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Bernard Gordon has been called a "modern-day inventor in the tradition of Thomas Edison and Benjamin Franklin." Fifty years ago he was a member of the team that developed the world's first commercially available digital computer. He is most widely known as a father of high-speed analog-to-digital conversion; he led teams that went on to design and create breakthrough devices such as the fetal monitor, a mobile CT scanner, and an advanced security imaging system to help detect explosives and other contraband.

As one of the founders of the digital information and entertainment age, Gordon has had a huge impact on the world stage, inventing important devices that save lives and enhance the way we live and work. His core technology of high-speed analog-to-digital conversion is now found in everything from computers, compact discs and televisions to EKG machines, digital thermometers, atomic clocks and imaging equipment.

Yet when asked about the accomplishments that have given rise to so many of this century's innovations, he speaks simply and with characteristic economy. "I enjoy what I do," he says, sitting in his memento-filled office at Analogic, the high-tech company of which he is founder, CEO and chairman, in Peabody, Massachusetts. "To be honest, I was born to be an engineer. I have always liked to put things together and to be useful."

Indeed, although his professional accomplishments might be the dream of many an engineer in the making, they are far less about himself, he says, than about helping society move forward.

"My primary motivation, even from the beginning, was never self-serving," comments Gordon, 72. "I derive satisfaction from doing something that is useful for other people. I was brought up that way, and I was trained that way."

Honest and direct, Gordon inspires a credibility that has had a profound influence on his profession of engineering. As his achievements unequivocally demonstrate, he has lived up to his own standards: not a one-shot wonder, but a man consistently committed to finding solutions.

"Bernie is a true visionary, someone who can see a problem in technology and in society and use his technical skills to make life better," says Roy Forsberg, vice president and publisher of Test and Measurement magazine. "His example can serve as a guiding light for the industry, and it's why engineering is so important. He reminds us that engineers are curious and intrigued by how things work."

Tufts Senior Vice President Thomas W. Murnane, who has known Gordon almost two decades, agrees. "Bernie is the kind of person you meet only once in your lifetime. His record of accomplishment speaks for itself; he represents engineering professionalism at its finest. And, as his generous gift to this university attests, he is a role model for what it means to give back to society. We are extremely fortunate he has chosen to invest in

Tufts, that he sees this university as a forerunner for developing leadership in engineering."

Trained to Be Useful

Gordon grew up during the Depression era in western Massachusetts. A quiet, studious boy, he liked to fix radios and transmitters early on, and would seize a challenge when he saw one: he earned his first dollar at 13, building and selling improved outhouses featuring a cord that, when pulled, released lime and helped leach waste into the ground. Being Jewish in western Massachusetts, however, also required other kinds of expertise. One day, when he came home crying after the other boys had once again beaten him up, his uncle, an army physical education instructor, handed him a pair of boxing gloves. "He taught me to defend myself," says Gordon.

Another indelible influence was his father, who was considered an "ethical sage" who gave sermons in churches, schools, synagogues. "My father used to say, 'A-minus is not good enough,' "says Gordon. " 'Virtue triumphs, but not always.'" During his years at Springfield Technical High School, those values proved instrumental. He won science prizes, but Gordon recalls that he studied English literature and French as well as calculus, physics and electronics. He also competed on the track and wrestling teams, and was class co-president with Paul Robeson's son.

"It was not a classical high school, it was a technical high school attended by kids who might want to be carpenters or plumbers," he recalls. "Yet I would make this comment: I was better educated in high school in1943 than most college graduates are today. I could read and write and quote Shakespeare, I had classes in philosophy, logic and psychology, and I was taking apart airplanes and automobiles. This education was a very important influence on how I think about the teaching of engineering."

At age 16, Gordon applied to MIT, only to be surprised by the response. "The professor who interviewed me asked what I did after school," says Gordon. "I told him I made outhouses and fixed radios. He actually told me: 'I don't think you're the type we want at MIT.' "

So Gordon turned his attention toward another option: the Navy's officer training program. The Navy first sent him to MIT, but Tufts was also one of the schools selected to support the V-12 program, and during 1944, Gordon found himself housed on the Tufts campus in West Hall, taking a variety of college-level classes. He would spend six to eight months studying engineering and psychology along with naval navigation and strategy. He was only 17 and one of several hundred naval officer candidates on campus, a young man with prospects, eager to be on his way.

Tufts might have been a place he simply passed through had it not been for one brief encounter. One day, as he walked across campus in his uniform, a tall gentleman, who turned out to be President Leonard Carmichael, was approaching near the site of the old Barnum Museum. Carmichael greeted him: "And how are you, Bernard?" "I didn't know him, and to this day I wonder how he knew me!" says Gordon. "But it seemed to me that

Tufts was a small and friendly place with a personal atmosphere, and I was fortunate to have had my first taste of college learning there."

Today, some 50 years after that chance encounter with Carmichael, Gordon's positive impression remains, and his Tufts involvement has grown. He is a trustee and a member of the Board of Overseers for Engineering. His philanthropy, a remarkable gift for Tufts - $20 million for engineering-now brings new and exciting promise to the university's diverse programs. "It's a pleasure to be associated with Tufts," says Gordon, who now also has a grandson attending the Fletcher School of Law and Diplomacy. "It's grown tremendously, but it still has that friendly atmosphere that I remember so well, and I believe it encourages students to think creatively and positively."

President John DiBiaggio says Gordon's ongoing support of Tufts and his deep involvement over the years, are gifts received with great gratitude. "We are very fortunate to have been the beneficiaries of Bernie's remarkable belief in Tufts and its future. Tufts will continue to thrive thanks to his faith in our accomplishments and our possibilities."

Contributing to Society

As a Naval officer, Gordon was assigned to destroyer escorts. Remaining a Ready Reserve officer, he returned to MIT on the G.I. Bill, graduating with a bachelor's (1948) and a master's in electrical engineering (1949).

Gordon began his own professional career working at the Eckert-Mauchly Computer Company. There, he was fortunate to be involved in a historic technological breakthrough, the development of UNIVAC, the world's first commercial digital computer. Gordon joined the Laboratory for Electronics as a project engineer, developing navigation radar and air traffic control systems, and in 1953, he co-founded and set the technical direction for EPSCO, Inc. In 1964, he founded Gordon Engineering, an organization recognized as inventing the first solid-state X-ray generator and many other pioneering products. He then founded Analogic Corporation, which augmented Gordon Engineering's design and development strengths with manufacturing capabilities in the fields of medical and industrial imaging and measurement systems and subsystems.

At EPSCO, in the early 1950s, Gordon saw a tremendous potential in the technology of analog-to-digital conversion. Analog-to-digitial converters take signals from the real, or analog, world, and convert them into very precise digital signals for processing by a computer. During the 1950s and 1960s, he was involved in the development of such innovations as the dot matrix display (with An Wang), the fetal monitor, CT scanners, digital Doppler radar, navigation and traffic control systems, and checkout systems. At Analogic, he established a worldwide leader in areas such as ultrasonography and digital imaging, supplying the digital electronic processing subsystems for the leading laser imagers in the industry-the equipment that prints the modern version of black-and-white X-ray films. Inventing instant imaging computed tomography (CT) scanning in 1975, Analogic has also made a name in the area of innovative medical imaging subsystems and patient and fetal monitors, and developed the world's first lightweight, mobile CT scanner. Gordon is quick to credit the resourcefulness of the Analogic's engineering team

of more than 450 engineers and scientists who innovatively apply advanced and proven technology to solve customer problems. Yet for his leadership, Gordon has been acknowledged for his far-reaching contributions to society.

In 1971 he received the Outstanding Living Engineer Award from the Engineering Societies of New England. He was elected an Institute of Electrical and Electronic Engineers Fellow in 1972 and later received that organization's Engineering Leadership Recognition Award. In 1986, he was honored with the second National Medal of Technology from President Ronald Reagan; in 1992, he received the Benjamin Franklin Award for Innovation in Engineering and Technology from the Franklin Institute. Elected a member of the National Academy of Engineering in 1991, he has also been awarded several honorary degrees, including one from Tufts in 1992.

Last November, one week after being awarded a Tufts Presidential Medal, he received a Distinguished Community Leadership award from the American Jewish Congress for his exceptional contributions toward improving health care via medical imaging, for his work on advanced security systems to deter terrorism and for improving engineering education.

A Matter of Loyalty

These achievements, Gordon says, reflect, on one level, a personal fear of failing. "Most unsuccessful people are afraid of failing, so they don't attempt to succeed," he says. "For me, and I think for highly successful people in general, there is no alternative but to succeed. Failure is not an option."

John Libertino, vice chair of the board for the Lahey Clinic, says that Gordon's adherence to such high expectations defines him not simply as a successful man, but also as a man of principle who is willing to put himself on the line for what he believes.

"I've known him a long time, and have firsthand knowledge of his effectiveness and integrity," says Libertino. "He's incredibly intellectually driven, he's always desirous of being on the cutting edge, and he's not daunted by prospects of success or failure. He's energetic and enthusiastic and always sees a project right through to completion."

When asked about his success in business, Gordon responds with a philosophy that has stood him in good stead as an engineer and as an entrepreneur. He cites a small, worn book, tucked neatly under a Chelsea ship's clock on his office shelf called Naval Leadership with Some Hints to Junior Officers. From this treasured "bible," Gordon quotes a line that evokes the Golden Rule: "Loyalty downward begets loyalty upward."

All his diverse contributions, he says, are connected by "the development of ethical relationships with the people we are serving. Technology is changing all the time; you have to be ready to change with it, and we do. But we have one constant, a basic approach that's very simple. If we do a proper job and give our customers a superior product that enables them to do their jobs, then we succeed. Our loyalty to them begets their loyalty to us."

As such, he defines success by measures other than wealth. "It's measured by people who accomplish something for the good of others." For instance, he says, an estimated 1 million people a day are scanned and diagnosed on CT scanners (first known as CAT scanners). To make this valuable technology available to many more people, Analogic conceived and developed a lightweight mobile CT scanner, which can be operated by one person, easily moved among hospital rooms, and plugged into a standard electrical outlet. These design innovations in size, weight and power also save precious time, money and lives. This kind of practical problem solving of such enormous scale and potential, says Gordon, is deeply satisfying, as is the case with the fetal monitor, developed in the 1950s.

"Our team designed and built the first fetal monitor after Dr. Hahn at Yale emphasized how important it was to monitor the fetus in the womb to help ensure a safe delivery for mother and child. A few months later we delivered the world's first fetal monitor."

Writing History

If technology does not stand still, neither, insists Gordon, should the education of engineers. A longtime critic of engineering preparation, he has taken a tough stance on the curriculum for some 20 years, writing and speaking out on the pressing need for engineers who can relate to society and take leadership roles.

Gordon's investment in education reform goes deeper than rhetoric. In 1984, he created the Gordon Institute, a graduate-level program for career engineers. The Institute provides engineers and technical professionals with the option to pursue either a one- or two-year program that features classroom study and an intensive, real-world project, or a master's degree in engineering management. To date, this program has strengthened the managerial and communication skills of more than 120 "enterprise leaders" from corporations that include GE, Data General, Bose, Compaq, Toshiba and Hitachi. Through the efforts of the late Tufts President Jean Mayer, the institute, first based in Wakefield, Massachusetts, was allied with Tufts in 1992, and relocated to Tufts' Medford/Somerville campus in 1994.

Gordon remains focused on "re-engineering" education; much, he says, is at stake. American competitiveness is not what it used to be, in large part because engineers have become too specialized. Today, they are too removed from the big picture to think creatively about a complex problem. "Committees," he says, "don't conceive things."

Instead, Gordon says engineers need better communication and interpersonal skills, a sense of economic discipline and an "interdisciplinary" approach that will enable them to conceptualize solutions and follow those solutions through the manufacturing process. Gordon emphasized the immediacy of the engineering problem in a keynote address, "What Is an Engineer?" presented to the European Society for Engineering Education Annual Conference in 1984, and now in its fourth printing. Here he proposes that the future depends in large measure on educating "real" engineers. A "real" engineer, according to Gordon, is not the "geek" or "nerd" who has sacrificed intellectual breadth and social ease for narrow expertise and introversion. Rather, it is a person who, because of his or her broad education and habit of thought, "can conceive and invent, who does

not wait to be told to initiate, but imagines, conceives, proposes, propagandizes, pleads and debates for a cause and an impossible dream. The real engineer is willing to take a risk . . . because it may lead to new products beneficial to society."

His $20 million investment in Tufts seeks to expand opportunities for leadership training, particularly through project experiences. It also gives weight to the role of academia in building good character and attitude by reinforcing the virtues of responsibility and perseverance. "Engineering schools have concentrated on knowledge and skills but have not traditionally stressed attitudes and leadership," says Gordon. "Yet I believe that the greater the breadth of knowledge, the more varied the skills, and the more dedicated the attitude, the more significant will be the accomplishments."

Ultimately, the "high priests" of engineering, says Gordon, will be those people who are as at ease in the specialized and generalized disciplines of advanced mathematics, physics, chemistry and biology as they are in social ethics, psychology, history, economics and sociology. "They will have to be practical engineers," he says, "who can create real machines that work."

A tall order, perhaps, but Gordon is used to demanding a lot, of himself and of others. He still comes to work each day and keeps fit through a time-honored Navy discipline-100 push-ups a day.

Looking ahead, he is optimistic that Analogic will continue to excel. One of the most recent products, for instance, is an advanced generation explosive detection system to examine checked luggage at airports. Incorporating Analogic's advanced scanning technology, it is the first explosive detection system able to provide complete images of the entire contents of a bag in one pass, gathering and analyzing about 10 times more data per bag than the previous generation of machines. The product, says Gordon, offers "the equivalent of finding not a needle, but a toothpick in a haystack."

As for himself, Gordon points to a pair of boxing gloves that hang in his office. They were given to him by his friend Libertino, after Gordon helped the Lahey Clinic through a difficult situation. "I think," says Gordon, "I can still box a few rounds."