they brick walls are there to stop the people who don't want it badly enough. They're there to stop the other people.

All right, fast forward to 19991. We did a system back at the University of Virginia called "Virtual Reality on Five Dollars a Day". Just one of those unbelievable spectacular things. I was so scared back in those days as a junior academic. Jim Foley's here and I just love to tell this story. He knew my undergraduate advisor, Andy VanDamm. And I'm at my first conference and I'm just scared

to death and this icon in the user interface community walks up to me and out of nowhere just gives me this huge bear hug. And he says, "That was from Andy." And that was when I thought, "Okay, maybe I can make it. Maybe I do belong."

And a similar story is that this was just this unbelievable hit because, at the time, everybody needed a half a million dollars to do virtual reality. And everybody felt frustrated. And we literally hacked together a system for about $5,000 in parts and made a working VR system. And people were just like, "Oh my god." This like, Hewlett-Packard garage thing. This is so awesome.

And so I'm giving this talk and the room has just gone wild. And during the Q and A, a guy named Tom Ferness, who was one of the big names in virtual reality at the time. He goes up to the microphone and he introduces himself. I didn't know what he looked like, but I sure as hell knew the name. And he asked a question. And I was like, "I'm sorry, did you say you're Tom Ferness?" He said, "Yes." I said, "Then I would love to answer your question, but first, will you have lunch with me tomorrow?" And there's a lot in that little moment. There's a lot of humility, but also, asking a person where he can't possibly say no.

And so, Imagineering, a couple of years later was working on a virtual reality project. This was top secret. They were denying the existence of a virtual reality attraction after the time that the publicity department was running the TV commercials. So Imagineering really had nailed this one tight. And it was the Aladdin attraction where you would fly a magic carpet. And the head mounted display, sometimes known as gator vision. And so, I had an in. As soon as the project had just … You know, they started running the TV commercials and I had been asked to brief the Secretary of Defense on the state of virtual reality. Okay, Fred Brooks and I had been asked to brief the Secretary of Defense. And that gave me an excuse. So I called them up, I called Imagineering and I said, "Look, I'm briefing the Secretary of Defense. I'd like some materials on what you have 'cause it's on of the best VR systems in the world." And they kind of pushed back. And I said, "Look, is all this patriotism stuff in the parks a farce?" And they're like, "Mm, okay." They said, "This is so new that the PR department doesn't have any footage for you so I'm gonna have to connect you straight through to the team who did the work." Jackpot.

So I find myself on the phone with a guy named John Snoddy, who is one of the most impressive guys I have ever met. And he was the guy running this team. And it's not surprising they had done impressive things. And so he sent me some stuff. We talked briefly, he sent me some stuff and I said, "Hey, I'm gonna be out in the area for a conference shortly. Would you like to get

together and have lunch?" Translation, I'm going to lie to you and say that I have an excuse to be in the area so I don't look too anxious. But I would go to Neptune to have lunch with you."

And so John said sure. And I spent something like 80 hours talking with all the VR experts in the world saying, "If you had access to this one unbelievable project, what would you ask?" And then I compiled all of that and I had to memorize it, which anybody who knows me knows that I have no memory at all. 'Cause I couldn't go in looking like a dweeb with, "Hi, question 72 …"

So, I went in and this was like a two hour lunch. And John must have thought he was talking to some phenomenal person because I was doing was channeling Fred Brooks and Ivan Sutherland and Andy VanDamm and people like that. Henry Fooks. So, it's pretty easy to be smart when you're parodying smart people.

And at the end of the lunch with John, I sort of, as we say in the business, made the ask. And I said, "You know, I have a sabbatical coming up." He said, "What's that?" The beginnings of the culture clash. And so, I talked to him about the possibility of coming there and working with him. And he said, "That's really good, except, you know, you're in the business of telling people stuff and we're in the business of keeping secrets." And then what made John Snoddy, John Snoddy, was he said, "But we'll work it out." Which I really loved.

The other thing that I learned from John Snoddy, I could do easily an hour long talk just on what've I learned from John Snoddy. One of the things he told me was that, wait long enough and people will surprise and impress you. He said, "When you're pissed off at somebody and you're angry at them, you just haven't given them enough time. Just give them a little more time and they'll almost always impress you." And that really stuck with me. I think he's absolutely right on that one.

So, to make a long story short, we negotiated a legal contract. It was going to be the first, some people referred to it as the first and last paper ever published by Imagineering. But the deal was, I go, I provide my own funding, I go for six months, I work with the project, we publish a paper.

And then we meet our villain. I can't be all sweetness and light, because I have no credibility. Somebody's head's gonna go on a stick. Turns out that the person who gets his head on a stick is a dean back at the University of Virginia. His name is not important, let's call him Dean Wormer. And Dena Wormer has a meeting with me where I say I want to do this sabbatical thing. And I've actually gotten the Imagineering guys to let an academic in, which is insane. I mean, if John

hadn't gone nuts, this would never have been a possibility. This is a very secretive organization.

And Dean Wormer looks at the paperwork and he says, "Well, it says they're gonna own your intellectual property." I said, "Yeah, we got the agreement to publish the paper. There is no other IP. I don't do patentable stuff." He says, "Yeah, but you might. So deal's off. Just get them to change that little clause there and then come back to me." I'm like, "Excuse me?" And then I said to him, "I want you to understand how important this is. If we can't work this out, I'm going to take an unpaid leave of absence and I'm just gonna go there and I'm gonna do this thing." And he said, "Hey, you know, I might not even let you do that. I mean, you've got the IP in your head already and maybe they're gonna suck it out of you so that's not gonna fly either."

It's very important to know when you're in a pissing match. And it's very important to get out of it as quickly as possible. So I said to him, "Well, let's back off on this. Do we think this is a good idea at all?" He said, "I have no idea if this is a good idea." I was like, "Okay, well we've got common ground there." Then I said, "Well, is this really your call? Isn't this the call of the dean of sponsored research? If it's an IP issue?" And he said, "Yeah, that's true." So I said, "If he's happy, you're happy?" "Yeah, then I'd be fine." Like Wile E Coyote. And I find myself in Gene Block's office, who's the most fantastic man in the world.

And I start talking to Gene Block and I say, "Let's start at the high level," since I don't want to have to back out again. I said, "Let's start at the high level. Do you think this is a good idea?" He said, "Well, if you're asking me if it's a good idea, I don't have very much information. All I know is that one of my start faculty members is in my office and he's really excited, so tell me more." Here's a lesson for everybody in administration, they both said the same thing. But think-

… they both said the same thing, but think about how they said it. Right? I don't know. Well, I don't have much information but one of my star faculty members is here and he's all excited so I want to learn more. They're both ways of saying "I don't know" but boy, there's a good way and a bad way. So anyway, we got it all worked out. I went to Imagineering. Sweetness and light. And all's well that ends well.

Some brick walls are made of flesh. So I worked on the Aladdin project. It was absolutely spectacular. I mean, just unbelievable. Here's my nephew, Christopher. This was the apparatus. You would sit on this sort of motorcycle-type thing and you would steer your magic carpet and you would put on the head-mounted display. The head-mounted display was very interesting. It had two parts

and it was a very, very clever design. To get throughput through, the only part that touched the guests' head was this little cap and everything else clicked onto it, all the expensive hardware. So you could replicate the caps, because they were basically free to manufacture. And, this is what I really did, is I was a cap cleaner.

I loved Imagineering. It was just a spectacular place. Just spectacular. Everything that I had dreamed. I love the model shop. People crawling around on things the size of this room that are just big physical models. It was just an incredible place to walk around and be inspired. I'm always reminded, when I went there and people said "Do you think the expectations are too high?" And I said, "Did you ever see the movie Charlie and the Chocolate Factory, Willie Wonka and the Chocolate Factory?" where Gene Wilder says to the little boy, Charlie, he's about to give him the chocolate factory and he says, "Well, Charlie, did anybody ever tell you the story of the little boy who suddenly got everything he ever wanted?" Charlie's eyes get like saucers and he says, "No, what happened to him?" Gene Wilder says, "He lived happily ever after."

Okay. So, working on the Aladdin VR, I describe it as a once in every five years opportunity and I stand by that assessment. It forever changed me. It wasn't just that it was good work and I got to be a part of it, but it got me into the place of working with real people and real HCI user interface issues. Most HCI people live in this fantasy world of white collar laborers with PhDs and Masters degrees and, you know, until you got ice cream spilled on you, you're not doing field work, right?

And, more than anything else, from Jon Snoddy, I learned how to put artists and engineers together, and that's been the real legacy. We published a paper, just a nice academic cultural scandal. When we wrote the paper the guys at Imagineering said, well, let's do a nice big picture, like you would in a magazine. And the SIGGRAPH committee, which accepted the paper, it was like this big scandal. Are they allowed to do that? There was no rule. So we published the paper and, amazingly, since then there's a tradition of SIGGRAPH papers having color figures on the first page. I, so I've changed the world in a small way.

And then at the end of my six months, they came to me and they said, "You wanna do it for real? You can stay." And I said, "No". One of the only times in my life I have surprised my father. He was like, "You what?" He said, "Since you were, you know, all you wanted, and now you that you got it and you're like huh?"

There was a bottle of Maalox in my desk drawer. Be careful what you wish for. It was a particularly

stressful place. Imagineering, in general, is actually not so Maalox-laden, but the lab I was in … Oh, Jon left in the middle. It was a lot like the Soviet Union. It was a little dicey for a while, but it worked out okay. And, if they had said "Stay here or never walk in the building again", I would have done it. I would have walked away from tenure. I would have just done it. But they made it easy on me. They said, "You can have your cake and eat it too". And I basically become a day a week consultant for Imagineering and I did that for about ten years. And that's one of the reasons you should all become professors, because you can have your cake and eat it too. Okay?

I went on and consulted on things like DisneyQuest. So there was the Virtual Jungle Cruise and the best interactive experience, I think, ever done, and Jesse Schell gets the credit for this, Pirates of the Caribbean. Wonderful at DisneyQuest.

And so, those are my childhood dreams. And, you know, that's pretty good. I felt good about that. So, then the question becomes, how can I enable the childhood dreams of others? And again, boy, am I glad I became a professor. What better place to enable childhood dreams? Maybe working at EA, I don't know, that'd probably be a good close second. But, and this started in a very concrete realization that I could do this because a young man named Tommy Burnett, when I was at the University of Virginia, came to me, was interested in joining my research group and we talked about it and he said, "Oh, and I have a childhood dream." It gets pretty easy to recognize them when they tell you. And I said, "Yes, Tommy, what is your childhood dream?" He said, "I want to work on the next Star Wars film." Now, you gotta remember the timing on this. Where is Tommy? Tommy is here today. What year would this have been? Your sophomore year?

TOMMY: It was around 1993.

RANDY PAUSCH: Are you breaking anything back there, young man? Okay. All right. So, in 1993. And I said to Tommy, "You know they're probably not going to make those next movies." And he said, "No, they are." And, Tommy worked with me for a number of years as an undergraduate and then as a staff member, and then when I moved to Carnegie Mellon, every single member of my team came from Virginia to Carnegie Mellon except for Tommy because he got a better offer. And he did indeed work on all three of those films. So …

And then I said, well, that's nice but, you know, one at a time is kind of inefficient. And people who know me know that I am an efficiency freak. So I said, "Can I do this en masse?" Can I get people turned in such a way that they can be turned onto their childhood dreams?

And I created a course, I came to Carnegie Mellon, I created a course called Building Virtual Worlds. It's a very simple course. How many people have ever been to any of the shows? Okay. So you have a, some of you have an idea. For those of you who don't, the course is very simple. There are 50 students drawn from all the different departments of the university. There are randomly chosen, randomly chosen teams. Four people per team, and they change every project. A project only lasts two weeks, so you do something, you make something, you show something, then I shuffle the teams. You get three new playmates, and you do it again. And, it's every two weeks, and so you do five projects during the semester.

The first year we taught this course, it is impossible to describe how much of a tiger-by-the-tail we had. I was just running the course because I wanted to see if we could do it. We had just learned how to do texture mapping on 3D graphics and we could make stuff that looked half decent but, you know, we were running on really weak computers, by current standards. But I said, "I'll give it a try." And at my new university I made a couple of phone calls and I said I want to cross list this course to get all these other people. And within 24 hours it was cross-listed in five departments. I love this university. I mean, it's just, it's the most amazing place.

And I said, and the kids said, "Well, what content do we make?" I said, "Hell, I don't know. You make whatever you want." Two rules: no shooting violence and no pornography. Not because I'm opposed to those in particular but, you know, that's been done with VR, right? And you'd be amazed how many 19-year old boys are completely out of ideas when you take those off the table. Anyway, so I taught the course.

The first assignment, I gave it to them. They came back in two weeks and they just blew me away. I mean, the work was so beyond, literally, my imagination, because I copied the process from Imagineering's VR lab but I had no idea what they could or couldn't do with it as undergraduates and how, because their, and their tools were weaker. And they came back in the first assignment and they did something that was so spectacular that I literally didn't, ten years as a professor and I had no idea what to do next. So I called up my mentor. I called up Andy Van Dam. And I said, "Andy, I just gave a two week assignment and they came back and did stuff that if I'd given them the whole semester, I'd have given them all A's. Sensei, what do I do?" And Andy thought for a minute and he said, "You go back into class tomorrow and you look them in the eye and you say, guys, that was pretty good but I know you can do better." And that was exactly the right advice because what he said was, "You obviously don't know where the bar should be and you're only

gonna do them a disservice by putting it anywhere." And, boy, was that good advice because they just kept going.

And during that semester it became this underground thing. I'd walk into a class with 50, with 50 students in it and there were 95 people in the room because it was the day we were showing work. And people's roommates and friends and parents … I've never had parents come to class before. It was flattering and somewhat scary.

And so, it snowballed and we had this bizarre thing of, well, we've gotta share this. If there's anything I've been raised to do, it's to share. And I said, "We've gotta show this at the end of the semester. We've gotta have a big show." And we booked this room, McConomy. I have a lot of good memories in this room. And we booked it, not because we thought we could fill it, but because it had the only A/V setup that would work, because this was a zoo. All right? Computers and everything. And then we filled it. And we more than filled it. We had people standing in the aisle.

I will never forget the dean at the time, Jim Morris, was sitting on the stage right about there. We had to kind of scoot him out of the way. And, the energy in the room was like nothing I had every experienced before. And President Cohen, Jerry Cohen, was there and he sensed the same thing. He later described it as like an Ohio State football pep rally, except for academics. And, and he came over and he asked exactly the right question. He said, "Before you start, he said, I gotta know, where are these people from?" He said, "The audience, what departments are they from?" And we polled them and it was all the departments. And I felt very good because I had just come to campus. He had just come to campus. And my new boss had seen in a very corporal way that this is the university that puts everybody together. And, and that made me feel just tremendous.

So we did this campus-wide exhibition and people performed down here. They're in costume and we project just like this. And you can see what's going on. You can see what they're seeing in the head-mount. There's a lot of big props. So there's a guy whitewater rafting. This is a fan and E.T. And, yes, I did tell them if they didn't do the shot of the kids biking across the moon, I would fail him. That is a true story. And I said, I thought I'd show you just one world. And if we can get the lights down, if that's at all possible. No. Okay. That means no. All right. All right. We'll just do our best then.

ANIMATED: Oh, hello there. I'm lonely. Make me a world. Yay. Yay. Yay. Yay. Make me some

trees. Yay. Yay. Yay.

RANDY: Now, now they're gonna turn this on it's head. Watch closely. The world doesn't want to go on to the next thing in the show. So she's ready to move on and it's not.

ANIMATED: What are you doing? You can't end this now.

ON-SCREEN SPEAKER: But there's so many other worlds that have to go.

ANIMATED: But our world is the best world. Hey, hey, hey. Hey, No! Here I am.

ON-SCREEN SPEAKER: We're gonna shut you down. Control-alt-delete.

ANIMATED: Not control-alt-delete! You left us. You left us. We love you. Goodbye.

RANDY PAUSCH: It was an unusual course with some of the most brilliant, creative students from all across the campus. It just was a joy to be involved with. And they took the whole stage performance aspect of this way too seriously. And it became this campus phenomenon every year. People would line up for it. It was very flattering. And, it gave kids a chance, a sense of excitement, of putting on a show for people who were then excited about it. And I think that that's one of the best things you can give somebody, the chance to show them what it feels like to make other people get excited and happy. I mean, that's a tremendous gift.

We always tried to involve the audience, whether it was people with glow sticks or batting a beach ball around or driving. This is really cool. This technology actually got used at the Spider-Man 3 premiere in LA, so the audience was controlling something on the screen. So that's kind of nice.

And, I don't have a class picture from every year but I dredged all the ones that I do have, and all I can say is that, what a privilege and an honor it was to teach that course for something like ten years. And, all good things come to an end and I stopped teaching that course about a year ago.

People always ask me, "What was my favorite moment?" I don't know if you can have a favorite moment but, boy, there's one I'll never forget. This was a world with, I believe, a roller skating ninja. And one of the rules was that we performed these things live, and they all had to really work, and the moment it stopped working, we went to your backup video tape. And this was very embarrassing. So we had this ninja on stage and he's doing this roller skating thing and the world, it did not crash gently. And I come out and, I believe it was Steve, wasn't it? Was it? Where is he? Okay. Where is Steve? Ah. My man. Steve Audio. And talk about quick on your feet. Right?

I say, “Steve, I’m sorry but your world has crashed and we’re going to go to videotape.” And he pulls out his ninja sword and says, “I am dishonored. Whaa!” And just drops. And so I think it’s very telling that my favorite moment in ten years of this high technology course was a brilliant ad lib. And then, when the videotape is done and the lights come up, he’s lying there lifeless and his teammates drag him off. It was really a fantastic moment.

And, the course was all about bonding. People used to say, well, you know, what’s gonna make for a good world? I said, “I can’t tell you beforehand” but right before they present it, I can tell you if the world’s good just by the body language. If they’re standing close to each other, the world is good. All right?

And BVW was a pioneering course. And, I won’t bore you with all the details but it wasn’t easy to do, and I was given this when I stepped down from the ETC and I think it’s emblematic. If you’re gonna do anything that’s pioneering, you will get those arrows in the back, and you just have to put up with it. I mean, everything that could go wrong did go wrong, but at the end of the day, a whole lot of people had a whole lot of fun.

When you’ve had something for ten years that you hold so precious, it’s the toughest thing in the world to hand it over. And the only advice I can give you is, find somebody better than you to hand it to. And that’s what I did. There was this kid at the VR studio way back when. And you didn’t have to spend very long in Jesse Schell’s orbit to go, “The Force is strong in this one.” And one of my greatest, my two greatest accomplishments, I think, for Carnegie Mellon were that I got Jessica Hodgins and Jesse Schell to come here and join our faculty. And I was thrilled when I could hand this over to Jesse and, to no one’s surprise, he has really taken it up to the next notch and, you know, the course is in more than good hands. It’s in better hands.

But it was just one course. And then we really took it up a notch and we created what I would call The Dream Fulfillment Factory. Don Marinelli and I got together and, with the university’s blessing and encouragement, we made this thing out of whole cloth that was absolutely insane. Should never have been tried. All the sane universities didn’t go near this kind of stuff, creating a tremendous opportunistic void.

So, the Entertainment Technology Center was all about artisan technologists working in small teams to make things. It was a two year professional Masters degree. And, Don and I were two kindred spirits. We’re very different. Anybody who knows us knows that we’re very different

people. And we like to do things in a new way. And the truth of the matter is that we were both a little uncomfortable in academia. I used to say that I'm uncomfortable as an academic because I come from a long line of people who actually worked for a living. So, I detect nervous laughter. All right. And I want to stress, Carnegie Mellon is the only place in the world that the ETC could have happened. By far. The only place.

So, okay. This picture was Don's idea, okay? And we like to refer to this picture as Don Marinelli on guitar and Randy Pausch on keyboards. But we really did play up the left brain, right brain and it worked out really well that way. Don is an intense guy. And Don and I shared an office. And at first it was a small office. We shared an office for six years. All right? Now, those of you who know Don know he's an intense guy. Right? And, you know, given my current condition, somebody was asking me … This is a terrible joke but I'm gonna use it anyway … because I know Don will forgive me. Somebody said, "Given your current condition, have you thought about whether you're gonna go to heaven or hell?" And I said, "I don't know but if I'm going to hell, I'm due six years for time served." I kid.

Sharing an office with Don was really like sharing an office with a tornado. Right? There was just so much energy and you never knew which trailer was next, right? But you knew something exciting was gonna happen. And, and there was so much energy. And I do believe in, in giving credit where credit is due. So, in my typically visual way, right? If Don and I were to split the success for the ETC, he clearly gets the lion's share of it. He did the lion's share of the work. Okay? He had the lion's share of the ideas.

It was a great teamwork. I think it was a great ying and a yang, but it was more like ying and yang. Right? And he deserves that credit and I give it to him because the ETC is a wonderful place and, you know, he's now running it and he's taking it global. We'll talk about that in a second. Describing the ETC is really hard and I finally found a metaphor. Telling people about the ETC is like describing Cirque Du Soleil if they'd never seen it. Sooner or later you're gonna make the mistake, you're gonna say, "Well, it's like a circus". And then you're dragged into this conversation about, oh, how many tigers? How many lions? Right? How many trapeze acts? And that misses the whole point.

So when we say we're a Masters degree, we're really not like any Masters degree you've ever seen. Here's the curriculum … The curriculum ended up looking like this. All I want to do is visually communicate to you that you do five projects in Building Virtual Worlds. Then you do three

more. All of your time is spent in small teams making stuff. None of that book learning thing. Don and I have no patience for the book learning thing. It's a Masters degree. They already spent four years doing book learning, right? By now they should have read all the books. Right?

The keys to the success were that Carnegie Mellon gave us the reigns. Completely gave us the reigns. We had no deans to report to. We reported directly to the provost, which is great because the provost is way too busy to watch you carefully. We were given explicit license to break the mold. It was all project-based. It was intense. It was fun. And we took field trips. Every spring semester in January we'd take all 50 students in the first-year class and we'd take them out to shops at Pixar. We'd take them to Pixar, Industrial Light and Magic. And of course when you've got guys like Tommy there acting as host, right? It's pretty easy to get entrée to these places.

So, we did things very, very differently. The kind of projects students would do, we did a lot of what we'd call edutainment. We developed a bunch of things with the Fire Department of New York. A network simulator for training firefighters using "videogame-ish"-type technology to teach people useful things. That's not bad. Companies did this strange thing. They put in writing, we promise to hire your students. I've got the EA and Activision ones here. I think there are now, how many? Five? … So, there are five written agreements. I don't know of any other school that has this kind of written agreement with any company. And so that's a real statement. And these are multiple year things. So they're agreeing to hire people for summer internships that we have not admitted yet. That's a pretty strong statement about the quality of the program.

And Don, as I said, he's now, he's crazy. And I mean that in a wonderful, complimentary way. He's doing these things where I'm like, "Oh, my God!" He's not here tonight because he's in Singapore because there's gonna be an ETC campus in Singapore. There's already one in Australia and there's gonna be one in Korea. So this is becoming a global phenomenon. So, I think this really speaks volumes about all the other universities. It's really true that Carnegie Mellon is the only university that can do this. We just have to do it all over the world now. Right?

One of the big successes about the ETC is teaching people about … oh, now I hear the nervous laughter from the students. I had forgotten the delayed shock therapy effect of these bar charts. When you're taking Building Virtual Worlds, every two weeks we get peer feedback. We put that all into a big spreadsheet and at the end of the semester you've had three teammates per project, five projects. That's 15 data points. That's statistically valid. And you get a bar chart telling you, on a ranking of how easy you are to work with, where you stack up against your peers. Boy, that's

hard feedback to ignore. Some still managed but … But for the most part, people looked at that and went, "Wow, I gotta, I gotta pick it up a notch. I better start thinking about what I'm saying to people in these meetings." And that is the best gift an educator can give is to get somebody to become self …

… and that is the best gift an educator can give is to get somebody to become self-reflective.

So the ETC was wonderful, but even the ETC and even as Don scales it around the globe, it's still very labor intensive. It's not Tommy one at a time, it's not a research group 10 at a time. It's 50 or 100 at a time per campus times four campuses. But I wanted something infinitely scalable, scalable to the point where millions or tens of millions of people could chase their dreams with something. You know, I guess that kind of a goal really does make me the Mad Hatter.

Alice is a project that we've worked on for a long, long time. It's a novel way to teach computer programming. Kids make movies and games, the head fake — again, we're back to the head fakes. The best way to teach somebody something is to have them think they're learning something else. I've done it my whole career.

The head fake here is that they're learning to program, but they just think they're making movies and video games. This thing has already been downloaded well over a million times. There are eight textbooks that have been written about it. 10% of U.S. colleges are using it now, and it's not the good stuff yet. The good stuff is coming in the next version.

I, like Moses, get to see the promised land, but I won't get to set foot in it. That's okay, because I can see it, and the vision is clear: millions of kids having fun while learning something hard. That's pretty cool. I can deal with that as a legacy.

The next version's going to come out in 2008. It's going to be teaching the Java language if you want them to know they're learning Java; otherwise, they'll just think that they're writing movie scripts. We're getting the characters from the best-selling PC game in history, The Sims. This is all already working in the lab, so there's no real technological risk. I don't have time to thank and mention everybody in the Alice team, but I just want to say that Dennis Cosgrove is going to be building this, has been building this. He is the designer, it's his baby. For those of you who are wondering, "Well, you know, in some number of months, who should I be emailing about the Alice project," where's Wanda Dann? Oh, there you are. Stand up, let them all see you.

Everybody say, “Hi, Wanda.”

AUDIENCE: Hi, Wanda.

RANDY PAUSCH: Send her the email.I’ll talk a little bit more about Caitlin Kelleher, but she’s graduated with her Ph.D. and is at Washington University, and she’s going to be taking this up a notch and going to middle schools with it. So grand vision, and to the extent that you can live on in something, I will live on in Alice.

All right, so now the third part of the talk, lessons learned. We’ve talked about my dreams. We’ve talked about helping other people enable their dreams. Somewhere along the way, there’s got to be some aspect of what lets you get to achieve your dreams.

First one is the role of parents, mentors, and students. I was blessed to have been born to two incredible people. This is my mother on her 70th birthday. I am back here. I have just been lapped. This is my dad riding a roller coaster on his 80th birthday, and he points out that, you know, he’s not only brave; he’s talented, because he did win that big bear the same day.

My dad was so full of life. Anything with him was an adventure. I don’t know what’s in that bag, but I know it’s cool. My dad dressed up as Santa Claus, but he also did very, very significant things to help lots of people. This is a dormitory in Thailand that my mom and dad underwrote, and every year, about 30 students get to go to school who wouldn’t have otherwise. This is something my wife and I have also been involved in heavily, and these are the kind of things that I think everybody ought to be doing, helping others.

But the best story I have about my dad is … unfortunately my dad passed away a little over a year ago, and when we were going through his things … he had fought in World War II in the battle of the Bulge … and when we were going through his things, we found out he had been awarded the Bronze Star for valor. My mom didn’t know it. In 50 years of marriage, it had just never come up.

My mom. Mothers are people who love you even when you pull their hair. I have two great mom stories. When I was here studying to get my Ph.D. and I was taking something called the theory qualifier … which I can definitively say is the second worst thing in my life after chemotherapy … and I was complaining to my mother about how hard this test was and how awful it was, and she just leaned over and she patted me on the arm, and she said, “We know how you feel, honey,

and remember, when your father was your age, he was fighting the Germans."

After I got my Ph.D., my mother took great relish in introducing me as, "This is my son. He's a doctor but not the kind who helps people."

These slides are a little bit dark, but when I was in high school, I decided to paint my bedroom. I'd always wanted a submarine and an elevator. The great thing about this … what can I say?

The great thing about this is, they let me do it, and they didn't get upset about it, and it's still there. If you go to my parents' house, it's still there. Anybody who is out there who is a parent, if your kids want to paint their bedroom, as a favor to me, let them do it, okay? It'll be okay. Don't worry about resale value on the house.

Other people who help us besides our parents: our teachers, our mentors, our friends, our colleagues. God, what is there to say about Andy Van Dam? When I was a freshman at Brown, he was on leave, and all I heard about was this Andy Van Dam who was like a mythical creature, like a centaur, but like a really pissed off centaur, and everybody was really sad that he was gone but kind of more relaxed. I found out why, because I started working for Andy. I was a teaching assistant for him as a sophomore, I was quite an arrogant young man, and I came in to some office hours, and of course it was 9:00 at night, and Andy was there at office hours, which is your first clue as to what kind of professor he was.

I come bounding in, and, you know, I'm just, I'm going to save the world. There are all these kids waiting for help, da da, da da, da da, da da. Afterwards, Andy literally dutch-uncled … he's Dutch, right? He dutch-uncled me, and he put his arm around my shoulders, and we went for a little walk, and he said, "Randy, it's such a shame that people perceive you as so arrogant, because it's going to limit what you're going to be able to accomplish in life."

What a hell of a good way to word "You're being a jerk." Right? He doesn't say, "You're a jerk." He says, "People are perceiving you this way," and he says, "The downside is, it's going to limit what you're going to be able to accomplish."

When I got to know Andy better, the beatings became more direct. I could tell you Andy stories for a month, but the one I will tell you is that when it came time to start thinking about what to do after graduating from Brown, it had never occurred to me in a million years to go to graduate school, just out of my imagination. It wasn't the kind of thing people from my family did. We

got, say, what do you call them? Jobs.

Andy said, "No, don't go do that. Go get a Ph.D. Become a professor." I said, "Why?" He said, "Because you're such a good salesman that any company who gets you is going to use you as a salesman, and you might as well be selling something worthwhile like education."

Thanks.

Andy was my first boss, so to speak. I was lucky enough to have a lot of bosses. That red circle is way off. Al is over here. I don't know what the hell happened there. He's probably watching this on the webcast going, "My god, he's targeting, and he still can't aim!"

I don't want to say much about the great bosses I've had except that they were great, and I know a lot of people in the world have had bad bosses, and I haven't had to endure that experience, and I'm very grateful to all of the people that I ever had to report to. They've just been incredible.

But it's not just our bosses. We learn from our students. I think the best head fake of all time comes from Caitlin Kelleher … excuse me, Dr. Caitlin Kelleher … who just finished up here and is starting at Washington University. She looked at Alice when it was an easier way to learn to program, and she said, "Yeah, but why is that fun?"

I was like, "Well, because I'm a compulsive male. I like to make the little toy soldiers move around by my command, and that's fun." She's like, "Hmm."

She was the one who said, "No, we'll just approach it all as a storytelling activity." She's done wonderful work showing that, particularly with middle school girls, if you present it as a storytelling activity, they're perfectly willing to learn how to write computer software. So all-time best head fake award goes to Caitlin Kelleher's dissertation.

President Cohon, when I told him I was going to do this talk, he said, "Please tell them about having fun, because that's what I remember you for."

I said, "I can do that, but it's kind of like a fish talking about the importance of water." I mean, I don't know how to not have fun. All right, I'm dying, and I'm having fun, and I'm going to keep having fun every day I have left, because there's no other way to play it. Right?

So my next piece of advice is, you just have to decide if you're a Tigger or you're an Eeyore. I think I'm clear where I stand on the great Tigger-Eeyore debate.

Never lose the childlike wonder. It's just too important. It's what drives us. Help others. Denny Proffitt knows more about helping other people. He's forgotten more than I'll ever know. He's taught me by example how to run a group, how to care about people.

M.K. Haley … I have a theory that people who come from large families are better people, because they've just had to learn how to get along. M.K. Haley comes from a family with 20 kids. Yeah, unbelievable. She always says, "It's kind of fun to do the impossible."

When I first got to Imagineering, she was one of the people who dressed me down, and she said, "I understand you've joined the Aladdin project. What can you do?"

I said, "Well, I'm a tenured professor of computer science."

She said, "Well, that's very nice professor boy, but that's not what I asked. I said, 'What can you do?'"

I mentioned sort of my working class roots. We keep what is valuable to us, what we cherish, and I've kept my letterman's jacket all these years. I used to like wearing it in grad school, and one of my friends, Jessica Hodgins would say, "Why do you wear this letterman's jacket?"

I looked around at all the non-athletic guys around me who were much smarter than me, and I said, "Because I can."

She thought that was a real hoot, so one year she made for me this little raggedy randy doll. He's got a little letterman's jacket too. That's my all-time favorite. It's the perfect gift for the egomaniac in your life.

I've met so many wonderful people along the way. Loyalty is a two-way street. There was a young man named Dennis Cosgrove at the University of Virginia, and when he was a young man, let's just say things happened, and I found myself talking to a dean, and the dean … no, not that dean. Anyway, this dean really had it in for Dennis and I could never figure out why, because Dennis was a fine fellow, but for some reason, this dean really had it in for him.

I ended up basically saying, "No, I vouch for Dennis." The guy says, "You're not even tenured yet, and you're telling me you're going to vouch for this sophomore or junior or whatever?" I think he was a junior at the time. I said, "Yeah, I'm going to vouch for him, because I believe in him."

The dean said, "And I'm going to remember this when your tenure case comes up." I said, "Deal."

I went back to talk to Dennis, and I said, "I would really appreciate you … that would be good." But loyalty is a two-way street. I mean, that was God knows how many years ago, but that's the same Dennis Cosgrove who's carrying Alice forward. He's been with me all these years, and if we only had one person to send in a space probe to meet an alien species, I'm picking Dennis.

You can't give a talk at Carnegie Mellon without acknowledging one very special person, and that would be Sharon Burks. I joked with her, I said, "Well, look, if you're retiring, it's just not worth living anymore." Sharon is so wonderful, it's beyond description, and for all of us who have been helped by her, it's just indescribable.

I love this picture, because it puts her together with Syl, and Syl is great, because Syl gave the best piece of advice pound for pound that I have ever heard, and I think all young ladies should hear this.

Syl said, "It took me a long time, but I've finally figured it out. When it comes to men that are romantically interested in you, it's really simple. Just ignore everything they say and only pay attention to what they do. It's that simple. It's that easy."

I thought back to my bachelor days, and I said, "Damn."

Never give up. I didn't get into Brown University. I was on the wait list. I called them up, and they eventually decided that it was getting really annoying to have me call every day, so they let me in.

At Carnegie Mellon, I didn't get into graduate school. Andy had mentored me. He said, "Go to graduate school. You're going to Carnegie Mellon. All my good students go to Carnegie Mellon," and yeah, you know what's coming.

He said, "You're going to go to Carnegie Mellon, no problem." What he had kind of forgotten was that the difficulty of getting into the top Ph.D. program in the country had really gone up, and he also didn't know I was going to tank my GREs, because he believed in me, which based on my board scores, was a really stupid idea. I didn't get into Carnegie Mellon. No one knows this till today I'm telling the story. I was declined admission to Carnegie Mellon.

I was a bit of an obnoxious little kid. I went into Andy's office and I dropped the rejection letter on his desk. I said, "I just want you to know what your letter of recommendation goes for at Carnegie Mellon."

Before the letter had hit his desk, his hand was on the phone, and he said, "I will fix this." I said, "No, no, no, I don't want to do it that way. That's not the way I was raised. You know, maybe some other graduate schools will see fit to admit me."

He said, "Look. Carnegie Mellon's where you're going to be." He said, "I'll tell you what. I'll make you a deal. Go visit the other schools." Because I did get into all the other schools. He said, "Go visit the other schools, and if you really don't feel comfortable at any of them, then will you let me call Nico?" Nico being Nico Habermann.

I said, "Okay, deal." I went to the other schools. Without naming them by name — Berkeley, Cornell — they managed to be so unwelcoming that I found myself saying to Andy, "You know, I'm going to get a job." And he said, "No, you're not," and he picked up the phone, and he talked in Dutch. He hung up the phone, and he said, "Nico says if you're serious, be in his office tomorrow morning at 8:00 A.M."

For those of you who know Nico, this is really scary. So I'm in Nico Habermann's office the next morning at 8:00 A.M., and he's talking with me, and frankly, I don't think he's that keen on this meeting. I don't think he's that keen at all.

He says, "Randy, why are we here?"

I said, "Because Andy phoned you?" I said, "Well, since you admitted me, I have won a fellowship, the Office of Naval Research, it's a very prestigious fellowship. I've won this fellowship, and that wasn't in my file when I applied."

Nico said, "A fellowship, money, we have plenty of money." That was back then. He said, "We have plenty of money. Why do you think having a fellowship makes any difference to us?" And he looked at me.

There are moments that change your life, and 10 years later, if you know in retrospect it was one of those moments, you're blessed, but to know it at the moment with Nico staring through your soul … and I said, "I didn't mean to imply anything about the money. It's just that it was an honor. There were only 15 given nationwide, and I did think it was an honor that would be something that would be meritorious, and I apologize if that was presumptuous." He smiled, and that was good.

So, how do you get people to help you? You can't get there alone. People have to help you, and I

do believe in karma, I believe in paybacks. You get people to help you by telling the truth, being earnest. I'll take an earnest person over a hip person every day, because hip is short-term. Earnest is long-term.

Apologize when you screw up and focus on other people, not on yourself. I thought, how do I possibly make a concrete example of that? Do we have a concrete example of focusing on somebody else over there? Could we bring it out?

See, yesterday was my wife's birthday. If there was ever a time I might be entitled to have the focus on me, it might be the last lecture. But no, I feel very badly that my wife didn't really get a proper birthday, and I thought it would be very nice if 500 people …

(singing)

Now you all have an extra reason to come to the reception.

Remember, brick walls let us show our dedication. They are there to separate us from the people who don't really want to achieve their childhood dreams.

Don't bail. The best of the gold is at the bottom of barrels of crap.

What Steve didn't tell you was the big sabbatical at EA. I had been there for 48 hours, and they loved the ETC. We were the best. We were the favorites, and then somebody else pulled me aside and said, "Oh, by the way, we're about to give $8 million to USC to build a program just like yours. We're hoping you can help them get it off the ground."

Then Steve came along and said, "They said what? Oh God."

To quote a famous man, "I will fix this," and he did. Steve has been an incredible partner, and we have a great relationship, personal and professional, and he has certainly been point man on getting a gaming asset to help teach millions of kids, and, you know, that's just incredible. But it certainly would have been reasonable for me to leave 48 hours into that sabbatical, but it wouldn't have been the right thing to do, and when you do the right thing, good stuff has a way of happening.

Get a feedback loop and listen to it. Your feedback loop can be this dorky spreadsheet thing I did, or it can just be one great man who tells you what you need to hear. The hard part is the listening to it.

Anybody can get chewed out. It's the rare person who says, "Oh, my God, you're right," as opposed to, "No wait, the real reason is …" we've all heard that.

When people give you feedback, cherish it and use it. Show gratitude. When I got tenure, I took all of my research team down to Disney World for a week, and one of the other professors at Virginia said, "How can you do that?" I said, "These people just busted their ass and got me the best job in the world for life. How could I not do that?"

Don't complain; just work harder. That's a picture of Jackie Robinson. It was in his contract not to complain, even when the fans spit on him.

Be good at something; it makes you valuable. Work hard. I got tenure a year early as Steve mentioned. Junior faculty members used to say to me, "Wow, you got tenure early. What's your secret?"

I said, "It's pretty simple. Call me any Friday night in my office at 10:00 o'clock and I'll tell you."

Find the best in everybody. One of the things that Jon Snoddy, as I said, told me is that you might have to wait a long time, sometimes years, but people will show you their good side. Just keep waiting, no matter how long it takes. No one is all evil. Everybody has a good side. Just keep waiting. It will come out. Be prepared. Luck is truly where preparation meets opportunity.

Today's talk was about my childhood dreams, enabling the dreams of others, and some lessons learned. But did you figure out the head fake? It's not about how to achieve your dreams. It's about how to lead your life. If you lead your life the right way, the karma will take care of itself. The dreams will come to you.

Have you figured out the second head fake? The talk's not for you. It's for my kids. Thank you all. Good night.

"Creative Thinking"

delivered by CLAUDE SHANNON

Most people have never heard his name, but Claude Shannon was one of the most influential thinkers of the 20th century. This talk was delivered on March 20, 1952 at the offices of Bell Labs as part of an internal lecture series. This transcript was originally found **here**.

A very small percentage of the population produces the greatest proportion of the important ideas. This is akin to an idea presented by an English mathematician, Turing, that the human brain is something like a piece of uranium.

The human brain, if it is below the critical lap and you shoot one neutron into it, additional more would be produced by impact. It leads to an extremely explosive of the issue, increase the size of the uranium. Turing says this is something like ideas in the human brain. There are some people if you shoot one idea into the brain, you will get a half an idea out. There are other people who are beyond this point at which they produce two ideas for each idea sent in. those are the people beyond the knee of the curve. I don't want to sound egotistical here, I don't think that I am beyond the knee of this curve and I don't know anyone who is. I do know some people that were. I think, for example, that anyone will agree that Isaac Newton would be well on the top of this curve. When you think that at the age of 25 he had produced enough science, physics and mathematics to make 10 or 20 men famous – he produced binomial theorem, differential and integral calculus, laws of gravitation, laws of motion, decomposition of white light, and so on. Now what is it that shoots one up to this part of the curve? What are the basic requirements? I

think we could set down three things that are fairly necessary for scientific research or for any sort of inventing or mathematics or physics or anything along that line. I don't think a person can get along without any one of these three.

The first one is obvious – training and experience. You don't expect a lawyer, however bright he may be, to give you a new theory of physics these days or mathematics or engineering.

The second thing is a certain amount of intelligence or talent. In other words, you have to have an IQ that is fairly high to do good research work. I don't think that there is any good engineer or scientist that can get along on an IQ of 100, which is the average for human beings. In other words, he has to have an IQ higher than that. Everyone in this room is considerably above that. This, we might say, is a matter of environment; intelligence is a matter of heredity.

Those two I don't think are sufficient. I think there is a third constituent here, a third component which is the one that makes an Einstein or an Isaac Newton. For want of a better word, we will call it motivation. In other words, you have to have some kind of a drive, some kind of a desire to find out the answer, a desire to find out what makes things tick. If you don't have that, you may have all the training and intelligence in the world, you don't have questions and you won't just find answers. This is a hard thing to put your finger on. It is a matter of temperament probably; that is, a matter of probably early training, early childhood experiences, whether you will motivate in the direction of scientific research. I think that at a superficial level, it is blended use of several things. This is not any attempt at a deep analysis at all, but my feeling is that a good scientist has a great deal of what we can call curiosity. I won't go any deeper into it than that. He wants to know the answers. He's just curious how things tick and he wants to know the answers to questions; and if he sees thinks, he wants to raise questions and he wants to know the answers to those.

Then there's the idea of dissatisfaction. By this I don't mean a pessimistic dissatisfaction of the world – we don't like the way things are – I mean a constructive dissatisfaction. The idea could be expressed in the words, "This is OK, but I think things could be done better. I think there is a neater way to do this. I think things could be improved a little." In other words, there is continually a slight irritation when things don't look quite right; and I think that dissatisfaction in present days is a key driving force in good scientists.

And another thing I'd put down here is the pleasure in seeing net results or methods of arriving at results needed, designs of engineers, equipment, and so on. I get a big bang myself out of

providing a theorem. If I've been trying to prove a mathematical theorem for a week or so and I finally find the solution, I get a big bang out of it. And I get a big kick out of seeing a clever way of doing some engineering problem, a clever design for a circuit which uses a very small amount of equipment and gets apparently a great deal of result out of it. I think so far as motivation is concerned, it is maybe a little like Fats Waller said about swing music—"either you got it or you ain't." if you ain't got it, you probably shouldn't be doing research work if you don't want to know that kind of answer. Although people without this kind of motivation might be very successful in other fields, the research man should probably have an extremely strong drive to want to find out the answers, so strong a drive that he doesn't care whether it is five o'clock—he is willing to work all night to find out the answers and al weekend if necessary. Well now, this is all well and good, but supposing a person has these three properties to a sufficient extent to be useful, are there any tricks, any gimmicks that he can apply to thinking that will actually aid in creative work, in getting the answers in research work, in general, in finding answers to problems? I think there are, and I think they can be catalogued to an certain extent. You can make quite a list of them and I think they would be very useful if one did that, so I am going to give a few of them which I have thought up or which people have suggested to me. And I think if one consciously applied these to various problems you had to solve, in many cases you'd find solutions quicker than you would normally or in cases where you might not find it at all. I thing that good research workers apply these things unconsciously; that is, they do these things automatically and if they were brought forth into the conscious thinking that here's a situation where I would try this method of approach that would probably get there faster, although I can't document this statement.

The first one that I might speak of is the idea of simplification. Suppose that you are given a problem to solve, I don't care what kind of a problem—a machine to design, or a physical theory to develop, or a mathematical theorem to prove, or something of that kind – probably a very powerful approach to this is to attempt to eliminate everything from the problem except the essentials; that is, cut it down to size. Almost every problem that you come across is befuddled with all kinds of extraneous data of one sort or another; and if you can bring this problem down into the main issues, you can see more clearly what you're trying to do and perhaps find a solution. Now, in so doing, you may have stripped away the problem that you're after. You may have simplified it to a point that it doesn't even resemble the problem that you started with; but very often if you can solve this simple problem, you can add refinements to the solution of this until you get back to the solution of the one you started with.

A very similar device is seeking similar known problems. I think I could illustrate this schematically in this way. You have a problem P here and there is a solution S which you do not know yet perhaps over here. If you have experience in the field represented, that you are working in, you may perhaps know of a somewhat similar problem, call it P', which has already been solved and which has a solution, S', all you need to do — all you may have to do is find the analogy from P' here to P and the same analogy from S' to S in order to get back to the solution of the given problem. This is the reason why experience in a field is so important that if you are experienced in a field, you will know thousands of problems that have been solved. Your mental matrix will be filled with P's and S's unconnected here and you can find one which is tolerably close to the P that you are trying to solve and go over to the corresponding S' in order to go back to the S you're after. It seems to be much easier to make two small jumps than the one big jump in any kind of mental thinking.

Another approach for a given problem is to try to restate it in just as many different forms as you can. Change the words. Change the viewpoint. Look at it from every possible angle. After you've done that, you can try to look at it from several angles at the same time and perhaps you can get an insight into the real basic issues of the problem, so that you can correlate the important factors and come out with the solution. It's difficult really to do this, but it is important that you do. If you don't, it is very easy to get into ruts of mental thinking. You start with a problem here and you go around a circle here and if you could only get over to this point, perhaps you would see your way clear; but you can't break loose from certain mental blocks which are holding you in certain ways of looking at a problem. That is the reason why very frequently someone who is quite green to a problem will sometimes come in and look at it and find the solution like that, while you have been laboring for months over it. You've got set into some ruts here of mental thinking and someone else comes in and sees it from a fresh viewpoint.

Another mental gimmick for aid in research work, I think, is the idea of generalization. This is very powerful in mathematical research. The typical mathematical theory developed in the following way to prove a very isolated, special result, particular theorem – someone always will come along and start generalization it. He will leave it where it was in two dimensions before he will do it in N dimensions; or if it was in some kind of algebra, he will work in a general algebraic field; if it was in the field of real numbers, he will change it to a general algebraic field or something of that sort. This is actually quite easy to do if you only remember to do it. If the minute you've found an answer to something, the next thing to do is to ask yourself if you can generalize this anymore –

can I make the same, make a broader statement which includes more – there, I think, in terms of engineering, the same thing should be kept in mind. As you see, if somebody comes along with a clever way of doing something, one should ask oneself, "Can I apply the same principle in more general ways? Can I use this same clever idea represented here to solve a larger class of problems? Is there any place else that I can use this particular thing?"

Next one I might mention is the idea of structural analysis of a problem. Suppose you have your problem here and a solution here. You may have two big a jump to take. What you can try to do is to break down that jump into a large number of small jumps. If this were a set of mathematical axioms and this were a theorem or conclusion that you were trying to prove, it might be too much for me try to prove this thing in one fell swoop. But perhaps I can visualize a number of subsidiary theorems or propositions such that if I could prove those, in turn I would eventually arrive at this solution. In other words, I set up some path through this domain with a set of subsidiary solutions, 1, 2, 3, 4, and so on, and attempt to prove this on the basis of that and then this one the basis of these which I have proved until eventually I arrive at the path S. Many proofs in mathematics have been actually found by extremely roundabout processes. A man starts to prove this theorem and he finds that he wanders all over the map. He starts off and prove a good many results which don't seem to be leading anywhere and then eventually ends up by the back door on the solution of the given problem; and very often when that's done, when you've found your solution, it may be very easy to simplify; that is, to see at one stage that you may have short-cutted across here and you could see that you might have short-cutted across there. The same thing is true in design work. If you can design a way of doing something which is obviously clumsy and cumbersome, uses too much equipment; but after you've really got something you can get a grip on, something you can hang on to, you can start cutting out components and seeing some parts were really superfluous. You really didn't need them in the first place.

Now one other thing I would like to bring out which I run across quite frequently in mathematical work is the idea of inversion of the problem. You are trying to obtain the solution S on the basis of the premises P and then you can't do it. Well, turn the problem over supposing that S were the given proposition, the given axioms, or the given numbers in the problem and what you are trying to obtain is P. Just imagine that that were the case. Then you will find that it is relatively easy to solve the problem in that direction. You find a fairly direct route. If so, it's often possible to invent it in small batches. In other words, you've got a path marked out here – there you got relays you sent this way. You can see how to invert these things in small stages and perhaps three

or four only difficult steps in the proof.

Now I think the same thing can happen in design work. Sometimes I have had the experience of designing computing machines of various sorts in which I wanted to compute certain numbers out of certain given quantities. This happened to be a machine that played the game of nim and it turned out that it seemed to be quite difficult. If took quite a number of relays to do this particular calculation although it could be done. But then I got the idea that if I inverted the problem, it would have been very easy to do – if the given and required results had been interchanged; and that idea led to a way of doing it which was far simpler than the first design. The way of doing it was doing it by feedback; that is, you start with the required result and run it back until – run it through its value until it matches the given input. So the machine itself was worked backward putting range S over the numbers until it had the number that you actually had and, at that point, until it reached the number such that P shows you the correct way. Well, now the solution for this philosophy which is probably very boring to most of you. I'd like now to show you this machine which I brought along and go into one or two of the problems which were connected with the design of that because I think they illustrate some of these things I've been talking about. In order to see this, you'll have to come up around it; so, I wonder whether you will all come up around the table now.

Thank you for reading.

I'm always searching for insightful speeches that are not well-known. Whenever I find a gem, I create a transcript and add it to my list of great speeches.

You can find the full list at the link below.

Learn more at

JAMESCLEAR.COM/GREAT-SPEECHES