ELECTRONIC COMMUNICATIONS

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ABSTRACT
Astounding changes have occurred over the past 100 years related to electronic communications. With the advent of electricity, the telegraph transformed communication, followed by the telephone and facsimile. Development of computer communication capabilities on mainframe systems were followed by personal computers and the tremendous popularity of e-mail. Recent development of multimedia information system capabilities in the WWW have once again transformed electronic communication. Our challenge as forage scientists, educators, farmers and ranchers, and agribusiness men and women is to make effective use of the available technologies. Much has been done to integrate electronic communication into our offices, laboratories, and classrooms. Much remains, however, to fully utilize current capabilities and to extend those capabilities to our needs. This paper will describe a bit of the history of electronic communication, current uses, and future needs related to forage and grassland applications.

KEYWORDS
Computers, E-mail, Internet, WWW, Global Information Systems

ACRONYMS
World Wide Web (WWW), electronic mail (e-mail), Advanced Research Projects Agency (ARPA)

INTRODUCTION
Today, I'd like to share with you a bit of the Past, Present, and Future of Electronic Communications. In doing so, I'd like to reminisce with you about how far we've come, and more importantly, I want you to think about the pioneers that developed the various applications because we can emulate them in developing tools to benefit individuals worldwide with an interest in forages.

We live in an amazing world, don't we? Hand-held communication devices of many types are connecting individuals around the world by the use of satellites. Most of us probably have called home to our offices and families since the beginning of the conference using one of the telephone satellites. And many of us are using computers to help with various aspects of our work: routine word processing, connecting with our colleagues around the world using e-mail, and "surfing the Internet," to find information about every imaginable topic, from airplane and hotel reservations, to recipes from the National Cattlemen's Beef Association, to pictures of animals and insects to entertain and inform our children.

More Work Needed. As amazing as it is to communicate worldwide and receive CNN news clips from around the globe, technology advances haven't solved all of our communication challenges. We've all been subject to the super hype of how electronic technologies are going to make our lives easier, faster, less complicated. Unfortunately, "not ready for prime time" is a better descriptor of some of the current and emerging technologies than the Madison Avenue advertising suggests. But, before we get too cynical about it all, let's take a brief look at the history of some of the predecessors of our current communication technologies. I think you'll find it an interesting and illuminating brief trip - before returning to looking at some of the current and future forage and grassland applications of electronic technologies.

PAST
Most of our memories don't go back much beyond 40, 50, 60, or 70 years. Perhaps there are a few in the audience that can personally remember farther back than that, but most of us have to depend on the writings of others to track the history of communication. Many of you are familiar with the Tower of Babel account in Genesis 11. That account describes the confusion that resulted from introducing various languages. Communication technologies have had to deal with issues of geographical separation and scores of languages ever since. Let's look at a few of the more widely renowned communication styles and technologies that have been used, leading up to where we are today.

COMMUNICATION STYLES AND TECHNOLOGIES
Person to person communication has been used since the beginning of human existence. The person to person style certainly has many advantages, but requires that all individuals involved in the conversation be located at the same place for it to happen. Thus, for local communication it's great, but for reaching someone around the block or around the world it's not very useful.

Perhaps that's part of what prompted native Americans and Canadians to develop smoke signals as a form of communication. Smoke signals were an improvement over requiring all parties of the communication to be in the same place, but the vocabulary was limited, a lot rested on interpretation, and a line of sight was still required.

Regular mail (now unsympathetically called snail mail) typically was slow - often taking weeks or months to get to the destination. In the 1860's the pony express was an improvement in speed, but that speed came at considerable risk to the delivery folks and still required days to get a message across the country (Houghton Mifflin, 1996). During the same historical period, the utilization of electricity for instantaneous communication was launched. In 1844 the first telegraph message was sent from Baltimore to Washington (DC). Invented in 1837 by Samuel Morse, the telegraph provided a means of sending and receiving code by intermittent current. The telegraph and the railroad progressed in tandem; along the railroad lines a telegraph network was set up. This may have been the best example of early cooperative work.

In 1866 the first trans-Atlantic cable was laid as the first step toward a global telegraph network. Just imagine the work involved with that job!

Personal communication in "natural language" that we're all familiar with was made possible in 1876 with the first telephone (ATT, 1996; URL: http://www.att.com/attlabs/chrono/). In 1924, a related technology, the facsimile, resulted in the ability to send messages which included text and graphics to a location by phone line, at any time of the day or night. It was called "telephotography" then but the fax has become the procrastinator's favorite appliance.

Satellites have been used to send messages and signals of all types to various locations for several decades.

But it was the more recent history of the 1970's that brought us computer electronic mail. This technology dramatically changed communication again. "Network email," created in 1971, permanently changed the way people viewed computers and human communication (Hardy, 1996).

Interestingly, email developed as an outgrowth of the Defense

Defense Advanced Research Projects Agency (DARPA; URL: http://www.darpa.mil) of the U.S. Department of Defense. DARPA was founded in 1958 (one year after the Soviet Union's launch of Sputnik I). The goal of DARPA was to "help maintain U.S. technological superiority." Research supported by DARPA in the area of computer networking led to the implementation of DARPANET in 1969. Strangely, the idea of using DARPANET to facilitate human communication among researchers was not widely recognized until the creation of network email in 1971. DARPANET was designed rather as a means of sharing computer programs. It may have been that long distance communication (already addressed by the postal system, telephone, radio, and automated telex) was viewed as too trivial an application for highly specialized computers.

DARPANET and the associated netmail application was a logical outgrowth of messaging that had developed on mainframe time-share computers. Instead of leaving a message for another on the same machine, the message was sent to another mainframe computer located across the country or somewhere around the world.

For those of you who were early adopters of email, you might be interested to know that Queen Elizabeth sent her first email message in 1976! (Hardy, 1996).

In July of 1979, CompuServe began a service to computer hobbyists called MicroNET offering bulletin boards, databases, and games. In December, Hayes Microcomputer Products introduced the 110/300 baud modem for the Apple II ($380). (http://www.islandnet.com/camphist/comp1977.htm)

Thus, the capabilities that had been developed on mainframe computers for national defense purposes were poised for application on a grand scale with the introduction and proliferation of personal computers. Finally, in the 1980's, email becomes a possibility for the more everyday user of computers and not just for computer "techies."

In 1991, three significant events occurred related to electronic communications; 1) the Wide Area Information Servers (WAIS) computer program was released by Thinking Machines Incorporated, 2) GOPHER was released by the University of Minnesota, and 3) the World Wide Web (WWW) software program was released by CERN (Zakon, 1996).

World Wide Web technologies opened up a new form of electronic communication. Developed as an outgrowth of physicists needing to communicate graphic information to their colleagues, the WWW release provided peoples of the globe with a communication technology capable of quickly transmitting formatted text, graphics, color pictures, sound, and motion video.

In 1992 the World Bank came online (http://www.worldbank.org). In 1993, the Whitehouse came on line (http://www.whitehouse.gov) including email addresses for the President (president@whitehouse.gov), Vice-President (vice-president@whitehouse.gov), and First Lady (root@whitehouse.gov). And, also in 1993, the United Nations came online (http://www.un.org).

In 1994, the Congress of the United States government came online (House of Representatives URL: http://www.house.gov/) (Senate URL: http://www.senate.gov/). In November of 1994, the Forage Information System came online (http://www.forages.css.orst.edu).

1995 CompuServe, America On-Line, and Prodigy began to provide Internet access. The Canadian government also came online (http://canada.gc.ca/).

Growth of computer hosts (or net-connected computer) has been remarkable; from 4 in 1969 to nearly 13 million in 1996.

PRESENT

Where are we today with respect to electronic communication? The development of the microcomputer industry and the now nearly ubiquitous presence of desktop and laptop computers at use in industry, education, and entertainment has seen an explosion of the use of electronic communication including email and WWW technologies. Although agriculture was not the originator of these technologies, it is a significant user.

Email. Interpersonal messaging via email is still by far the greatest use of the Internet. Many individuals now use email routinely in their work and extracurricular activities. This was a gradual process, however, with small steps of becoming familiar with the technological capabilities being presented to them by departmental visionaries or company computer "evangelists." The advantages of not "playing phone tag" or waiting for "snail mail" are now widely appreciated.

Email, however, presents different dynamics than face-to-face or phone communication. When you send or receive an email message, you can't read body language or voice language. This can lead to misunderstandings or unintended offenses. It can even be tempting to be rude, since it's not a "real person" at the other end of the email message.

Electronic mail can be a good mechanism for breaking down traditional hierarchies of organizations. Sending a message to your university President or College Dean is much more likely via email, since you're not demanding their time in the same way a phone message would and it's much simpler than typing out a formal letter. There can be dangers also, however. Once the message is sent, it can't be retrieved and, worse, what you've sent can be copied and sent to others even though you didn't intend that. Thus, email requires etiquette awareness and use.

Mailing Groups. Besides person-to-person email communication, mailing groups now exist for nearly every possible topic. Hundreds of people may be reached by sending one message to the group.

Examples of mailing groups include dairy-L, graze-L, and forage-mg. Individuals from around the globe can interact on subjects of interest to them. Answers to questions can be obtained within minutes. Experience gained in one location can be immediately shared with others. In addition to the subject matter expertise available, part of the appeal of mailing groups is the camaraderie and collaboration of people working on common problems.

Disadvantages of mailing groups, however, include the potential for annoying hundreds of people at a time by sending them an unsolicited message better intended for a limited audience. Also, because mailing groups are typically open to all, there is no filter for the quality of information being disseminated. Unlike research or extension publications or discussions with "certified experts," mailing group opinions are presented on a more equal basis. This creates more of a burden to "consider the source" before taking action. The potential for information overload is a real problem too. Hundreds of messages from various mailing groups can take all of your time if you let them.

WWW. Limitations of "text-only" communication via email or

mailing groups have been overcome by the use of WWW technologies. Where email is often characterized by unpolished, unfinished, unformatted text, WWW technologies provide capabilities for transmitting formatted text, graphics, color pictures, sound, and motion video.

WWW site development and use is increasing at an astounding rate. Educational institutions, government agencies, and commercial businesses are all developing sites for their customers.

Today, these capabilities require faster computers and networks, or a great deal of patience. But, communication using these enrichments allows for more complete information and more effective teaching. Examples include full color pictures of forages, video clips of operating machinery, and publications identical to those typically obtained from printed sources but with more frequent updating. The initial extra effort needed to access these resources is well worth it in a current, high-quality, and swiftly transported product.

Other advantages include a greater number of information sources from around the world, and access is user-controlled; the information is available to you but not imposed on you in the form of email messages from mailing groups.

Issues yet to be resolved include providing faster access to the WWW via high-speed national and international networks, faster modems and computer processors, etc., reducing the duplication of effort, promoting more timely updating of sites and information, developing a peer-review process, and providing more logical navigation to similar subject sources.

ON-LINE DEMONSTRATION

To demonstrate current electronic communication capabilities, an on-line demonstration of the Forage Information System (URL: http://www.forages.css.orst.edu) is planned. This will include accessing various forage and grassland web sites and exploring available information resources, thereby demonstrating existing global connectivity and cooperatively developed projects.

FUTURE

What does the future hold for electronic communications? We've seen some of the tremendous progress that has been made over the course of the last 100 years. Even the changes of the last decade have been astounding. Since 1969 (the year of the manned moon landing), the number of networked servers has grown from 4 to 13 million! How can we even pretend to forecast the future of development? It's probably sheer folly.

Nevertheless ….. there are a number of needs that were mentioned in the previous section describing current conditions. And these needs will drive future development:

- faster access to the WWW via high-speed national and international networks, faster modems and computer processors, etc.,
- reducing the duplication of effort,
- promoting more timely updating of sites and information,
- developing a peer-review process, and
- providing more logical navigation to similar subject sources.

Higher speed networks will be developed by national and international efforts of countries and multinational companies. Higher speed processors are already being announced. Intel recently reported success with a supercomputer performing 1 trillion instructions per second. As forage scientists, farmers and ranchers, and agribusiness people, this area is not one we are likely to affect, except as users of the technology.

The other items we can affect significantly, however. We can "team-up," using technology to bring people together as described in "The Fourth Turning" book by historians William Strauss and Neil Howe (Strauss and Howe, 1996). I believe that collaboration with forage colleagues worldwide to jointly develop a global forage resource is in our future. I believe it will happen over the next few years. But it's not a small challenge, and it will require working differently than we have in the past.

I foresee a future where we and our clients will spend less time looking for information and more time working together, and teaching and learning. We can:

- reduce the duplication of effort, thereby saving time, energy, and money,
- promote more timely updating of sites and information to offer current research to a wide audience,
- develop a peer-review process to ensure accurate information, and
- provide more logical navigation to similar subject sources for easy access.

At the beginning of this presentation I asked you to think about the pioneers of electronic communications. Pioneers like: Alexander Graham Bell, and Samuel Morse. But, interestingly it is difficult to name single individuals as pioneers of the recent progress in electronic communications. The amazing advances in technology have been made recently by groups: the space program, MicroNET, CERN. But those groups are really individuals who were willing to forsake the individual recognition and chose to work together.

I would like you to become a pioneer and join our group!

We will need pioneers. Willing cooperators to put the goal of mutual benefit ahead of individual recognition and current rewards structure. We must change the system and not allow it to dictate what we will work on and how. But this will require "teaming-up" with each other and our professional societies, with information scientists, computer specialists, communication specialists, instructional designers, and graphic artists.

I would like you to take a focused look at the FIS with the goal in mind of determining how you best fit in. What can we improve? What can you add? It's an enormous undertaking. But if you'll contribute your time, your effort and expertise, we can do it together.

Vision without action is merely a dream.
Action without vision just passes the time.
Vision with action can change the world.
Joel Arthur Barker (1990)

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