March 15, 2001

To the citizens of Colorado Springs in the year 2100:

I am writing to you to describe the "high-tech" industry in Colorado Springs during the latter part of the 20th century. I have worked in this industry for over twenty years and have witnessed much of the explosive, high-tech growth in Colorado Springs.

Marshall Sprague, a local historian and author, in one of his best known books, "Newport in the Rockies," describes the emergence of high-tech in Colorado Springs: "By 1970, handsome factories had sprung up on the jack-rabbit mesas above the creeks, making products so weird nobody could even pronounce their names – the plants of Kaman Nuclear, Hewlett-Packard, Ampex." By 1980, I as well, had sprung up in Colorado Springs - working for Hewlett-Packard making one of those weird products - a "protocol analyzer," used to analyze and troubleshoot computer communication networks. My own story is similar to many people in the latter part of the 20th century and is typical of the high-tech industry in Colorado Springs.

We have transformed from an agricultural society to an industrial society, and starting in the 1950's, into an information society where workers are primarily involved in creating, processing, and distributing information. The information age is inextricably linked with the high-tech industry. The high-tech industry includes a broad spectrum of technology including computer design, software, electronics, semiconductors, communications, and artificial intelligence. We live in a world that is heavily influenced by technology – most homes in Colorado Springs have a television set, numerous telephones, mobile cellular phones, entertainment devices, personal computers, and Internet connections. The high-tech industry changes quickly - new companies are formed, companies change names, new companies come to town, employees change jobs, fortunes are made, and fortunes are lost. Business is so fast-paced that it is difficult to capture it in a letter. I can only imagine how much it will change over the next one hundred years.

How did high-tech come to Colorado Springs? In the 1940's Colorado Springs began to transform from a small town with a tourist economy to a much larger city with an economy based on the military and the high-tech industry. During the early 1940's the US government selected Colorado Springs for the site of

Camp Carson (now called Fort Carson), a large US Army post. Later, in 1948, the Air Force opened a facility at Peterson Field and later opened Ent Air Force Base, the headquarters for NORAD – the North American Air Defense Command, with its Combat Operations Center buried deep in Cheyenne Mountain. In 1954 the Air Force announced that the new Air Force Academy would be built in Colorado Springs and in 1958 the Academy opened with 4,400 cadets and 500 faculty members. The military payrolls significantly changed the Colorado Springs economy and by 1970 the population grew over four-fold from 35,000 people to over 150,000 people. Space-defense and space-communications companies were attracted to Colorado Springs with its premiere military facilities.

During the late 1950's and early 1960's many corporations were seeking to expand their operations nation-wide. Hewlett-Packard (HP), like many high-tech companies headquartered in California, was looking at other regions of the country and world for expansion. By 1960, Bill Hewlett and Dave Packard had already had a major impact on the high-tech business landscape. They founded their company in 1938 in a garage in Palo Alto, California. Their first product was an audio oscillator. Disney Studios, one of their first customers, ordered eight oscillators to make the movie "Fantasia." As successful as their products were, their real contributions were in creating a model for business known as the "HP Way." Simply put, this means creating an environment for people to do a good job and putting confidence in people to do a good job. Their technical and business contributions spawned "Silicon Valley," the heart of the computer, electronic and software business in the 20th century.

In 1959, Hewlett-Packard decided to expand its US manufacturing to Loveland, Colorado and made a purchase of an 84-acre site. A pilot manufacturing operation was launched beginning in 1960. During that first year of operation Hewlett-Packard decided to move the research and development to Loveland to be close to the manufacturing facility. This was a significant catalyst for high-tech growth in Colorado. Dave Packard already had unique ties to the state of Colorado and the city of Colorado Springs. Dave was born and raised in Pueblo. His parents, Sperry Packard and Ella Graber, graduated from Colorado College in Colorado Springs, where Packard Hall now bears the family name.

Late in 1961 Dave Packard came to Colorado to visit the Loveland facility and afterwards drove to Pueblo to visit his family home. While driving through Colorado Springs he thought that it would make an excellent site for a second manufacturing site. Packard asked if there was an engineering school in town. Governor Steve McNichols responded quickly to Dave Packard's request and instructed the University of Colorado to expand its curriculum in Colorado Springs to include engineering, paving the way for the expansion of the high-tech industry in Colorado Springs. Subsequently, Hewlett-Packard's oscilloscope division, which was located in Palo Alto, California, was moved to

Colorado Springs as a pilot operation. An oscilloscope is a piece of electronic test equipment that is used by engineers and technicians to measure electrical signals. Engineering, marketing, and manufacturing were started in the spring of 1962 by 15 California transplants. The first Hewlett-Packard building was completed in 1964 on the west end of Garden of the Gods Road. Subsequently, 165 managers and engineers were transferred to Colorado Springs along with the worldwide responsibility for the oscilloscope product line. Hewlett-Packard has continued to steadily grow in Colorado Springs over the past 40 years and now employs approximately 2,000 employees and is home to several different product and service divisions.

I was attracted to Colorado Springs for the same reasons as many others and for the same reasons that high-tech companies choose to locate their facilities here. Colorado Springs offers a small town atmosphere, unparalleled natural beauty, a pleasant climate, and a thriving high-tech environment. Of all the front-range cities, it's one of the few nestled against the mountains. Denver is within an hour's drive and offers all of the entertainment, sports, and cultural benefits of a large metropolitan area. Colorado Springs offers awesome natural beauty and unlimited outdoor activities – hiking, mountain biking, skiing, camping, fishing, hunting, and rock climbing. The overall quality of life is excellent and it's a great place to raise a family. Yet, Colorado Springs is not for everyone. People from the east coast or west coast often find Colorado Springs lacking as a metropolitan area, ironically the same reason the people here like it so much. For most, Colorado Springs is a wonderful place to live. I hope that this is still true one hundred years from now. Colorado Springs companies attract highly talented technical people. In many cases, people who work in high-tech in Colorado Springs have turned down better career opportunities in metropolitan areas such as Boston or Dallas or the Bay Area in Northern California in order to stay in Colorado Springs.

Many high-tech companies in Colorado have come here via expansions from California. My own story is similar to many others who relocated from California. I started my career with Hewlett-Packard in California and then moved to Colorado Springs in 1980. The land around San Jose, California was once a fertile farming valley filled with fruit orchards but by the 1970's, it had become a bustling, crowded metropolitan area focused entirely on the computer, electronics, and software industry. I had joined Hewlett-Packard after graduating from Michigan Technological University in Houghton, Michigan in the spring of 1979. Like many other engineering students I was eager to work for a "cutting-edge" technology company and put my electrical engineering degree to use as quickly as possible. I moved to Cupertino, California and began working for Hewlett-Packard on the operating systems of their computers. "Silicon Valley" was the place to be for an engineer in the computer business. Most of the major computer companies were either headquartered in the Bay Area or had offices in the Bay Area. Young, new companies were constantly starting up based on the ideas being generated by

the talented young engineers at these companies. But with all of these opportunities there was a price to pay. The Bay Area was, and still is, a very expensive place to live. It was, and still is, crowded. People often spend 1-2 hours commuting each way to work in their cars. Hopefully you have much better ways of commuting to work than everybody driving his or her own car! And finally the Bay Area is prone to earthquakes. In the year and half that my wife and I lived in California we experienced two significant earthquakes including a 6.5 magnitude quake on our second wedding anniversary, August 6, 1979. During the 1970's and 1980's many companies were looking for areas to expand their operations to other cities – ones offering a better quality of life than the Bay Area of California.

Following the trend of expansion outside of California, Hewlett-Packard decided to move a division of its operations from Mountain View, California to Colorado Springs. This new division would move some of its people from the existing division, hire additional people in Colorado Springs, and start a business that would design, manufacture and market instrumentation and test tools for telecommunications and data communications networks. It would focus on the computer communications networks that were the forerunners of the Internet or the World Wide Web. During the 1960's the US Defense Department sponsored projects to interconnect computer systems, thus creating the Internet. Subsequently, this interconnected computer network was widely used by university professors for communicating on academic research projects. This computer network was continually developed and ultimately became the World Wide Web.

Colorado Springs seemed like a good place to open a new division. There was already an existing division of Hewlett-Packard, located on the Garden of the Gods Road, building oscilloscopes, logic analyzers, and computer and terminal displays. The city was near a major transportation hub, had a local university for recruiting engineers and for continuing education of the employed engineers. The city had a high quality of life with access to the mountains and outdoor activities. The division from Hewlett-Packard in California offered relocation benefits and financial assistance to its employees expecting most of them to jump at the chance to move from California to Colorado. Instead, only some of the employees decided to move. The younger employees, those with no family ties or without houses in the Bay Area decided to make the move while those older employees with family ties and investment in real estate decided to stay and take jobs in other parts of the company in California.

The project that I had been working on in California was the design of a large computer system with 128 engineers assigned to it. It was coming to an end and I was to be assigned to another project. One of the engineers that I worked with had decided to join the new division and move to Colorado. She

came back from a visit to Colorado Springs telling me of what a beautiful city it was and what a great job opportunity it was. I decided move to Colorado.

My first day on the new job in Colorado Springs I was shown to our new "office." Ten engineers were spread out in a haphazard array of desks in the basement of one of the Hewlett-Packard buildings on Garden of the Gods Road. The first day I used a stack of boxes for a desk and chair until regular office furniture could be located. All of the engineers were between the ages of 20 and 30. The project I was to work on was staffed with 8 engineers, the oldest being about 25 and having two years of job experience. We were to build a new instrument called a protocol analyzer that would analyze and display the data being transferred between computers over communication networks. The project was to be "leveraged" heavily from a logic analyzer already in production at the existing oscilloscopes division of Colorado Springs. None of us had any significant industry experience but we were filled with a sense of optimism and approached this enormous task undaunted. This attitude dominates the computer, software and high-tech electronics business. The industry is filled with young, enthusiastic engineers who like nothing better than a challenge, who like nothing better than to be told that something can't be done and then do it anyway, and who aren't intimidated by technological challenges. This was a wonderful opportunity – it was the chance to be part of a "start-up" – creating a new business. Projects in the company were assigned code names; usually cartoon characters, movie names, mountains, or animals. This one was code-named "Cookie Monster," after a large, blue, furry, cookie-eating monster that appeared regularly on a children's television show called "Sesame Street." Naming projects increased the already high sense of camaraderie on the team.

Recently Colorado Springs has been called one of Colorado's three cyber cities, the others being Boulder and Denver, with each city experiencing extraordinary high-tech employment growth during the 1990's. Colorado Springs now has over 25,000 people classified as high-tech workers, about three times higher than other US cities of similar size. We are one of the top 50 high-tech cities in the country and currently one of the top 10 fastest growing cities for high-tech jobs. All other business indicators such as growth rate, high-tech payroll, average wages, and number of high-tech establishments distinguish Colorado Springs as one the fastest growing cyber cities in the nation. The Colorado Front Range has a solid base of high technology and science-driven companies in the aerospace, computing, artificial intelligence, medical, and telecommunications industry, and there is continuing interest from companies outside the area. The Front Range has been describe by some as mushrooming, the new "Silicon Valley." As we were leaving California, my landlord told me that within 5 years "Silicon Mountain" would be just like "Silicon Valley." So far that prediction hasn't come true, but maybe it has by the time you're reading this. Colorado Springs is still a great blend of small town, beautiful outdoors environment, and a

stimulating high-tech industry. Today, while Colorado Springs is a high-tech region, the economy and life style is still diverse and is not like “Silicon Valley” which is completely driven by the high-tech industry.

Starting in the 1960’s and 1970’s, numerous computer memory, electronics, instrumentation, and semiconductor companies started business operations in Colorado Springs. Companies such as Ampex, Texas Instruments, ROLM, Digital Equipment Corporation (DEC), Fluke, Kaman Nuclear, Intel, Ramtron, United Technology Memory Center, Honeywell, TRW, Atmel, Simtek, and MCI WorldCom opened major facilities. One hundred years from today I’m sure that most of these names will have been forgotten and the products and technologies that they created will be forgotten as well. But during our time they are significantly shaping the way people live, work and communicate. These companies are involved in building computer systems, communications systems and semiconductor components for electronic equipment. There are now over 600 companies in Colorado Springs that are considered part of the high-tech industry, ranging in size from “garage shop” operations and “Mom and Pop” businesses, to small businesses and large corporations. Computer companies in Colorado Springs include Apple Computer, Compaq and Digital Equipment Corporation (DEC). Software companies include Optika, Channel Point, Noochee, Tribal Voice, Oracle, Front Range Solutions, Opus Wave, and Telsoft. Semiconductor companies include LSI Logic, Intel, Atmel, and SCI Systems. Companies working closely with the Department of Defense include Lockheed Martin, SAIC, Harris, and Aerojet. Each time there is an announcement of a major new company coming to Colorado Springs there is an air of excitement.

Atmel, for example, develops and manufactures a broad range of high-performance memory components and programmable logic devices. In 1989, Atmel purchased a 47-acre wafer manufacturing site and plant from Honeywell, Inc. and began the fabrication of silicon wafers for CMOS circuits with 950 employees. Atmel’s customers include commercial and military customers in the telecommunications, computers, consumer products, and automotive industries.

Ford Microelectronics, Inc., a subsidiary of Ford Motor Company, came to Colorado Springs in 1982. They design and manufacture sensors and activators for the global automotive industry. The facility provides a fully integrated research and development, product design, and manufacturing capability for silicon micro-machined sensors and actuators.

MCI (later acquired by WorldCom) is a global communications company serving residential and business clients. MCI develops the software systems underpinning its worldwide network. The Information Technology and Information Systems Development, located in Colorado Springs, develops, tests, and maintains the software systems that support MCI’s global

communication networks. MCI got its start in 1969 by challenging the AT&T telephone monopoly and operating a long-distance telephone network between St. Louis and Chicago. MCI purchased the IBM/ROLM facility on Garden of the Gods Road in the early 1990's. MCI has over 5,000 full-time and part-time employees in Colorado. Many of the system programmers and developers transferred from MCI facilities in Virginia.

Philips Laser Magnetic Storage is the largest manufacturer of optical drives in America. The company's headquarters, optical and tape manufacturing, and engineering facilities are located in Colorado Springs. The company has offices in England, France, and Germany.

Not all high-tech company expansions came from California. One notable exception was that of Seymour Cray's company, Cray Computer Corporation. Seymour Cray, a genius in the field of super high-speed computers, started his career in 1950 at Engineering Research Associates and later at Control Data Corporation before founding his own company, Cray Research Company, in 1972, in Chippewa Falls, Wisconsin. His company created the Cray-1, a super-computer (the world's fastest computer) based on advanced GaAS (Gallium Arsenide) semiconductor technology. This project was followed by a faster Cray-2 and an even faster Cray-3. The Cray Research Company decided that it couldn't support both the Cray-3 and another promising project, the C90. Subsequently the development of the Cray-3 was spun off into a new company called Cray Computer Corporation. In the spring of 1988, the Cray-3 project was moved from Chippewa Falls, Wisconsin to Colorado Springs. In 1989 Seymour Cray founded Cray Computer Corporation. Seymour Cray continued to develop super-computers until his untimely death in an automobile accident in 1996.

Most of the people who are hired in the high-tech industry are engineers, scientists, or marketing specialists. High-tech companies recruit such workers from universities around the United States. The top graduates are in great demand and have their pick of companies to work for and places to live. Typically these people have studied electrical engineering, computer science, computer engineering, mechanical engineering, or business and have graduated from a university with a Bachelor's degree or Master's degree. In some cases, particularly in specialized fields like semiconductor technology, people have earned Ph.D. degrees. One hundred years ago there were no degree programs in fields such as Computer Science. There must be many new disciplines for degree programs by the time you're reading this.

In many cases, engineers continue their education while working for high-tech companies. Many people come to work with a Bachelor's degree and then go to school part-time to attain a Master's degree while working. Many continue to take classes to maintain their technical skills. I personally took advantage of these opportunities to learn more about computer systems and took

courses in integrated circuit design and computer operating systems at the University of Colorado at Colorado Springs (UCCS). Since its founding in 1965, UCCS has played an important role in the high-tech community by supplying new graduates to fill positions and to provide continuing education to people on the job. There are currently over 7,000 full-time and part-time students enrolled at UCCS.

Because of hectic work schedules, and the need to balance work with family life and other responsibilities, many workers take courses or work towards a degree via "distance learning." In this format, courses are taught over television networks or via the World Wide Web. Traditional universities offer such programs regularly and some institutions such as the National Technological University (NTU) exist exclusively to offer learning programs in this manner. In addition to continued course work, some engineers and scientists stay up to date by belonging to professional associations. The Association of Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) are two predominant international professional associations. The same interest in education extends into the community. Many of the high-tech companies, in particular the larger corporations, sponsor educational events in math and science for the local elementary, junior high, and high schools.

High-tech companies in Colorado Springs and other parts of the country and world compete to hire talented, trained people and in particular engineers. Engineers with degrees in electrical engineering, computer engineering, and computer science are the most sought after. The high-tech workers of Colorado Springs are an optimistic group of people. The products that they design and manufacture help people and there is a sense of importance and a sense of value about the work being done.

The business atmosphere in the high-tech industry is extremely competitive. There is a thriving sense of competition between companies competing for the same customers and this drives companies to excellence. Colorado Springs is also a typical high-tech community in that companies compete for the same workers and recruit engineering talent from each other. Acquisitions, divestitures, "spin-offs," and "start-ups" are all a part of everyday life. In 1999 Hewlett-Packard made the decision to split into two companies. The computer, printers, and image scanning products remained part of Hewlett-Packard and the communications, semiconductors, and test and measurement product businesses were formed into a new company named Agilent Technologies.

Fortunately, Colorado Springs has been able to attract people from many regions of the country and around the world. I work with people from the US, Canada, India, Russia, Germany, Scotland, England, Mexico, Venezuela, China, and Japan. Agilent, like many other companies in Colorado Springs, is

an international company, with other divisions and customers around the world.

The 20th century has been one of technological innovation. The high-tech industry has been dramatically changed by the invention of the transistor that enabled electronics to be miniaturized and enabled computers to become a reality. The development of the microprocessor brought computing to the desktop, enabled just about any device to be embedded with computing capability, and enabled the high-tech revolution. The personal computer has drastically changed the way we live and work in the last twenty years. It has significantly changed the way routine office work is completed. The Internet or World-Wide Web enabled computers to be interconnected on a global scale, making vast amounts of information readily available. However, with all the information available today, we worry that we are drowning in information but starving for knowledge. Communication via electronic mail (commonly called e-mail) is now a part of everyday life. Cellular telephones, interconnected by wireless networks, are common, allowing people to talk with one another from just about anywhere. Much of what is commonplace today was predicted one hundred years ago by visionaries or by authors of science fiction. Since I am neither, I hesitate to make any predictions but … looking towards the 21st century, we expect to see continued leaps forward in technology and wonder how it will affect our lives and ultimately your lives. We expect to see the pace of change, particularly technological change, to continue to accelerate. Brain-machine interfaces, applications of artificial intelligence, the ability to interconnect computers via the Internet (or whatever replaces it), quantum computing, nano-technology, super-conducting compounds, natural language applications, and gene mapping seem to be a few of the possibilities. Computer software design must have made tremendous advances – today it attracts many creative, intelligent people because it is such a creative realm. It allows people to develop ideas in an abstract forum that is relatively unbounded by the laws of physics. It's fun to invent things and create things – that spirit is alive and well at the beginning of the 21st century and I'm sure that it will be at the beginning of the 22nd century when you're reading this. I can only guess what the technological innovations of the next century will be – but I'm sure that the creative spirit of innovation is thriving.

Sincerely yours,

Stephen Witt

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P.S. My day-to-day tasks that seem very urgent pale in comparison to the far more permanent task of writing a letter to the contemporaries of my great-grandchildren and great-great-grandchildren one hundred years in the future. I hope that what I have written gives you some insight into the technological society that we live in today and that it provides encouragement. I hope that my speculations are, at best insightful, and, at worst, amusing. Now, I would like to take advantage of this opportunity to include a personal note to my great grandchildren and great great grandchildren.