Animal, Meat and Food Science Resources on the Internet

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INTRODUCTION

The Internet is a global collection of computer networks—a network of networks. These networks all use the same computer communications protocols that allow them to be linked together and transfer information packets among themselves. There are seven different layers of computer protocols but the one that deals with information packet transfer is called Transport or Transmission or Transfer Control Protocol/Internet Protocol or TCP/IP for short. The Internet was named for this protocol (Levine and Baroudi, 1993). All the computers that interact on the Internet must be running a software program that is TCP/IP-compatible so they can share information packets or send information packets through a gateway that converts the information to Internet Protocol.

In the United States, the Internet evolved from the Department of Defense (DOD) ARPANET which was a project started in 1969 to provide reliable communications between the DOD and military research contractors at universities and laboratory institutions (Levine and Young, 1994). In the 1980's the National Science Foundation (NSF) set up five supercomputing centers and provided widespread academic and research institution access to them on a new network, NSFNET. It also set up a number of regional networks to connect from the institutions to the main NSFNET backbone. Eventually most traffic shifted from the ARPANET to the NSFNET, and the ARPANET was closed down to research traffic. Since the NSFNET only allowed research and educational traffic, commercial network providers came on the market. Recently in a cost-cutting and privatization move, the NSFNET backbone was put out for bid and is now supplied by SPRINT. In other countries, the networks are owned and run either by the government or telecommunications/postal operations.

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Reciprocal Meat Conference Proceedings, Volume 48, 1995.

The Internet is growing geometrically every year in the amount of information available on it, the amount of usage by individuals and the number of computers with access to it. But it is a very unregulated and unstructured environment. Information sources change rapidly and this presentation can only give a current snapshot to give a flavor of what is available. Although the author has selected relatively significant and stable items for examples, it is with the caveat that the content and location of sites change rapidly in the electronic environment. The means to access the Internet also change rapidly as new versions of software programs to access it are developing on a monthly time frame and hardware is evolving with a generation time of about 18 months.

Each computer, or "host," attached to the Internet has a unique address known as the Internet Protocol (IP) address. This unique address allows for the sending and receiving of information packets to the correct computer. IP addresses have two forms, numeric and character. The numeric address consists of four sets of digits separated by periods, such as 128.194.178.7. The character form usually consists of short words or acronyms that identify the computer and the network it is locally attached to and the type of network it is on. The character address of the numeric example is "vtam.tamu.edu" which is a particular IBM computer at Texas A&M University. An "edu" ending signifies an educational institution, a "com" is a commercial organization, a "gov" is a government body, a "net" is a networking organization, a "mil" is a military site and an "org" is a miscellaneous organization. A two-letter ending is a country abbreviation, such as "ca" for Canada. To aid in Internet navigation, an identification system called the Uniform Resource Locator (URL) is also under development. The URL gives the domain name, address and file path to computer files or programs allowing a direct jump to locations if one knows their URL address.

The Internet has greatly enhanced the ability to transfer information in three major formats; electronic mail, transferred data and software files and remote access to distant computers. This paper will introduce how to use these three formats and the kinds of animal, meat and food science information that can be obtained by them with specific examples of sources.

ELECTRONIC MAIL AND MAILING LISTS

One format of electronic information transfer is the electronic mail message (e-mail). In general form, it resembles the written letter but has the major advantage of almost instantaneous transmission and delivery compared to physical mail. A piece of e-mail can go around the world in seconds, or minutes if traffic is heavy, compared to days or weeks for physical mail. It means that rapid exchanges can take place if both parties are checking their mail frequently and responding to it. One needs an address and mail sending and receiving service to use e-mail. These are frequently provided at the workplace but can also be obtained by individuals from commercial services such as CompuServe or America on Line. E-mail has the advantage over the telephone of not requiring the other party to be there to answer and be available to talk. But it does require regular checking by the receiving party or delayed communication can result that is worse than "telephone tag."

Research scientists have used e-mail to share research ideas and results with colleagues since the early ARPANET. Since the late 1980's, businesses have used e-mail to facilitate communication. Communications have been greatly enhanced for both the agricultural research and agribusiness communities.

Listservs

In addition to single e-mail transactions, the capability to collect and automatically redistribute e-mail messages has led to the creation of subject-oriented mailing list discussion groups. They are commonly called "lists" or "listservs" for the computer program that collects messages, manages their redistribution and keeps track of the mailing list through subscriptions to it. To join a discussion list that is of interest, one sends an e-mail message to the listserv address with only a short subscription message that takes the form: subscribe name-of-list your-name. For example, if the author wanted to subscribe to the broad agricultural discussion group AGRIC-L, an e-mail message would be sent to "listerv@uga.cc.uga.edu" with the body "subscribe agric-l Rob McGeachin" (do not include the quotation marks and leave the message subject line blank). The listserv program automatically reads the e-mail address from the message, adds people to its distribution list and sends a welcoming message with information about the list. Thereafter, unless one sends a message unsubscribing or suspending delivery, the individual receives a copy of every message sent to the list.

Discussion group lists can be either public and open to all or private and restricted to a select group by the list manager. Lists can be moderated by a list manager who screens messages for fit to the published scope of the discussion group and only appropriate messages are passed on to the list. In unmoderated lists, every message sent to it is automatically distributed to all. Many people find the filtering action of moderated lists a great benefit as purely junk e-mail and off topic messages are excluded.

The following is a selected list of discussion lists available for animal, meat and food sciences:

AGRIC-L listserv@uga.cc.uga.edu
broad topics range including beef cattle and pigs

ANSSTDS listserv@msu.edu
animal, dairy and poultry science—academics only

BEEF-L listproc@listproc.wsu.edu
beef specialists

DAIRY-L listserv@umdd.umd.edu
academic and extension dairy science

EQUINE-L listserv@psuvm.psu.edu
forum for horse lovers

EQREPRO-L listproc@cornell.edu
horse reproduction

SM-RUM listserv@vm.cnuce.cnr.it
small ruminants

USENET News

Another approach to mass distribution of topic-related messages is called USENET news. It is a globally-distributed bulletin board system that collects and sends copies of all received e-mail messages, called "posts" or "articles," to every other site periodically (Levine and Baroudi, 1993). There are thousands of topic-related "newsgroups" that can be accessed. One uses a news reader software program to view the entire hierarchy of all topics and selects newsgroups of interest. One browses lists of message subject lines and selects individual posts to view. The individual can also subscribe with the reader software to see only a selected list of newsgroups. Some listservs are duplicated by USENET news groups and one can forgoe a listserv subscription, where every message goes to one's e-mail account, and instead read only those postings that are of interest to you from the newsgroup display. In this manner, the individual gets to act like a list moderator and only read what is most pertinent to their interests.

The following is an annotated list of newsgroups of interest to animal, meat and food sciences:

alt.agriculture.misc
general discussion of all agricultural topics

alt.food
all aspects of food and commercial sources of foods

alt.food.professionals
general discussion of food service and restaurants

bionet.general
broad range of biological and biotechnology topics

bionet.jobs
announcements of biological and biotechnological jobs

bionet.molbio.genbank
molecular biology and the genbank program

bionet.molbio.genbank.updates
daily updates on new additions to genbank
bionet.molbio.gene-linkage
gene linkage analysis and results
bionet.molbio.proteins
analysis and biotechnology of proteins
bionet.software
software for biological and biotechnology research
misc.rural
general discussion of rural life and problems
news.announce.conferences
announcements of academic conferences on all subjects
rec.equestrian
all aspects of horse ownership
rec.food.preserving
all aspects of home food preservation
sci.agriculture
general discussion of all agricultural topics
sci.bio.food-science
topics related to food science and technology
sci.bio.technology
all aspects of biotechnology
sci.chem
all aspects of chemistry
sci.med.nutrition
medical aspects of nutrition

File Transfer

The second major mode of information access on the Internet is the transfer of computer data files and software program files by copying the files from one computer to another. This is done using the File Transfer Protocol (FTP). Many Internet-connected computer operators have placed public domain software or data files in publicly-accessible directories that anyone can connect to by what is known as "Anonymous FTP." Running a FTP software program, one makes a connection to the remote-computer FTP directory and logs in as "anonymous" and gives the password of either "guest" or one's e-mail address. One then changes to the appropriate subdirectory where the file of interest is located. There are two main types of files: ASCII text and binary computer program code. Before transfer, one must set the appropriate type of transfer for the target file by issuing a command of either ascii or binary. One then issues a 'get "filename" newfilename' command (where filename is the actual name of the file and newfilename is what it should be named on the local computer) to have the file copied to the local computer.

There are millions of files available and finding the location of a desired file and FTP site could be a daunting task. But a utility named ARCHIE searches for filenames at FTP sites and makes locating them very easy—if you can connect to an ARCHIE utility site that is not completely busy with others already accessing it.

An example of an FTP site useful to animal or meat sciences is a collection of Lotus 1-2-3 spreadsheet files of agricultural and livestock production statistics at Cornell University with the IP address "usda.manlib.cornell.edu" in the directory "usda." One logs in as anonymous and gives one's e-mail address as the password.

REMOTE ACCESS OF DISTANT COMPUTERS

Telnet

The third mode of Internet information access is by logging into a remote computer and controlling it from a distance as if it were your local computer. The Internet protocol for this is called telnet. Once again, computer operators have made certain computers available for remote access to computing facilities. They may be available to anyone for anonymous login and access or may be restricted to computers from certain address domains.

A telnet-capable software program is needed with the usual command taking the form "telnet IP address." The remote computer usually responds asking for a login id and password which may take the "anonymous" form or may be a publicly-distributed one specific to that computer. Once logged on, one behaves like any local user accessing data or program files.

Gopher

The command-driven telnet procedure for the computer novice is relatively complex so the Microcomputer and Workstation Networks Center at the University of Minnesota developed a more user-friendly interface and server program called GOPHER. The gopher program initially displays a hierarchical menu with each line representing a telnet command to another local menu item or another remote gopher server. Each time one clicks or presses enter on a line, it invisibly telnets to that location to either another gopher menu line or eventually a computer file. When one accesses a text data file, it is displayed by the gopher software, and if of interest, it can also be either printed to one's local printer or downloaded to the local computer drive. Binary files can be downloaded to the local computer drive more easily than with FTP programs. One easily traverses up and down gopher menus, often linking to widely dispersed geographic sites. But this easy navigation is the result of people setting up gopher servers with useful resources arranged in a logical hierarchiecal manner. There are many valuable gopher information servers with resources useful to the animal, meat and food sciences in a wide range of disciplines such as agriculture, biology, chemistry, economics and weather.

World Wide Web and Hypermedia

An even greater advance in user friendliness of interaction with the Internet is the concept of hypertext or hypermedia links in a seamless client/server environment. Again people put links to computer resources on servers that

can be accessed from remote computers with compatible client-interface software program. People and organizations create "home pages" which contain information and hyperlinks to other locations. The hyperlink is a "hot button" that when engaged by clicking on it, causes the client software, also known as "browser" software, to simply jump to the appropriate location and perform a transfer of computer information of almost any type. Possible transfers now include sending e-mail, FTPing files, gophering, telneting and doing hypertext transfers of text, graphic, audio or video files. This latter retrieval is done using the HyperText Transfer Protocol (HTTP). Each hypertext link contains the URL necessary to connect to the appropriate computer site or resource.

Where gopher uses hierarchical menus to navigate the Internet, the collection of hypermedia-capable servers linked around the world is known as the World Wide Web (WWW) because the jumble of hyperlinks resembles the complexity of a spider's web. Where gopher is text-based and gopher clients often are text screen displays, the WWW clients usually have a Graphical User Interface (GUI) and can display pictures and video and play audio in addition to displaying text. But this means that newer computers with at least four megabytes of RAM are needed (8 or 16 Mb preferred) unless one uses a text-only display client. But the ease of use of top line WWW browsers such as Netscape Navigator or NCSA Mosaic which allow one to very easily do HTTP, GOPHER, FTP and Usenet News have the author's recommendation for accessing the Internet. The sites listed below can be accessed by entering their URLs in the "open" or "open URL" options of browsers.

Selected Gopher and Web Resources

This section presents a selected list of useful Internet gopher and WWW resources. The URL is followed by a brief description of the content.

http://ipm_www.ncus.edu/cernag/cern.html
: The subject page for agriculture from the WWW Virtual Library provides many links to resources and can be a good starting point to finding and exploring Internet resources.

http://www.okstate.edu/~animsci/library/
: The Livestock Virtual Library page includes links to domesticated species and breed information, livestock gene-mapping projects, market information, animal science departments, livestock research centers and professional organizations.

http://gallus.tamu.edu/1h/posc/dother.html
: The Poultry Science Virtual Library page has links to poultry science departments and organizations and other bird-related resources dealing with topics such as raptors and ratites.

http://sparib.clemson.edu/biiscom/
: Beef Industry Information System is a collection of documents and resources by and about the Beef Board, National Cattleman's Association, Beef Industry Council and the Meat Export Federation. It is still under development. It includes 15 beef industry electronic newsletters.

http://savell-j.tamu.edu/jeff.html
: The homepage of Meat Science at Texas A&M University provides descriptions of meat science activities at Texas A&M and links to many related information sources.

http://www.ozemail.com.au/~davidrob/
: A prototype page for the Australian Meat Industry with links to meat science industry and market resources.

gopher://penpages.psu.edu/
: The PENPAGES gopher site is a very large collection of fulltext information relating to agriculture, human nutrition, aging, rural family and community development and consumer issues. It includes about 12,000 reports, newsletters, bibliographies, and fact sheets. It also includes USDA daily press releases and USDA market news reports including: Livestock & Meat; Poultry; Field Crops and Dairy Products. Another site with USDA daily market reports is at the University of Nebraska–Lincoln (URL–gopher://UNLVM.UNL.EDU:70/11/markets).

gopher://gopher.nalusda.gov:70/11/ag_pubs/cris
: The USDA Current Research Information System (CRIS) which gives summary reports of current research projects.

gopher://eos.esusda.gov:70/11/server/gopher/ag-census
: The 1992 Census of Agriculture which includes production and economic data down to the county level for livestock and crop production in the United States.

gopher://usda.mannlib.cornell.edu/
: The USDA Economics and Statistics System jointly operated by the USDA and the Mann Library of Cornell University contains over 250 data sets in Lotus 1-2-3 files of historic crop production data including livestock, dairy, poultry and field crops and fulltext monthly and quarterly situation and outlook reports by the Economic Research Service, the National Agricultural Statistics Service and the World Agricultural Outlook Board.

gopher://gopher.nalusda.gov:70/11/ag_pubs/usda_ars_qr
: The USDA Agricultural Research Service Quarterly Reports of Selected Research Projects give brief summary results of significant findings in all areas of agricultural research. For example, the first-quarter report of 1995 includes results that keeping cattle regularly fed when going to market is necessary to maintain normal rumen microflora and suppress pathogenic bacteria like *E. coli* O157:H7.

gopher://gopher.nalusda.gov/
: The National Agricultural Library (NAL) gopher server provides information about the resources and service centers available at the NAL, such as the Biotechnology Information Center (BIC) and the Food and Nutrition Information Center, USDA. It also includes links to other agriculture information gopher servers and fulltext publications reviewing Internet agriculture resources. A

complete phone list of NAL staff is included.

http://probe.nalusda.gov:8000/

The NAL Agricultural Genome Web page provides access to the Plant Genome Databases; GrainGenes, AAtDB (Arabidopsis), Mace (maize), Soybase, TreeGenes, RiceGenes, solGenes (Solanaceae) and access to the animal genome databases ACeDB (C. elegans), Human Chromosome 21, ACeMap (human chromosome X), FLyDB (Drosphila melogaster), MycDB (mycobacteria), and AGsDB (A Genus species Database).

http://www.ncbi.nlm.nih.gov/

The National Center for Biotechnology Information page provides access to the Genbank genetic sequence database which collects all delineated DNA sequences from researchers around the world. It includes search capabilities of Genbank and links to other genetic sequence databases.

gopher://cyfer.esusda.gov/11/fnic

The Food and Nutrition Information Center of the USDA has many consumer-oriented nutrition publications, programs and educational materials.

http://vm.cfsan.fda.gov/

The Center for Food Safety and Applied Nutrition of the FDA has links to information such as food additives, pesticide and chemical contaminants, foodborne illness, food labeling and nutrition, biotechnology, consumer advice on food safety, a fulltext version of the handbook *Foodborne Pathogenic Microorganisms and Natural Toxins 1992* and other FDA agency web servers.

gopher://zeus.esusda.gov/11/feds/fda

This site contains public information on the Nutrition Labeling and Education Act (NLEA) of 1990, including summaries of final rulings of claims that are and are not allowable on food labels.

Resource Guides

gopher://gopher.nalusda.gov:70/00/nalpub/absp_int

Agricultural Based Services and Products - Available on the Internet by Robert Anderson of the NAL reviews gopher and telnet sites, library catalogs and listservs.

http://www.lib.lus.edu/sci/njc.html

Not Just Cows: A Guide to Internet/Bitnet Resources in Agriculture and Related Sciences by Wilfred Drew is another comprehensive guide to Internet resources that includes library catalogs, gopher, listservs, bulletin boards, Usenet News groups, WWW and electronic magazines and newsletters.

Electronic Publications

gopher://bluehen.ags.udel.edu/11/.news/.sheepnews

Sheep News

gopher://joe.uwex.edu/

Journal of Extension

http://sparrib.clemson.edu/biiscom/ncamag.html

National Cattleman Magazine

REFERENCES

Levine, J.R.; Baroudi, C. 1993. The Internet for Dummies. IDG Books, San Mateo, CA 355 pp.

Levine, J.R.; Young, M.L. 1994. More Internet for Dummies. IDG Books, San Mateo, CA 390 pp.