

Technology: A Sacred Explosion

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Good morning to all of you. Greetings to family and friends of the graduates, and most special greetings to the graduates this morning. It's an honor to be with you on this special day.

In fact, my remarks are meant especially for you graduates. I realize that you're anxious to get this over with so that you can move on to more important parts of this celebrations, like the College reception that will take place after these exercises. But I'm afraid that I've got bad news for you; you see, with old age, along with arthritis, baldness, and dementia, comes an irresistible urge to give advice to young people. So, I'm afraid that you'll have to endure one more professor's lecture today.

Today, you graduates are receiving a degree that signifies that you have expertise in some aspect of the amazing technology that dominates our society. I hope to add some perspective about why you have it and what you might do with it.

Nearly 4000 years ago, a wonderful Old-Testament prophet by the name of Abraham was promised that his seed would "bear this ministry and Priesthood unto all nations"¹. Further, the purpose was that "all the families of the earth [would] be blessed, even with the blessings of the Gospel, which are the blessings of salvation, even of life eternal"².

I think that it's fairly obvious that, in Abraham's day, taking the gospel to "all nations" was impossible. This was so, because transportation was only as fast as a horse could run, communication was only as far as a person could yell from one mountain top to another, and record keeping was only as fast as one could write on scrolls or (even worse) metal plates.

Now, you graduates have learned to graph things, so I want you to draw a graph in your mind. On the horizontal axis is time, and you should mark it off in centuries. On the vertical axis, we'll plot three variables, so it will be a triple-axis plot. One variable will be transportation, perhaps in miles per hour or, for the metrically-inclined, kilometers per hour. The second variable that we'll plot is communication, using whatever measure and units you select. And the third variable is the ability to record and transfer information, again using whatever measure and units you select. Draw your curves beginning with Abraham, then to his son Isaac, and then to his son Jacob, or Israel. Continue your plot along the time axis to Moses and then to Isaiah, and finally to the meridian of time when the Savior commanded his apostles to "teach all nations"³. From there, continue your graph to the time when we were establishing our independence from England and forming a new nation. How does your graph look?

In fact, your graph should look like 3 horizontal lines, because transportation, communication, and information management were the same during the Revolutionary War as they were in the days of Abraham. Watt had just improved the steam engine, but a high-pressure version, which was needed to be really useful, had not yet been developed. The printing press

had been invented, but day-to-day record keeping was still being done by pen and paper. And the distance and speed of communication had not changed at all.

At the opening of the 19th Century, the scientific world was deadlocked; in fact, it was going nowhere in answering one of the most fundamental of all scientific questions: what is matter made of? Sure, many substances had been identified by that time, including those that we now know as oxygen, nitrogen, carbon dioxide, hydrogen, carbon, uranium, osmium, cerium, chromium, iridium, and osmium. In addition, Avagadro would soon publish what would eventually be called the ideal gas law.

But the debate still raged on about what matter was made of. Was it just energy or power? The more religious scientists of the day proposed that it was the power of God, implying that the question might forever remain a Divine mystery. Or was it, as proposed by Dalton, composed of particles, whose characteristics were unique to each substance? If so, what forces held the particles together?

Relative to that last question, a few forces were known at that day. The force of *gravity* was certainly known, but it was difficult to imagine how it applied to holding Dalton's particles together. *Magnets* had been discovered centuries earlier, and the Chinese had compasses as early as 1300 AD, maybe even sooner. And then there was that mysterious *electricity*.

The term "electricity" had been coined by that great American inventor and scientist Benjamin Franklin as he played with kites and lightning rods during thunder storms. Actually, static electricity was known as far back as ancient Egypt, where magicians used it for their magic tricks in Pharaoh's court. But Franklin wanted to demonstrate that electricity had considerable energy, especially when it came in the form of lightning. In fact, one story is told that one day, he connected a lightning rod to a live turkey. If that story is true, we probably should add to his list of inventions the first electric turkey roaster. But lightning wasn't a very dependable source of electricity for study or for harnessing, and it didn't shed much light on the question of what might hold matter together.

In other efforts, men were learning to produce electricity without using lightning. Luigi Galvani had discovered that if two different metals were brought into contact under just the right conditions and touched to the nerve of an animal, the animal would jump. At face value, this didn't seem to be of much use except to torture the neighbor's cat. Progressing on, Alessandro Volta repeated Galvani's experiments without the animal and stacked multiple metal pairs together to produce the first multi-cell battery. But all that came from these crude batteries was a spark, and it wasn't clear what it meant or what to do with it, relegating these primitive inventions to the realm of scientific curiosities. Nor did they answer the question about holding matter together.

And then, something happened! A Professor of Chemistry and Physics at Copenhagen University, by the name of Hans Christian Oersted was one day lecturing to a class of advanced students. His goal was to demonstrate to them two scientific curiosities – Volta's battery and a compass. Whether it was intentional, which he later claimed, or it was by accident, as reported by

one of his students, he placed the compass near the battery circuit. When he closed the circuit to produce the spark, *the compass needle jumped*. If you'll pardon the pun, he was SHOCKED! Over the next few months, Oersted repeated the "experiment" using different configurations and orientations and then wrote up his observations and submitted them to the premier scientific journal of the day – *The Annals of Philosophy*.

When Oersted's paper was published,⁴ if you'll pardon another pun, the effect was ELECTRIC. The significant news was that electricity has magnetic properties!!! One historian wrote that the paper "excited the wonder of the entire scientific world".⁵ A large number of the most prominent scientists of the day immediately re-directed their research to this new phenomenon of "electromagnetism". Included were names like Ampere, Biot, Savart, Ohm, Green, Davy, Faraday, Arago, Gauss, Volta... some of the most important names in the history of science. Another historian wrote:

"During the next few months, a number of scientists, including [Sir Humphrey] Davy, [Michael] Faraday, and William Hyde Wollaston [of the Royal Institute of London] repeated and extended Oersted's work. A burgeoning literature, including many forays into the theory of electromagnetism, sprang from this celebrated experiment."⁶

Important discoveries followed quickly. André-Marie Ampere quickly invented the galvanometer, an instrument to measure current.⁷ Ampere and Francois Arago also reported the use of helical wires to form electromagnets.⁷ Stronger electromagnets were developed that were capable of moving larger parts, laying the groundwork for the first electric motor. But the greatest development was the discovery by the brilliant Michael Faraday that you could run the process in reverse⁶ — you could move a magnet past metal wire and *cause* electrical current to flow— hence the first electrical generator and the principle upon which generators operate today.

In Oersted's lifetime, his discovery was praised profusely. He received the Copley medal of the English Royal Society, the prize of the French Institute, the Dannebrog order of knighthood, and "numerous testimonials from nearly every quarter of Europe".⁵

But no one then could have imagined the longer-term results. Before the end of the 19th century, commercial electrical power was available. The telegraph had been invented, followed by the telephone and the radio. The internal combustion engine was invented, and the first automobiles appeared in Europe. Further, building on the observations and theories of electromagnetism, Joseph Thomson discovered electrons, which provided significant new understanding of the atom, giving rise to modern chemistry... and some insight into the question of what matter was made of and what held it together.

As we entered the 20th century, the explosion gathered momentum. Automobiles were being produced on assembly lines. The Wright brothers built one of those internal combustion engines and put it into their glider, and powered air travel was born. Modern chemistry led to new materials — plastics, ceramics, metal alloys. The television was invented (with credit usually given to a Utahn named Philo Farnsworth). By the end of World War II (a number of us in this audience can add their personal recollection), most homes in the United States had a telephone

and at least one automobile. Computers, large and slow by today's standards, began to appear. Then came the first transistors, followed by the transistor radio and other semiconductor-based electronics. Then came jet travel, the tape recorder, integrated circuits, and personal computers. You young graduates can now jump in with your own memories, as we saw the arrival of fax machines, satellites and satellite communication, cell phones, CDs, and the internet.

Transportation, communication, and information management had not changed significantly for nearly 4,000 years since the time of Abraham. Now, within a few decades, those capabilities jumped by a factor of 10... 100... 1000... and in some aspects, much more. What does your graph look like now? It should change suddenly from horizontal to nearly straight up, with Oersted's experiment at the point where the turn begins.

Did Oersted's discovery affect the ability to take the gospel to every nation? Pres. James E. Faust said:

“Technology provides significant support to the ongoing mission of the Church. In the late 1950s, as the jet age began, President David O. McKay boarded a jet after dedicating the temple in New Zealand. As he arrived in Los Angeles, he said to Elder Henry D. Taylor and others, ‘Brethren, next Thursday when the First Presidency and Council of the Twelve meet, I am going to recommend that a stake be organized in New Zealand.’ He then said, ‘With these fast planes it will be possible for the General Authorities to travel swiftly to any part of the world, to visit stakes as they are organized.’

Today

- General Authorities virtually circle the globe daily
- Missionaries are sent to all corners of the world, quickly & easily
- Membership information transfers electronically and is stored in computers
- Church financial transfers occur weekly from 30,000 wards and branches
- Family history information is being gathered in giant computer databases
- Temple ordinance data are managed on giant databases
- Computers help in translating Church teaching materials into other languages
- Computerized architectural plans support the massive building program of the Church
- Computer-based printing operations publish millions of volumes of Church materials each year
- Gospel messages and lessons are delivered via CDs, DVDs, Kiosks, etc.
- General Conferences and Priesthood Leadership Training Meetings are broadcast around the world

Was it an accident? Was it a coincidence? You may be interested to know that Oersted's discovery took place *early in the spring of 1820*. Does that date sound familiar? You will recognize it in this account from a young boy prophet:

“So, in accordance with, my determination to ask of God, I retired to the woods to make the attempt. It was on the morning of a beautiful, clear day, *early in the spring of eighteen hundred and twenty...* When the light rested upon me I saw two Personages, whose brightness and glory defy all description, standing above

me in the air. One of them spake unto me, calling me by name and said, pointing to the other — “This is My Beloved Son. Hear Him!”⁹ [italics added]

With that visit of the Father and the Son to young Joseph came an explosion of light and knowledge that set in motion the Restoration of the Priesthood and the Gospel that Abraham’s seed was promised and commanded to take to all nations. On an historical scale, EXACTLY at the same moment, an explosion of technology was initiated that provided the way for Abraham’s seed to accomplish the thing that He commanded them.¹⁰

No, it was no coincidence. President Brigham Young said:

“Every discovery in science and art, that is really true and useful to mankind, has been given by direct revelation from God”¹¹

Similarly, President Howard W. Hunter said this:

“The role of technology in this work has been accelerated by the Lord himself, who has had a guiding hand in its development and will continue to do so.”¹²

And, finally, from President Spencer W. Kimball:

“I believe that the Lord is anxious to put into our hands inventions of which we laymen have hardly had a glimpse. ... When we have used the satellite and related discoveries to their greatest potential, ... then, and not until then, shall we approach the insistence of our Lord and Master to go unto all the world and preach the gospel to every creature.”¹³

My young friends, the Lord provided the way for the seed of Abraham to fulfill their prophetic assignment. You and I ARE the seed of Abraham.¹⁴ That technology that you hold in your hand is not here by accident.

Now here comes the advice:

First: Don’t ever believe that this technology is here merely because men are so smart.

Second: Treat this knowledge as sacred and never use it for dishonorable purposes

Third: Please remember who you are and what you have

Fourth: Your professional success will give you unique opportunity to spread the gospel. As Elder Neal A. Maxwell admonished us, live with your citizenship in the Kingdom and your passport in the professional world – not the other way around. Don’t be bashful about your primary citizenship. And always look for ways to apply technology to building the Kingdom.

While this meeting is being held in an auditorium for secular purposes, I wish to bear spiritual witness that the Gospel of Jesus Christ has been restored, and that the tools for spreading its message are not here by accident. It is also no accident that you are here and that you have these tools in your hands. You are, indeed, Saturday’s warriors – it’s your turn. We have great faith in you. May the Lord bless you. In the name of Jesus Christ. Amen.

References:

1. Abr 2:9
2. Abr 2:11
3. Matt 28:19

4. Oersted, HC., "Experimenta circa effectum conflictus electrici in acum magneticam," *Annals of Philosophy*, October 1820, vol XVI, pp. 273-276.
5. Motteley, PF, Bibliographical History of Electricity and Magnetism, London, Charles Griffen & Co. Limited, 1922, p. 454. Also, see Gregory, F., "Oersted and the Discovery of Electromagnetism," http://www.clas.ufl.edu/users/fgregory/oersted.htm#N_17
6. Cantor, G., Michael Faraday: Sandemanian and Scientist - A Study of Science and Religion in the Nineteenth Century, New York, St. Martin's Press, 1991, p. 227.
7. Cantor, loc. Cit., p. 228.
8. "This Is Our Day" *Ensign*, May 1999, 17
9. Jos. Sm. Hist. 1:14,17
10. see 1 Ne 3:7
11. *Deseret News*, 22 Oct. 1862, 129 quoted by Elder Oaks, "Focus and Priorities," *Ensign*, May 2001, 82
12. "We Have a Work to Do" *Ensign*, Mar. 1995, 64
13. In 1974, at a Regional Representatives' Seminar, quoted by Kathleen Lubeck, "The Church and Computers: Using Tools the Lord Has Provided," *Ensign*, June 1984, 24
14. see D&C 84:33-34

For your interest - Some historical mileposts

1. Transportation
 - a. Steam engine: 1698 1st practical, 1763 Watt's improvement, 1815 hi-Pres.)
 - b. Automobile: internal combustion eng.: 1885 Europe, 1893 U.S., 1901 production
 - c. Airplane (Wright Bros.): 1902 glider, 1904 powered
2. Communication
 - a. Telephone: 1876 (Bell)
 - b. Radio: 1895 (Marconi), 1907 first vacuum tube
 - c. Television: 1929 (after many contributions, including Philo Farnsworth)
3. Chemistry
 - a. Theory of atoms: John Dalton 1803
 - b. Electrons: Joseph Thomson 1897 (helped by Faraday's earlier work)
 - c. Nucleus: Ernest Rutherford 1911
 - d. Model of the atom: Neils Bohr: 1913
 - e. Neutrons: James Chadwick: 1932
4. Data Management
 - a. Computer: 1946
 - b. Transistor: 1947