EXPERIMENTS IN MEDICAL COMMUNICATIONS VIA THE ATS-1 SATELLITE

EDSAT Center
1225 West Dayton Street
Madison, Wisconsin 53706

EXPERIMENTS IN MEDICAL COMMUNICATIONS VIA THE ATS-1 SATELLITE

EDSAT CENTER PARTICIPATION IN THE ALASKA SATELLITE COMMUNICATIONS PROJECT

21 June 1971 - 20 March 1972

The EDSAT Center
Space Science and Engineering Center
The University of Wisconsin
Madison, Wisconsin

The research in this document has been supported by the Lister Hill National Center for Bio-medical Communications of the National Library of Medicine, National Institutes of Health, on Contract NIH71-4717

PREFACE

The EDSAT Center has undertaken to conduct tests and experiments to determine the optimum hardware to be used in a medical relay experimental system. This report considers the following experiments conducted under NIH71-4717:

I. The Electrowriter Experiment

II. The Slow-Scan Television Experiment

III. A Preliminary Report on the X-Ray Image Processing Experiment

IV. Satellite Base Station Operation

The combination of the telephone and satellite image transmission will provide a great potential for the development of specialized communication grids. To achieve this potential, equipment must be tested and developed and special combinations of equipment must be devised to determine and verify the communication performance of the final configurations. It is with this purpose in mind that the experiments detailed in this report have been undertaken.

The EDSAT Center wishes to acknowledge the guidance and counsel of Mr. Al Feiner, Mr. Dave Moriarty and Mr. Ben Tate of NLM in the conduct of this work. The Center further wishes to acknowledge the leadership of Doctor Edwin Wallace and Mr. James Waeffler in the organization, supervision and development of the project.

Delbert D. Smith
Director
The EDSAT Center

EDSAT

NLM PROJECT TEAM

Project Leader

Edwin A. Wallace, M.D.

Project Manager

W. James Waeffler

Project Secretary

Sandra L. Griffith

Medical Communications Specialists

Jerry J. Keliher
(Slow-Scan Experiment)

Richard L. Paider
(Slow-Scan Experiment)

Principal Investigator

Dr. Delbert D. Smith

Project Engineers

Kenneth J. Bures
(X-Ray Experiment)

William E. Dumke

John A. Kruse

Project Technicians

Jeffery S. Huntley

James A. Maynard

Medical Illustrator

Edwin V. Hord
(Slow-Scan Experiment)

COOPERATING MANUFACTURERS

Electrowriters - Victor Graphic Systems, Inc.

Xerox Telecopiers - Xerox Corporation

Radio Equipment - Motorola Corporation

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I

ELECTROWRITER EXPERIMENT

THE ELECTROWRITER EXPERIMENT

BACKGROUND

The Victor Electrowriter Remote Blackboard (VERB) system, which is marketed by Victor Comptometer Corporation, is a graphic communications system that can be used to transmit written and/or drawn messages.* These messages are usually transmitted via telephone lines but FM radio transmission at 3 KHz and below is also possible.

The Electrowriter was first used by business and industry, and they remain the largest users of Electrowriter equipment to date. The Electrowriter is also used in educational situations as a visual aid in remote teaching activities. For example, the Engineering Department of the University of Wisconsin-Extension Division uses the Electrowriter Remote Blackboard in its Statewide Engineering Education Network (SEEN). SEEN is an effort to bring campus-originated engineering and science courses directly to selected localities throughout the state for those engineers who desire continuing education but cannot leave home and job to do so.

The Electrowriter, when used in conjunction with a two-way telephone network, enables remotely located students to view the development of equations, notes and sketches and listen to the lecturer as he teaches his class at a central location. Although the VERB concept has been used in engineering

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*Much of the background material appearing here is taken from a more extensive review of Electrowriter activities in Wisconsin found in Teleconferencing in Wisconsin, October, 1971, an EDSAT report on research supported by the National Aeronautics and Space Administration.

and science education, little or no experience has been had with the concept in medical education.

The Electrowriter has been designed for the transmission of handwritten information over commercial telephone lines. However, it has been demonstrated that many types of data conveyed over telephone lines can also be transmitted with little difficulty via satellite radio circuits. The purpose of this experiment is to examine the feasibility and potential medical applications of the use of the Electrowriter when transmitted via the ATS-1 experimental communications satellite.

OBJECTIVES OF THE EXPERIMENT

The objectives of the experiment are threefold:

1. To test and evaluate the technical feasibility of transmitting Electrowriter hard copy and hard copy accompanied with voice via the ATS-1 satellite in both simplex and duplex modes.
2. To test and evaluate the Electrowriter-via-satellite as a medium for conveying medically useful information.
3. To identify potential applications of the Electrowriter-via-satellite as an aid in medical communications with emphasis on providing remote health care and education to isolated areas in Alaska.

EXPERIMENTAL PROCEDURES

1. Test Plan

Tests in the experiment were conducted according to the following outline.

Electrowriter equipment check out (Tests 1-4)

Tests 1-4 were conducted to determine the feasibility of sending Electrowriter (EW) information via satellite link. Electrowriter information was exchanged between Stanford University and both satellite stations at the University of Wisconsin. Each test utilized 30-40 minutes of air time on the ATS-1 satellite.

Test time was used to determine appropriate equipment interconnection, optimum operating procedures and, in general, to familiarize project personnel, including the participating physician, Dr. Wallace, with the experimental set-up.

Transmission of medical information (Tests 5-7)

Tests 5-7 were conducted to provide the participating physician with opportunities to experiment with the transmission of different kinds of hand-written information for medical purposes.

Test 5 - A series of medical visuals were transmitted to Stanford University to document the information-carrying capability of the EW.

Test 6 - A simulated medical lecture was transmitted to Stanford University to document the use of the EW as an aid to medical voice communications. The lecture was designed to convey information relative to the surface anatomy of the abdomen to para-medicals at an isolated location: Voice and EW sketches were transmitted alternately (simplex mode).

Test 7 - A second simulated lecture was transmitted to Stanford University. The purpose was essentially the same as in Test 6 except that in this test the voice and sketches were transmitted simultaneously (duplex mode).

Experimentation with facsimile transmission (Tests 8-10)

Tests 8-10 were conducted to document the feasibility of transmitting information using the Xerox Telecopier. The purpose here was to compare the capabilities of the facsimile and Electrowriter methods of transmitting similar kinds of information

2. Technical Set-Up

The Electrowriter is an electronic writing table which converts the sender's pen position and movements into frequencies which can be transmitted and decoded to position a receiver's pen and repeat the same movements. The bandwidth of the information is between 300 and 3000 Hertz so ordinary phone lines may be used as the transmitter media. (See Appendix IV for full specifications for voice bandwidth data channels.)

Because the Electrowriter had a balanced 600 ohm output impedance, it could be connected directly to the phone lines, the transmitter and receiver. Commercially available phone couplers were used to capture the line while using the equipment. For the most part, both the receiver and transmitter were at the remote site. One of the experiments was set up as in Figure 1.

Electrowriter operation Different levels of frequency deviation were used on the radio transmitter with 3 KHz being choosen based on smoothness of response. Because of receiver noise, the signal was attentuated 8 to 10 dB before being run into the Electrowriter receiver. The operator was also required to hold the pen up high when not writing to avoid having the receiver scribble on the message. Acceptable copy was received when ever the received signal plus noise to noise ratio was greater than 18 dB. It takes up to 3 minutes to draw a typical Electrowriter sketch.

In duplex operation the operator can talk while writing. This requires that carrier levels to the satellite be matched. This could not be done because the 375 watt unit could not get down to the 100 watt unit of the other transmitter. The satellite also splits the power between the two channels with a compression effect on the weaker one. This means you are trying to receive a transmitted signal of less than 20 watts. A successful transmission and reception was made under these conditions by Stanford keying its carrier on one channel and Wisconsin transmitting the signal on another.

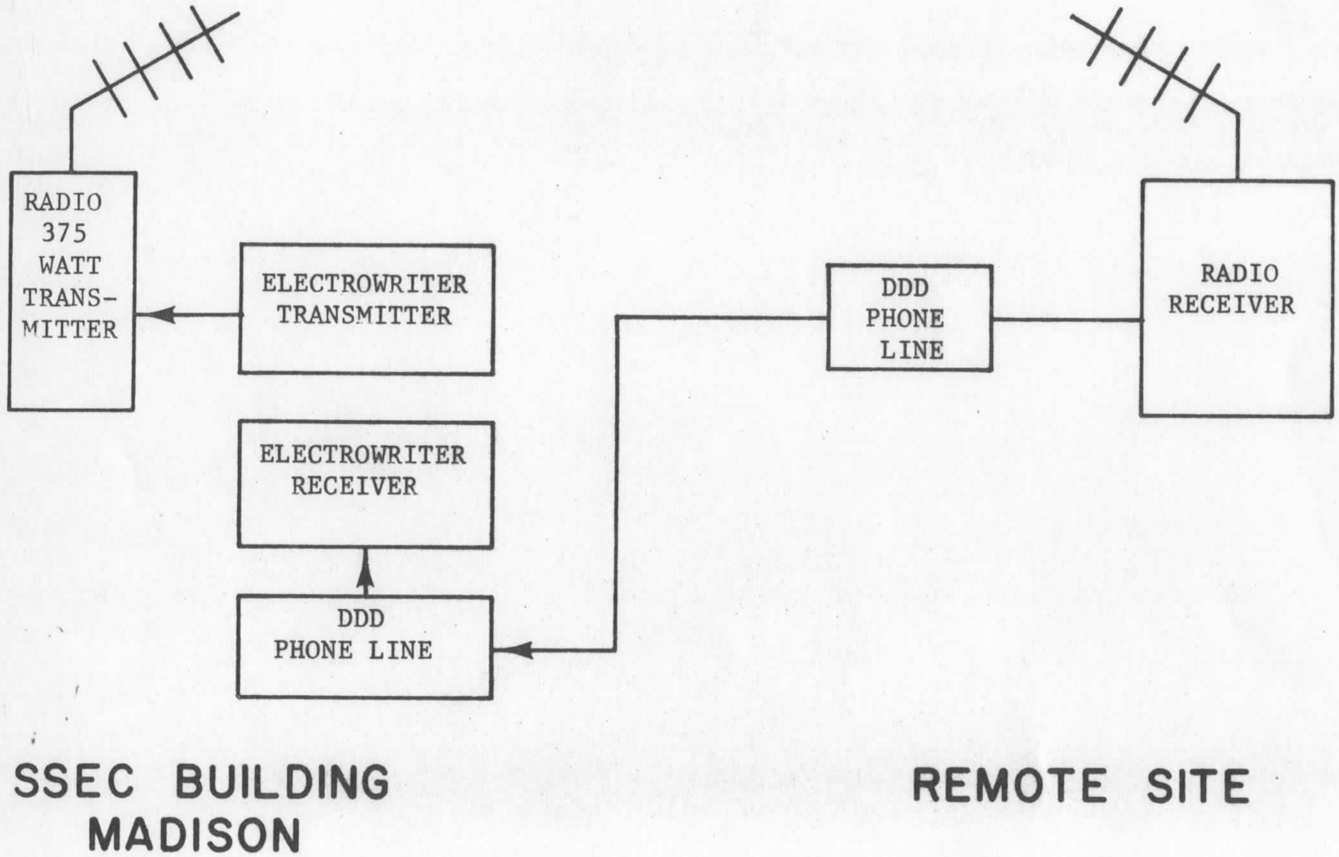


Figure 1: One of Several Test Set Ups Used in The Electrowriter Experiment

Telecopier operation The Xerox Telecopier is a commercially available piece of equipment that is designed to be used with regular telephone lines. Rather than have the material required to be written out, the Telecopier accepts hard copy (any written material, pictures, etc.) and scans it, converts it to electrical signals and plays it into the mouth piece of the telephone. The transmission of an 8 1/2 by 11 piece of paper can either be high resolution (6 minutes) or low resolution (4 minutes). No voice can be transmitted while using the Telecopier in the simplex mode. For best results, 3.5 KHz was used on the transmitter.

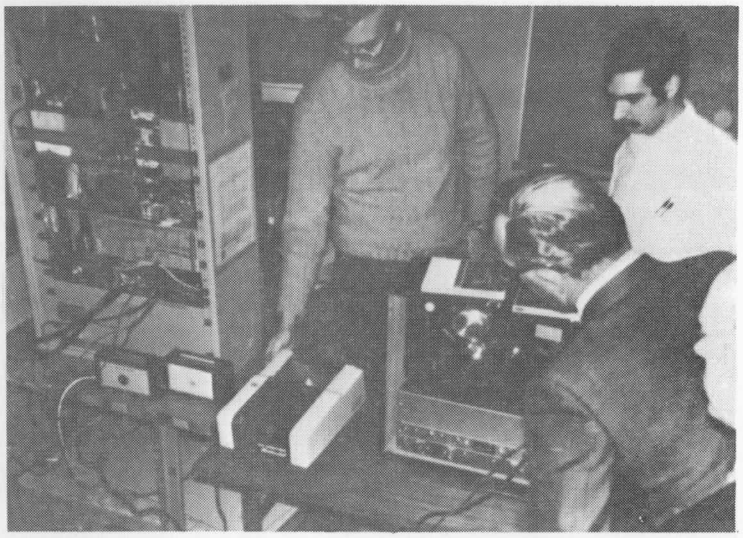
The Telecopier is available on a rental basis from the Xerox Corporation at an approximate rate of $43.00/month per unit. Each unit is designed to perform both transmit and receive functions.

DESCRIPTION OF ELECTROWRITER EQUIPMENT

The size of a basic transmitting unit is 12 by 6 inches. In the unit is a roll of paper which the user advances as he writes in the 3 1/2" x 5" writing area. Messages are written on this paper with a special pen connected to its own ink reservoir. The movement of the pen tip is "sensed" by the transmitting unit and sent as electrical impulses. There is a stylus on the receiving unit which then responds to these impulses and almost simultaneously reproduces an exact copy of the written message.

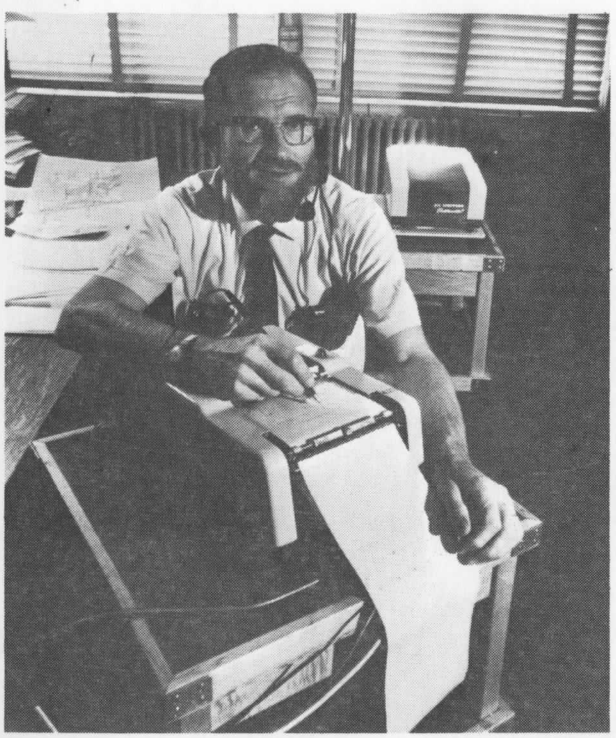
There are a number of different units and combinations of units available. First, there is the basic transmitter which has been described above. The cost is approximately $1100. The cost of a basic receiver in which the message is reproduced on paper is usually $1270. Transceivers which allow both sending and receiving from either end cost about $1875. Educators most often use a system in which the receiver is used in conjunction with an overhead projector. For this, the receiver (or transceiver)

PICTURES OF THE
ELECTROWRITER AND
BASE STATION SET UP

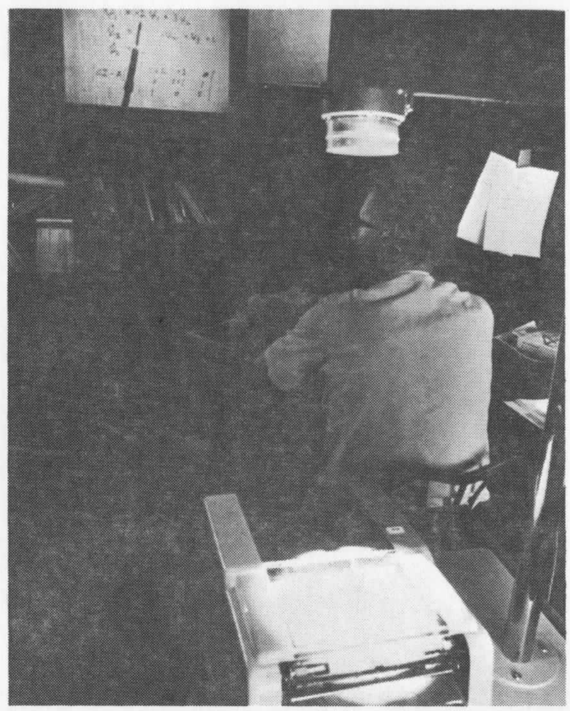


(above) The Electrowriter receiver with base station unit at the remote receiving site during actual experimental transmission via satellite

(below) Operator using the Electrowriter transmitter



(below) Operator using the Electrowriter transmitter (middle ground) with the Electrowriter receiver and overhead unit (foreground) and projected image (background)



is fitted with a roll of clear acetate rather than paper. When the message is received on the acetate, it is projected onto a standard movie screen.

A simple transmitter-to-receiver connection requires one telephone line. However, it is also possible to connect a number of receivers to a single transmitter. Each receiver requires a separate line. In the VERB overhead projector system, the 601A Data Phone is generally used, at a cost of $8 per month. This phone gives the lecturer an audio line and the students a means of feedback. A new phone is being developed that will cost about half as much to lease. "Inter-machine" phone lines can be leased at the cost of obtaining an extension phone ($1 per month). Standard telephone installation and equipment is all that is necessary to make VERB operational. Regular "lamp-cord" can be used between machines but has been found to be unreliable and very susceptible to interference. Most VERB users seek greatest transmission quality and secure telephone company lines.

Some difficulties have been experienced by Electrowriter users. Besides adjustments that must be made in teaching techniques, some technical limitations have to be overcome. Victor has had trouble with the ink and pens on the VERB units. The pen has its own reservoirs, and in some instances the ink has "eaten" through and damaged some of the machinery. Pens have been a problem because they required cleaning and maintenance. Both a lack of training for Electrowriter operators and the machines' extreme sensitivity to handling made the system susceptible to damage. Victor is now working on a felt tip pen with a new kind of ink that will not smudge or damage the equipment. This will in turn reduce the amount of regular maintenance required and will hopefully reduce equipment sensitivity to handling.

Another technical limitation is the inability to go back to a previous frame. Once the paper on the transmitter has been written on and advanced, the lecturer cannot turn back to it. The lecturer must also keep this fact in mind and be sure to call attention to particularly important frames. The new two-frame receiver and projector which show both the previous and immediate frames are answers to the problem.

TEST RESULTS

Results obtained from satellite tests with the Electrowriter fall into three categories.

1. Electrowriter performance
2. Electrowriter capability for transmitting medical information
3. Electrowriter-with-voice performance

For a summary of tests completed refer to Table I.

1. Electrowriter Performance

Results of tests conducted in the simplex (one channel at a time) and duplex (two channels simultaneously) modes appear in Figure 2-7. Both the

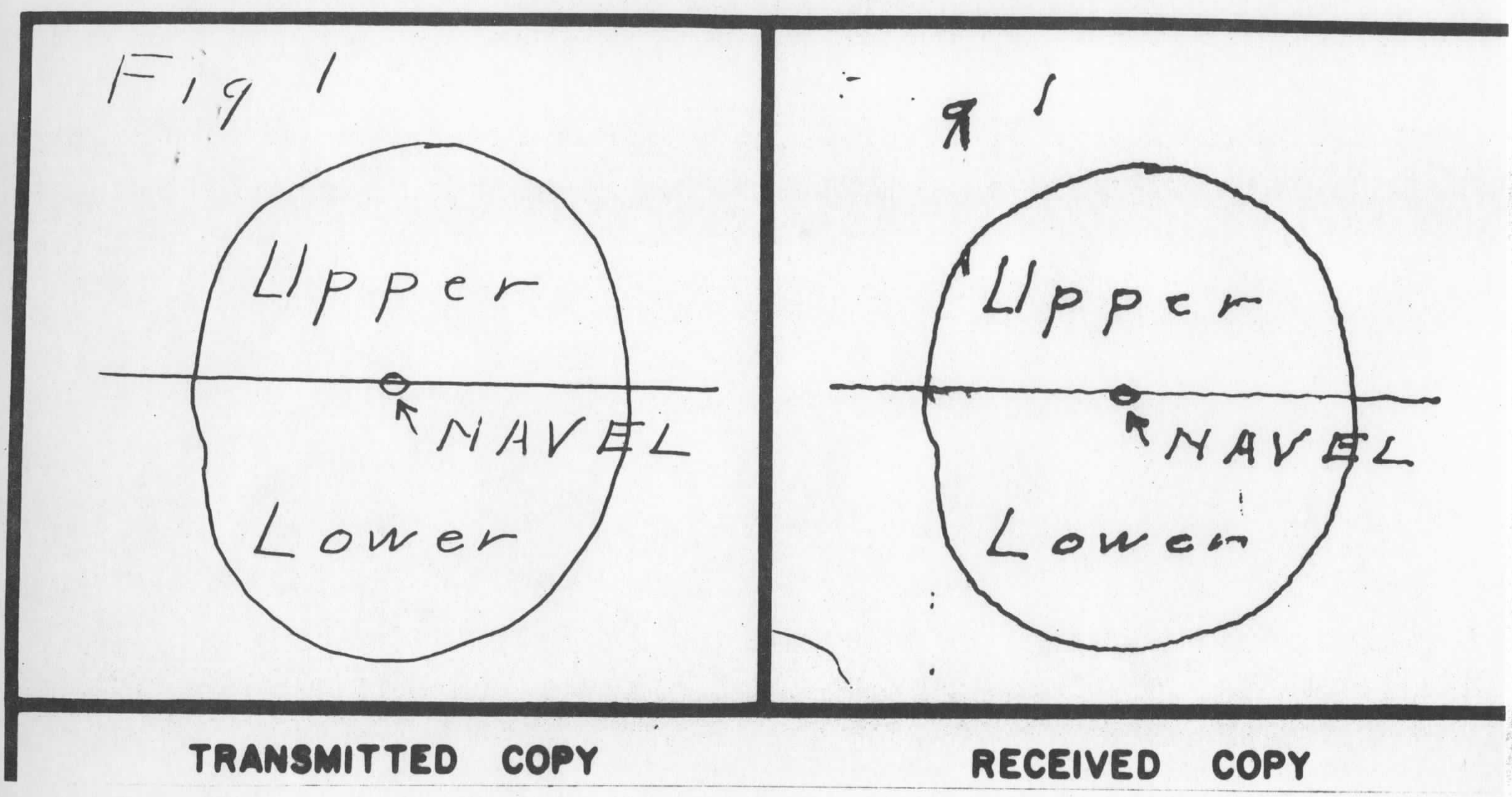


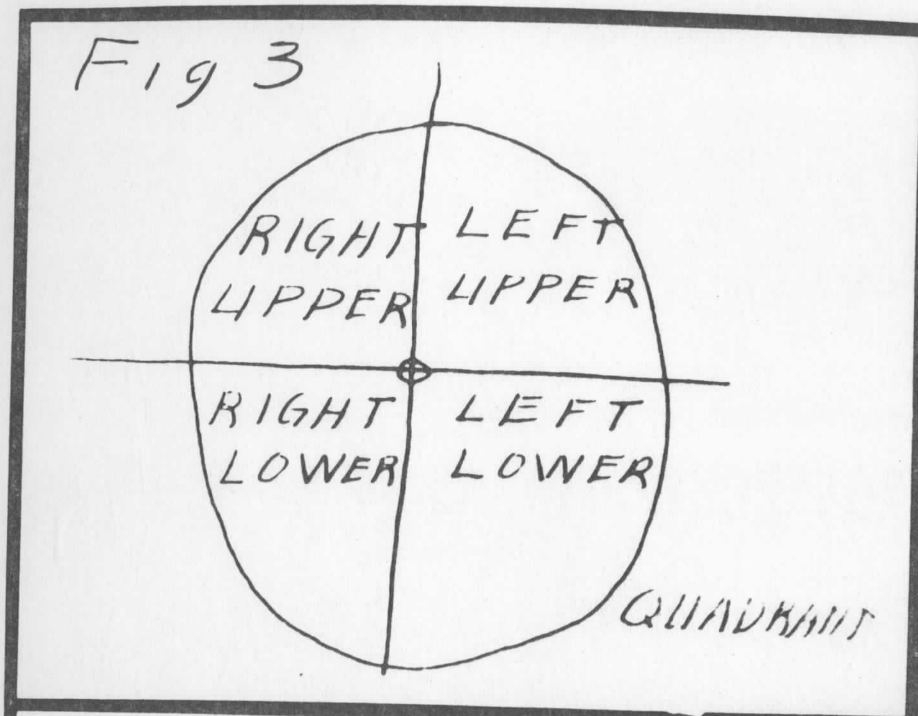
Figure 2: First Comparison of Transmitted with Received Electrowriter Copy. SIMPLEX MODE (Via ATS-1 satellite, 6 Jan 72)

TABLE I

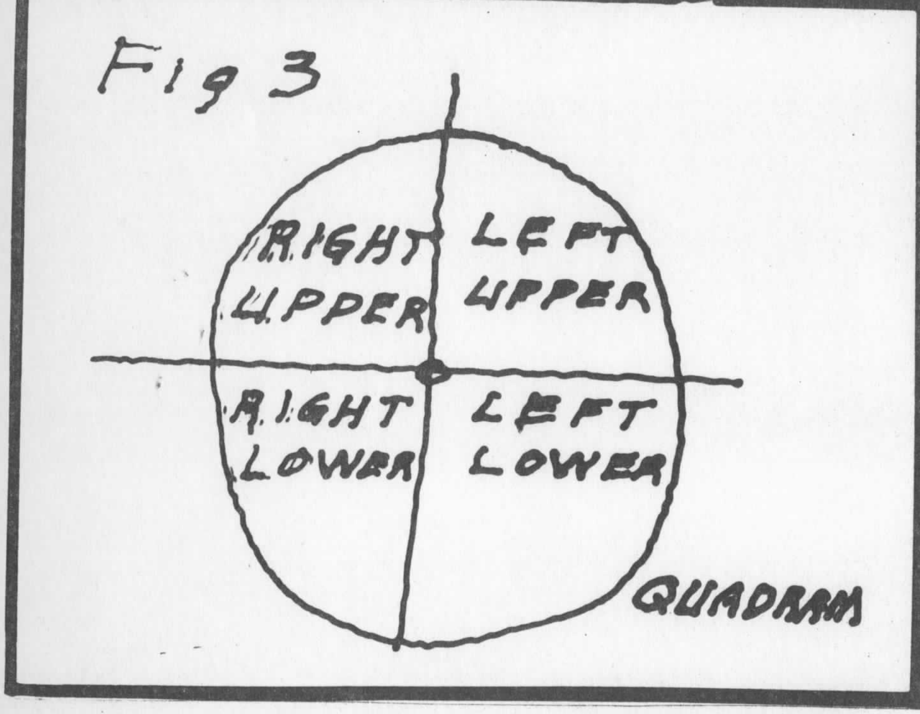
SATELLITE TESTS COMPLETED ON THE ELECTROWRITER EXPERIMENT

Test No.	Date	Objective	Comments
1	9 Dec	Test the feasibility of EW transmission via ATS-1 satellite	Copy received at Stanford
2	14 Dec	Technical adjustments, establish operator familiarty	Copy received at Stanford and Wisconsin
3	16 Dec	Same	Same
4	23 Dec	Dr. Wallace to test feasibility of transmitting medical information with voice in simplex mode.	Copy and voice received at Stanford
5	30 Dec	Experiment with transmission of variety of medical information for evaluation. Simplex mode.	Copy received at Stanford
6	6 Jan	Demonstrate simulated medical lecture to remotely located paramedicals. EW and voice in simplex mode.	Copy and voice received at Wisconsin and Stanford
7	13 Jan	Demonstrate simulated medical lecture for comparison of simplex and duplex modes.	Poor antenna performance at Wisconsin adversely affects duplex transmission Copy and voice received at Stanford
8	10 Feb	Test feasibility of Telecopier hard copy transmission via ATS-1 satellite	Copy received at Stanford
9	22 Feb	Same	Same
10	24 Feb	Transmit medical information via Telecopier for purposes of comparison with the EW	Copy received at Stanford and Wisconsin

Figure 3: Second Comparison of Transmitted with Received Electrowriter Copy. SIMPLEX MODE (Via ATS-1 satellite, 6 Jan 72)

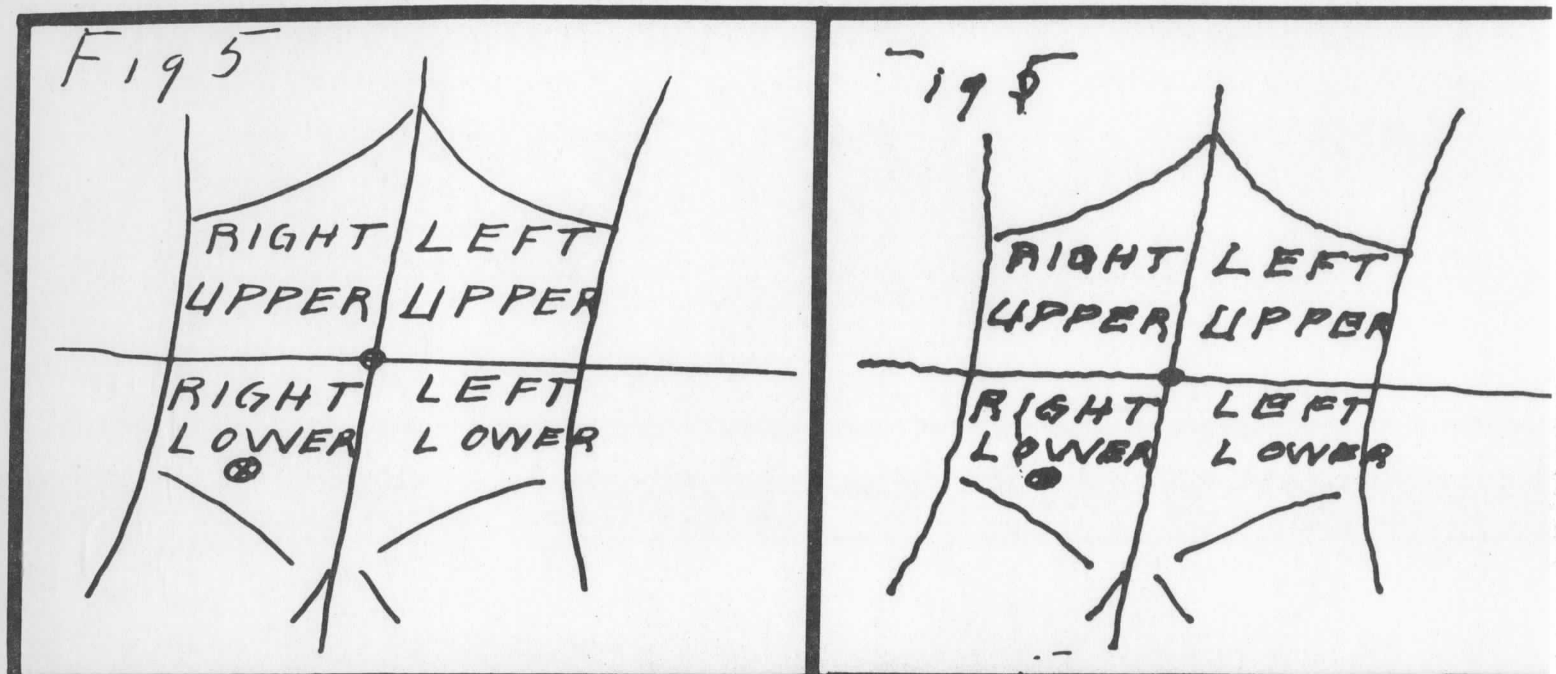


TRANSMITTED COPY



RECEIVED COPY

information originally written on the Electrowriter transmitter (the "transmitted" copy) and the information received via satellite at a second location on the Electrowriter receiver (the "received" copy) are shown for purposes of comparison.



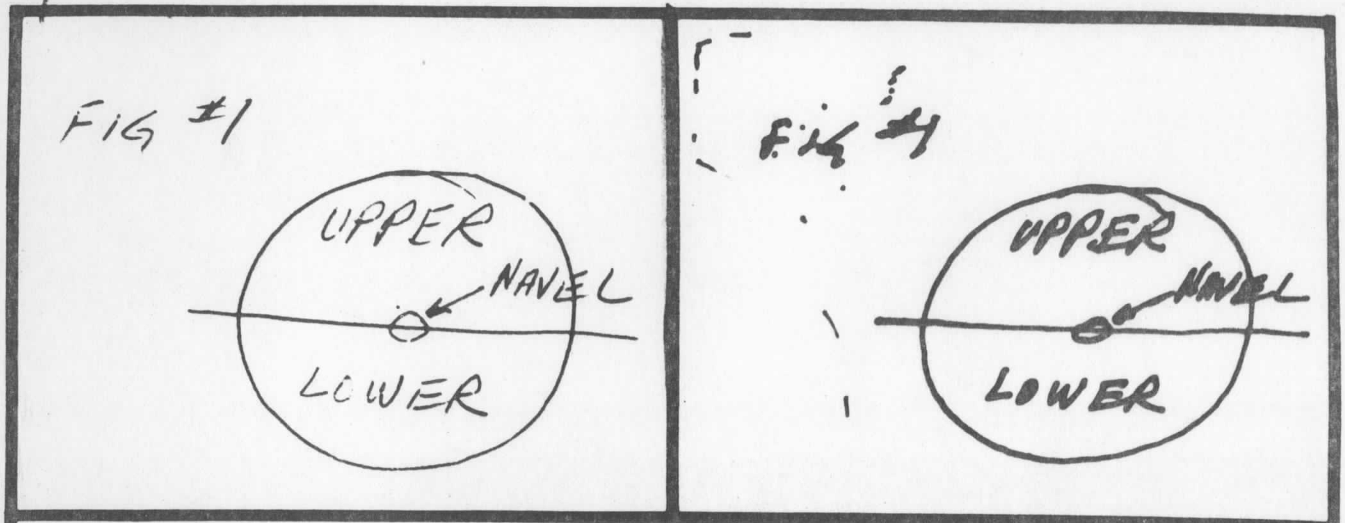
TRANSMITTED COPY **RECEIVED COPY**

Figure 4: Third Comparison of Transmitted with Received Electrowriter Copy. SIMPLEX MODE (via ATS-1 satellite, 6 Jan 72)

Pen skipping In Figure 2, pen skipping is apparent in the received copy in the title of the received information--"Fig 1." Pen skipping is usually the result of ink clogging or of an unbalanced writing table.

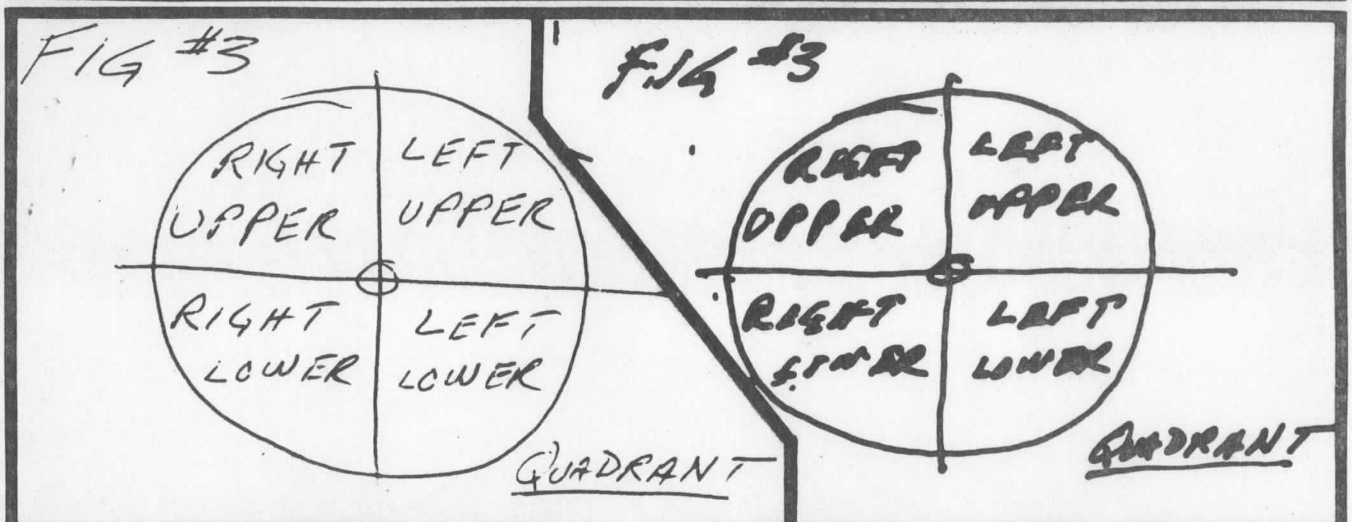
Pen wobble In Figures 3 and 4, pen wobble is apparent in the received copies in, for example, the horizontal and vertical lines which run through both diagrams. This is due to signal degradation in the satellite link.

Operator haste In Figures 5, 6 and 7, the effects of operator haste are apparent in the original, transmitted diagrams. Because of a shortage of satellite time, the operator was rushed and took less care in sketching these diagrams than he did with earlier diagrams. Somewhat more rapid pen



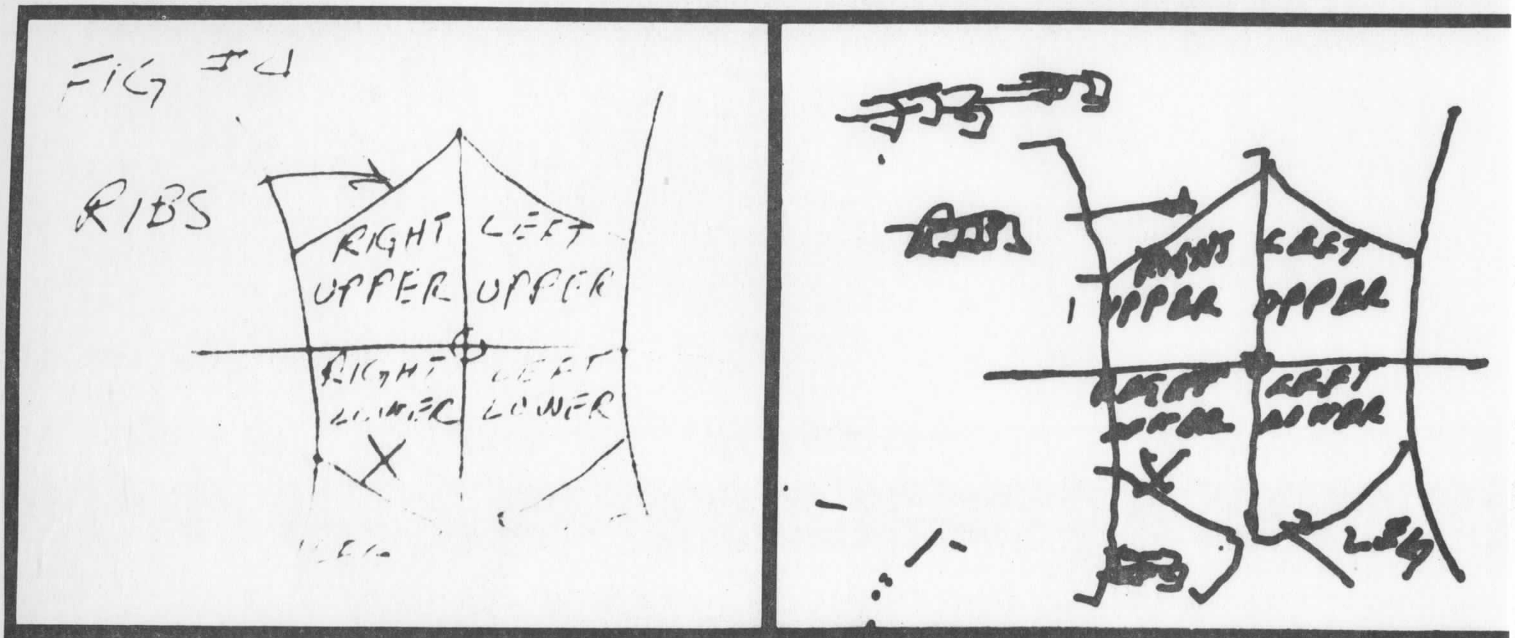
TRANSMITTED COPY **RECEIVED COPY**

Figure 5: First Comparison of Transmitted with Received Electrowriter Copy. DUPLEX MODE (Via ATS-1 satellite, 13 Jan 72)



TRANSMITTED COPY **RECEIVED COPY**

Figure 6: Second Comparison of Transmitted with Received Electrowriter Copy. DUPLEX MODE (Via ATS-1 satellite, 13 Jan 72)



TRANSMITTED COPY **RECEIVED COPY**

Figure 7: Third Comparison of Transmitted with Received Electrowriter Copy. DUPLEX MODE (via ATS-1 satellite, 13 Jan 72)

movement was also required. Some of the distortion in the received copies is attributable to these factors.

Limitations on size of lettering In Figure 7, the operator used lettering in the original sketch that was smaller than he had used in other sketches. This again was largely because he was rushed to complete the diagram within alloted program time. Notice that the lettering on the received copy is almost too small to be legible.

Comparison of simplex and duplex transmission In Figure 8, a comparison of simplex and duplex received copies is shown. Additional signal degradation characteristic of the duplex mode is apparent in pen jitter (middle "duplex" diagram) and pen skipping (both middle and lower "duplex" diagrams.)

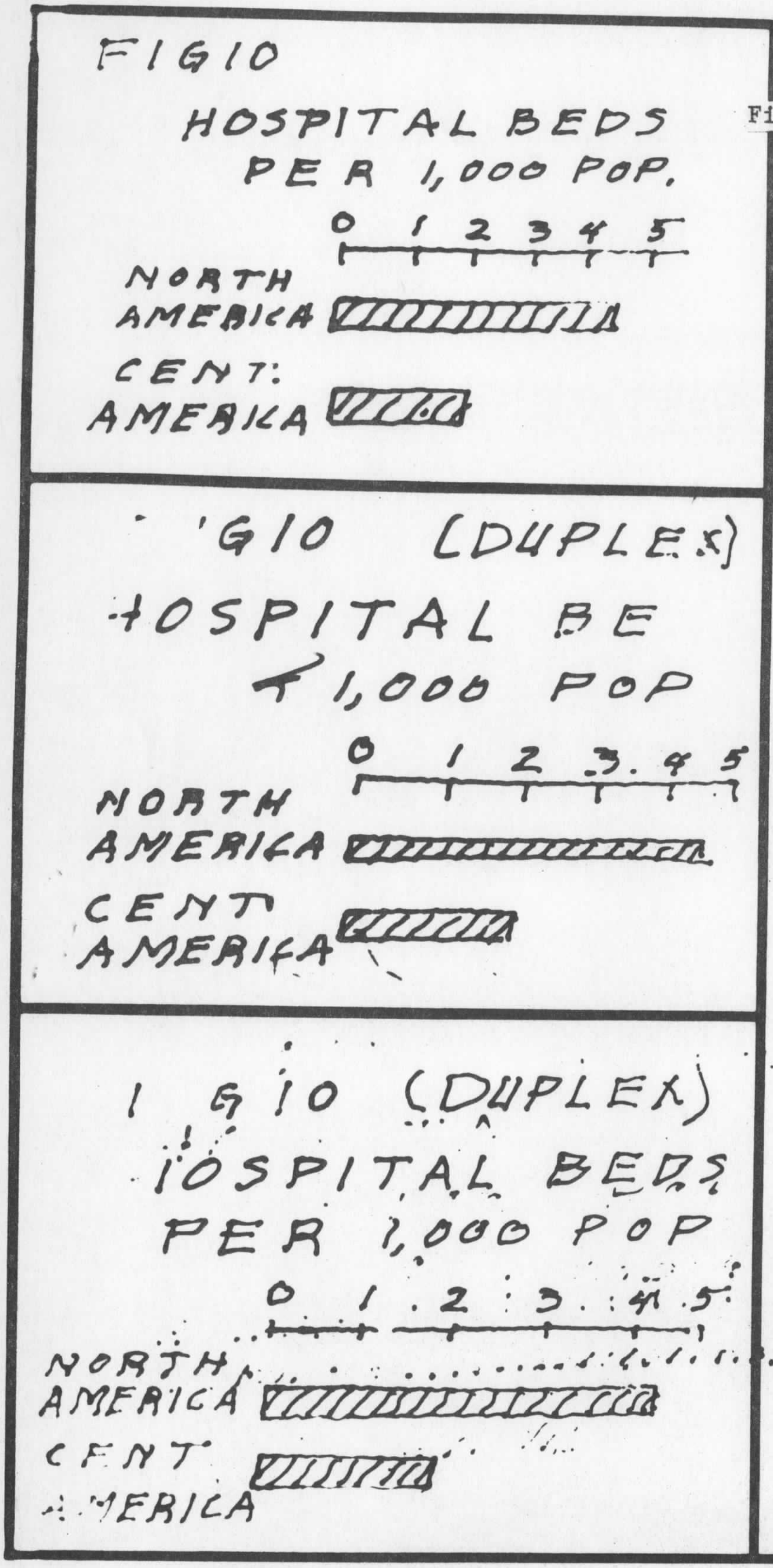


Figure 8: Comparison of simplex and duplex received copies (via ATS-1 satellite, 6 Jan 72)

SIMPLEX

DUPLEX

DUPLEX

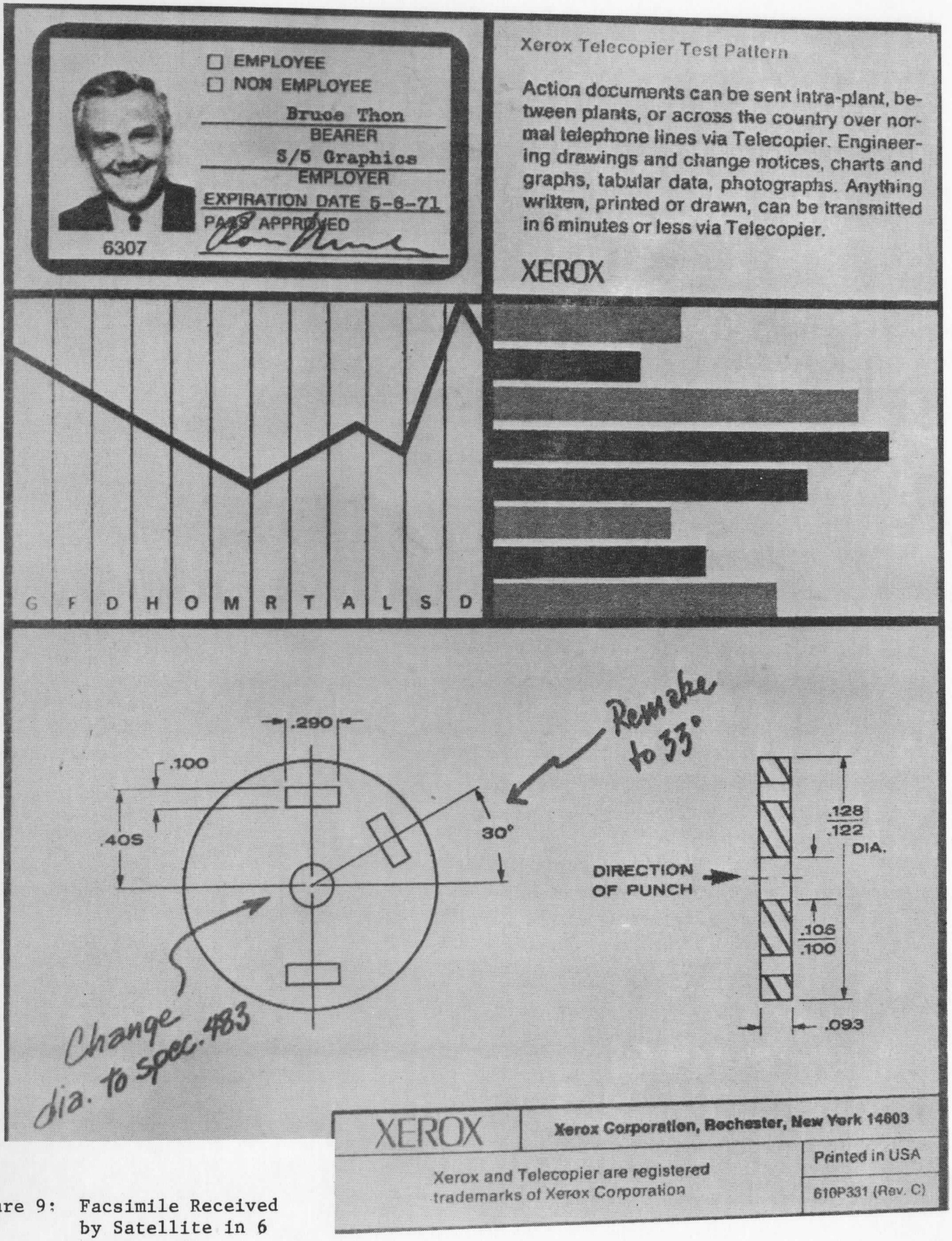
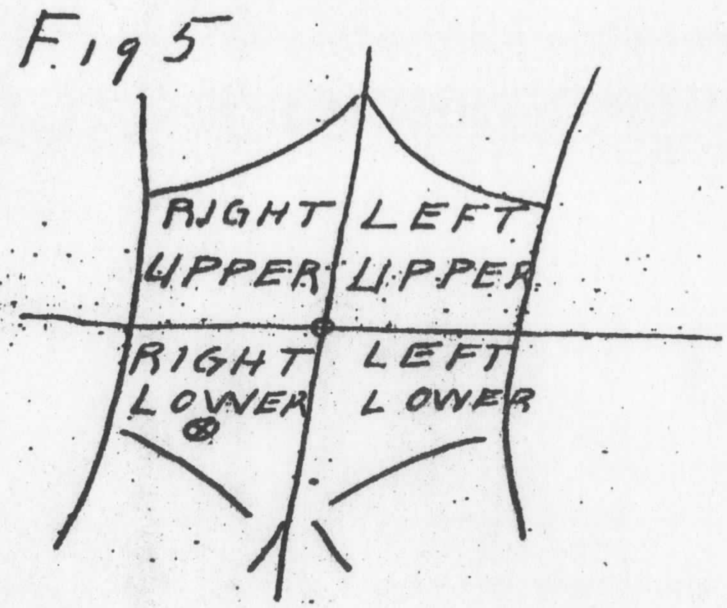


Figure 9: Facsimile Received by Satellite in 6 minute mode

ELECTROWRITER TRANSMISSION
VIA ATS-1 SATELLITE
6 JAN 72

E5

TRANSMITTED
COPY
(MADISON, WI)



RECEIVED
COPY
(ARLINGTON, VA)

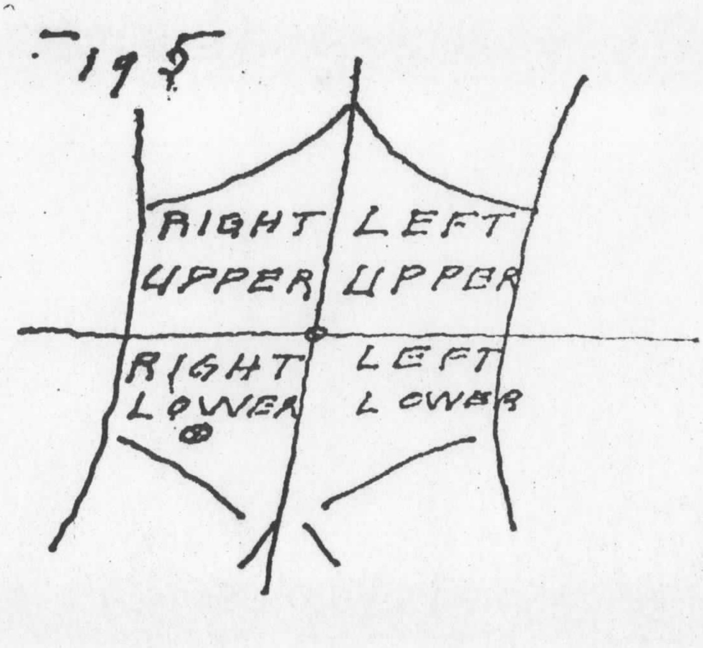


Figure 10: Facsimile Transmission of Previous Electrowriter Results

Comparison of the Electrowriter and Telecopier In Figures 9 and 10, results of Telecopier facsimile transmission are displayed. In Figure 10, particularly, it is apparent that the Telecopier is able to reproduce the Electrowriter sketches with almost no loss in detail. Notice that distinctions between the "transmitted" and "received" information (recorded in an earlier Electrowriter transmission and later retransmitted using the Telecopier) are clear and immediately recognizable.

2. Electrowriter Capability for Transmitting Medical Information

Figures 11 and 12 contain additional examples of Electrowriter information that was transmitted from Madison to Stanford via ATS-1 satellite in the simplex mode. The purpose in attempting these transmissions was to document the versatility of the Electrowriter as an information-carrying medium in medical communications. Sketches appearing in these figures include one table, one chart, one chemical equation, one set of instructions for emergency medical care and two graphs. Only the information received via satellite is shown.

By comparing Electrowriter sketches with the Telecopier results in Figures 9 and 10, it is evident that the two media differ substantially in terms of information-carrying capabilities. When interpreting results, it might be helpful for the reader to consider some of these contrasting capabilities. For example, Electrowriter sketches are developed by the lecturer as he speaks allowing a certain flexibility in presentation of material and adaptability in responding to unanticipated problems and questions. On the other hand, the Telecopier facsimile allows the transmission of very detailed information in the form of charts, graphs, and even photographs.

Figure 11: Examples of Medical Information Received at Stanford from Madison. SIMPLEX MODE (via ATS-1 satellite 30 Dec 71)

FIG ①

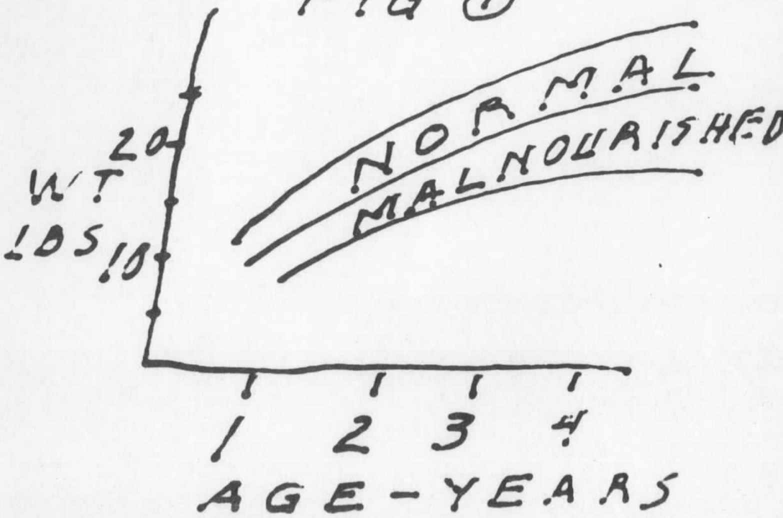


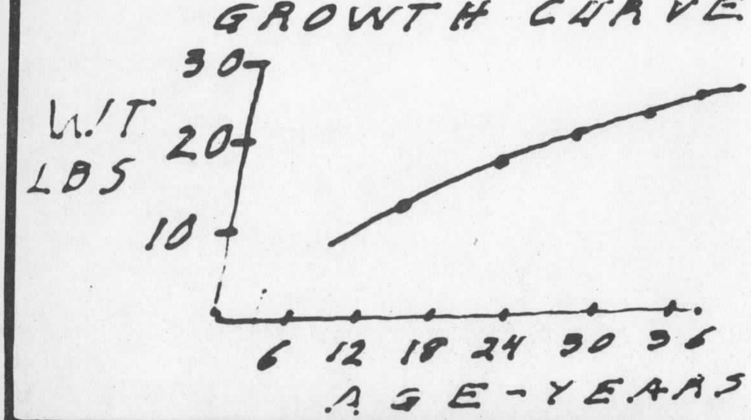
FIG ②

GROWTH DATA

AGE (MONTHS)	WEIGHT (POUNDS
6	12.2
12	16.1
18	18.3
24	20.5
30	22.2

FIG ③

GROWTH CURVE



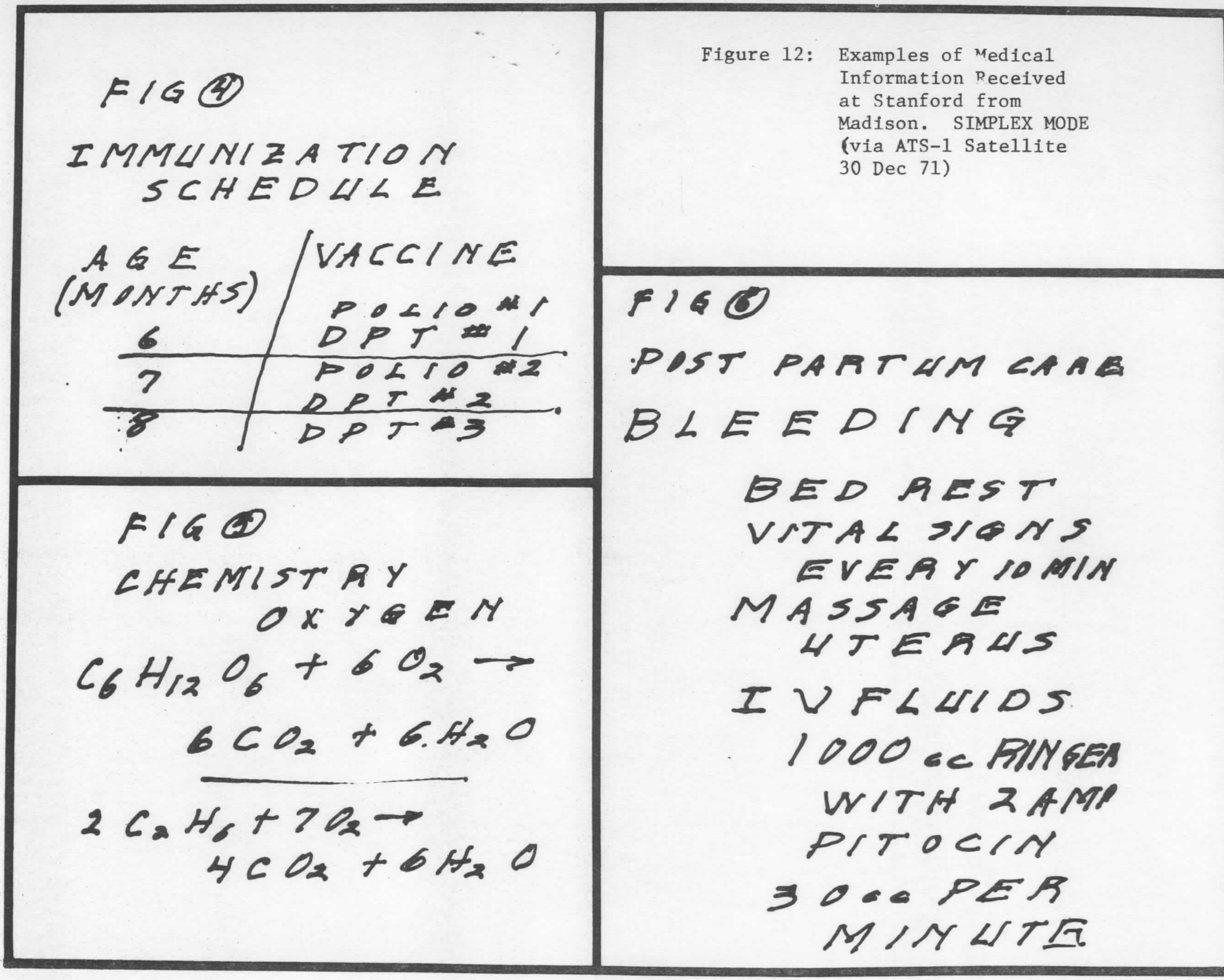


Figure 12: Examples of Medical Information Received at Stanford from Madison. SIMPLEX MODE (via ATS-1 Satellite 30 Dec 71)

3. Electrowriter-With-Voice Performance

Information displayed in Figures 2-7 was originally transmitted in the form of visual aids for two simulated lectures to remotely located para-medical personnel. The subject of both lectures was "The Surface Anatomy of the Abdomen." There was no live audience.

The first lecture was transmitted in the simplex mode, i.e., voice and Electrowriter sketches were transmitted alternately. The second lecture was transmitted in the duplex mode, i.e., voice and Electrowriter sketches were transmitted simultaneously.

The voice portions of each lecture were recorded on audio tape. A cassette tape recording of the two transmissions accompanies the submission of this report to the granting agency.

Simplex/duplex voice results In the audio recording of the two lectures, simplex voice quality is noticeably superior to duplex voice quality. Some degradation of voice quality in duplex is to be expected since repeater power at the satellite (40 watts at full power) is split between two channels (20 watts on each of two channels). However, earlier voice tests with Stanford University indicate that a signal of acceptable quality is possible in duplex if atmospheric conditions are good and the power levels of the two signals reaching the satellite are approximately equivalent. Since the duplex Electrowriter lecture was conducted under adverse atmospheric conditions (constant polarization shifts) with damaged antennas, and since the two transmitters at Wisconsin were of significantly different power outputs (375 watts for the Electrowriter signal and 100 watts for the voice signal), some of the degradation in voice quality apparent in the duplex segment of the audio recording may be discounted.

EVALUATION

At the conclusion of the experiment, a demonstration was developed which included a tape recording and visuals of pertinent segments of the voice and Electrowriter image transmissions. This demonstration was presented to a group of medical educators at both the Stanford and University of Wisconsin Schools of Medicine. Evaluation procedures used in the demonstration are presented in Appendix V. A questionnaire similar to the one administered appears in Appendix VI. The mean scores of responses are indicated in the sample questionnaire. The overall evaluation presented below is an interpretation of these results in the context of total project experience with the Electrowriter.

1. Evaluation of the technical feasibility of transmitting Electrowriter sketches via ATS-1 satellite

The feasibility of transmitting Electrowriter sketches via the ATS-1 satellite on specified equipment was clearly demonstrated in both simplex and duplex modes. However, the quality of sketches transmitted in the duplex modes was considered inadequate for most medical purposes. The quality of sketches transmitted in the simplex mode was considered adequate for most medical purposes, especially where no other means of data transmission are available.

2. Evaluation of Electrowriter transmission accompanied by voice

Utilizing the equipment selected and given a choice between voice and data transmitted alternately (simplex) and voice and data transmitted simultaneously (duplex), the evaluators prefered the first. Given the state-of-the-art, the possible advantages of simultaneous transmission are outweighed by the corresponding losses in voice and data quality and the added cost and complexity involved in duplex transmissions. (In duplex operation, two base station transmitters at the site of program origin and two receivers at the site of reception are required in order to send both voice and data in the same direction simultaneously.)

3. Evaluation of the Electrowriter as a medium for transmitting medical information

Evaluators considered the Electrowriter as a "moderately practical" medium for conveying medical information. In general, the main disadvantage cited was that the Electrowriter is limited to the transmission of relatively simple, hand-written material. A disadvantage of simplex transmission of sketches is that students (and others) may be distracted by the 2-4 minute time delay involved in actual sketching.

Four main potential applications of the Electrowriter were identified early in the project. An evaluation of each follows.

Transmission of records The limitation of the Electrowriter medium to hand-written messages is considered a serious disadvantage. Facsimile transmission of records, as demonstrated in this project with the Xerox Telecopier, is much better suited to providing reliable transmission of detailed information.

Aid to Remote Teaching For remote teaching in isolated areas, the Electrowriter does not seem to compare favorably with some other media, such as tape slide presentations which are more versatile. The limited content of Electrowriter visuals seem to be their primary disadvantage. The "remote blackboard" or chalkboard capability of the Electrowriter is not often required in many areas of health education. Remote medical lectures would have to be designed carefully to fit within system limitations. Few medical lectures have content easily adaptable to this format.

Aid to Remote Diagnosis and Patient Care Evaluators asked to identify potential applications of the Electrowriter indicated that its particular virtues as a medium would seldom be applicable to remote diagnosis and treatment of acutely ill patients. In emergency care situations, voice alone is considered adequate under most circumstances. Because of the limitations of the medium to hand-written notes and sketches, the addition of information via Electrowriter would seldom add significantly to the solution of a given medical problem. Also, the Electrowriter lacks the high level of accuracy necessary in conveying data and instructions regarding patient care. By comparison, facsimile transmission is more accurate and probably preferable.

Aid to Peer Group Teleconferencing In several areas of the health sciences such conferencing could be practical. Basic sciences such as biochemistry, genetics and similar subjects which lend themselves to chalkboard - type of discussions would be most appropriate for teleconferences.

GENERAL CONCLUSIONS

On the basis of evaluation, the following conclusions are made regarding the use of the Electrowriter in medical communications.

Transmission of Records The Electrowriter is generally not practical for the transmission of medical records. Other means, such as hard copy (facsimile) transmission, are generally more practical.

Aid to Remote Teaching The Electrowriter is generally not practical as an aid to remote medical teaching; however, it may be practical in specific cases depending on the topic and preferences of the instructor especially when the topic lends itself to chalkboard - type presentations; other means, such as tape-slide presentations, are more practical.

Aid to Remote Diagnosis and Treatment The Electrowriter is generally not practical as an aid to remote diagnosis and treatment; in many cases, voice communications will suffice; facsimile with voice seem to have considerable potential in this area, and their application in diagnosis and treatment should be studied further.

Aid to Peer Group Teleconferencing The Electrowriter may be practical for teleconferencing on subjects which lend themselves to "chalkboard" types of discussions.

SUMMARY AND RECOMMENDATIONS

The Electrowriter may be applicable in teleconferencing situations and, to a limited extent, in remote medical teaching situations when the need exists for a "chalkboard-type" capability. However, its applicability to medical communications is not general and, in most cases, other media (such as facsimile, teletypewriter and tape-slide presentations) when combined with voice communications seem to offer more flexibility. Based on its limited applicability in medical communications,

(1) it is recommended that the Electrowriter not be used in the Alaska Experimental Satellite Network at this time.

It is quite possible that future remote teaching and teleconferencing activities may arise for which the Electrowriter "chalkboard" capability would be particularly well-suited. On this basis,

(2) it is recommended that consideration be given to possible future Electrowriter applications in medical teaching and teleconferencing in which the Electrowriter's unique "chalkboard" capability may be useful.

Further experimentation with Electrowriter applications in medical teaching and teleconferencing may be appropriate in the upcoming ATS-F experiments in the Rocky Mountain region.

II

SLOW-SCAN TELEVISION EXPERIMENT

SLOW-SCAN
TELEVISION EXPERIMENT

BACKGROUND

Slow-scan television is a device for transmitting still television pictures over narrow-band, telephone-grade communications channels. By and large, slow-scan technology is still in the developmental stages.

In the Spring of 1971, the University of Wisconsin Department of Continuing Medical Education undertook a pilot project to test the use of slow-scan television (SSTV) for providing lectures to remotely located third year medical students. Results of the experiment were not considered satisfactory by the Medical Center. Major problems encountered included equipment malfunction (power supply failure), operator error and reluctance of faculty to adapt their presentations to the particular limitations and capabilities of the SSTV network.

Improvements in power supply technology at the beginning of the present experiment indicated that equipment malfunction could be minimized. The purpose of the experiment was to continue to explore the applications of SSTV technology to medical communications. Specifically, the effort was directed at determining the feasibility of transmitting SSTV pictures via ATS satellite for medical purposes.

OBJECTIVES

The objectives of the experiment were threefold:

1. To test and evaluate the technical feasibility of transmitting slow-scan television pictures via the ATS satellites.

2. To develop criteria for preparing visuals for use with slow-scan television via satellite.

3. To identify potential applications of slow-scan television as an aid in medical communications with emphasis on providing remote health care and education to isolated areas in Alaska.

EXPERIMENT PROCEDURES

1. Test Plan

The test plan originally projected for the experiment was as follows:

Equipment Checkout (Tests 1,2)
Two preliminary tests were planned to establish the feasibility of transmitting SSTV pictures via ATS satellite.

Medical Lectures (Tests 3-7)
Five medical transmissions were planned to develop data for evaluation.

Demonstration Lectures (Tests 8,9)
Two demonstration lectures were planned to assist medical personnel at Stanford and Wisconsin in evaluation.

The completion of medical and demonstration lecture transmissions was, of course, contingent upon the success of equipment check out tests. Since the technical feasibility of transmitting acceptable SSTV pictures was not fully established in the experiment, the medical lectures and demonstration programs were not attempted.

Tests actually conducted were limited to the Equipment Check-Out phase of the experiment and were of two basic types:

(1) actual satellite transmission of SSTV pictures,

(2) simulation of satellite transmission of SSTV pictures to determine the minimum link requirements (S/N ratio) for transmission of SSTV pictures of acceptable quality.

2. Technical Design

The experiment, utilizing the ATS-1 satellite, involved connection of a telephone company data line (Class C-2) from the University of Wisconsin

SLOW-SCAN TELEVISION MAIN CONSOLE

Hospital, where the Westinghouse SSTV console is located, to the EDSAT radio transmitter in the Space Science and Engineering Center (See Figure 1). This line was to carry picture content for medical lectures originating at the hospital. The audio portion of the lectures was to be fed to a second EDSAT radio transmitter located at a remote site on a farm north of Madison by a conventional dial telephone line. This line was to utilize a Bell Telephone KS-19645-L2 recorder connector in the hospital control room and a Bell Telephone KS-19522-L1 recorder coupler at the farm, where voice transmission to the satellite was to take place. Additional dial telephones were provided at University Hospitals, EDSAT, and the remote site for coordination of the experiment. Reception of both the audio and video portions of the program was assigned to the remote base station because of the low-noise environment there.

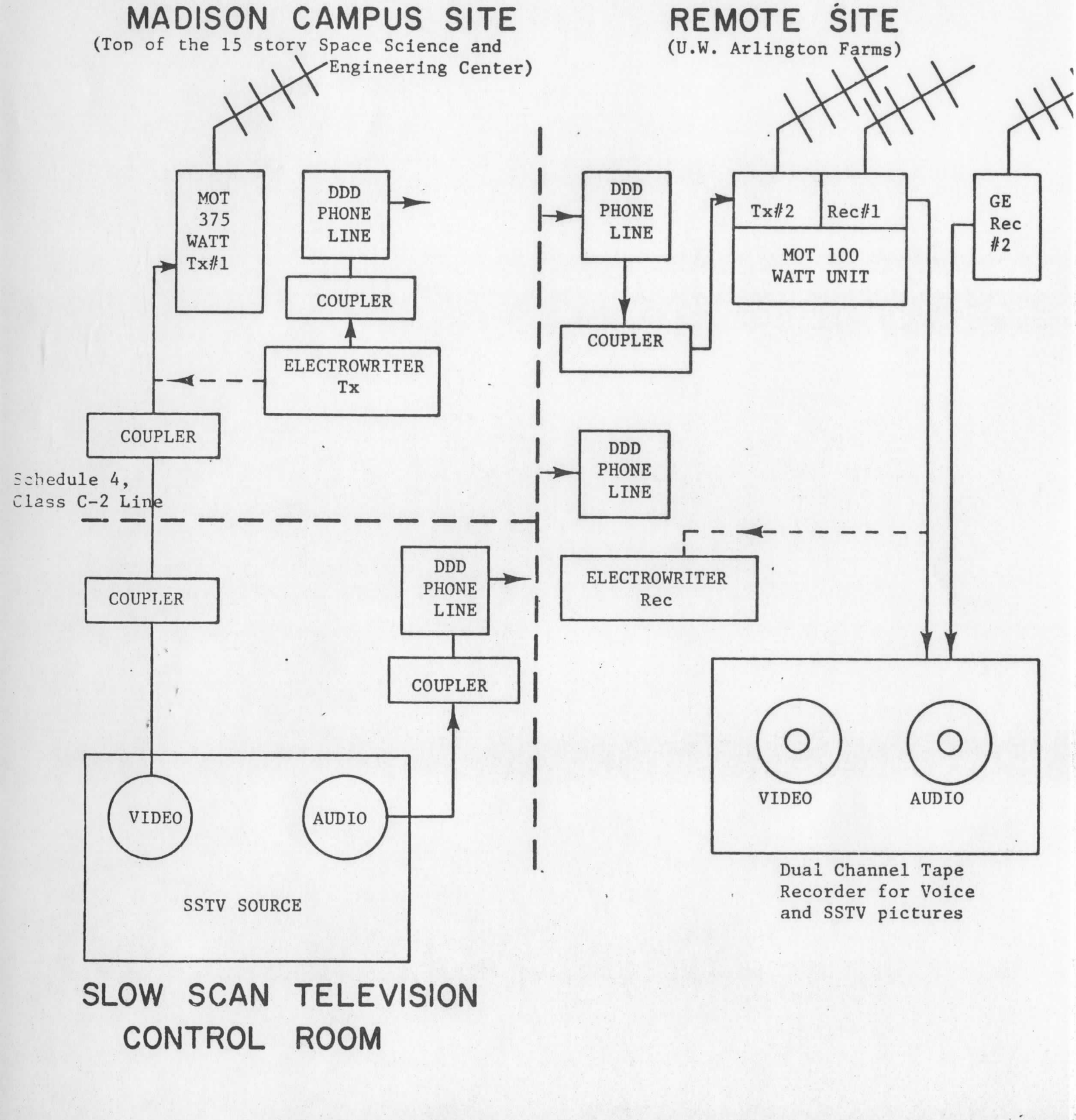


Figure 1: Diagram of Slow-Scan Television Test Set Up

3. Use of Audio Recorders for Reception from Satellite

The original experiment plan called for movement of two SSTV receivers, one to the Arlington Farms base station and the other to Stanford University. Because of the sheer bulk and complexity of the equipment, transportation, especially to Stanford, was determined to be very expensive. With all of the program content falling within the audio spectrum, it seemed that securing the lease of reliable two-channel audio recorders would be a far more economical method of doing this series of tests. To this end, a search was instituted for a suitable machine*, and, as a result, two Crown International CX-722/20K2-2/2CX-6/Q units were leased and utilized for recording and later play back and display of voice and SSTV pictures received from the satellite at Wisconsin.

Figure 2 illustrates that the use of the Crown Recorder does not noticeably affect picture quality. The first picture shows a slide as displayed on the SSTV monitor. The second picture shows the same slide after it was recorded on audio tape and then played back again on the monitor.

4. Further Details on Procedure

For further details on experimental procedures relating to satellite test format, recording and documentation, consult Appendix VII.

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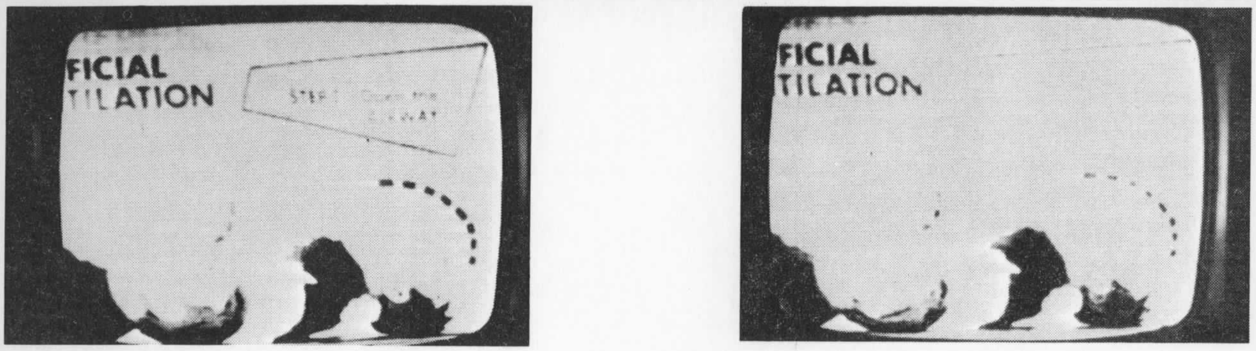
*The state-of-the-art in audio recorders of the reel-to-reel type today is such that bandwidth, signal-to-noise, and distortion are maintained well within the limits necessary for our purpose. On the other hand, wow and flutter of the tape transport could seriously degrade the slow-scan picture by making it appear to swim in circular motion about the television screen. After reviewing specifications of those recorders available to us, the Crown International product was selected. The published wow and flutter specifications of .06 per cent at 15 inches per second and .09 per cent at 7 1/2 inches per second would, we knew, induce some picture movement, but because this picture degradation could be easily identified as a function of the recorder, it would not influence the results of the experiment.



ORIGINAL SLIDE DISPLAY

SLIDE DISPLAY AFTER AUDIO TAPE RECORDING AND PLAYBACK

Figure 2: Illustration of the Effects of the Audio Tape Recorders on Picture Quality

DESCRIPTION OF EQUIPMENT AND OPERATION

The slow-scan television system used in these experiments was constructed for the University of Wisconsin Medical Center by the Westinghouse Learning Corporation. It consists of five separate pieces of equipment: the transmitting console and four slow-scan receivers with their attendant television monitors.

1. SSTV Console and Receivers

The console (Figure 3) permits the selection of still television pictures and their subsequent transmission to the receivers from three sources: a conventional television camera viewing a lecturer or blackboard, a similar camera viewing selected charts or radiographs, and a slide camera capable of viewing either 2 x 2 or 3 1/4 x 4 slides. There are picture storage facilities for three pictures before transmission and for five received pictures before display. All pictures conform to the conventional Electronic Industries Association (EIA) format, insuring system compatability with existing television equipment.

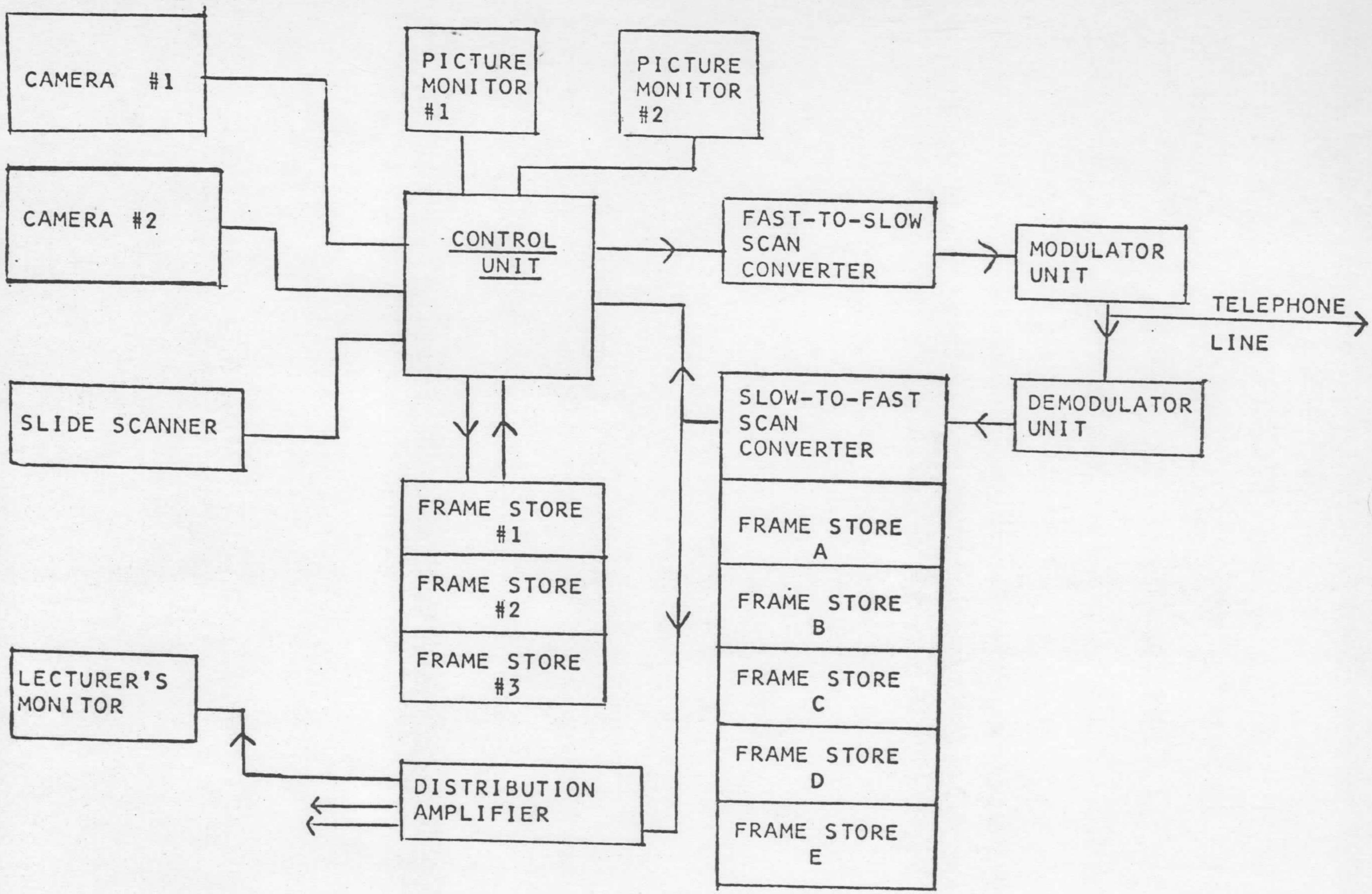


Figure 3; Diagram of Slow-Scan Television
Console at the U.W. Medical Center

Operation of remotely located SSTV receivers (Figure 4) is completely dependent on signals originating from the central transmitting console. Video, in the form of audio signals, is received via the connecting data line or satellite link, scan-converted back to video format and stored in a pre-display track. The received picture is held until a display code is transmitted from the console, at which time it is shown to the audience on a television monitor. Because all receivers used for display are connected to the data line in parallel, all receive the same commands and picture content. It is, therefore, not possible to send different program content to different receivers.

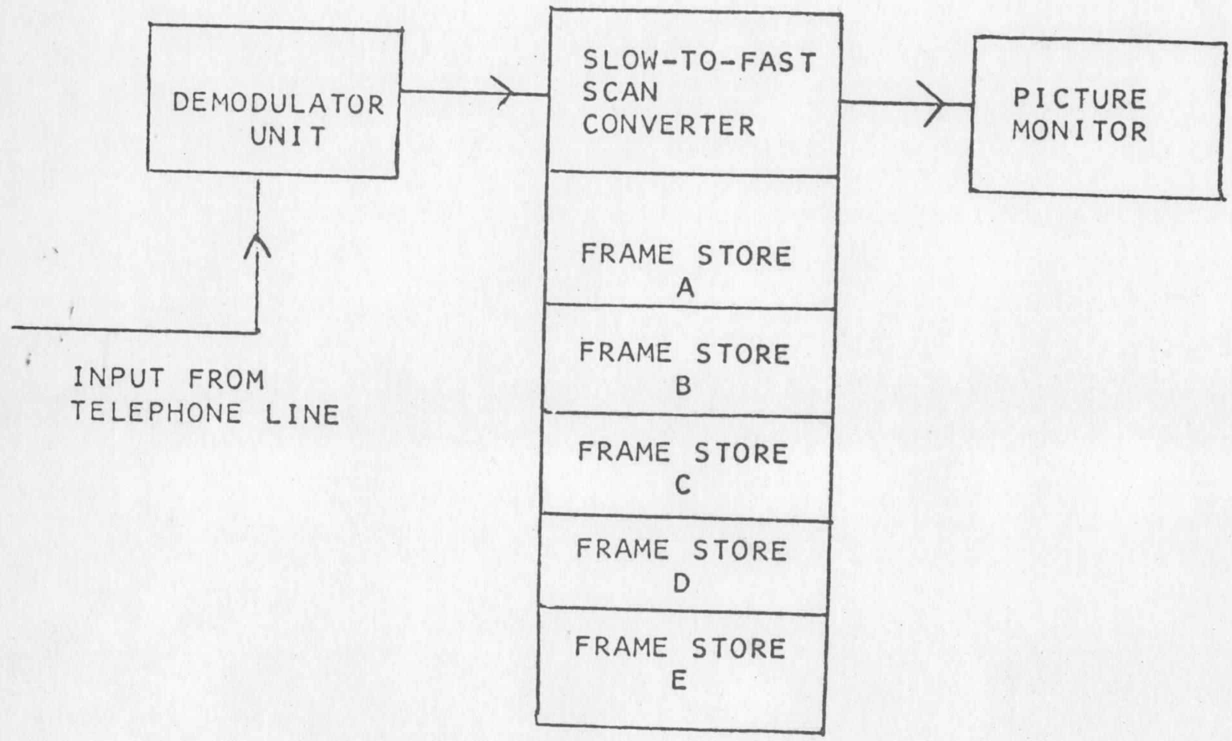


Figure 4: Diagram of Slow-Scan Television Receiver at U.W. Medical Center

2. SSTV Operation

It is possible to send any visual in one of two resolution states. High resolution, with a transmission time of two minutes and eighteen seconds, has a resolution of 600 lines. The low resolution mode transmits in half the time and offers 300 lines of resolution. Visuals containing no detailed information can take advantage of the low resolution transmit time, while most graphs, charts and the like need higher resolution for effective display. The console operator transmits and stores the first three visuals in the pre-display tracks, continuing to fill the pre-transmit and pre-display tracks until all five of the latter have picture content. During this phase of operation, the receiver television monitor screens display no picture.

The lecturer conducts his presentation as he normally would, calling for visuals in sequence. The audience in the central lecture hall sees the slides projected on a conventional movie screen, while the remote audience views them on a television monitor as each picture is displayed by the console operator. When the lecturer is finished with the first visual, the console operator stores the sixth visual on that storage track. This process continues until the lecture is finished.

This system was designed to operate on a Schedule 4, Class C-2 conditioned telephone line. Its characteristics are similar to those furnished for private line telephone service.*

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*Line conditioning guarantees the envelope delay distortion will not exceed 500 milliseconds between 1000 and 2600 Hz, 1500 milliseconds between 600 and 2600 Hz, and 3000 milliseconds between 500 and 2800 Hz. Frequency response is controlled to within 4 dB from 1000 to 2400 Hz, (with reference to 1000 Hz), and within 8 dB from 300 to 2700 Hz. The expected steady-state noise varies with circuit length and the number of points connected. Typical figures are 28 dBrnc, (-62 dBm) from 0 to 50 miles; 31 dBrnc, (-59 dBm) from 50 to 100 miles; 34 dBrnc, (-56 dBm) from 100 to 400 miles; and 50 dBrnc, (-40 dBm) from 8000 to 16,000 miles.

3. SSTV Equipment Costs

The slow-scan television equipment used in this experiment was built by Westinghouse for approximately $115,000.00. The equipment was custom made for the University. Westinghouse does not presently manufacture SSTV equipment commercially. Estimates from the corporation are that similar but updated SSTV systems could be produced in quantity for costs ranging from $10,000.00 to $100,000.00 depending on equipment features desired.

Some manufacturers indicate that they have designed SSTV systems costing less. For example, Colorado Video Corporation estimates a cost of $5000.00 for their system. This system and others like it do not have many of the features of the present Westinghouse systems such as the picture storage capability discussed above.

SUMMARY OF TEST RESULTS

A summary of tests conducted is shown in Table I. Of the fourteen tests conducted the first twelve related to actual transmission of slow-scan television pictures. Test thirteen simulated the transmission and reception of pictures at different S/N (signal-to-noise) levels to determine the minimum satellite link performance requirements for transmission of pictures of acceptable quality.

1. Results of Actual Picture Transmission

Examples of pictures actually transmitted via ATS-1 satellites are shown in Figures 5a and 5b. Figure 5a shows a black and white test slide before and after transmission. Figure 5b shows a medical slide ("artificial ventilation") before and after transmission. Both slides were transmitted and received under good conditions (-22 dB carrier quieting*). The quality of both received slides shown in these pictures was considered unacceptable for medical purposes.

2. Determination of the Minimum Link Requirements (Signal/Noise Ratio) For Transmission of Acceptable Pictures

Optimization of system performance in tests one through twelve produced results such as those shown in Figures 5a and 5b. On the basis of these results, it was apparent that pictures of acceptable quality could not be transmitted given optimum performance of all system components, i.e., the satellite, base station equipment and the slow-scan television equipment. Consequently, a scheme was devised to determine exactly what the minimum requirements would be for satellite link (satellite and base station com-

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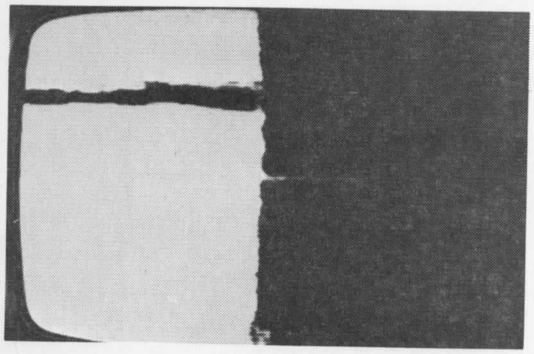
*Carrier quieting (without modulation) measurements bear no numerical relation to S/N or $\frac{S+N}{N}$ measurements. However, both are a measure of system performance. Carrier quieting measurements will be usually higher valued (in absolute terms) than S/N or $\frac{S+N}{N}$ measurements taken at the same time.

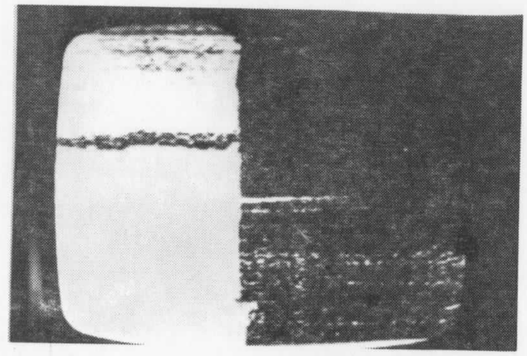
SATELLITE TESTS COMPLETED FOR SLOW-SCAN TELEVISION EXPERIMENT

TABLE I

Test No.	Date	Objective	Comments
1	29 Oct	Preliminary Test	--
2	15 Nov	Compare ATS-1 to ATS-3	ATS-1 preferred due to high spin modulation on ATS-3
3	24 Nov	Test feasibility of transmitting pre-recorded SSTV signals.	SSTV tape must be of a continuous run to permit servo for pictures.
4	30 Nov	Same	Unsuccessful
5	2 Dec	Check for frequency offset at the satellite	Plot of results indicates another test required.
6	9 Dec	Check frequency response curve for data line in ground link	Data line functioning properly.
7	14 Dec	Check frequency response curve again.	Discovered that receiver notch filters are affecting response curve.
8	16 Dec	Check frequency response curve with notch filter removed.	Plot of results indicates improvement.
9	21 Dec	Determine best deviation level for optimizing signal to noise ratio for a multiple frequency SSTV signal	Completed successfully
10	28 Dec	Test feasibility of transmitting audio and video portions of medical program in sequence in the simplex mode	Test not completed for lack of air time. Audio received successfully. Two-three pictures received but of poor quality.
11	4 Jan	Test to optimize quality of transmitted pictures.	Test completed. Picture quality remains poor
12	11 Jan	Same	Same
13	18 Jan	Test SSTV console using "white noise test."	Test completed. High S/N ratio required for good pictures.
14	20 Jan	Test frequency response of the satellite link using frequency compensator at input of data line at U.W. Hospital	Test completed. Compensator is not sufficient for picture code transmission. Pictures are better but still poor.



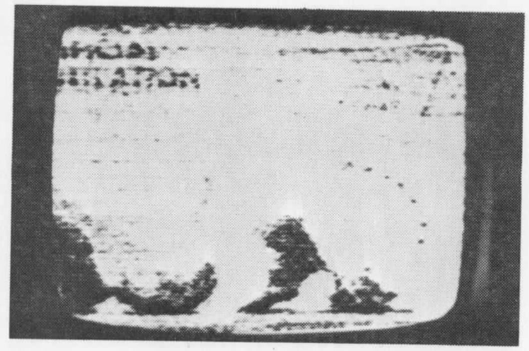
BEFORE TRANSMISSION



AFTER TRANSMISSION

Figure 5a: Black and White Test Slide Before and After Satellite Transmission

BEFORE TRANSMISSION



AFTER TRANSMISSION

Figure 5b: Artificial Ventilation Slide Before and After Satellite Transmission ponents of the total system) performance in order to transmit acceptable pictures assuming no change in the Westinghouse slow-scan television equipment. Test thirteen was the primary test conducted along these lines.

Test thirteen (the "white noise test" discussed in a later section) consisted of the deliberate artificial degradation of picture quality to correspond to hypothetical levels of satellite link performance. Original picture quality was degraded by the introduction of progressively higher levels of electronic "noise." This resulted in a series of pictures illustrating the effects of eight different hypothetical levels of satellite link performance. The test was applied to two different medical slides and the two sets of results are shown in Figures 6 and 7. Both series were examined to determine the minimum performance levels (i.e., the maximum permissible noise levels), that would be required for the transmission of readable pictures. (When examining the pictures, please disregard the white and dark bands running diagonally across the face of the monitor. They are related to photographic technique and do not bear on the quality of the pictures themselves.)

A discussion of these results appears in the section on Evaluation.

3. Results Related to the Establishment of Criteria for the Preparation of SSTV Visuals

The development of criteria for SSTV visuals was to have proceeded in two stages. First, baseline criteria were to have been developed for the use of visuals with a properly functioning SSTV ground network. Second, a set of modified criteria was to have been developed to account for any added degradation due to satellite transmission of pictures. However, while the SSTV ground link functioned satisfactorily, pictures of sufficient quality for development of meaningful criteria were not successfully transmitted so that stage two was not attempted. A full discussion of criteria established in stage one appears in Appendix VIII.

Figure 6: Picture Quality at Different Hypothetical Levels of Signal Degradation Caused by Satellite Transmission

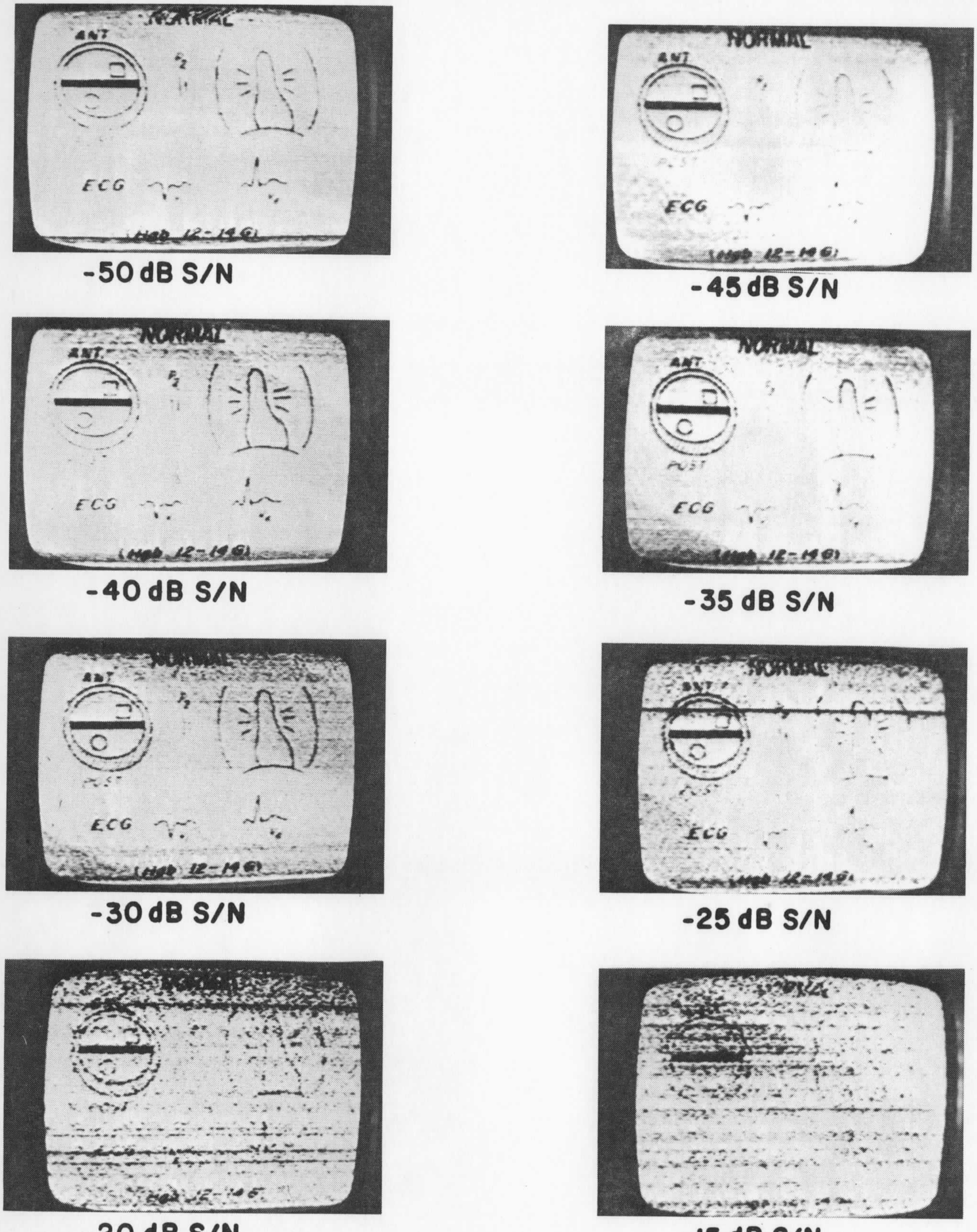


Figure 7: Picture Quality at Different Hypothetical Levels of Signal Degradation Caused by Satellite Transmission

TECHNICAL DISCUSSION OF RESULTS

The Westinghouse SSTV system was designed to operate on a Schedule 4, Class C-2 conditioned telephone line. However the equipment used for the satellite ground station was designed for voice-only communications. This conflict led to many technical difficulties in interfacing. Audio notch filters used in the control system of the Motorola base station equipment prevented transmission of portions of the SSTV signal. The modulation acceptance of the receiver limited the amount of transmitter deviation with SSTV to well below that normally used for voice communications. And the base station audio passband (meant for voice communications) also hampered transmission of the SSTV signal.

A complete discussion of these problems which relate to the slow-scan television/base station interface follows.

1. Attenuation of Video Information

It was determined, upon viewing results of early tests, that video signals from 1740 Hz to 2290 Hz were severely attenuated. During investigation of the radio transmitter, a notch filter was discovered at 2175 Hz which so attenuated the video frequencies that no picture could be received. This notch filter was normally used for a remote control function and was not necessary for the SSTV experiment since the remote control capability of the transmitter was not utilized. Subsequently, the notch filter was bypassed.

The effect of the notch filter can be seen in Figure 8. Figure 9 is a plot of the frequency response of the transmit-receive link after removal of the notch filter.

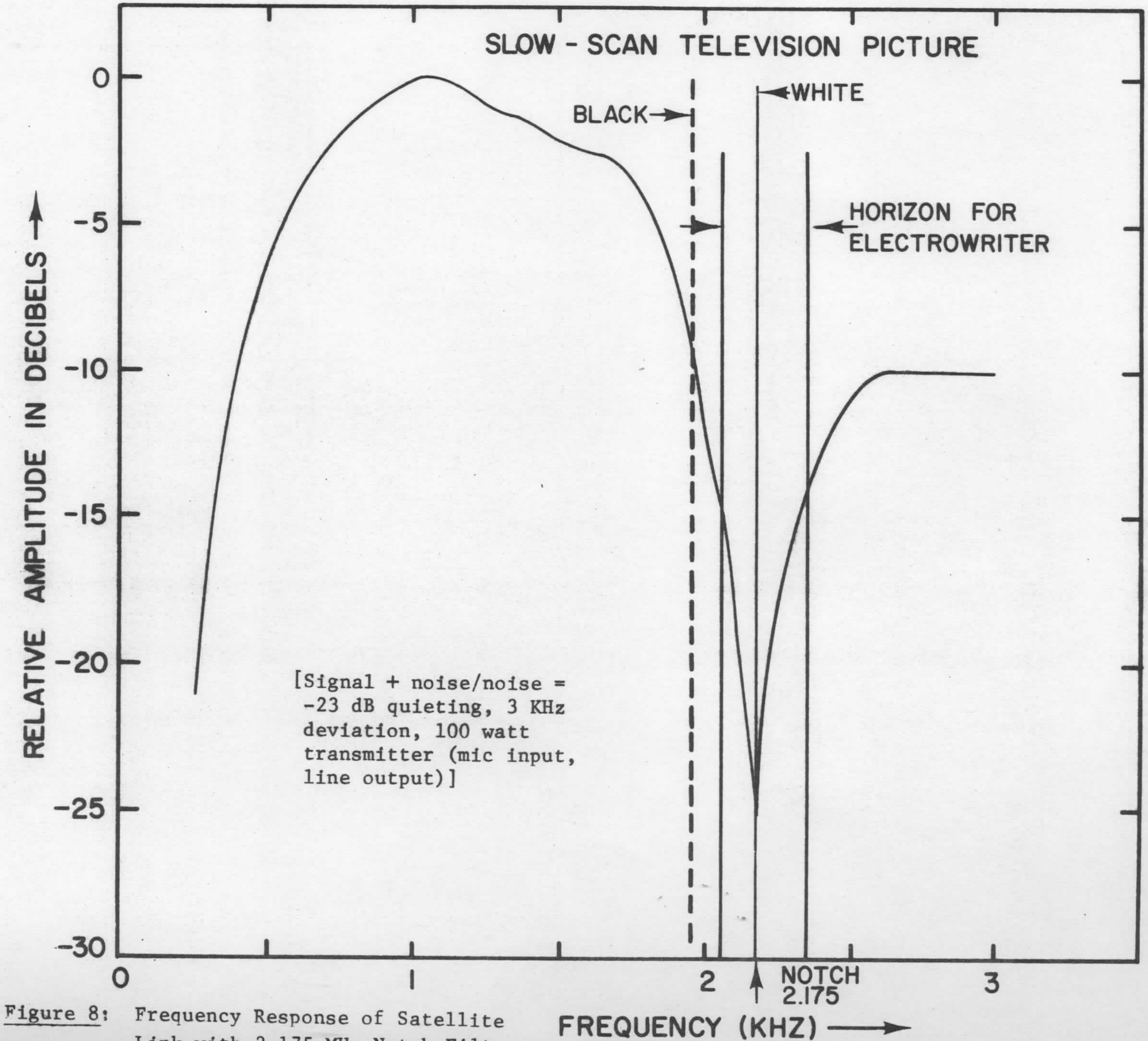


Figure 8: Frequency Response of Satellite Link with 2.175 MHz Notch Filter Present in Receive Line

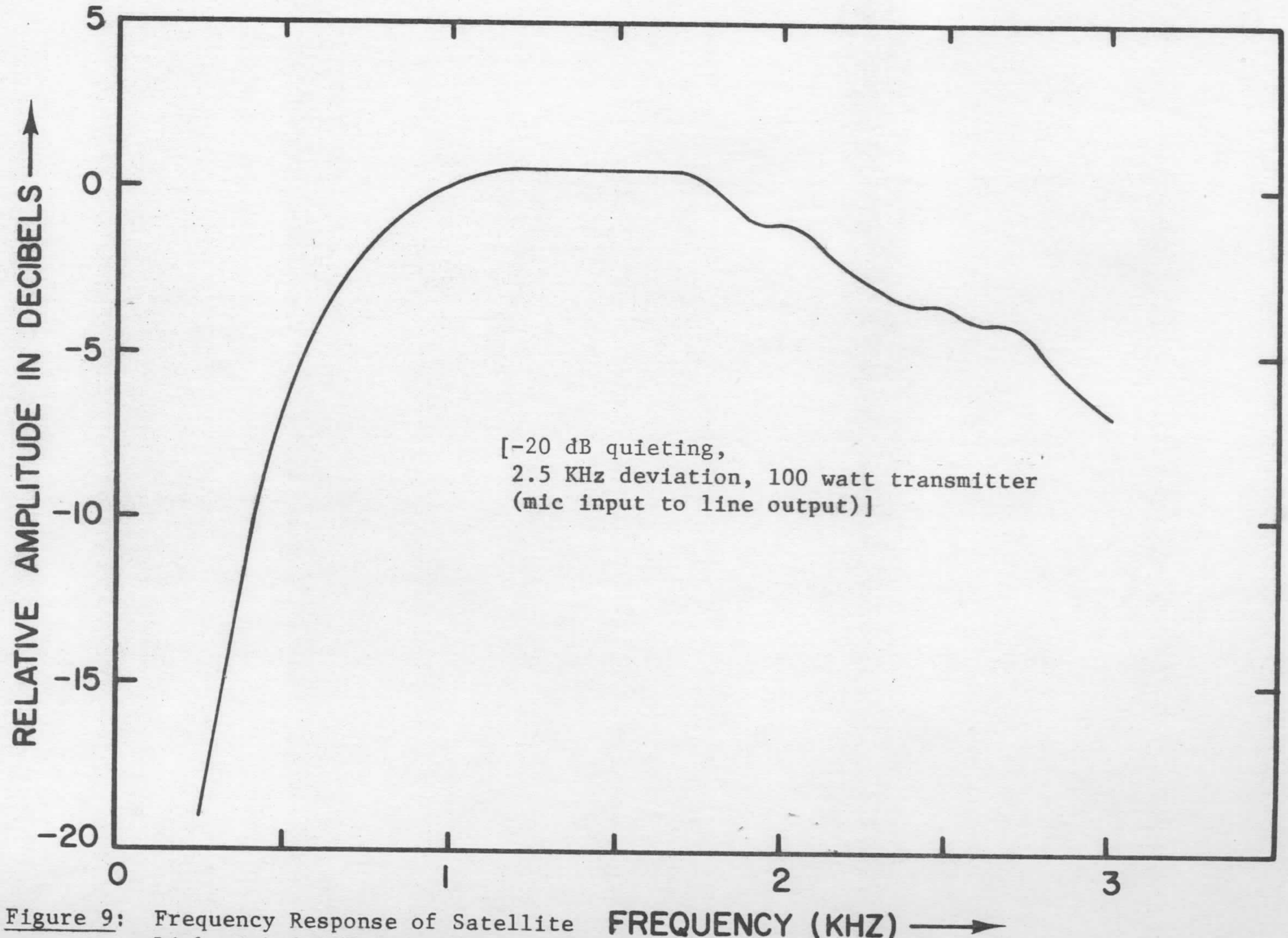


Figure 9: Frequency Response of Satellite Link with 2.175 MHz Notch Filter Removed from Line

2. Attenuation of Code Information

A second difficulty arose in the lack of reception of the code frequency at 310 Hz. A frequency response of the data line from the University of Wisconsin Hospital to SSEC, Figure 10, indicated that the data line would attenuate the code frequency at 310 Hz by 4 dB relative to 2 KHz. The frequency response of the transmit-receive link (Figure 9) produces an extra 14 dB of attenuation. Thus the entire loop attenuates a single tone at 310 Hz, 18 dB relative to a single tone at 2 KHz.

A Hewlett-Packard audio spectrum analyzer was used to examine the SSTV SERVO signal. The resultant spectrum is shown in Figure 11. It is shown that the code frequency at 310 Hz is normally 7 dB down from the video portion at 2 KHz. Thus, it would be expected that the code frequency at 310 Hz would be (18 dB + 7 dB) 25 dB down from 2 KHz through the entire link. If the signal to noise ratio on the link was less than 25 dB the codes would not be above the noise.

The spectrum of an actual SERVO signal through the satellite link is shown in Figure 12. Here the codes are only 5 dB down from normal in comparison to Figure 11.

A white noise signal was transmitted through the entire link, and its spectrum is shown in Figure 13. Here the 310 Hz component is shown to be 6 dB down from 2 KHz. This would tend to confirm the result of 5 dB with the actual SERVO signal

This discrepancy may be due in part to the "modulation acceptance" of the system to various forms of audio signals, described in the following section. The higher frequency signals may have had more noise generated due to the passband of the receiver. In using an averaging AC voltmeter for monitoring the receiver output levels, this additional noise at the

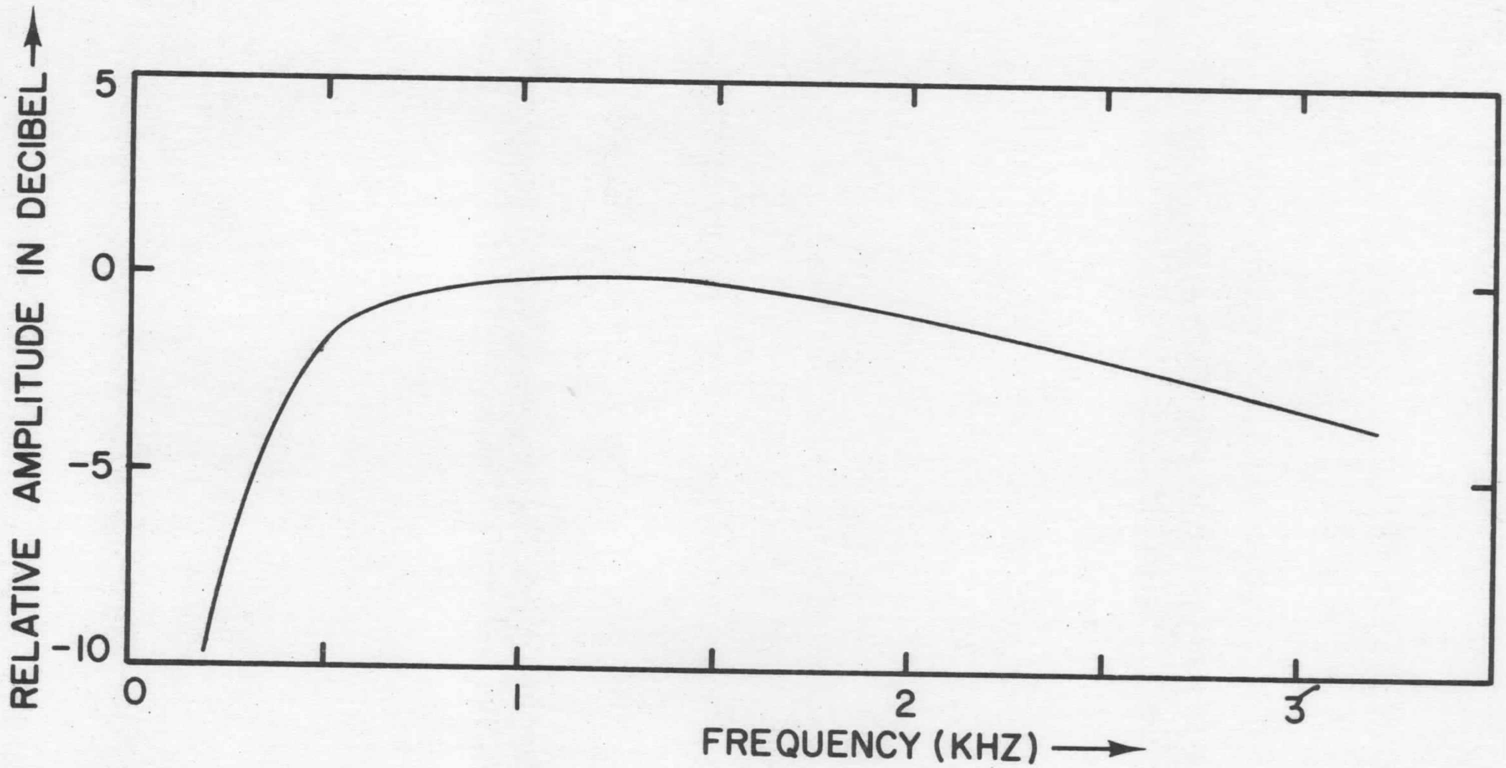
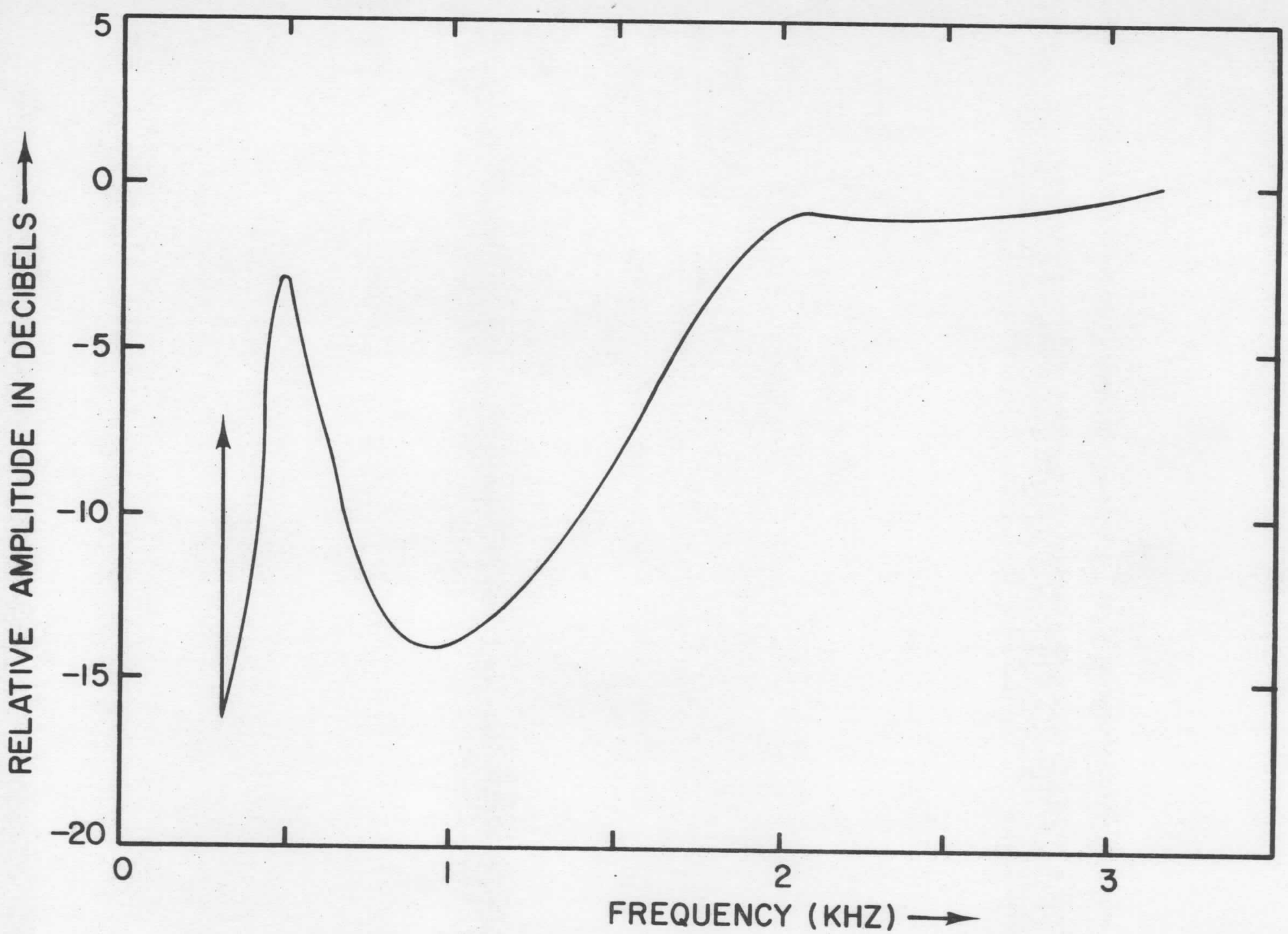
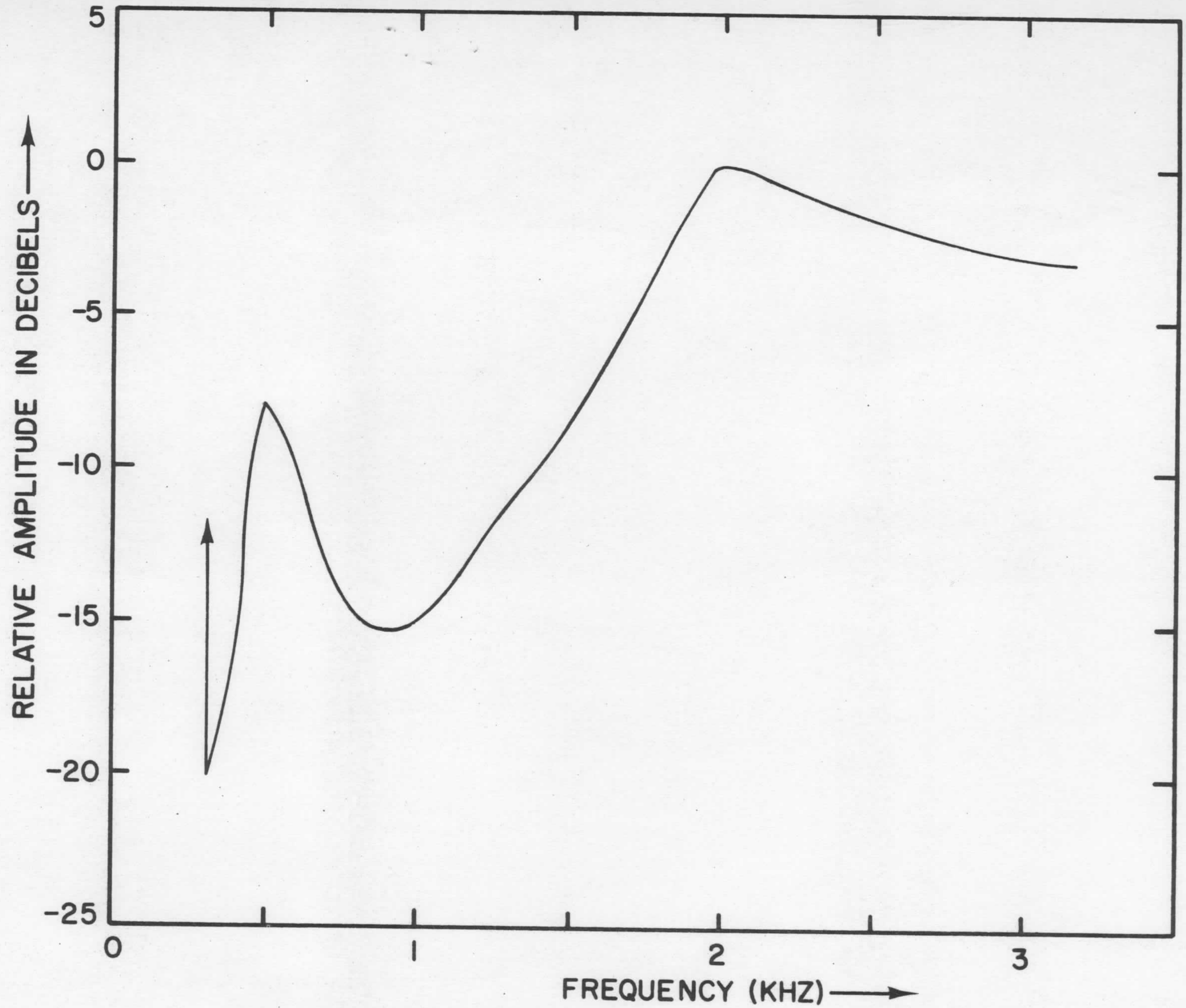


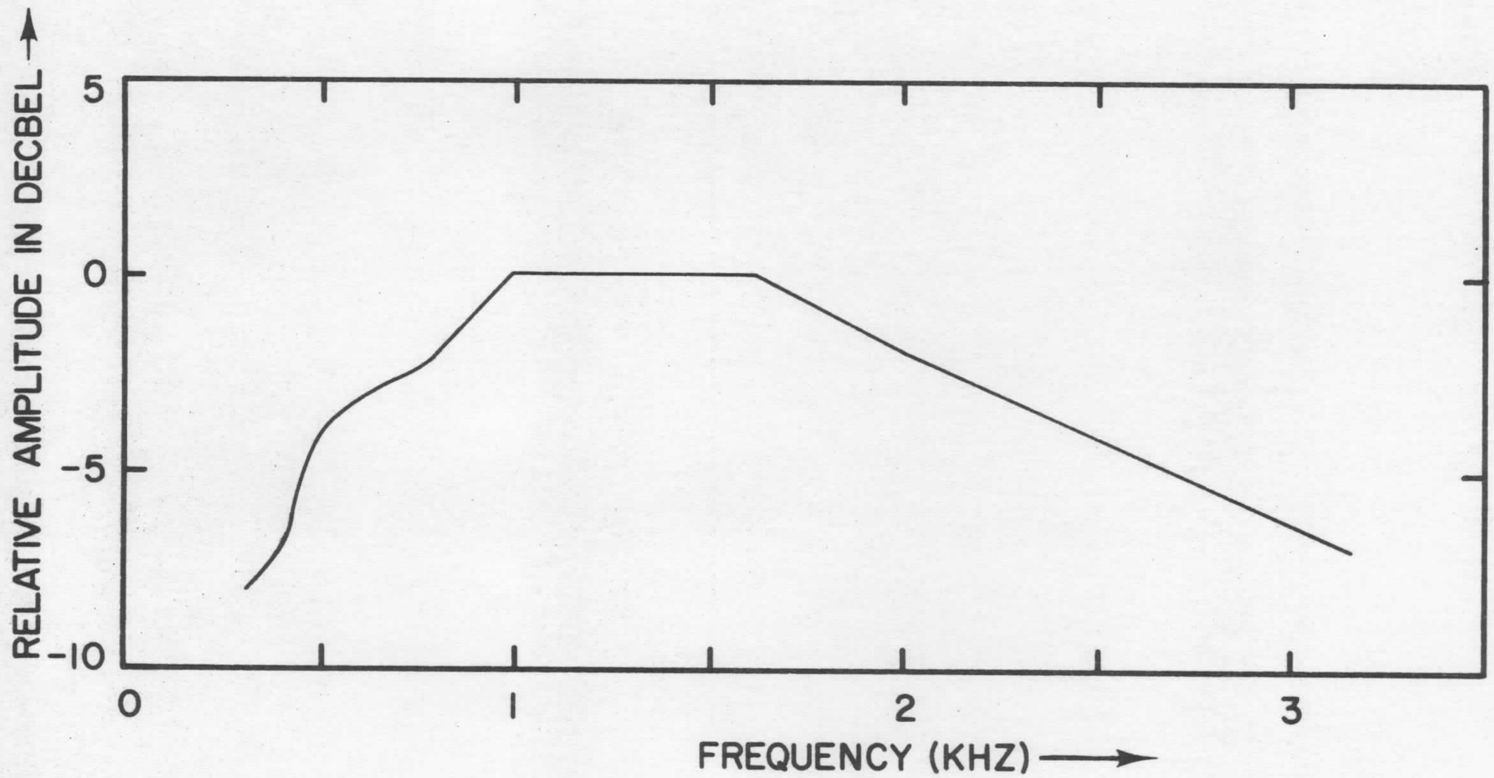
Figure 10: Data Line Frequency Response
(U.W. Hospital to SSEC)



<u>Figure 11</u>: Spectrum of "Servo" Signal From the Slow-Scan Television Console



<u>Figure 12</u>: Spectrum of "Servo" Signal From the Satellite



<u>Figure 13</u>: White Noise Spectrum Plot
(From slow-scan television console through data line to 375 watt transmitter to satellite to Arlington satellite receiver, to Crown tape deck to console.)

higher frequencies may have made it appear that the lower frequencies were attenuated more greatly than they actually were.

The discrepancy may also be due in part to the audio limiter in the transmitter modulator producing non-linear effects on the complex SSTV signal and white noise signal.

Motorola rates their transmitter to have an audio passband of +1 to -3 dB for 6 dB/octave pre-emphasis for 300 Hz-3 KHz and their receiver to have a response of +1 dB to -3 dB for a 6 dB/octave de-emphasis. The variation in response of the receiver may have added to the severe attenuation of the lower frequencies.

An audio frequency compensator was utilized to adjust for the low frequency attentuation and did aid in the reception of the necessary codes.

Modulation Acceptance

Assume a sine wave modulating signal at fo. If the transmitter deviation is set to some modulation index, it will have an infinite number of sidebands spaced at nfo from the carrier where "n" is an integer. The amplitudes of these sidebands are given by the Bessel functions corresponding to that modulation index. If the receiver had an infinite passband, the recovered signal would be proportional to the deviation or modulation index of the transmitter. However, in practice, the receiver passband is limited. In the case of the Motorola narrow band receiver, the modulation acceptance is ±7 KHz minimum. Thus the number of sidebands accepted by the receiver is dependent on the frequency of the modulating signal. A signal at 1 KHz will have a larger number of sidebands accepted by the receiver than will a signal at 3 KHz. And for deviation levels beyond a certain point, background noise and distortion will increase as total receiver input signal power decreases due to the transmitter power going more into sidebands outside the receiver passband. Thus a given receiver will have a certain "modulation acceptance" dependent on the modulating frequency and modulation index of the transmitted signal.

The modulation acceptance of the receiver will dictate that for given distortion and noise, the modulation index or deviation of the transmitter must be limited. For a 1 KHz test signal the transmitter may be set at the full 5 KHz deviation. For a typical voice signal, which has a power density concentrated around 1 KHz, the transmitter may also be set at the full 5 KHz deviation.

However, a SSTV signal which has a high power density near 2 KHz and 3 KHz, the deviation must be reduced from what it was at 1 KHz to produce the same distortion. A plot of apparent $\frac{s+n}{n}$ versus deviation for a SSTV SERVO signal is given in Figure 14. It can be seen that the slope of the curve decreases beyond 2.5 KHz due to the addition of increasing noise and distortion beyond this point. Thus the curve is not actually a representation of $\frac{s+n}{n}$ at deviation levels higher than 2.5 KHz since the noise was not constant and was in fact an increasing function with signal level. Below 2.5 KHz deviation, the noise due to carrier quieting masks the noise increasing with signal deviation and thus the noise is relatively constant.

Due to the previously observed phenomenon, individual SSTV pictures were transmitted at different deviation levels and observed in order to determine the best deviation level to use with SSTV. Results are shown in Table II.

The best picture, although still poor, was at 3 KHz deviation. This confirms the plot of Figure 14. Thus a SSTV signal of this type with a high power density in the region of 2-3 KHz operates at a disadvantage over voice

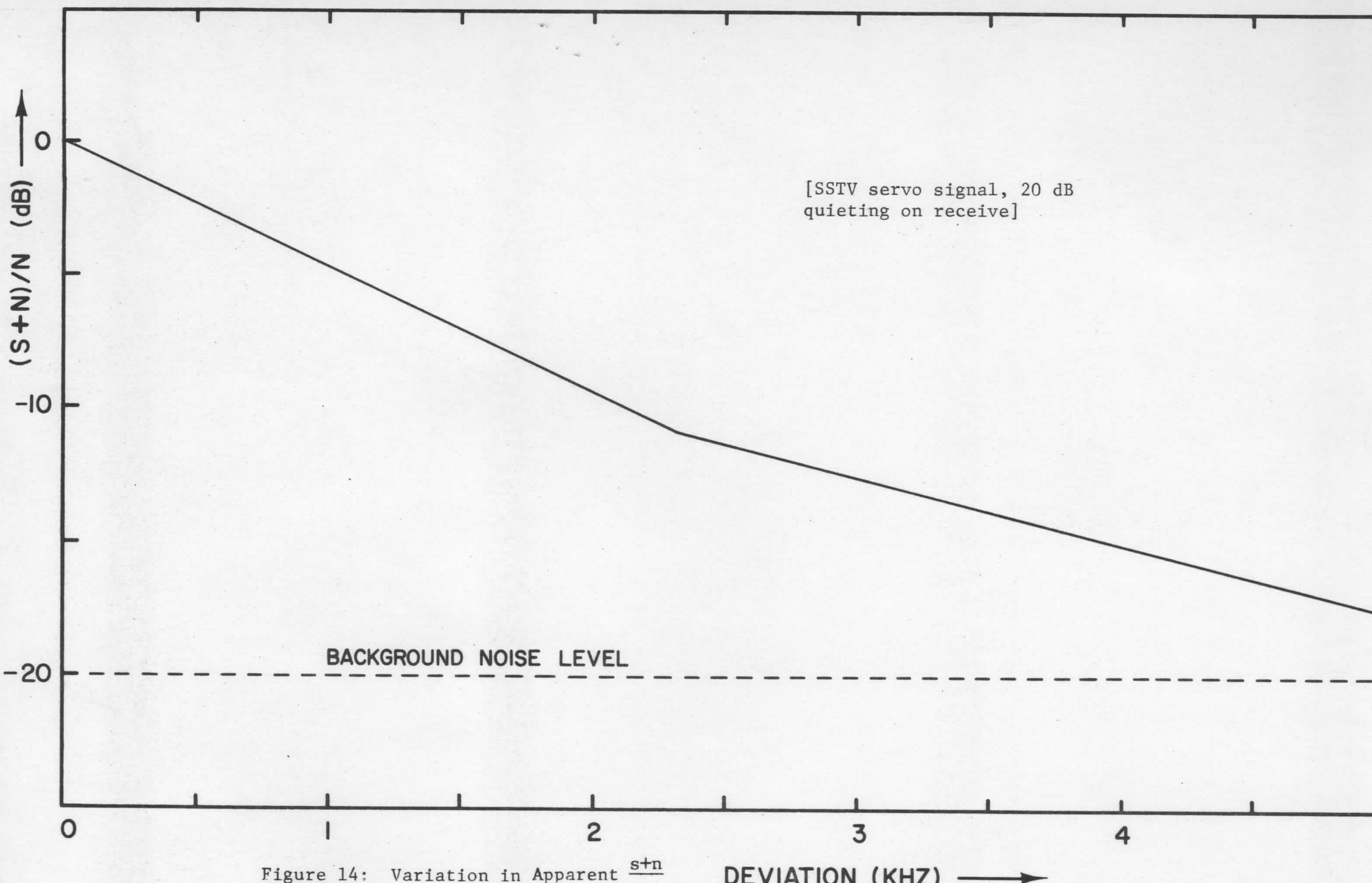


Figure 14: Variation in Apparent $\frac{s+n}{n}$ Ratio with Transmitter Deviation

Table II

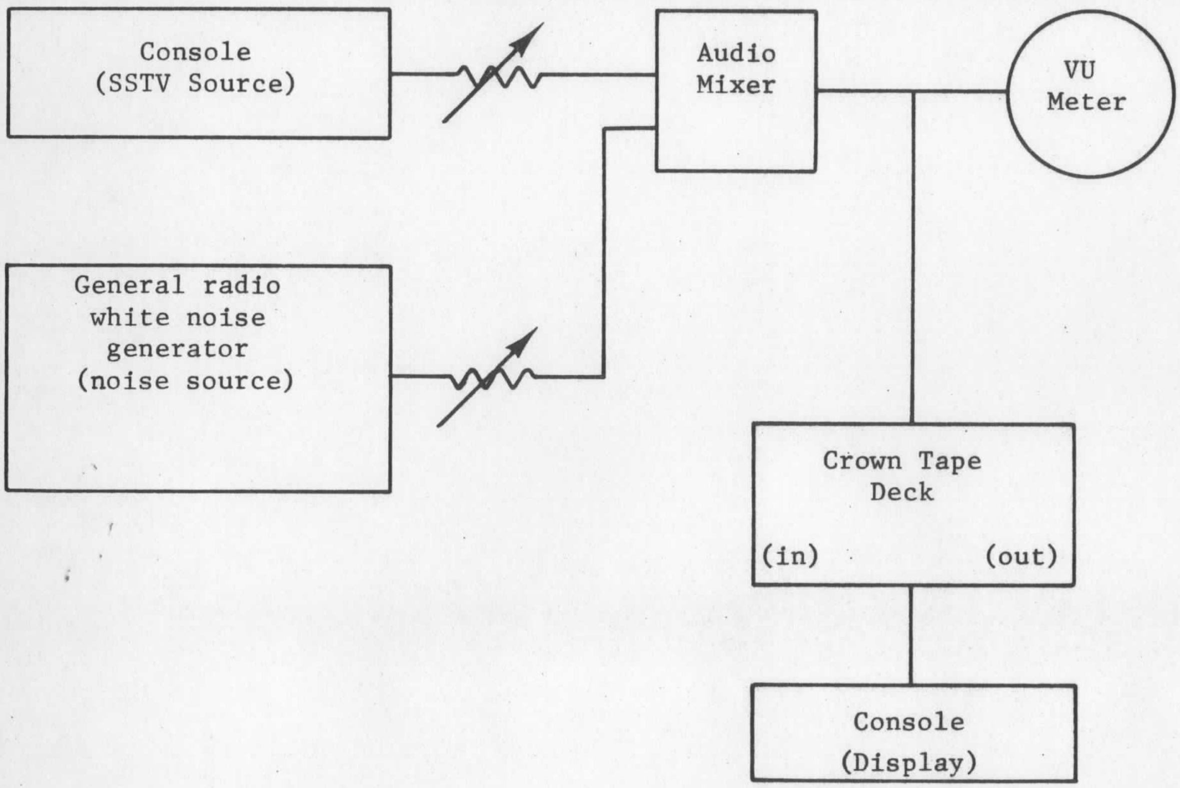
SSTV DEVIATION TEST RESULTS

Trial No.	Average Deviation (KHz)	Results (High resolution)
1	4	Very grainy
2	3	Better picture than No. 1
3	2	Worse than Trial No. 2
4	5	Errors and distortion in signal (no picture)

transmission concentrated at 1 KHz since it's $\frac{s+n}{n}$ ratio is much less due to the signal level being restricted to 1/2 times that of the signal level for a typical voice signal, while the carrier noise remains constant.

4. Determination of Minimum Acceptable S/N Ratio for Successful SSTV Transmission

Using the test set-up shown in Figure 15, a test was performed to determine the maximum allowable signal to noise level required to seriously degrade a typical SSTV signal. By independently setting the levels of the noise generator and the SSTV signal with the VU meter, outputs with known S/N levels could be generated. These were recorded and then played back and displayed for later evaluation to determine what S/N level would provide a picture of minimal acceptable quality. (Refer back to Figures 5 and 6 for picture results.)



<u>Figure 15</u>: Set up for White Noise Test

EVALUATION OF RESULTS

On the basis of tests run to determine the S/N ratio required to transmit a picture of minimum acceptable quality, it was concluded that, for most medically useful visuals, a S/N ratio of at least 30-35 dB is desirable. Higher ratios would be required for low contrast type visuals. (Refer again to Figures 6 and 7 for illustrations of picture quality at different S/N ratios.) The maximum $\frac{S+N}{N}$ ratio ever measured during SSTV tests was 19 dB at a deviation of 3.5 KHz. On this basis, it appears that present performance levels are at least 11 dB (30 dB - 19 dB) below the minimum acceptable level.*

Based on test results, several solutions to the problem of sending quality SSTV pictures via satellite are possible:

Modifying the SSTV signal If the high frequency components of the SSTV signal could be heterodyned down to lower frequencies, the $\frac{S+N}{N}$ could be increased since the allowable deviation could be increased.

Modifying the satellite ground station equipment Broadening the audio passband of the equipment might aid in better reception of the code frequencies. Using wideband FM equipment instead of narrowband equipment may aid in improving the modulation acceptance, although the sensitivity of such equipment is less.

Utilizing better antennas and a higher powered transmitter will of course increase the S/N ratio obtainable through the satellite. The receiver was operating at about maximum obtainable sensitivity for this mode

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*Thirty (30) dB S/N is approximately equivalent to 30 dB $\frac{S+N}{N}$ for high S/N ratios. Also, A/N ratios are always lower than $\frac{S+N}{N}$ ratios since noise is an increasing function with deviation beyond 2.5 KHz for SSTV signals and because of the presence of noise (N) terme in the numerator of the $\frac{S+N}{N}$ ratio.

of communications and thus little improvement can be expected here. Location of the ground station closer to the projected ground location of the satellite will result in better reception due to less susceptibility to tropospheric variations.

While such modifications might make it feasible to utilize the Westinghouse SSTV equipment now on hand at Wisconsin, they would be expensive and impractical. It might be better to investigate the use of other types of SSTV equipment which may be more adaptable to inexpensive ground station operation.

CONCLUSIONS

1. The quality of slow-scan television images transmitted via the ATS-1 satellite in this experiment was inadequate for medical purposes.

2. Given the "state-of-the-art" of slow-scan television and satellite communications technologies utilized in this experiment, the transmission of medically useful SSTV pictures via the ATS-1 satellite is not presently feasible.

RECOMMENDATIONS

1. Inclusion of slow-scan television into the present Alaska ATS-1 medical satellite system should not be attempted.

2. Since the next generation of educational satellites will include the technical capability for regular television transmission, and since regular television is far superior to slow-scan television for educational and patient care purposes, it would seem unlikely that slow-scan television will be a practical consideration. If, however, narrow band widths are necessary because of the limited number of available television channels, slow-scan television should be tested, evaluation with cost/benefit considerations in mind. Appropriate experiments should be planned and designed at this time for implementation using a ATS-F.

3. The design of effective visuals for use in any form of slow-scan television programming should follow specific guidelines such as those which have been devised in this experiment.*

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* See Appendix VIII.

III

PRELIMINARY REPORT ON THE X-RAY IMAGE PROCESSING EXPERIMENT

PRELIMINARY REPORT ON THE X-RAY IMAGE PROCESSING EXPERIMENT:

An Analysis of Image Processing Techniques and Equipment for Transmitting X-Ray Information via ATS Satellite

BACKGROUND

Information of critical importance is often barely discernible in normal X-ray images because, for example, of small differences in density between normal and abnormal tissue or between tissue and non-metallic foreign bodies. When an X-ray image is scanned, transmitted and reconstructed, the image suffers loss of resolution because of the addition of noise. Equipment capable of high quality data transmission is complex and expensive and, at best, may not be able to transmit X-ray images without losing the information of critical importance.

The University of Wisconsin Space Science and Engineering Center (SSEC) has developed an extensive capability to process earth images obtained from the ATS satellites. Both analog and digital techniques are employed to select and treat portions of the image so as to increase readability. Equipment and software are applicable to other data processing with relatively minor modifications.

The successes achieved in processing ATS pictures have suggested application of the same or similar techniques where low cost and high reliability are important. The interest of the National Library of Medicine in investigating methods of providing medical communications in Alaska has focused our attention on the possible application of image processing techniques in the transmission of X-ray images. It is expected that information loss during image transmission and reconstruction can be minimized by performing pre-transmission and, perhaps, post-transmission image processing. Image processing may be useful also in increasing readability of X-rays in ordinary hospital use.

EXPERIMENT OBJECTIVE

The objective of the experiment is to provide a basis for design of low-cost equipment to be used in transmitting X-ray information from remote terminals to a Medical Center where experts in interpreting X-ray images are located. To accomplish this objective it is necessary to define an acceptable X-ray image in communication engineering terms, e.g., contrast, edge definition and information density. Using this definition as the required output characteristic and examples of typical X-ray images as the input characteristic, the required information transfer function of the transmitting channel can be described. With the required characteristics of the communication and display process established it is then possible to determine the type and degree of image processing required. Upon completion of the theoretical analysis, the complete communication and display channel including pre- and post-transmission processing will be simulated using existing equipment. Images processed by the simulated system will be evaluated to confirm expected performance, and specifications will be prepared describing the performance characteristics and basic design of low-cost terminal equipment capable of reproducing similar results in field application.

It is not expected that eventual field operational equipment will be digital. However, because of its great versatility, digital processing is advantageous in simulating the ATS channel and the input-output device transfer functions and in determining optimum X-ray image processing schemes.

STATUS OF THIS REPORT

This is a report of preliminary work completed for the X-Ray Image

Processing Experiment. This work included the modification of an optical cloud correlator to serve as a scanning microdensitometer and the following preliminary analysis of image processing techniques and equipment options. Work on the experiment is being continued on a follow-on contract with the National Institutes of Health.

TYPES OF X-RAY IMAGE PROCESSING

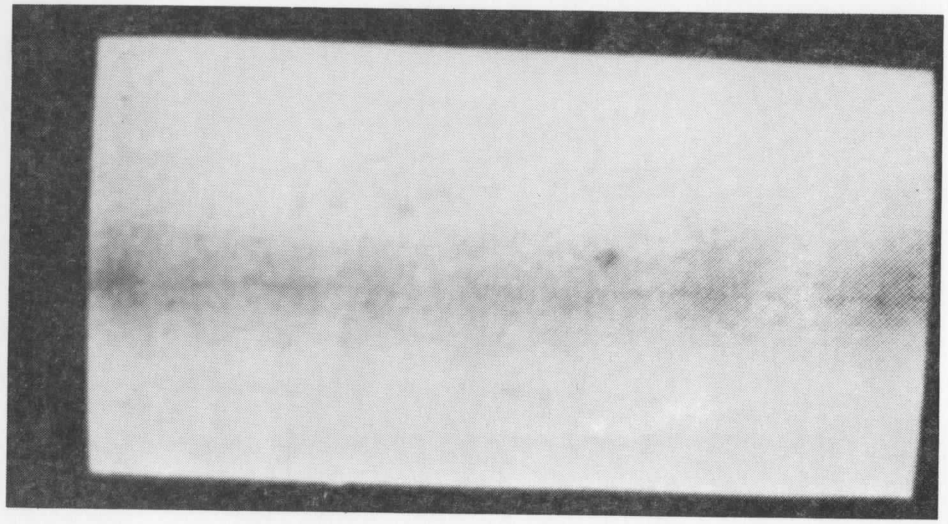
Two basically different types of X-ray images are considered here: the broken bone and the lung abnormality.

The important information in the broken bone image is in the sharp edges of the bone break. This information is revealed on the X-ray as a large change in image contrast (transmittance) for small spatial displacements. In other words, the useful information is concentrated in the high spatial frequencies of the image.

The image of the lung abnormality is characterized by subtle, diffuse variations in image contrast covering a relatively large area. However in this case also, as will be seen, the information is contained in the higher spatial frequencies.

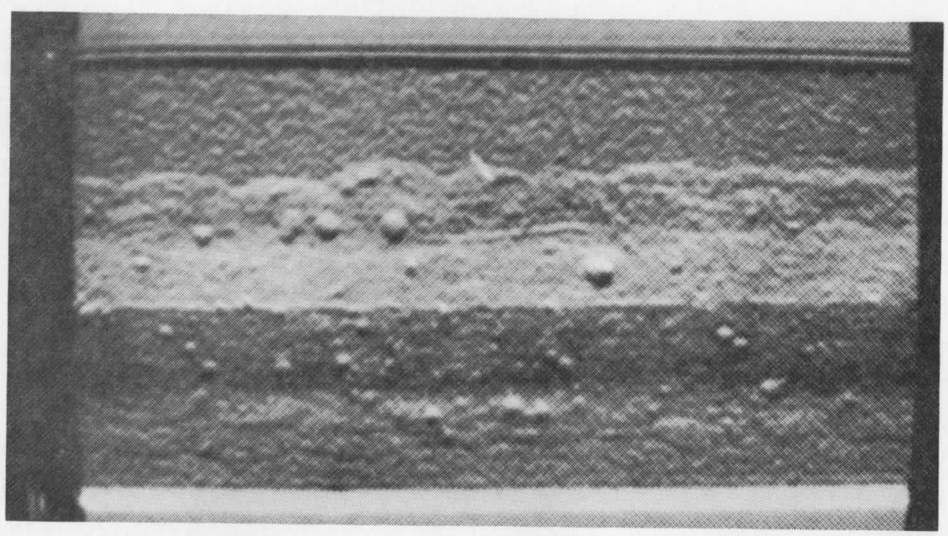
In either case, it is seen that the information content can be optimized by retaining the high spatial frequencies and supressing the low spatial frequencies. We cannot increase the information content of an image but we can increase the apparent information by increasing the signal (the desired information) -to-noise (the undesired information) ratio. By maximizing the signal-to-noise ratio before transmission, we are assured of the maximum signal-to-noise ratio at the receiver after transmission through the ATS channel.

As mentioned above, the broken bone and lung abnormality X-rays contain useful information in the higher spatial frequencies. Figure 1a is a



WELD X-RAY

Figure 1a



ENHANCED WELD X-RAY

Figure 1b

re-photographed picture of an X-ray of a weld between two metal plates. A fine but blurry and interrupted line is seen to run horizontally through the middle of the picture. This is the junction between the two metal plates and is analogous to the bone break. The range of contrasts in this picture is not great, but the spatial rate of change of contrast in the vertical direction is very great. The useful information can be obtained, therefore, by emphasizing the higher spatial frequencies in this figure.

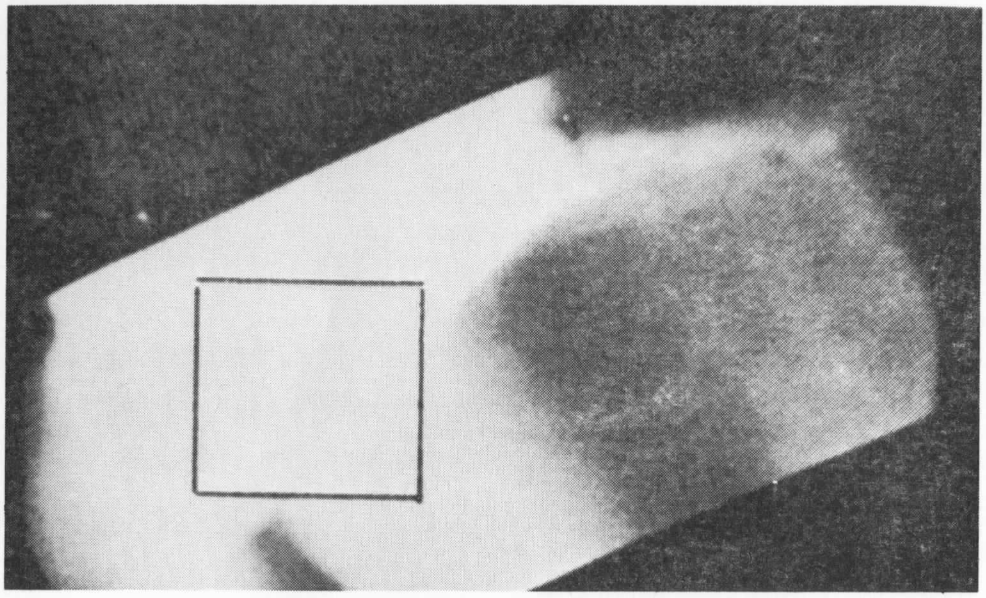
Figure 1b illustrates this by showing the derivative of the image reflectance (Figure 1a) with respect to the vertical spatial dimension. The image is not differentiated horizontally. The differentiation could be done electronically by high-pass filtering in the vertical dimension only. It is obvious from Figure 1b that the presence of the break is more noticeable, i.e., that the signal-to-noise ratio has been increased.

The signal-to-noise ratio could be further increased with nonlinear contrast enhancement. For example, all gray levels below a certain threshold could be made black, and all gray levels above the threshold could be made white.

The lung abnormality X-ray is analogous to the X-ray weld defect shown in Figure 2a. Here the actual defect (inside the small box) is not readily visible. However, if we again differentiate in the vertical dimension, the defect becomes apparent. Again, contrast enhancement might improve the diagnostic usefulness of such an X-ray even more.

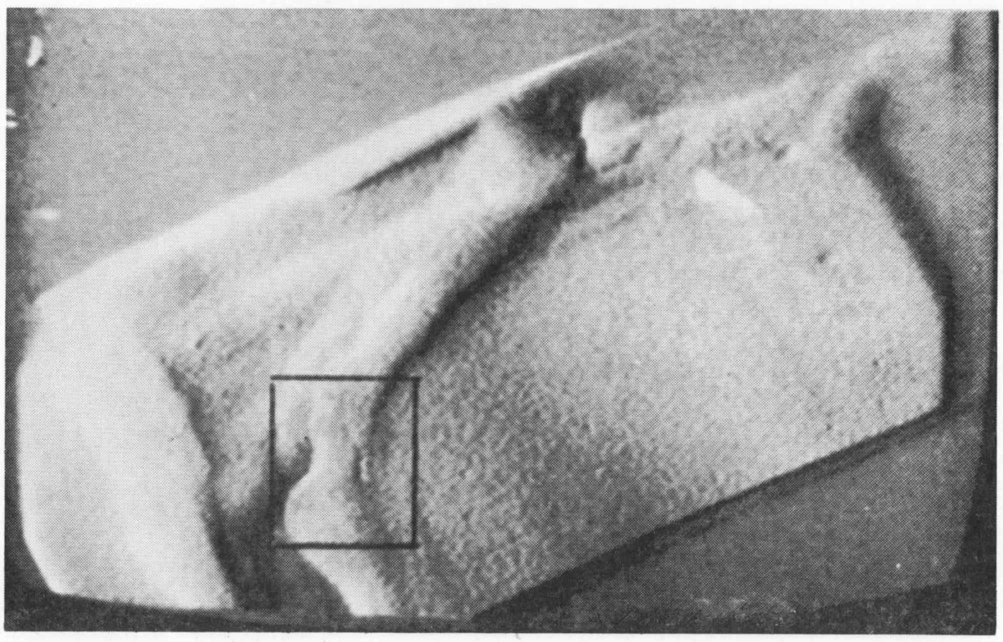
We have argued that two types of processing would improve the readability of medical X-rays: (1) differentiation and (2) nonlinear contrast enhancement. The questions which must yet be answered are:

1. What time constants must be used in the differentiation?
2. What nonlinear contrast enhancement must be used?



ORIGINAL X-RAY WELD DEFECT

Figure 2a



ENHANCED X-RAY WELD DEFECT

Figure 2b

3. In what order must the two processing methods be done?

4. In what orientation must the one-dimensional differentiation be done?

These details of the processing are best done experimentally on actual X-rays.

X-RAY IMAGE PROCESSING TECHNIQUES

It must be decided initially what general type of X-ray image processing technique is to be used. Three possibilities come to mind: (1) processing of sample-valued X-rays by a digital computer, (2) two-dimensional coherent optical processing and (3) analog (or digital) processing of one-dimensional X-ray scans. The three techniques are considered below.

1. <u>Processing of Digitized X-Rays</u>

In this image processing scheme, sample values of an X-ray image are stored as three-dimensional vectors--the two spatial coordinates of a sample point and the transmittance of the X-ray transparency at that point. It is important to note that this data form does not imply a scan of the X-ray in the sense that each data point is uniquely identified by its own spatial coordinates rather than by its relative position in a sequence of data points.

It is quite likely that the data would, in fact, be obtained by a scanning operation, i.e., linear scans of a microdensitometer across an X-ray. But once the X-ray is sampled and stored (preferably in a random access memory), it is possible to process the data in directions different from the original scan direction. The only precaution which must be taken is that the data must be sampled at greater than the Nyquist rate, i.e., at a rate at least twice as great as the highest frequency present in the data, to ensure that the information content is preserved.

Actual image processing is accomplished on a digital computer. The resultant processed sample points are read out in sequence to a digital-to-analog converter and then to a facsimile machine or to a cathode ray tube display.

This image processing technique is advantageous because it uses a digital computer, which is the most versatile method for determining exactly what constitutes an effective X-ray enhancement. Once the most suitable type of enhancement is determined, the digital computer could be replaced by a specialized analog computer for an operational system.

The digital computer is particularly suited to contrast enhancement and one-dimensional spatial filtering. Two-dimensional spatial filtering is also possible but at the expense of a great deal of computer time.

2. Two-Dimensional Coherent Optical Processing

Two-dimensional spatial filtering can be accomplished with Fourier optical techniques. The method is based on the fact that a lens can take the two-dimensional Fourier transform of a transparency (the X-ray). The Fourier transform can then be modified by spatial filters (also transparencies), and Fourier-transformed again by a second lens. The result can be shown to be equal to the convolution of the original X-ray and the impulse response of the spatial filter.

Two-dimensional spatial filtering could be an extremely useful enhancement technique; however, the complications of performing such an enhancement by coherent optical means are formidable. The optical technique requires a sizeable investment in precision optical components. In particular, a continuous output (CW) laser with a coherence length greater than approximately the diagonal dimension of the X-ray is needed. This limits X-rays to small sizes. In fact, photographically reduced copies of the X-rays would probably be required. This is, by itself, not a difficulty. But if this technique were to be adapted to a low-cost operational package, the extra step of photographic reproduction would be undesirable. Two high quality, large aperture lenses, an optical bench and two liquid gates (devices to eliminate wavefront distortion due to photographic emulsion thickness irregularities) would also be needed. The basic set-up is shown in Figure 3.

The spatial filters would probably be nothing more than appropriately positioned masks which would do high-, low-, bandpass- and bandstop-filtering of spatial frequencies. However, it is possible to have complex filters which affect the phase as well as the amplitude of the spectrum of the X-ray. If this type of filter is used, additional optical components are needed so that a modification Mach-Zehnder interferometer can be built to make the filters.

The optical processing method is dependent on the scale and orientation of the X-ray relative to that of the spatial filter. Again, this is not a problem in a laboratory because the scale and orientation can be carefully controlled. But for operational equipment the alignment of the transparencies would be a major problem.

The conclusion to be drawn from the above discussion is that the coherent optical processor, despite its unique two-dimensional processing capability, is unsuitable for X-ray enhancement on an operational basis.

3. Analog (or Digital) Processing of One Dimensional Scans

This technique consists of scanning an X-ray transparency in one dimension and processing that scan line as an entity. Thus, each scan line is treated independently of adjacent scan lines. The processing could be done digitally by sampling each scan line, converting the sample

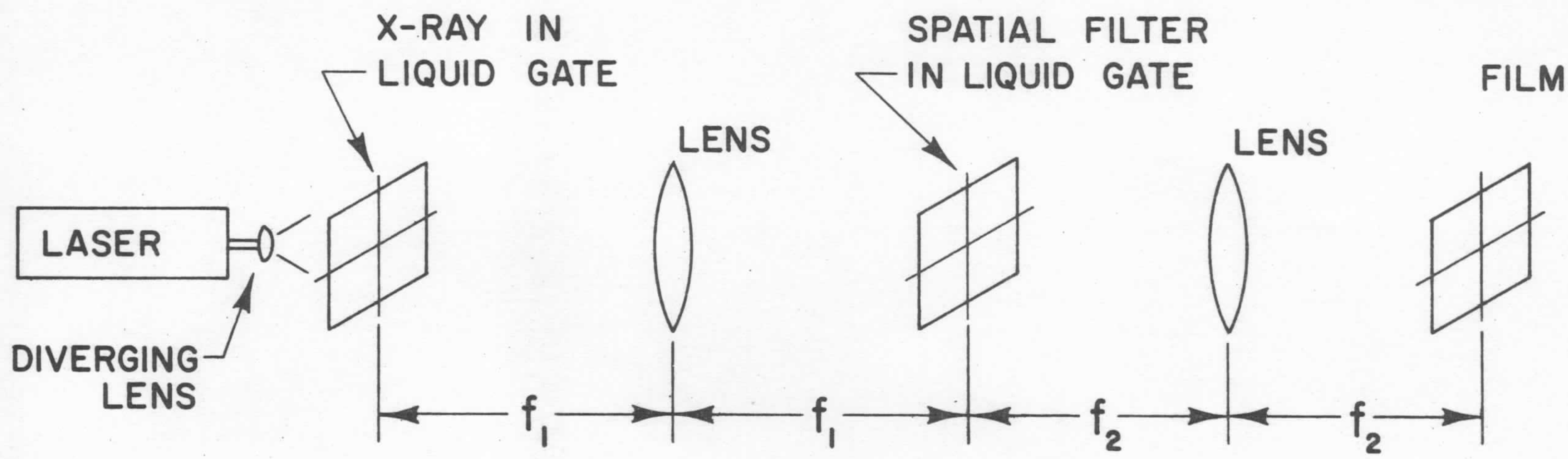


Figure 3: Coherent Optical Processor

values into digital words and processing the digitized scan line as an entity with the digital computer. This technique is versatile, but an operational system would be cheaper and faster if it used an analog computer to do the processing.

Processing individual scan lines is a severe limitation of the X-ray enhancement possibilities. It does, however, offer the possibility of a relatively cheap operational system. Furthermore, there is evidence that one-dimensional processing may be adequate. Figures 1 and 2, the X-rays of welds, have been edge-enhanced (high-pass filtered) in the vertical domension only. It is this system which is being pursued at SSEC.

X-RAY IMAGE PROCESSING EQUIPMENT

This section considers the equipment that is required to perform one-dimensional (scan line) processing. The X-ray processor requires the following subsystems: (1) an optical scanner to convert the X-ray image into an electrical signal, (2) an electronic pre-processor to do the enhancing of the X-ray, (3) an interface to the transmitter, (4) an interface to the receiver, (5) an electronic post-processor to either process the received signal further or to "un-do" the original processing and (6) a reproducer which converts the final electrical signal back into a picture.

There are two basically different design concepts for the scanner/reproducer subsystem. The first concept is a mechanical system similar to a facsimile machine. The basic idea is that the X-ray is placed on a rotating drum and illuminated by a light source. A photocell records light variations at a small point as the X-ray spins on the drum, thus producing a photocell voltage that is proportional to the X-ray film density along the narrow path scanned by the photocell. With each rotation of the drum, a leadscrew mechanism moves the photocell along the drum axis by one scan line width. As the photocell advances across the X-ray, it produces, scan line by scan line, an electrical signal related to the original X-ray.

In the reproducer, a piece of unexposed film is placed on the drum, and a light source, modulated by the received signal, is moved across the rotating drum in synchronism with the transmitter scanner. The light source exposes the film which, when developed, is a copy of the transmitted X-ray.

The advantage of such a scheme is that a conventional facsimile machine could be adapted to the X-ray problem. The modification, however, would be extensive since the device must work on a transparency and, therefore, must be capable of preserving the wide dynamic range of transparency density values.

The second scanner/reproducer concept is the electronic flying spot scanner. This technique, illustrated in Figure 4, consists of a small, constant intensity spot which scans across the face of a low-persistence cathode ray tube (CRT) face to form a raster. The CRT face is imaged onto the X-ray (or a photo-reduced copy of the X-ray) and is, in turn, imaged onto a photomultiplier tube. The photomultiplier tube output is proportional to the X-ray transmittance.

The reproducer would consist of the same CRT flying spot, but now the spot intensity is modulated by the received signal. A polaroid or conventional camera is placed in the image plane of the CRT lens, and, as the flying spot scans the CRT face, the camera records the light intensity variations. The result is a copy of the transmitted X-ray.

This technique offers more flexibility in design and operation than the facsimile device. However, it is generally more complicated and expensive.

The other X-ray enhancement subsystems--the pre- and post-processors and the interfaces--are similar for both scanning subsystems. The processors

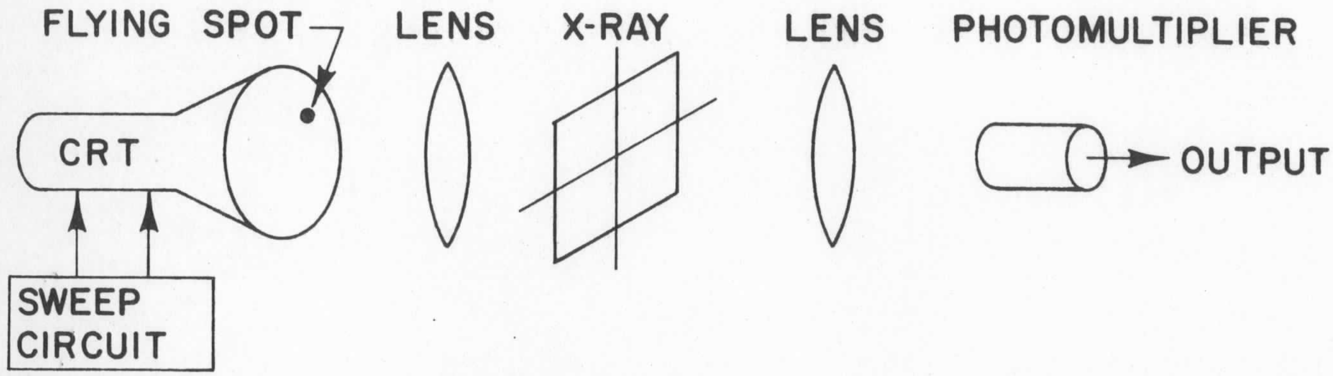


Figure 4: Flying Spot Scanner System

would be nonlinear gain amplifiers for contrast enhancement and electronic filters for spatial filtering. The interfacing circuitry would simply match voltage and impedance levels for compatibility with the available satellite FM communication equipment.

DESCRIPTION OF EQUIPMENT TO BE USED IN THE EXPERIMENT

This section considers a piece of equipment needed to perform the processing of digitized X-rays described above. In particular, a device is discussed which records sample values (two spatial coordinates of a sample point and the X-ray density at that point) in a form suitable for digital processing.

Either the facsimile machine or the flying spot scanner could be used for this. However, a more versatile system would have independent x- and y-position control. Such an arrangement is shown in Figure 5. A transparent table holding the X-ray is rigidly mounted to a frame. A photomultiplier-lightbulb combination, controlled by x- and y-axis stepper motors, moves across the X-ray table and measures the transparency density.

This arrangement would be too slow and expensive for an operational system. However, it is very flexible when used in conjunction with a digital computer for preliminary work to determine exactly what types of enhancement are optimum. Furthermore, this arrangement is particularly attractive because a piece of equipment already exists at SSEC which is being modified for use as a two-dimensional X-ray scanner/reproducer. The piece of equipment is the SSEC optical cloud correlator. The mechanical drive portion of the cloud correlator was a great success. The unsuccessful portions were in the correlator subsystem which will not be used in the X-ray enhancement device. The xy-transport of the cloud correlator has been removed, and

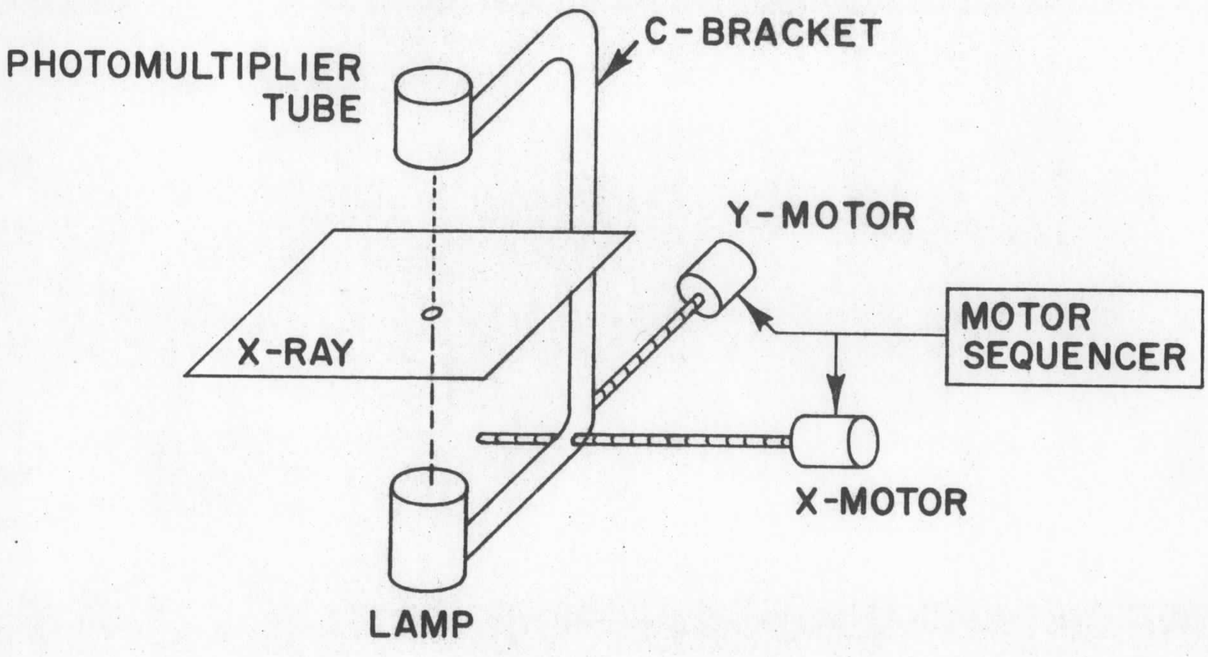


Figure 5: Two-Dimensional X-Ray Scanner

the photomultiplier-lightbulb combination has been fitted to it with a C-bracket as shown in Figure 5.

The system is capable of scanning a transparency up to 5 3/4" by 6 1/2" maximum, with 1008 lines per inch resolution. This would be a maximum of about one million data points per square inch--far more than are needed for sharp resolution. The stepper motors are currently capable of about 240 steps per second, so that 4.5 seconds are required for each inch of scanning in one dimension. (It would take 48 hours to scan a single full-sized transparency!)

The time for one inch of scan can very easily be reduced to about 2.6 seconds per inch with a resolution of 576 samples per inch. If a small photographic reproduction of the X-ray is used instead of the X-ray--say a 2" by 2" transparency--the scan time can be reduced to about 100 minutes. Even 576 samples per inch is more than necessary. By reducing this by a factor of two (by changing motor gearing) a 2" by 2" picture would require 25 minutes for a complete scan.

The data rates are seen to be very low. With further mechanical work, the data rates could be increased. But, for the task of using a digital computer to determine the optimum enhancement process, the low data rates are acceptable. Faster data rates can be obtained (but not in real time) by recording the data on tape at a slow speed and playing the tape back for processing and transmission at a higher speed.

To use the same apparatus as a reproducer requires only that the point light source be capable of being modulated or pulsed. The method of operation would be to put a piece of unexposed film on the X-ray table, scan across the film in synchronism with the original scan and modulate or pulse the light with the received signal. Upon development, the film will be a copy of the received X-ray.

Construction/Modification Progress

Electronic circuitry which controls the stepper motors has been designed, built and successfully tested. This circuitry consists of all the necessary subsystems including power supplies, motor-driver circuits, digital counters and control logic, drive oscillator, manual override circuitry and photomultiplier circuitry.

The photomultiplier circuit has been tested, and a plot of photomultiplier voltage output versus test transparency density has been made. The curve is approximately linear for densities from 0.0 to 3.0. The output voltage at 0.0 density is 20 volts. This will have to be scaled by a factor of two for compatibility with the analog-to-digical (A/D) converter associated with our Raytheon 440 digital computer. A sample pulse signal generator (which tells the A/D converter when to take a sample) must still be made. Both of these are simple tasks.

The original cloud correlator has been modified mechanically for use as an X-ray scanner. In particular, the unnecessary equipment of the correlator has been removed, and brackets for the photomultiplier and light source have been added. In addition, an enclosure has been built for the apparatus so that it can operate in a lighted room. A precision variable-spot-size light source has been fabricated, but it has not yet been aligned and tested.

The final remaining task is to write the computer software to interface with the A/D converter. This has been done frequently at SSEC and is a routine task.

SUMMARY

This report has argued that X-rays contain their useful information in the rapid contrast changes (high spatial frequencies) of the image. It is necessary, therefore, to preserve or even to enhance these spatial frequencies in order to assure faithful X-ray transmission via ATS satellite.

The characteristics of several X-ray processing hardware concepts including digital processing of sampled X-rays, two-dimensional optical processing, and analog or digital processing of one-dimensional scan lines are discussed. It is argued that the one-dimensional analog scanner appears to be the most promising for an operational system. But the method of digital processing of one-dimensional scan lines is the most promising for experimental work because of the available equipment and experience at the Space Science and Engineering Center. The digital processing hardware acts as an input-output device to the digital computer which then simulates the X-ray electronic conversion and enhancement process, the ATS communication channel, and the post-reception processing and conversion back to the image.

IV

SATELLITE

BASE STATION OPERATION

SATELLITE

BASE STATION OPERATION

INTRODUCTION

This section of the report conveys the results of investigations into small terminal satellite ground station operating techniques utilizing the ATS (Applications Technology Satellite)-1 and ATS-3 satellites. The investigations were made over a nine month period at the University of Wisconsin-Madison in cooperation with similar efforts at Stanford University, Stanford, California, and the University of Washington, Seattle, Washington.

Tests conducted in the course of the project involved a series of experiments with voice and data transmission capabilities including hand-written messages (Electrowriter), facsimile (Xerox Telecopier) and slow-scan television. Both the simplex voice (one-way at a time) and the duplex voice (simultaneous two-way) modes of communication were tested. The results of each particular experiment appear elsewhere in this report and in the reports of the other cooperating universities.

It is hoped that the experience gained in ground station operating techniques set forth here will be of value to others who are presently engaged in setting up and operating similar satellite communications ground terminals.

ANTENNA PERFORMANCE

1. General Requirements

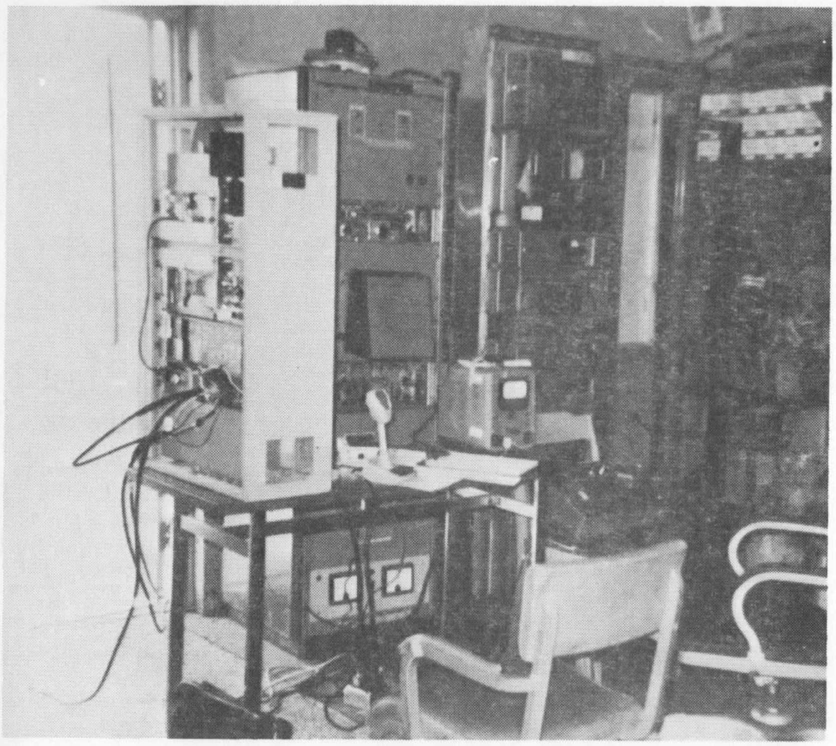
Gain The minimum antenna gain suitable for satellite communications can be calculated from power budget requirements. In using a Yagi array, gain can be increased by either adding elements or by "stacking" arrays. In either case, alignment of the antenna and matching harness becomes more difficult for more gain, minimum side lobes in the antenna pattern, and pattern stability. However, practical Yagi antennas with ten elements in the frequency range desired can be constructed by stacking in groups of two or four.

Polarization Another requirement for reliable communications through ATS-1 and ATS-3 is that the antenna be circularly polarized. Both satellites receive as well as transmit using linear polarization. Because of the unpredictability of the sense of this polarization at any given moment, due to satellite position and Faraday rotation of the polarized signal through the ionosphere, it is necessary to utilize ground station antennas which are not influenced by these variations. Therefore, the use of circular polarization is desirable. In the experiments at Wisconsin, major polarization shifts have been detected in less than 15 minutes.

A Yagi array can be constructed for circular polarization utilizing two linearly polarized arrays fed 90° apart in phase through the use of a one-quarter wavelength wiring harness. Several difficulties in utilizing this scheme will be pointed out later.

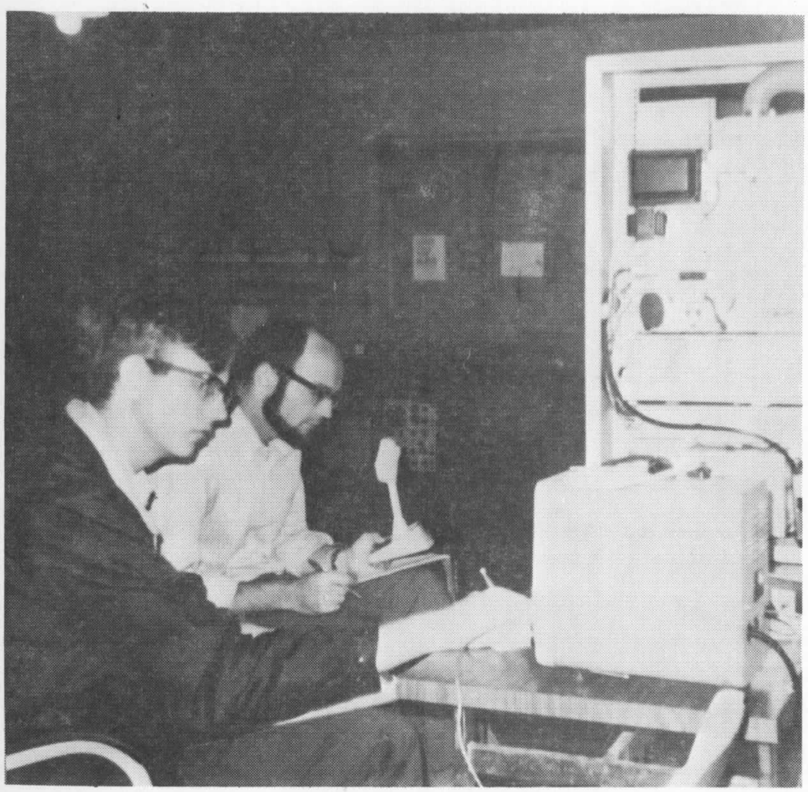
Bandwidth Another desirable quality of an inexpensive satellite communications antenna is large bandwidth. Unless a log periodic structure is involved, the Yagi array will not suffice for both receive and transmit

PICTURES OF SATELLITE BASE STATIONS

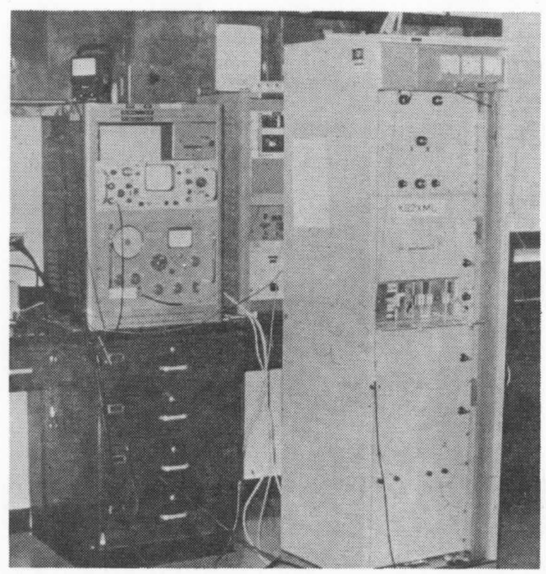


(left) Base station at University of Wisconsin Arlington Farms in the rural Madison area. (Motorola 100 watt transceiver in left foreground)

(below) Staff at the Arlington Farms station during medical discussion with Stanford University (October, 1971)



(below) Base station at the Space Science and Engineering Center on the Madison Campus (Motorola 375 watt transceiver)



functions on ATS-1 or ATS-3 due to the large difference between the 135.60 MHz (receive) and 149.22 MHz (transmit) frequencies. Thus, two Yagi antennas are required at the station for simplex operation. This is also necessary in most cases, however, for duplex operation. (A single antenna may be used for both transmit and receive functions simultaneously if a "duplexer" is utilized, at a sacrifice in cost and, usually, with a resultant loss of signal strength.) A helical antenna, on the other hand, has a broad bandwidth and can be used for both transmit and receive functions.

Reliability Other desirable features of a commercially produced ground station antenna are reliability and guaranteed specifications. The following factors should be carefully considered before selection of an antenna:

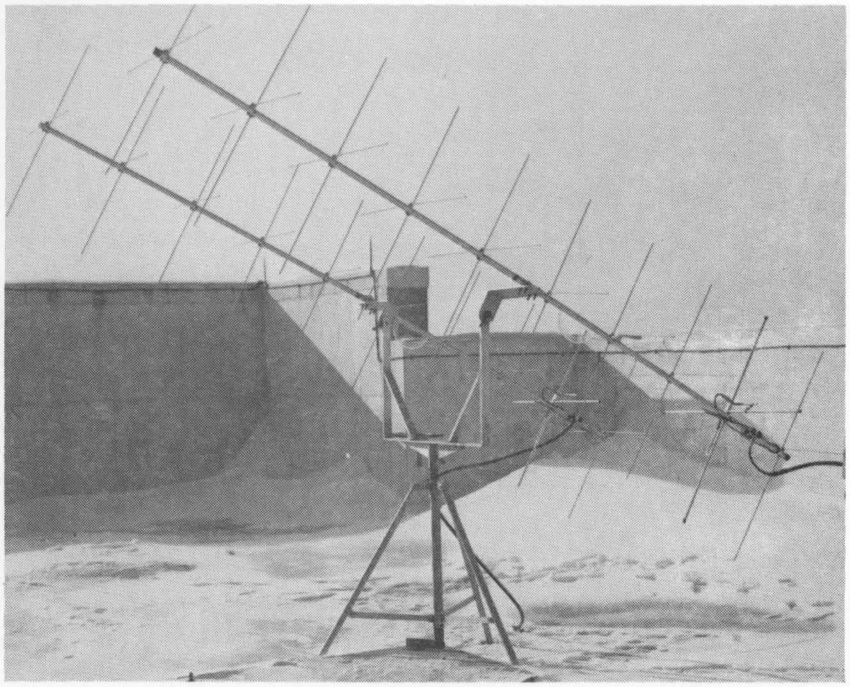
- the effect of weathering and aging on gain and polarization characteristics
- the reliability of the manufacturer's specifications for gain and polarization
- dependability of operation under extreme weather conditions.

2. Evaluation of an Inexpensive Commercial Yagi Array

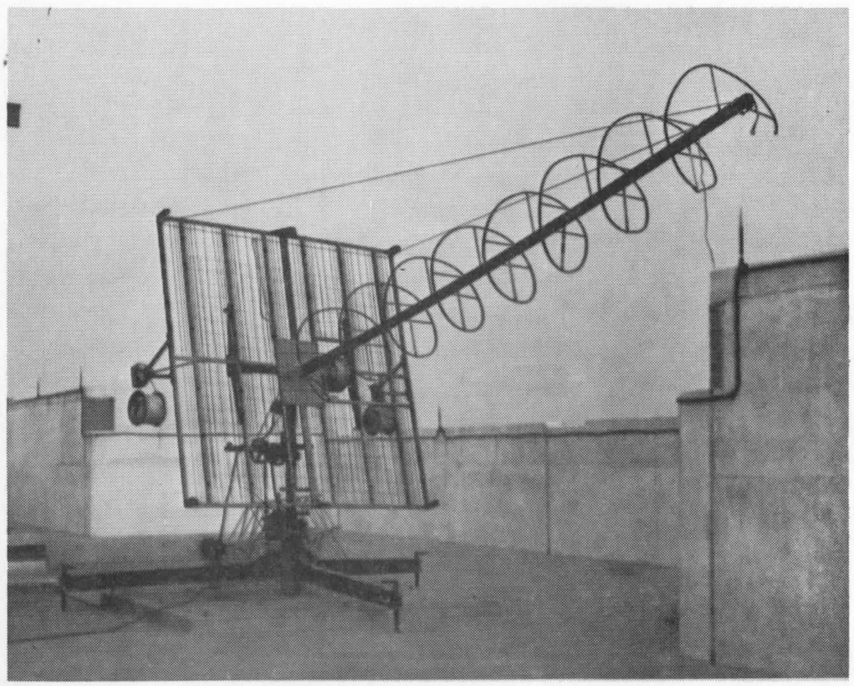
At the outset of the project, it appeared that an inexpensive commercial Yagi array could meet the necessary requirements. Specifications for the antenna cut to frequency were 13.6 dB forward gain at 400 KHz bandwidth for circular polarization. The cost of such a unit was approximately $50.00. A quad array of these antennas costs approximately $250.00. As a result, a quad array was purchased along with two single receive arrays and two single transmit arrays.

Water damage Several difficulties related to effects of water damage presented themselves with these antennas: the gamma matches on the driven elements were damaged; the heat-shrinkable tubing protecting the fixed

PICTURES OF ANTENNAS



(above) Cushcraft Crossed Yagi Antenna



(left) Example of a Helical Design Antenna capacitor of the gamma match allowed water seepage between it and the aluminum it was covering; and the "UHF" style coaxial cable connectors on the gamma matches were damaged. Because of the construction of these connectors, it was impossible to repair or replace them once damaged. Even after extensive weatherproofing utilizing rubber tape, plastic tape, and silicone grease the problem remained. (In planning to construct an antenna, it would be advisable to use type "N" connectors or some other similar constant impedance weather proof connector.)

Polarization Another difficulty involved the poor circular polarization characteristics of these antennas. Even though the antennas were mounted away from any metal booms by using wood standoffs, carrier quieting could be varied by as much as 11 dB by rotating the antenna about its longitudinal axis, thus indicating poor circular polarization. In Figure 1 (a graph of carrier quieting versus signal input power for the Motorola base station receiver), the 11 dB quieting variation indicates an actual variation in polarization of approximately 8 dB. Thus, these antennas had to be continually readjusted during transmission to match the sense of polarization received from, as well as that transmitted to, the satellite.

Because of the critical nature of the Yagi array related to the physical dimensions of construction required for proper operation, other problems which may occur are aging of the wiring harness, causing a degradation in circular polarization, and movement of the antenna elements due to wind, causing a decrease in gain and circularity.

3. Discussion of the Merits of Helical Antennas

Because of the unsuitability of the inexpensive commercial antenna and because of the critical nature of the Yagi array itself, it is suggested that a helical antenna be utilized.

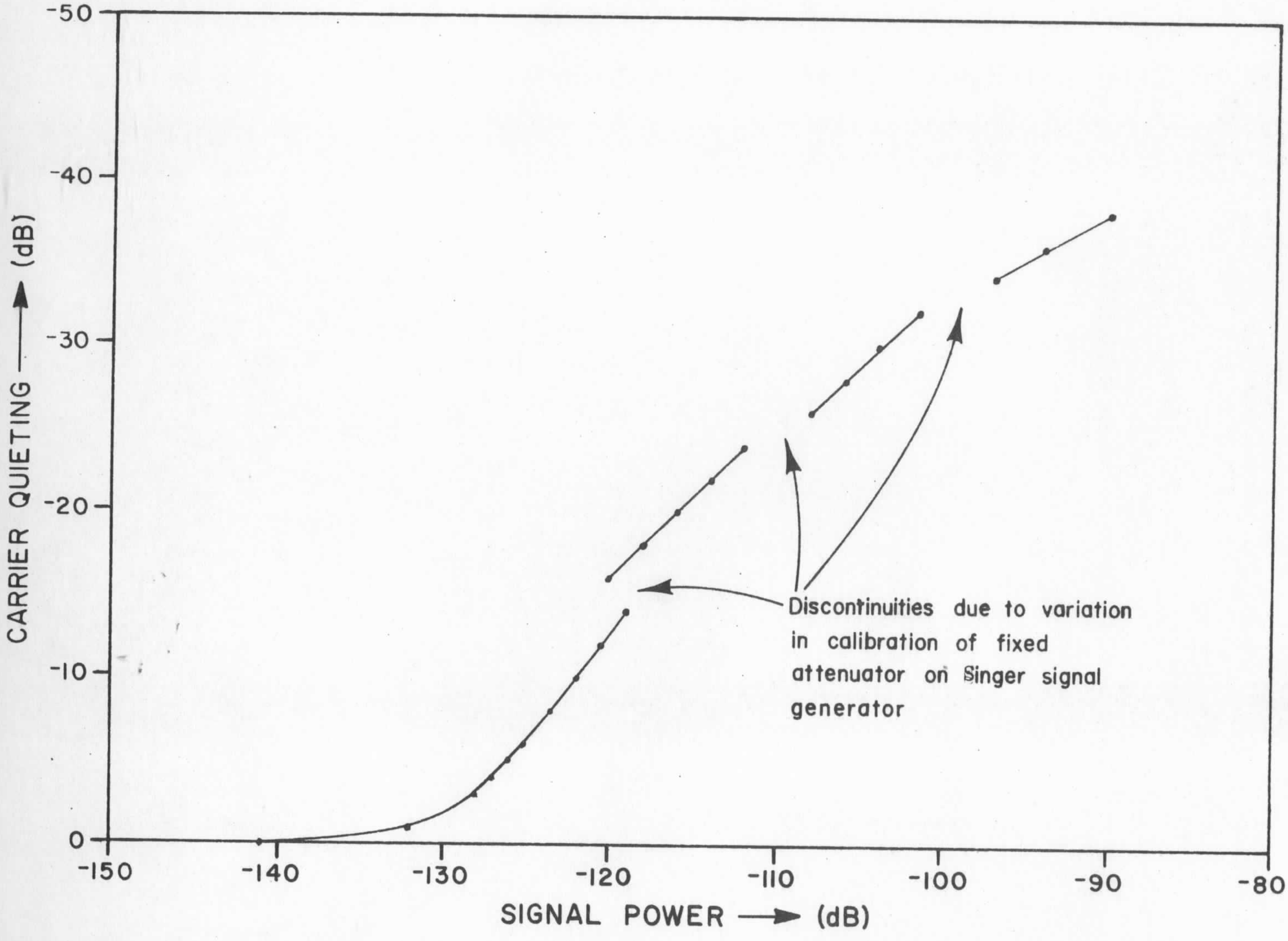


Figure 1: Carrier Quieting vs. Signal Input Power for the Motorola Base Station Receiver

Advantages A helical antenna has many advantages over the circularly polarized Yagi array, for the same forward gain.

1. It is a broadband device and can be used for both transmit and receive in a simplex situation.

2. Being a broadband antenna, it is less critical with respect to construction than a similar Yagi array. Thus it is easier to align. The length of the 90° phasing harness with the Yagi array directly influences the circularity of polarization, and is thus quite critical. Due to the symmetry of the helical antenna, however, the polarization will not be influenced by the length of the matching section. Only the power transfer will be affected.

3. A helical antenna's gain increases linearly with length whereas the increase in gain of a Yagi array is not linear with length. Thus it would be possible to double the effective radiated power of a helical antenna by doubling the physical length. However, to double the effective radiated power of the Yagi array, more than double the length would be required. Thus, stacking two or more Yagi arrays is the usual procedure for increasing gain. This leads to more complications again with the phasing harness and spacing for optimum gain with minimum side lobe structure.

4. In certain situations the side lobe structure of the antenna may be of significance with reference to the ground reflection problem. This is shown in Figure 2. If a phased array is utilized, more side lobes will be present thus adding to the complexity and unpredictability of the problem. A single helical array will have fewer side lobes than a comparable Yagi array. In either case, it is best to mount the antennas near the ground to minimize this effect.

Disadvantages A helical antenna does have some disadvantages in comparison to a Yagi array.

1. It is usually more bulky and more difficult to support mechanically.

2. It usually has more wind loading and, thus, may be more subject to mechanical stress.

3. There are no inexpensive helical arrays suitable for satellite use available commercially.

College Alaska, the University of Washington, and Stanford University have successfully utilized helical antennas of their own design in their programs. Because of their superiority over the Yagi array, as outlined previously, this type of antenna is advisable for use with ATS-1 and ATS-3 satellite communications.

SITE LOCATION

The site location for a satellite ground station is an important factor for successful and reliable communications. When selecting a site, five potential sources of signal degradation must be considered: satellite path obstructions, ground reflection cancellation, propagation changes, electrical interference, and interference from other transmitters.

1. Satellite Path Obstructions

A clear path to the satellite should be of first concern in selecting a site. Even if the path is only partially obstructed by, for example, buildings, hills or mountains, there may be considerable signal degradation due to knife edge diffraction around these obstacles. This may occur, even if the obstruction is some angular distance from the line of sight path to the satellite.

2. Ground Reflection Cancellation

The geometry of ground reflection is shown in Figures 2a and 2b. At low angles of incidence, an antenna is particularly subject to phase cancellation from the reflected wave since the angle of the reflected wave is within the beamwidth of the receive antenna. At higher angles, the antenna side lobe structure may also influence this degradation.

As was indicated in tests related to establishing a better site for the location of the ground station, the best way to deal with this problem is to mount the antennas on the ground in a flat area with a clear view to the satellite. This will eliminate most of the ground reflections and subsequent fading due to changing relative phase shifts between the two paths.

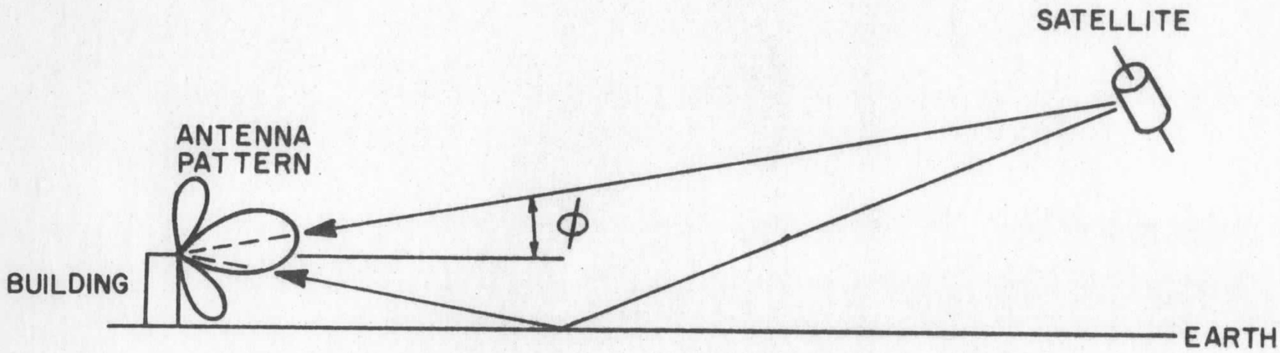


Figure 2a: The Geometry of Ground Reflection at Low Angles (Due to the low angle, ϕ, of the satellite, lobe structure has little effect on ground reflection.)

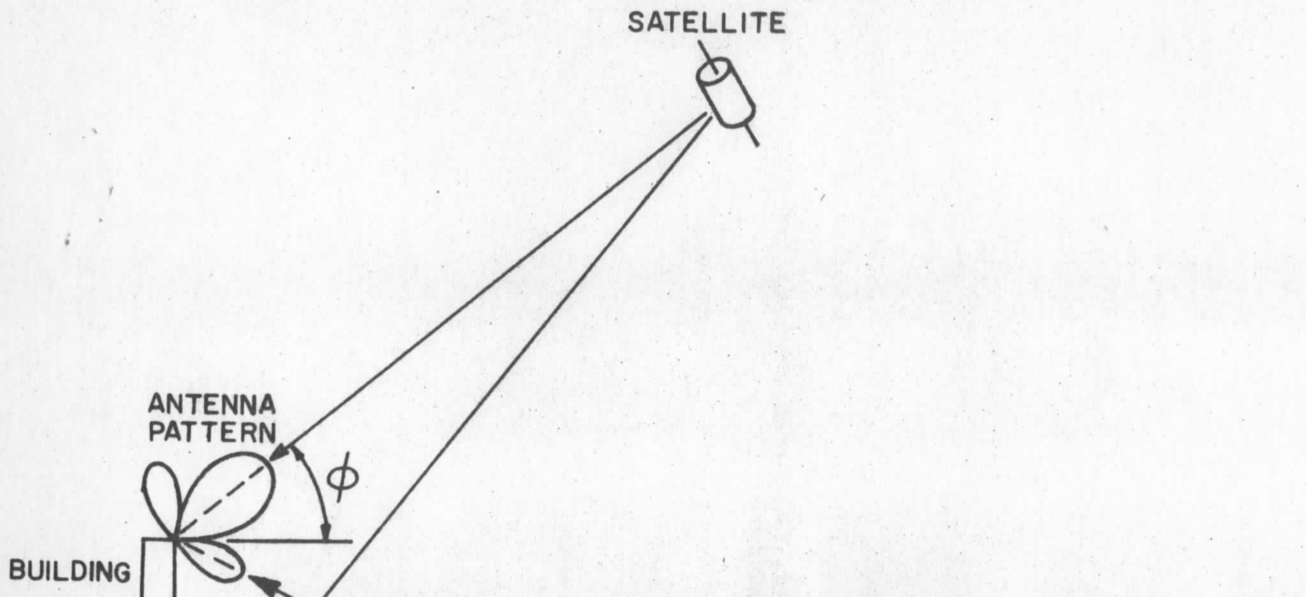


Figure 2b: The Geometry of Ground Reflection at High Angles (With higher angle, ϕ, the side lobe mitigates the ground reflection problem.)

Degradation of signal strength at SSEC, observed during site tests, was due to ground reflection and antenna polarization, since comparable antennas and equipment were utilized at all sites (see Table 1).

One noteworthy result is that reception at remote sites was more consistent (25 dB or greater) than reception at SSEC. Polarization and ground reflection problems create gross fluctuations as well as simple degradation in reception.

TABLE I

SATELLITE RECEPTION AT REMOTE SITES COMPARED TO SIMULTANEOUS RECEPTION AT SSEC

Remote Site	Best Quieting Achieved At Remote Site	Best Quieting Achieved At SSEC
Site 1	25 dB	≈20 dB
Site 2	26 dB	18 dB
Site 3	28 dB	17 dB
Site 4	25 dB*	15 dB
Site 5	27 dB*	10 dB

*Adjusted antennas for Polarization

3. Propagation Changes

Due to the low angle of the path to the ATS-1 satellite from Madison, more atmosphere is encountered along the path thereby increasing propagation difficulties.

One frequent propagation difficulty is degradation of signal strength due to polarization shifts. These shifts are caused by Faraday rotation through the ionosphere. The best solution to this problem is obtained by the use of good, circularly polarized antennas. If such an antenna is used, the polarization of the incoming signal and changes in polarization will be of little consequence.

Another difficulty encountered is related to tropospheric inversion layers. These layers, which consist of warm, moist air over cold air, refract satellite signals which will then be attenuated along the line of sight path. This must be taken into account in the fade margin budget.

4. Electrical Interference

Many types of electrical interference may effect selection of a site. Ignition noise is usually the most common type. Any site should be kept away from well-traveled roads and highways. If located on a farm, attention should be given to keeping tractors and trucks out of the immediate area.

Any type of electrical machine or appliance is also a potential source of interference. Because of the difficulty in suppressing this interference at the source, it is best to place the site away from industrial areas, construction sites, high voltage power transmission lines and highways.

One of the advantages of frequency modulation is its impulse noise suppression property due to hard limiting. However, this noise suppressing property is seriously degraded under marginal reception since the limiters are not fully saturated. Because marginal reception is often encountered, electrical interference is of serious consequence in the average ground station receiver.

5. Interference from Other Transmitters

Aircraft interference One of the difficulties in the use of the ATS-1 and ATS-3 satellites is that their transmitter output frequencies coincide with some aircraft frequencies. As a result, ground station receivers may encounter some interference from either the aircraft itself or the aircraft ground facility transmitter.

At Wisconsin interference has been encountered on 135.60 MHz. A Chicago sectional aeronautical chart indicates that a transmitter exists in Burlington, Wisconsin, operated by the Chicago air route traffic control center on 135.60 MHz. To alleviate this problem on a temporary basis, it is possible to use another channel through the satellite thereby avoiding the signal entirely. Notification of any problems such as these should be made to NASA headquarters.

Receiver Intermodulation If the ground station receiver is located in an area of congested "high band commercial operation" along with VHF broadcasting service operation, there may be a combination of certain frequencies in use which may mix in the receiver and produce a spurious response on the receive frequency. Direct "intermod" such as this is usually characterized as a carrier, with or without audio, and usually a squeal or screech associated with it. Three actions can be taken to minimize this problem: (1) The best alternative is to move the receiver site away from the sources of interference. Because of the unpredictability of this type of interference, it is usually wise to place the receiver outside of any cities and away from broadcasting transmitters. (2) If the interfering signals are spaced far enough away from the receive frequency, a filter (either cavity or special crystal) may be used in the receive line to reduce the strength of the interfering signals. However, there is usually a loss associated with these devices which may be unacceptable under marginal conditions. (3) Another possibility is to obtain a receiver with better intermod performance. Manufacturer's specifications will aid in this matter.

An external preamp will usually degrade intermod performance. If the intermod mixing is occurring in the receiver, the additional gain of the preamp may increase the level of the interfering signals. Also, the intermod may be occurring in the preamp itself. This is especially true of many bipolar transistor preamps. Removing the preamp thus may aid in this problem.

Jamming One of the disadvantages of any repeater system is its susceptibility to deliberate jamming. With the recent publication of the satellite's channel 1 frequencies in a popular magazine, this problem has become potentially more dangerous. If jamming does occur, it may possibly originate from anywhere in an area covering 1/3 of the globe. If there is reason to suspect that it may be originating in a given area, a receive crystal for the ground station transmit frequency may be of aid in locating the source.

In some cases it may be possible to switch to another channel after which the jammer (if he is crystal controlled on the well-known frequency) may give up.

* * * * *

In summary, it is advisable to locate a ground station on flat land with a clear view to the satellite and with antennas as close to the ground as possible. The site should be located far away from possible sources of interference. Heavily populated areas should be avoided if possible.

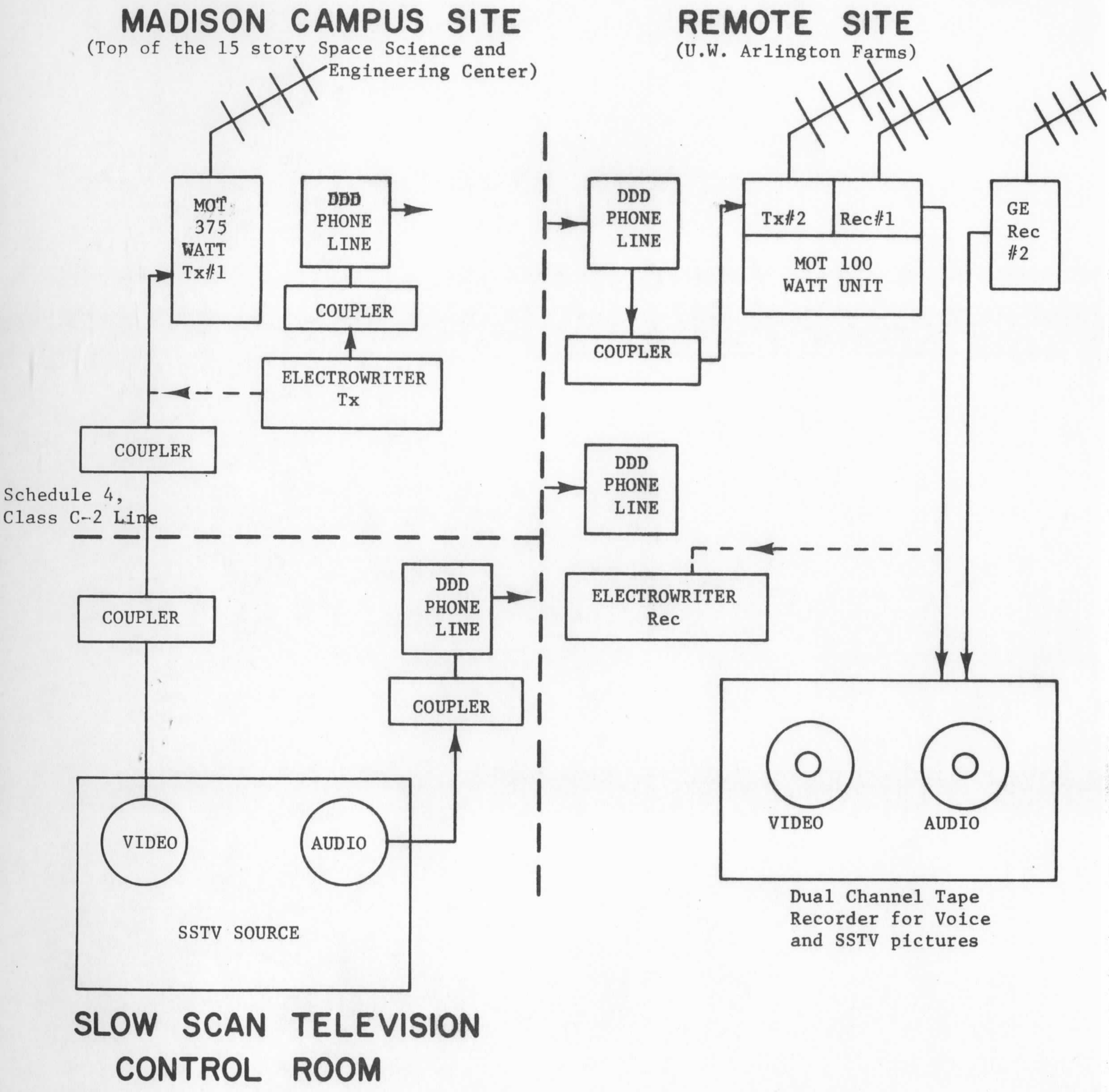
RECEIVER SENSITIVITY

Receiver sensitivity is an important factor in any communications link, especially in the case of the ATS-1 satellite where the satellite's transmitted power is 40 watts at more than 22,000 miles away. The 375 watt

Motorola base station (model #B93 MPB-1136A) receiver has a specified receiver sensitivity of less than 0.5 microvolts (μv) for 20 dB quieting. This is also true of the 100 watt unit (model #C73MHX-1126AR-W-SP1). An alignment by the manufacturer's representative was done on the receiver to ensure performance within specifications. In addition, a preamplifier was used with the receivers producing a minimum specified sensitivity of 0.25 μv for 20 dB quieting. Sensitivities as low as 0.175 μv were measured. During early project tests from the 15 story Space Science and Engineering Center (SSEC) building, reception was poor (at times, 10 dB or less) due to poor site location and antenna performance. (See Figure 3 for diagram of base station set-up.) At that time, special attention was paid to receiver sensitivity in order to obtain better reception. However, improved sensitivity was not the key to better performance as was proved later at the remote site. There, 20 dB and better quieting were experienced with the same sensitivities measured before. The 0.175 μv sensitivity represents about the lowest figure obtainable in standard communication equipment. When using a receiver in an experiment that runs over several months, it is recommended that the sensitivity be periodically checked. A down link power budget for the 40 watt ATS-1 satellite is shown in Table II.

TRANSMITTED POWER

Effective communications links were established through the ATS-1 satellite using two transmitters with different power levels. The SSEC building transmitter was a 375 watt unit with a 70 watt loss in the antenna feed. The transmitter was used with an antenna which had a specified gain of 13.6 dB. This power level usually saturated the satellite and was more than adequate even for the low (poor) transmitting angle to ATS-1 (8-10°



<u>Figure 3</u>: Diagram of Basic Satellite Test Set Up

above the horizon) and the wide antenna beam width (10-20°). The second transmitter was a 100 watt unit used at the remote site which on days with poor atmospheric conditions and low antenna gain did not always provide optimum satellite repeater signals. If the transmit angle is better (greater than 10° to the horizon), if there are low losses in the coax (less than 40 watts), and if an antenna is used which has 10 dB or greater gain, a 100 watt unit is adequate for effective transmissions, as shown in Table III.

Maximum power, as stated in the FCC's Rules and Regulations, Part 5, Paragraph 5.015,... "shall not be in excess of the maximum obtainable power of the transmitter consistent with satisfactory technical operation."

Limits on types of emissions are stated in that document and are listed under Paragraph 5.103. The reader is referred to that document for definitions and regulations.

OPERATOR INTERFACE

Prior to an experiment, actual operator convenience is all too often given little thought. Yet it is this man-machine interface that makes for a successful and efficient experiment.

During a typical experiment, an operator will be required to operate the transmit switch, volume control, squelch control; read the power output meter, frequency deviation meter; make quieting measurements; switch in auxiliary equipment (e.g., Electrowriter, tape recorder); operate the equipment, and record measurements all within alloted satellite time. If excessive air time is spent getting equipment positioned and married together, this robs valuable experiment or satellite programming time.

TABLE II

VHF Communication Link

Power Budget for ATS-1

Down Link fo = 135.6 MHz

Required Received Carrier Power in dBw For .25 v Sensitivity for 20 dB Quieting	-149.2
Transmitter Power, dBw	16.0
Transmitting Losses, dB	-2.4
Path Losses, dB	-166.6
Polarization Loss, dB	-3.0
Line Loss	-1.0
Receiving Antenna Gain	13.6
Spin Modulation Fading Allowance	-3.0
Degradation Due to Tropospheric Refraction (Depends on Weather)	?
Probable Received Carrier Power Under Stable Conditions	-137.4

TABLE III

VHF Communication Link Power Budget

Up Link fo = 149.20 MHz
B = 25 KHz

Receiver Noise Figure, dB	5
Receiver Noise Temperature, °K	660
Receiving Antenna Noise Temperature, °K	300
Total Noise Temperature, °K	960
Total Noise Temperature, dB above 1°K	29.8
Boltzmann's Constant, dBw/°K/Hz	-228.6
RF Bandwidth, dB above 1 Hz	44.0
Total Receiver Noise Power dBw	-154.8
C/N Allowance, dB	10
Required Received Carrier Power, dBw	-144.8
Transmitted Power, dBw	20
Transmitted Posses, dB	-1
Transmitting Antenna Gain	13.6
Path Losses, dB	-167
Receiving Antenna Gain	8.5
Receiving Losses, dB	-1
Polarization Loss, dB	-3
Spin Modulation Fading Allowance	-3
Probable Min. Received Carrier Power, dB	-132.9

Power Margin 9.9 dB

All equipment which must be operated and material that is to be read by the controller must be within arm's reach from a seated central location. All equipment that must feed into the transmitter should be wired to a central selector switch to provide convenient operator selection and isolation. In many cases, the person giving the lecture may need one hand on his notes and another to operate a visual aid, requiring a complete hands-off operation of the radio. In the case of simplex operation, a simple toggle switch is required to convert from voice to visual aid transmission.

While each station site and test set-up is different, it cannot be over-emphasized that each transmission be proceeded by a dry-run to check for equipment interface and possible operator inconvenience and confusion. All switch positions must be labeled and diagrams of the controls posted in a convenient spot for immediate reference.

It is imperative that courtesy and consideration always be used when working with a satellite communications link that has many users and listeners. General rules of operation having to do with station identification, test identification, time usage and sign off calls are the radio operator's "punctuation marks." They should be carefully followed. Proper air time authorization from ATS Operations Control is important. Unless test times are carefully confirmed, resulting confusion may lead to interference with another station's test. "Keying" the carrier signal at the wrong time, for example, can destroy the experiment of another group.

V

GENERAL RECOMMENDATIONS

GENERAL RECOMMENDATIONS

1. The versatility and scope of coverage offered by the combination of telephone and satellite image transmission offers great potential for the future. Such a combination will unite the extensive coverage capability of telephone with the long distance isolated coverage advantages of satellites. Research effort on future satellites (ATS-F&G) is recommended to develop a technical capability for combining the media of telephone and satellite.

2. ATS-1 experimentation should continue as long as possible focusing on the utilization of the voice and facsimile transmission. These forms have already been demonstrated to be technically feasible. The development of software and the application of this media to solve present problems and experiment with new projects can continue without waiting for more sophisticated satellites. Demonstration of the versatility and practicality of satellites in the near future can provide visibility essential for long range future support and development.

3. In the future, there will be circumstances when narrow band with television via satellite will be feasible and practical for education and service purposes. Research and development should be continued using ATS-F.

A P P E N D I C E S

Appendix I

OBTAINING NASA AND FCC APPROVAL FOR EXPERIMENTAL OPERATION

The first step toward authorization for the use of ATS-1 or ATS-3 is to write a letter to

Mr. Richard B. Marsten
Director, Communications Programs
Office of Space Science and Applications
National Aeronautics and Space Administration
400 Maryland Avenue, S.W.
Washington, D.C. 20546

Once authorization is obtained, the contact for operational matters is

ATS Ground Support Manager
Code 460
Goddard Space Flight Center
Greenbelt, Maryland 20771

Further information can be found in the "ATS UHF Experimenter's Guide."

In addition to NASA approval, the experimenter needs a radio station license to transmit on 149.22 MHz and 149.25 MHz.

The necessary forms can be obtained from

Federal Communications Commission
Washington, D.C. 20554

The two forms required are

1. FCC Form 440
   Application for New or Modified
   Radio Station Construction Permit
   Under Part 5 of FCC Ruler

2. FCC Form 403
   Application for Radio Station License
   or Modification Thereof

Approximately 90 days are required for receipt of the license. Further information is in "Rules and Regulations Part 5" of the Federal Communications Commission.

Appendix II

MODIFICATIONS REQUIRED FOR OPERATION OF THE MOTOROLA 100 WATT COMPA-STATION (Model No. C73MHX-1126AR W SP1)

The use of separate receive and transmit antennas is required when using the Yagi array since the transmit and receive signals are on widely separated frequencies. The receiver input cable was disconnected from the antenna relay and connected to an additional UHF connector that was mounted on the back panel. The transmit antenna connections were left unchanged.

It became necessary to disable the receiver mute control circuitry in order to prevent receiver muting when operating in the "duplex" mode. This modification also permits monitoring of the transmitted signal coming back. Diode CR7, line driver disable, was removed from the line driver module. Receiver wires for audio disable (#13) and receiver mute (#14) were also removed.

The receiver control circuitry automatically connects channel element number one to the receiver when the transmitter is operated on transmit channel one. The receive and transmit elements for channel number two function in a similar manner. The automatic switching was disabled by the removal of diodes CR12 and CR13 on the C2-R2 control module. A SPOT toggle switch was connected between ground and the two receiver channel elements to allow amnual channel selection. The switch was physically mounted on a small metal bracket that was mounted on the C2-R2 control module.

Two notch filters, one for receive and one for transmit are located on the F1 control module. The notch filters, which have a center frequency of 2175 Hz, suppressed desired signal information in the Electro-writer and slow-scan television experiments.

The filters were disabled by removing the input and output leads from the filter and then coupling these leads together with a capacitor.

Appendix III

MODIFICATIONS REQUIRED FOR OPERATION OF THE MOTOROLA 375 WATT BASE STATION

(Model No. B93MPB-1136A)

Modifications on the Motorola 375 watt Base Station were more extensive than the modifications to the 100 watt Compa-Station. This is due partly to the fact that the Base Station has two receivers and partly to the addition of the manual mute control.

A list of wire and component changes and a circuit diagram are shown below, as well as a block diagram of the modified base station control circuitry. Antenna connection changes are identical to those on the Compa-Station.

The mute control modifications provide several options. Switch S4 is a SPDT "center-off" toggle switch. In the "center-off" position, neither receiver is muted at any time. In the "up" position, receiver one or receiver two, depending on the position of switch S3, will be muted at all times. In the down position, the receiver selected by Switch S3, will be muted only when the transmitter is operated.

The manual, channel selection modification on the Base Station was identical to the modification on the Compa-Station, with the exception that two switches were added because the Base Station has two receivers. The squelch and level controls for receiver number two were trim pots mounted on the C2-R2 control module. These pots were replaced by conventional one-turn carbon pots in order to provide easier access. The switches and pots are mounted on a bracket that is mounted on the C2-R2 control module. The notch filter modification that applied to the Compa-Station also applied to the Base Station.

Wire Changes

1. Remove (Cut P.C. Line) connection from Pin #19 of Station Logic Module to Pin #3 of C2-R2 Control Module.

2. Remove (Cut P.C. Line) connection from Pin #9 of OP Module to Pin #9 of C2-R2 Control Module.

3. Add wire from Receiver 1 Mute (Pin #C-1) to Pin #19 of C2-R2 Control Module.

4. Add wire from Station Logic Module (Pin #3) to Pin #18 of C2-R2 Control Module.

5. Add wire from Receiver 2 (Pin #F-2) to Grey Wire Pin #3 of C2-R2 Control Module.

6. Add wire from Receiver 2 (Pin #F-3) to Pin #9 of C2-R2 Control Module.

Components Removed

1. Line Driver Module -- diode CR7

2. C2-R2 Control Module -- diode CR10

3. C2-R2 Control Module -- diode CR12

4. C2-R2 Control Module -- diode CR13

Components Added - C2-R2 Control Module

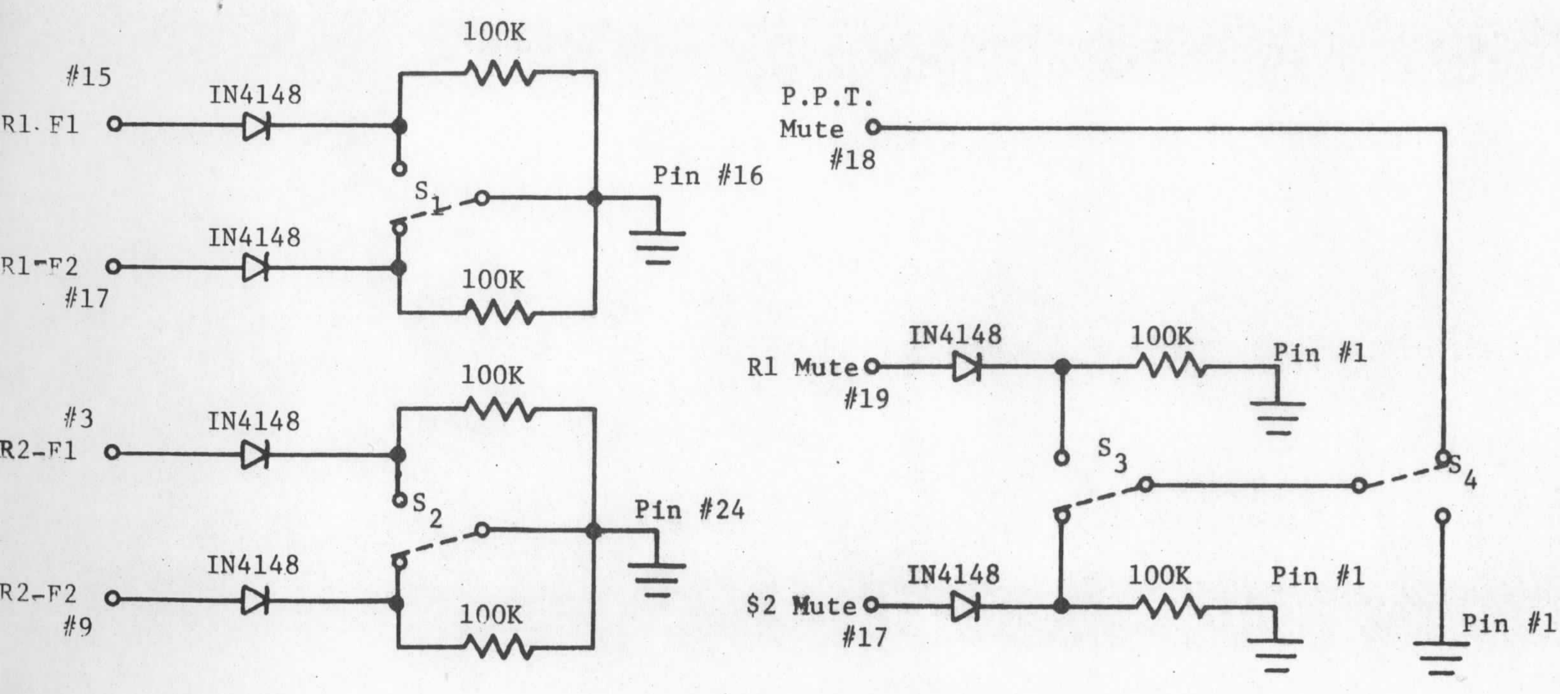


Figure 1: Diagram of Circuit Changes

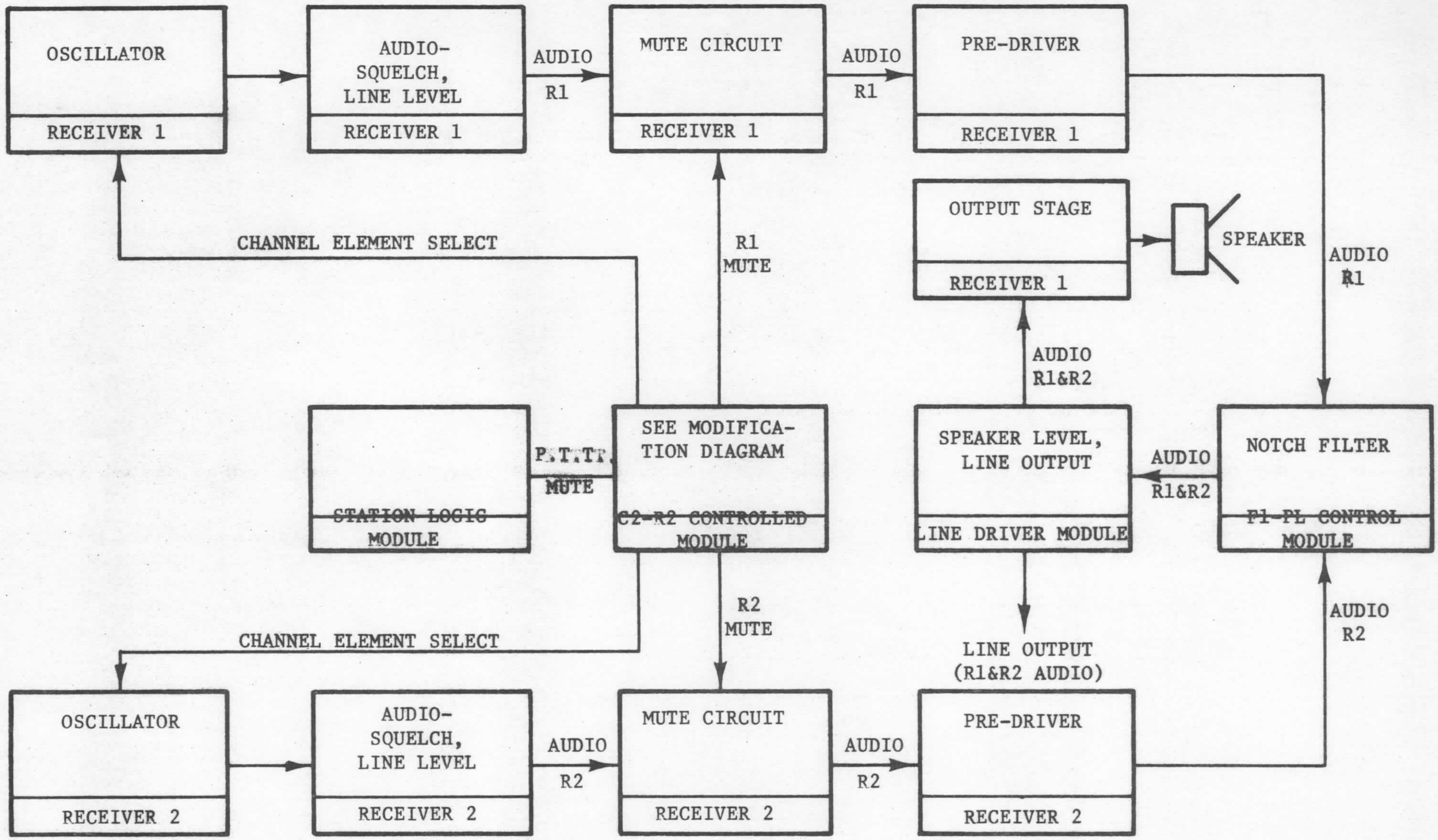


Figure 2: Modified Base Station Control Circuitry

APPENDIX IV

SPECIFICATIONS FOR VOICE BANDWIDTH DATA CHANNELS

AT&T, the source of most communication channels of this nature, specifies and guarantees the electrical characteristics of most of its leased telephone lines. FCC Tariff No. 260 describes the most commonly used line, Type 3002. This line is virtually the same as lines used on a dial-up telephone network. The Type 3002 is designed primarily to handle the electrical characteristics of voice, but it can also transmit data alternately such as the Electrowriter. Aside from AT&T administrative instructions, the type 3002 has no FCC regulated distortion specifications. Even though the line's frequency response extends from about 300 Hertz to over 3000 Hertz, its usable bandwidth is very narrow; only about 1800 Hz. AT&T only specifies distortion levels between 800 and 2600 Hz. Within that frequency range, its frequency response can vary in amplitude by as much as 10 dB. Its bandwidth can vary, its envelope delay can vary, and its characteristics can even vary with the weather. To widen the usable bandwidth, AT&T offers at additional cost, line equalization to specified and federally regulated electrical characteristics.

Table of

Specifications for a Voice Bandwidth
Data Channel (3002) (Courtest of AT&T)

General Characteristics	
Type of Service	2 Point or Multipoint
Mode of Operation	Half- or Full-Duplex
Method of Termination	2-wire or 4-wire
Imped-Source & Load	600 ohm- Resistive-Bal.
Maximum Signal Power	0 dBm for Composite Data Signal, 0 VU for Voice
Attenuation Characteristics	16 dB ± 1 @ 1000 Hz
Measured between 600 ohm Impedances at Lineup (Recommended)	Short-term ± 3 dB
Expected Max. Variation of Loss	Long-term ± 4 dB
Frequency Response (Ref.) 1000 Hz	Freq. Range-Var. dB 300-3000, -3 to +12 500-2500, -2 to +8
Frequency Error	±5 Hz
Delay Characteristics	
Absolute Delay	Not Specified
Envelope Delay Distortion	Less than 1750 us @ 800-2600 Hz

APPENDIX V

University of Wisconsin--Madison

EDSAT Center

NLM Project

SATELLITE EXPERIMENT: MEDICAL USES OF ELECTROWRITER EVALUATION PROCEDURES

I. Introduction

Satellite communication systems utilize "stationary" satellites to relay radio signals. Using the present experimental educational satellite system, radio transmissions which would originate from any location can be beamed to a satellite, which would then retransmit the same information. Because of the height of the satellite above the earth, any receiving equipment within an area covering 1/3 of the surface of the earth can utilize the transmitted information.

Communication satellites have been used commercially for several years. Many applications, some in the field of education and health are in the process of being developed and evaluated. Such systems offer the opportunity for 1) communication over long distances (often where telephones are unavailable or impractical) and 2) the origination of messages from any site within the communication "shadow" (area) of the satellite and 3) dissemination and reception of the communication over an area as large as 1/3 of the surface of the earth.

Electrowriter is a method of transmission of a handwritten copy over distance. The equipment has been designed for the transmission of the image over commercial telephone lines. However, it has been demonstrated that many types of data signals conveyed over telephone lines can also be transmitted with little difficulty over long distances via radio. This fact has prompted the experimentation of sending many different kinds of data - designed for telephone transmission - via radio.

II. Experiment

The EDSAT Center has recently completed a series of tests with Stanford University sponsored by the National Library of Medicine which were designed to investigate the use of satellite communications for medical purposes. The NASA experimental satellites ATS-1 and ATS-3 were utilized. These same satellites are now being used for actual health care and health education purposes in isolated areas within the State of Alaska.

A main objective of the Electrowriter experiment is to assess and evaluate the Electrowriter as used via experimental satellite in the health sector. This includes the evaluation of this medium--at the present state-of-the-art--for such areas as acute patient care, education of health professionals, health education of a public, medical research and administration.

In this phase of evaluation there will be participation by those involved in health education at both the University of Wisconsin and at Stanford. The results of several experiments will be presented. It is important to note that the medium and not the program content is to be evaluated.

To demonstrate the potential of the medium, several types of information have been transmitted--charts, graphs, line drawings, words, phrases, numbers and combinations of these.

III. Evaluation

This evaluation will have seven (7) parts.

1. Demonstration of the Electrowriter
2. Evaluation of Electrowriter performance via satellite in mode 1
3. Evaluation of Electrowriter performance via satellite in mode 2
4. Comparative evaluation of Electrowriter with voice in modes 1 and 2
5. Evaluation of the Electrowriter as a medium for conveying medical information
6. Evaluation of potential applications
7. General comments

In this experiment, two alternative modes have been examined for the transmission of Electrowriter messages (images) accompanied by voice.

Mode 1 utilizes a single transmitting channel so that only the voice or the written message may be transmitted at any given time. In this mode, the two signals cannot be sent simultaneously.

Mode 2 utilizes two transmitting channels so that the two signals can be transmitted simultaneously.

An important characteristic of mode 1 is that the total time consumed by transmitting voice commentary and a written message separately is more than the time consumed by transmitting the same information simultaneously as in mode 2. Typical Electrowriter messages require two-four minutes for transmission depending on their complexity.

An important characteristic of mode 2 is that, given the present state-of-the-art, the two signals when transmitted simultaneously are weaker and therefore "noisier." This means that either the quality of the voice or the message or both may not be as good as in mode 1.

Please keep in mind that the Electrowriter is being considered primarily as an aid to voice communications to isolated areas where communications are presently marginal and where telephones could not be used. It is assumed that two-way communications between a central location and isolated areas would be available. This means that each station could transmit and receive the Electrowriter messages along with voice communications. Communications may be between a single source and single receiver or a single source and many receivers (e.g., villages in Alaska).

Part 1 - Demonstration of the Electrowriter

a) The person in charge of the demonstration will write a few words and sketch 1 or 2 simple figures to show you how the Electrowriter works. [The EW transmitter will be connected directly to the EW receiver and to the EW overhead projector.]

b) Person in charge will briefly explain principles of operation.

Part 2 - Evaluation of Electrowriter Performance via Satellite in Mode 1

a) Person in charge will play segment 1 of cassette tape. This recording was made 6 January 1972. Transmission originated at Madison and was received at Stanford and Arlington, Wisconsin. This recording was made at Arlington. [While tape is playing, person in charge will simulate free hand the messages actually transmitted while the EW tone is transmitted. Use EW overhead projector.]

b) When segment 1 of tape is completed, person in charge will project actual results (transparencies E1-E5) obtained via satellite on a normal overhead projector.

c) Evaluators will at this point respond to questions A-1 and A-2 on the questionnaire.

Part 3 - Evaluation of the Electrowriter Performance via Satellite in Mode 2

a) Person in charge will play segment 2 of cassette tape. This recording was made 13 January 1972. Transmission originated at Madison and was received and recorded at Stanford. [While tape is playing, person in charge will again simulate free hand the messages actually transmitted while voice was being transmitted. Use EW overhead projector.]

b) When segment 2 of tape is completed, person in charge will project actual results (transparencies E6-E9) obtained via satellite on a normal overhead projector.

c) Evaluators will at this point respond to questions A-3 and A-4 on the questionnaire.

Part 4 - Comparative Evaluation of Electrowriter with Voice in Modes 1 and 2

a) Person in charge will project actual results obtained via satellite in modes 1 and 2 to serve as additional data for comparison. (Transparency E17)

b) Evaluators will respond to question B on the questionnaire.

Part 5 - Evaluation of the Electrowriter as a Medium for Conveying Medical Information.

a) Please read:

As a medium for conveying medical information the Electrowriter has some obvious advantages and disadvantages. For example, it permits the speaker to make written notes, comments, diagrams, etc. as he talks.

The pen itself can be used as a pointer to emphasize particular notes. The whole message may be projected on to a screen for simultaneous large-group viewing at remote sites. On the other hand, the Electrowriter cannot transmit photographs or very complex charts and figures as can be done via satellite with the Xerox Telecopier.

The purpose of this part of evaluation is to get your reaction to the information-carrying capability of the Electrowriter as it might be applied in several kinds of medical communications.

b) Person in charge will show actual results (transparencies E10-E16) on normal overhead projector. These results, together with what you have already seen will serve to illustrate the kinds of information that can be successfully transmitted.

c) Evaluators will respond at this point to question C on the questionnaire.

Part 6 - Potential Applications of the Electrowriter in Medical Communications to Remote Areas

(Please respond to question D on the questionnaire.)

Part 7 - General Comments

(Please respond to question E on the questionnaire.)

16 February 1972

APPENDIX VI

Electrowriter Satellite Experiment

QUESTIONNAIRE

SAMPLE

(Mean scores actually obtained in evaluation are indicated.)

Evaluator's Name ______________________________

Evaluator's Professional Field ________________

Mode 1 - Electrowriter image alternated with voice
Mode 2 - Electrowriter image simultaneous with voice

A. Quality of the Electrowriter Image Received via Satellite (Note: Some of the transmitted images appear faded. This is because the kind of ink used in the original drawing did not reproduce well on the xerox machine. Please disregard this fading of the transmitted images in your evaluation.)

1. Select a number from the scale to indicate how you felt about the quality of the received Electrowriter image in mode 1 when compared to the transmitted image.

POOR 1 2 3 4 5 6 7 EXCELLENT

5.6 (Place a number from the scale)

2. Select a number from the scale to indicate the extent to which you felt the quality of the received Electrowriter image in mode 1 was adequate for the following purposes.

VERY INADEQUATE 1 2 3 4 5 6 7 VERY ADEQUATE

a. Transmitting records (charts, graphs, memos, patient records, etc.) 5.4

b. Visual aid in remote teaching 6.0

c. Aid in remote diagnosis and patient care (description of injuries, instructions for care of patient, etc.) 6.2

d. Visual aid in peer group teleconferencing (among researchers, teachers, administrators, etc.) 5.7

3. Select a number from the scale to indicate how you felt about the quality of the received Electrowriter image in mode 2 when compared to the transmitted image.

POOR 1 2 3 4 5 6 7 EXCELLENT

3.9

4. Select a number from the scale to indicate the extent to which you felt the quality of the received image in mode 2 was adequate for the following purposes.

VERY INADEQUATE — VERY ADEQUATE

1 2 3 4 5 6 7

a. Transmitting records (charts, graphs, memos, patient records, etc.) 3.5

b. Visual aid in remote teaching 4.1

c. Aid in remote diagnosis and patient care (description of injuries, instructions for care of patient, etc) 3.8

d. Visual aid in peer group teleconferencing (among researchers, teachers, administrators, etc.) 4.2

B. Comparison of the Electrowriter in Modes 1 and 2

Select a number from the scale to indicate what, given the present state-of-the-art, would be your preferred mode of Electrowriter-with-voice operation in the following situations.

MODE 1 STRONGLY PREFERRED — MODE 2 STRONGLY PREFERRED

1 2 3 4 5 6 7

a. Transmitting records 2.4

b. Remote teaching 2.6

c. Remote diagnosis and patient care 2.5

d. Peer group teleconferencing 2.8

C. Suitability of the Electrowriter for Use in Conveying Medical Information

The Electrowriter can transmit a variety of images (messages) as illustrated. Select a number from the scale to indicate the extent to which you feel this capability is practical for conveying medical information for the following purposes.

VERY IMPRACTICAL — VERY PRACTICAL

1 2 3 4 5 6 7

a. Transmitting records (charts, graphs, memos, patient records, etc.) 5.2

b. Visual aid in remote teaching 5.5

c. Aid in remote diagnosis and patient care (description of injuries, instructions for care of patient, etc.) 5.3

d. Visual aid in peer group teleconferencing (among researchers, teachers, administrators, etc.) 5.1

D. Potential Application of the Electrowriter in Medical Communications

1. Have you personally been involved before in any of the following activities:

a. Electronic transmission of medical records? ____ yes ____ no

b. Remote teaching or "tele-lecturing?" ____ yes ____ no

c. Remote diagnosis or patient care? ____ yes ____ no

d. Peer group teleconferences? ____ yes ____ no

2. Please list and/or comment on potential medical applications of the Electrowriter-via-satellite.

E. General Evaluation

(Please comment freely)

APPENDIX VII

FURTHER DETAILS OF SLOW-SCAN TELEVISION OPERATING PROCEDURES

1. Satellite Test Format

An experiment procedure sheet was distributed to all personnel by the Medical Communications Center to reduce the possibility of wasting valuable satellite time. The first ten minutes of the hour were devoted to identifying the transmitting stations and optimizing the radio frequency transmitters, receivers and antennae. At 00:10:30 Arlington Farms was to transmit a 1 KHz tone until 00:12:00, while the transmitter at EDSAT sent SSTV SERVO signals to synchronize the SSTV console and the "slave" television receiver.

A series of clearing codes were generated by the SSTV console for the next fifteen seconds to insure that both the console and receiver were in the proper logic states. Because the frequency response, levels, and frequency offset of the total transmission path was unknown, a series of test slides were transmitted and displayed from 00:12:15 to 00:17:55 so adjustments could be made at the SSTV receiver.

During this period, the Arlington Farms transmitter sent a 100 Hz tone to facilitate later identification of events by the personnel operating the SSTV receiver. The audio channel was to be silent from 00:17:55 to 00:18:00 while one additional code was sent on the data channel to blank the screen of the SSTV receiver. Program transmission then was to take place, with the last five minutes of the hour reserved for blanking the television screen, SERVO signals, and station sign-off.

Early in the experiment, it was learned that a full hour of satellite time at full power was not always available. As a result, many tests were necessarily condensed into thirty- and forty-minute segments to match available air time.

2. Recording Procedures

Most tests involved the sequential transmission of program audio and video information utilizing the excellent running time reliability of the Crown Recorders for recording purposes.

A cueing point was first established on channel one of the audio tape (voice count-down), followed by six minutes of silence and the program audio. The program tape and the recorder were then carried to the console location and the audio was sent by telephone line to the radio transmitter site, through the satellite, and recorded on channel one of the second Crown Recorder located at Arlington Farms. When the program audio had finished, both tapes were rewound, the machines put in ready mode at the cueing point and changed to record on channel two of the tapes. A "ready, set, go" countdown was given to both the slow-scan console operator and to the personnel at Arlington Farms by land line, and the recorders were started simultaneously. The first six minutes of audio silence were utilized for SERVO and code transmission, as well as test pictures to adjust the slow-scan receivers for envelope delay distortion and transmission of the first program visuals. When the program audio began, it was monitored by the console operator who, taking into account the time delay imposed by the satellite transmission path, displayed each visual as called for by the lecturer and continued to transmit, store, and display visuals until the end of the program.

After each experiment, both audio tapes were evaluated to determine the quality of transmission, as well as reception. During these evaluations, it was possible to determine which part of the video frequency spectrum was failing whenever unsatisfactory reception was received.

3. Documentation

The Crown recorders were also used to document test results. During early tests, only visuals were sent over the satellite. A test slide designed for SSTV system checks by Westinghouse Research and Development engineers was selected so that information could be simultaneously gathered on equipment used in tests. During later tests, both voice and picture transmissions were sent and recorded using slides typical of the visual content of medical lectures.

APPENDIX VIII

CRITERIA FOR THE PREPARATION OF VISUALS FOR SLOW-SCAN TELEVISION

1. General Comments on Technique

In preparing visuals for slow-scan television presentations, one must be ever mindful of certain legibility standards. Like other media, slow-scan has certain characteristics which limit legibility. The following visuals have been prepared to help define these limits.

Each visual was produced on medium grey TV illustration board using a 9 x 12 format. All inking was done with K & E Leroy pens and black India ink. Thirty-five mm slides were made with Kodak Ektachrome film and bound with standard 2 x 2 mounts. It has been demonstrated by previous experiment that color film is most suitable for slow-scan projection. Black and white orthochromic film is less suitable because of the high intensity of light passing through the transparency. If such film is used, one must introduce a dense blue filter between the light source and the scanner.

2. Criteria for Use of Lines

The first slide (Figure 1) is a sample of vertical lines of varying thickness, ranging from a #1 pen to a #6 pen. The numbers appearing beneath the lines were made with K & E Leroy templates, from left to right: 140, 175, 200, 240, 425, and 500. It is noted that on high resolution the lines made with pens #1 through #3 were visible but would be substandard in regards to legibility if used on a graph or chart presented on slow-scan. On low resolution, a #4 pen was marginal in regards to legibility. Pen #5 and #6 are satisfactory on both high and low resolution.

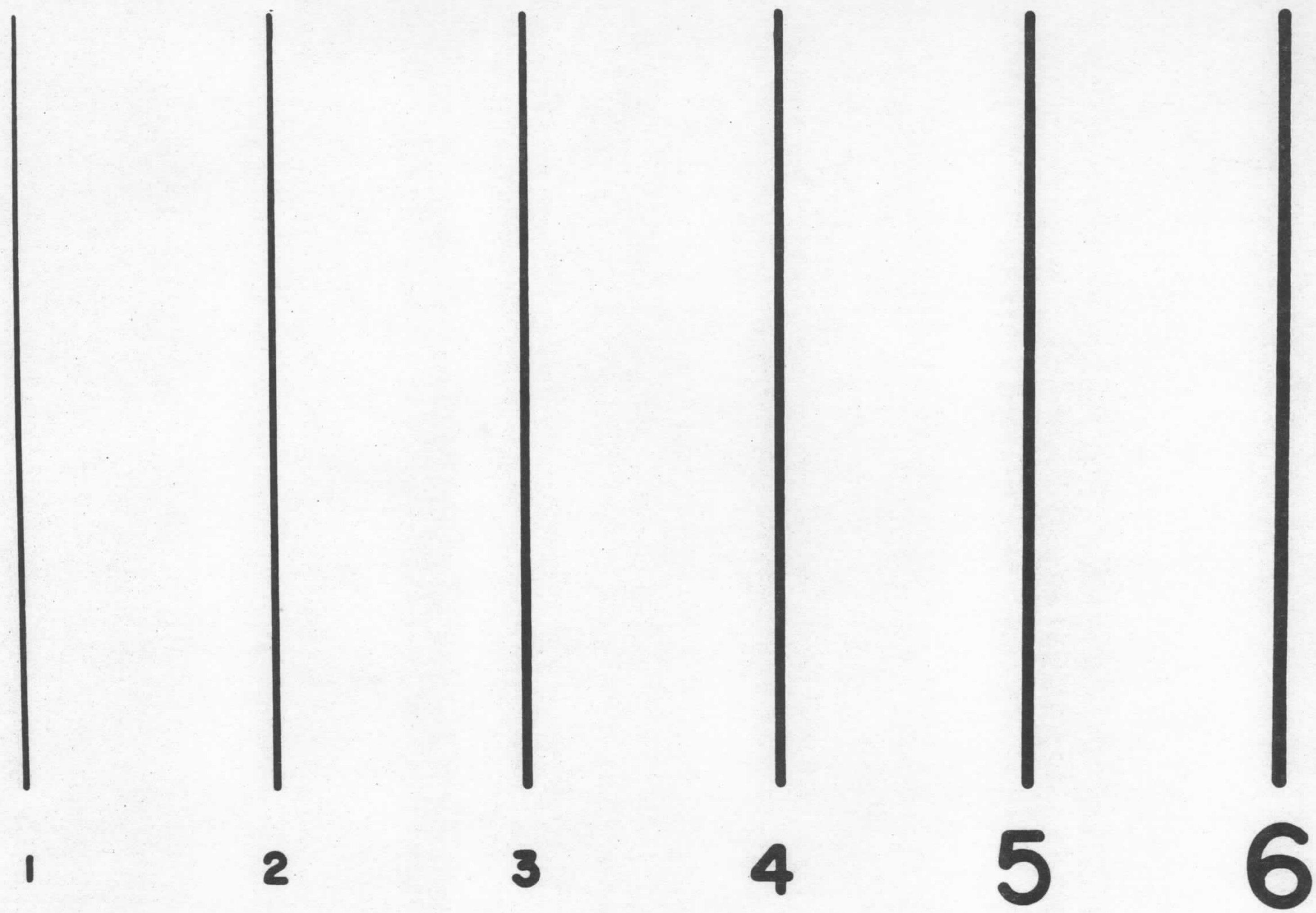


Figure 1: Vertical Lines in Slow-Scan Television Visuals

The second slide (Figure 2) was prepared with the same pens and templates as slide one. The lines, however, were slanted 22 1/2 degrees, the full slant position on the Leroy scriber. On high resolution the diagonal lines give a better differentiation of line thickness. All lines are visible Pens #1 through #4 are marginal and, again, #5 and #6 pens are the only acceptable ones.

3. Criteria for Use of Points

The third slide (Figure 3) is a sample of various dot sizes. From left to right, the sizes are: 1/6, 3/32, 1/8, 5/32, 3/16, 1/4, 5/16, and 3/8 inches. On low resolution, the 3/16 inch dot is marginal and the 1/4 inch and above are acceptable. The same information holds true on high resolution.

4. Criteria for Use of Lettering

Slide four (Figure 4) is a sample of the word Leroy in upper and lower case, using standard Leroy templates and pens, from left to right, top to bottom: 500 template and #6 pen; 240 template and #3 pen; 200 template and #2 pen, 175 template and #2 pen; and 140 template and #1 pen. It has been found that the 500 template and #6 pen is the only acceptable combination acceptable for low resolution. On high resolution, the 500 and #6 pen is the only combination acceptable for lower case while the 240/3 combination is marginal. The upper case samples conform to the same information as on high resolution. Slide five (Figure 5) is a sample of the previous words on a 22 1/2 degree slant. Again, the 500/6 combination is the only acceptable one on low resolution. None of the words in lower case are acceptable. On high resolution, the 500/6 combination is preferred, but the 240/3 combination is marginal.

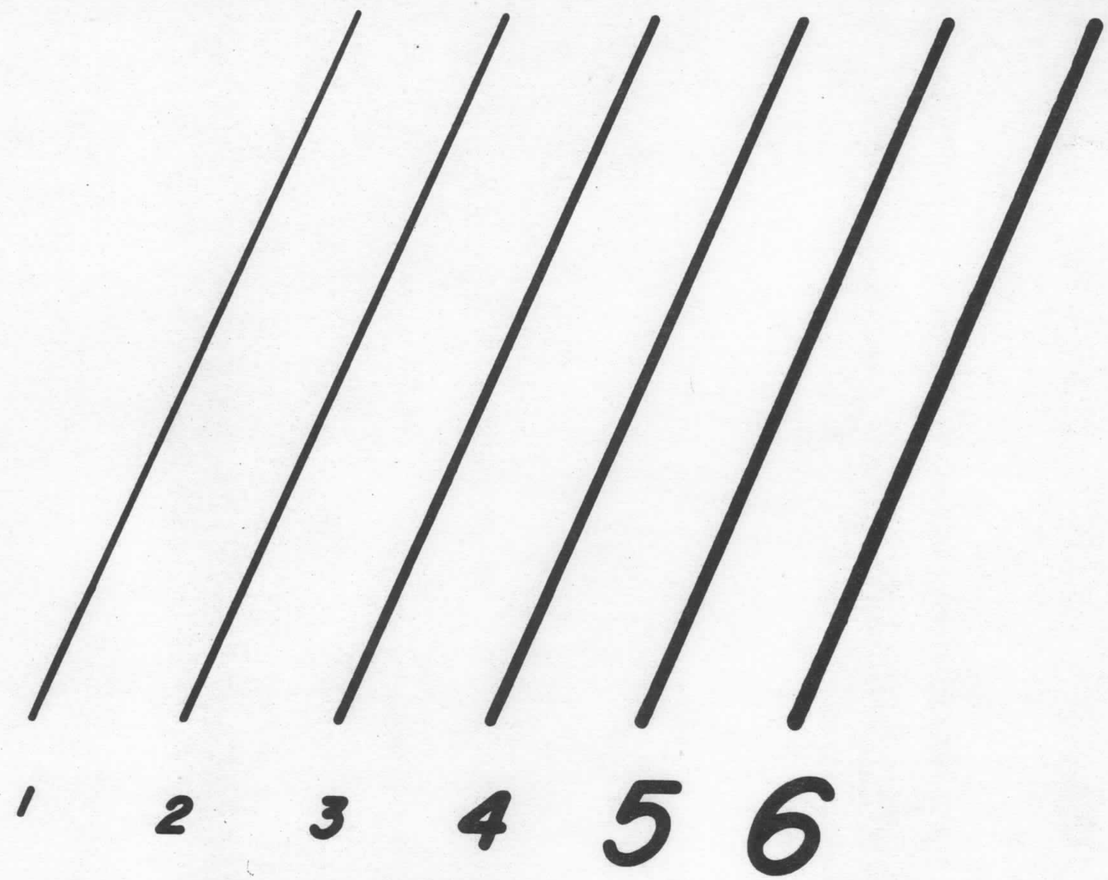


Figure 2: Slanted Lines in Slow-Scan Television Visuals

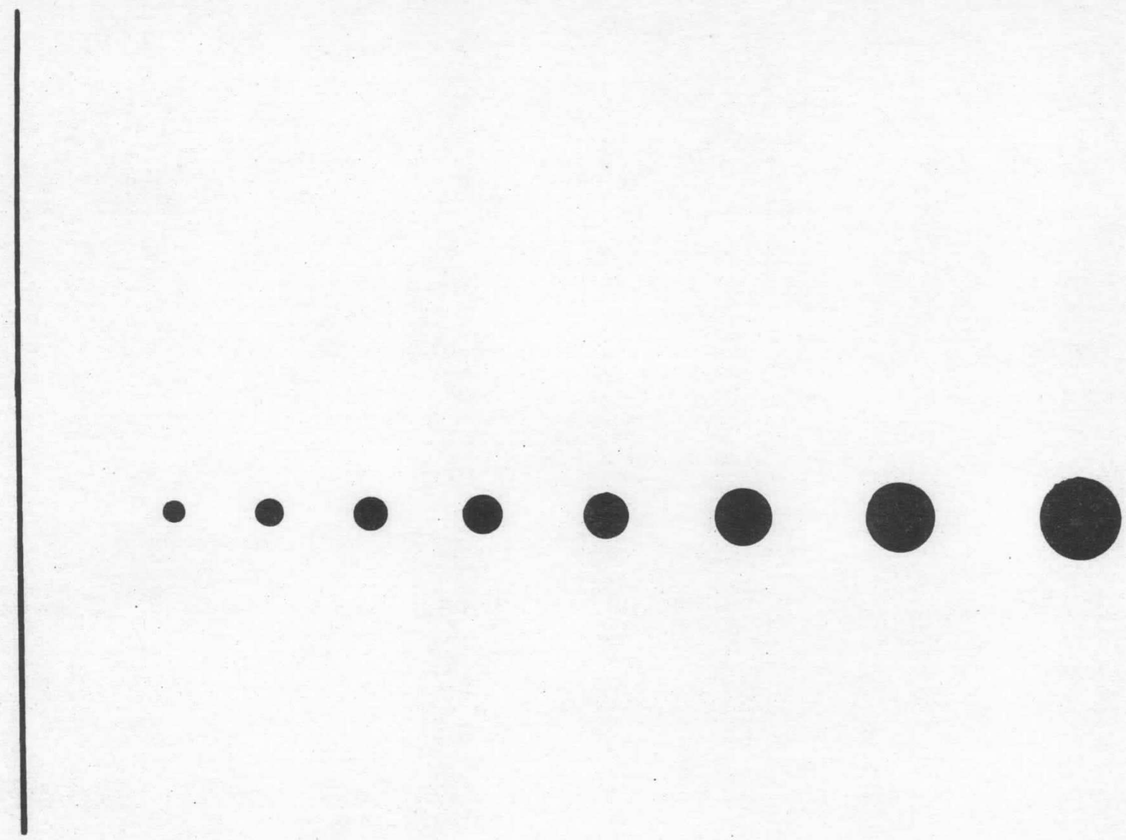


Figure 3: Dot Sizes in Slow-Scan Television Visuals

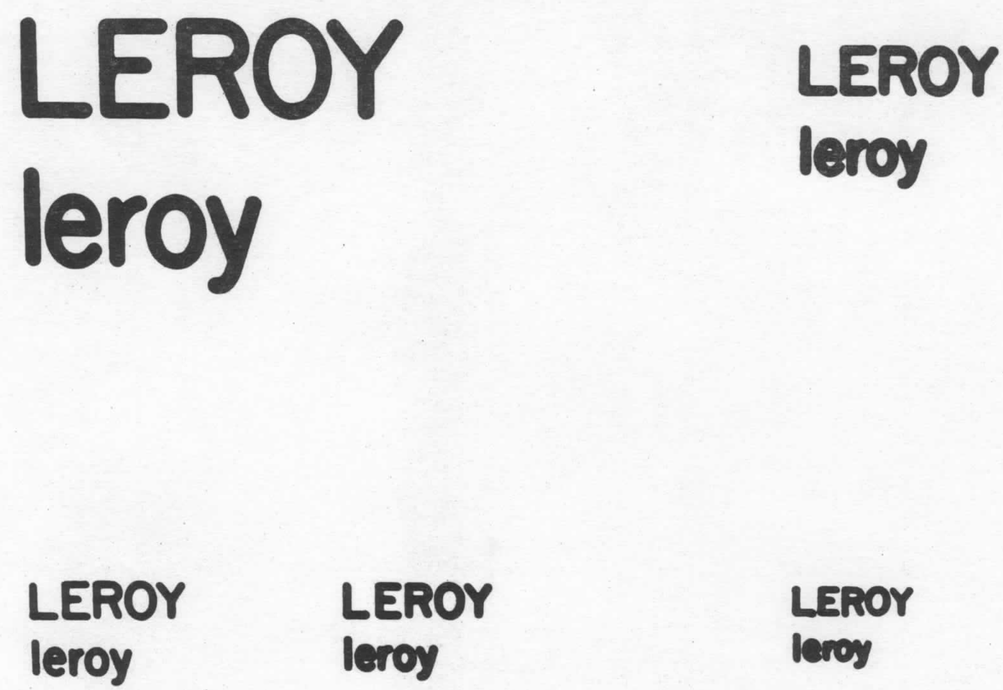


Figure 4: Lettering in Slow-Scan Television Visuals

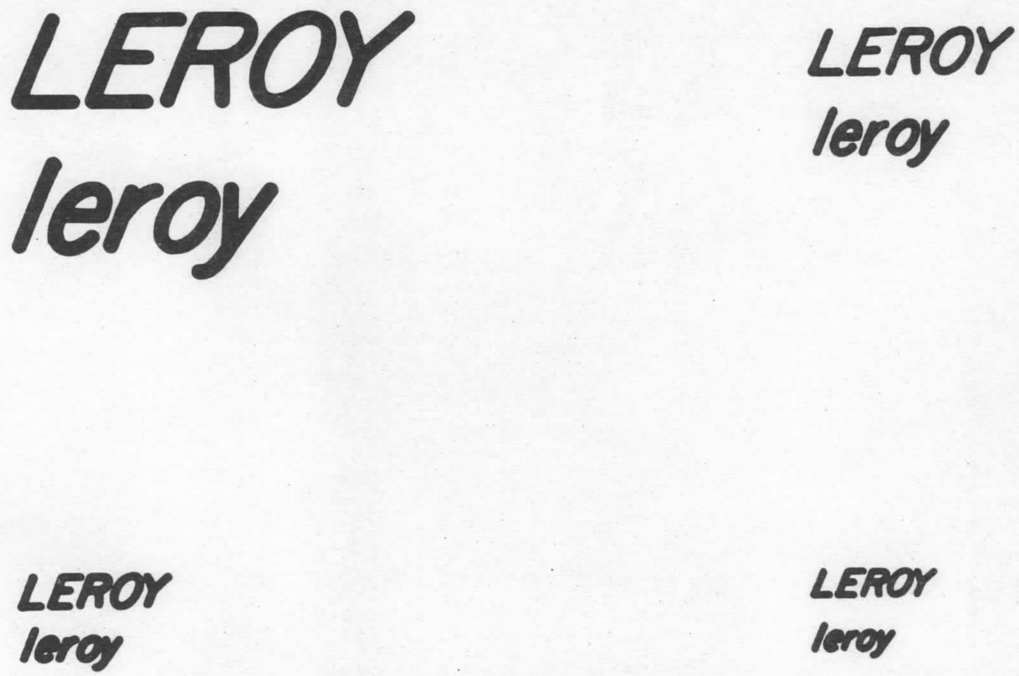


Figure 5: Slanted Lettering in Slow-Scan Television Visuals

5. Criteria for Use of Geometric Shapes

Slide six (Figure 6) shows a sample of two geometric shapes. By using two pen sizes, #3 and #5, it was intended that an optical illusion would be presented. The box on the left should appear normal, but the box on the right should appear as the top view of a truncated pyramid. On low resolution, the difference is a bit clearer, but the effect intended is still lost.

6. Criteria for Use of Graphs

Slide seven (Figure 7) is a sample of a typical graph with standard size lines and letters for this size format. The template and pen combinations are indicated on the graph. On low resolution, it is noted that the lines are not very legible yet are visible, especially the axis lines which were made with a #1 pen. From this information, I would be inclined to step up to a #3 pen for the axis lines. Also this experiment indicates a need for a step up in template sizes, as the numerals and letters are not legible enough. On high resolution, the lines and letters are acceptable, but a step up in pen and template size is indicated.

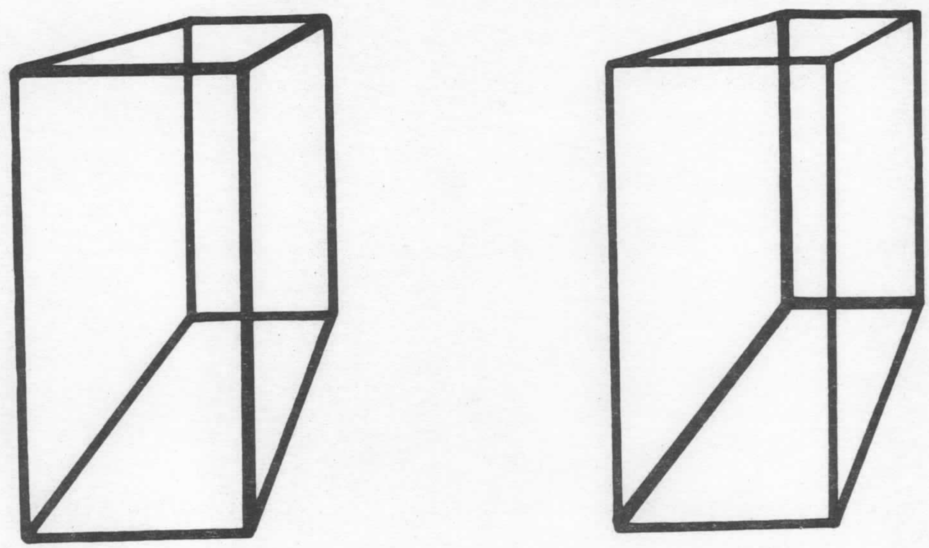


Figure 6: Geometric Shapes in Slow-Scan Television Visuals

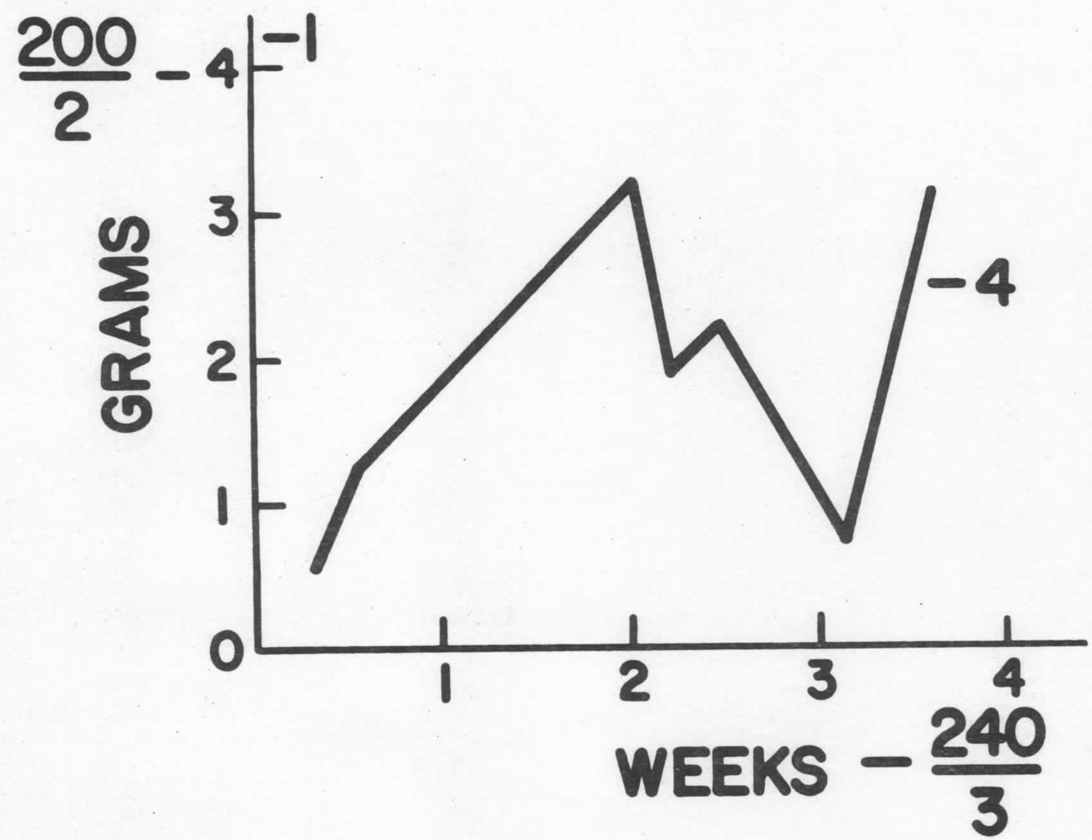


Figure 7: A Typical Graph in Slow-Scan Television Visuals

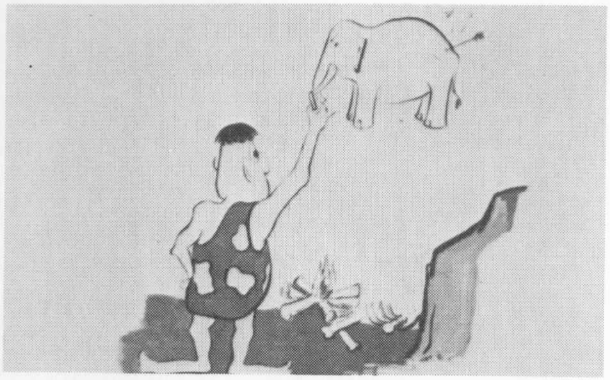
7. Examples of Good Visuals

The six slides shown in Figure 8 were prepared for a presentation adapted to slow-scan television. They include various media commonly used in producing slide visuals and should give a true representation of acceptable quality in both tone and line legibility. The first slide is a cartoon. This visual was rendered with opaque gouache and colors outlined with black India ink. The lines were made with a brush rather than a pen for added thickness. Ektachrome film was used in making the slide.

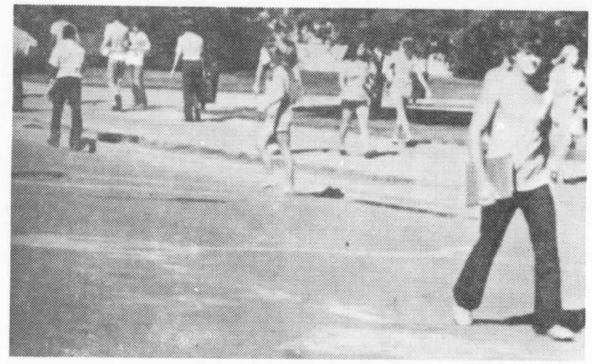
Slide two is a color photograph taken on Ektachrome film. The intensity of this photograph is acceptable for slow-scan use though the composition could be improved by arranging the subjects more toward the center. Slide three is a sample of a color anatomical diagram. It was rendered with opaque gouache colors and outlined in black India ink. Again a brush was used in making bolder lines. This is an example of an acceptable slow-scan visual. If it were to be labeled, I would suggest using acetate overlays with a minimum number of labels on each.

Slide four is an example of a low intensity photograph on Ektachrome film. It is not as effective as the first photograph seen on slide two, but it passes legibility standards. The composition in this slide is superior to slide two. Slide five is an example of a typical bar graph. It was produced on blue color match (Craftint, Mfg., Co.) with red film (Chartpak Co.) for the colored bars. Standard K & E Leroy templates and pens were used for all letters and numbers. Again black India ink was used for all lettering and drawing.

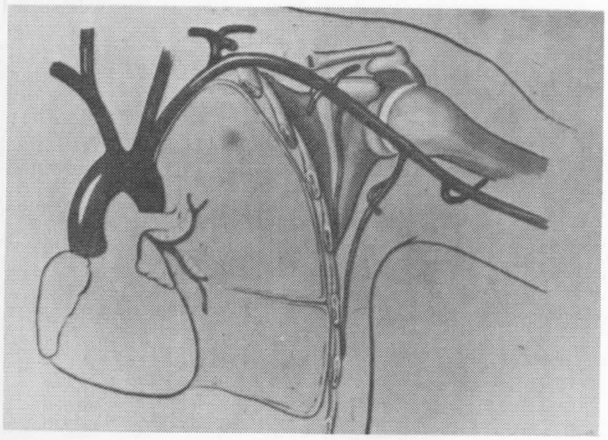
The last slide, slide six, is an example of a map using four colors. The base is Blue Color Match, Yellow and Orange Color Match sheets were cut to the proper shapes and applied to this base. The letters were made



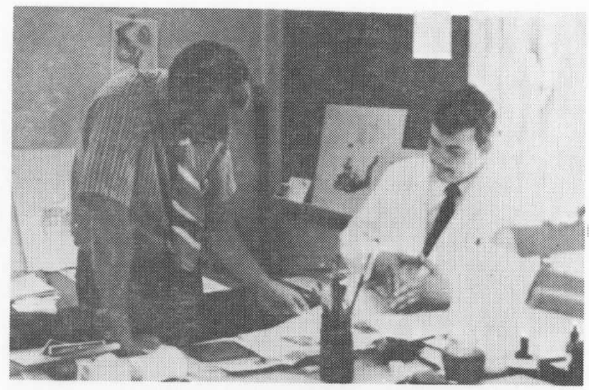
SLIDE ONE



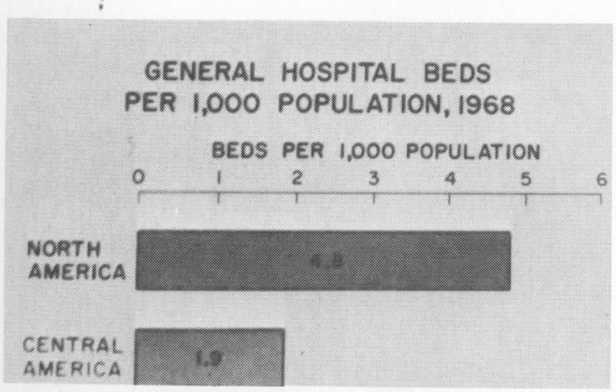
SLIDE TWO



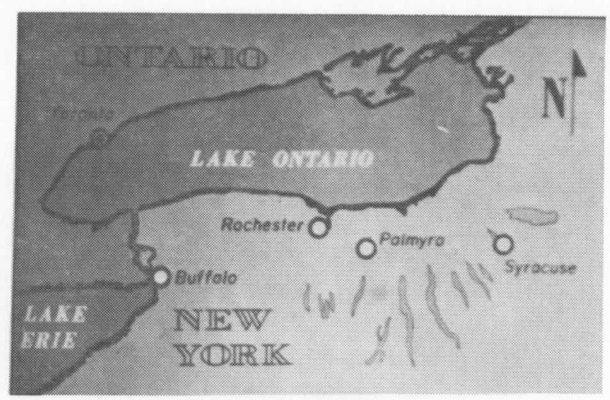
SLIDE THREE



SLIDE FOUR



SLIDE FIVE



SLIDE SIX

Figure 8: Examples of Good
SSTV Visuals

with a Varigraph Head writer (Varigraph Co.) and standard Leroy templates and pens. Black India ink was used for the letters and outlines of the lake and white ink was used for the cities indicated, and the names of the lakes. The entire map was mounted on a sheet of dark brown Cresent illustration board.

In preparing and viewing these visuals for slow-scan presentation, as many samples and variations as possible have been covered. The lecturer has been kept in mind; first, because he must be cognizant of the characteristics of slow-scan, and secondly, he must know what to expect of his visuals when they are presented on this unique communication medium. The artist and the draftsman have been included in these thoughts because it is their responsibility to produce effective visuals for slow-scan presentations.

APPENDIX IX

TECHNICAL SUMMARY OF SIMPLEX/DUPLEX VOICE TESTS IN SUPPORT OF STANFORD UNIVERSITY

INTRODUCTION

University of Wisconsin participation in the Alaska Satellite Communications Project involved cooperation with Stanford University and the University of Washington. Each of the three schools took primary responsibility for a particular set of experiments, as well as providing support for test activities of the other schools as their experiments required. Stanford University, for example, provided extensive test support for Wisconsin's Electrowriter tests. This section of the report outlines tests conducted at the University of Wisconsin early in the project to establish successful voice communications with Stanford University to serve as a basis of technical support for the simplex/duplex voice communications experiment conducted by Stanford.

DETAILS OF INITIAL VOICE TESTS

Initial voice tests at Wisconsin were conducted in order to optimize base station transmission and receiving capabilities. An informal log of these tests follows.

Test No.	Date	Objective	Comments
1	19 Aug	Preliminary equipment checkout	SWR bridge used to align antenna, went through alignment procedure on power amplifier, TX, and receiver
2	20 Aug	Check received signal strength	Directed antennas, tried resonant cavity in receive and transmit lines with no noticeable improvement. (Keyed the carrier and measured the returned signal strength)
3	23 Aug	First voice communications with Stanford and ATS Control	Transmitted 1 KHz test tone at 5 KHz deviation. (Compared relative signal strengths)
4	7 Sept	Checked equipment	Measured antenna coax losses, checked receiver sensitivity, measured the loss through a resonant cavity. We decided at this time to try a remote site because of high ambient noise and ground reflections
5	17 Sept	Test remote site at Arlington Farms	Measurements at Arlington Time — Quieting 1:05 — 20 dB 1:10 — 20 dB 1:14 — 17 dB 1:20 — 22 dB 1:25 — 23 dB 1:35 — 25 dB This was much better reception than what we had received at the Space Science Building (10-14 dB)
6	22 Sept	Antenna performance test	The Quad Yagi did not provide any better reception than the single array
7	23 Sept	Support Stanford's test	Tested the satellite compression effects of the repeater (Ref. "ATS VHF EXPERIMENTER'S GUIDE," p. 11)
8	24 Sept	Test remote site at Oregon, Wisconsin	Time — SSEC — Oregon 3:00 — 17 dB — 25 dB 3:05 — 15 dB — 23.5 dB 3:10 — 17 dB — 25 dB 3:15 — 17 dB — 25 dB 3:20 — 16 dB — 25 dB 3:25 — 16 dB — 25 dB 3:30 — 16 dB — 26 dB Receivers of identical sensitivity were used, with SSEC using the Quad Yagi and Oregon using the single array.
9	29 Sept	Test remote site at Hill Farm Park in Madison	Again better reception experienced at the remote site (8-10 dB higher)

Test No.	Date	Objective	Comments
10	1 Oct	Test remote site at Bjorksten Research Lab in Madison	Discovered in this test that the Yagi's were not circularly polarized, thus more subject to atmospheric effect
11	6 Oct	Test remote site at University Farms at Mineral Point Road in Madison	Remote site is as high as 18 dB better than SSEC building. Reception improved by votating Yagi antenna about its boom's axis.
12	15 Oct	Selected Arlington as the remote site and did a preliminary simplex/duplex experiment with Stanford	The remote site operated marginally with 70 watts of transmitted power. Antennas were positioned and checked for mutual interference. Had trouble with ignition noise from a farm vehicle, also channel elements had to be switched manually to facilitate duplex operation.
13	20 Oct	Preliminary simplex/duplex experiment	Antennas repositioned and aligned. Signal fading experienced due to inversion layer. University of Washington participated also. University of Wisconsin transmitted 75 watts of power for this test.

THE SIMPLEX/DUPLEX VOICE EXPERIMENT

A formal demonstration of simplex and duplex voice communications was designed to simulate a medical emergency in a remote villiage in Alaska which required consultation between a medical person in the village and a doctor at a central hospital.

With the cooperation of Dr. John Johnson from Stanford Medical Center and Dr. Edwin Wallace from the University of Wisconsin, a test was generated that would enable both doctors to discuss the problem in the basic communications formats of simplex and duplex under varying signal-to-noise ratios. The intent was to establish the technical requirements for adequate voice communications between medical personnel and to determine if there is any preference shown by such personnel for either duplex or simplex voice communications as a function of the signal-to-noise ratio.

The basic equipment layout is shown in the following figure. Stanford University represented the central hospital and therefore the VHF transceiver was connected by telephone lines to Dr. John Johnson's office. The University of Wisconsin served as the remote site. Dr. Edwin Wallace was located at the remote site and used the transceiver directly.

The results of this experiment appear in the Stanford University report together with an evaluation of the simplex and duplex modes of voice communications for medical purposes.

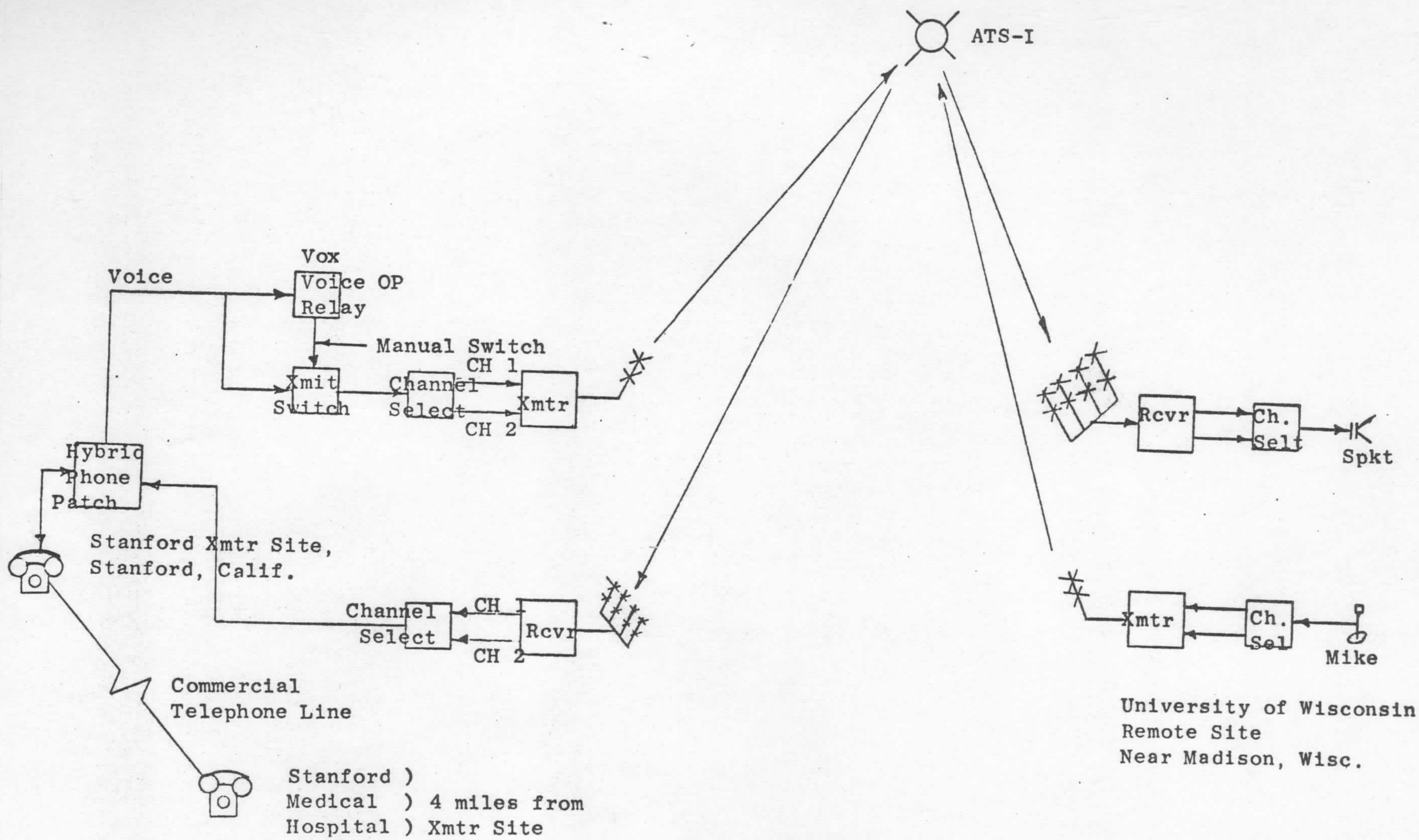


Fig. 1 General Layout of Experiment Equipment (Provided by Stanford University)

EDSAT CENTER
Space Science and Engineering Center
The University of Wisconsin
Madison, Wisconsin

TELECONFERENCING IN WISCONSIN

by

Richard G. Lawson

The research in this document has been supported by the National Aeronautics and Space Administration.

October 1971

ACKNOWLEDGMENTS

I want to thank all of those who gave so generously of their time to provide information for this report. Special thanks are due Craig Mills, Jeffrey Kuhel and Floyd Keene for their assistance in gathering this information. Additional thanks go to Katherine Shervis, Sandra Noe and Nancy Wulfers for their assistance in the preparation of this report, and to Jan Noyola for her expert typing and suggestions.

Larry Chambers, serving as Project Manager, was responsible for the overall supervision of the research assistants, following up initial contacts and information, and assisting in the editing of this final report. Additionally, he authored his own report on CATV which appears in Appendix G of this volume.

A final note of thanks goes to Merton Barry, Chairman of the EDSAT Policy Advisory Committee, for his assistance in editing this document, and to Charles A. Wedemeyer of University Extension, The University of Wisconsin, with whom I worked so closely in the early years of developing the EDSAT idea.

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CHAPTER I

INTRODUCTION

> Communication offers a way out. If we can expand our present capabilities to transmit voices, pictures, data, live images, whole books of information, if we can learn to do these things on a sufficient scale, with sufficient fidelity and, most important, with sufficient economy, we can largely eliminate this troublesome traffic of people and things and replace it with a traffic of information.[1]

The rapidity of change in our world has been more than amply discussed. Nowhere is the change so dramatically crucial as in the area of information and knowledge resources. This so-called acceleration of history, which some equate with a contraction of time[2] has resulted in the cutting up of our knowledge into smaller and smaller areas or "disciplines," and required more delegation of responsibility and division of labor over vast bodies of information.

Striking Scaling-Up in Size

One of the most pressing problems today is making available information necessary for decision making. Not only is this a powerfully important need because of the knowledge explosion but also because we are experiencing a startling growth of institutions and organizations. This growth is both in size, and in power.

The scaling-up in size of the organizations and institutions including the government establishment, universities and research laboratories since the early 1900's has been striking. Peter F. Drucker, a noted economist, cautions us that "we cannot hope to understand this society of ours unless we accept that all institutions have become giants."[3]

Making up what Fritz Machlup called the "knowledge industries,"[4] a group of institutions have blossomed and grown enormously in the last few decades to produce and market the ideas and information for the large organizations of our society. A startling prediction is made by Drucker that in the late 1970's these knowledge industries will account for one-half of the total gross national product in the United States. As he so graphically puts it, "every other dollar earned and spent in the American economy will be earned by producing and distributing ideas and information, and will be spent on procuring ideas and information."[5]

Meetings Important Means of Information Exchange

Notwithstanding, the work of the organizations, especially in the knowledge industries, is carried on by individuals. These individuals obtain inspiration and data from other individuals who may not be a part of the same organization. While it is possible to obtain some of this information from archival publications, the information is often relatively old for research purposes. As a consequence, meetings, conferences and discussions have become increasingly important vehicles for the transfer of knowledge.

> On the other hand, in terms of the currency of the information exchanged and the speed at which it can be filtered and applied to the interests of the individuals concerned, meetings are among the most effective media of dissemination. We believe that meetings have a crucial role to play in scientific and technical communication and that fulfilling that role more effectively is a major challenge.[6]

Rapid Growth in Size and Numbers of Meetings

The problems of conducting a conference so that there is optimum exchange of information to advance research are in need of rigorous study. Because of the increasing importance of education, increasing specialization, growth in size of the organizations and the emergence of the organizations as the protector of research opportunities, the conferences have grown in importance over the last few years. In England one of the prime organizations in the field of program and conference sponsors, British Institute of Management, presented about 700 one-day and one-week conferences annually in 1970, and had seen its business double in the last five years.[7] In 1969 during one month 353 half-day sessions were held in New York City alone.[8] Between February and May of 1968 over 884 meetings and events of "chemical interest," many international in scope, were listed in Chemical and Engineering News.[9] Iron Age listed 140 meetings and conventions on the calendar for "leading metal working groups" in 1969.[10]

A quick appraisal of few conference centers in Wisconsin underscores the importance of the conference. During calendar 1970 The Johnson Foundation in Racine hosted 153 one- to five-day conferences involving approximately 6,100 participants.[11] University Extension of The University of Wisconsin-Milwaukee's Civic Center Campus held a total of 120 events, ranging in length from one to 20 days each, and serving a total of 3,883 persons during the 1970-71 fiscal year.[12]

The Wisconsin Center on the University of Wisconsin Madison Campus during the 1970-71 fiscal year conducted 714 conferences and institutes of from one day to 78 days in length for a total of 42,648 conferees. In addition the Center conducted 56 Extension classes and 57 Educational Telephone Network events serving an additional 3,238 people together. The classes and ETN events ran from one to 42 sessions in length. Adding almost 900 committee sessions, lectures and other miscellaneous events of one to six days in length, the total number of events conducted by The Wisconsin Center alone was 1,721 attended by 78,989 conferees. The corresponding totals during the 1960-61 fiscal year were 992 events and 53,950 conferees.[13]

These figures indicate the dramatic volume of conferencing in the few areas where information was obtained. Little is known about the number and length of other conferences since there is no central source of data and hotel and motel chains are reluctant to provide information on the grounds it is of a confidential nature. Yet such information is useful in planning for alternative information exchange activities.

Similarly, data on conference costs are difficult to obtain. However, some indication may be found in the figures quoted in an article in Chemical and Engineering to their subscribers explaining the rise in registration fees for their Society's Annual Convention:

> The rental for a meeting room in New York City, for example, costs from $100 to $600 per half-day. It is equipped with blackboard, chalk, eraser, two microphones, electric pointer, two projectors, screen and, at the door, an easel with an ACS sign on it. . . . Exclusive of the room rental, the average cost of equipment and personnel for each meeting is from $125 to $150 per half-day session, depending on the city.[14]

In addition there are costs for personnel, housing, food, transportation, etc., making the business of conference conducting and attending expensive indeed. With the rise not only in costs, but in actual number of conferences, one does begin to wonder if there is not a better system of transferring information. Of even greater moment, the sheer impossibility of attending all conferences within one's own discipline makes the thought of going outside a specific area of specialty untenable. Yet such interdisciplinary exchanges are thought to be more and more important to advancement in productivity in research and in knowledge.

Interdisciplinary Discussions Desirable

> A host of studies seems to point to the same conclusion. Whatever the boundary -- department, laboratory, industry, social segment or country -- recognition of the boundary itself tends to dampen innovation. Where ideas, communication and people flow across boundaries, successful breakthroughs tend to occur. Where they do not, the ideas do not germinate.[15]

The reasons success in research is so closely associated with communication outside one's project and specialty are not clear, even though the concept of cross-fertilization is intuitively appealing. In a study involving 179 distinguished physical and biological scientists and their communication patterns, it was found that a very strong positive correlation existed between communication outside the scientist's department and his productivity. Communication within the scientist's own department, but outside his project or specialty, the correlation, though less striking was still positive. Some feel that interdepartmental and intradepartmental communication are critically important.[16] The Pugwash Conference discussed the difficulty in obtaining international cooperation in free information exchange and was reported to have felt that this difficulty resulted from the fact that scientific research was in the hands of individual scientists and scientific societies which were "notoriously individualistic and independent."[17]

The growth in specialization and this need for cross-cultural communication, coupled with the increase in meetings and conferences, make it imperative that some means be developed to move ideas rather than people. Some form of mediated teleconferencing may be the answer. However, such teleconferences must not be simply media applied to conferences as we now know them. Most conferences present papers by distinguished scholars, and where time permits, discussions may ensue. Since such discussion often is so structured as to prohibit real interaction, it becomes more of forum for statements than discussions among colleagues or participants.

Further, the length of time consumed by the preparation of the paper for a conference mitigates against currency of information. It has been reported that the average paper delivered at a physical scientific or engineering conference was begun 12 to 18 months prior to the meeting, while for the social science groups the inception of work culminating in a paper was 24 to 30 months before.[18]

As for publication, the average research was begun some 30 to 36 months prior to the appearance of the results. Although an informal report was possible in only 20 months, an article based on the work took six to nine months to appear in a journal after it was submitted.[19]

Need for Informal Interactive Channels

Such a problem is less an indictment of meetings and conferences than the lack of flexible and economic means for interactive dialogue among researchers. The meetings are effective in providing information and some opportunity for mutual cooperation and discussion. But this informal contact tends to become increasingly difficult as the participants return to their laboratories and institutions. Yet, it is precisely while they are apart and in the midst of their individual research projects that dialogue might be the most helpful. It is a fact that most productive research is not accomplished in isolation.

The real need is not an enlargement of the formal systems, including publication and large conferences. It is not the need to bring people together physically to create a "team" -- for this indeed can generate problems among creative researchers. Almost any problem has a limited number of people who can be really effective in finding a solution. These people need to be brought together interactively, in what Licklider and Taylor call "close intellectual partnership, so that their ideas can come into contact with one another."[20]

There are several cogent reasons why this development of informal, interactive channels is sorely needed. First of all, as the Report by the Committee on Scientific and Technical Communication of the National Academy of Sciences-National Academy of Engineering stated, "the originators and users of scientific and technical information are largely the same individuals. . . ."[21] Secondly, if you let each researcher go his own way there is a great tendency for each to create his own empire.[22] Thirdly, the so-called "knowledge explosion" cannot be handled adequately by the formal channels. These channels are especially deficient in their ability to handle current research activities.[23] Finally, cross-fertilization from other researchers within, and especially from without, one's specialty encourage greater productivity. Formal systems of communication cannot provide this contact economically in either time or money.

Informal discussion, or what Licklider and Taylor so accurately called "the meeting of many interacting minds,"[24] provides some of the answers assuming a free and informal discussion among actively interested participants directed toward specific subjects or problems. "Much of the scientific and technical information on which we depend is stored in the human brain rather than in the literature or in mechanical devices -- and much of it never gets beyond this repository."[25] Informal, person-to-person communication plays a major role in the dissemination of this very essential information as it fulfills two major functions:

"1. It stimulates and fosters the progress of research

2. It is one of the most effective ways of transferring technology to the point of application."[26]

Large groups by their very structure possess blocks to both these functions in the passive role delegated to the listener, his anonymity, aesthetic separation from the speaker, and the one-way flow of information from the platform.[27]

Probably the most important and cogent statement concerning this need for enhancing the channels for information communication came from the Report on Scientific and Technical Communication:

> . . . of the communication that is used by each researcher as an inspiration and as a data flow that makes his own work possible . . . some 80 percent . . . comes to him from other researchers at a stage before formal communication and through the informal channels of the grapevine, the conference, the seminar, the preprint, and the other tentacles of what we now call the Invisible College.[28]

The Use of Telecommunication Media

Basically we need new systems or media which are adaptable to ad hoc use, which provide for multi-access and interaction at the direction of the users, so that very current or "hot" research issues and problems may be promptly discussed, and systems which are not overburdening either in their cost of operation or capital outlay. The ultimate goal is the partial replacement of face-to-face communication retaining person-to-person access.[29]

Pre-Conference Communications

Mediated interactive two-way communication would be useful in preparation for conventional conferences and meetings. The first reportable dates for research work is from three to six months before the meetings in the case of the physical sciences and engineering groups, and eight to nine months in advance of the meetings in the social science groups.[30] Most researchers do participate in some sort of pre-meeting discussion or presentation of their work, but this is of little advantage for most meeting attenders. Bertita Compton in discussing the early results of studies undertaken by the Johns Hopkins Center for Research in Scientific Communications, asserted that "only 3% . . . reported having read a journal article and 3% a progress or technical report . . ., and only 5% had heard any type of pre-meeting oral report of . . . material [presented at the meetings]."[31]

Pre-conference disseminating channels are entirely too restrictive to be as useful as they might be. As a consequence another vital role that could be fulfilled by easily accessible, readily available interactive media is the involvement of more participants in pre-conference planning. Clarification of goals, setting of agenda, making participant lists, etc., could be more actively engaged in by greater numbers of conferees, providing for greater involvement and "relevance" for more participants.

Post Conference Communication

By far the most important aspect of mediated informal channels is found in post-meeting interaction. The evidence is clear that researchers initiate informal contacts and maintain them after the meetings, often with great difficulty, because these contacts and resultant dialogues assist them in their on-going research. Such contacts provide opportunities to clarify or obtain additional information and data, to receive reports on future work, and to acquaint others of one's own work and receive reactions to it.[32]

It is shocking to find that "about a third of them [researchers] had not known previously of the work about which they now considered it important to maintain awareness."[33] In other words, opportunities for dialogue apparently were not available to the respondents.

Initial studies conducted by the Johns Hopkins Center for Research in Scientific Communication found, among other things:

> That meetings facilitate the extension of informal networks of communication, especially among authors and requestors of program material. . . .
>
> That relatively high percentages of those who initiated information exchange at a meeting planned to continue it thereafter.
>
> . . . .
>
> That some two-fifths to more than half the session attendants at the various meetings reported some effect of meeting attendance upon their work. . . .
>
> That steps taken . . . to increase the facilities and scheduled occasions for information interaction should further enhance the effectiveness of meetings.[34]

Media As Face-to-Face Substitutes

There are those who feel that in the not too distant future telecommunications media will replace face-to-face communication in instances of person-to-person interactive situations.[35] Although this is now technically possible, it is questionable whether or not the systems which are presently readily available are adequate in their ability to be used as a substitute for travel. Yet, it is felt by many that "there has to be some way of facilitating communication among people without bringing them together in one place."[36]

More Research Is Required

The goal is to develop a system which is flexible in structure and provides for "continual readjustment of knowledge, information, and finally of action.[37] This is difficult since technology provides answers concerning better ways of doing things, but our discovery of the things we want to do lags far behind. In the final analysis the society itself decides what innovations will be allowed in terms of social needs and economic limitations.

All of this points to the need for further research and study of the media themselves and their social applications. This research, especially in the latter area, must be undertaken with some rigor and care because "collection of offhand opinions of scientists and technologists about the information services they think they want have little utility. . . ."[38]

We need more detailed studies to discover the real parameters of successful informal, interactive communication if we are to design a system which will facilitate the process. To be truly directed at the user's discretion it will be necessary to develop a multi-access system which will facilitate ad hoc arrangements. "Creative, interactive communication requires a plastic or moldable medium . . . contributed to and experimented with by all."[39] The real danger is that either the scientific community will resist the new media or that their use will become formal, thus vitiating the entire solution.

Informal systems tend toward formality as they are developed and used. Rules of operation and conduct become established. Ad hoc accessibility becomes difficult. Speculation about current research work tends to be less acceptable within a more rigid and formal framework, thus depriving the participants of ancillary information and data which most feel are important to their own current research. Free flowing feedback and interaction becomes difficult. Informal channels tend to be temporary and unstable and formalizing them is a rather natural outcome in the adjustment of the growing informal system.[40]

It must be kept in mind that the research needed in this area concerns such concepts as we have already discussed:

A. Informal systems are established because formal, permanent and public systems do not provide all of the information and contact that scholars and researchers feel they need or require.

B. Informal systems tend to accelerate the diffusion of innovation.

C. Informal telecommunication systems move ideas rather than people.

Wisconsin is a heavy user of telecommunications for the purpose of instruction and conferencing. Some of the systems, such as Subsidiary Communication Authorization (SCA), Educational Telephone Network (ETN), Medical Dial Access Library (DAL) were begun in Wisconsin or reached their fullest development and use there. Therefore, a descriptive analysis of the activities in the area of teleconferencing as found in the State of Wisconsin will be undertaken to establish our present position, and the current "state of the art."

There are two general categories within which we will make this analysis:

A. Telelecture without feedback -- this includes such systems as Instructional Television (ITV), Instructional Television Fixed Services (ITFS), Subsidiary Communication Authorization (SCA), and most importantly, Dial Access Library (DAL) systems. Chapter II has this discussion.

B. Teleconferencing with feedback -- this includes ITV, ITFS in conjunction with telephone feedback, ETN and two-way telephone systems, and Victor Electrowriter Remote Blackboard (VERB). Chapter III has this discussion.

Chapter IV discusses specifically the development and use of ETN and SCA in Wisconsin, paying special attention to the medical application. Finally, in Chapter V, the recommendations resulting from this examination of Wisconsin's teleconferencing activities are presented and they include:

A. An indication of the further need for new research into the role and development of informal channels;

B. The role voice channels, such as telephone and radio, can play as economical, creative, interactive systems which are readily available; and

C. The value of the very mechanisms and techniques used in the conduct of teleconferencing in providing for data storage and retrieval for the necessary research.

It is not our purpose to suggest that teleconferencing replaces normal face-to-face conferences or meetings. Quite the contrary, the meetings themselves could be made more successful in their substantive goals if easily accessible and usable channels of informal dialogue were available before, during and after the meetings. Further, in light of the rising cost in conducting and attending the face-to-face conferences already in existence, teleconferencing offers a means of increasing participation and enlarging the impact of these meetings and an opportunity for involvement in discussion groups and subjects which might not be able to justify the high cost of a regular face-to-face conference.

It is in this mold that the analysis is cast. It is the purpose of this paper to suggest the variety and scope of potential teleconferencing systems and the ways in which these have and may in the future benefit the users in participating in the creative, interactive dialogue which will advance thinking and research, and be a benefit to mankind.

NOTES

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[35]Lynch, "A Communications Revolution," 20.

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CHAPTER II

TELELECTURE SYSTEMS WITH NO FEEDBACK

Instructional Television (ITV)

Instructional television has been called a master teacher, a great pedagogical tool and aid to education rivaling the book. In 1960, then Senator John F. Kennedy wrote of ITV as a "device which has the potential to teach more things to more people in less time than anything yet devised."[1]

In 1961, the Director of the already existing Alabama Educational Television Commission which operates the Alabama ETV network succinctly defined ITV as providing "educational agencies with the means for doing better what they exist to do, and it is accepted as an essential part of the educational process."[2]

Wisconsin had one of the oldest broadcasting stations in the nation (W9XM, 1919) which became WHA-AM, and one of the earliest educational television stations thus establishing a reputation of innovation in the field. Instructional television grew rapidly in the United States so that by 1963 it supplied a part of the teaching to nearly three million school children to say nothing of its use on the college campuses.[3] Yet, it was not until 1971 that the Legislature allocated money for the establishment of a non-commercial public television network, for use, among other things, for instruction in Wisconsin public schools. In July, 1971, $2.5 million was allocated to be spent over a two-year period.[4]

The major stations in the proposed network include not only the state's two stations already in operation, WHA-TV in Madison and WMVS-TV in Milwaukee, but WPNE, Channel 38 under construction in Green Bay, and proposed stations in La Crosse, Eau Claire and Wausau. Microwave links will be used to carry programs originating from the major program centers (Madison, Milwaukee and Green Bay) to each of the other cities. The Green Bay station will be the first in Wisconsin to be licensed to the Educational Communication Board which was set up to supervise, among other things, the State ETV Network. WHA-TV is licensed to University Extension, The University of Wisconsin, and WMVS-TV is licensed to the Milwaukee Area Vocational Technical College.[5]

Northeastern Wisconsin In-School Television (NEWIST)[6]

Wisconsin has lagged most states in the development of instruction by television for its elementary and secondary school children.

In 1971, the only organization offering instructional television on a regular basis to both public and parochial elementary schools in Northeast Wisconsin was NEWIST. Between 9 a.m. and 11 a.m. Monday through Friday, this public, non-profit organization broadcasts instructional video tapes over a commercial Green Bay station, WLUK, Channel 11. Most of the video tapes are rented from either National Instructional Television, Inc., of Bloomington, Illinois, or from Great Plains Instructional Television Library, Lincoln, Nebraska.

Since it began in 1967, NEWIST has paid $40,000 per semester for the use of Channel 11's facilities. It is intended that the service will use WPNE, Channel 38, the Green Bay educational television station when it is in operation in early 1972.

NEWIST receives funds both from the Green Bay area public and parochial schools which subscribe for the service, and from the State of Wisconsin through the Educational Communication Board.

The demand for the service has been very low from both teachers and administrators of the public schools. A majority of teachers see no pressing need for the services of NEWIST, and have had little training in the application of instructional television to the classroom learning situation.

Most of the Director's staff of two full-time and four part-time personnel serve primarily as salesmen soliciting participation of the Northeast Wisconsin schools. Nevertheless, NEWIST intends to expand its service to five hours each day, five days each week when Channel 38 begins operation.

Instructional Television Fixed Service (ITFS)

ITFS is a specially licensed television transmission system using channels at frequencies higher than regular VHF or UHF television broadcasting channels. In 1963, the Federal Communication Commission designated 31 microwave channel frequencies (2500-2686 MHz) as Instructional Television Fixed Services. Maximum power allotment is 10 watts giving an effective radius of coverage of approximately 20 miles. Repeater channels may be used to increase the coverage. Antenna mounted microwave converters switch ITFS signals to VHF so that standard television receivers and conventional audio and visual distribution systems may be used.[7]

In the Milwaukee area, the Milwaukee Archdiocese, Marquette University and The University of Wisconsin-Milwaukee, along with the Milwaukee Public School System all use ITFS facilities to bolster their educational programs with instructional television.

Although a feedback potential exists within the ITFS system itself, as well as the simultaneous use of a telephone system for feedback, the services offered by the Milwaukee Archdiocese, Marquette University and UW-M are one-way telelecture only. The development of two teleconferencing systems are being considered for the Milwaukee area and will be discussed in Chapter III, when systems including feedback are examined.

The Milwaukee Archdiocese[8]

The most advanced ITFS system in Milwaukee is run by the Milwaukee Roman Catholic Archdiocese. With its main transmitter in New Berlin and two repeater-transmitters in Kenosha and Elkhorn, the Milwaukee Archdiocese uses ITFS to bring televised educational programs to over 40,000 Catholic elementary school students. Receivers are located in 101 sites, 95 of them in elementary schools. Begun in 1968 this system transmits programs over four separate channels from 9 a.m. to 3 p.m. Monday through Friday. At other times in-service programs for teachers and religious education programs for adults are transmitted. Most of the programming is recorded material of a dramatic nature (e.g., Davey and Goliath) rather than lectures.

Monsignor Schmidt, Director of the Milwaukee Archdiocese Communication Center, stated that the annual operating expense is approximately $130,000. By late 1971 almost $900,000 had been invested in the system. When three more repeater-transmitters are in operation by the end of 1972, the cost for the ITFS system will approach $1.4 million.

The present system using three transmitters reaches five counties containing approximately half of the children in the State who attend Catholic elementary schools. Three more repeater-transmitters are being constructed so that ten Wisconsin counties will be included. The Archdiocese has very tentative plans to expand its ITFS system to include programming for Milwaukee's Catholic high schools.

The only evaluative research that has been conducted is in the form of teacher evaluations of the courses offered by the system. More rigorous research has not been requested since the system has been so well received. According to Sister Mary Eric of the Archdiocese's Communication Center staff, the system has been "overwhelmingly successful." The number of schools desiring to join the system has been so large that receivers are becoming difficult to acquire.

<u>Marquette University</u>[9]

Initiated in 1969, Marquette's ITFS system is used to transmit programs to Marquette University buildings, Cardinal Stritch College, Alverno College, and to the Marquette School of Nursing, all in the Milwaukee area. Generally, the programs have been supplements to courses, such as special experiments and interviews with well-known visitors, rather than lectures for large courses. Some of the programming is live.

According to a budget summary provided by Kenneth Shuler, Chief Engineer of Marquette University's Instructional Media Services, the initial costs including equipment and installation for two transmitters and four receiving stations totaled $33,628. Yearly operating costs totaled approximately $5,834.

The success of the program is underscored by the fact that Marquette has applied to the FCC for two additional channels to the two currently being used. However, no evaluative research has been undertaken.

The University of Wisconsin-Milwaukee (UW-M)[10]

The University of Wisconsin-Milwaukee is completing a four-channel ITFS system for use in Milwaukee. Limited operations began in the Fall of 1971. Two channels will be used by the University as a whole, and two specifically reserved for the School of Nursing for instruction of students receiving clinical training at nine Milwaukee area hospitals.

Receiving stations others than those in hospitals will be located at UW-M's downtown campus, in Milwaukee's inner core and at the University of Wisconsin-Waukesha. At present no regularly scheduled programs are planned other than those for the School of Nursing. Instead, the ITFS system will be reserved for special programs, guest speakers, and the like.

No feedback is currently planned. There is some discussion concerning a telephone feedback system to the main studios from four UW-M classrooms involving students enrolled in a proposed economics course shown over the ITFS system. There are plans in the Milwaukee area for the use of ITFS in conjunction with a telephone callback system both in the Milwaukee Public Schools and Marquette University. These will be discussed in the next chapter.

Budget information on the system was unavailable when this report was written. However, James Cheski, Assistant Coordinator of the Instructional Media Laboratory at UW-M was compiling a budget summary from scattered budget sources in early October, 1971. There has been no evaluation of the system or its use.

Dial Access Audio Systems

Wisconsin Medical Center Dial Access Library (DAL)

Background. Telephone dial access systems have developed out of pressing need for the services that such systems could offer. Studies were initiated into their potential because more traditional means simply could not keep up with the increasing demand for ever-expanding information in all fields of medicine. Therefore, the criteria of success became the amount the system was used and the number of people served.

A general practitioner faces many difficulties. Two difficulties susceptable to solution by a dial access system were felt to be: (A) the schedule of a general practitioner does not allow him opportunity to undertake continuing formal education as a means of keeping abreast of recent developments; and, (B) the general practitioner frequently faces problems which demand immediate action when he does not have his usual sources of reference at hand.[11]

Consequently, a pilot project was initiated at The University of Wisconsin in 1966 sponsored by the Department of Postgraduate Medical Education of the University Medical Center and University Extension Health Sciences. The project was designed with the following objectives in mind:

> (a) provide authoritative "core" information on a variety of medical subjects for use in emergency situations and as a method of updating medical information and (b) have the information available at any time of the day or night and accessible wherever the physician may be and at lowest possible cost.[12]

The system and its use. The original library content was established by the Medical Center Committee on Continuing Education with a limit of four to six minutes length on each tape. Inexpensive tape repeaters with self-winding cartridges played the caller's selection, and service was available on a 24-hour a day basis.

With two lines installed, one serving physicians in Madison, and the other serving the rest of the state, in 1966 the statewide medical community had access to 88 tapes. Toll charges on calls outside Madison were paid by the individual caller. After a grant from the Regional Medical Program Services United Health Division of H.E.W. in 1967, the library was expanded and a duplicate library was established in Milwaukee.

Under the sponsorship of the Wisconsin Regional Medical Program in 1968, the Medical Dial Access Library was enabled to use Inward Wide Area Telephone Service (IN-WATS), providing free service to all in-State physicians.[13]

In January, 1968, 230 tapes were available around-the-clock to any physician in Wisconsin toll-free, and all Wisconsin hospitals received continuing notices about the services with a catalogue of tapes. By

June, 1971, the Wisconsin Medical Dial Access Library contained a selection of about 500 tapes which are continually revised and renewed. In June, 1971, a new service to patients was begun. Patients who are to undergo certain tests or surgery may call the DAL and request tapes explaining what procedures they might expect in an attempt to allay fears.[14]

All tapes are recorded by audio technicians and announcers at the University of Wisconsin Medical Communication Center. Duplicates are available for sale to other dial access libraries across the nation. This sale has progressed at a rapid rate. Those states and institutions which have purchased duplicates of Wisconsin's entire library are Arizona, Alabama, Ohio (Northwestern Regional at Toledo), Oklahoma, and the University of Saskatchewan Medical School. Partial library customers have been Missouri, New Mexico, Intermountain (Utah) Regional Medical, Nebraska, New Jersey, and central New York. In addition, there are several affiliates of the Wisconsin Dial Access Library: the states of Minnesota and North Dakota, Veterans' Administration Hospitals throughout the country (calling on the Federal Telephone System), and AT&T affiliated physicians. (A list of the Wisconsin Medical Dial Access Library tapes may be found in Appendix A.)

Cost. In the past, the Medical Dial Access Library leased three metered lines of 15 hours each at $225 each per month from Bell Telephone. This meant that only the calling time was charged to the DAL and totaled until 15 hours of calls was reached. Then the next of the three lines was used. This operation is different from the Inward Wide Area

Telephone Service in that the IN-WATS is leased at a flat rate of $600 per month, regardless of the number of calls. However, the $225 per month charged for each of the three metered lines proved to be more effective than using the all-hour IN-WATS service. The annual operating expenses total approximately $15,000.[15]

The metered line service was changed to the IN-WATS service occasionally to match the temporary overflow of calls during the month or two after a new tape catalogue brochure or addition had been mailed the doctors and hospitals.

Service is now limited to those physicians who pay a yearly $25 flat subscription. Under this plan, each doctor is issued a subscription number with which to identify himself when he calls, and only those doctors holding subscription numbers are given service. No charge is made on an individual call basis. This action drastically reduced the metered line usage, thereby reducing cost.[16] According to Roy T. Ragatz, Educational Coordinator for the Wisconsin Regional Medical Program, the reason for this action is that the Wisconsin Regional Medical Program withdrew funding in September, 1971, in accordance with an original agreement that the Wisconsin Medical DAL would become self-sustaining.

Evaluation. In the evaluation of the success of this system, the staff of the Wisconsin Medical Dial Access Library collected information in two ways: data received from the physician at the time of the call were recorded on a log sheet including the date and time of the call, the number of the tape requested, the caller's name and city, his practice status (general practitioner, specialist, intern, medical student); and secondly, the users of the library were surveyed by return postcard to determine the effectiveness of the service.

The log sheet procedure mentioned above remained unchanged from January 1, 1968 to October 31, 1969, a total of 22 months. However, the original postcard survey form was modified on October 1, 1968, after 10 months' use. More accurate data came from a nine month use of the second form (October 1, 1968 to June 30, 1969).[17] This card has two parts, one for the physician who called regarding a specific patient problem and another for those physicians who called for general reasons (see Fig. 1).

Approximately 71.1 percent of those doctors receiving postcards between October 1, 1968 and June 30, 1969, returned them. The results[18] may be found in Figure 2.

Fig. 1

CALL # ________________

COMPLETE SECTION A OR SECTION B
Your Answers Will Be Kept Anonymous   TITLE: ______________________

Section A

Answer here if you called because of a specific condition of a particular patient.

CIRCLE Yes or No

1. I found the information in the tape talk
   a. changed one (or more) items of my management of a specific patient problem. YES NO
   b. gave me new information. NO YES
   c. gave me confidence in managing the patient problem. YES NO
   d. too elementary NO YES
2. I called because of an immediate or emergency patient condition. YES NO
3. Complete the sentence below in your own words:

Section B

Answer here if you called because of general interest, curiosity or other general reason (i.e., other than a specific patient problem).

CIRCLE Yes or No

1. I found the tape talk
   a. gave me new ideas for improving my management of health care. NO YES
   b. helpful in reviewing and evaluating my approach to health care. YES NO
   c. caused me to change one (or more) aspects of my health care practice. NO YES
   d. too elementary. YES NO
2. Complete the sentence below in your own words:

I probably will/will not call again because ______________________

____

____

Fig. 2

PRIMARY REASON FOR CALL
(NINE MONTHS)

Reason	Percent of Total Calls
Specific Patient Problem	44.8
General Reason	47.6
Both	7.6

Fig. 3

RESULTS OF CALLS RELATED TO SPECIFIC PATIENT PROBLEMS (NINE MONTHS)

Result	Percent "Yes"	Percent "No"	Not Answered	Total Percent
Changed Patient Management	19.7	21.8	10.9	52.4
Gained New Information	36.9	9.4	6.1	52.4
Gained Confidence	39.9	4.3	8.2	52.4

Fig. 4

RESULTS OF CALLS RELATED TO GENERAL INTEREST (NINE MONTHS)

Result	Percent "Yes"	Percent "No"	Not Answered	Total Percent
Gained Ideas for Management	33.2	12.0	10.0	55.2
Helpful Review	47.3	3.3	4.6	55.2
Changed Aspects of Practice	12.8	25.6	16.8	55.2

During the 22 month period from January 1, 1968, to October 31, 1969, a total of 10,389 calls were received averaging 15.6 calls a day. Most of the calls were received in the evening with a peak about ten o'clock. During the survey period, October 1, 1968 to June 30, 1969, 79.8 percent of the total callers indicated that they would probably call again (19 percent did not answer the question). Figures 5, 6 and 7 graphically show distribution of calls.

Fig. 5

DAILY DISTRIBUTION OF CALLS (22 MONTHS)

Day of Week	Percent of Total Calls
Monday	16.1
Tuesday	15.9
Wednesday	15.4
Thursday	15.3
Friday	13.4
Saturday	12.0
Sunday	11.9

Fig. 6

DISTRIBUTION OF CALLS BY PRACTICE LOCATION (22 MONTHS)

Community Size	Percent of Total Calls
Under 2,500	8.0
2,500-9,999	10.5
10,000-24,999	4.4
25,000-49,999	11.0
50,000-99,999	3.9
100,000-499,999 (Madison)	16.4
Over 500,000 (Milwaukee)	40.0
Outside Wisconsin	5.3
Not Ascertained	0.5

Fig. 7

DISTRIBUTION OF CALLS BY TYPE OF PRACTICE
(22 MONTHS)

Type of Caller	Percent of Total Calls
General Practitioners	34.5
Specialists	28.1
In Training	28.4
Others	9.0

In the distribution of calls among identified user groups, it had been expected by the survey team that General Practitioners would constitute the largest group, yet students and specialists were the majority of users (Fig. 7).

In a feasibility study for a proposed national medical dial access library,[19] it was found that the greatest number of calls came from rural rather than urban areas. Ragatz believes this result is due to the greater number of information sources (hospitals, clinics, libraries, etc.) available in urban than in rural areas.[20] In the survey conducted of the Wisconsin Medical Dial Access Library, it was found that over one-half (56.4 percent) of the calls came from the metropolitan areas of Madison and Milwaukee. Ragatz felt that this did not necessarily contradict the earlier findings of the feasibility study since most of those who called in the Madison and Milwaukee areas were students and specialists rather than physicians.[21]

Nursing Dial Access Library (DAL)

The system and its use. Developed by the Department of Nursing, Health Science Unit of University Extension, The University of Wisconsin, the Nursing Dial Access Library was patterned after the Wisconsin Medical DAL. The Department of Nursing was assisted in developing its system by Thomas C. Meyer, M.D., Chairman, Department of Postgraduate Medical Education, who initiated the Wisconsin Medical Dial Access Library.

Funding from the Wisconsin Regional Medical Program for the Nursing Dial Access Library began September 1, 1968. Nurses affiliated with the University of Wisconsin Department of Nursing made suggestions for tape subjects and content to the Nursing Tape Review Committee.[22] Topics were drawn up from the suggestions, and questionnaires with proposed subjects were mailed to 1,800 nurses on the department's mailing list, representing a 10% sampling of the State's registered nurses.[23]

The results from the questionnaire revealed the interest of nurses in a dial access system, and formed the basis for the content of the tape library. Some topics suggested required visual presentations to make them understandable. Therefore, several of the original topics were left out, the Tape Review Committee concentrating on subjects which could be covered verbally.

The stated purposes of the Nursing DAL were somewhat different from those of the Medical DAL. The Nursing DAL intended to provide core information on (a) nursing care in emergency situations; (b) new procedures and equipment; (c) recent developments in nursing; and, (d) legal aspects in nursing situations.[24] The Nursing Dial Access Library has tried as its target audience nurses practicing in isolated settings--

school nurses, occupational health nurses, and nurses in small hospitals and nursing homes.

Scripts for the tapes in the Nursing Dial Access Library were prepared by individual nurses who volunteered for the task. With each script, three literary references were submitted so that a Bibliographic Reference Sheet was made available to nurses interested in more detailed study beyond the tapes (a list of current tapes is found in Appendix B).[25]

Both the Nursing DAL and the Medical DAL have drawn from the same tape library, and now use the same telephone lines. The receptionist no longer answers calls identifying it as either "Nursing" or "Medical", but simply "Dial Access Library." The library itself is located at 41 North Mills Street, Madison, and is under the direct supervision of Robert Devenish, Communications Manager, The University of Wisconsin.

Cost. Tapes are recorded at the University Medical Communications Center, as are those of the Medical DAL. The costs of the individual tape cartridges, Cousino Repeaters and other hardware purchased for the library are as follows:[26]

Cousino Repeater, Model R-7320	$100.00
Echo-Matic Self-Threading Cartridge, 1410MT	2.00
U-Tape-It-Kit, K6	10.70
Tape Splicer, Robins TS-4J	5.50
Audio Tape, 3M 150-1/4-1800 polyester base	3.34
Lubricated Audio Tape, 3M 151-1/4-1600	3.57
Connect Plug, Cinch Mfg. Corp. DB-19604-432	3.49
Hood, Cinch Mfg. Corp. DB-51226-1	1.41
Approximate total	$130.01

The telephone rates for the Nursing system were much like the Medical system, fluctuating between all-hour IN-WATS for $600 per month and metered IN-WATS for $225 for 15 hours of use per line per month.

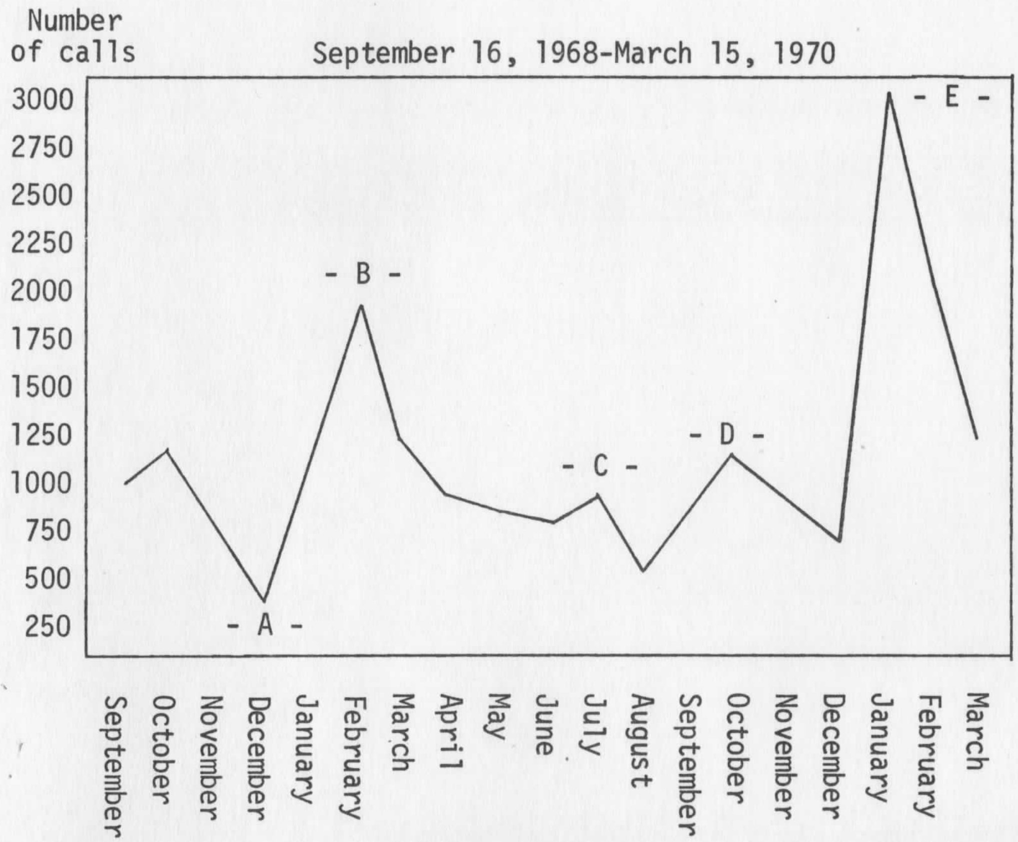
Since October, 1970, under the direction of Wisconsin Communications Manager, Robert Devenish, the system for both Medical and Nursing systems (handled as one library) used one all-hour IN-WATS line ($600), two metered IN-WATS lines (2 x $225 per month and $13 for each hour above the metered 15 hours), and three local lines (3 x $11.35). This arrangement was in effect until September, 1971, when the Subscription System became effective.[27] The annual operating expense for the Nursing DAL is approximately $20,000.[28] The evaluations of the Medical and Nurses' Dial Access systems were long and detailed covering several years, yet they were never really compared to the existing systems of continuing medical education through journals, conferences, and consultations. (A more detailed discussion and evaluation may be found in Appendix C.)

Evaluation. In a fifteen month period between January 1, 1969 and March 15, 1970, 16,258 calls were received by Nursing Dial Access (Wisconsin Medical received about 10,000 for a twenty-two month period--January, 1968 to October, 1969).[29]

The graph on the following page relates the timing of publicity mailings to the number of calls. The brochures mentioned on the graph contained the listing of tapes and supplementary information.

Fig. 8

NUMBER OF CALLS BY MONTH[30]



A - Funds not available for publicity

B - First brochure mailed to individual nurses

C - Supplement mailed to selected groups

D - Supplement mailed to selected groups

E - Second brochure mailed to individual nurses

In order of those who make the most calls, the prime users of the Nursing Dial Access system are: (1) Registered Nurses; (2) Licensed Practical Nurses; (3) Student R.N.'s; (4) Student L.P.N.'s; (5) Student M.D.; and (6) several other groups such as nursing assistants and health-related professionals. To determine whether or not the Nursing DAL was reaching the rural community, statistics were compiled for "calls per nurse" in each county (i.e., the number of calls from each county divided by that county's number of nurses). In those counties with less than 60 percent urban population, the average call per nurse was .78, and in counties with more than 60 percent urban population, the number of calls per nurse was only .58.[31]

As with the Medical Dial Access Library, a duplicate Nursing DAL was located in the South Division of the Mental Health Unit--Milwaukee County Hospital. However, both Milwaukee libraries are now only reference libraries for the Milwaukee County Hospital. This action was taken because of the shift in the importance of dial access service from urban to rural areas. The number of calls received in Milwaukee was not sufficient to warrant continued service, since so many other reference sources are available to medical personnel.[32]

Although the Medical DAL has approximately five times more tapes than the Nursing DAL, the latter has three times more calls than the former. This largely is due to more extensive promotional campaigns undertaken by the Nursing DAL.[33]

The Medical and Nursing dial access projects were designed to provide information for use in emergency situations and to make medical information available at any time of the day or night. The founders of these systems believed that other methods of continuing medical education would not be sufficient to meet these exigencies. However, the evaluation data indicate that more calls were made for general interest information than were made for information dealing with specific patient problems (including emergency calls).

The peak time for calling is 10:00 p.m. with few calls between midnight and morning, showing that the "anytime of the day or night" opportunity was not significantly used.[34]

Even though the "emergency" and the "anytime" opportunities are convenient to have, usage by callers has shown that they are not the primary motives for calling. Indeed, the services received when calling for general reasons, such as information about patient management, general information, and for reasons of confidence, could be duplicated well enough by other means such as journals to bring the advantage of dial access, proportionate to its cost, into question.

Wisconsin Heart Association Dial Access Systems

Stimulated by the success of the Medical Dial Access System at The University of Wisconsin, the Board of Directors of the Wisconsin Heart Association developed a dial access system as a tool in disseminating information concerning heart disease and related health problems to the general public. The system is different from the Medical DAL in that the number of possible users is much larger. As a result, the

Wisconsin Heart Association could not hope to cover the entire State of Wisconsin with a single system because of projected costs and the potential number of calls the system might be required to handle.

After the Board of Directors discussed the proposed DAL with the aid of Thomas Meyer, M.D., Chairman of the Postgraduate Medical Center of the University of Wisconsin (and a Wisconsin Heart Association Board member), it was decided that two dial access systems, one established in La Crosse, and the other in Green Bay, would serve as control locations for the dissemination of health information to the State. Each system would serve only local calls without cost. Long distance toll charges would be paid by the caller.

La Crosse[35]

The system and its use. La Crosse was well suited for a Heart Association dial access system because of the nearby location of the Gunderson Clinic which conducts research in heart disease. Dr. Erik Gunderson, director of the clinic, wrote many of the scripts for the tapes and acted as medical consultant for the dial access system.

The original establishment of the La Crosse "Heartline," as it was called, was handled by Jack Forbes, who in 1969 was director of the La Crosse District of the Wisconsin Heart Association and is presently Director of the Madison District. Forbes planned to have the tape library handled by an answering service using one local telephone line and one Cousino repeater. The library numbered approximately 20 tapes on smoking, lung and heart disease, and associated illnesses.

A major technical problem developed in the effort to have a call automatically terminated by the electrical equipment at the end of a tape. A special connector had to be designed. Because the call was coming through the switchboard of an answering service, the usual connection equipment (from Cousino to line) would terminate the call at the telephone company, while leaving the answering service connected to a dead line. In an effort to solve this "double cutoff" problem, Forbes asked the Bell Telephone Company to construct a special connector, since he assuming that the local independent La Crosse Telephone Company would not handle it. Delays forced Forbes to go back to the La Crosse Telephone Company where the connection was successfully constructed and installed. In the eventual setup, the Cousino playback cartridge was tied in with the connector and then tied in to the local line (both leased from the La Crosse Telephone Company).

The Medical Communications Center of the University of Wisconsin recorded the cartridges, and a publicity drive started on January 15, 1970. LaCrosse newspapers gave the service good coverage, and single-page leaflets listing the tapes available were placed into housewives' grocery bags by the local supermarkets. Even though the publicity drive was limited, on the opening day of January 30, 1970, hundreds of calls were received from interested people.

As the system became a few weeks old, another problem arose when callers did not know the tape selection and wanted the answering service to read the list. This particular problem occurred enough times to become cumbersome, so Forbes bought space in the telephone book. In the yellow pages, all of the available tapes were listed under "Heartline", and uninformed callers were referred to that page.

Cost. "Heartline" use leveled off at an average of about 25 calls per day primarily from housewives and middle-aged adults. A $450 budget for the first six months of operation was broken down to:

Preparation of tapes	$147.00
Cousino Repeater	100.00
Madonna Lammers Answering Service	15.00/mo.
Local Line	9.75/mo.
Coupler	3.50/mo.
Special Installment	4.50
Cousino Connector	20.00
Yellow Pages Ad	9.35/mo.

The cost per call was 12.7¢.

Evaluation. The only data kept on this dial access system was a listing of which tapes were requested most and the number of calls per day. No evaluation was attempted, or could be afforded.

Green Bay[36]

The system and its use. Patterned after the somewhat small scale, yet consistent success of the La Crosse Dial Access System, the Green Bay (Brown County Heart Unit) Dial Access System was directed by Darryl Reed, Director of Green Bay District, Wisconsin Heart Association (presently Area Director, South East Wisconsin). He was assisted by Jerry Kanuth.

The Green Bay area is serviced by the Bell Telephone Company. Similar to La Crosse, technical difficulties in connecting two Cousino repeaters to two local lines delayed the planned simultaneous opening of Green Bay's system with La Crosse by six months.[37] The two telephone lines and taped library were handled by firemen at Fire Station No. 1 in Green Bay enabling 24-hour service. Leaflets similar to La Crosse's listing 12 available tapes centering on the prevention of heart disease were distributed by mail and by grocery bags. The Green Bay Press Gazette ran several advertisements concerning the service.

Cost. With roughly double the equipment of the La Crosse system, Green Bay received an average of only five calls per day. The tapes were recorded by a commercial audio studio at fairly costly rates, resulting in a first year cost for production and operation of $704. This was itemized in the following manner:[38]

Preparation of tapes	$150.00
Cousino Repeaters (2)	200.00
Tape and Electronic Equipment	63.00
Telephone Installation	54.00
Telephone Rental	237.00
Total	$704.00

These expenses cover a library of 10 recordings and one year of operation. They do not reflect expenditures for staff or long distance toll calls. The cost of production for the tapes is an estimate since the cost can vary considerably from recording to recording, depending upon the production requirements.

Evaluation. As with the La Crosse system, Green Bay encountered technical difficulties. Additionally, the Green Bay system suffered from low use (five calls per day average) partly because the firemen serving as operators were not able to handle the calls with the ease of an answering service. Often callers would spend considerable time discussing the problem with the fireman-operator before the tape was played.[39] This fact, coupled with an equipment oversupply, weighed heavily against the Green Bay system.

Conclusions

Like the La Crosse "Heartline," the Green Bay DAL offering information to the general public is especially interesting in its possible application to other public service organizations. Although both systems attempted only small-scale coverage, they were limited in their publicity campaign, which weakened their impact. Further, the two Wisconsin Heart Association DAL's not only depend on donations for their operating expenses, but since 1970 have had to operate in the midst of an overall reorganization of the Heart Association itself. This reorganization is the reason for the district relocation of both Forbes and Reed, and these changes had considerable negative impact on the continuity of each system.

Notwithstanding, Forbes was still optimistic about the potential of dial access systems for public service and education--particularly in the comparative costs of his system and one as large as the University of Wisconsin Medical Dial Access Library. He felt that a system trimmed to its barest essentials could be very useful.

In contrast to a statement in the "Educational Products Information Exchange Report on Dial Access" that a successful dial access system needs in excess of 50 tape sources and 50 people or locations to be served, the Wisconsin Heart Association has shown that approximately

10 to 20 tapes can be used with success.[40] Integrating a dial access system with an answering service is a useful idea as the operators are easily trained in handling both the equipment and calls.

Madison Campus Student Dial Access System[41]

The growth in size and complexity of the university and colleges in the United States have resulted in confusion concerning the curriculum, degree requirements, drugs, demonstrations, and the like. These changes and social problems have generated a concomitant need for more accessible and accurate information dissemination systems. On the University of Wisconsin campus at Madison, the College of Letters and Sciences has instituted a "telephone Dean." This is an Associate Dean or a member of the Associate Dean's staff who specifically handles telephone questions. This has been so successful that the College of Letters and Sciences and the Division of Student Affairs recommended that the University of Wisconsin establish a Dial Access Telephone Information System to complement their various other telephone services.

There has been strong support for the proposal for several reasons. The system proposed will involve the use of relatively inexpensive equipment, and will require far fewer and less qualified personnel than the present "Telephone Dean." The experience of the University Medical Dial Access System provides excellent experience and data concerning equipment, techniques and costs. Finally, the lessening of burden on the current advisory systems will provide better information more rapidly.

The use of a dial access system is expanding in university and college campuses. Michigan State University, for example, uses a taped information system. Of possibly more importance is the fact that such a system would provide the general public an opportunity to obtain information about the campus potentially reducing the tension which sometimes exists between the public and the university community.

The success of establishing and operating a campus DAL will depend upon the perspective of the administration, faculty and student body concerning the problems and potential solutions. The experience of the Wisconsin Heart Association should be helpful. A copy of the Memorandum to the Vice-Chancellor for Academic Affairs of the Madison Campus is found in Appendix B and provides a thorough discussion of the proposed system and its costs.

Conclusion

This has been a short discussion of the role of one-way telecommunications in Wisconsin, especially concerning the Dial Access System of telephone information dissemination. Such systems are not teleconferencing, by any stretch of the imagination. However, they are the precursers of such interactive systems. No new technique should be viewed as replacing an older or as extending it so much as providing a means of doing what was formerly impossible. When we begin our discussion of multi-access, interactive systems for use in telelectures with feedback and in teleconferencing, we will concentrate not on what can be replaced, but on what can now be accomplished which formerly was only hoped for or not thought about at all.

What is somewhat discouraging in an examination of telecommunications systems of the one-way variety is that it takes so long for innovation to diffuse throughout society. True, cost factors often slow down the adoption, but even more important, there is a resistance to change among the members of our society that causes us to stumble on our way toward providing approaches to our myriad problems. Two-way communication and interaction will not create problems so much as will their absence. Yet we are reticent to establish open lines and channels.

It is the purpose of the next chapter to discuss the various approaches to two-way communication taken in Wisconsin as a means of increasing our understanding of the attendant problems, in hopes of generating possible solutions.

NOTES

[1]Senator John F. Kennedy, a letter to William G. Harley, President of the National Association of Educational Broadcasters, October 14, 1960, quoted in Educational Television, Hearings, before the Subcommittee on Communications and Power, Committee on Interstate and Foreign Commerce, House of Representatives, on H.R. 132, 87th Cong., 1st sess., March 1, 1961, p. 4.

[2]Raymond D. Hurlbert, General Manager, Alabama Educational Television Commission, "Comments on the Roberts Educational Television Bill, H.R. 132," Educational Television, Hearings, before the Subcommittee on Communications and Power, Committee on Interstate and Foreign Commerce, House of Representatives, on H.R. 132, 87th Cong., 1st sess., March 21, 1961, p. 67.

[3]Wilbur Schramm, Jack Lyle, and Ithiel de Sola Pool, The People Look at Educational Television: A Report of Nine Representative ETV Stations (Stanford: Stanford University Press, 1963), p. 1.

[4]Lee Franks, Director, Educational Communication Board, Madison, Wisconsin, Private Interview, August 19, 1971.

[5]Ibid.

[6]Information concerning NEWIST was provided by Russell Widoe, Director, Northeastern Wisconsin In-School Television (NEWIST), Green Bay, Wisconsin, Telephone Interview, August 19, 1971.

[7]IEEE Spectrum, VII, 5 (May, 1970), 79.

[8]Information on the Milwaukee Archdiocese was provided by Monsignor Schmidt, Director of the Milwaukee Archdiocese Communication Center, Telephone Interview, October 12, 1971; and Sister Mary Eric of the Milwaukee Archdiocese Communication Center, Private Interview, July 6, 1971.

[9]Information about Marquette University was provided by Kenneth Shuler, Chief Engineer of the Instructional Media Department at Marquette University, Milwaukee, Wisconsin, Telephone Interview, July 22, 1971.

[10]Information about UW-M was obtained in a telephone interview with Robert Hoye, Coordinator of the Instructional Media Laboratory at UW-M, June 29, 1971; and an interview with James Cheski, Assistant Coordinator of the Instructional Media Laboratory at UW-M, held June 30, 1971.

[11]Thomas C. Meyer, Richard Hansen, and Roy Ragatz, "Providing Medical Information by Telephone Tapes," Journal of Medical Education, XLV (December, 1970), 1060.

[12]Ibid.

[13]Ibid., 1061.

[14]Interview with Roy T. Ragatz, Educational Coordinator, Wisconsin Regional Medical Program, June, 1971.

[15]Ibid.

[16]Ibid.

[17]Meyer, Hansen, and Ragatz, "Providing Medical Information," 1061.

[18]Ibid., 1063.

[19]Department of Postgraduate Medical Education, A Study on the Feasibility of Establishing a National Medical Dial Access Information Retrieval System, Contract No. NLM69-22, National Library of Medicine, 1970, p. 121.

[20]Ragatz Interview.

[21]Ibid.

[22]Members on the Tape Review Committee include Mrs. Signe Cooper, R.N., Professor and Chairman of the Department of Nursing, and Mrs. Anne G. Niles, R.N., Project Coordinator.

[23]Anne G. Niles, R.N., Coordinator, Definitive Dialing--Nursing Dial Access: A Report of the Planning Year and the First Eighteen Months in Operation, September 18, 1968 - March 15, 1970, Under the Direction of Signe S. Cooper, R.N., Project Director, assisted by Martha Asthana, Project Assistant (Madison: University Extension, The University of Wisconsin, Health Sciences Unit, Department of Nursing, 1970), p. 9.

[24]Ibid.

[25]Ibid.

[26]Niles, Definitive Dialing, p. 12.

[27]Interview with Robert W. Devenish, Communications Manager and Controller, State of Wisconsin, Madison, July 7, 1971.

[28]Richard Hansen, Coordinator of Medical Extension, The University of Wisconsin, Telephone Interview, October 13, 1971.

[29]Meyer, Hansen, and Ragatz, "Providing Medical Information," 1062.

[30]Niles, Definitive Dialing, p. 19.

[31]Ibid., p. 21.

[32]Ragatz Interview.

[33]Hansen Interview.

[34]Meyer, Hansen, and Ragatz, "Providing Medical Information," 1061.

[35]Information about La Crosse "Heartline" was provided by Jack Forbes, Director, Madison Heart Association, Telephone Interview, July 8, 1971.

[36]Information about Green Bay Dial Access System was provided by Darryl Reed, Director, South East Wisconsin Area Heart Association, Telephone Interview, July 12, 1971.

[37]Forbes Interview.

[38]Reed Interview.

[39]Ibid.

[40]"Educational Products Report: Dial Access Systems and Alternatives," Educational Products Information Exchange, #36, 1971, p. 9.

[41]Information about the Campus Dial Access Telephone Information System was provided by Steven R. Saffian, Director, Campus Assistance Center and Communications, Madison, Private Interview, and from his "Memorandum" to Joe Corry, Assistant Vice-Chancellor for Academic Affairs, Co-Authored with Blair Mathews, Associate Dean, College of Letters and Sciences, Madison; Devenish Interview.

CHAPTER III

TELECONFERENCING WITH FEEDBACK

Television with Audio Feedback

Television with Multiplexed Audio Feedback[1]

When Wisconsin's Educational Communication Board (ECB) was given $2.5 million to establish an educational television network, bids were requested for the installation of the microwave relay links between the stations to allow for live networking. Midwestern Relay, a joint venture between American Microwave Company of Iron Mountain, Michigan, and The Milwaukee Journal Company, was low bidder and will be responsible for setting up the system. Pending an FCC decision, Midwestern Relay is prepared to supply the necessary equipment to allow for two-way audio to be multiplexed or carried along with the regular television signal.

By way of a simplified technical explanation, this two-way audio would occur during the vertical blanking interval or that portion of the television signal currently used to transmit the vertical blanking pulse. In a television system, as the electron beam completes its scan at the bottom of the picture field, it is necessary to return it to the top or starting point of the next field. During this rapid movement it is essential that the electron beam be cut off completely for a time slightly longer than the time required for retrace in order to eliminate spurious signals and blank out retrace lines on the picture. The time of the vertical blanking interval results in up to 42 scanning lines in each frame composed of 525 total lines being unavailable for picture information.

Therefore, a series of vertical blanking pulses to cut off the electron beam is broadcast during this interval.[2] However, there is still sufficient channel width to multiplex five voice channels "on top of" the vertical blanking pulses.[3]

There are many uses for these five voice channels, including studio-to-transmitter two-way links, audio feedback systems for instructional use and computer exchanges between the State Universities and the six cities of the system. Definite plans have not been made for the use but, pending an FCC decision, teleconferencing and data exchange capabilities can exist as a part of Wisconsin's Educational Television Network, and as a supplement to the telephone and radio systems already in use. It would be a 24-hour capability whether a picture was being transmitted or not.

ITFS with FM Radio Feedback

A teleconferencing potential also exists within ITFS systems in addition to a feedback via telephone, currently in use. In June, 1969, the FCC allocated channels between 2686-2690 MHz to be used for frequency modulated (FM) radio feedback to the ITFS transmitter. It has been estimated that such a talkback system would cost approximately $15,000 for special equipment at the transmitter and at the remote locations.[4] Currently Wisconsin has no plans for such use.

WAU-27[5]

The system and its use. The Milwaukee Regional Instructional Television Station, WAU-27, is an Instructional Television Fixed Services (ITFS) station located at the Veterans' Administration Hospital in

Milwaukee. Dr. A. Stephen Close, Director of WAU-27, applied for and received funds for the equipment and facilities to create the ITFS service as a part of a substantial hospital remodeling project. Currently WAU-27 operates on one channel. A second channel has been applied for and will be in operation as soon as the necessary facility modifications have been made. The maximum range of the station is approximately 20 miles, but this may be extended by using an unmanned repeater station costing about $12,000.

WAU-27 has a television studio, a control room and a film chain at its disposal. The station uses both black and white and color studio originated television as well as films and videotapes.[6] In live studio situations, viewers are able to interact with questions and discussion via a telephone hookup.

The broadcast staff of WAU-27 consists of a network director, a technical coordinator, a broadcast engineer and two cameramen. To provide better liaison with the nurses in schools and hospitals, Dr. Close plans to add a nursing program coordinator to the staff.

The station averages about 80 telecasts each month, including films, video tapes and live studio productions in both color and black and white, to all directors of in-service nursing schools, Deaconess Hospital, Marquette University, The University of Wisconsin-Milwaukee, and the Milwaukee Area Technical College.

Some teleconferencing takes place over the system. For example, a medical conference (gastro-intestinal) is broadcast live twice monthly.[7] It is broadcast within the V.A. hospital and to four other

Milwaukee hospitals. The conference is structured so that the case histories of three patients are considered. The cases are chosen as examples of types of cases and are presented in such a manner as to stimulate responses and diagnoses by the audience.

Typically, each case is considered in three parts. A doctor acting as moderator identifies the case initially. He then turns over the laboratory results and symptom analysis to the doctor in charge of the case. Secondly, each case is discussed and analyzed by a specialist. Three color slide magnifications of affected tissues are presented and discussed by this specialist. X-rays of the case are presented using a black and white camera. Finally, the moderator directs questions and comments to a panel of four or five senior surgeons. Audience participation is encouraged throughout the presentation. Once discussion ends, the moderator goes on to the next case history, which is handled in a similar manner. Many of the staff members in the audience are on call, so that the size of the group varies as people come and go during the hour.

Cost. While a budget breakdown of the WAU-27 operation was requested, it was not obtainable by the time this report was written.

Evaluation. In the overall WAU-27 operation, program and materials are evaluated by participants for planning and scheduling purposes, but little rigorous evaluative research has been undertaken. WAU-27 sends out bulletins previewing the schedule for coming months some two weeks before the actual schedule is made out. The various listening stations are encouraged to make comments and suggestions before the scheduling is finalized. In addition, senior nursing instructors view films and tapes before they are used and these are discussed and evaluated, often by telephone conference calls. Finally, conference participants in the studio at the Veterans' Administration Hospital are given evaluation sheets to fill out after each program. Individuals at other listening stations are encouraged to respond either by letter or telephone.

Proposed Milwaukee ITFS Teleconferencing Systems

Two teleconferencing systems are being considered by Milwaukee area institutions. A program is in the planning stages at Marquette University to transmit live in-service programs to engineers working in various Milwaukee firms over the ITFS system. The engineers would participate in discussion via a telephone callback to the studio where 25 lines would be set up to take incoming calls. Although plans for this project are completed, funding was unavailable as of Summer, 1971.[8]

The Milwaukee Public Schools also have proposed a teleconferencing system utilizing an FM allocation granted by the FCC to transmit educational programs to the area schools. Talkback will occur over a Centrex Telephone System through which incoming calls can be heard over the FM station as they come in. This is tentatively scheduled to begin in early 1972.[9]

UW-Green Bay Microwave System[10]

The system and its use. The University of Wisconsin-Green Bay Campus began television courses via microwave in the summer of 1970. This system beams video signals from Green Bay to the Marinette Center and utilizes regular telephone lines with a speakerphone for two-way audio feedback. Transmission to Marinette covers about 60 miles and is relayed by one tower. No video is sent to the Manitowoc or Menasha Centers which are also in the program. Telephone lines are used to provide both the audio portion of the program and the two-way audio feedback.

After being in operation for one year, the system expanded its programming from one course to three, and as of Fall 1971, the course offering was increased to eight. Eventual plans call for the system to operate from 8 a.m. to 5 p.m., Monday through Friday, carrying 12 courses. Special programming is carried during the evening hours, including guest lectures and presentations by the University of Wisconsin-Green Bay. Invited audiences specifically interested in the topics gather at each of the centers for these special presentations. In this way, local citizens are able to use the UW-GB facilities, and it it hoped that this will foster a better relationship between the campus and the community.

Future plans for this system include expanded video service to Menasha and Manitowoc. Robert Van Abel, Director of Instructional Resources, UW-Green Bay, believes that at least one of these centers will receive video service within the 1971-72 school year. The major future development Van Abel feels will be the incorporation of video tape-recording capability in the UW-Green Bay Television studio facilities. By video-taping more courses could be offered, with greater impact and in less time. The lectures containing the basic study materials for a particular course could be on video tape and broadcast over microwave.

Feedback over telephone lines could provide live question and answer sessions between the professor and students separate from the lectures. Van Abel expressed the feeling that questioning during lectures tended to create confusion and consume valuable time.

Cost. Little budget information was available concerning the microwave system. Partly this was due to lack of a separate operating payroll of any sort. All personnel have other assignments and serve the system as an extra duty. Partly the lack of budget information was due to the fact that all equipment is used primarily for other purposes and was not purchased for the system. Therefore, the only cost figure available was the $12,900 per year paid to Bell Telephone Company for the leasing of the microwave system.

Evaluation. No comprehensive evaluation of the system has been completed.[11] An evaluation of one of the courses (an interdisciplinary study titled "Man and Social Environment") was compiled by Robert M. Jiobu, Assistant Professor in the College of Community Sciences at UW-Green Bay. However, this was a preliminary study of data obtained from a student questionnaire. Copies of the questionnaire, the resulting statistical data, and Jiobu's observations are included in Appendix C. of this report. In establishing this microwave system, Van Abel felt there was urgent need for it whether it was evaluated or not. Microwave television was a "logical" method of meeting the educational needs of the students in the areas served. He felt the system was very effective. However, rigorous evaluative research is contemplated to study the nature of learning gain for individual courses using control groups.

VERB[12]

The Victor Electrowriter Remote Blackboard (VERB), which is marketed by Victor Comptometer Corporation, is a graphic communications system that can be used to transmit written and graphic messages. These messages are usually transmitted via telephone lines, but FM transmission is possible and experimental transmission via satellite has been successful.

The size of a basic transmitting unit is 12 by 6 inches. In the unit is a roll of paper which the user advances as he writes in the 3 1/2" x 5" writing area. Messages are written on this paper with a special pen connected to its own ink reservoir. The movement of the pen tip is "sensed" by the transmitting unit and sent as electrical impulses. There is a stylus of the receiving unit which then responds to these impulses and almost simultaneously reproduces an exact copy of the written message. Educators most often use a system in which the receiver is connected to an overhead projector. For this, the receiver (or transceiver) is fitted with a roll of clear acetate rather than paper. When the message is reproduced on the acetate, it is projected onto a standard movie screen with a maximum size of 9 feet by 13 feet. The overhead projector was developed by Bell Telephone Labs for Victor.[13] Also available are dual frame projectors, and dual frame receivers. These units allow viewing of the previous written frame and the most recent frame, simultaneously.

One of the latest developments in equipment is what Victor calls the "Compensator." Using an Ampex model 2100 tape recorder, the VERB user records both the written and verbal information. Then, he can run the tape through a "Compensator" attached to either the sending or receiving end of VERB, and it will reproduce the lecture in its entirety.

It is easiest to discuss VERB use in terms of the telephone because most VERB systems rely on telephone line interconnection. While FM and satellite VERB transmissions are possible, they are still in the developmental stage.

A simple transmitter to receiver connection requires one telephone line. However, it is also possible to connect a number of receivers to a single transmitter. Each receiver requires a separate line. In the VERB overhead projector system, the 601A Data Phone with third party capability is generally used. This phone gives the lecturer and the students a means of interactive feedback. Standard telephone installation and equipment is all that is necessary to make VERB operational. Regular "zipcord" can be used between machines but it is unreliable and very susceptible to interference. Consequently, most VERB systems use telephone company lines.

Cost. The cost of a basic transmitter is approximately $1,100, that of a basic receiver, which reproduces the message on paper, is $1,270. Transceivers which allow both sending and receiving cost approximately $1,875 each. The dual frame projectors cost $610 and the companion dual frame receivers cost $1,530 each. The Compensator for use with an Ampex tape recorder sells for $1,000. All Victor equipment is available on a purchase-only basis.

Since both private telephone lines and regular and long-distance lines may be used, the charge for interconnecting VERB units is similar to installation and service charges for the desired telephone service.

Limitations. Some limitations have been experienced by VERB users. Both lack of training for operators and the equipment's sensitivity to handling have made the system susceptible to operational difficulties. Beside the adjustments that must be made in teaching techniques, some technical limitations have to be overcome.

Victor has had trouble with the ink and pens on VERB units. The pen has its own reservoirs, and in some instances the ink has leaked resulting in damage to the machinery. Pens have required regular cleaning and maintenance. Victor is consequently working on a felt tip pen with a new kind of ink that will not smudge or damage the equipment. This will in turn reduce the amount of maintenance required to avoid equipment breakdown.

Another technical limitation most frequently mentioned by VERB users is the inability to go back to previous frames. Once the paper on the transmitter has been advanced, the lecturer cannot turn back to it. He must keep this fact in mind, calling attention to particularly important frames in advance. The new Dual-Frame receivers and projectors which show both the previous and immediate frames provide a partial answer to this problem.

Electrowriter Users in Wisconsin[14]

The Victor Electrowriter Remote Blackboard was first used by business and industry, and they remain the largest users.

Business, industry, and government agencies find the Electrowriter useful because of the elimination of verbal error, silent operation, having permanent records of communication, and the completely automatic message reception.

The Caterpillar Tractor Corporation of Milwaukee has eight Electrowriters, one for each foreman. With these transceivers, the foremen can contact the maintenance department, the tools department or the company's two warehouses. The maintenance department will accept only written requests, thus eliminating many communication errors and time consuming interruptions.

Another Wisconsin company, the Trane Corporation, maintains 12 Electrowriter transmitters in their design department and five Electrowriter receivers in the blueprint department. In this system, the transmitters and receivers are only 60 feet apart. Justification for this is that much wasteful walking back and forth between departments is eliminated and interruption of workers is reduced to a minimum. The silence of operation and precise copies of information make the system valuable to this company. Cost per line is one dollar per month--the same cost as adding an extension telephone in one's home.

A completely different Electrowriter application is employed by the Wisconsin Gas Company. Many of their maintenance problems are relayed through a telephone switchboard. At the Gas Company, the operator receives a complaint and copies down the address and pertinent information on an Electrowriter transmitter. This information is received by the dispatcher who then dispatches a truck to rectify the problem. The accuracy and speed of this type of communication, and the hard copy record is especially valuable.

The following list of some of the other Electrowriter users in Wisconsin was supplied by Victor Corporation:

Holt Industries, Milwaukee, Wisconsin
General Mitchell Field, Milwaukee, Wisconsin
St. Luke's Hospital, Racine, Wisconsin
Downtowner Hotel, Milwaukee, Wisconsin
Pfister Hotel, Milwaukee, Wisconsin
Miller Compressing, Milwaukee, Wisconsin
SAL Air Force Base
Wisconsin Telephone Company
The Playboy Club, Lake Geneva, Wisconsin
Kimberly Clark Corporation
Sears, Madison, Wisconsin
West Allis Fire Department
Wauwatosa Fire Department

The first educational use of VERB in the State of Wisconsin was in the Wausau Joint School District Number One from 1967-70. Financed under a Title III Grant, the program was dropped after three years because of a singular lack of success.[15] Presently the only educational system in Wisconsin using VERB is the Statewide Engineering Educational Network (SEEN) under the auspices of University Extension, The University of Wisconsin. Interest has been shown in using VERB equipment in Oshkosh, Wisconsin, in a joint project between the local high schools and Oshkosh State University. The idea is merely in the formative stages. The largest single educational user of the VERB system is the Province of Quebec in Canada. The United States Armed Forces Institute (USAFI, which provides continuing education for servicemen, has expressed interest in VERB not only for classroom-to-classroom use, but also ship-to-shore and ship-to-ship uses via FM radio signals in conjunction with satellites.

Wausau School District #1 Tele-Writer Project[16]

In 1967, a project using a VERB system coupled with telephone feedback (Tele-Writer) was proposed to provide in-service training for teachers in the Wausau (Wisconsin) Joint School District Number One. The project, entitled "The Individualization of In-Service Education,"[17] was conducted under a Title III, E.S.E.A. Grant. Included in the teaching program were the Wausau, Rothschild-Schofield, Mosinee and Antigo School Districts. The stated purpose of the in-service teaching program was

> To put into operation a new introduction in the function and design of in-service professional staff through a cooperative effort involving school systems on a regional basis with related educational agencies. The program . . . incorporate[d] well-tested techniques and new patterns of organizational design within the professional day for teachers.[18]

The system and its use. The schools which participated in this project realized a need for a new in-service teaching program. Some method or program for providing teachers with current information on the latest educational innovations was required. The teachers were reluctant to attend lectures, to use their free time before or after the regular school day, or to travel any distance to attend classes. Consideration in the scheduling of continuing education classes was most often given to the lecturer and rarely allowed for varied schedules of the teachers. The Tele-Writer project was designed to correct this problem.

VERB receiving units were placed in the schools, to allow teachers to attend classes without difficulty in terms of time and travel. As part of this program, it was decided that the training sessions should take place during the regular school day. The sessions were to be planned in each school according to the teachers' schedules. Previously, very few lecturers were willing to travel any distance to speak to teachers. The Electrowriter-Tele-Lecture, or Tele-Writer, equipment overcame this problem, making it possible to engage more highly qualified lecturers. It was thought that the Tele-Writer program could also be carried out at reasonable cost to the school systems. Wisconsin State University-Stevens Point cooperated extensively in the program providing faculty and staff leadership as well as transmitting facilities.

In conjunction with the technical system, a paraprofessional program was suggested to provide monitorial assistance in the classrooms for the teachers while they attended the Tele-Writer sessions.

Cost. During the three year period of the Title III, E.S.E.A. Grant, $216,364 was expended in the conduct of the project, excluding equipment.[19] Over $8,000 was spent on the original equipment including four VERB receivers, four projectors, and one transmitter. Wisconsin State University at Stevens Point provided space for the project office and equipment, a transmitting room as well as $3,000 worth of professional staff time for the project annually. The College of Education contributed staff time equal to a three credit teaching load.[20]

Evaluation. The low attendance during the first year of operation indicated to the project administrators that the program was not reaching a large segment of the intended audience. The administrators were unable to solve the problem, and low attendance continued to plague the program throughout its three-year duration. Finally, the Tele-Writer Project was terminated on May 31, 1970.[21]

Scheduling was one of the problems of the system mentioned most often in the survey of participating teachers. Many teachers were reluctant to leave their students to go to the Tele-Writer classes. Other teachers were unable to leave their classes when certain local school administrators did not cooperate in arranging schedules.

In no instances were separate rooms set aside for the Tele-Writer classes. Teachers many times had to use classrooms designated for other purposes and often felt uncomfortable about displacing students. Some listening stations were located in multi-purpose rooms which were often in use resulting in distractions.

There is some evidence in the final summary that the equipment was not adequately cared for. Suggestions that the special writing pen be cleaned, the ink supply checked, the acetate projection surface cleaned, and that the machine be covered when not in use were particularly noted. One can only infer from this that these routine maintenance details were often neglected. Furthermore, while explicit instructions on use of the system were provided, many teachers were reluctant to use the equipment for fear of damaging it.[22]

The final summary contains, among other things, results of a teacher questionnaire which was responded to by 66% of the intended user group. The teachers were asked if the time was well spent attending Tele-Writer programs. Of the respondents who actually attended, 159 said yes and 95 said no. When asked whether they applied the new information to the classroom, 150 said yes and 58 said no. When asked if they would advocate usage of the system to others, 135 said yes and 110 said no. At least 15 people (67%) who felt the system was valuable would not recommend it to others.[23]

Russell S. Way, Program Administrator for Title III E.S.E.A., suggested what he felt to be some of the contributing factors leading to the termination of the Tele-Writer project. First, the project failed to get teachers and other administrative personnel involved. The project was carried on almost exclusively by the project administrators. As the grant period was drawing to a close, the head administrators of each of the five school districts had left, either having moved to new schools or having been replaced. Thus, those who gave initial consent and encouragement to the project were no longer involved. A final determining factor was one of money. The tightly budgeted school districts involved could not spare as much money as they had planned to help the project.

The total attendance for the three-year period was 5,533. There was little evidence of change in the use the teacher makes of the material learned at the in-service session, since few teachers attended regularly and since only a questionnaire was used for evaluation with little attempt at rigorous research. Consequently, it was "almost impossible to make any valid judgment."[24]

The entire program was summed up by the Project Director, E. J. Scharrschmidt, as leaving him feeling "inhibited and useless as an administrator . . . and the frequent victim of vast feelings of FRUSTRATION!!!"[25]

Statewide Engineering Education Network (SEEN)[26]

Begun in 1969, the Statewide Engineering Education Network (SEEN) is a network combination of the VERB system and a telephone conferencing providing continuing education courses for engineers. SEEN has as its target audience all of the engineers in Wisconsin and Northern Illinois, including graduate, professional and registered engineers in all disciplines. Courses are offered jointly by the Department of Engineering, University Extension of The University of Wisconsin; the Division of University Extension, The University of Illinois at Urbana; and the College of Applied Science and Engineering at The University of Wisconsin-Milwaukee.

The Wisconsin portion of the SEEN program is aimed at an estimated 25,000 engineers in the State. This figure includes 7,000-8,000 people who, while not actually graduate engineers, serve specialized engineering functions. SEEN is capable of reaching nearly 80% of the engineers, without anyone having to commute over 20 miles.

The system and its use. Equipment for SEEN includes a two-way telephone network and an Electrowriter system. The two-way audio provides for interaction between the lecturer and the student and the Electrowriter, with a graphic information transmission capability, supplements the voice with drawings, diagrams, graphs, and figures. Using this equipment, SEEN is capable of reaching large numbers of widely scattered students at a nominal cost. Travel time is saved and much of the inconvenience and high cost of continuing, on-the-job education is eliminated. Because of these advantages, business and industry have been very willing to encourage their employees to continue their education.

As an arm of extension education in Wisconsin and Illinois, SEEN is utilized by people with different levels of educational attainment and different levels of expertise. Reasons for participating also vary. Many students enrolled in courses are seeking solutions to specific problems, while others take courses as a means of keeping up with changes in their field. Consequently, in planning courses, course coordinators consult with faculty committees, community advisory committees and interested local industries. The University Extension Adult Educational Agents in the field play a significant role in evaluating student needs and the effectiveness of the network.

While most often groups of interested engineers from industry and education request specific courses, SEEN obtains students through other means. News releases, demonstrations and exhibitions of the system to engineering societies and technical groups are employed. Lists are maintained of all students who have taken University Extension technical and engineering courses in Wisconsin, and all Wisconsin companies with over 500 employees, to provide the basis for mailing course announcements.

Almost 14,000 course announcements were mailed to these groups in the Fall of 1971.

The SEEN Network includes 12 listening stations in Wisconsin, with two to be added, and 10 locations in Illinois.[27] (A complete listing of all locations may be found in Appendix D.) The Wisconsin portion of SEEN is funded by and operates under the direction of University Extension of The University of Wisconsin. Independent of Wisconsin, the Illinois segment is funded by the Division of University Extension of The University of Illinois. This report will deal with The University of Wisconsin, University Extension (UWEX) operation.

The Electrowriter/telephone system operates on standard telephone lines with one line for the Electrowriter and as many telephone connections as are required between the different receiving points and the lecturer. Dr. John Klus, Chairman, Department of Engineering, Mathematics and Applied Sciences of UWEX, requested discussion concerning these hookups between the Wisconsin Telephone Company, the Illinois Telephone Company, AT&T, the University of Illinois, and the University of Wisconsin. The two universities indicated what distances would be covered and where the lines would be necessary and then set a minimum quality standard for the system. The telephone companies were able to meet these requirements with "dedicated lines" reserved for SEEN's exclusive use.

Cost. Harold Green, present Wisconsin SEEN Program Coordinator, is currently in the process of compiling a complete budget summary and expenditure breakdown. The budget system that has been used did not allow for accurate information on either capital or operational expenses. He estimated that the annual operating cost was between $50,000-$60,000, including an annual telephone charge of $13,500. Approximately 90 percent of the latter was charged on governmental lines at special rates, making the figure seem high.

Basic costs of operation are covered by the tuition which engineers pay to enroll in SEEN courses. The cost for a three credit, one semester course is $105; and the cost for a non-credit, one semester course is $65. User departments of the University are encouraged to include in their budgets honoraria for lecturers in their field. SEEN has been seeking funds from both the University of Wisconsin Central Administration and the Graduate School Office. According to David Hartmann, former SEEN Program Coordinator for Wisconsin, until more financial assistance is available, it will not be possible to offer business management courses which are in great demand. SEEN-UWEX stresses enrollment for credit, since it is believed that greater enrollments for credit will encourage greater support from The University of Wisconsin. SEEN presently receives additional financial support from the Trane Corporation, Holt Industries, Kimberly Clark and Ansul Chemical.

Average enrollment has been approximately 165 students per semester, of which nearly 100 are Wisconsin engineers. Peak enrollment for a single semester has been 185 students. Green believes it should be a self-supported system. This would require SEEN to obtain between $50,000-$60,000 annually, and to achieve this, Green feels that an enrollment of 350-400 students per semester would be required.

Evaluation. As has been the case with most programs examined for this project, there has been little evaluative research carried out. An evaluation of one of the first courses offered by SEEN-UWEX was conducted in the Spring of 1970 by Bashir Ahmad, a graduate student at The University of Wisconsin.[27] Ahmad's study dealt with an electrical engineering course in control systems. He gathered data by observation during the course and from a questionnaire which was sent to students taking the course.

It is difficult, however, to make anything more than preliminary statements about the Electrowriter system on the basis of this report. First, of the 20 students enrolled in the course, 13 were auditing, only six took the course for credit, and one dropped. Of the initial 20, only 11 responded to the questionnaire.

Despite its obvious weaknesses, the evaluation indicates some potential factors which need greater study concerning telecommunication systems generally and VERB specifically. Several of the students stressed they felt unprepared in background to undertake the course. This may indicate, among other things, that the course level was too high for the students, that the students were too far removed from their last class experience, or that the lecture presentation was inadequate. At any rate, care must be taken in surveying student backgrounds.

Another problem Ahmad discovered was that some remote points had only one student and therefore the student had no reference group. He could not interact with other students in the room to compare their reactions to his own. Ahmad concluded that means of providing interaction must be found.

SEEN experienced line quality problems and technical difficulties. An additional questionnaire sent to each student who completed one or more of four different courses, indicated that 70 percent of the respondents complained of equipment faults including such things as high speaker volume, poor voice reception, and Electrowriter breakdown. Yet in response to a question concerning overall program, approximately 66 percent rated it good-to-excellent. This seems to indicate that the high number of complaints has less to do with a dissatisfaction with the entire system than an annoyance with certain parts of the system.

Many of the problems which SEEN has faced are related to the fact that the system is based on a relatively new teaching method which creates new and unusual situations. Green noted that there will be three less courses offered in the Fall of 1971 than in the previous Spring. Of the 18 courses offered in the Fall term, seven will be originated by the University of Illinois, and this number constitutes about half of the courses offered for credit. Green attributes this, in part, to the fact that the change in SEEN-UWEX coordinators took place during the usual period for course-planning. Another factor limiting the number of UWEX course offerings for credit is that UWEX is emphasizing basic courses, particularly in mathematics. For this reason, Green expects enrollment to be down in the Fall semester. He stressed that the UWEX policy of offering courses for which there is a determined need sometimes precludes offering courses solely to stimulate large enrollments.

Dr. John Klus discussed the relative merits of the Victor Electrowriter as an educational tool. Certain compromises must be made, and lectures must be prepared with the limitations of the system in mind. Because there is no eye contact between instructor and the students, grimaces, smiles, and worried or puzzled looks cannot serve as indicators of acceptance or comprehension of the materials. The unit has a small writing area, and there is no recall capability for the device. Once the paper on the transmitter is advanced, it cannot be reversed. Finally, writing must be very clear and discernable as the system magnifies any mistakes.

Klus believes that these limitations can be overcome. The lecturer must be better prepared than if he is speaking in an in-class situation. He must plan listing, formulae, definitions, etc., with the size of the screen in mind. Particularly important points should be emphasized, and at the same time, the lecturer should remind the class that the machine does not have a recall capacity and that the students should refer to their notes at appropriate times. Generally, if the lecturer encourages questions and comments at regular intervals, he will elicit from the student more verbal response, which is vital for the success of such a system.

One important advantage of the Electrowriter/telephone system is that the lecture, in its entirety, can be recorded. By simply taping the voice and xeroxing the acetate "print out" from the receiver, the student or the center at which he is located can have a permanent record. This can be useful for assembling entire course records or helping a student who was unable to participate in the live transmission. In this respect, the system is superior to in-class lectures where most students must rely solely on their own notes.

The SEEN project has been appraised as "successful." Certainly it is an important use of teleconferencing techniques for instructional purposes. This, coupled with the lack of methodological rigor in the design of research into the various aspects of the program underscores the urgent need for the comprehensive study of the SEEN program specifically and the Electrowriter/telephone system generally.

Telephone Only Used for Conferencing

As important as these systems and uses are, they are not what may be called teleconferencing systems. That is, they do not involve interaction of colleagues in dialogue to pursue the solution of specific problems. The feedback loop system as used in the telelecture system, serves to enhance comprehension of material presented to dispersed participants by a lecturer. In the teleconferencing uses the creators of the material and the users are one in the same, and all participate as equals in dialogue.

Conference Calls Through the State Centrex System[28]

The simplest form of teleconferencing is a call placed to more than one party so that all may discuss together--a conference call. These calls are usually placed through a conference operator for a small fee in addition to any long distance tolls. It is extremely difficult to obtain any hard information especially concerning the frequency, occupations or organizations who engage in conference calling. The telephone companies tend to feel such data are confidential.

However, in March, 1971, AT&T conducted a 14-day nationwide study of conference calls. The results available were as follows:

Total number of conference calls - 9,306

3 party	5,427
4 party	1,203
5 party	756
6 party	528
over 6	1,392

In the month of August, 1970, Wisconsin Telephone averaged 600 conference calls per month. In the month of August, 1971, this figure rose to an average of 1,000 per month.[29]

The Centrex System in Madison serving the University of Wisconsin, University Hospitals, State Capital Buildings and City-County Buildings, was willing to provide information about the number of conference calls. The results of a one-month period (July 28 through August 30, 1971) indicate very little use indeed. In conference calls requiring no long distance charges, four were completed involving three parties, and one involving four parties. Of the conference calls within the State requiring long distance tolls, 13 were attempted, but only 11 were completed involving three parties, and three were attempted, one of which was not completed involving four parties. Finally, of those requiring long distance calls outside the State, six were three-party calls, and one was a five-party call which was not completed. Only eight of the above conference calls involved The University of Wisconsin. By far most were between and among State government offices.

American Automobile Association[30]

On the three major holiday weekends of the summer--Memorial Day, July 4th and Labor Day--the AAA utilizes teleconferencing as a means of disseminating travel information. An information center is established, which compiles information on traffic conditions, weather information, camp ground situations, and various other items of interest to travelers. Once each hour during these three weekends of heavy travel, conference calls are placed to various radio stations throughout the State, for the purpose of informing them of the travel situation. Five radio stations at a time are interconnected into a single conference call. Once the five parties are on the line, the operator then dials a special number at the AAA information center which disperses a recorded travel report. This process is repeated eight times per hour to different groups of radio stations, so that 40 stations covering the State are reached each hour.

1971 was the third summer of operation for the system. One problem that seems to be plaguing the system is the cost of the conference calls. The rates are figured by taking the long distance charge to the farthest point called in each five-way conference and multiplying that rate times five. Therefore, the necessity exists to call groups of stations in the same area at the same time. AAA provides this service free of charge to the radio stations because they feel it is a public service to their subscribers who are part of the stations' listening audience, and that the service will promote AAA's image to potential subscribers. The AAA estimated their telephone bill for the Labor Day 1971 weekend at $800.

University of Wisconsin President[31]

The President of The University of Wisconsin has a speaker-phone in his Madison office for use in teleconferencing with the Chancellors of the campuses within the University of Wisconsin system. It consists of a standard desk telephone and a loudspeaker with three microphones, each capable of accommodating two persons. A maximum of five outside or long distance telephones can participate in a single teleconference. If they are equipped with a similar speaker-phone system, the President has the potential to initiate a teleconference linking as many as 30 participants. The cost for this service includes a $50 installation fee for the speaker-phone, $11 per month service charge, plus long distance tolls.

This teleconference system is used strictly for emergency procedures. President John Weaver prefers the personal contact of face-to-face meetings. As more experience is gained, however, the speaker-phone may become more useful.

The West Bend-Sheboygan Classroom Hookup[32]

As of September, 1971, freshman and sophomore Spanish classes at the Sheboygan and West Bend Campus Centers of The University of Wisconsin are linked together by telephone. The teacher commutes between the two cities, holding classes in Sheboygan one day and in West Bend the next. Alternately, the class from which he is absent participates in the discussions and hears his lecture via this telephone hookup. To obtain the service at a lower cost than regular long distance rates, the telephone circuit is "dedicated" (specifically assigned) to the teleconference network. It is estimated that the entire project will cost the Sheboygan

Campus $1,000, and the West Bend Campus $700 for the nine-month school year. If the experiment is a success, more classes are expected to be linked in 1972.

University Extension, Baraboo, Wisconsin[33]

The Baraboo Campus of the University of Wisconsin Extension utilizes a speaker-phone installation fairly heavily. Classes in which guest speakers lecture from locations outside Baraboo have provided students an opportunity to hear persons who otherwise would not have been available. The two-way capability is used in a spontaneous conferencing situation between the students and the speaker.

Conferences between university personnel at various campuses are often conducted via telephone. For example, the audio-visual staffs from various University county campuses regularly hold meetings in this manner. Campuses without a speaker-phone installation can participate via regular telephone calls using extension telephones.

The cost of the speaker-phone without special microphones is $7 per month in addition to standard line charges. According to James E. Kirchstein, Director of Audiovisual Aids at the Baraboo Campus, the speaker-phone has been very successful, and has aided the educational process in a variety of ways.

Maxco International[34]

Maxco International is the operator and intermediary in a communications network set up to fill the parts exchange needs of auto salvage yards in the Midwest. The hookup is a continuous 24-hour long-lines system that allows Maxco subscribers to call each other in search of parts they need but do not have in their own yards. Initially, a teletype system was used, but efficient, trained operators were hard to find and it was too slow. Maxco switched to telephone long-lines in 1959, and has been using this system ever since.

Equipment for the hookup is quite simple and straightforward. It includes a telephone handset that rests on a "continuous speaker." Everything that is being said over the long-lines is heard until the receiver is lifted. By lifting the receiver, the voice is cancelled and a call can be made. If, for instance, a Milwaukee dealer needs a fender for a customer, he waits until no one is speaking and then calls out for the part he needs. He may get a response from as far away as Minot, N.D., or from within 10 minutes of his own yard.

The arrangements for the system were made with AT&T's long-lines division in Milwaukee. AT&T will not deal with individual salvage yards but will collect only from a single leasee. Maxco charges include a handling fee in addition to the toll charges based on the length of the link. Maxco has 70-75 subscribers from Wisconsin, Minnesota, North and South Dakota, Illinois, Iowa and Michigan. Maxco checks out the credit rating of prospective customers before accepting them as subscribers.

Harold Locketz, President of Maxco, described the organization as a mediator between these yards as well as a communications system. While each dealer is responsible for his own shipping and receiving, Maxco offers help and suggestions. Little or no publicity is used by Maxco, and Locketz feels there is no need for it. Salvage dealers are made aware of the service through others who are subscribers.

Teleconferencing is used occasionally via the long-lines. At least twice a year, Maxco "calls up" all its subscribers for business meetings. The discussions generally deal with nonpayment of bills by the salvage yards, complaints about shipping and handling, and other system-related problems. The potential for conference type calls is always present, and many informal, impromptu meetings and discussions are held via these lines. Disputes of various nature between yards are often discussed and settled through the Maxco link.

Schmidt's Auto Salvage[35]

Schmidt's Auto Salvage in Madison, Wisconsin, is a subscriber to four different telephone long-lines systems for parts retrieval. One is Maxco International, another is Kethley Auto Salvage Company in Milwaukee,[36] a third is Illinois Auto Parts, and the fourth is a national hookup. Schmidt's pays $600 per month for these four lines.

Norman Schmidt, owner of Schmidt's Auto Salvage, feels that interest in long-lines is declining because of the expensive costs and inefficiency of such systems. He plans to reduce his long-line subscription by at least two systems by January 1, 1972. The remaining lines will not include Maxco International because Schmidt considers it to be the most expensive and the least efficient line of the four.

Inefficiency and inconvenience seem to characterize the dissatisfaction with the lines. According to Schmidt, the lines are not the only answer, because they are no better or worse than the people on them. Apparently, cliques develop with particular groups of three or four yards dealing only among themselves.

While the quality of the line transmission is reasonably good, it seems that the real problem with the long-line system is the nature of the business that must be conducted in conjunction with it. Promises of money and shipment, relative lack of recourse for unsatisfactory transactions and the extra cost of shipping and handling all seem to be more trouble than they are worth.

Schmidt felt that a monthly publication, The Spotter, was a much cheaper and more effective way of locating parts. Salvage yards subscribe to this publication and send in lists of their available parts. The publication also accepts advertisements and prints requests for rare parts.

Madison Academic Computing Center (Computer Sciences-UW)[37]

The Madison Academic Computing Center on the Madison Campus of The University of Wisconsin demonstrates the application of two-way communications to the function of systems maintenance in serving the State of Wisconsin. The computer center provides access to the University of Wisconsin computers for students, faculty and employees of the University throughout the State. Access is provided between approximately 10 remote terminals and the center itself by means of cable links either by teletype or telephone line. Equipment exists at each remote terminal to program the computer, and receive the computer responses.

An additional link or "hot line" between each terminal and the center enables open-line voice communication between all terminals allowing them to speak to each other and the center at the same time over modified speaker-phones. The most prevalent use of this "hot line" is for the controller to notify the terminals when the computer is ready to receive calls, is malfunctioning, or is closing down, and for the terminals to notify the controller by voice that perhaps the relay system is faulty, or that responses from the computer are unclear, etc.

Usually two-way communication exists between only one terminal and the center. However, the practice of talking between several terminals and the Madison Center is sometimes used for settling large scale problems or practices, through teleconferencing.

George Luther, Shift Supervisor at the Madison Academic Computing Center, believes that the "hot line" will continue to be used primarily for two-way calls with full scale teleconferencing being the exception rather than the rule. The Madison Center is an example of an institution having equipment with a teleconferencing capability, yet not using its full potential.

The use of the telephone as a teleconferencing device is not difficult or expensive, and is everywhere available in the United States. Other devices are more sophisticated, but are generally more expensive. Further, they do not provide the interactive dialogue potential of a telephone system without the need for sophisticated technical equipment at all terminals in the discussion pattern. The uses of the telephone along with other systems to make them two-way and interactive as discussed in this chapter are not as successful nor as widespread as the ETN/SCA system described in Chapter IV.

NOTES

[1]Information on the Wisconsin ETV network multiplexed audio system was provided by Lee Franks, Director, Wisconsin Educational Communications Board, Madison, Private Interview, August 19, 1971.

[2]Howard A. Chinn, Television Broadcasting (New York: McGraw-Hill Book Co., Inc., 1953), pp. 3-15.

[3]Franks Interview.

[4]Carl Mitchell, "Preliminary Report" (unpublished technical report, Stanford University, June 30, 1971).

[5]Information about WAU-27 was provided by Dr. A. Stephen Close, Director of the Milwaukee Regional Medical Instructional Television Stations, Inc., Telephone Interview, July 12, 1971; and by George Spuda, Technical Director of the Milwaukee Regional Medical Instructional Television Stations, Inc., Telephone Interview, July 12, 1971.

[6]Films and video tapes are selected from catalogues of the National Audio Visual Center, Video Nursing, Inc., the major drug companies, V.A. hospitals, the Federal Government, the American Medical Association and the American Nursing Association.

[7]Plans for three more conference programs in the same format as the "GI" conferences include programs on cardiology, infectious diseases, and renal diseases. The introduction of these programs is dependent upon the date that WAU-27's E-2 channel becomes operational.

[8]Telephone Interview with Kenneth Shuler, Chief Engineer, Instructional Media Department, Marquette University, July 22, 1971.

[9]Telephone Interview with Robert Suchy, Director, Instructional Research, Milwaukee Public Schools, July 15, 1971.

[10]Information on the UW-Green Bay Microwave System was provided by Robert Van Abel, Director, Instructional Resources, UW-Green Bay, Telephone Interview, October 13, 1971.

[11]Robert M. Jiobu, Assistant Professor, UW-Green Bay, Letter, July 23, 1971.

[12]Information about the Victor Electrowriter Remote Blackboard including its cost was provided by Jack H. Gleason, Account Executive, Electrowriter Sales, Business Machines Group, Victor Comptometer Corporation, Telephone Interview, July 28, 1971.

[13]"New A-V Tool," Sales Meetings: Sales Management, Part Two, May 21, 1965. (Reprint PR-34 Victor Comptometer Corporation.)

[14]Gleason Interview.

[15]Final Summary, Title III: Tele-Writer Project, Project Number 59-69-0118-2 (Wausau: Wausau District Public Schools, 1970), pp. 53-54.

[16]The information concerning the Wausau Tele-Writer Project was provided by Russell S. Way, Program Administrator, Title III E.S.E.A., State of Wisconsin, Department of Public Instruction, Madison, Private Interview, July 21, 1971.

[17]Final Summary, Title III: Tele-Writer Project, p. 1.

[18]Application for Operational Grant: Proposed Project for Wausau, Rothschild-Schofield, Mosinee, and Antigo School Districts Under Title III - P.L. 89-10 (Wausau: Wausau Joint School District No. 1, January, 1967), p. 1.

[19]Final Summary, Title III: Tele-Writer Project, p. i.

[20]Ibid., p. 59.

[21]Ibid., p. 58.

[22]Ibid., pp. 49-50.

[23]Ibid., pp. 45-47.

[24]Ibid., pp. 53-54.

[25]Ibid., p. 16.

[26]Information on SEEN was provided by David Hartmann, Program Coordinator for SEEN (until June, 1971), University Extension, The University of Wisconsin, Private Interview, July 29, 1971; Harold Green, Program Coordinator for SEEN (since June, 1971), University Extension, The University of Wisconsin, Private Interview, July 29, 1971; and Dr. John Klus, Chairman of the Department of Engineering, Mathematics and Applied Sciences, University Extension, The University of Wisconsin, Private Interview, July 30, 1971.

[27]Bashir Ahmad, Preliminary Report on the Survey Carried Out for Evaluating the Electro-Writer Course (EWC) Offered by the UW Extension Department of Engineering, n.d. (Mimeographed.)

[28] "Summary of Conference Calls Placed through the State Centrex Conference Operator, July 28-August 30, 1971," Madison (unpublished manuscript).

[29] Telephone Interview with Richard Bergin, Wisconsin Telephone Company, August 30, 1971.

[30] Information concerning AAA was provided by Robert E. Berigan, Jr., Personnel Supervisor, American Automobile Association, Madison, Telephone Interview, September 3, 1971.

[31] Information on President Weaver's use of the speaker-phone was provided by Joanne Hurley, Secretary to President Weaver, The University of Wisconsin, Madison, Telephone Interview, June 23, 1971. Information on the costs of President Weaver's speaker-phone was provided by Mike Toner, an engineer with The University of Wisconsin Telephone Service, Telephone Interview, June 23, 1971.

[32] Information concerning the West Bend-Sheboygan classroom hookup was provided by Dean James Smith of the Sheboygan Center, Telephone Interview, August 20, 1971.

[33] Information concerning University Extension-Baraboo was provided by James E. Kirchstein, Director of Audiovisual Aids, Baraboo Campus, Telephone Interview, July 8, 1971.

[34] The information concerning Maxco International was provided by Harold Locketz, President, Maxco International, La Crosse, Wisconsin, Telephone Interview, July 26, 1971.

[35] The information concerning Schmidt's Auto Salvage was provided by Norman Schmidt, Madison, Wisconsin, Telephone Interview, July 26, 1971.

[36] Kethley Auto Salvage Company, 5140 North 124th Street, Milwaukee, Wisconsin, operates a long-lines system with 40 subscribers in Wisconsin, Illinois and Michigan.

[37] Information concerning the Madison Academic Computer Center was provided by George Luther, Shift Supervisor, Madison Academic Computing Center, Telephone Interview, August 26, 1971.

CHAPTER IV

THE ETN/SCA SYSTEM OF THE UNIVERSITY EXTENSION THE UNIVERSITY OF WISCONSIN[1]

ETN/SCA is a teleconferencing system used by the University Extension of The University of Wisconsin throughout the State. The entire system is coordinated in Madison where the ETN/SCA system has an office in 628 Lowell Hall. ETN and SCA are actually two very distinct systems of communication, joined by need, use and administrative structure. It is one system in conception and use. For the sake of clarity, we shall first discuss them individually.

ETN

ETN (Educational Telephone Network) is, basically, a private telephone network similar to an old fashioned rural system with many parties on the same line. Each ETN station consists of one loudspeaker, which allows participants to hear program material, and one handset, through which a listener may participate in the conference by asking questions or making comments. Picking up the handset automatically turns off the loudspeaker, thus eliminating the high pitched squeal so often heard on public address systems. When a person is through asking a question he must replace the handset immediately if others at his station are to hear the conference over the loudspeaker.[2]

ETN in Wisconsin

The University of Wisconsin Extension first used ETN in November of 1965 when Wisconsin doctors at 10 locations listened in to a medical conference being held in San Francisco.[3] At that time, the locations were not equipped with handsets so listeners could not actually participate in the conference, but could only listen to it via a single long-distance call. In 1966, however, stations were equipped with handsets and the current party-line system began.

The first regularly scheduled program on ETN was a postgraduate medical program for practicing physicians throughout the State. In 1967, more programs of different types were added to the ETN schedule, including Chancellor Donald McNeil's University Extension faculty meeting in January, 1967. ETN continued to expand rapidly from 1967 to 1969 in both the number of programs aired and the number of affiliated stations. This growth leveled off in 1969-1970 and remains steady today. Figure 9 graphically demonstrates the growth. In 1971-1972, new ETN stations are anticipated in 9 library locations and 18 mental hospitals. There is an ETN station located in each county courthouse. Figures 10 and 11 show ETN locations in Wisconsin by type.

The ETN system originates in Madison. Six single legs run out of Madison to Eau Claire, Rice Lake, Stevens Point, Appleton, Milwaukee, and Racine. These six legs, along with a seventh in Madison, act as distribution centers for the ETN network, sending programs to ETN stations in their area. Telephone lines are used entirely except in the Northwest

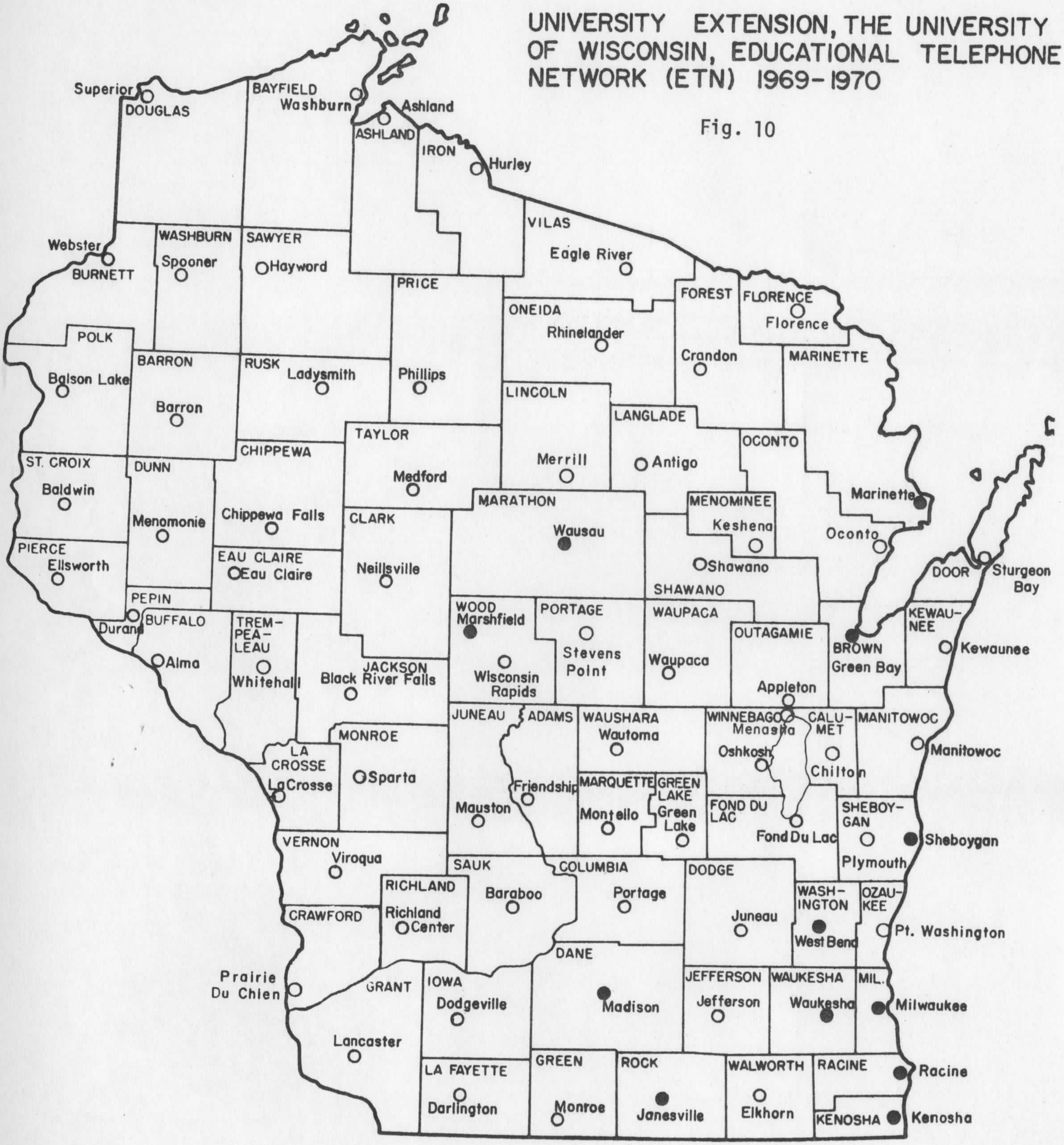
Fig. 9

GROWTH CHART OF ETN NETWORK[4]

Year	Number of Participants	Listening Stations	Total No. of Sessions During School Year
1965-66	190	18 hospitals and clinics	1
1966-67	12,000	48 hospitals and clinics 19 courthouses 11 UW Centers	147
1967-68	41,000	55 hospitals and clinics 46 courthouses 11 UW Centers	481
1968-69	80,000 (projected)	56 hospitals and clinics 50 courthouses 15 UW Centers	982
1969-70	------	54 hospitals and clinics 72 courthouses 14 UW Centers	877
1970-71	------	57 hospitals and clinics 72 courthouses 14 UW Centers 1 Library	261 as of Nov. 28, 1970

UNIVERSITY EXTENSION, THE UNIVERSITY OF WISCONSIN, EDUCATIONAL TELEPHONE NETWORK (ETN) 1969-1970

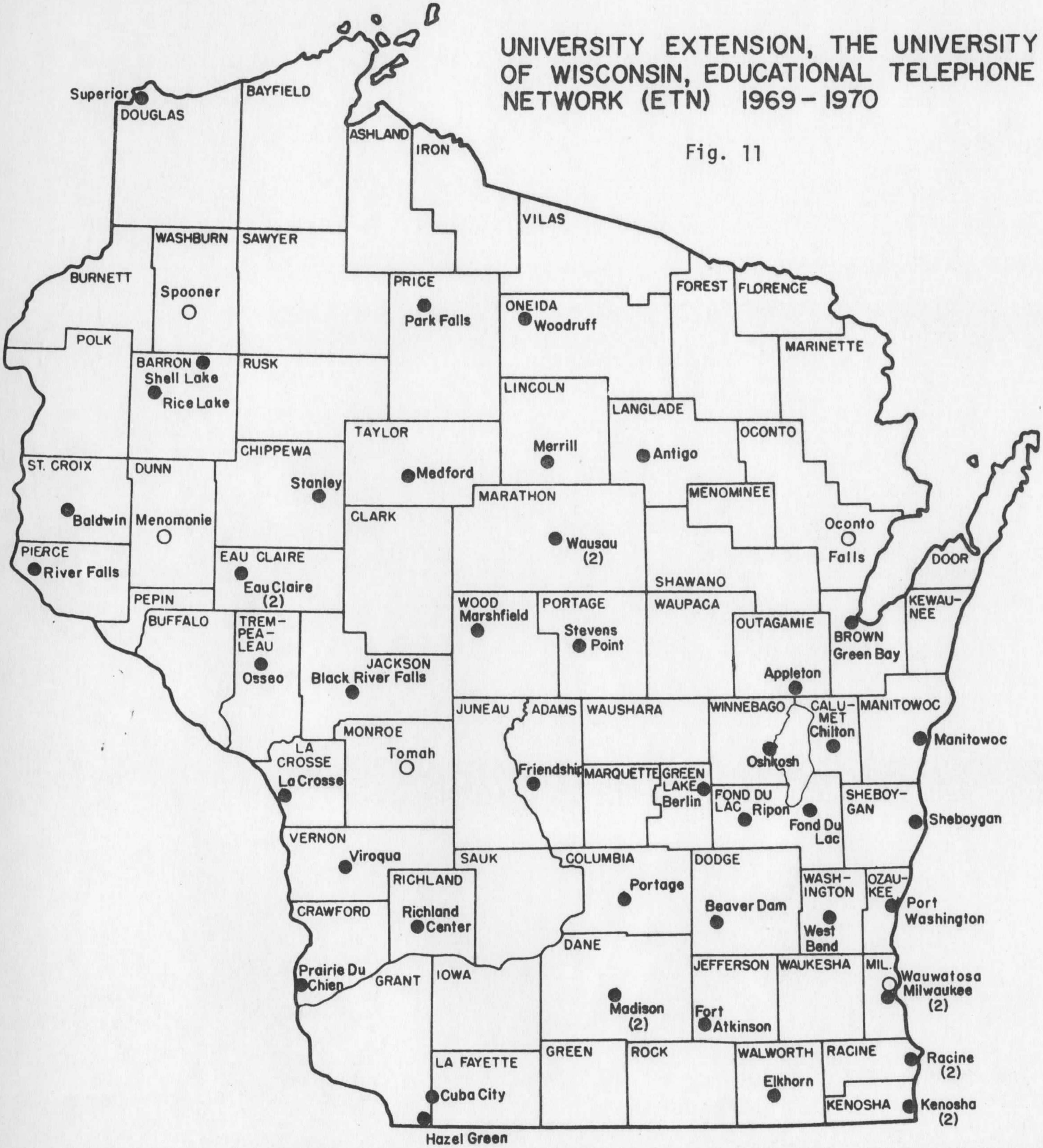
Fig. 10



● ETN UW CENTER LOCATIONS
○ ETN COUNTY LOCATIONS

UNIVERSITY EXTENSION, THE UNIVERSITY OF WISCONSIN, EDUCATIONAL TELEPHONE NETWORK (ETN) 1969 - 1970

Fig. 11



● ETN HOSPITAL LOCATIONS

where a microwave relay sends programs from the Eau Claire leg to Superior and the Ashland county area.

Cost. There are three types of costs involved in establishing a new ETN station: 1) reception equipment installation cost; 2) telephone lines charges; and 3) equipment rental. In establishing telephone lines to a new station the telephone company charges ETN/SCA for line-of-sight distances between the new station and an already established one. In these proceedings, ETN/SCA deals exclusively with the Bell Telephone System, which in turn deals with other smaller, often rural, telephone companies.

Rent for the entire system is between $7,500 and $7,800 each month, varying with the number of locations and the terminal equipment that is leased each month. This figure does not include installation. Lines are rented by the year, but are suspended[5] in the summer when the ETN/SCA programs are not conducted. Suspending ETN's lines for the summer costs UWEX approximately $3,800, but if ETN were to give up its lines, reinstallation every Fall would cost about $4,200. Moreover, ETN uses Federal Government telephone lines (GSA) which are less expensive than regular lines, and, were ETN to give these up every summer, the high demand for these less expensive lines makes it highly likely ETN could not get them back the following Fall.

SCA

Multiplexing is an electronic technique that places two or more separate signals into a single channel. SCA (Subsidiary Communication

Authorization) is the name given to a specific type of FM multiplexing. SCA signals can be received only by a special receiver and the regular FM signal must be operating in order to send out an SCA signal. Unlike regular broadcasting, the receivers may not be used without the broadcaster's consent. The broadcaster may charge a fee for this use. In 1955, the FCC allowed SCA to be transmitted "piggyback" on commercial FM stations in order to help these stations economically. SCA signals were used for background music in restaurants, office buildings, etc., and helped keep many FM stations solvent in the late 1950's and early 1960's. The FM station made its money from leasing the receivers.

SCA in Wisconsin

Educational broadcasters expressed neither a desire nor a need for SCA and were specifically excluded from the FCC's 1955 authorization. In February of 1961, however, the FCC authorized SCA operations by educational FM stations. Wisconsin was one of the first states to realize the educational potential of SCA:

> . . . the first educational FM station [to utilize] SCA . . . WHA-FM, University Extension, The University of Wisconsin's educational radio station, started transmitting test music via the newly installed SCA equipment on August 15, 1967.[6]

WHA-FM's first regularly scheduled SCA programs were third year French and Spanish courses, offered to Lincoln High School students in Wisconsin Rapids, Wisconsin, beginning September 9, 1967. The programs were "the result of University Extension foresight in allocating monies for the purchase of SCA equipment for WHA-FM and eight state network stations."[7] SCA was used because the Wisconsin Rapids High School did not have the staff nor the money to offer advanced foreign language courses.[8] The teacher was heard over SCA and participants' questions and/or comments were made by placing telephone calls to the originating station. These calls were then broadcast over the SCA system so that all participants could hear them.

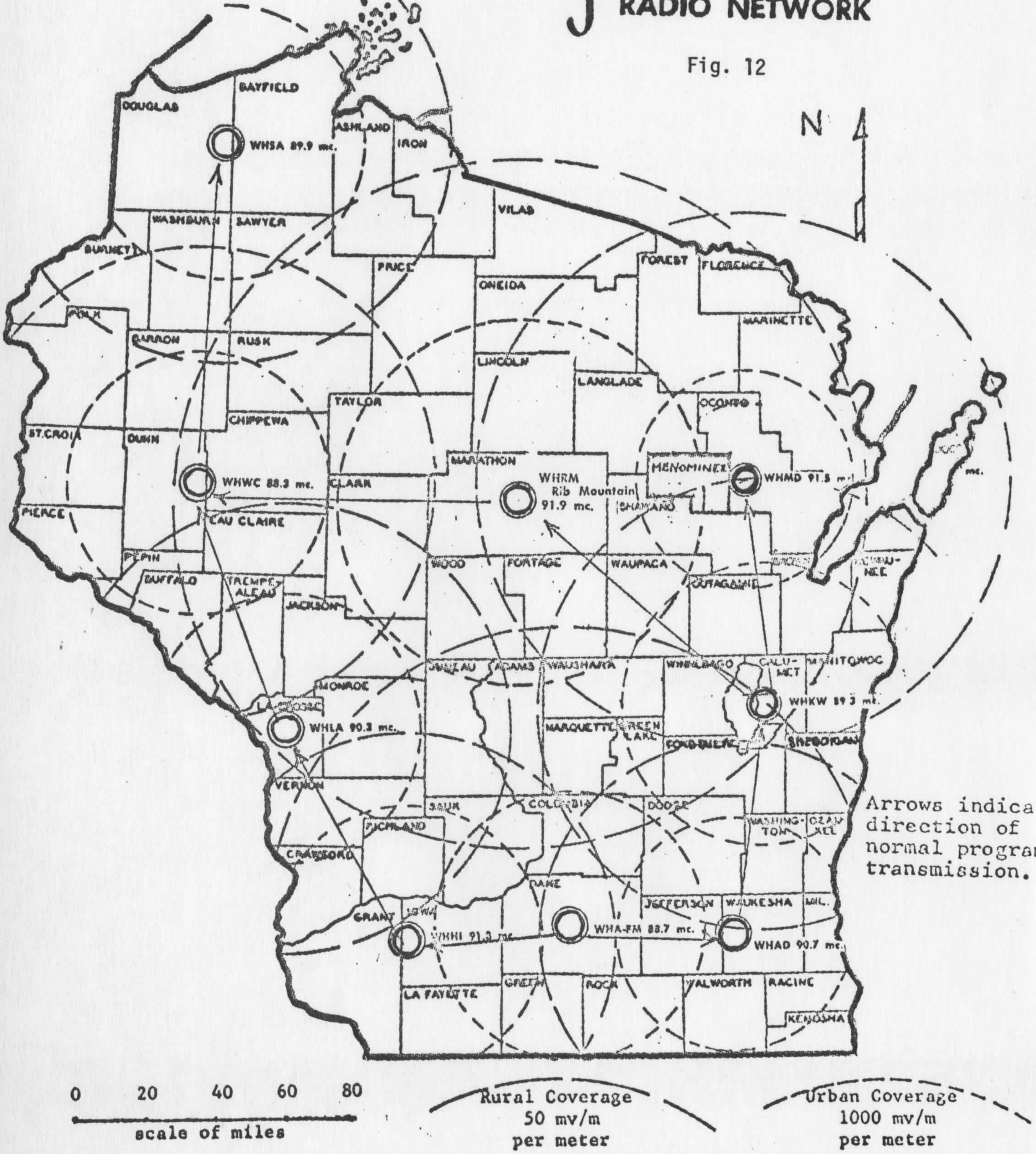
The number of SCA receivers in Wisconsin had grown from two in 1967 to 80 by 1968.[9] By December, 1969, there were 90 SCA receivers located in 30 of the State's 72 counties.[10] Receivers are purchased through the ETN/SCA coordinator's office.

As with ETN stations, SCA receivers are located in courthouses, hospitals, and UW campuses. In order to obtain satisfactory signals, receivers must be located within a 50-mile radius of one of the nine transmitters which make up the WHA-FM network.[11] This network consists of WHA-FM, the originating station, and eight other stations which rebroadcast the WHA-FM signal on different frequencies (see Figure 12). While this network adequately provides state-wide SCA coverage, SCA reception problems have arisen in the Northwest portion of the State. This is a technical problem resulting from the geology of the area affecting radio broadcasting generally.

Cost. The investment required of an FM station to add SCA multiplex transmission equipment has been estimated at $6,000.[12] The cost for receivers varies depending upon the installation. A portable model with built-in speaker and antenna costs approximately $175, and the cost of a portable receiver with external speaker and yagi antenna for use in larger halls at fringe reception areas averages $200.

WISCONSIN'S fm RADIO NETWORK

Fig. 12



EDUCATIONAL COMMUNICATIONS
DIVISION, Radio Hall
Madison, Wisconsin 53706

ETN/SCA in Wisconsin

The system and its use. Although both ETN and SCA are non-broadcast, point-to-point communications systems, ETN is a two-way, multi-access system, while SCA is one-way. ETN provides maximum flexibility as an interactive informal channel. SCA may obtain some feedback through individually placed telephone calls. ETN is limited in range only by the limitation of the existing telephone system, while SCA range is limited by the propagation characteristics of its channel and transmitters.

Each of the two system has distinct economic advantages. Numerous long-distance telephone calls make SCA more expensive than ETN for programs sent long distances from the originating station. Since ETN must lease its lines, for programs intended for reception near the site of origination, SCA is less expensive. For these reasons, the University Extension often simultaneously transmits programs over SCA to the Madison area and over ETN to locations far from Madison.

Many types of programs have been transmitted over ETN/SCA including courses, workshops, training sessions and conferences. Conferences in medicine, law, pharmacy, staff training and development, social work, library science, nursing, 4-H projects, engineering and music have been conducted over ETN/SCA successfully. Weekly faculty meetings of the Community Programs Division of University Extension involving over 350 faculty members around the State, are conducted over ETN/SCA.[13]

ETN/SCA service is available to all University Extension departments. Other agencies and institutions can use the service "by requesting it through the University Extension faculty member responsible for the subject matter programming area."[14]

Programming time is available between 7:00 a.m. and 11:00 p.m., Monday through Friday, and between 7:00 a.m. and 12:00 noon on Saturday. Of this total time, SCA alone accounts for only five percent for the one program in high school science that it does not simultaneously broadcast over ETN. ETN alone programs 75 percent of this time. The remaining 20 percent is made up of simultaneously broadcast programs over both ETN and SCA. From this, it is fairly apparent that the potential of SCA is far from realized. As Lorne Parker, ETN/SCA Coordinator, suggests of SCA use, "the surface has barely been scratched."[15]

A typical program on ETN/SCA lasts from one to two hours. Different formats are used, but the most usual consists of a lecture followed by a question and answer session. Visual material is used to supplement the lectures and discussions through slides, film strips, printed materials and programmed notebooks. These are mailed to the listening locations and referred to at appropriate times by the lecturers or participants.

Cost. Information concerning the budget for ETN/SCA is difficult to obtain. The accounting procedures employed do not allow for easy acquisition of specific information. However, some data were available.

SCA has cost the State approximately $75,000 for installation and modification of existing studio and transmitter facilities and $18,000 for receiver, speaker and antenna installation at about 90 listening locations. Initially approximately $15,000 was spent to provide SCA capabilities at WHA-FM. In 1971, $60,000 was spent to provide this capability to all the stations and the microwave system in the Wisconsin FM Network. Since separate budgets are not maintained, no comparable figures are available as to the total cost for ETN only.

The annual operating budget for ETN/SCA in 1971-72 was projected to be $137,462. It was broken down in the following manner:[16]

Salaries		$58,035.00
Supplies and Expenses		
Basic system costs	$64,000.00	
Summer GSA lines	2,300.00	
Basic installation costs	1,500.00	
DAIN and toll charges	1,752.00	
Audio tape	2,000.00	
Office and travel	2,875.00	74,427.00
Capital Equipment		5,000.00
TOTAL		$137,462.00

Evaluation. No systematic or comprehensive evaluative research of ETN/SCA has been undertaken. Individual programs have been studied, but there has been little attempt to analyze the system in its entirety. Further, the results of the course evaluation are not readily available, as they are made primarily for the lecturer's use. A discussion of the Program Evaluation Checklist (PEC) which has been employed since 1968 by the ETN/SCA Coordinator to evaluate the individual courses and programs is included in Appendix E. It is provided as an example of the most careful attempt to date of evaluating telelecture and teleconference systems in Wisconsin. It hardly need be stated that a systematic comprehensive study is long overdue.

Medical Programs Offered Over ETN/SCA[17]

Medicine offers a good example of the use of a combined ETN/SCA system. A wide variety of postgraduate medical programs are offered to physicians, nurses, pharmacists, and allied health personnel throughout Wisconsin over the ETN-SCA network. Transmitted simultaneously over both ETN and SCA, these programs include workshops, conferences, institutes, and special classes. A complete list of 1971-72 programs in medicine and a discussion of fees may be found in Appendix E.

Participants attend sessions at hospitals, county courthouses, and University of Wisconsin extension campuses affiliated with the ETN/SCA network. A vast majority of medical participants attends sessions at hospitals, which may enroll in the ETN/SCA system in two ways. First, the hospital may pay an annual fee which covers inclusion in the ETN/SCA network and the enrollment fees for most personnel employed by the hospital. Payment of this annual fee, which is based on the size of the hospital, must be made at the beginning of the year or in three installments. Second, the hospital may pay a "station fee" of $200 which allows it to join the ETN/SCA network, but does not pay for enrollment of hospital personnel.

A hospital's station fee allows it to join either the ETN or SCA network. If the hospital chooses to join the ETN system, a minimum of $600 in individual fees must be guaranteed ETN/SCA in order to establish a station within the hospital. University Extension pays for initial installation of an ETN telephone, along with a slide projector.

The hospital is responsible for providing a projection screen, and for payment attendant to change in the location of the ETN telephone.

If a hospital joins the SCA network, there is no minimum guarantee. However, the hospital is responsible for the purchase of the SCA receiver (approximately $200) and for its maintenance.

The Department of Nursing,[18] University Extension, The University of Wisconsin, sponsors a variety of programs over ETN/SCA. In 1971-72, non-credit special classes in nursing will be aired in three separate series. Each class has an $11.25 enrollment fee, if a nurse's hospital is not enrolled under an annual fee. A nurse may enroll in all three series for $30.00. Live lectures with feedback are heard once each week and taped replays of the lecture only may be heard twice weekly.

The Department of Nursing also sponsors W.I.N.S. (Wisconsin Inactive Nurse Studies) telephone/radio conferences for professional nurses who are no longer working. This project is funded by the Wisconsin Regional Medical Program, Inc. Beginning operations in April, 1969, this program is specifically designed to help update the general nursing knowledge of nonpracticing professional nurses throughout Wisconsin. Although geared specifically for inactive, recently returned, and part-time nurses, W.I.N.S. classes are open to all nurses.

Each W.I.N.S. program consists of a lecture followed by a question and answer session. Content includes new developments in administration of medications, recent trends in nursing, prevention and control of infectious and contagious diseases, relationship of community health services, and a variety of clinical areas. Sessions are conducted by University Extension Nursing faculty members and experts in specific subject areas. Supplementary materials are sent to participants prior to the programs, while textbooks and nursing periodicals are borrowed from local libraries and various university-affiliated libraries. Additionally, audio tapes of each conference are available on loan for one week. Other bonus offerings, including programmed instructional units and bonus tapes, are available periodically. Regularly scheduled programs are transmitted on the second and fourth Mondays in every month, except June, July, and August, during which there are no ETN or SCA. transmissions.

Teleconferencing in The Wisconsin Center[19]

The Wisconsin Center is a large, well appointed conference facility located on The University of Wisconsin Madison Campus. Operated by University Extension, it utilizes teleconferencing only when required. The Center provides the service in situations where a speaker is unable to attend a conference or when the expense of his coming to Madison for a conference is prohibitive. Robert P. Lee, Director of The Wisconsin Center, feels that while a teleconferencing hookup is useful in situations where it is necessary, there is no substitute for the actual presence of the lecturer.

Teleconferencing was first used at The Wisconsin Center in the late 1950's when a meteorologist was delayed in Florida, and it was too late to postpone his scheduled lecture. The lecture took place using a "Rube Goldberg" system developed on the spot by Center personnel using standard telephone equipment, and films and slides mailed to Wisconsin.

Since that time, there have been a number of teleconferences, including hookups to London and St. Maxin, France.

The Wisconsin Center maintains teleconferencing facilities at an approximate cost of $20-25 per month for a speaker-phone, plus whatever long distance charges might be incurred. The Center also compensates WHA Radio at a rate of $8.00 per hour when its services are required. Teleconferences at The Wisconsin Center last between 15 minutes to two and one-half hours, depending on the nature and goals of the conference. Usually no more than two teleconferences are held each month.

The Wisconsin Center has a staff of two academic employees and 20 classified employees. Teleconferences are arranged and conducted by the same personnel who arrange regular conferences. Only one assistant is employed who has special knowledge of audio-visual aids.

If a group qualifies for use of The Center, it may use the teleconferencing facilities. Any group from The University of Wisconsin, another State University, or state agency may use The Center facilities and have access to the teleconferencing facilities at no charge for either. The Center is supported entirely by the State of Wisconsin. Appendix F contains the Annual Report of The Wisconsin Center detailing its conferencing and meeting activities.

NOTES

[1]Information concerning ETN/SCA system was provided by Lorne A. Parker, Coordinator of ETN/SCA, University Extension, The University of Wisconsin, Private Interview, July 27, 1971.

[2]Lorne A. Parker, ETN-SCA Program Handbook (Madison: University Extension, The University of Wisconsin, 1969), pp. 5-7.

[3]Lorne A. Parker, "The Development of the Educational Telephone Network (ETN) and the Subsidiary Communications Authorization (SCA) Systems," as published in Program Preview, I, 9 (November, 1968), University Extension, The University of Wisconsin, p. 2. (Mimeographed.)

[4]Ibid., p. 3.

[5]"Suspended" means that during the Summer the lines are reserved by ETN/SCA for the following Fall, but are not used.

[6]Lorne A. Parker, SCA, A New Medium (Madison: University Extension, The University of Wisconsin, 1969), p. 35.

[7]Parker, "The Development of ETN and SCA," p. 4.

[8]Parker, SCA, A New Medium, p. 35.

[9]Parker, "The Development of ETN and SCA," p. 4.

[10]Lorne A. Parker, "The Development and Utilizations of Subsidiary Communications Authorization," Educational Broadcasting Review (December, 1969), 43.

[11]Parker, ETN-SCA Program Handbook, p. 8.

[12]Parker, "Development and Utilizations of SCA," 37, n. 10.

[13]Ibid., 42.

[14]Parker, ETN-SCA Program Handbook, p. 1

[15]Parker, "The Development of ETN and SCA," p. 5.

[16]Parker Interview.

[17]Ibid.

[18]Information concerning ETN/SCA activities of the Department of Nursing was provided by Signe S. Cooper, Chairman of the Department of Nursing, University Extension, The University of Wisconsin, Telephone Interview, October 6, 1971.

[19]The information on The Wisconsin Center was provided by Robert P. Lee, Director of The Wisconsin Center, The University of Wisconsin, Madison, Private Interview, July 27, 1971.

CHAPTER V
RECOMMENDATIONS

This report was undertaken because of a belief that media offer urgently needed assistance to the scientist, technologist and humanist who are staggering under a frighteningly increasing load of information in all fields. We are in the midst of an intellectual and social environment of rapid change, in a society made up of institutions and agencies dramatically and continuously scaling-up in size. Information has become an imperative for all people, especially scientists, technologists, and humanists, in order to cope with these crucial problems. With increasing regularity, rapid change and growing size demand decisions of increasing consequence possessing a continuity. Media provide one solution.

An examination of the media applications for teleconferencing in Wisconsin has generated several recommendations. If development and widespread application of media are to be successful in offering assistance in the transfer of information, we deem these recommendations as crucial.

RECOMMENDATION A: Because of the need to increase the informal, interactive, creative dialogue among scientists, technologists and humanists, there is a concomitant need to increase the number and capacity of channels available for informal communication.

The kind of information required has changed in the last 30 years. Currency has become increasingly important--at times more important than accuracy. Speculation and hunches are especially useful in a search for varied responses to rapidly occurring changes. This reliance on current speculation and hunches results in a critical need for instantaneous feedback. Consequently, interactive dialogues of an informal nature in which all interested parties can participate in creative and evaluative give-and-take are the surest means of avoiding the pitfalls attendant to the use of less refined and accurate information.

As Peter F. Drucker, noted economist, stated, knowledge in the early part of the industrial age was more ornamental than functional as an economic tool. Today knowledge is "the foundation and measurement of economic potential and economic power. 'Knowledge' rather than 'science' has become the foundation of the modern economy." Knowledge is not a service like manufacturing, but a primary industry "which makes available to man the products of nature."[1]

Meetings, conferences and conventions provide an effective way of stimulating information exchange activities. Yet meetings, like other more formal channels such as books, libraries, indices and retrieval systems, afford little chance for "the jointly constructive, the mutually reinforcing aspects of communication."[2] Informal channels, on the other hand, provide a basis for open-ended speculation on current information with rapid interaction and critical feedback.

There is an imperative implicit in this recommendation. Karl W. Deutsch of the Department of Government at Harvard University, in an article for a book concerning the acquisition of knowledge, discussed an ultimate result of new learning exceeding the learning speed of a society:

> If, of course, the learning acquired is very fast, and if the society cannot learn fast enough . . . the society may perish. Anthropologists have numerous societies on record which, in fact, did so perish. The leading elites of Greek society learned remarkably fast from the seventh to the fifth centuries, B.C., but only more slowly thereafter, and finally not fast enough.[3]

Meetings, conferences and conventions provide an effective way of stimulating information exchange activities necessary to "learn fast enough." Yet the format of most meeting sessions, along with formal channels affords little chance for interactive dialogue. If they are available and accessible, informal channels provide for the routing of current data to those who find it relevant to their current research and work. Informal channels provide for information data that is evaluated and synthesized by the participants through interaction. Upon request from participants, informal channels provide a mechanism to carry speculative information with instantaneous critical feedback among participants rather than documents. Informal channels tend to be user oriented rather than subject oriented. For all of these reasons, informal channels need to be developed in numbers and in quality.

RECOMMENDATION B: Informal channels of whatever media should not be offered as alternatives to the more formal and traditional information exchange channels of the conference, convention, library, index or retrieval system.

It must be understood that we do not recommend that teleconferencing be viewed as an alternative to face-to-face conferencing. Colleague-to-colleague informal dialogue must not be posited as a substitute for more formal means. Formal systems are not becoming less important, so much as informal system are becoming more important because of the steadily increasing information needs.

Additionally, the goal of new applications of technology should not be to perform some task or operation slightly more efficiently. Rather the goal should be to accomplish something new that was formerly impossible or exceedingly difficult and consequently little done. Therefore, the application of media to conferencing and meetings must not be to conduct the meeting via electronic media, but to allow attendance at meetings by people who formerly could not attend, to hold meetings which formerly were not conducted, and to provide a continuation of ad hoc dialogue begun at meetings and conferences after the scientists and scholars have returned to their institutions.

RECOMMENDATION C: Emphasis should be placed on the activity of informal, interactive, creative dialogue, and not on the media when research and development of these channels are undertaken.

Colleague-to-colleague interactive dialogue can be stifled by the very channels created to assist it. Too often in the last 50 years technology has been applied to various social problems simply because the technology existed. If technology is viewed as something new, as a means of doing that which formerly could not be done, then our concentration and focus must be upon the need. The user and the use must generate the technology, not vice-versa, if we are to approach a solution to the information crisis.

By their very structure, media themselves provide a high degree of formative control over content. The difficulty or ease with which certain tasks may be performed greatly influence the use of the technology. Need and objectives should be the basis of the technical design, not the technology.

RECOMMENDATION D: Voice-channel media offer the most attractive means of attaining the desired interactive dialogue because of their accessibility, availability, simplicity and inexpensiveness.

We should not correct problems that are largely the result of technology by massive doses of new technology. The information crisis is the result of increased technical capability in generating information, which in turn has generated new technical capability. Sophisticated technologies require rather sophisticated interfaces between themselves and users. If we concentrate on the need, rather than on the media, voice-channels provide the best hope of offering informal, interactive dialogue through simple, easily available, readily acceptable, economical terminals. If these terminals are capable of multi-access, a creative and interactive dialogue can take place. Ad hoc meetings among self-selecting groups can occur with relative ease.

Telephone channels answer most of these needs in the United States. Radio can be used with success, but with slightly more sophisticated terminal gear. These channels provide ample band-width for the transmission of visual materials via facsimile, Electrowriter, slow-scan TV, etc. As Licklider, Taylor and Herbert point out "the difficulty is that the common carriers do not provide the kind of service one would like to have--a service that would let one have ad lib access to a channel for short intervals and not be charged when one is not using the channel."[4]

Viewed from the requirements advanced by most scholars for the exchange of information via informal channels, voice-channel media provide an effective means. Other methods such as television carry a heavy technical and cost load and make ad hoc multi-accessible interactive use difficult, if not prohibitive.

RECOMMENDATION E: Community Antenna television (CATV) systems should be carefully studied as a possible medium for interconnecting teleconference participants.

In examining the educational communication activities of the State of Wisconsin, it was inevitable that CATV be studied as a potential distribution system. Cable communication systems are in their infancy, but they are mushrooming all over the country. Business and industry see these systems less as a television carrier than as an interactive communication system useful to them for many purposes. It is likely CATV will be installed throughout most of the metropolitan areas of the country in a few years with up to 64 channels available in each system.

Most of the installation franchises are awarded by the city with little thought for potential uses other than as a one-way television distribution system. Consequently, it is imperative that a careful and systematic examination of CATV be undertaken in order that ordinances, legislation and rule-making procedures may dedicate some of these channels to two-way teleconferencing activities. CATV could well be an alternative to the telephone, as a distribution mechanism associated with a space satellite world-wide teleconferencing system. To this end, Larry Chambers, Project Manager for the current study, undertook an exploratory examination of CATV as a potential interactive system. His report is found in Appendix G.

RECOMMENDATION F: The same media used in conducting a teleconference provide and should be employed as a storage and retrieval system allowing unhurried systematic and comprehensive research.

One of the largest problems facing a researcher of interactive communication is the need to obtain data which are not overly influenced by the collection mechanism. Observers in interactive situations tend to intrude and affect what they are attempting to observe. Tape recorders, microphones and television cameras placed to pick up for later study the behavior of participants tend to be distracting, and distrusted. Yet without such mechanisms, behavior cannot be systematically studied except with great difficulty. Non-verbal behavior tends to disappear altogether from our purview.

These media can be used without distraction intervening when they are the means for maintaining the communication activity. If the media are used because the participants desire the contact and dialogue available through them, the media will tend to retreat into the background, lessening their influence on the research.

RECOMMENDATION G: A program of systematic evaluative research into the activity of informal information exchange behavior must be undertaken to isolate variables, discover relationships and establish guidelines for allocation of money and personnel to formal and informal channels, and for the design and structure of these channels.

There was little, if any, evaluative research of a systematic and rigorous nature concerning formal and informal channels of information exchange behavior discovered in our study. "Most critiques of evaluative research today conclude that too few evaluation studies are being made and that, furthermore, those that do exist are generally of low quality."[5]

Partly this is because most evaluation is conducted by people who are close to program management, if indeed they are not the project directors. This may result in a search for success rather than an objective appraisal of the value of the program.[6]

This lack of evaluation of the efforts of a particular program does not necessarily indicate an inability or reticence to measure existing public needs or resources. Nor does it necessarily indicate a lack of care in defining objectives and administering the program activity. Yet this lack does seem to indicate a reticence and unwillingness of many administrators to evaluate their efforts in any systematic and comprehensive way. Possibly this is due to the strong vested interest the administrator has in the success of his program. For most of us, the worthwhileness of our activities require little or no proof. Additionally, there may be a conflict between the program or organization and the evaluative research, since one of the purposes of evaluative research is to discover whether or not a program should be continued.[7]

Because of diminishing budgets, coupled with the expanding information needs, evaluative research is required as a basis for allocation decisions involving personnel and money. In the case of rising costs for meetings and the expenses associated with developing new informal channels, research will be helpful in establishing the need for the latter, their design and their effectiveness as a means of deciding to continue, change or discontinue their operation.

RECOMMENDATION H: To assist the researcher and the developers in their tasks, a center or clearinghouse for teleconferencing data should be established.

Possibly the most disheartening difficulty faced in undertaking this current research was the surprising lack of data concerning cost, users, uses, content, design and evaluation and a host of other important variablescrucial to any study of teleconferencing. The problem is not simply the lack of such facts, but the fact that such data are scattered and difficult to obtain. Once the material is discovered, it should be readily available for other researchers. We should build upon previous research, and not simply cover the same ground collecting the same data.

Some mechanism should be developed for assisting in the acquisition of information about teleconferencing. The mechanism should be up-dated regularly and contain current facts. The mechanism should provide information about people and their activities in teleconferencing as well as projects, budgets and evaluation data. The mechanism should allow for creative interaction of researchers and data. It should foster cooperation among researchers in the field. Finally, the mechanism must not become so formalized that the information is entrapped deep in bureaucratic bedrock. If the information is old and relatively useless by the time it is obtained, then the research is of questionable use. The development of such a mechanism should receive the highest priority.

Conclusion

There is little doubt that teleconferencing techniques are an essential ingredient of tomorrow's world of scholarship and research. There is little doubt that we are faced not with a surfeit but a surplus of answers. In a sense, "our problems never had it so good," because there are more than enough answers to go around. The difficulty and danger it seems is to assure that the answers fit the problems. Our technology provides us with some high-powered solutions which can swamp such sensitive personal activities as interactive and creative dialogue of a speculative nature concerning our own research. It is important and essential to bring the right people in contact with each other, to see that the right subjects are being discussed and that the right messages are being delivered about the subject.[8] "In its bare essentials a meeting is a collection of people interacting."[9] It is the people that should receive our first priority of research interest, then the subject, and finally only then the medium.

That the medium is crucial is a truism, and should not be ignored. Yet we must not be blinded by the technology and its efficiency and lose sight of the human and social reasons for applying it. But apply it we must, if we are to withstand the increasing onslaught of information. It must be applied for the benefit of individuals in their need to receive, filter and process information. Deutsch posits this information processing ability as the quintessential ingredient of our intellectual world today.[10]

Information processing is impossible without communication, for they are one and the same. The impact of the media used in information exchange activity is formative to the activity itself, and finally to the society. In his article, "A Communications Revolution," Charles J. Lynch summed up the basic fact that our research has underscored:

> Communication is, after all, the means by which people interact across both time and space; it is the stuff of which society is made, a yard stick by which civilization is measured. Anything that can dramatically change the means of communication has potential for making great changes in our society.[11]

NOTES

[1]Peter F. Drucker, The Age of Discontinuity: Guidelines to Our Changing Society (New York: Harper and Row, Publishers, Inc., 1969), pp. 264-65.

[2]J. C. R. Licklider, Robert W. Taylor, and Evan Herbert, "The Computer as a Communication Device," Science and Technology, LXXVI (April, 1968), 22.

[3]Karl W. Deutsch, "Knowledge in the Growth of Civilization: A Cybernetic Approach to the History of Human Thought," The Foundations of Access to Knowledge: A Symposium, ed. by Edward B. Montgomery, Frontiers of Librarianship, No. 8 (Syracuse: Syracuse University, Division of Summer Sessions, 1968), p. 50.

[4]Licklider, Taylor, and Herbert, "The Computer," 26.

[5]Edward A. Suchman, Evaluative Research: Principles and Practice in Public Service and Social Action Programs (New York: Russell Sage Foundation, 1967), p. 19.

[6]Charles A. Wedemeyer, "Evaluation of Continuing Education Programs," American Journal of Pharmaceutical Education, XXXIII, 5 (1969) 793.

[7]Suchman, Evaluative Research, pp. 146-47.

[8]George T. Vardaman and Carroll C. Halterman, Managerial Control through Communication: Systems for Organizational Diagnosis and Design (New York: John Wiley and Sons, Inc., 1968), p. 84.

[9]John S. Morgan, Practical Guide to Conference Leadership (New York: McGraw-Hill Book Co., Inc., 1966), p. 32.

[10]Deutsch, "Knowledge in the Growth of Civilization," p. 49.

[11]Charles J. Lynch, "A Communications Revolution," Science and Technology, LXXVI (April, 1968), 15.

APPENDIX A

LIBRARY TAPES *

ALCOHOLISM AND DRUG ABUSE

255. Acute Alcohol, Withdrawal, Treatment of (7:00) **1970R**
S. C. Kaim, M.D., Washington, D.C.

49. Delirium Tremens, Management of (5:40) **1971R**
S. C. Kaim, M.D., Washington, D.C.

292. Amphetamine Abuse (5:10) **1971R**
The Medical Letter

404, 405: See Box Below

SPECIAL TAPES ON DRUG PROBLEMS
If you have young people using drugs and you wish advice, we urge that you listen to tapes 404 and 405. Both have been prepared by Doctor Alan Reed, Milwaukee, who has been closely associated with the "Underground Switchboard," and can put you in touch with those who know the dangerous combinations of drugs commonly used. Also he has some important advice for all physicians as to the effective way to meet these problems on the local level.

406. Drug Abuse and the Role of the Professional Medical Person (9:23) 1970
Robert Samp, M.D., Madison

441. Drug Abuse: General Principles and **Terminology** (5:20) 1970
Joseph M. Benforado, M.D., Madison

442. Drug Abuse: Narcotic Abuse (5:00) **1970**
Joseph M. Benforado, M.D., Madison

443. Drug Abuse: Amphetamine Abuse (5:00) **1970**
Joseph M. Benforado, M.D., Madison

444. Drug Abuse: Hallucinogens (5:40) **1970**
Joseph M. Benforado, M.D., Madison

445. Drug Abuse: How To Treat a Bad Trip (5:30) **1970**
Joseph M. Benforado, M.D., Madison

446. Drug Abuse: Drug Abuse & Society (4:50) **1970**
Joseph M. Benforado, M.D., Madison

211. Drug Abuse by Teenagers (5:50) **1971**
J. C. Westman, M.D., Madison

274. Suicidal Attempts with Sedative Drugs, Medical Management of (7:00) 1970R
Avery Harrington, M.D., Madison

ALLERGY

76. Anaphylaxis, Management of (5:45) **1970R**
E. R. Stiehm, M.D., Los Angeles, Calif.

551. Asthma, Home Care of the Child with (8:38) **1971R**
Mary Sather, R.N., New Richmond

166. Asthma, Office Treatment of (5:30) **1971R**
C. E. Reed, M.D., Madison

287. Asthma, (Bronchodilator Aerosols for) (6:40) **1971R**
The Medical Letter

199. Asthma, Problems of Aerosol Treatment (3:00) **1971R**
John Arkins, M.D., Milwaukee

3. Status Asthmaticus, Management of (6:10) **1971R**
C. E. Reed, M.D., Madison

* from the Dial Access Library Catalog of Tapes mailed to Physicians and Nurses who are subscribers. The list covers from Sept. 1,1971 to August 31, 1972.

ALLERGY (Cont.)

88. **Bee Sting**, Treatment of (4:45) **1970R**
Sture A. M. Johnson, M.D., Madison
384. **Corticosteroids** in Allergic Disease **(7:40)** **1971R**
John A. Arkins, M.D., Milwaukee
383. **Drug Allergy**, Approach to (6:30) **1971R**
John A. Arkins, M.D., Milwaukee
198. **Hay Fever**, Office Treatment (4:10) **1971R**
John A. Arkins, M.D., Milwaukee
306. **Itching**, Hot Water For (3:13) **1970R**
The Medical Letter
280. **Penicillin Allergy** (9:55) **1970**
The Medical Letter
165. **Serum Sickness** (4:57) **1971R**
C. E. Reed, M.D., Madison
167. **Urticaria**, Diagnosis and Treatment **(5:29)** **1971R**
C. E. Reed, M.D., Madison

BLOOD & LYMPHATICS

251. **Agranulocytosis**, Mgmt. of (5:50) **1969R**
George Rivers, M.D., Marshfield
244. **Anemia:** Hypochromic, Microcytic **(6:22)** **1969R**
Robert Schilling, M.D., Madison
371. **Anticoagulant Drugs** (5:30) **1971R**
Francis J. Kazmier, M.D., Rochester, Minn.
500. **Anticoagulant Therapy**, The Patient on **(6:40)** **1970R**
Virginia Higbie, R.N., Durham, N.H.
195. **Coumarin and the Anticoagulants** and Management of Toxicity (5:30) **1971R**
Ovid Meyer, M.D., Madison
258. **Coumarin Anticoagulants:** Potentiators and Antagonists (3:57) **1970R**
Ovid Meyer, M.D., Madison
356. **Bleeding Emergencies** (5:50) **1971R**
E. J. W. Bowie, M.D., Rochester, Minn.
368. **Bleeder**, Elective Operations in the **(4:50)** **1971R**
E. J. W. Bowie, M.D., Rochester, Minn.
466. **Blood Transfusion Reactions** **(5:10)** **1971**
Herbert Polesky, M.D., Minneapolis, Minn.
305. **Blood Transfusion Reactions:** Emergency Therapy (3:55) **1970R**
Myrna Traver, M.D., Madison
113. **Coagulation Defects**, Emergency Treatment of (4:50) **1970R**
A. J. Quick, M.D., Milwaukee
59. **Erythroblastosis Fetalis**, Indications for Exchange Transfusion (6:50) **1969R**
L. G. Thatcher, M.D., Milwaukee
111. **Hemolytic** Crisis (4:30) **1969R**
A. V. Pisciotta, M.D., Milwaukee
112. **Leukemia**, Acute, Emergency Treatment of **(6:30)** **1969R**
A. V. Pisciotta, M.D., Milwaukee

BLOOD & LYMPHATICS (Cont.)

378. **Leukemia**, Chronic Lymphocytic, Treatment of (7:10) **1971R**
Richard W. Hill, M.D., Rochester, Minn.
277. **Anemia of Leukemia**, Management of **(3:55)** **1971R**
Don Korst, M.D., Madison
432. **Lymphedema of the Extremity**, Management of **(3:40)** **1970**
John E. Healy, M.D., Houston, Texas
346. **Lymphography** in Staging of Lymphoma **(5:20)** **1971R**
Joseph M. Kiely, M.D., Rochester, Minn.
206. **Lymphoma**, Diagnostic Measures in **(5:35)** **1970R**
Donald Korst, M.D., Madison
207. **Lymphoma and Leukemia**, Investigational Drugs (4:30) **1969R**
Donald Korst, M.D., Madison
448. **Multiple Myeloma**, Diagnosis of (6:18) **1970**
Horace H. Zinneman, M.D., Minneapolis, Minn.
328. **Multiple Myeloma**, Treatment of (6:22) **1971R**
Robert A. Kyle, M.D., Rochester, Minn.
523. **Parenteral Fluid Therapy**, Nursing Care Responsibilities in (6:30) **1971R**
Janice R. Anderzon, R.N., Madison
596. **Recognition of Fluid and Electrolyte Imbalance** **1971**
Joanne E. Wall, R.N., Madison
348. **Polycythemia Vera** (3:25) **1971R**
Charles F. Stroebel, M.D., Rochester, Minn.

CANCER

(All Houston tapes from M.D. Anderson Hospital and Tumor Institute, Houston, Texas.)

438. **Cancer**, Diagnosis—Crisis for Patient and Family (7:20) **1970**
Sandra Hicks, R.N., Houston, Texas
437. **Cancer**, The Family and the Child With **(7:03)** **1970**
H. Grant Taylor, M.D., Houston, Texas
375. **Cancer**, Detection in the Physician's Office **(9:20)** **1971R**
Ralph E. Speiderman, M.D., Rochester, Minn.
103. **Cancer**, Early Detection in the Office (5:30) **1970R**
Frederick J. Hofmeister, M.D., Milwaukee
591. **Cancer**, Philosophy of Nursing Care of Patients with (8:28) **1970**
Renilda Hilkemeyer, R.N., Houston, Texas
585. **Cancer**, Psychiatric Management of Patient with **(5:38)** **1970**
E. E. Johnstone, M.D., Houston, Texas
547. **Cancer Prevention**, Nurse's Role in (5:30) **1969**
Jerry Weston, R.N., Rockville, Md.
476. **When Should Cancer Chemotherapy Be Instituted?** (5:00) **1971**
Fred J. Ansfield, M.D., Madison
589. **New and Promising Drugs** (6:37) **1970**
Emil Frei, M.D., Houston, Texas
75. **Cancer Chemotherapy**, Selection of Patients for (5:30) **1966**
A. R. Curreri, M.D., Madison

CANCER (Cont.)

505. Chemotherapeutic Drugs for Cancer, The Patient Receiving (8:45) 1971R
Hortense Mergen, R.N., Madison, Wisc.

16. Cancer Chemotherapy, Treatment of Toxicity in (5.45) 1968
J. M. Schroeder, M.D., Madison

344. Chemotherapy in Gynecologic Malignancy **(7:21)** 1971R
David G. Decker, M.D., Rochester, Minn.

95. 5-FU in Advanced Cancer, Indications for Use of (6:32) 1971R
Fred Ansfield, M.D., Madison

380. Chemotherapy, Systematic Cytotoxic, Which Patient with Disseminated Malignancy Should Be Treated with (4:00) 1971R
David L. Ahmann, M.D., Rochester, Minn.

40. Cancer Chemotherapeutic Agents in Children, Toxic Manifestations of (6:15) 1969R
Patricia Joo, M.D., Madison

436. Abdominal Tumors in Childhood: What's Next After Palpation? (6:25) 1970
Margaret Sullivan, M.D., Houston, Texas

101. Abdominal Tumors in Infants and Young Children (7:00) 1969R
Thomas Haug, M.D., Rhinelander

435. Intrathoracic Tumors of Childhood (5:26) **1970**
W.W. Sutow, M.D., Houston, Texas

413. Breast Cancer, Advanced, Management of **(6:06) 1970**
B. J. Kennedy, M.D., Minneapolis, Minn.

34. Breast Cancer, Advanced, Summary of Therapy **(5:50)** 1970
F. J. Ansfield, M.D., Madison

588. Frozen Shoulder Post-Mastectomy, Highlights **(6:20)** 1970
John E. Healey, M.D., Houston, Texas

427. Mammography, When and Why **(6:06) 1970**
David Paulus, M.D., Houston, Texas

97. Cervical Cancer, Invasive, Diagnosis and Mgmt. of (5:30) 1971R
Andrew Boyd, M.D., Milwaukee

587. Ileal Conduit, Care of Patient with **(9:03) 1970**
Renilda Hilkemeyer, R.N., Houston, Texas

141. Cancer of the Larynx (5:40) 1970R
James Brandenburg, M.D., Madison

398. Cancer of the Larynx, Choice of Treatment **(6:50)** 1971R
Lawrence DeSanto, M.D., Rochester, Minn.

223. Cancer of the Larynx, Cigarettes and (623) **1971R**
Paschal A. Sciarra, M.D., Sheboygan, Wisc.

185. Cancer of the Larynx, Radiotherapy in Mgmt. of (5:20) 1971R
Robert W. Edland, M.D., Madison

142. Post-Laryngectomy Patient, Rehabilitation of **(4:45)** 1969
James Brandenburg, M.D., Madison

CANCER (Cont.)

590. Tracheostomy—Aspects of Nursing Head and Neck Patients (6:27) 1970
Phyllis Knauff, R.N., Houston, Texas

529. Tracheostomy, Care of the Patient with **(6:10) 1968**
Karen E. Witt, R.N., Platteville

Advanced Gastrointestinal
C. G. Moertel, M.D., Rochester, Minn. 1971R

399. Supportive & Nutritional Mgmt. (5:06)

400. Relief of Pain (5:45)

401. Edema and Ascites (6:15)

402. Specific Symptomatic Problems (6:10)

178. Cancer, Stomach, Early Diagnosis of (5:40) **1968R**
James R. Hoon, M.D., Sheboygan

430. Coloni Polypi—Rationale of Management **(7:01) 1970**
Robert C. Hickey, M.D., Houston, Texas

566. Colostomy, Care of Patient With (8:50) 1969
JoAnn Hunglemann, R.N., Milwaukee

431. Enterostomy Care With Emphasis on **Colostomy** (8:15) 1970
Rosie Taylor, R.N., Houston, Texas

464. Why Fuss With Proctoscopy? (6:05) 1971
Victor Gilbertsen, M.D., Minneapolis, Minn.

345. Lung Cancer, Early Diagnosis (6:08) 1971R
David T. Carr, M.D., Rochester, Minn.

416. Lung Cancer, Preoperative Evaluation of Patients with (6:45) 1970
Edward W. Humphrey, M.D., Minneapolis, Minn.

412. Mediastinoscopy (4:08) 1970
A. J. Duvall, M.D., Minneapolis, Minn.

432. Lymphedema of the Extremity, Management of (3:40) 1970
John E. Healey, M.D., Houston, Texas

346. Lymphography in Staging of Lymphoma (5:20) 1971I
Joseph M. Kiely, M.D., Rochester, Minn.

426. Malignant Melanoma, Surgical Management of (6:37) 1970
Charles McBride, M.D., Houston, Texas

183. Multiple Myeloma, Cutaneous Manifestations (4:50) 1971R
William F. Schorr, M.D., Marshfield

448. Multiple Myeloma, Diagnosis of (6:18) 1971
Horace H. Zinneman, M.D., Minneapolis, Minn.

328. Multiple Myeloma, Treatment of (6:22) 1971R
Robert A. Kyle, M.D., Rochester, Minn.

584. Oral Cancer Patient, Oral Care (8:00) 1970
Thomas Daly, D.D.S., Houston, Texas

423. Polyneuritis Associated with Carcinoma and Other Malignant Neoplasms (4:35) 1970
William S. Fields, M.D., Houston, Texas

586. Postoperative Cancer Patient, Respiratory Support for the (8:55) 1970
William Derrick, M.D., Houston, Texas

428. Pulmonary Metastases, Treatment of (6:57) 1970
C. F. Mountain, M.D., Houston, Texas

CANCER (Cont.)

418. Retinoblastoma (6:49) 1970
W. W. Sutow, M.D., Houston, Texas
179. Skin Pre-Cancer: Part I—The Keratoses (6:05) 1971
Sture A. M. Johnson, M.D., Madison
180. Skin Pre-Cancer: Part II—Leukoplakia (6:10) 1971
Sture A. M. Johnson, M.D., Madison
117. Skin, Pre-Malignant Lesions of (6:00) 1970R
Donald Ruch, M.D., Milwaukee
424. Skin, Cancer of the (4:22) 1970
William S. MacComb, M.D., Houston, Texas
421. Exposed Surfaces, Cancer of (7:44) 1970
A. J. Ballantyne, M.D., Houston, Texas
422. Lip, Cancer of the—Its Significance and Management (6:09) 1970
Oscar Guillamondegui, M.D., Houston, Texas
419. Parotid Tumor (6:23) 1970
A. J. Ballantyne, M.D., Houston, Texas
420. Sub-Maxillary Gland and Minor Salivary Glands, Tumor of the (5:43) 1970
A. J. Ballantyne, M.D., Houston, Texas
417. Tonsillar Area and the Palatine Arch, Carcinoma of the (8:00) 1970
Robert D. Lindberg, M.D., Houston, Texas
388. Prostate Gland, Carcinoma of the—Diagnosis and Evaluation (6:55) 1971R
John B. Wear, M.D., Madison
389. Prostate Gland, Carcinoma of the—Treatment (7:00) 1971R
John B. Wear, M.D., Madison
429. Testicle, Cancer of the (5:29) 1970
Joseph R. Castro, M.D., Houston, Texas
54. Testicle, Cancer of, Treatment of (5:00) 1971R
J. B. Wear, M.D., Madison
458. Testicular Carcinoma, Management of (5:45) 1971
Richard G. Hahn, M.D., Rochester, Minn.
125. Trophoblastic Tumors, Diagnosis & Mgmt. of (5:45) 1970R
Eleanor Delfs, M.D., Milwaukee
802. Nuclear Medicine, Safety in the Lab (5:13) 1971
J. Joseph Allen, M.S., Madison
803. Technetium 99m and Iodine 131, Safety In Handling (4:27) 1971
J. Joseph Allen, M.S., Madison
355. Radiotherapy in Cancer of the Bladder (6:00) 1971R
Paul Scanlon, M.D., Rochester, Minn.
592. Radium Implant, Nursing Care for Patient with (7:09) 1970
Renilda Hilkemeyer, R.N., Houston, Texas
513. X-ray Therapy, The Patient Receiving (5:50) 1970
Ethel Wallestad, R.N., Madison

CARDIOVASCULAR AND RENAL

247. Coronary Risk Factors—Office Evaluation and Management (6:05) 1969R
W. B. Parsons, M.D., Madison
232. Abdominal Aorta, Aneurysm of (6:15) 1970R
Victor Bernhard, M.D., Milwaukee
55. Angina Pectoris, Present Status of, Treatment of (5:00) 1971
George Rowe, M.D., Madison
249. Arterial Disease of the Extremities (Chronic Occlusive—Evaluation of) (5:40) 1970R
Richard Botham, M.D., Madison
250. Arterial Disease of the Extremities (Chronic Occlusive—Management of) (4:05) 1970R
Richard Botham, M.D., Madison
324. Arterial Embolism of the Lower Extremities (4:25) 1971R
Victor Parsonnet, M.D., Newark, N.J.
56. Arteriography, Emergency for Vascular Lesions (2:45) 1970
A. B. Crummy, M.D., Madison
115. Coronary Arteriography, Indications for and Complications of (5:52) 1970R
George Rowe, M.D., Madison
374. Coronary Arteriography, Contraindications, Indications and Risks of (5:55) 1970
Ben D. McCallister, M.D., Rochester, Minn.
215. Atherosclerosis, Experimental (4:50) 1971R
David Kritchevsky, M.D., Philadelphia, Pa.
329. Coronary Atherosclerosis, Risk Factors in (4:34) 1971R
Kenneth G. Berge, M.D., Rochester, Minn.
233. Lower Extremity, Failing Circulation of (Clinical and Special Procedures) (6:00) 1971R
Victor Bernhard, M.D., Milwaukee
234. Lower Extremity, Failing Circulation of (Surgical Therapy for) (6:00) 1970R
Victor Bernhard, M.D., Milwaukee
1. Embolism, Pulmonary, Acute, Diagnosis of by Lung Scan (4:55) 1969R
Ian Tyson, M.D., Madison
6. Embolism, Pulmonary. Treatment of Acute (5:26) 1970R
Dean Emanuel, M.D., Marshfield
393. Embolism, Pulmonary, Prevention of (5:15) 1971R
Herbert Plass, M.D., Minneapolis, Minn.
126. Embolectomy, Pulmonary, Indications for (5:12) 1971R
Ben Lawton, M.D., Marshfield
36. Embolization, Arterial, Acute. Management of (5:15) 1971R
George Kroncke, M.D., Madison
362. Cardiac Arrest (4:05) 1970
Wilbert J. Henke, M.D., St. Paul, Minn.
552. First Aid for Heart Attack (10:12) 1969
Mary Bielski, R.N., New York, N.Y.

CARDIOVASCULAR-RENAL (Cont.)

79. **Cardiac Arrest**, Treatment After (5:15) 1968
Betty Bamforth, M.D., Madison

135. **Cardiac Arrhythmias**, Emergency Treatment of (5:10) 1967
Richard Wasserberger, M.D., Madison

527. **Cardiogenic Shock**, Emergency Treatment of (6:40) 1971
Katherine Bordicks, R.N., Jackson, Miss.

171. **Shock (Cardiac)**, Management of (6:15) 1970R
W. Stuart Sykes, M.D., Madison

360. **Cardiogenic Shock**—Pathophysiology and Diagnosis (5:20) 1971R
James C. Dahl, M.D., Minneapolis, Minn.

129. **Infarction**, Acute Cardiac, Diagnosis (7:33) 1969R
John Huston, M.D., Milwaukee

130. **Infarction**, Acute Cardiac, Treatment of (9:55) 1969R
John Huston, M.D., Milwaukee

128. **Decompensation**, Acute Cardiac, Management of (7:06) 1968R
Robert M. Green, M.D., La Crosse

74. **Pulmonary Edema**, Acute, Etiology, Diagnosis and Treatment of (5:15) 1969
John Rankin, M.D., Madison

323. **Venous Occlusion**, Acute (5:56) 1971R
Victor Parsonnet, M.D., Newark, N.J.

410. **Heart Disease**, Recognition of and Management of Congestive Heart Failure (6:05) 1970
M. K. Ledbetter, M.D., Madison

317. **Atrial Dysrhythmias** Following Acute Myocardial Infarction, Treatment of (5:40) 1969
Edward A. Ryan, M.D., Duluth, Minn.

326. **Congestive Heart Failure** in Acute Myocardial Infarction, Treatment of (5:15) 1970
Mortimer L. Schwartz, M.D., Newark, N.J.

327. **Congestive Heart Failure**, Chronic (4:04) 1971R
Louis F. Albright, M.D., Neptune, N.J.

132. **Myocardial Contusion** (4:35) 1971R
Francis F. Rosenbaum, M.D., Milwaukee

365. **Acute Myocardial Infarction**, Less-Known Complications of (6:48) 1971R
James C. Mankey, M.D., Minneapolis, Minn.

366. **Myocardial Infarction**, Uncomplicated, Treatment of (5:54) 1971R
William L. Hedrick, M.D., Minneapolis, Minn.

391. **Post Myocardial Infarction Syndrome** (2:45) 1970R
Reuben Berman, M.D., Minneapolis

278. **Myocardial Infarction**—Sexual Intercourse After (5:30) 1971R
S. E. Sivertson, M.D., Madison

279. **Exercise and Coronary Heart Disease** (5:00) 1971R
The Medical Letter

519. **External Cardiac Resuscitation**, Joint Policy Statement (3:45) 1971R
Wisconsin Nurses' Association, Inc., and the State Medical Society of Wisconsin

CARDIOVASCULAR-RENAL (Cont.)

210. **Cardioversion**, Elective: Pros and Cons (5:35) 1969R
A. J. Richtsmeier, M.D., Madison

459. **Cardioversion of Cardiac Dysrhythmias**, Elective (7:43) 1971
Emilio R. Giuliani, M.D., Rochester, Minn.

372. **Myocardial Infarction**, The Role of Coronary Care Unit in the Treatment of (3:50) 1971R
Carlos E. Harrison, Jr., M.D., Rochester, Minn.

191. **Coronary Care Unit** Pros and Cons (5:25) 1970R
William Rock, M.D., Madison

175. **Coronary Care** Unit, Requirements for (5:55) 1971R
J. H. Wishart, M.D., Eau Claire

577. **Role of Nurse in Coronary Unit**, Joint Policy Statement (10:45) 1971R
Wisconsin Nurses' Association, State Medical Society of Wisconsin, Wisconsin Hospital Association, State of Wisconsin Board of Nursing, Wisconsin Division of Health

363. **The Coronary Care Unit**, Nurses' Role in (3:55) 1971R
Wilbert J. Henke, M.D., St. Paul, Minn.

521. **First Aid for the Stroke Patient** (8:19) 1968
Margaret A. Kaufman, R.N., Denver, Colo.

332. **Echoencephalography** in the Diagnosis of Cerebral Lesions (4:42) 1971R
Burton A. Sandok, M.D., Rochester, Minn.

228. **Hypertension:** Prognosis, Treated and Untreated (7:00) 1970R
John H. Moyer, M.D., Philadelphia, Pa.

229. **Hypertension** and Antihypertensive Agents (6:15) 1970R
John H. Moyer, M.D., Philadelphia, Pa.

108. **Hypertensive Patient**, Designing a Drug Regime (6:40) 1971R
Mischa Lustok, M.D., Milwaukee

62. **Hyptertensive Crisis**, Management of: Part I—Reserpine and Arfonad (4:25) 1971
Thomas Ansfield, M.D., Madison

63. **Hyptertensive Crisis**, Management of: Part II—Pentolinium, Hydralazine, Aldomet and Regitine (5:04) 1971
Thomas Ansfield, M.D., Madison

152. **Hyptertensive**, Young, Investigation of (5:31) 1971
Douglas D. Klink, M.D., Milwaukee

153. **Hypertensive**, Older, Investigation of (5:44) 1971
Douglas D. Klink, M.D., Milwaukee

155. **Hypertension** Amenable to Surgery (8:15) 1968R
Donald Koepke, M.D., Milwaukee

127. **Hypertension**, Diagnostic Techniques (5:18) 1970
Dean Emanuel, M.D., Marshfield

330. **The Hypertensive Patient**, Peroperative and Postoperative Management of (4.54) 1971R
P. J. Osmundson, M.D., Rochester, Minn.

131. **Hypertension** in Children (5:04) 1970
Charles Lobeck, M.D., Madison

CARDIOVASCULAR-RENAL (Cont.)

227. **Renal Failure**, Chronic, Management of (5:45) 1969R
R. Rieselbach, M.D., Madison
465. **Renal Failure**, Management of, Chronic (5:53) 1971
Donald A. Duncan, M.D., Minneapolis, Minn.
259. **Kidney Transplantation** (5:00) 1971
William A. Kisken, M.D., LaCrosse

DEFICIENCY AND METABOLIC

343. **Acid-Base Measurements**, Indications for and Use of (8:50) 1971R
Robert O. Burns, M.D., Madison
133. **Crash Dieting and Dehydration** in Wrestlers, Hazards of (3:50) 1970R
A. J. Ryan, M.D., Madison
546. **Cystic Fibrosis**, Home Care of the Child with (6:22) 1971R
Margaret L. Walter, R.N., Madison
390. **Diabetes:** Adult Onset (7:30) 1970
E. S. Gordon, M.D., Madison
450. **Diabetes in Childhood**—Including Chemical Diabetes (6:29) 1971
23. **Diabetes Mellitus**, Management of During and After Surgery (4:45) 1971R
E. C. Albright, M.D., Madison
571. **Diabetes**, Foot Care For the Patient with (6:25) 1970
Kay Richards, R.N., New Richmond
19. **Diabetic Coma**, Treatment of (6:20) 1970
E. S. Gordon, M.D., Madison
302. **Diabetic Mother**, Specific Prophylactic Therapy in an Infant of a (7:10) 1969
Michael McCann, M.D., Madison
39. **Diabetic Acidosis** in Children, Management of (6:00) 1969R
George Kerr, M.D., Madison
553. **Insulin**, Differences in Types of (9:12) 1971R
David Zilz, Madison
288. **Oral Hypoglycemic Agents** (6:20) 1971R
The Medical Letter
554. **Oral Hypoglycemic Agents** (7:23) 1971R
David Zilz, Madison
248. **Hypercholesteremia**, Management of (7:20) 1969R
W. B. Parsons, M.D., Madison
143. **Hyperkalemia**—Diagnosis and Management (4:45) 1970R
Robert O. Burns, M.D., Madison
386. **Hyperlipidemias**, Diet and Drugs in the Treatment of (10:35) 1971R
Medical Letter
415. **Lipid Clinic:** Partial Ileal Bypass (5:35) 1970
Henry Buchwald, M.D., Minneapolis, Minn.
273. **P K U:** The Diagnosis of (4:20) 1971R
Harry Waisman, M.D., Madison
367. **Phenylketonuria** (5:39) 1971R
Robert O. Fisch, M.D., Minneapolis, Minn.

DEFICIENCY AND METABOLIC (Cont.)

316. **Potassium Formulations** and Therapy (8:30) 1970R
The Medical Letter
52. **Water Intoxication**, Diagnosis and Treatment of the Syndrome of (3:10) 1970R
Robert O. Burns, M.D., Madison

E.E.N.T.

349. **Adeno-Tonsillectomy**, Modern Indications and Preparations for (8:00) 1971R
Thomas V. Geppert, M.D., Madison
291. **Corticosteroids**, Adverse Opthalmic Effects of (7:00) 1971R
The Medical Letter
149. **Eye Injury**, Acute Management of (4:23) 1967
Clare Hutson, M.D., Madison
212. **Loss of Vision**, Patient Who Complains of (6:10) 1970R
Frank Myers, M.D., Madison
186. **Glaucoma**, Recognition and Management (6:05) 1970
John V. Berger, M.D., Madison
395. **Papilledema** (5:50) 1970
David E. Eifrig, M.D., Minneapolis, Minn.
209. **Red Eye** (5:50) 1971R
James Allen, M.D., Madison
361. **Squint**, Childhood Problems in (8:55) 1971R
Otto A. Wiegmann, M.D., Milwaukee
394. **Strabismus** (5:15) 1970
David E. Elfrig, M.D., Minneapolis, Minn.
222. **Middle Ear Effusion** (5:40) 1971R
Paschal A. Sciarra, M.D., Sheboygan
231. **Otitis Media**, Secretory, in Children, Diagnosis and Treatment of (4:50) 1971R
Watson B. Larkin, M.D., Eau Claire
140. **Larynx** and Upper Trachea, Injuries to, and Management of (4:40) 1970R
James Brandenburg, M.D., Madison
339. **Larynx**, Automobile Crash Injuries to, and Trachea (5:18) 1971R
David J. Buran, M.D., Minneapolis, Minn.
246. **Lesions of the Neck and Oropharnyx**, Differential Diagnosis and Treatment (6:25) 1971R
John K. Scott, M.D., Madison

ENDOCRINE

335. **Adrenal Insufficiency**, Screening Tests for (7:20) 1971R
Edwin C. Albright, M.D., Madison
263. **Buccal Smear**, Indications for (8:35) 1971
John Opitz, M.D., Madison

CARDIOVASCULAR-RENAL (Cont.)

43. **Heart Failure,** Congestive, in Infants (7:20) 1971R
Marion Ledbetter, M.D., Madison

98. **Infants,** Recognition of Cardiovascular Conditions (4:30) 1970R
Lynn Eggman, M.D., Rhinelander

313. **Cyanotic Heart Disease** in the Newborn (4:25) 1969
Julien Hoffman, M.D., San Francisco, Calif.

119. **Hemochromatosis** as a Cause of Cardiac Disease (5:30) 1970R
Warren Simmons, M.D., Rhinelander

325. **Pericarditis,** Acute (6:06) 1971R
Thomas M. McMillan III, M.D., Mt. Holley, N.J.

107. **Rheumatic Fever,** Acute, Management of (4:45) 1970R
Jay Levy, M.D., Madison

333. **Temporal Arteritis** (5:29) 1971R
John W. Joyce, M.D., Rochester, Minn.

347. **Vascular Disease** of the Bowel (5:30) 1971R
Douglas B. McGill, M.D., Rochester, Minn.

104. **Coronary Artery Disease.** Surgical Treatment of (5:10) 1969
W. D. Johnson, M.D., Milwaukee

314. **Ventricular Septal Defects,** How to Handle (4:26) 1969
Julien Hoffman, M.D., San Francisco, Calif.

106. **Valvular Disease,** Cardiac, Indications for Surgery (6:15) 1970R
Derward Leppley, M.D., Milwaukee

379. **Valvular Replacement,** Complications Following (7:10) 1971R
Thomas T. Schattenberg, M.D., Rochester, Minn.

318. **Heart Block and Pacemakers** (5:20) 1971R
James I. Thompson, M.D., Duluth, Minn.

105. **Heart Block** and Cardiac Pacemakers (5:36) 1968R
Kenneth Klatt, M.D., Rockford, Ill.

226. **Carotid-Cavernous** Fistula (6:20) 1970R
Sanford Larson, M.D., Milwaukee

181. **Laboratory Tests in Hypertension** (6:45) 1971
Douglas D. Klink, M.D., Milwaukee

526. **Laboratory Tests for Aid in Diagnosis of Myocardial Infarction**—LDH and SGOT (Transiminase) (6:40) 1968
Virginia Blume, R.N., Milwaukee

528. **Digitalis Products,** Differences in (6:00) 1968
Virginia Blume, R.N., Milwaukee

542. **Digitalis Toxicity,** Symptoms of (10:15) 1969R
Betty Bergersen, R.N., Chicago, Ill.

213. **Digitalis,** Pharmacological Action of (4:20) 1970R
Leon Goldberg, M.D., Atlanta, Ga.

322. **Digitalis,** Administration, Use and Side Effects of (4:06) 1971R
William S. Wilson, M.D., New Brunswick, N.J.

114. **Digitalis Toxicity** (5:30) 1968R
Francis F. Rosenbaum, M.D., Milwaukee

334. **Digitalis Toxicity:** Diagnosis and Treatment (5:40) 1971R
T. L. Johnson, M.D., Duluth, Minn.

CARDIOVASCULAR-RENAL (Cont.)

520. **Digitalis,** Nursing Observations on Patients Receiving (5:58) 1971R
Carolyn Littlejohn, R.N., Oshkosh

214. **Cholesterol Lowering Agents,** Current Status of (6:20) 1971R
David Kritchevsky, M.D., Philadelphia, Pa.

Drug Therapy in Dysrhythmias Complicating Acute Myocardial Infarction

358. **Pt. 1—Propranolol, Inderal** (2:38) 1971R
John C. Morgan, M.D., St. Paul, Minn.

359. **Pt. 2—Lidocaine, Pronestyl and Quinidine** (5:39) 1971R
John C. Morgan, M.D., St. Paul, Minn.

456. **Lidocaine** as an Anti-Arrhythmic Agent (5:00) 1971
The Medical Letter

364. **Diphenylhydantoin (Dilantin):** Usage in Arrhythmias Secondary to Myocardial Infarction (4:58) 1971R
James C. Dahl, M.D., Minneapolis, Minn.

216. **Catecholamines** as Cardiotonics (3:50) 1968
Steven Wolfson, M.D., Boston, Mass.

492. **Nitroglycerin,** Disintegration and Storage of (4:15) 1971
The Medical Letter

217. **Propranolol:** Uses and Contraindications (4:30) 1968
Steven Wolfson, M.D., Boston, Mass.

218. **Diuretic Therapy,** Today's Problems (6:30) 1971R
Arthur Bernstein, M.D., Newark, N.J.

331. **Diuretics,** Old and New (8:06) 1971R
Ross M. Tucker, M.D., Rochester, Minn.

260. **Diuretic Agents,** Newer (5:04) 1970R
W. D. Shelp, M.D., Madison

518. **Central Venous Pressure**—What Is It? (6:40) 1971
Barbara Gessner, R.N., New Richmond

342. **Central Venous Pressure Technique** and Indications (7:15) 1971R
Robert O. Burns, M.D., Madison

565. **Central Venous Pressure Measurement,** Nursing Care In (8:18) 1971
Barbara Gessner, R.N., New Richmond

550. **Hemodialysis**—What Is It? (4:40) 1969
Elizabeth Bartlett, R.N., Garden Grove, Calif.

574. **Hemodialysis,** Nursing Aspects of (4:45) 1970
Carol Clarke, R.N., Madison

549. **Peritoneal Dialysis**—What Is It? (4:15) 1969
Elizabeth Bartlett, R.N., Garden Grove, Calif.

575. **Peritoneal Dialysis,** Nursing Aspects of (6:10) 1970
Christine V. Maloney, R.N., Madison

245. **Stress ECG's:** Methods, Criteria and Indications (5:50) 1970R
D. J. Freeman, M.D., Wausau

12. **Renal Failure,** Acute, Management of (6:00) 1970R
A. B. Weinstein, M.D., Madison

805. **Renal Failure,** Acute, Treatment (6:00) 1971
E. M. Kjellstrand, M.D., Minneapolis, Minn.

ENDOCRINE (Cont.)

433. **Hypercalcemia**—Medical Management (5:54) 1970
C. Stratton Hill, M.D., Houston, Texas

434. **Hypercalcemia**—Surgical Management (5:58) 1970
Robert C. Hickey, M.D., Houston, Texas

414. **Hyperthyroidism**, Diagnosis and Management of (4:58) 1970
John P. Delaney, M.D., Minneapolis, Minn.

451. **Hyperthyroidism**, Treatment of (6:42) 1971
Alvin L. Schultz, M.D., Minneapolis, Minn.

449A. **Thyroid Function Tests**, Types of (2:00) 1971
Frank Q. Nutall, M.D., Minneapolis, Minn.

449B. **Thyroid Function Tests**—Normal and Abnormal Value (7:50) 1971
Frank Q. Nutall, M.D., Minneapolis, Minn.

208. **Thyroid Hormones**, Use of (5:10) 1971R
Edwin Albright, M.D., Madison

373. **Pheochromocytoma** (6:25) 1971R
Sheldon G. Sheps, M.D., Rochester, Minn.

28. **Steroid Therapy**, Major Surgery After Prolonged Treatment (5:45) 1969R
F. C. Larson, M.D., Madison

GASTROINTESTINAL

539. **Bowel Retraining** (6:03) 1969R
DeRuth Wagner, R.N., Downey, Calif.

566. **Colostomy**, Care of Patient With (8:50) 1969
JoAnn Hunglemann, R.N., Milwaukee

431. **Enterostomy Care**, With Emphasis on Colostomy (8:15) 1970
Rosie Taylor, R.N., Houston, Texas

559. **Enema**, Precautions in Giving (9:30) 1971R
May Hornback, R.N., Madison

512. **Fecal Impaction** (7:45) 1971R
May Hornback, R.N., Madison

271. **Barium Enema after Age 40**—Indications (6:20) 1971R
John Swingle, M.D., Madison

268. **Esophagoscopy**: Indications for (5:40) 1971R
John Morrissey, M.D., Madison

370. **Gastric Analysis**, When and How to Do a (7:16) 1971R
Donald A. Wolochow, M.D., Rochester, Minn.

267. **Gastroscopy & Gastrophotography**. Indications for (5:40) 1969R
John Morrissey, M.D., Madison

26. **G. I. Bleeding**, Radiology in (6:10) 1971R
John Juhl, M.D., Madison

464. **Why Fuss With Proctoscopy?** (6:05) 1971
Victor Gilbertsen, M.D., Minneapolis, Minn.

15. **Biliary Colic**, Acute, Treatment of (5:46) 1971
K. E. Lemmer, M.D., Madison

GASTROINTESTINAL (Cont.)

357. **Diarrhea, Chronic**, Investigation of a Patient with (6:25) 1971R
Paul A. Green, M.D., Rochester, Minn.

264. **Diarrhea with Vomiting in Infants**: Home Management of (4:15) 1971
Clinton Lillibridge, M.D., Rochester, N.Y.

297. **Diarrhea, Persistent Infantile**, Caused by Disaccharidase Deficiency (4:45) 1970R
Clinton Lillibridge, M.D., Rochester, N.Y.

484. **Diarrhea, Traveler's** (3:05) 1971
The Medical Letter

203. **Disaccharide Intolerance** (4:15) 1969R
James Manier, M.D., Minneapolis, Minn.

205. **G. I. Bleeding**, Acute, Therapy of (5:45) 1969R
James Manier, M.D., Minneapolis, Minn.

461. **Gastric Ulcer**, Treatment of (6:45) 1971
Philip W. Brown, Jr., M.D., Rochester, Minn.

44. **Hepatic Failure**, Management of (5:30) 1970R
J. L. Sims, M.D., Madison

472. **Hepatitis**, Diagnosis of Chronic Active (4:52) 1971
Arthur R. Page, M.D., Minneapolis, Minn.

473. **Hepatitis**, Therapy of Chronic Active (4:20) 1971
Arthur R. Page, M.D., Minneapolis, Minn.

148. **Mesenteric Arterial Embolism**, Management of (5:41) 1969R
Adolph Gundersen, M.D., La Crosse

269. **Pancreatitis, Acute**, Diagnosis and Management (5:30) 1971R
Blake Waterhouse, M.D., Madison

270. **Pancreatitis, Chronic**, Diagnosis and Management (6:51) 1971R
Blake Waterhouse, M.D., Madison

369. **Pancreatitis**, The Diagnosis of (7:10) 1971R
Earl E. Gambill, M.D., Rochester, Minn.

430. **Coloni Polypi**—Rationale of Management (7:01) 1970
Robert C. Hickey, M.D., Houston, Texas

475. **Intestinal Polyposis**, Syndromes of (6:37) 1971
Lloyd G. Bartholomew, M.D., Rochester, Minn.

239. **Rectal Polyps**, Diagnosis and Treatment (5:02) 1971R
Gordon Marlow, M.D., Madison

238. **Perirectal Abscess and Fistulae**—Dx & Rx (5:40) 1971R
Gordon Marlow, M.D., Madison

71. **Rectal Bleeding**, Causes and Treatment of (5:28) 1971
Jack Longley, M.D., Madison

176. **Regional Enteritis**, Surgery of (5:40) 1970R
George Collentine, Milwaukee

196. **Ulcerative Colitis** (6:15) 1970R
Harry Kanin, M.D., Milwaukee

204. **Ulcerative Colitis**, Medical & Surgical Treatment (5:20) 1969R
James Manier, M.D., Minneapolis, Minn.

457. **Ulcerative Colitis**, Medical Management of Chronic (5:40) 1971
Richard E. Sedlack, M.D., Rochester, Minn.

GENITOURINARY

541. **Bladder Training** for the Patient with a Retention Catheter (6:10) 1971R
Annie M. Grdjan, R.N., Downey, Calif.

540. **Bladder Training** for the Patient Without a Retention Catheter (4:10) 1968
Edna M. Briggs, R.N., Downey, Calif.

587. **Ileal Conduit,** Care of Patient with **(9:03) 1970**
Renilda Hilkemeyer, R.N., Houston, Texas

543. **Incontinence,** Caring for the Patient with **(9:50) 1969R**
Lena M. Plaisted, R.N., and Meribah Stanton, R.N., Boston, Mass.

560. **Neurogenic Bladder,** from Spinal Cord Disorder, Patient with (8:32) 1971R
Annie M. Grdjan, R.N., Downey, Calif.

514. **Urethral Catheter,** Care of the Indwelling **(6:50) 1968**
Erna Ziegel, R.N., Madison

447. **Neurovesical Dysfunction,** Recent Advances in Diagnosis and Treatment (5:12) **1971**
Daniel C. Merrill, M.D., Minneapolis, Minn.

388. **Prostate Gland,** Carcinoma of the, Diagnosis and Evaluation (6:55) 1971R
John B. Wear, M.D., Madison

389. **Prostate Gland,** Carcinoma of the—Treatment **(7:00)** 1971R
John B. Wear, M.D., Madison

60. **Prostatectomy,** Indications for (5:44) **1971R**
John B. Wear, M.D., Madison

397. **Prostatitis,** Chronic (9:45) 1970
John B. Wear, M.D., Madison

51. **Urethral Trauma,** Management of (4:50) **1971R**
D. T. Uehling, M.D., Madison

283. **Urinary Tract Infections** (3:25) **1971R**
The Medical Letter

350. **Urinary Tract Infections** in the Adult Female **(8:50)** 1971R
David T. Uehling, M.D., Madison

22. **Urinary Tract Infection** in Children **(4:54) 1970**
C. C. Lobeck, M.D., Madison

53. **Urinary Tract Infection,** The Treatment of **(5:18) 1971R**
J. B. Wear, M.D., Madison

48. **Uropathy** in Children, Management of **(5:10) 1971R**
D. T. Uehling, M.D., Madison

338. **Vasectomy** (5:58) 1971R
Robert Benjamin, M.D., Minneapolis, Minn.

GYNECOLOGY & OBSTETRICS

102. **Examination,** The Gynecologic (5:00) **1970R**
Frederick J. Hofmeister, M.D., Milwaukee

122. **Maturation Index,** The Vaginal Smear (5:45) **1971R**
Dorothy Barbo, M.D., Milwaukee

9. **Pap Smear,** Positive, How to Proceed with **(5:12)** 1968R
A. E. Schultz, M.D., Madison

GYN & OBSTETRICS (Cont.)

118. **Cervix,** Carcinoma In-Situ, Treatment of (5:11) **1970R**
Herbert Sandmire, M.D., Green Bay

123. **Cervix,** When to Cone (5:50) 1971
Douglas Clark, M.D., Milwaukee

151. **Uterine Cytology** (5:00) 1969R
Ben Peckham, M.D., Madison

96. **Menopausal Bleeding,** Diagnosis and **Management** (4:45) 1970R
Andrew Boyd, M.D., Milwaukee

10. **Postmenopausal Bleeding** (3:20) 1968R
A. E. Schultz, M.D., Madison

452. **Pelvic Inflammatory Disease,** Acute **(6:15) 1971**
Donald W. Freeman, M.D., Minneapolis, Minn.

470. **Evaluation of the Infertile Couple** (7:10) 1971
George E. Tagatz, M.D., Minneapolis, Minn.

299. **Intrauterine Contraceptive Devices** (6:40) **1971R**
The Medical Letter

488. **Laparoscopy** (6:15) 1971
Preston P. Williams, M.D., Minneapolis, Minn.

495. **Laparoscopic Sterilization** (5:30) 1971
Preston P. Williams, M.D., Minneapolis, Minn.

286. **Oral Contraceptives**—Thromboembolic Effects **(5:55)** 1971R
The Medical Letter

315. **Hormone Pregnancy Tests,** Safety of (3:05) **1970R**
The Medical Letter

569. **Administration of Oxytocic Drugs,** Administrative Guidelines for the Professional Nurse in the **(6:10)** 1970
Anita Grand, R.N., Madison

45. **Abruptio Placentae** (5:45) 1970R
Ben Peckham, M.D., Madison

252. **Bacteremic Shock** in Obstetrics **(5:50) 1969R**
A. L. Kennan, M.D., Madison

30. **Bleeding,** Last Trimester, Treatment of **(5:28) 1970R**
Ben Peckham, M.D., Madison

243. **Breech Presentation, Mgmt. of** (5:47) **1970R**
T. A. Leonard, M.D., Madison

27. **Hemorrhage,** Postpartum, Diagnosis and **Treatment** (6:36) 1970R
C. Weir Horswill, M.D., Madison

4. **Rh Negative**—Pregnant Patient, **Latest Trends in** Management of (4:58) 1970R
A. L. Kennan, M.D., Madison

182. **Rh Immunization,** Prevention of (6:20) **1970**
S. J. Masouredis, M.D., LaJolla, Calif.

256. **Toxemia & Eclampsia,** Treatment of
Pt. 1—Control of Convulsions and Blood **Pressure** (5:55) 1970R
Everett L. Roley, M.D., Madison

257. Pt. 2—Delivery of Patient & Prognostic Signs **(5:30)** 1970R
Everett L. Roley, M.D., Madison

GYN & OBSTETRICS (Cont.)

125. **Trophoblastic Tumors,** Diagnosis & Mgmt. of (5:45) 1970R
Eleanor Delfs, M.D., Milwaukee

82. **Twins,** Delivery of: Part I—Course of Labor (3:15) 1971R
Ronald Olson, M.D., Madison

83. **Twins,** Delivery of: Part II—Conduct of Delivery (4:00) 1971R
Ronald Olson, M.D., Madison

INFECTIONS

285. **Antibacterial Therapy:** Administration and Duration of (2:35) 1971R
The Medical Letter

493. **Gonorrhea,** Diagnosis of (5:51) 1971
J. D. Kabler, M.D., Madison

494. **Gonorrhea,** Treatment of (9:12) 1971
J. D. Kabler, M.D., Madison

579. **Gonorrhea,** Teaching and Follow-up of the Patient with 1971
Wilma Lewis Jeffson, R.N., Madison

300. **Malaria,** Dx and Treatment of Vietnam Veterans (5:50) 1970R
Edwin L. Overholt, M.D., La Crosse

85. **Measles Vaccination** (4:45) 1970R
E. Richard Stiehm, M.D., Los Angeles, Calif.

301. **Melioidosis,** Dx and Treatment of Vietnam Veterans (4:20) 1970R
Edwin L. Overholt, M.D., La Crosse

29. **Meningitis,** Bacterial, Acute, in Children (Treatment) (7:00) 1970R
June Osborn, M.D., Madison

281. **Meningitis:** Initial Treatment of (2:50) 1971R
The Medical Letter

192. **Mumps Vaccine** (2:30) 1970R
June Osborn, M.D., Madison

240. **Osteomyelitis** in Childhood (6:18) 1970R
June Osborn, M.D., Madison

65. **Rabies,** The Management of (6:00) 1971
Stanley Inhorn, M.D., Madison

340. **Rubella Immunization** and Potential Problems (6:25) 1971R
David H. Carver, M.D., Baltimore, Md.

293. **Rubella Virus Vaccine**—Recommendations and Precautions (6:45) 1970
Marjorie Forman, M.D., Galveston, Texas

282. **Sepsis:** Initial Treatment of (2:20) 1971R
The Medical Letter

172. **Shock (Septicemic),** Management of (6:45) 1970R
W. Stuart Sykes, M.D., Madison

284. **Superinfections** (2:00) 1971R
The Medical Letter

INFECTIONS (Cont.)

145. **Syphilis,** Acute, Treatment of (5:30) 1970R
Garrett Cooper, M.D., Madison

66. **Syphilis** Serology, Testing (5:25) 1971
Stanley Inhorn, M.D., Madison

21. **Tetanus,** Prophylaxis (5:06) 1970R
Sanford Mackman, M.D., Madison

MUSCULOSKELETAL AND CONNECTIVE TISSUE

ARTHRITIS AND RHEUMATIC DISEASE

(*Indicates tapes prepared by the Committee on Rheumatic Disease of the Minnesota State Medical Association.)

*813. **Aching Back, The**—Help from a Physiatrist 1971
Michael Kosiak, M.D., St. Paul, Minn.

*463. **Arthritis,** Diagnosis of by Physical Examination—The Hand (5:40) 1971
Paul J. Bilka, M.D., Minneapolis, Minn.

*808. **Arthritis,** Joint Fluid Analysis in Diagnosis of 1971
Paul H. Andreini, M.D., Rochester, Minn.

*479. **Arthritis,** Treatment of Acute Suppurative (5:50) 1971
Jerome W. Dougan, M.D., Minneapolis, Minn.

201. **Rheumatoid Arthritis,** Acute, Management of (6:50) 1970R
Mark Mueller, M.D., Madison

202. **Rheumatoid Arthritis,** Chronic, Management of (6:45) 1970R
Mark Mueller, M.D., Madison

*462. **Rheumatoid Arthritis,** Early Diagnosis of (5:63) 1971
Paul J. Bilka, M.D., Minneapolis

*489. **Rheumatoid Arthritis,** Systematic Complications of (7:00) 1971
Roger S. Colton, M.D., St. Paul, Minn.

*490. **Rheumatoid Arthritis,** Local Complications of (6:24) 1971
Roger S. Colton, M.D., St. Paul, Minn.

*499. **Rheumatoid Arthritis,** Planning Treatment Program for the Patient with (6:50) 1971
J. G. Mayne, M.D., Rochester, Minn.

*811. **Butazolidine in Rheumatoid Disorders,** Use of 1971
John W. Worthington, M.D., Rochester, Minn.

*498. **Cortisone in Arthritis,** The Proper Use of (5:40) 1971
G. G. Hunder, M.D., Rochester, Minn.

*806. **Gold Therapy In Rheumatoid Arthritis,** Indications for (6:00) 1971
G. T. Mullin, M.D., Minneapolis, Minn.

*812. **Physical Therapy**—A Necessity in Rheumatoid Arthritis 1971
Herbert A. Schoening, M.D., Minneapolis, Minn.

*810. **Juvenile Rheumatoid Arthritis** 1971
Homer Venter, M.D., St. Paul

*809. **Rheumatoid Variants** 1971
Conrad Butwinick, M.D., Minneapolis

MUSCULOSKELETAL AND CONNECTIVE TISSUE (Cont.)

*491. **Wear and Tear Athritis**—The Arthroses (6:01) 1971
Roger S. Colton, M.D., St. Paul, Minn.

*497. **Dermatopolymyositus and Scleroderma** (6:10) 1971
C. H. McKenna, M.D., Rochester, Minn.

*469. **Dupuytren's Contracture of the Hand** (6:42) 1971
James H. House, M.D., Minneapolis, Minn.

*478. **Gout and Pseudogout**, Diagnosis and Management of (6:00) 1971
Jerome W. Dougan, M.D., Minneapolis, Minn.

*496. **Lupus Erythematosus**, Systemic, Diagnosis and Treatment of (6:30) 1971
C. H. McKenna, M.D., Rochester, Minn.

545. **Cast**, Care of the Patient with (9:50) 1970R
Alice Simonds, R.N., Madison

72. **Charley Horse** (4:39) 1971R
A. J. Ryan, M.D., Madison

468. **Cornpicker Hand Injuries** (7:26) 1971
James H. House, M.D., Minneapolis, Minn.

544. **Immobile Patient**, Care of (9:00) 1969R
Doris Arnold, R.N., Milwaukee

290. **Indomethacin** (Indocin) (5:40) 1971R
The Medical Letter

2. **Knee Injury**, Athletic, Prevention of (4:15) 1970R
A. J. Ryan, M.D., Madison

453. **Osteoporosis** (6:00) 1971
Charles C. Lai, M.D., Minneapolis, Minn.

94. **Rib Fractures**, Treatment of (4:22) 1971R
A. J. Ryan, M.D., Madison

254. **Scoliosis in Children** (5:30) 1971R
Walter Blount, M.D., Milwaukee

90. **Shoulder** Separation (3:45) 1971R
A. J. Ryan, M.D., Madison

91. **Sports Medicine**, Quackery in (3:50) 1971R
A. J. Ryan, M.D., Madison

289. **The Sprained Ankle** (9:40) 1971R
A. J. Ryan, M.D., Madison

NERVOUS SYSTEM

230. **Bell's Palsy**, Early Treatment of (6:00) 1971R
Watson B. Larkin, M.D., Eau Claire

241. **Brain Tumor, Suspected**—What To Do (7:20) 1971R
Frank Goldstein, M.D., Milwaukee

89. **Concussion** in the Athlete (3:45) 1971R
A. J. Ryan, M.D., Madison

86. **Trauma**, Head Acute (6:12) 1970R
Glenn Meyer, M.D., Washington, D.C.

61. **Cervical Spondylosis** and Myelopathy (5:25) 1971R
M. B. Glover, M.D., Albuquerque, N.M.

225. **Herniated Intervertebral Disc** (6:30) 1970R
Sanford Larson, M.D., Milwaukee

NERVOUS SYSTEM (Cont.)

87. **Hydrocephalus**, Recognition and Treatment (6:00) 1971R
M. B. Glover, M.D., Albuquerque, N.M.

5. **Hypertension, Intracranial** in Children (5:46) 1969R
R. W. Chun, M.D., Madison

387. **Intracranial Pressure**, Increased Drugs for Reducing (6:35) 1971R
Medical Letter

578. **Multiple Sclerosis:** Symptoms and Management (8:10) 1970
The National Multiple Sclerosis Society, New York

304. **Muscular Dystrophy**, Management of (9:12) 1971R
H. A. Peters, M.D., Madison

11. **Myasthenia Gravis** Including Crisis (8:42) 1970R
H. A. Peters, M.D., Madison

38. **Neuritis**, Acute and Polyneuropathies, Diagnosis and Treatment of (7:10) 1970R
H. A. Peters, M.D., Madison

272. **Occult Hydrocephalus** (4:50) 1971R
Frederick Pitts, M.D., Madison

35. **Parkinson's Disease**, Neurosurgery In (5:23) 1969R
Flavio Puletti, M.D., Madison

31A. **Parkinson's Disease:** Treatment with Levodopa 1971
G. G. Celesia, M.D., Madison

31B. **Parkinson's Disease:** Treatment with Anticholinergics and Amantadine 1971
G. G. Celesia, M.D., Madison

594. **Parkinson's Disease:** Nursing Care of Patients on L Dopa Therapy (7:00) 1971
Maureen B. Duszynski, R.N., Brookfield
Ronald E. Jones, R.N., Brookfield

188. **Phenol Block for Spasticity** (5:15) 1971R
Louis L. Bensman, M.D., Milwaukee

64. **Polyneuropathies**, Chronic, Etiology and Management of (6:30) 1970R
H. A. Peters, M.D., Madison

161. **Porphyrias, The** (9:35) 1970
H. A. Peters, M.D., Madison

544. **Immobile Patient**, Care of (9:00) 1969R
Doris Arnold, R.N., Milwaukee

144. **Transient Ischemic** Attacks (3.25) 1970R
John Marshall, M.D., London, England

18. **Subarachnoid Hemorrhage**, Spontaneous, Mgmt. (4:12) 1971R
H. E. Booker, M.D., Madison

200. **Stroke**, Diagnostic Procedures and Indications for Carotid Endarterectomy (7:15) 1971R
Manucher Javid, M.D., Madison

110. **Strokes**, Differential Diagnostic Approach (8:45) 1967
John W. Nelson, M.D., Milwaukee

120. **Stroke** Patient, Screening Techniques in the Evaluation (5:10) 1970R
Philip White, M.D., Milwaukee

NERVOUS SYSTEM (Cont.)

37. **Brain Scanning** in the Diagnosis of Stroke and Head Trauma (5:20) 1971R
Ian Tyson, M.D., Madison

17. **Stroke,** Medical vs. Surgical (5:15) **1969R**
H. E. Booker, M.D., Madison

311. **Stroke,** Medical or Surgical—Supplementary Comments (5:45) 1971R
John E. Somers, M.D., Columbia, Mo.

109. **Strokes,** Surgical Treatment of (10:18) **1970R**
George B. Murphy, M.D., Anchorage, Alaska

41. **Stroke**—Carotid Insufficiency, Surgery for (5:18) 1971R
M. J. Javid, M.D., Madison

137. **Stroke, Acute,** Immediate Care of (5:55) **1970R**
John B. Baker, M.D., Milwaukee

521. **Stroke,** First Aid for (8:19) 1968
Margaret A. Kaufman, R.N., Denver, Colo.

147. **Stroke** Patient, Follow-Up Care (4:51) **1969R**
F. M. Forster, M.D., Madison

261. **Stroke Patient,** Mobilization of (6:26) **1971R**
Arthur Siebens, M.D., Baltimore, Md.

134. **Hemiplegic,** Assistive Devices for (5:55) **1970R**
Edwin C. Welsh, M.D., Milwaukee

136. **Hemiplegic,** Bed Positioning for (4:55) **1970R**
Edwin C. Welsh, M.D., Milwaukee

139. **Ambulation** Retraining (7:00) 1971
Robert W. Boyle, M.D., Milwaukee

187. **Bracing and Splints for Hemiplegics** (4:30) **1970R**
Paul A. Dudenhoefer, M.D., Milwaukee

157. **Speech Problems in Stroke** (6:00) **1969R**
Richard T. Flynn, M.D., Milwaukee

506. **Speech Therapy,** Implications of CVA's—Left Side (4:30) 1970
Janice D. Stovall, Madison

507. **Speech Therapy,** Implications of CVA's—Oral Paralysis (4:15) 1970
Janice D. Stovall, Madison

508. **Speech Therapy,** Implications of CVA's—Right Side, Part I (6:50) 1970
Janice D. Stovall, Madison

580. **Speech Therapy,** Implications of CVA's—Right Side, Part 2 (5:19) 1970
Janice Stovall, Madison

262. **Spinal Cord Tumors,** Diagnosis and Treatment (5:50) 1970R
Frank Goldstein, M.D., Milwaukee

73. **Spinal Cord Trauma,** Acute, Management of (5:40) 1970R
Glenn Meyer, M.D., Washington, D.C.

353. **Status Epilepticus,** Treatment of (9:00) **1971R**
William E. Karnes, M.D., Minneapolis, Minn.

57. **Status Epilepticus,** Definition and Treatment of (5:35) 1971
F. M. Forster, M.D., Madison

NERVOUS SYSTEM (Cont.)

14. **Seizure Disorder,** Treatment of (5:10) **1970R**
W. G. Peterson, M.D., Madison

396. **Seizure Disorders** in Children (6:34) **1970**
Kenneth Swaiman, M.D., Minneapolis, Minn.

354. **Seizure or Syncope?** (8:00) 1971R
Juergen E. Thomas, M.D., Rochester, Minn.

455. **Spontaneous Subarachnoid Hemorrhage** (5:58) **1971**
Don M. Long, M.D., Minneapolis, Minn.

576. **Determining Levels of Consciousness** (7:50) **1970**
Mary Alyce McCullough, R.N., Boston, Mass.

516. **Unconscious Patient,** The (5:30) 1971R
Dorothy L. Sexton, R.N., Boston, Mass.

376. **Vascular Headache,** Management of Pt. 1—Cluster Type (5:40) 1971R
E. Douglas Rooke, M.D., Rochester, Minn.

377. Pt. 2—Migraine Type (6:35) 1971R
E. Douglas Rooke, M.D., Rochester, Minn.

NEWBORN AND PEDIATRICS

467. **Down's Syndrome** (Mongolism) (5:17) **1971**
Burton L. Shapiro, D.D.S., Minneapolis, Minn.

221. **Intrauterine Growth Retardation** (4:40) **1971R**
Frederick C. Battalglia, M.D., Denver, Colo.

220. **Ruptured Membranes,** Prolonged, Management of the Newborn (3:30) 1970R
Thomas K. Oliver, M.D., Seattle, Wash.

302. **Diabetic Mother,** Specific Prophylactic Therapy in an Infant of a (7:10) 1971R
Michael McCann, M.D., Madison

381. **Hypoglycemia,** Acquired Transient Neonatal, The Causes and Treatment of (9:15) 1971R
Michael L. McCann, M.D., Madison

303. **Excretion of Drugs** in Human Milk (6:45) **1969**
Drug Information Center, Univ. Hosp., Madison

485. **Bleeding Problems in the Newborn** (9:20) **1971**
R. A. Barta, M.D., Madison

59. **Erythroblastosis Fetalis,** Indications for Exchange Transfusion (6:50) 1969R
L. G. Thatcher, M.D., Milwaukee

440. **Jaundice in the Newborn** (5:50) 1970
Richard D. Zachman, M.D., Madison

482. **Parenteral Fluids for Newborns and Infants** (11:30) 1971
John Grausz, M.D., Milwaukee
Staney Graven, M.D., Madison

480. **Respiratory Distress,** Idiopathic Syndrome of the Newborn (10:20) 1971
John Grausz, M.D., Milwaukee

NEWBORN AND PEDIATRICS (Cont.)

474. Resuscitation, Newborn (5:34) 1971
John W. Reynolds, M.D., St. Paul, Minn.

481. Resuscitation of the Depressed Newborn (11:20) **1971**
John Grausz, M.D., Milwaukee

483A. Sepsis in the Newborn: Diagnosis (6:06) **1971**
Thomas Geppert, M.D., Madison

483B. Sepsis in the Newborn: Treatment (7:40) **1971**
Thomas Geppert, M.D., Madison

46. Premature Infant, Management of the (5:40) **1969R**
Thomas Geppert, M.D., Madison

486. Use of the Incubator and the Environment in the Management of the Premature Infant (10:18) **1971**
Stanley Graven, M.D., Madison

Low Birth-Weight Infants: Early Nutritional Therapy
336. Parenteral Regimen (11:16) **1970**
337. Oral Feeding (7:45) **1970**
Michael McCann, M.D., Madison

98. Infants, Recognition of Cardiovascular Conditions (4:30) 1970R
Lynn Eggman, M.D., Rhinelander

313. Cyanotic Heart Disease in the Newborn (4:25) **1969**
Julien Hoffman, M.D., San Francisco, Calif.

43. Heart Failure, Congestive, in Infants (7:20) **1971R**
Marion Ledbetter, M.D., Madison

477. Neonatal Seizures (5:00) 1971
Richard D. Grassy, M.D., Madison

230. Bell's Palsy, Early Treatment of (6:00) **1971R**
Watson B. Larkin, M.D., Eau Claire

84. Surgical Emergencies, Neonatal (5:53) **1966**
J. R. Pellett, M.D., Madison

297. Persistent Infantile Diarrhea Cause by Disaccharidase Deficiency (4:45) 1970R
Clinton Lillibridge, M.D., Rochester, N.Y.

101. Abdominal Tumors in Infants and Young Children (7:00) 1969R
Thomas Haug, M.D., Rhinelander

436. Abdominal Tumors: Childhood, What's Next After Palpation? (6:25) 1970
Margaret Sullivan, M.D., Houston, Texas

551. Asthma, Home Care of the Child with (8:38) **1971R**
Mary Sather, R.N., New Richmond, Wisc.

403. Breathholding in Children (7:00) 1970
George Wolcott, M.D., Madison

40. Cancer Chemotherapeutic Agents in Children, Toxic Manifestations of (6:15) 1969R
Patricia Joo, M.D., Madison

437. The Family and the Child With Cancer (7:03) **1970**
H. Grant Taylor, M.D., Houston, Texas

438. Cancer Diagnosis—Crisis for Patient and Family (7:20) 1970
Sandra Hicks, R.N., Houston, Texas

570. Child Abuse Law in Wisconsin (9:15) **1970**
Max Wald, Madison

NEWBORN AND PEDIATRICS (Cont.)

298. Children Who Fail To Thrive, Evaluation of (4:55) 1970
Clinton Lillibridge, M.D., Rochester, N.Y.

546. Cystic Fibrosis, Home Care of the Child with **(6:22)** 1971R
Margaret L. Walter, R.N., Madison

7. Delinquent Child, Recognition and Management **(4:50)** 1971R
J. C. Westman, M.D., Madison

39. Diabetic Acidosis in Children, Management of **(6:00)** 1969R
George Kerr, M.D., Madison

450. Diabetes in Childhood—Including Chemical Diabetes (6:29) 1971
Donnell D. Etzwiler, M.D., Minneapolis, Minn.

409. Febrile Seizures in Children (7:07) 1970
George J. Wolcott, M.D., Madison

439. Headaches in Children (7:50) 1970
George J. Wolcott, M.D., Madison

572. Hospitalized Child, Emotional Needs of the **(7:00)** 1970
Margaret DuRose, R.N., Madison

131. Hypertension in Children (5:04) **1970R**
Charles Lobeck, M.D., Madison

5. Hypertension, Intracranial in Children (5:46) **1969R**
R. W. Chun, M.D., Madison

152. Hypertensive, Young, Investigation of **(5:31) 1971**
Douglas D. Klink, M.D., Milwaukee

435. Intrathoracic Tumors of Childhood (5:26) **1970**
W. W. Sutow, M.D., Houston, Texas

29. Meningitis, Bacterial, Acute, in Children **(Treatment)** (7:00) 1970R
June Osborn, M.D., Madison

192. Mumps Vaccine (2:30) 1970R
June Osborn, M.D., Madison

50. Psychiatric Emergencies in Children, Management of (5:51) 1969R
William Bolman, M.D., San Francisco, Calif.

231. Otitis Media Secretary, in Children, Diagnosis and Treatment of (4:50) 1971R
Watson B. Larkin, M.D., Eau Claire

240. Osteomyelitis in Childhood (6:18) **1970R**
June Osborn, M.D., Madison

236. Respiratory Infections in Children, Upper **(6:15)** 1970R
June Osborn, M.D., Madison

237. Respiratory Infections in Children, Lower **(6:15)** 1970R
June Osborn, M.D., Madison

340. Rubella Immunization and Potential Problems **(6:25)** 1971R
David H. Carver, M.D., Baltimore, Md.

293. Rubella Virus Vaccine—Recommendations and Precautions (6:45) 1970
Marjorie Forman, M.D., Galveston, Texas

NEWBORN AND PEDIATRICS (Cont.)

8. **Schizophrenia**, Childhood Psychosis (5:32) 1971R
J. C. Westman, M.D., Madison
138. **School Phobia** (or School Refusal) (5:32) 1969R
William Bolman, M.D., San Francisco, Calif.
254. **Scoliosis** in Children (5:30) 1971R
Walter Blount, M.D., Milwaukee
396. **Seizure Disorders** in Children (6:34) 1970
Kenneth Swaiman, M.D., Minneapolis, Minn.
361. **Squint**, Childhood Problems in (8:55) 1971
Otto A. Wiegmann, M.D., Milwaukee
581. **Stress on Today's Children** (5:30) 1971
Julie Murphy, R.N., Menasha
22. **Urinary Tract Infection** In Children (4:54) 1970
C. C. Lobeck, M.D., Madison
48. **Uropathy** in Children, Management of (5:10) 1971R
D. T. Uehling, M.D., Madison

PSYCHIATRIC

Psychiatric Emergencies:
James M. A. Weiss, M.D., Columbia, Mo.
307. **Introduction** (7:55) 1971R
308. **Principles of Interviewing** (7:20) 1971R
309. **A Simple Classification System** (5:04) 1971R
310. **Chemotherapy** (7:45) 1971R
50. **Psychiatric Emergencies** in Children, Management of (5:51) 1969R
William Bolman, M.D., San Francisco, Calif.
7. **Delinquent** Child, Recognition and Management (4:50) 1971R
J. C. Westman, M.D., Madison
174. **Delinquent** and His Family, The (5:40) 1970R
Carl Whitaker, M.D., Madison
121. **Psychotic** and His Family, The (5:30) 1970R
Carl Whitaker, M.D., Madison
8. **Schizophrenia**, Childhood Psychosis (5:32) 1971R
J. C. Westman, M.D., Madison
138. **School Phobia** (or School Refusal) (5:32) 1969R
William Bolman, M.D., San Francisco, Calif.
581. **Stress on Today's Children** (5:30) 1971
Julie Murphy, R.N., Menasha
159. **Tranquilizers:** Side Effects and Contraindications (5:45) 1970R
Leigh Roberts, M.D., Madison
312. **The Suicidal Patient** (7:55) 1971R
James M. A. Weiss, M.D., Columbia, Mo.
33. **Suicidal Threat**, Recognition and Treatment of (4:58) 1971
Milton Miller, M.D., Madison
567. **Suicide: The Enemy Within** (9:25) 1971R
Janet R. Nusinoff, R.N., Winneconne
32. **Psychiatrist**, Choosing Your, Do's and Don'ts in (5:25) 1970R
Leigh Roberts, M.D., Madison

PSYCHIATRIC (Cont.)

47. **Psychiatric Patient**, What to Tell the Patient When Referring as a (3:05) 1969
Seymour Halleck, M.D., Madison
197. **Mental Patient**, Procedure for Commitment (5:50) (Wisconsin) 1970R
Leigh Roberts, M.D., Madison
253. **Sex Deviate Law** In Wisconsin (5:05) 1970R
Asher Pacht, Ph.D., Madison
582. **Listening and the Nurse** (6:10) 1971
Julie Murphy, R.N., Menasha
583. **Some Don'ts in Listening** (5:00) 1971
Julie Murphy, R.N., Menasha
351. **Frigidity in the Female**, Treatment of (6:15) 1970
Carl A. Whitaker, M.D., Madison
352. **Impotence in the Male**, Treatment of (5:56) 1970
Carl A. Whitaker, M.D., Madison
470. **Infertile Couple**, Evaluation of the (7:10) 1971
George E. Tagatz, M.D., Minneapolis, Minn.
13. **Marriage on the Rocks** (4:45) 1970R
Carl Whitaker, M.D., Madison

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RESPIRATORY

173. **Respiratory Failure**, Acute, Treatment of (6:05) 1969R
Claude Taylor, M.D., Madison
411. **Treatment of Acute Respiratory Failure in Chronic Obstructive Lung Disease** (6:01) 1970
Charles W. Drage, M.D., Minneapolis, Minn.
80. **Apnea**, Prolonged, Treatment of (5:15) 1968
Betty Bamforth, M.D., Madison
68. **Chest Injury**, Acute Crush (5:45) 1967
John Pellett, M.D., Madison
382. **Cough**, Chronic, Management (8:40) 1971R
Donald P. Schlueter, M.D., Milwaukee
163. **Farmers' Lung**, Diagnosis and Treatment of (6:01) 1969R
John Rankin, M.D., Madison
164. **Silo Filler's Disease**, Recognition and Treatment (2:55) 1969
John Rankin, M.D., Madison
158. **Intrathoracic Disease**, Biopsy Aids In Diagnosis of (5:07) 1970R
Ben Lawton, M.D., Marshfield
162. **Lung Abscess**—Medical Therapy (5:30) 1969
John Rankin, M.D., Madison

RESPIRATORY (Cont.)

25. **Obstructive Pulmonary** Crisis, Recognition and Treatment of (5:06) 1969R
R. A. Barbee, M.D., Tucson, Arizona

193. **Obstructive Pulmonary Disease:** Office Diagnosis (6:14) 1969R
Ross C. Kory, M.D., Milwaukee

194. **Obstructive Pulmonary Disease:** Office Treatment (6:24) 1969R
Ross C. Kory, M.D., Milwaukee

78. **Pneumonias,** Acute, Treatment of (5:23) **1970R**
H. A. Dickie, M.D., Madison

67. **Pneumothorax,** Spontaneous (5:35) **1967**
John Pellett, M.D., Madison

522. **Postural Drainage** (7:10) 1968
Louise Nett, R.N., and Ann Guthrie, Denver, Colo.

471. **Oxygen Therapy,** Methods of: How Effective Are They? (7:39) 1971
Joseph J. Buckley, M.D., Minneapolis, Minn.

509. **Oxygen,** Administered by Nasal Catheter (4:45) 1971
Signe S. Cooper, R.N., Madison

510. **Oxygen,** Administering by Tent (4:15) 1971
Signe S. Cooper, R.N., Madison

511. **Oxygen,** Safety Precautions in the Administration of (5:00) 1971
Signe S. Cooper, R.N., Madison

557. **Oxygen Toxicity** (8:40) 1969
Virgina Earles, R.N., Amherst, Mass.

236. **Respiratory Infections in Children, Upper** (6:15) 1970R
June Osborn, M.D., Madison

237. **Respiratory Infections in Children, Lower** (6:15) 1970R
June Osborn, M.D., Madison

189. **Sputum Lung Cancer Cytology** (6:00) 1971
Stanley L. Inhorn, M.D., Madison

242. **Sputum Problems,** Mgmt. of (7:30) 1970R
Samuel Hirsch, M.D., Milwaukee

590. **Tracheostomy,** Aspects of Nursing Head and Neck Patient (6:27) 1970
Phyllis Knauff, R.N., Houston, Texas

529. **Tracheostomy,** Care of the Patient with (6:10) 1968
Karen E. Witt., R.N., Platteville

276. **Tuberculosis**—Chemoprophylaxis for Positive TB Reactors (5:22) 1970R
Helen Dickie, M.D., Madison

487. **Isoniazid Prophylaxis** for Mantoux Converters (5:16) 1970
Thomas F. Mulrooney, M.D., Minneapolis, Minn.

SKIN & CONNECTIVE TISSUE

93. **Bed Sores,** Treatment of (5:20) 1967
G. J. Derus, M.D., Madison

425. **Decubitus,** Prevention and Care of (4:06) 1970
A. Blanco, R.N., Houston, Texas

532. **Decubitus Ulcers,** Prevention of (6:00) 1971R
Emily B. Campbell, R.N., Madison

533. **Decubitus Ulcers,** Care and Treatment of (6:00) 1971R
Emily B. Campbell, R.N., Madison

124. **Skin Eruptions** of the Bed Patient (6:20) 1970
Robert R. Baumann, M.D., Monroe

320. **Chronic Leg Ulcers,** A Diagnostic Approach to the Patient with (5:45) 1971R
Benjamin F. Fuller, M.D., Minneapolis, Minn.

184. **Cutaneous Ulcers,** Treatment of (5:00) 1970R
William F. Schorr, M.D., Marshfield

319. **Stasis Ulcers,** Treatment of (5:43) 1971R
Benjamin F. Fuller, M.D., Minneapolis, Minn.

146. **Contact Dermatitis** (Including Poison Ivy, Oak and Sumac) (7:06) 1971
Sture A. M. Johnson, M.D., Madison

266. **Cutaneous Drug Reactions,** Reaction and Management (5:52) 1970R
Robert Baumann, M.D., Monroe

275. **Frostbite,** Treatment Today (5:55) 1971R
Charles Yale, M.D., Madison

392. **Pruitus Ani** (6:25) 1971R
William Bernstein, M.D., Minneapolis, Minn.

804. **Spiders: Brown Recluse and Black Widow** (9:20) 1971
Sture A. M. Johnson, M.D., Madison

265. **Stasis Dermatitis,** Management of (5:02) 1970R
Robert Baumann, M.D., Monroe

454. **Warts**—Diagnosis and Treatment (6:35) 1971
Isadore Fisher, M.D., Minneapolis, Minn.

460. **Urticaria** (6:00) 1971
W. Mitchell Sams, Jr., M.D., Rochester, Minn.

MALIGNANCIES

421. **Cancer of Exposed Surfaces** (7:44) 1970
A. J. Ballantyne, M.D., Houston, Texas

422. **Cancer of the Lip**—Its Significance and Management (6:09) 1970
Oscar Guillamondegui, M.D., Houston, Texas

424. **Cancer of the Skin** (4:22) 1970
William S. MacComb, M.D., Houston, Texas

116. **Carcinomas of the Skin,** Basal Cell and Squamous Cell (6:45) 1971R
Donald Ruch, M.D., Milwaukee

179. **Skin Pre-Cancer:** Part I—The Keratoses (6:05) 1971
Sture A. M. Johnson, M.D., Madison

180. **Skin Pre-Cancer:** Part II—Leukoplakia (6:10) 1971
Sture A. M. Johnson, M.D., Madison

117. **Skin,** Pre-Malignant Lesions of (6:00) 1970R
Donald Ruch, M.D., Milwaukee

SKIN & CONNECTIVE TISSUE (Cont.)

24. **Moles and Melanoma**, Diagnosis and Treatment of (5:24) 1970R
Robert O. Johnson, M.D., Madison

426. **Malignant Melanoma**, Surgical Management of **(6:37)** 1970
Charles McBride, M.D., Houston, Texas

183. **Multiple Myeloma**, Cutaneous Manifestations **(4:50)** 1971R
William F. Schorr, M.D., Marshfield

448. **Multiple Myeloma**, Diagnosis of (6:18) **1971**
Horace H. Zinneman, M.D., Minneapolis, Minn.

328. **Multiple Myeloma**, Treatment of (6:22) 1971R
Robert A. Kyle, M.D., Rochester, Minn.

TOXICITY & INJURY

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555. **Poison Control Centers** (5:29) 1971R
David Zilz, Madison

20. **Aspirin Poisoning**, Diagnosis and Treatment of **(6:39)** 1970
M. F. Hansen, M.D., Madison

69. **Burns, Acute** (Thermal), Immediate Management of (7:00) 1970
Gordon Davenport, M.D., Madison

168. **Carbon Monoxide** Poisoning, Treatment of **(3:35)** 1970R
Karl Siebecker, M.D., Madison

468. **Cornpicker Hand Injuries** (7:26) 1971
James H. House, M.D., Minneapolis, Minn.

542. **Digitalis Toxicity**, Symptoms of (10:15) 1969R
Betty Bergersen, R.N., Chicago, Ill.

219. **Diuretics**, Thiazide, Untoward Effects (5:05) 1969
Albert Brest, M.D., Philadelphia

568. **Emergency Care of the Accident Victim** (11:40) 1970
Alice Simonds, R.N., Madison

385. **Injured Patient**, Initial Evaluation of the (5:58) 1970
Louis Bernhardt, M.D., Milwaukee

77. **Heat Stroke** in Athletics, Prevention of (7:55) 1971R
A. J. Ryan, M.D., Madison

154. **Local Anesthesia**—Treatment of Side Effects (6:43) 1969R
Curtis Knight, M.D., Tucson, Arizona

321. **Lupus Erythematosus Syndrome** (3:49) 1970R
Drug Information Center, Univ. Hosp., Madison

802. **Nuclear Medicine Laboratory**, Safety in the (5:13) 1971
J. Joseph Allen, M.S., Madison

807. **Parathion** (Insecticide) Poisoning (7:00) 1971
Poison Control Center, Madison

170. **Shock (Hemorrhagic)**, Management of (6:51) 1970R
W. Stuart Sykes, M.D., Madison

156. **Shock**, Vasoconstrictor and Steroid Therapy in (10:30) 1971R
Harold D. Itskovitz, M.D., Milwaukee

TOXICITY & INJURY (Cont.)

525. **Shock**, New Concepts in (6:13) 1968
Ruth Schacht, R.N., Milwaukee

804. **Spiders: Brown Recluse and Black Widow** (9:20) **1971**
Sture A. M. Johnson, M.D., Madison

274. **Suicidal Attempts with Sedative Drugs**, Medical Management of (7:00) 1970R
Avery Harrington, M.D., Madison

803. **Technetium 99m & Iodine 131**, Handling Safely **(4:27)** 1971
J. Joseph Allen, M.S., Madison

MISCELLANEOUS

190. **Application of Heat** (5:40) 1969R
James F. McDermott, M.D., Milwaukee

341. **Automated Laboratory Tests** and Their Pitfalls **(9:20)** 1970
Frank C. Larson, M.D., Madison

801. **Breath Operated Electric Wheelchair** (5:29) **1971**
Tom E. Meath, Jr., Stamford, Conn.

235. **Chromosome Studies**, Indications for (4:00) **1968**
Frank Walker, M.D., Milwaukee

296. **Fresh Water Drowning** (5:10) **1970R**
John R. Evrard, M.D., Milwaukee

99. **Hyperbaric Oxygen** Therapy, Indications for **(4:45)** 1969R
Edgar End, M.D., Milwaukee

150. **Intractible Pain**, Surgical Relief of (4:40) **1969R**
C. Norman Shealy, M.D., La Crosse

295. **Pentazocine** (Talwin) (4:30) 1971R
The Medical Letter

556. **Nursing Books**, Sources of Information (5:52) **1971**
Ruth Schultz, Madison

534. **Nursing Publications** (4:00) 1971
Department of Nursing, University Extension, The University of Wisconsin, Madison

595. **Nursing Utilization:** A Patient-Care System **Project** (Description) 1971
Project Staff, Milwaukee

802. **Nuclear Medicine Lab**, Safety in the **(5:13)** **1971**
J. Joseph Allen, M.S., Madison

100. **Post-Hospitalized Patient**, Resources for **(7:10)** **1970R**
George Handy, M.D., Madison

592. **Radium Implant**, Nursing Care for the Patient with (7:09) 1970
Renilda Hilkemeyer, R.N., Houston, Texas

70. **Radiation Therapy**, Emergency Use of (4:55) **1971R**
Joyce Kline, Ph.D., Madison

81. **Radium** Source Leakage, Control of (5:00) **1971R**
Charles Kelsey, Ph.D., Madison

803. **Technetium 99m and Iodine 131**, Handling Safely **(4:27)** 1971
J. Joseph Allen, M.S., Madison

MISCELLANEOUS (Cont.)

224. **Scuba Diving**, Medical Phase of (5:10) **1970R**
John R. Evrard, M.D., Milwaukee
177. **Sex Education** and The Medical Profession **(7:00)** 1970
Robert Samp, M.D., Madison
92. **Smoking**, Doctors Advice on Quitting **(5:16) 1970**
Robert Samp, M.D., Madison

EMERGENCY CARE

(Toxicity and Injury Tapes on pages 30 and 31)

555. **Poison Control Centers** (5:29) 1970R
David Zilz, Madison
356. **Bleeding Emergencies** (5:50) 1971R
E. J. W. Bowie, M.D., Rochester, Minn.
305. **Blood Transfusion Reactions:** Emergency Therapy (3:55) 1970R
Myrna Traver, M.D., Madison
466. **Blood Transfusion Reactions** (5:10) **1971**
Herbert Polesky, M.D., Minneapolis, Minn.
69. **Burns**, Acute (Thermal), Immediate Management of (7:00) 1970
Gordon Davenport, M.D., Madison
168. **Carbon Monoxide** Poisoning, Treatment of **(3:35)** 1970R
Karl Siebecker, M.D., Madison
135. **Arrhythmias**, Cardiac, Emergency Treatment of **(5:10)** 1967
Richard Wasserberger, M.D., Madison
362. **Cardiac Arrest** (4:05) 1970
Wilbert J. Henke, M.D., St. Paul, Minn.
79. **Cardiac Arrest**, Treatment After (5:15) **1968**
Betty Bamforth, M.D., Madison
527. **Cardiogenic Shock**, Emergency Treatment of **(6:40)** 1971
Katherine Bordicks, R.N., Jackson, Miss.
552. **First Aid for Heart Attack** (10:12) 1969
Mary Bielski, R.N., New York, N.Y.
113. **Coagulation Defects**, Emergency Treatment of **(4:50)** 1970R
A. J. Quick, M.D., Milwaukee
385. **Injured Patient**, Initial Evaluation of the **(5:58) 1970**
Louis Bernhardt, M.D., Milwaukee
568. **Emergency Care of the Accident Victim** (11:40) 1970
Alice Simonds, R.N., Madison
112. **Leukemia**, Acute, Emergency Treatment of **(6:30)** 1969R
A. V. Pisciotta, M.D., Milwaukee
474. **Newborn Resuscitation** (5:34) 1971
John W. Reynolds, M.D., St. Paul, Minn.
170. **Shock (Hemorrhagic)**, Management of **(6:51) 1970R**
W. Stuart Sykes, M.D., Madison
171. **Shock (Cardiac)**, Management of (6:15) **1970R**
W. Stuart Sykes, M.D., Madison

EMERGENCY CARE (Cont.)

521. **Stroke Patient**, First Aid for the (8:19) **1968**
Margaret A. Kaufman, R.N., Denver, Colo.
274. **Suicidal Attempts with Sedative Drugs, Medical** Management of (7:00) 1970R
Avery Harrington, M.D., Madison

PATIENTS WITH SPECIFIC PROBLEMS

500. **Anticoagulant Therapy**, The Patient on (6:40) **1970R**
Virginia Higbie, R.N., Durham, New Hampshire
551. **Asthma**, Home Care of the Child with (8:38) **1971**
Mary Sather, R.N., New Richmond
541. **Bladder Training** for the Patient with a **Retention** Catheter (6:10) 1971R
Anne M. Grdjan, R.N., Downey, Calif.
540. **Bladder Training** for the Patient Without a **Retention** Catheter (4:10) 1968
Edna M. Briggs, R.N., Downey, Calif.
560. **Neurogenic Bladder**, from Spinal Cord Disorder, **Patient** with (8:32) 1971R
Annie M. Grdjan, R.N., Downey, Calif.
543. **Incontinence**, Caring for the Patient with (9:50) **1969R**
Lena M. Plaisted, R.N., and Meribah Stanton, R.N., Boston, Mass.
514. **Urethral Catheter**, Care of the Indwelling (6:50) **1968**
Erna Ziegel, R.N., Madison
539. **Bowel Retraining** (6:03) 1969R
DeRuth Wagner, R.N., Downey, Calif.
591. **Cancer**, Philosophy of Nursing Care of **Patients with**
Renilda Hilkemeyer, R.N., Houston, Texas
(8:28) 1970
545. **Cast**, Care of the Patient with (9:50) **1970R**
Alice Simonds, R.N., Madison
518. **Central Venous Pressure**—What Is It? **(6:40) 1971**
Barbara Gessner, R.N., New Richmond
565. **Central Venous Pressure** Measurement, **Nursing Care In** (8:18) 1971
Barbara Gessner, R.N., New Richmond
566. **Colostomy**, Care of Patient With (8:50) **1969**
JoAnn Hunglemann, R.N., Milwaukee
431. **Enterostomy Care** With Emphasis on Colostomy **(8:15)** 1970
Rosie Taylor, R.N., Houston, Texas
546. **Cystic Fibrosis**, Home Care of the Child with **(6:22)** 1971R
Margaret L. Walter, R.N., Madison
425. **Decubitus**, Prevention and Care of (4:06) **1970**
A. Blanco, R.N., Houston, Texas
532. **Decubitus Ulcers**, Prevention of (6:00) **1971R**
Emily B. Campbell, R.N., Madison
533. **Decubitus Ulcers**, Care and Treatment of **(6:00) 1971R**
Emily B. Campbell, R.N., Madison
169. **Dying Patient**, The (6:08) 1971R
S. E. Sivertson, M.D., Madison

PATIENTS WITH SPECIFIC PROBLEMS (Cont.)

530. **Dying Patient**, Emotional Needs of the (6:15) 1969R
Virginia Barckley, R.N., New York, N.Y.

531. **Dying Patient**, Meeting the Needs of the Family of a (7:50) 1969R
Virginia Barckley, R.N., New York, N.Y.

537. **Dying Patient**, Physical and Psychological Support to the (7:32) 1970R
Sister Mary Willa Kyle, F.S.P.A., La Crosse

538. **Dying Patient**, Spiritual Aspects of Care to the (8:05) 1970R
Sister Mary Willa Kyle, F.S.P.A., La Crosse

571. **Diabetes**, Foot Care For the Patient with (6:25) 1970
Kay Richards, R.N., New Richmond

593. **Emotional Stresses of Surgery**, Preparing the Patient for (5:00) 1971
Rosemary Berchem, R.N., Madison

559. **Enema**, Precautions in Giving (9:30) 1971R
May Hornback, R.N., Madison

512. **Fecal Impaction** (7:45) 1971R
May Hornback, R.N., Madison

550. **Hemodialysis**—What Is It? (4:40) 1969
Elizabeth Bartlett, R.N., Garden Grove, Calif.

574. **Hemodialysis**, Nursing Aspects of (4:45) 1970
Carol Clarke, R.N., Madison

587. **Ileal Conduit**, Care of Patient with (9:03) 1970
Renilda Hilkemeyer, R.N., Houston, Texas

544. **Immobile Patient**, Care of (9:00) 1969R
Doris Arnold, R.N., Milwaukee

509. **Oxygen**, Administered by Nasal Catheter (4:45) 1971
Signe S. Cooper, R.N., Madison

510. **Oxygen**, Administering by Tent (4:15) 1971
Signe S. Cooper, R.N., Madison

511. **Oxygen**, Safety Precautions in the Administration of (5:00) 1971
Signe S. Cooper, R.N., Madison

557. **Oxygen Toxicity** (8:40) 1969
Virginia Earles, R.N., Amherst, Mass.

523. **Parenteral Fluid Therapy**, Nursing Care Responsibilities In (6:30) 1971R
Janice R. Anderzon, R.N., Madison

594. **Parkinson's Disease**, Nursing Care of Patients on L. Dopa Therapy (7:00) 1971
Maureen Duszynski, R.N., Brookfield
Ronald E. Jones, R.N., Brookfield

549. **Peritoneal Dialysis**—What Is It? (4:15) 1969
Elizabeth Bartlett, R.N., Garden Grove, Calif.

575. **Peritoneal Dialysis**, Nursing Aspects of (6:10) 1970
Christine V. Maloney, R.N., Madison

522. **Postural Drainage** (7:10) 1968
Louise Nett, R.N., and Ann Guthrie, Denver, Colo.

592. **Radium Implant**, Nursing Care for the Patient with (7:09) 1970
Renilda Hilkemeyer, R.N., Houston, Texas

PATIENTS WITH SPECIFIC PROBLEMS (Cont.)

596. **Recognition of Fluid and Electrolyte Imbalance** 1971
Joanne Wall, R.N., Madison

506. **Speech Therapy**, Implications of CVA's—Left Side (4:30) 1970
Janice D. Stovall, Madison

507. **Speech Therapy**, Implications of CVA's—Oral Paralysis (4:15) 1970
Janice D. Stovall, Madison

508. **Speech Therapy**, Implications of CVA's—Right Side, Part 1 (6:50) 1970
Janice D. Stovall, Madison

580. **Speech Therapy**, Implications of CVA's—Right Side, Part 2 (5:19) 1970
Janice D. Stovall, Madison

590. **Tracheostomy**, Aspects of Nursing Head and Neck Patients (6:27) 1970
Phyllis Knauf, R.N., Houston, Texas

529. **Tracheostomy**, Care of the Patient with (6:10) 1968
Karen E. Witt, R.N., Platteville

576. **Determining Levels of Consciousness** (7:50) 1970
Mary Alyce McCullough, R.N., Boston, Mass.

516. **Unconscious Patient**, The (5:30) 1971R
Dorothy L. Sexton, R.N., Boston, Mass.

504. **Wound Dehiscence** 1971
Shirley Watson, R.N., Madison
Barbara Gessner, R.N., New Richmond

513. **X-ray Therapy**, The Patient Receiving (5:50) 1970
Ethel Wallestad, R.N., Madison

DIETARY MANAGEMENT

548. **Cardiac Patient**, Dietary Management at Home (5:30) 1971R
Martha Kjentvet, Madison

564. **Diet, Modified Fat** (6:40) 1971R
Bonita Fong, Madison

562. **Diet, Sodium Restricted** (8:30) 1971R
Bonita Fong, Madison

563. **Diet for Patient Receiving Radiotherapy to Head and Neck Region** (7:30) 1971R
Bonita Fong, Madison

501. **Diet for Patients Unable to Chew** (5:50) 1971R
Betty Jordan, Madison

COMMUNITY RESOURCES (WISCONSIN)

561. Cancer Patient, Community Resources for (6:48) **1971**
Rosemary K. Vahldieck, R.N., Madison

536. Cardiac Patient, Referral Agencies for the (5:56) 1970R *Edith May, R.N., Madison*

524. Home Care and Home-Maker Services, Sources of Referral (5:40) 1971R
Lois Shannon, R.N., Madison

573. Library Services for the Blind and Physically Handicapped (8:35) 1970
Wisconsin Regional Library For the Blind and Physically Handicapped

502. Long-Term Patient, Sources of Financial Assistance for (6:00) 1971
John W. Norby, Madison

515. Medicare Information, Sources of (5:15) 1971
Bernice Brynelson, R.N., Madison

100. Post-Hospitalized Patient, Resources for (7:10) **1970R**
George Handy, M.D., Madison

535. Rehabilitation, Referral Agencies for (6:40) **1971R**
Frieda Laubach, R.N., Madison

LEGAL ASPECTS (WISCONSIN)

569. Administration of Oxytocic Drugs, Administrative Guidelines for the Professional Nurse in the (6:10) 1970 *Anita Grand, R.N., Madison*

570. Child Abuse Law in Wisconsin (9:15) **1970**
Max Wald, Madison

519. External Cardiac Resuscitation, Joint Policy Statement (3:45) 1971R
Wisconsin Nurses' Association, Inc., and the State Medical Society of Wisconsin

577. Role of Nurse in Coronary Unit, Joint Policy Statement (10:45) 1971R
Wisconsin Nurses' Association, State Medical Society of Wisconsin, Wisconsin Hospital Association, State of Wisconsin Board of Nursing, Wisconsin Division of Health

517. Procedure for Professional Nurse Registration in Wisconsin (5:37) 1971R
Division of Nurses, Wisconsin Department of Regulation and Licensing

558. Procedure for Licensure of the Practical Nurse in Wisconsin (7:50) 1971R
Division of Nurses, Wisconsin Department of Regulation and Licensing

197. Mental Patient, Procedure for Commitment **(Wisconsin)** (5:50) 1970R
Leigh Roberts, M.D., Madison

253. Sex Deviate Law In Wisconsin (5:05) **1970R**
Asher Pacht, Ph.D., Madison

503. Witnessing a Will, The Nurse's Responsibility In **(7:20)** **1970R**
George L. Frederick, Madison

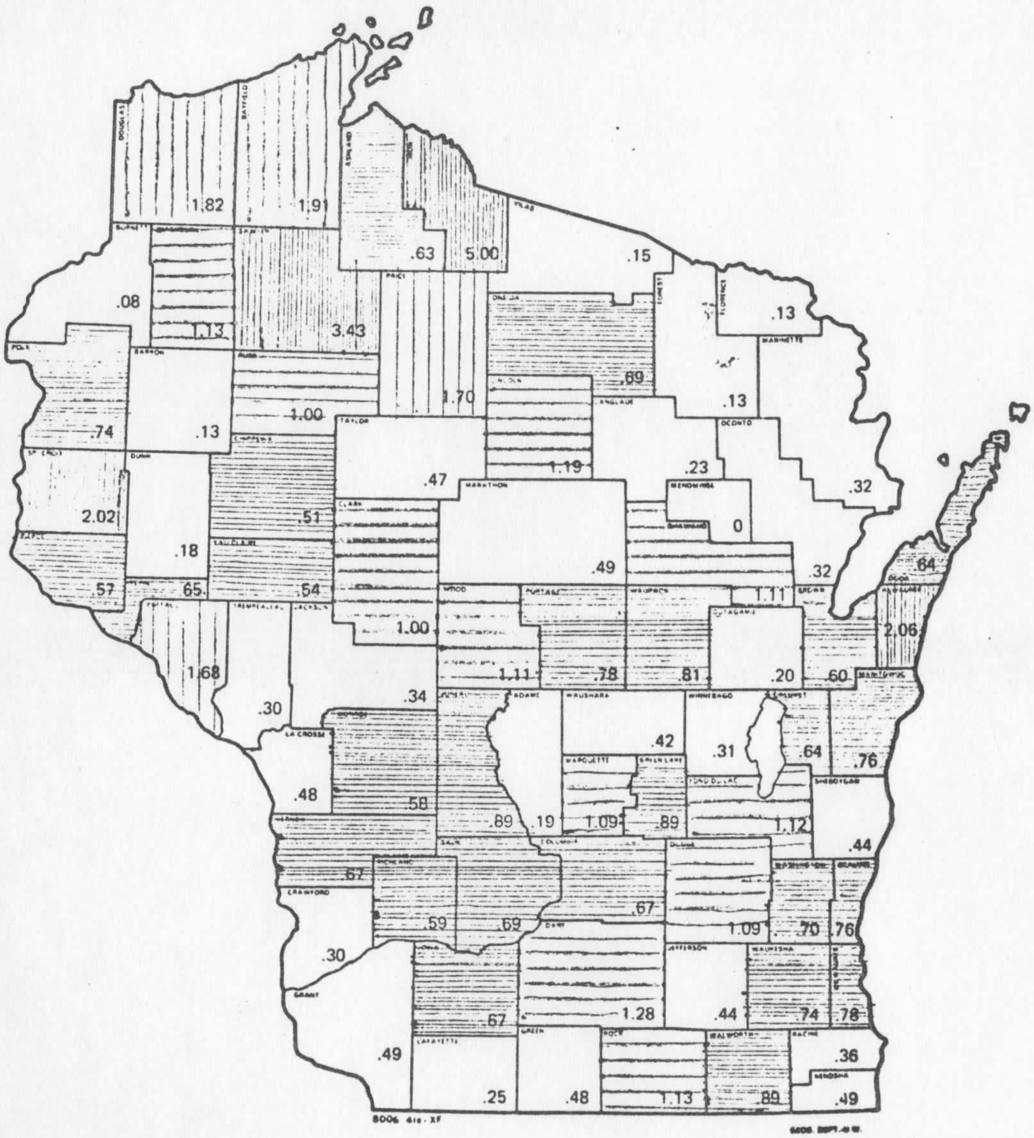
Nursing DAL

Map Showing Average Calls per Registered Nurse by County *

Code for Number of calls

- (dense vertical lines) = 2 or more
- (spaced vertical lines) = 1.5 - 1.99
- (heavy horizontal lines) = 1.0 - 1.49
- (light horizontal lines) = .50 - .99

No Marking = 0.49 or less



* Anne G. Niles, R.N., Coordinator, Definitive Dialing--Nursing Dial Access: A Report of the Planning Year and the First Eighteen Months in Operation, September 18,1968 - March 15, 1970, University Extension, The University of Wisconsin, Health Sciences Unit, Department of Nursing, 1970.

Nursing Tapes With More Than 100 Requests

(Out of total of 58 tapes)

September 16, 1968 - September 14, 1969

Tape Number	Topic	Percent	Number of Calls*
518	Central Venous Pressure—What is it?	4.0	495
512	Fecal Impaction	2.9	359
500	Anticoagulant Therapy, The Patient on	2.6	323
520	Digitalis, Nursing Observations on Patients Receiving	2.4	299
514	Urethral Catheter, Care of the Indwelling	2.4	291
523	Parenteral Fluid Therapy, Nursing Care Responsibilities in	2.3	278
503	Witnessing a Will, The Nurse's Responsibility in	2.3	276
521	First Aid for the Stroke Patient	2.2	264
505	Chemotherapeutic Drugs for Cancer, The Patient Receiving	1.9	236
519	External Cardiac Resuscitation, Joint Policy Statement, Medical Society of Wisconsin and Wisconsin Nurses' Association	1.8	225
533	Decubitus Ulcers, Care and Treatment of	1.8	222
516	Unconscious Patient, The	1.5	183
525	Shock, New Concepts in	1.5	182
504	Wound Dehiscence	1.4	177
527	Cardiogenic Shock, Emergency Treatment	1.3	160
537	Dying Patient, Physical and Psychological Support to the	1.3	153
532	Decubitus Ulcers, Prevention of	1.2	146
545	Cast, Care of the Patient with	1.1	134
552	First Aid for Heart Attack	1.1	131
509	Oxygen, Administered by Nasal Catheter	1.1	129
517	Procedure for the Professional Nurse Registration in Wisconsin	1.0	123
506	Speech Therapy, Implication of CVA's—Right Side	1.0	119

*Based upon total calls for first year—12,242

Not all tapes were in the library the same length of time as tapes were added at intervals.

Medical Tapes With More Than 100 Requests

(Out of total of 78 tapes)

September 16, 1968 - September 14, 1969

Tape Number	Topic	Percent	Number of Calls*
92	Smoking, Doctors Advice on Quitting	2	245
93	Bed Sores, Treatment of	2	240
211	Drug Abuse by Teenagers	1.5	184
4	RH Negative—Pregnant Patient, Latest Trends in Management of	1.4	177
138	School Phobia (or School Refusal)	1.3	157
88	Bee Sting, Treatment of	1.3	153
72	Charley Horse	1.3	153
33	Suicidal Threat, Recognition and Treatment	1.2	149
135	Arrhythmias Cardiac, Emergency Treatment	1.2	142
7	Delinquent Child, Recognition and Management	1.1	140
159	Tranquilizers: Side Effects and Contra-indications	1.1	137
130	Infarction, Acute Cardiac	1.1	136
79	Cardiac Arrest, Treatment after	1.1	131
49	Delirium Tremens, Management of	1.0	117
50	Psychiatric Emergencies in Children	.9	116
105	Heart Block and Cardiac Pacemakers	.9	113
46	Premature Infant, Management of	.9	111
169	Dying Patient, The	.9	105

*Based upon total calls for first year—12,242

Not all tapes were in the library the same length of time as tapes were added at intervals.

EVALUATION

For evaluation purposes the tape number, time, and city is recorded for each call. Each Call Sheet provides data collection for ten calls, one of which requires that the caller be identified by name, address, and occupation. (See Appendix E). During the first year, this individual was sent a double postal card eliciting specific information to assist in evaluating the particular tape requested as well as the concept of the program. (See Appendix E). Data from this card and from the Call Sheet were put on punch cards to facilitate the evaluation procedure.

It should be kept in mind that the number of calls will not always reflect the number of listeners, as it is not unusual for several individuals to hear a tape by use of conference telephone lines or a speaker attached to the telephone. Some institutions have done this as a "mini" inservice education activity.

The Department of Nursing has taken a stance that the needs of the patient are a prime consideration. Therefore, if a member of a discipline other than professional nursing requests the information contained in the NURSING DIAL ACCESS Library, these calls will be accepted. Solicitation to others is not promoted because the volume of calls might become too great with the present method of operation. Therefore, a certain amount of control is determined by circulating the brochure listing the tapes and telephone numbers to professional nurses only. However, brochures are generally available in hospitals and nursing homes, and others, then, do have access to the tape and telephone numbers.

COOPERATIVE ARRANGEMENTS WITH OTHER STATES

Persons preparing tapes for the NURSING DIAL ACCESS Library sign releases giving permission to the Department of Nursing or the Wisconsin Regional Medical Program to use the tapes for medical and nursing educational purposes. (Appendix C). By arrangement, and at-cost charge, other Regional Medical Programs or university medical or nursing schools may use those tapes which do not pertain specifically to Wisconsin nursing practice or resources. The nursing tapes in the library are available for audit without charge.

Control of tapes remains with the Department of Nursing, and they are subject to annual review by the speakers as well as by the department. The following phrase is presented at the end of each tape:

"Recorded in (month and year) through the Wisconsin Regional Medical Program, Inc. All rights reserved."

Physicians in North Dakota and Minnesota have hooked into the Medical Dial Access Library and use the same facilities and tapes as Wisconsin physicians. In return the physicians in these states prepare tapes to be added to the library. Separate telephone lines are installed, and administration, promotion, and evaluation procedures are taken care of by each state independently.

Several neighboring states are exploring a tie-in with NURSING DIAL ACCESS and a number of states are using the nursing tapes in their own programs. Before a state decides to set up its own library, it is suggested that cooperative arrangements with other states be explored. Funds for the NURSING DIAL ACCESS grant provided for a quarter-time coordinator, but in reality this position required twice this amount of time. There are some administrative duties which could be shared by several states, and regional libraries could appropriately be considered with sharing of staff.

SUMMARY

After nearly two years in operation, NURSING DIAL ACCESS has continued to be a popular program in Wisconsin and is meeting a need for ready-access information.

The Wisconsin Physician's Dial Access Library pioneered this media and found it to be a feasible one for the distribution of information. The nursing program has enlarged the scope of the service in Wisconsin, and both programs have assisted others in developing similar services.

Though systems of information retrieval will change as technology advances, the concept of the Telephone Dial Access Library – on-the-spot-learning – will endure. Other disciplines have shown interest in this type of library service, and the Wisconsin Heart Association has initiated a similar program to provide health information to the public. There would seem to be unlimited opportunities for others to expand from the Wisconsin foundation.

The Department of Nursing is grateful to the Wisconsin Regional Medical Program for the grant which provided nursing the opportunity to make a contribution towards the development and direction of the Telephone Dial Access Library.

RECOMMENDATIONS

As a result of this study and the experience with this information retrieval system, it is recommended that:

1. A Regional Telephone Dial Access Library be considered as an effective way to disseminate nursing knowledge more broadly.

2. Cooperative arrangements should be explored before a state initiates a Dial Access Library.

3. Since it is probable that some nurses might benefit from hearing medical tapes which have not been listed in the nursing brochure, and since some physicians might benefit by listening to nursing tapes, the issuance of a joint brochure for physicians and nurses be considered.

4. The use of professional narrators be explored.

5. An honorarium should be paid to the person preparing material for the tape.

6. Prepared tapes available commercially would assist establishing a Dial Access Library for those institutions or agencies which do not have their own recording centers.

7. Tapes be made available reel-to-reel, by cartridge, or in cassette form for use in inservice programs.

8. The concept of a Telephone Dial Access Library be explored for patient information and health education.

CONCLUSIONS

1. NURSING DIAL ACCESS has been found to be an appropriate way to provide certain types of information.

2. Nurses have accepted this information retrieval system with enthusiasm.

3. The Wisconsin NURSING DIAL ACCESS program has been of special value in inservice education.

4. Non-professional nursing personnel have indicated interest and would use the library if it were promoted to them.

5. Disciplines other than medicine and nursing would like to use the library. Dietitians, pharmacists, and social workers have made specific inquiries. There is a need for other disciplines to develop tape libraries for continuing education purposes. However, there is also a need to make some tapes available on an interdisciplinary basis.

6. NURSING DIAL ACCESS was established to assist the nurse who practices outside the metropolitan areas of the state, and it appears that the program was successful in meeting this purpose.

NURSING DIAL ACCESS TAPE LIBRARY -- RECORD OF CALLS

Date: ____________
Day Month Year

PLEASE FILL OUT ENTIRELY FOR FIRST CALL ON THIS SHEET
(For Survey Purposes)

TAPE NO.___City__________ Hour______A.M.______P.M.______

IMPORTANT

Name ____________

Street Address ____________

Occupation
____ R.N. ____ L.P.N. ____ M.D. ____ Student

____________ OTHER (Specify)

CALL NO.	TAPE NO.	MADISON SYSTEM 257-0762 Madison (Check)	City (If NOT Madison)	INWATS SYSTEM 362-8174 City	Midnight - 6 A.M.	6 A.M. - Noon	Noon- 6 P.M.	6 P.M.- Midnight
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								

CALL SHEET (BLUE) - Madison Library

NURSING DIAL ACCESS TAPE LIBRARY -- Record of Calls Date: ____________
Day Month Year

Call No.
1.

PLEASE FILL OUT ENTIRELY FOR FIRST CALL ON THIS SHEET
(For Survey Purposes)

TAPE NO.______City__________ Hour______A.M.______P.M.______

IMPORTANT

Name ____________

Street Address ____________

Occupation
____ R.N. ____ L.P.N. ____ M.D. ____ Student

____
OTHER (Specify)

	TAPE NO.	Milwaukee (check)	CITY (If NOT MILWAUKEE	Midnight - 6 A.M.	(CHECK ONE) 6 A.M. Noon	Noon 6 P.M.	6 P.M. Midnight
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

CALL SHEET (PINK)
Milwaukee Library

SURVEY CARD

Our records indicate that on ______________________ you called the NURSING DIAL ACCESS Library and requested the tape entitled: ______

____

____

We would appreciate your assistance in evaluating this program. Would you take a minute to fill out the attached card and return it to us? Thank you.

Sincerely,

Signe S. Cooper

(Mrs.) Signe S. Cooper, R.N.
Chairman Department of Nursing
University Extension
The University of Wisconsin

A Service of the Wisconsin Regional Medical Program, Inc., and the Department of Nursing, University Extension The University of Wisconsin

FILL OUT REVERSE SIDE – DETACH AND MAIL PLEASE

NURSING DIAL ACCESS Evaluation

Tape No.________ Call No.________

Please check one:
R.N. ☐ or student ☐
L.P.N. ☐ or student ☐
M.D. ☐ or student ☐
Other ____________
(Identify)

Please check one:
☐ Hospital *(Name)* ____________
☐ Nursing Home *(Name)* ____________
☐ Public Health Agency
☐ Industry
☐ School of Nursing
☐ Office
☐ Inactive
☐ Other *(Identify)* ____________

1. Have you used this service before?
   Yes ☐ No ☐
   a. If yes, about how many times? ________
2. Was call made for information on management of specific nursing problem? Yes ☐ No ☐
   IF YES
   a. Was problem an emergency? Yes ☐ No ☐
   b. Did call provide needed knowledge? Yes ☐ No ☐

   IF NO check reason for call:
   ☐ a. review or update knowledge
   ☐ b. gain new information
   ☐ c. curiosity about service
   ☐ d. other *(specify)* ____________
3. Did you listen to entire tape? Yes ☐ No ☐
4. Was information: helpful ☐ not helpful ☐
5. Was information: completely new ☐ extension of present knowledge ☐ a review ☐
6. Would you like to see an expansion of the taped library? Yes ☐ No ☐
   If yes, what topics would you suggest? ____________

Comments: ____________

Space and Equipment for Planning Personnel

NURSING DIAL ACCESS was funded by the Wisconsin Regional Medical Program and developed by the Department of Nursing, Health Sciences Unit, University Extension, The University of Wisconsin. Mrs. Signe S. Cooper, R.N., is Chairman of the Department and was named as Project Director. NURSING DIAL ACCESS "piggy-backed" onto a proposal which included a continuation of the Medical Dial Access Library and was developed by the Postgraduate Committee of the Wisconsin Regional Medical Program. Roy Ragatz, a member of the Department of Postgraduate Medicine, University Extension, The University of Wisconsin, was named over-all Project Coordinator for the medical and nursing libraries. Because of this cooperative arrangement the techniques for production of tapes and evaluation of the program as already in effect for Medical Dial Access were used by NURSING DIAL ACCESS.

The Project Director, Mrs. Signe S. Cooper, R.N., and the NURSING DIAL ACCESS Coordinator, Mrs. Anne G. Niles, R.N., have the responsibility for developing the nursing program. The proposal calls for a one-quarter time coordinator, but this has not been realistic, and it is suggested that the coordinator be a full-time person, unless there is a different distribution of functions than those presented in this guide. It is possible that many of the mechanics of an access program could be performed by a central staff if several disciplines are developing libraries, and in this way, a part-time position could be considered.

The Coordinator in NURSING DIAL ACCESS has responded to the suggestions of a Tape Review Committee composed of representatives from nursing faculties, public health, occupational health, the Wisconsin Nurses' Association and the Wisconsin League for Nursing. This group has assisted in determining topics for the tapes, selection of speakers, and assists on request with the review of manuscripts for the tapes. In addition, the Coordinator acts as a resource person to the Nursing Committee of the Wisconsin Regional Medical Program and attends committee meetings to keep members informed of the Dial Access program. There has been attendance at faculty meetings, professional meetings, and national and international conventions, the planning of publicity releases, exhibits, preparation of reports and materials for use in professional publications, and, of course, carrying out duties related to development of the library.

A full-time secretary is needed, and if the development of a Bibliography for the tapes is a part of the program, a part-time library assistant is useful. Wisconsin has developed such a reference list, but this part of the program will be further evaluated as its use during the first year has not been great.

Minimal equipment required should be: desk and supplies for coordinator and secretary (and library assistant if used), two four-drawer files, one typewriter and a tape recorder. This assumes that printing, mimeographing and Xeroxing services are purchased elsewhere. The mailing list for the Department of Nursing is 18,000, and this bulk mailing is taken care of by the mailing services of the University. Arrangements should be considered -- perhaps using a business services firm -- if the sponsoring agency for an access library does not have bulk mailing service.

Equipment and Personnel for Answering Services

The Wisconsin Dial Access Libraries are housed in Madison and Milwaukee, both areas of high medical and nursing population. Each telephone line is connected to a Cousino Audio Announcer (address for this equipment is found in the Five-Month Report). There was a cost of about $75 to make an adapter for this connection which was made by University personnel. In addition, there was an installation charge of $31 by the telephone company for each line and a $3.85 rental charge each month for a flashing light to indicate which telephone is ringing.

CONSIDERATIONS IN SETTING UP A NURSING TELEPHONE DIAL ACCESS LIBRARY

WISCONSIN REGIONAL MEDICAL PROGRAM, INC.

DEPARTMENT OF NURSING
HEALTH SCIENCES UNIT
UNIVERSITY OF WISCONSIN
606 STATE STREET
MADISON, WISCONSIN 53706
Telephone (608) 262-0566

1. Determine if there is a telephone access library in the area, state or region. At the present time (October 1969) Wisconsin is the only state with an operational program for nursing. The Wisconsin library began operation September 1968 after one year of planning. There are other states in the planning process.

2. Several states have, or are setting up, a telephone dial access library for physicians. Cooperative planning between disciplines may be advantageous. Some states have based their programs upon the Wisconsin Medical Dial Access Library which has been operational since 1966.

3. Discuss the WATS (Wide Area Telephone Service) with a representative from the local telephone company. The United States is zoned with special rates and services for long-distance calls. There are ways to bridge these zones so that more than one state can be serviced by a library. Consider setting up duplicate libraries to accept local calls if there is a high concentration of nursing personnel. In Wisconsin, regular business lines accept local calls from Madison and Milwaukee, both areas of high nursing population. The Madison installation also houses the In-WATS line for long distance calls. Mr. Douglas Kroeger of the Wisconsin Telephone Company has been our representative. Address: 122 West Main Street, Madison, Wisconsin 53706. Telephone: (608) 257-2241.

4. If more than one discipline is setting up a library, it might be advantageous to consider an overall Director to coordinate the mechanics of the program, with each discipline planning for its own development of tape content.

5. Consider the renting of tapes already prepared by another library, possibly developing some for mutual exchange and preparing some pertinent to the local situation only (e.g. -- Community Resources for the Patient with Cancer.)

6. Primary considerations in developing a telephone access library include:

    1. Space and equipment for planning personnel
    2. Space and equipment for answering personnel
    3. Funds for telephone service
    4. Funds and personnel for the mechanics of tape production
    5. Funds for publicity, printing and postage
    6. Funds for evaluation

7. Factors which have contributed to the success of the Wisconsin program include:

    1. 24-hour availability of service
    2. Toll-free feature
    3. Continuing publicity

The library is housed in the pharmacy of University Hospitals where 24-hour service is provided for the Poison Control Center. A secretary answers the calls during the day as a part of her regular duties, while a student is hired for the evening shift, and the pharmacist takes the calls at night. If the volume of night calls were sufficient, additional night personnel would be hired, but at the present time, the staff has not been overburdened. In Milwaukee, the library is installed in the Milwaukee County Institutions, where a 24-hour paging system is in effect. With the volume of calls in the Madison area, a token amount of $1,000 is paid annually to these answering services. This amount is negotiable should the volume of calls require the hiring of additional personnel.

Funds for Telephone Service

At the present time, NURSING DIAL ACCESS pays charges of $225 monthly for each In-WATS line for 15 hours of metered service and $13 for each hour of overtime. (Tax and flasher rental must be added to this amount.) When a new brochure is mailed, service is purchased on an unmetered basis of $600 per month, which allows for unlimited calls. There is always an increase in the volume of calls for 2-3 months following the issuance of a brochure. In addition, business lines in Madison ($11.85 monthly) and Milwaukee ($12.85 monthly) accept local calls from these areas. For budget purposes, it is wise to project on the basis of the unmetered In-WATS line, for the volume of calls is not easy to anticipate, and it is best to have a figure representing the maximum which might be needed rather than to be found short prior to the end of a budget period. The highest number of calls received in a single day was 141, but an average of thirty calls is more comfortable for the present answering staff to accomodate.

Production

Wisconsin is fortunate in having a Medical Communications Center in connection with the University, and all factors relating to production are taken care of by this Center and billed to the grant. Speakers from areas other than Madison and Milwaukee where University facilities are present use radio stations or professional recording studios for recording their tapes, and the costs are billed to NURSING DIAL ACCESS.

It is necessary to determine the type of equipment a library is going to use before a cost can be projected. The type of equipment used in the Wisconsin program is listed on page 3 of the Five-Month Report. (This is no endorsement of a particular product, only an indication that this equipment has been acceptable for our use.) Hint: Purchase at least two or more extra Repeaters to allow for mechanical failure and expansion of telephone service if the volume of calls requires adding a number in sequence to your telephone line. It has been our experience that there is a time lag between placing an order for this equipment and its receipt.

Publicity

Be certain to put into the projected budget sufficient funds to allow for development of a public relations program as well as publicity and printing. Costs for photographs and displays fall into expenditures in this category and are worth the investment.

Wisconsin has issued one printed brochure and several mimeographed supplements of the tape listings. A second brochure is presently being prepared. A goal might be for two printings a year after the program is established. The brochures are mailed to all nurses registered in Wisconsin, hospitals, nursing homes, schools of nursing, public health agencies and nurses, and occupational health nurses. Periodically posters are mailed to the institutions and agencies as reminders. The program is also publicized at offerings of the Department of Nursing, meetings of professional organizations, and released to professional publications and state newspapers.

Evaluation

Each call received is listed on a Call Sheet with the number of tape, city from which call originated, and the time of call. In addition, about 10 percent of the callers are asked identifying information so that a postal questionnaire may be sent to them for more specific information. We anticipate placing the data accumulated during the first year on punch cards in order to develop a profile of users for NURSING DIAL ACCESS.

OTHER POINTS TO CONSIDER

1. Develop tapes in groups of ten to fifteen. It is too confusing to work with a larger number of tapes.

2. In preparing a proposal, determine if the evaluation procedure can answer the question: "How has this program changed nursing practice?"

3. Consider sufficient funds for payment of an honorarium to the speaker. (This has not been done by the Wisconsin grant.)

4. Consider professional readers for the scripts. (Both this and number 3 above will increase production costs.) Wisconsin has used the author as the speaker. The most consistent criticism of the program has been the rapidity of the rate of the speaker. Some comments also indicate that a male voice is easier to understand.

5. Weigh costs of developing your own program against tying in with an existing program or developing one with an adjoining region. (One primary problem if each state develops its own tapes is the duplication of requests which might be made to authors to prepare tapes.)

Please contact us again if we have not answered your specific questions.

(Mrs.) Anne G. Niles, R.N.
Coordinator
NURSING DIAL ACCESS

October 1969

1. Those tapes in the Wisconsin Library which reflect nursing practice and resources in Wisconsin have been eliminated from the list of tapes available to other states. However, it is urged that professional nurses review all tapes before they are placed in another state's library to determine if they are compatible with acceptable practice in that state.

2. Some tapes make reference by number to one or more other tapes. Use of the Wisconsin numbering system is therefore suggested, and consideration should also be given to the inclusion of these referred tapes.

3. May we ask to be included on mailings for all of your brochures and other information relating to you DIAL ACCESS Program?

4. We would be most appreciative of any comments you receive about content or production of tapes from the Wisconsin system.

5. Any evaluation data you report would be of interest to us.

6. If additional tapes are prepared by your program, may we be advised of the topics and participants?

(Mrs.) Anne G. Niles, R.N.
Coordinator
NURSING DIAL ACCESS

Department of Nursing
Health Sciences Unit
University Extension
The University of Wisconsin
606 State Street
Madison, Wisconsin 53706

Telephone: 262-0762

January, 1970
NURSING DIAL ACCESS is a service of The Wisconsin Regional Medical Program and The University of Wisconsin

PRICE LIST FOR PURCHASE OF DIAL ACCESS TAPES:
(Wisconsin Regional Medical Program)

TAPE PURCHASE RESTRICTED TO REGIONAL MEDICAL PROGRAMS
AND MEDICAL SCHOOLS

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1. If entire Library purchased in sub-master form, in numerical sequence (with purchaser putting trailer on end of each lecture, identifying production source: "Produced at the University of Wisconsin, through the Wisconsin Regional Medical Program. Provided through (purchaser) ")............................$2.50 per topic

   ($4.00 per topic if Wisconsin puts on the individual trailer)

2. If selected topics, not in numerical sequence are purchased, in sub-master form (with purchaser putting on trailer as noted in #1 above)..$4.00 per topic

   ($5.50 per topic if Wisconsin puts on the individual trailer)

3. In cartridge form (for use with the "Cousino Repeater, Model R-7320"): 2 copies of each topic, wound in individual cartridges, with appropriate trailer added, ready for use.................$10.00 per topic

WHEN ORDERING:

Make out purchase order to: MEDICAL COMMUNICATIONS CENTER
(University of Wisconsin)

Send to: Project Director, M.D. Dial Access Library
Wisconsin Regional Medical Program
307 North Charter Street
Madison, Wisconsin 53706

NURSING DIAL ACCESS

The Department of Nursing, University Extension, University of Wisconsin, has developed NURSING DIAL ACCESS under a grant from The Wisconsin Regional Medical Program, Inc. The system provides an around-the-clock taped library available by telephone to all professional nurses in Wisconsin free of charge.

The library presents core information in the categories of:

a. *Nursing care in emergency situations*
b. *New procedures and equipment*
c. *Recent developments in nursing*
d. *Legal aspects in nursing situations*

The emphasis of the grant is on Heart, Cancer and Stroke, and the majority of the tapes relate to these conditions. The five-to-seven minute recordings, which are made by persons who have recognized skills in the subject covered, contain material which can be used for emergency information as well as for continuing education.

The program began operation in September, 1968, and receives about 1000 calls per month.

IN CONNECTION WITH YOUR NURSING DIAL ACCESS TAPE

TIME ALLOWANCE: 5 to 7 minutes

RECORDING: All tapes must be prepared in a sound-proof studio, under technical supervision.

Madison: Your tapes will be cut in the Medical Communication Center, Room 306 Medical Library, 1305 Linden Drive, by Jerry Keliher, Director of Communications, University of Wisconsin Medical Center, Telephone 262-6199.

Milwaukee: Your tapes will be cut at the Instructional Communication Center, Fine Arts Building, University of Wisconsin, by Mrs. Mary Reilly, Telephone 228-4664.

Other: Please arrange with your local radio station to cut your tape in their recording studio, and ask them to bill us for the tape and the time required for this service.

Billings and the completed tape should be mailed to: Wisconsin Regional Medical Program, Inc., NURSING DIAL ACCESS, 606 State Street, Room 1005, Madison, Wisconsin 53706.

Your tape will be reviewed to make certain its content is in line with other instructional tapes in the NURSING DIAL ACCESS library. If there is need for revision, you will be notified. After one year you will be asked to review your own tape to see if you desire to revise it in any way.

TIPS ON TAPING

The quality of the production as well as the quality of the content is important. In order to provide the best results, we ask that you review the suggestions listed here before you cut your tape.

CONTENT

1. These tapes are designed for the practicing registered nurse. However, it is recognized that many inactive nurses use this service.
2. The information contained may be needed for emergency situations or for continuing education.
3. Include answers to questions frequently asked, but exclude extensive literature review and statistics. You may wish to include a bibliography of no more than three references on a special form. The bibliographies will be made available to listeners on request.
4. Your tape should concern only the subject with which you are dealing. Please try to eliminate all extraneous information and phrasing.
5. When listing instructions, giving drug names or dosages, please speak slowly, spell out, and possibly repeat yourself. The listener may be writing the informations down.

MECHANICS

1. Milwaukee

   Your tape will be cut at the Instructional Communications Center, Fine Arts Building, University of Wisconsin, by Mrs. Mary Reilly, telephone 228-4664. Please allow at least two weeks for scheduling time.

   Madison

   Your tape will be cut at the Medical Communications Center, Room 306, Medical Library, 1305 Linden Drive, by Jerry Keliher, Director of Communications, University of Wisconsin Medical Center, telephone 262-6199.

   Other

   Arrange with your local radio station to cut your tape in a sound proof studio. Bills for these services may be submitted to: The Wisconsin Regional Medical Program, Inc., NURSING DIAL ACCESS, 606 State Street, Room 1005, Madison, Wisconsin 53706.
2. Type your script, double or triple space, and time your reading carefully. Tapes should run about 5 minutes.
3. When reading your script, do not rustle papers.

Please use the following phrase at the end of your tape:

Recorded in ____________________ (month and year) through The Wisconsin Regional Medical Program, Inc. All rights reserved.

PERMISSION TO RECORD BROADCAST AND RELEASE

I, the undersigned, hereby consent to the recording, broadcast and release of the whole or part of my recording on the audiotape designated:

The use of this instructional material shall be for non-profit medical or nursing educational purposes only, and its release shall be determined by the Department of Nursing, University of Wisconsin Extension and/or the Tape Review Committee of NURSING DIAL ACCESS

Signed ______________________

Title ______________________

Date ______________________

Bibliography for NURSING DIAL ACCESS

Topic:

References: (No more than three, if possible)

Signed:______________________

Title:______________________

____

Date:______________________

NURSING DIAL ACCESS

ANNUAL REVIEW

[ ] I do not plan to revise my tape at this time.

[ ] I do plan to revise my tape. (Please indicate when we may expect receipt of new tape.)

[ ] The bibliography references should not be changed.

[ ] Please make the following changes in the bibliography reference sheet:

[ ] No changes in the brochure are indicated.

[ ] Please make the following changes in the brochure:

TAPE TOPIC____________________ NAME______________________

______________________________ TITLE_____________________

______________________________ ADDRESS___________________

TAPE NUMBER___________________ __________________________

DATE______________________

RETURN TO:

Mrs. Anne G. Niles, R.N., Coordinator
Department of Nursing
University Extension
University of Wisconsin
606 State Street
Madison, Wisconsin 53706

APPENDIX B

THE UNIVERSITY OF WISCONSIN DIVISION OF STUDENT AFFAIRS

July 21, 1971

To: Joe Corry, Assistant to the Vice Chancellor for Academic Affairs

From: Steven R. Saffian, Director, Campus Assistance Center
Blair Mathews, Associate Dean, College of Letters and Sciences

Re: Campus Dial-Access Telephone Information System

INTRODUCTION

There seems to be little disagreement among college administrators that the growth of colleges and universities into huge organizations has been accompanied by an urgent need for more and better information and communication. Indeed the common response to much of the universities' recent troubles has been chalked up to inadequate information and communication. This need applies across the board to faculty, students and administrators. According to Hefferlin and Phillips in their recent book, *Information Services for Academic Administration*, "many students, professors, and staff members are poorly informed about their institutions. And worst of all, even more of them feel that they are uninformed, and consequently, that they are victimized, powerless institutional pawns."

To respond to this need institutions across the country have developed a variety of innovative mechanisms for more immediate, more efficient information dissemination. The more traditional approach to the problem has involved a broader use of print. This has led to a multiplicity of new pamphlets,

420 NORTH LAKE STREET
Communications Office (608) 263-1703
MADISON, WISCONSIN 53706
Campus Assistance Center (608) 263-2400

catalogs, newsletters and administration-produced, student-oriented newspapers, which do an excellent job of reinforcing the shotgun approach to information dissemination. On the other end of the delivery system spectrum we encounter the use of sophisticated media such as T.V., film and data processing equipment. Both print and media, however, do not reduce the complexities of the institution for the individual who has a particular problem at a particular time.

To deal with the communication problem on an individual and immediate basis, many schools are developing telephone information and referral services. At the University of Wisconsin the Division of Student Affairs, Campus Assistance Center is striving to provide near instantaneous information, advice when appropriate, and if necessary, referral to other campus agencies. The use of the telephone to provide this kind of quick response is not limited to the Campus Assistance Center nor are telephone clienteles limited to students. The Madison student and local community boasts of several phone services including a Rap Center, Drug Information Line, People's Office and Mental Health Wire. The sponsors of these services all report a pattern of increasing use and acceptability.

On a more specialized basis the College of Letters and Sciences has instituted a telephone dean. The telephone dean is actually a rotating member of the Associate Dean's staff who is responsible for handling college advisory information and policy explanation via telephone.

The acceptance of the telephone as a viable mechanism for disseminating information being well established, the College of L & S and the Division of Student Affairs recommends that the University establish a supplementary, standardized dissemination capacity on the Madison Campus. The system we are recommending is a Dial-Access Telephone Information System.

Dial-Access

A Dial-Access Telephone Information System utilizes specialized audio tape libraries and telephone hook-ups to provide callers with information in pre-determined areas of interest. A telephone operator receives the call and places the requested tape on a special playback mechanism that is hooked directly into the phone line. The estimated time elapse from initial phone contact until the operator places the tape on the line is 90 seconds. The length of the tape recording can vary although the optimal length seems to be about 4-1/2 minutes.

The University currently provides a diagnostic information service to medical personnel in a multi-state midwest area. Physician subscribers to this service call and ask for particular tapes based on a descriptive catalog that they have been sent in advance.

This service is under the auspices of the U.W. Medical School and is operated by the Communications Office. For the Medical School program tapes are designed and recorded by experts under the direction of the school.

The College of Letters and Science and the Division of Student Affairs have been studying the possibilities of Dial-Access for some time and feel that there are many possibilities for using a Dial-Access capability to complement our various telephone services.

Projected Use

The need for increased means of campus communication on the Madison Campus is particularly prominent at this time. During the academic year 1971-72 students, staff and faculty will have to be brought up to date on changes in the curriculum of several schools and colleges, registration, the calendar, health service, grading, etc.

The broad scope of the anticipated changes in the Letters and Sciences requirements prompts their interest in Dial-Access. Dial-Access will not replace the counselor-student contact. There are, however, many distinct policy and advising areas that lend themselves to the short taped format. The purpose of Dial-Access is not to substitute another mechanical device for an inter-personal relationship but to extend the capacity for the adviser and the University to communicate needed information to students and staff quickly and efficiently. This information presented via Dial-Access should save valuable staff time and provide the student with basic factual groundwork on which to ask his own personal question. The tape should minimize the possibility of variable presentation and be an easy accurate referral source for secretaries, faculty, etc. Beyond the current changes the Letters and Sciences tape library could easily include such topics as: How to Use the Faculty Advising Service; What Is the ILS Program, etc. It seems probable that such a system would have a comparable application in the other schools and colleges. The School of Nursing has already expressed an interest.

The Division of Student Affairs has a two-fold interest in Dial-Access. As the responsible unit for the Campus Assistance Center, the Division can document based on its 1970-71 experience the need for several standardized presentations in select academic and other areas to supplement its live phone service. In addition, descriptions of and how to use a number of student services could be placed on tape for those students who are hesitant about making personal contact. Included in this category might be such topics as: How to Fill Out a Financial Aids Application, The Services of the Housing Listing Office, Orientation to Placement Services, The Facilities of the Memorial Union.

Other campus departments for whom Dial-Access has obvious applications include the Registrar, the Library, the Computer Center, etc. An important prospective external user might very well be the high school counselor who needs to keep abreast of curriculum changes and requirements on a continuing basis. The system can also be used for such public information functions as announcing bus schedules, campus community events, Chancellor's statements, etc.

Procedure

Participating units would generate their own tape libraries according to a pre-established format. A staff member trained for the purpose could operate the system. The necessary resources for making tapes are already available on the Madison campus. Each unit would be responsible for the content and costs and updating of its tapes.

Limited copies of the tape inventory would be given to key campus offices with explicit instructions as to use. No tape should be referred to without mention of an individual's name who would reply to questions once the tape had been listened to. The tapes should be concluded in the same manner. The costs of tape production and promotional material would be the responsibility of the participant.

Costs and Equipment

The building block of this system will be the Instructomatic Cassette playback unit connected to the telephone line. In addition, a tape storage rack is required. A recorder coupler and a telephone line can be rented from the telephone company. Operating costs are estimated 7-1/2¢ per play which pays for operator's time and overhead.

Tape production in existing facilities is possible at minimal cost. WHA Radio rents studios by the hour. Additional costs would be for dubbing, tape and cassettes.

Handling time for each tape is 1-1/2 minutes. Each unit for example could handle ten 4-1/2 minute tapes per hour. Given the experience of existing programs, 4-1/2 minutes per tape seems optimal for maintaining listener attentiveness. For the purposes of generating budget estimates we are assuming 150 calls a week for a 34-week period from September 1971 to June 1972.

Recommendations

The College of Letters and Sciences and the Division of Student Affairs recommend that the Madison Campus underwrite the capital, rental, and operating costs of a one-unit Dial-Access system as described above for a period of one year.

Consultation and Evaluation

The Program Development section of the Division of Student Affairs which is responsible for the Campus Assistance Center would be willing to act as consultant to departments or offices who wish to use Dial-Access as well as monitor the quality and quantity of use, attempt to measure on a continuing basis changing needs of user and participant and review the effectiveness of tape presentations.

This information would be brought before a policy committee of participant users for periodic review. The first evaluation should take place at the end of the fall semester 1971 and be based on departmental participation, volume of traffic and user reaction. If the volume warrants it, increasing the capacity of the system should also be evaluated at this time.

DIAL ACCESS
Cost Summary

1. Capital Equipment

Instructomatic Cassette Playback Unit (1)		$287.50
Storage Rack		53.00
	Total	$340.00

2. Rentals (First Year)

Recorder Coupler - $3.50/mo.		$ 39.00
Phone Line - $6.00/mo.		72.00
Installation - $25.00		25.00
	Total	$136.00

3. Operating

Operator's Time and Overhead		$ .07.5 per play
34 weeks @ $.7.5 per est. 150 plays per week		$382.50
	Grand Total	$859.00

Tape Production

WHA Radio Studio rental--minimum time 1 hour	$ 5.00
WHA Radio dubbing charge per cassette $1.25	2.50
Tape--30 minute Scotch #175	2.58
Two cassettes at $1.09 each	
Total charge for initial program	$12.26

The following charges would cover the next 5 programs:

WHA Radio dubbing charge per cassette $1.25	$ 2.50
Two cassettes at $1.09 each	2.18
Charge for each additional program up to 5	$ 4.68
Estimated charge per tape	$ 3.35 per tape

APPENDIX C

uwgb
the university of wisconsin-green bay
GREEN BAY, WISCONSIN 54305

College of Community Sciences
120 South University Circle Drive

July 23, 1971

Mr. Jeff Kuehl
EDSAT Center
Space Science and Engineering Center
1225 W. Dayton
Madison, Wisconsin 53706

Dear Mr. Kuehl:

Enclosed is the informal course evaluation we discussed on the telephone.

A brief word concerning the table: the symbols FV indicates Fox Valley, MN is Manitowoc, and MR is Marinette. We have lower division campuses in all three of those communities in addition to the main campus in Green Bay. Green Bay Follow-Up refers to a second application of the various instruments done at the time of the final examination and on a voluntary basis for respondents.

The course CS 102: Man and His Social Environment, is a team taught, indisciplinary course which introduces students to the various social science disciplines and problems. It was arranged so that all five sections received television instruction at the same time (a teaching module of about 20 minutes presented by one of the instructors). Additionally, all campuses were simultaneously linked by two-way audio lines which permitted students to ask questions of the instructor presenting the television material.

Please do not interpret these very preliminary data as final as much work is yet to be done. I hope they are useful to you and please feel free to contact me if I can be of any assistance.

Sincerely yours,

Robert M. Jiobu
Assistant Professor

RMJ:lr

Brief Discussion: The general impression from the data is that we ranked somewhere slightly above an ambivalent or "inbetween" rating. We did best at Fox Valley and Manitowoc on both the specific CS102 items, and on the general attitude towards the course. The rankings of 7.7 and 7.4 represent placement somewhere between "some parts of this course are very worthwhile" and "this is a good course for college students to take." The ratings of 5.5 and 5.8 represent placement between "this course, no doubt, has some value for some people," and "there are better courses than this and there are worse courses."

Some interesting specifics are also present. We consistently received positive ratings on the films followed by the readings. Least liked aspects included audio-hookup (but note the intercampus variation), and the lectures. The videotapes and examinations were given equal, intermediate ratings.

Regarding student perceived learning, we were somewhat above the intermediate position on all three questions dealing with that topic, and tended to receive the highest ratings in the area of application.

The involvement score is more difficult to interpret. However, regardless of the absolute values, the data show that there is no intercampus variation and this factor cannot be used to explain intercampus variations in ratings. The same could probably be said about the lack of intercampus variations in examination performance.

Finally, it may be noted that the Green Bay follow-up sample tended to be as favorable, or more favorable, than the first wave of respondents. Given the manner in which both samples were drawn, the precise interpretation of this data must be tempered with caution.

NAME ______________________________ ID ______________________________

++	+	=	-	--
Much greater in this course	Greater in this course	About the same	Less in this course	Much less in this course

How would you rate the knowledge gained in this course compared with similar courses?

++ + = - --

How would you rate the critical thinking done on your part in this course compared with similar courses?

++ + = - --

How well have you seen applications and/or implications of the subject matter in this course as compared with other similar courses?

++ + = - --

If you were to start through the course again as you have just experienced it, what (if anything) would you hope we would do differently?

++	+	?	-	--
Very Positive	Positive	Neutral	Negative	Very Negative

What was your predominant reaction to the following:

Films	++	+	?	-	--
Videotapes	++	+	?	-	--
Lectures	++	+	?	-	--
Discussions	++	+	?	-	--
Reading assignments	++	+	?	-	--
Exams	++	+	?	-	--
Audio hook-up	++	+	?	-	--

About the <u>films</u>, what did you like the most?

least?

About the videotapes, what did you like the most?

least?

About the lectures, what did you like the most?

least?

About the discussions, what did you like the most?

least?

About the reading assignments, what did you like the most?

least?

About the exams, what did you like the most?

least?

You will remember that this course was structurally organized in three parts. The first part (I) relying largely on the four key films, might be called the COMPARATIVE APPROACH. The second part (II) made major use of the videotapes and may be identified by its emphasis on FUNDAMENTAL CONCEPTS. The third (III), most recent part, was an Introduction to the CONCENTRATIONS. Please put the number 1 on the line in front of the part you think was the best of the three; and put a 3 on the line in front of the part you think was the weakest.

_____ I Comparative Approach (films plus)
_____ II Fundamental Concepts (tapes plus)
_____ III Introduction to the Concentrations

Please explain why you ranked these parts the way you did.

In summarizing the results of this evaluation study, may we quote you providing proper precautions are taken not to reveal your identity?

YES ________ NO ________

Name ______________________ ID Number ______________________

Course ______________________

Below are eleven statements expressing various positions in the evaluation of this course.

1. Please read all the statements (A-K) carefully first before making any marks on this page.

2. Now that you have carefully read all the statements, UNDERLINE that one statement that comes closest to your evaluation of the course.

(1) A. This course should be thrown out of the curriculum.

(2) B. The benefits to be gained from this course hardly justify its existence.

(3) C. This course is too vague.

(4) D. The material taught in this course is not detailed enough.

(5) E. This course, no doubt, has some value for some people.

(6) F. There are better courses than this and there are worse courses.

(7) G. Some parts of this course are very worthwhile.

(8) H. This is a good course for college students to take.

(9) I. This course is very beneficial to the majority of students who take it.

(10) J. This course makes a valuable contribution to a college education.

(11) K. If I were limited to taking only one course in college, I would select this course as that one.

Please go back now that you have underlined the one statement that comes closest to your stand and put a mark (x) on the line next to all those statements that you consider also acceptable in describing this course.

The statements presented below are the same as those on the preceding page.

1. Please read all the statements again before making any marks on this page.

2. Now that you have read the statements again, cross out that one statement which is most objectionable from your point of view.

_____ A. This course should be thrown out of the curriculum.

_____ B. The benefits to be gained from this course hardly justify its existence.

_____ C. This course is too vague.

_____ D. The material taught in this course is not detailed enough.

_____ E. This course, no doubt, has some value for some people.

_____ F. There are better courses than this and there are worse courses.

_____ G. Some parts of this course are very worthwhile.

_____ H. This is a good course for college students to take.

_____ I. This course is very beneficial to the majority of students who take it.

_____ J. This course makes a valuable contribution to a college education.

_____ K. If I were limited to taking only one course in college, I would select this course as that one.

Now put a mark (x) on the line next to all those statements that you find also objectionable.

CS102 Evaluations
(Fall 1970)

Item	Green Bay	Green Bay Follow-up	FV	MN	MR	Mean of row means	SD
Inputs Specific to CS102:[a]							
Knowledge gained	2.7	3.2	3.4	3.6	2.7	3.1	.47
Critical thinking	2.9	3.2	3.3	3.6	3.1	3.2	.30
Application	3.1	3.7	3.6	3.8	3.1	3.4	.36
Films	4.3	4.4	4.5	3.9	4.2	4.2	.25
Videotapes	2.9	3.2	2.9	3.3	3.2	3.1	.21
Lectures	3.0	3.4	3.6	3.5	2.9	3.2	.35
Discussions	2.4	2.8	3.2	2.7	2.6	2.7	.34
Readings	3.4	3.9	4.3	3.9	3.3	3.7	.46
Examinations	2.7	3.9	3.5	3.3	2.7	3.0	.41
Audio hookup	2.2	2.2	2.2	3.2	3.9	2.9	.83
Mean of Columns	2.9	3.4	3.4	3.5	3.2	3.2	.26
Standard Deviation of Columns	.58	.68	.65	.37	.52	.68	
General Attitudes Towards Course:							
Own Position[c] 5.5	5.5	NA	7.7	7.4	5.8	6.6	1.7
Involvement[d]	3.7	NA	3.6	3.8	3.7	3.7	.00
Median examination Scores[e]	45.7	NA	45.0	45.0	41.0	44.2	1.9

[a]Mean rating based on ++=5, +=4, ?=3, -=2, --=1.

[b]Both sections combined

[c]Mean rating based on 11=most favorable, 1=least favorable. In practice, only the range of 2 through 9 were used by students.

[d]Mean number of items checked as unacceptable.

[e]Mean examination scores for all three tests were computed and the median located.

Sample: The above table is based on 269 responses out of 684 enrolled students as of January 20, 1970 (39 percent response rate). The follow-up, for both sections of Green Bay combined, consists of 60 responses.

APPENDIX D

SCHEDULE OF "SEEN" COURSES—FALL, 1971

Statewide Engineering Education Network

C.S. 101 (I) Introduction to Automatic Digital Computing
A beginning course. Topics in machine organization, problem formulation, automatic programming, numerical analysis, machine language programming, and applications of computers. 3 crs/$105.
TIME: 4:00-5:20 P.M. TT
INSTRUCTOR: T. A. Murrell, University of Illinois
TEXT: Text information supplied at time of enrollment.

E.E. 391 (I) Boolean Algebra and Switching Theory
Same as Computer Science and Mathematics 391. Boolean algebra with applications to sets, logic, electronic and relay combinational circuits; Karnaugh and Quine-McCluskey minimization procedures with applications; introduction to sequential circuits. 3 crs/$105.
TIME: 8:00-9:20 A.M. TT
INSTRUCTOR: Gernot Metze, University of Illinois
TEXT: Text information supplied at time of enrollment.

Math. 222 (W) Calculus and Analytic Geometry
Calculus for students of mathematics, science, and engineering. Topics: techniques of integration, conic sections, polar coordinates, vectors, infinite series. 5 crs/$105.
TIME: 5:30-8:00 P.M. TT
INSTRUCTOR: R. D. Wagner, University Extension, Mathematics Department
TEXT: Text information supplied at time of enrollment.

Math. 320 (W) Linear Mathematics
Introduction to linear algebra, including matrices, linear transformations, and eigenvalues. Linear systems of differential equations. Numerical aspects of linear problems. Prerequisite: Math 223. 3 crs/$105.
TIME: 5:30-8:00 P.M. MW
INSTRUCTOR: Carl J. Vanderlin, University Extension, Mathematics Department
TEXT: *Linear Mathematics*, by Gillett ($9.95). *Calculus (Schaum's Outline)*, by Ayres ($3.95).

Math. 345 (I) Differential Equations and Orthogonal Functions
Primarily intended for engineering students and others who require a working knowledge of differential equations. Credit is not given for both Math 345 and 341. Credit is not given for both Math 345 and 349. Prerequisite: Math 140 or 141 or 145, or equivalent.
TIME: 4:00-5:00 P.M. MWF
INSTRUCTOR: E. J. Scott, University of Illinois
TEXT: Text information supplied at time of enrollment.

Math 346 (I) Complex Variables and Applications
For students who desire a working knowledge of complex variables. Covers standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, Laplace transforms, and potential fields. Credit is not given for both Math 346 and 348. Prerequisite: Math 343 or consent of instructor. 3 crs/$105.
TIME: 1:00-2:20 P.M. TT
INSTRUCTOR: Jerald J. Janrisz, University of Illinois
TEXT: Text information supplied at time of enrollment.

M & M.E. 350 (W) Introduction to Materials Science
Basic structure and resulting properties, phase equilibria, metastability, rate and growth processes in solids. Prerequisite: Chem. 106 or equivalent. 3 crs/$105.
TIME: 12:00-1:00 P.M. MWF
INSTRUCTOR: Richard Moll, The University of Wisconsin
TEXT: Text information supplied at time of enrollment.

Statistics 110 (W) Elementary Statistical Analysis
Elements of probability theory, collection and presentation of sample data, basic problems of statistical inference, and applications including quality control, regression, elements of statistical design. Prerequisite: Math 221 or equivalent. 3 crs/$105.
TIME: 7:45-8:35 A.M. MWF
INSTRUCTOR: To be announced
TEXT: Text information supplied at time of enrollment.

TAM 150 (I) Analytical Mechanics (Statics)
Resultants of force systems; algebraic and graphical conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.: forces due to friction, centroids. Prerequisite: Physics 101 or 106, or Liberal Arts and Sciences 141; registration in Math 140, 141, or 145. 3 crs/$10
TIME: 12:00-12:50 P.M. TT
INSTRUCTOR: To be announced
TEXTS: Text information supplied at time of enrollment.

TAM 314 (I) Advanced Dynamics for Engineers
Three-dimensional kinematics of a rigid body, general dynamics of a rigid body, moments and products of inertia, kinetic energy, rotation of a rigid body about a fixed axis and about a fixed point, Euler equations of motion, gyroscopic theory; introduction to Lagrange equations; engineering applications. Prerequisite: Theoretical and Applied Mechanics 211 or equivalent, Math 341 or 345. 3 crs/$105.
TIME: 2:30-3:50 P.M. TT
INSTRUCTOR: Paul G. Jones, The University of Illinois
TEXTS: Text information supplied at time of enrollment.

TAM 425 (I) Mechanics of Inelastic Bodies
Presents methods of obtaining relations between load deformations, stresses, and strains in various members stressed beyond the elastic range. Most applications consider both time-independent and time-dependent (creep) inelastic deformations. Some specific topics are straight and curved beams, columns and beam columns, fully plastic analysis of statically indeterminate members and structures, torsion of circular and noncircular bars, and torsion-tension of bars of circular cross section. Prerequisite: Theoretical and Applied Mechanics 321. 3 crs/$105.
TIME: 11:00-11:50 A.M. MWF
INSTRUCTOR: Omar M. Sidebottom, University of Illinois
TEXT: Text information supplied at time of enrollment.

Information Engineering 410 (I) Advanced Linear Analysis
(Begins September 29, ends December 1, 1971)
Analysis of linear networks and systems in the time and frequency domains. Basis of loop and node equations. Signal flow graphs, transform methods, state variable representation, stability. Prerequisite: Introductory Circuit Analysis course; contact local coordinator. 3 crs/$105.
TIME: 2:00-3:50 P.M. WF
INSTRUCTOR: Roland Priemer, University of Illinois
TEXT: Text information supplied at time of enrollment.

CONTINUING EDUCATION COURSES

Basic Engineering Refresher (W)
An increasing number of engineers are meeting the requirements for professional registration each year and are licensed to practice in their state. This course, designed particularly for candidates for the Part A or EIT (Engineer-in-Training) examination, reviews chemistry, physics, statics, dynamics, strength of materials, fluid mechanics, electricity, and thermodynamics. The program is also of interest to anyone desiring a review of engineering fundamentals for any purpose.

Each enrollee in the course receives a book keyed to each of the subjects listed and designed especially for the Basic Engineering Refresher. It includes an ample quantity of problem sets (with answers) to provide reinforcement and review of the material presented. Fee: $65.
TIME: 8:00-10:00 P.M. Thurs.
INSTRUCTOR: Drawn from experienced staff
TEXT: *A Basic Engineering Review by Problem Sets*, by Klus & Gritzmacher, University Extension. Price. $7.50

Chemical Engineering Refresher
Tentatively scheduled. More information will be available upon request about mid-August.

Electrical Engineering for Non-Electrical Engineers
Designed to acquaint engineers of other disciplines with the foundational concepts of Modern Electrical Engineering. Among topics covered are: electric fields; basic network theorems; solid state device characteristics; rotating machinery. Each topic will be developed to the extent of providing an understanding of its basis as well as fundamental applicational aspects. Fee: $65.
TIME: 8:00-10:00 P.M. Mondays
INSTRUCTOR: Harold L. Green, University Extension
TEXT: *Basic Electrical Engineering*, by Fitzgerald/Higginbotham/Gabrel, McGraw-Hill. Price: $12.95

Structural Steel Design—1969 AISC Specifications
Intended for structural designers and engineers concerned with the design of beams, columns, bracing, plate girders, and bolted and welded connections based on the 1969 AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Differences between the 1963 and 1969 Specification will be emphasized. Background material on member design will serve as introductory material for the new designer and as a review for the established designer. Fee: $65.
TIME: 8:00-10:00 P.M. Wednesdays
INSTRUCTOR: Lawrence A. Soltis, University Extension
TEXT: *AISC Manual of Steel Construction, 7th Edition.* Price: $12.00

Solid Waste Management (NOTE: This program starts **Sept. 14** and ends Nov. 2, 1971.)
A series of eight guest lecturers discuss a wide range of aspects of solid waste management, to give the enrollee a comprehensive view of the many diverse contributions being made to the solution of waste disposal problems. Topics include: planning, regulation, site selection, site operation, education, research on disposal and recycling, intergovernmental cooperation, and legislation, etc. Aimed at engineers, planners, and citizens active in community betterment. Fee: $65.
COORDINATOR: Warren Porter, University Extension
TEXT: Text information supplied at time of enrollment.

Street Lighting (NOTE: This program starts Nov. 9 and ends Jan. 11, 1972.)
The following topics will be covered in the eight sessions: What Is Street Lighting? Basics of Lighting; Light Control Principles; Roadway Lighting Principles and Design; Structural and Physical Considerations; Maintenance and Economic Considerations. Fee: $65.
TIME: 8:00-10:00 P.M. Tuesdays
INSTRUCTOR: Harold A. Van Dusen, Jr., McGraw-Edison, Milwaukee, Wis.
TEXT: Text information supplied at time of enrollment.

(CHECK WITH YOUR LOCAL COORDINATOR FOR **LATE ADDITIONS** *TO THE SEEN SCHEDULE)*

Courses MAY be applicable for credit toward The University of Wisconsin's **Professional Development Degree** in Engineering. Details of this degree program are available upon request.

TIME SCHEDULE

	MON	TUES	WED	THURS	FRI
A.M.	7:45-8:35 Stat. 110 Elementary Stat. Analy. (Tent. time)	8:00-9:20 EE 391 • Boolean Algebra and Switching Theory	7:45-8:35 Statist. 110	8:00-9:20 EE 391	7:45-8:35 Statist. 110
	11:00-11:50 TAM 425• Mechanics of Inelastic Bodies		11:00-11:50 TAM 425		11:00-11:50 TAM 425
NOON	12:00-1:00 M&ME 350 Intro. to Materials Sci.	12:00-12:50 TAM 150• Analyt. Mechanics (Statics)	12:00-1:00 M&ME 350	12:00-12:50 TAM 150	12:00-1:00 M&ME 350
		1:00-2:20 Math 346 • Complex Variables and Applications		1:00-2:20 Math 346	
		2:30-3:50 TAM 314 • Advanced Dynamics for Engineers	2:00-3:50 • Inform. Engr. 410 Adv. Linear Analysis	2:30-3:50 TAM 314	2:00-3:50 Inform. Engr. 410
P.M.	4:00-5:00 Math 345 • Diff. Equations and Orthogonal Functions	4:00-5:20 CS 101 • Intro. to Automatic Digital Computing	4:00-5:00 Math 345	4:00-5:20 CS 101	4:00-5:00 Math 345
	5:30-8:00 Math 320 Linear Mathematics	5:30-8:00 Math 222 Calculus and Analytic Geometry	5:30-8:00 Math 320	5:30-8:00 Math 222	
	8:00-10:00 E.E. For Non-Elec. Engineers	8:00-10:00 Solid Waste Mgmnt. (1st half) Street Lighting (2nd half)	8:00-10:00 Structural Steel Design - AISC Specification -	8:00-10:00 Basic Engineering Refresher	8:00-10:00 Chem. Engineering Refresher (Tent. Sched.)

• ORIGIN - Univ. of Illinois

WISCONSIN LOCATIONS

Madison - UWEX, Harold Green, SEEN Coordinator, (608) 262-2061

Appleton - Institute of Paper Chemistry, Eugene Gibas, (414) 734-8731

Green Bay - UWGB, J. Wilbur Vickery, (414) 435-3211

Janesville - UW, Al Finger, (608) 752-7471, Ext. 254

La Crosse - Tran Company, I. T. Wetzel, (608) 782-8000

Manitowoc - Courthouse, John Buchholz, (414) 682-8811

Marinette - UWGB, Mrs. Mary Blazer, (715) 735-7477

Milwaukee - UWM, Paul Seaburg, (414) 228-4323

Racine - UWP, Kim Baugrud, (414)-Kenosha 658-4861, Racine 637-6744

Sheboygan - UW, H. L. Lautenschlager, (414) 458-5566

Waukesha - UW, R. Florence, (414) 452-8825

Wausau - UW, Mrs. Mary Freund, (715) 845-9602

ILLINOIS LOCATIONS

Belleville - U. of I. Extension Division, Mr. Fred W. Steuernagel, (618) 235-3980

Chicago - Circle Campus, Dick Casper, (312) 633-8560

Decatur - Farm Bureau Building, Mr. Warren E. Myers, (217) 877-6042

Freeport - Highland Community College, Mr. Robert VanRheeden, (815) 233-4011

Malta - Kishwaukee Junior College, Mr. Donald Higgs, (815) 825-2086

Morrison - General Electric Company, Mr. Ralph W. Gustafson, Manager, (815) 772-2131

Quincy - Gates Radio Company, Mr. Robert T. Fluent, (217) 222-8202

Rockford - Sundstrand Aviation, Mr. Stephen P. Symes, (815) 398-6800

Rock Island - Rock Island Arsenal, Dr. Virgil W. Alexander, (309) 794-7462

Rock Island - Quad-City Graduate Study Center, Dr. Virgil W. Alexander, (309) 794-7462

South Beloit - Warner Electric Brake & Clutch, Mr. Joseph E. Vercoe, (608) 365-3311

Springfield - U. of I. Extension Division, Mr. Walter V. Brown, (217) 525-7813

APPENDIX E

UNIVERSITY EXTENSION

The University of Wisconsin
606 State Street, Room 609
Madison, Wisconsin 53706
262-4342 • Area Code 608

Educational Communications

Memorandum

TO:

FROM: Lorne Parker and Harry Zimmerman

DATE:

RE: Evaluation Report of ETN-SCA Program

Introduction

ETN-SCA are media for instruction. The evaluation problem is complex. It involves the measurement of effectiveness in two fields, education and communication.

To meet this need, a Program Evaluation Checklist (PEC), an evaluation instrument, was developed to measure the strengths and weaknesses of an ETN-SCA program in order to assist the program coordinator and media specialist with establishing effective program design. Specifically, the PEC is concerned with measuring the participant's reaction to the overall program transmitted via the ETN-SCA systems.

The major evaluation variable is the educational program itself. It is assumed that expectations of this educational program can be systematically measured and evaluated. The expectations of a program via ETN-SCA follows.

It was assumed that expectations of this educational program could be defined and the organization, presentation and impact of the program could be systematically measured and evaluated. The expectations of an educational telephone program are measured in six aspects that make up an ETN program: (1) program facilities, (2) program convener, (3) program content, (4) program organization, (5) technical quality, and (6) program lecture.

First, the program presented over the educational telephone network will involve the development of an atmosphere which is conducive to learning (PF). Secondly, the program will be coordinated with the conveners at each listening station throughout the state of Wisconsin (M). Third, the program content will be organized and presented to maximize participant understanding and application of the course materials (C). Fourth, the program will be organized and presented as a well defined course unit (O). Fifth, the technical quality of the program transmitted via ETN (T), and sixth, the various aspects that determine a good lecture (PL).

These expectations were translated into the following specific and measurable evaluation variables:

(1) The Environment--the arrangement of the physical facilities, seating, lighting, etc.

(2) The Technical Components--the functioning of the mechanical components of the program (e.g. telephone equipment).

(3) The audio-visual materials--the use of auxiliary materials and equipment (slides, etc.).

(4) The Convener's behavior--the performance of the persons responsible for the individual listening stations.

(5) The Lecturer's behavior--the delivery of the course material.

(6) The Program Process--the involvement of the participants in the presentation and discussion of the program content.

(7) The Program Influence--the impact of the educational program upon the participants.

The Evaluation Instrument

The development of the Program Evaluation Checklist (PEC) for ETN programs involved a search for a systematic method of studying the profile of the adult participant and measuring the components of educational communication. Earlier research efforts included the use of questionnaires of open-ended questions which called for general evaluative comments and impressions from the participants. The information obtained from those questionnaires varied from participant to participant, depending, to a degree, on the patience and writing ability of each individual. This inherent instability in the data obtained from questionnaires contradicts our objectives of obtaining reliable evaluation data and formulating conclusions about a program with a high degree of confidence.

The search resulted in the selection of the rating scale method of evaluation, and the development of The Program Evaluation Checklist. This rating scale is best suited for this type of evaluation because it represents a systematic procedure for measurement. The data which may be derived from its use is amenable to statistical analysis. It is also a research tool which may be repeatedly employed to test hypotheses in the field of educational communications.

Purpose of Evaluation

The major purpose of the PEC evaluation method is to assist program coordinators and educational communication specialists in measuring the effect of a specific program design. The purpose is to determine the strengths and weaknesses of a particular program. This information will assist im making improvements in the program and provide students with the most suitable learning experience possible.

The evaluation results of a specific program are confidential and are only distributed to the program coordinator. As stated, it is the sole purpose of this evaluation system to assist with measuring the most effective program design so that the results of the evaluation can be built in to the next learning experience.

If the program coordinator wants to distribute the results of the evaluation, it is entirely up to that person. But this information will not be distributed by the ETN-SCA office to anyone but the program coordinator.

The Program Evaluation Checklist

The evaluation instrument consists of a list of statements (items) which define specific aspects of a program (its content, method of presentation, etc.). The participants were asked to evaluate each statement and determine how well it fits the description of this program. For example in evaluating the impact of the program, participants were asked to evaluate the statement: (19) "People tended to leave before the presentation was completed." They recorded their evaluation by selection of one of four categories:

( ) Not descriptive

( ) Minimally descriptive

( ) Somewhat descriptive

( ) Most descriptive

The Evaluation Method

The development of the Program Evaluation Checklist represents a part of the total program design. Evaluation was based on the checklist ratings obtained from participants in the educational program.

The procedures for evaluating this educational telephone program were designed to assure that ratings would be representative of the entire group of participants. From the total population of participants N-__________ (registration) samples were selected. The evaluation instrument consisted of 30 items. The sample consisted of N=______ that completed the PEC at the end of the program.

Program Evaluation Results

Program ______________________________ Time ________________

Date ________________________ Total Registration ______________

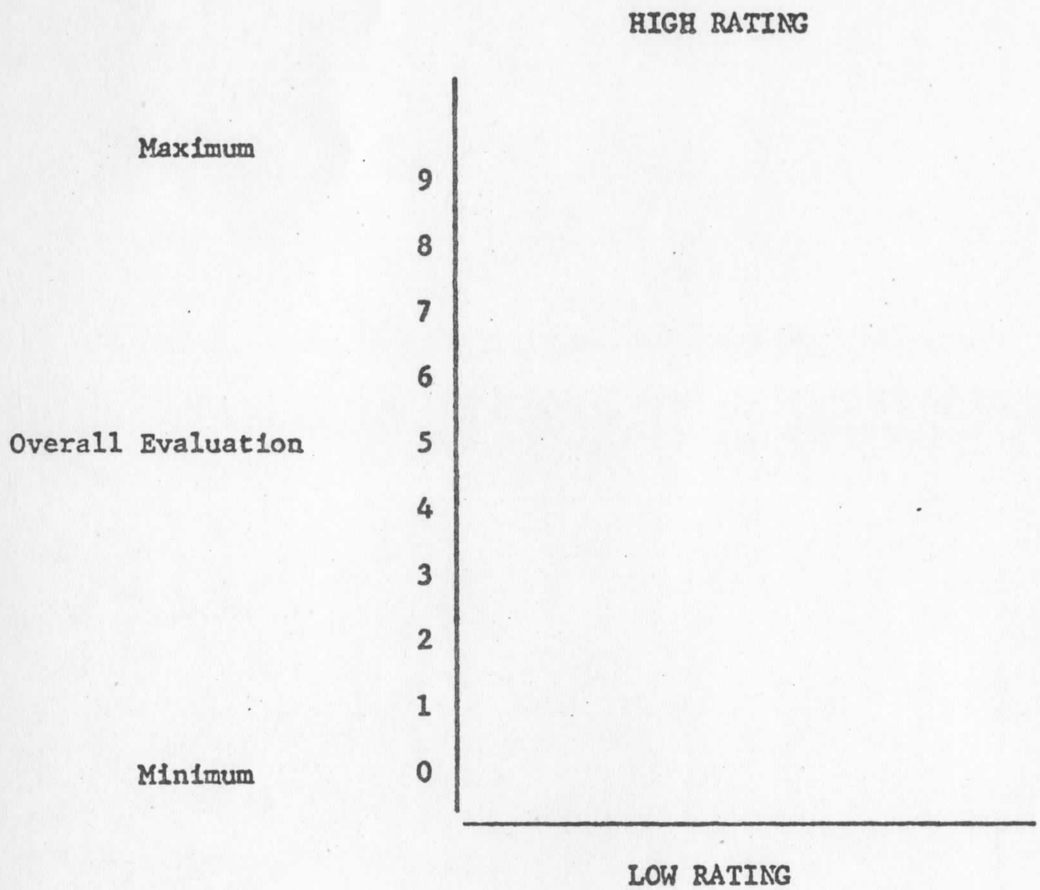
Total Evaluations Completed ____________ Program Coordinator __________

Department ________________________

Evaluation of the Program

Overall Evaluation

The participants were asked to evaluate the program as a complete unit. They recorded their evaluation by selecting a number on a nine (9) point distribution scale with a mid-point of _____. The participant's average rating of the program was _____.



Factor Evaluation -- Program Lecturer*

Four items on the evaluation instrument were concerned with the lecturer's voice, rate of speech, ease of presentation, etc. On a scale with the possible maximum rating of 16, thus an average of 8; the participant's mean rating was ______.

Factor Evaluation -- Convener

The convener is the person in charge of the local group meeting at one of the various ETN-SCA locations in the state. The convener is believed to be an important function in successful ETN-SCA programs. Thus, five items concerning the convener were included in this evaluation. The maximum rating was 20, thus an average of 10; the participant's average was _______.

Factor Evaluation -- Origination

The format of the program and involvement of individuals in the program were the main concerns here. There were six items with a maximum rating of 24. The average was 12, while the participant's average was _______.

*Each variable factor rating was based on an average derived by multiplying the number of items in the cluster by the item value (4) and dividing by (2). The participant's average rating was related to that figure.

Factor Evaluation -- Program Facilities

Two items were concerned with the arrangement of the room for hearing and discussion. This was to sample the location environment of each group. The maximum was 8 and the average 4, with the participant's average ________.

Factor Evaluation -- Program Material

This cluster with its seven items was one of the largest groupings. The maximum was 28, the average 14, with participant average rating at ________.

The graph shows how, in relationship with the maximum and averages, the various individual items were rated by the program participants.

Comments:

1971-72 FALL SEMESTER - ETN PROGRAMS

COURSE TITLE	COORDINATOR	PHONE	DATES	TIME
Brown Bag Seminar	D. Baker	262-2351	Nov. 3, Dec. 1, Feb. 2, Mar. 1	12 - 1 PM
Business Purchase Agreements	J. Keating	262-3833	Oct. 4, 11, 18, 25	12:10-1:30 PM
Continuing Education for School Librarians & Media Specialist	M. Fuller	262-3566	Oct. 4, 18; Nov. 1, 15, 29; Dec. 13	7-9 PM
Environmental Problems-Proposed Solutions	D. Hartmann	262-2061	Sept. 29; Oct. 6, 13, 27; Nov. 3, 10 Dec. 1, 8, 15; Jan. 5, 12, 26	6-8 PM
Exploring 4-H Project Problems	G. Barquest	262-3310	Nov. 5; Dec. 3; Jan. 7	10-11 AM
Health Science Librarians - A51	M. Fuller	262-3566	Sept. 22; Oct. 6, 20; Nov. 3, 17; Dec. 1, 15; Jan. 5*, 19*; Feb. 2*, 16*, Mar. 1*, 15*	10-12 noon *10:30-12 noon
Income Tax Preparation Refresher	J. Keating	262-3833	Dec. 7, 9, 14, 16, 21	4:30-6 PM
Intro. to Library Science - A50	M. Fuller	262-3566	Class A: Sept. 28; Oct. 12*, 26; Nov. 9*, 23; Dec. 7; Jan. 4, 25; Class B: Oct. 5, 19; Nov. 2, 16, 30; Dec. 21; Jan. 18	10-12 noon *10:30-12 noon
Issues in Vocational & Technical Education 310-520	H. Samson	262-3433	Sept. 13, 20, 27; Oct. 4, 11, 18, 25; Nov. 1, 8, 15, 22, 29; Dec. 6, 13, 20; Jan. 3, 10	4:30-6 PM
Library Trustees Series	M. Fuller	262-3566	Oct. 12, 26; Nov. 9, 23; Dec. 7	7:30-9 PM
Occupational Therapy	A. Johnston	263-2856	Oct. 13, Nov. 10, Dec. 8, Jan. 12	8-9:30 PM
Men and Masculinity	C. Threinen	262-9760	Oct. 21, 28; Nov. 4	9:30-11 AM
Municipal Labor Relations in Wis.	J. Keating	262-3833	Nov. 2, 9, 16, 23	4-5:30 PM

COURSE TITLE	COORDINATOR	PHONE	DATES	TIME
Nutritional Sciences #432	N. Johnson	262-9940	Sept. 22, 29; Oct. 6, 13, 20, 27; Nov. 3, 10, 17, 24; Dec. 1, 8, 15; Jan. 5, 12, 19, 26	4-6 PM
Partyline Conversation About Issues & Trends in Public Welfare	D. Baker	262-2351	Sept. 16, Dec. 16	1-3 PM
Public Library Series	M. Fuller	262-3566	Oct. 14, Nov. 11, Dec. 9, Jan. 13	10-12 noon
Public Service Careers Program	D. Baker	262-2351	Sept. 30	1-3 PM
Regional Arts Program Teleconference		262-4314	Sept. 14*, Oct. 5, Nov. 16, Dec. 14 Jan. 18*	7-8 PM *7-9 PM
Sea Grant	G. Hedden	262-0645	Nov. 18, Jan. 20	4:30-6 PM
Selected Topics in Pharmacology	J. Arndt	262-3130	Sept. 21; Oct. 5, 19; Nov. 2, 16, 30 Dec. 14	8-10 PM
Teaching Language Arts in Elementary School	R. Gelman	262-3880	Oct. 7, Nov. 11*, Dec. 2, Jan. 13*	6-7:30 PM *5:30-7 PM
Training Program for Directors/Coordinators for Senior Citizen Centers	E. Niedermeier	262-1411	Sept. 21, 28; Oct. 19; Nov. 16, Dec. 7, Jan. 25	9-10 AM
Veneral Disease & Society	J. Arndt	262-3130	Oct. 14, 21, 28; Nov. 4, 11	7-9 PM
Wis. Inactive Nurse Studies	R. Lutze	262-0566	Sept. 27; Oct. 11, 25; Nov. 8, 22; Jan. 10, 24	1:30-2:30 PM
Workshop for Freelance Writers	G. Hartung	262-3880	Oct. 25	7:30-9:30 PM

UNIVERSITY EXTENSION

The University of Wisconsin

628 Lowell Hall, 610 Langdon St.
Madison, Wisconsin 53706
262-4342 • Area Code 608

Educational Communications

ETN-SCA

MEMORANDUM

To: Local Program Administrators

From: Lorne A Parker

Date: September 30, 1971

Re: Utilization & Participation Survey of ETN Locations 1970-71

The survey material was collected from the ETN-SCA Program Announcements which indicated programs accepted by ETN locations and by Summary of Registrations which indicate the number of participants at each ETN location for each program.

Only programs with formal registration and ETN-SCA Program Announcements were included in the study. For example, a number of programs were used explicitly for staff meetings and informal Extension programs not requiring registration and thus contributing no participation figures.

Also the 140 hours of medical programs were not included in the study because most of the programs are involved in ETN-SCA hospitals throughout the state.

The study was designed to determine the utilization of 88 County-UW Centers and Campus ETN locations available during 1970-71. During this period 29 ETN-SCA programs, comprising more than 800 hours of instruction, were included in this study.

For each ETN location data is shown as to which programs each location initially agreed to receive, plus the number of actual participants each station had per program.

The total number of 1970-71 ETN participants excluding medical programs was 7,165. Total income collected from registration was $65.952.00.

The report is divided into three parts. Chart A shows the ranking of the ETN locations in order of total participants per location from the highest to the lowest participating locations. Chart B shows the percentage of ETN programs that each station agreed to take. Chart C is an alphabetical listing of the locations. Where two locations are in one city, the combined percentage of programs accepted for that area, as well as the total number of area participants, are shown. This data was compiled to determine whether one station's relatively limited program acceptance or participation might be attributable to the presence of another available ETN location in close proximity.

LAP/vds

enc.

cc. Steve Markstrom
Bob Dick
Luke Lamb

Chart A

Rank by

Total Number of Participants for 1970-71 ETN Programs

Rank		No. of Participants	% of Programs Accepted
1.	Madison - Wisconsin Center	520	90
2.	Milwaukee Civic Center	357	97
3.	Oshkosh Courthouse	206	76
4.	Waukesha UW Campus	198	72
5.	Janesville Courthouse	187	76
6.	La Crosse Courthouse	179	100
7.	Fond du Lac Co. Fairground	171	97
8.	Appleton Courthouse Annex	163	83
9.	Elkhorn Courthouse	152	97
10.	Juneau Courthouse	145	69
11.	Eau Claire Courthouse Annex	141	93
12.	Green Bay UW Campus	133	62
13.	Mauston Courthouse	132	90
14.	Superior Courthouse	127	79
15.	Wausau UW Marathon Co. Campus	121	93
16.	Green Bay Courthouse	115	55
17.	Menasha Fox Valley Courthouse	115	76
18.	Sheboygan UW Co. Campus	115	97
19.	Manitowoc Courthouse Annex	110	76
20.	Racine UW Parkside Campus	103	93
21.	Waukesha Courthouse	102	34
22.	Balsam Lake Ag Center	101	86
23.	Rhinelander Courthouse	101	65
24.	Chippewa Falls	99	72
25.	Kenosha Parkside Campus	98	69
26.	Lancaster Youth & Ag Bldg.	98	93
27.	West Bend UW Washington Co. Campus	96	83
28.	Jefferson Courthouse	94	79
29.	Wisconsin Rapids Courthouse	93	69
30.	Baraboo Courthouse	89	86
31.	Barron Courthouse	87	97
32.	Menomonie Courthouse	84	86
33.	Webster County Office Bldg.	81	69
34.	Milwaukee Marquette Law School	80	10
35.	Monroe Ag Bldg.	80	90
36.	Sparta Courthouse Annex	80	90
37.	Dodgeville Ag Center	79	90
38.	Ashland Courthouse	78	90
39.	Marshfield Wood Co. Campus	78	93
40.	Stevens Point County City Bldg.	76	90
41.	Whitehall Courthouse	73	79
42.	Milwaukee County Extension Office	72	62
43.	Neillsville Courthouse	72	79

Rank		No. of Participants	% of Programs Accepted
44.	Portage Ad Bldg.	72	86
45.	Medford Ag Center	66	93
46.	Kenosha Courthouse	66	38
47.	Ellsworth Courthouse	64	69
48.	Marinette Courthouse	63	62
49.	Oconto Courthouse	62	69
50.	Shawano Courthouse	62	76
51.	Sturgeon Bay Co. Safety Bldg.	62	86
52.	Richland Center Masonic Temple	59	65
53.	Viroqua Courthouse Annex Bldg.	58	69
54.	Darlington Courthouse	56	86
55.	Kewaunee Courthouse	54	86
56.	Antigo Courthouse	53	83
57.	Alma Courthouse Annex	52	66
58.	Phillips Normal Bldg.	52	69
59.	Port Washington Courthouse	47	65
60.	Janesville UW Rock County Campus	44	34
61.	Spooner Co. Highway Bldg.	44	86
62.	Baldwin Ag Center	41	66
63.	Black River Falls Courthouse	40	59
64.	Prairie du Chien	39	90
65.	Wautoma Courthouse	35	55
66.	Manitowoc Campus of UW-GB	34	41
67.	Eagle River Courthouse	30	62
68.	Durand Courthouse	30	69
69.	Green Lake Courthouse	30	76
70.	Hayward Courthouse	29	72
71.	Crandon Courthouse	27	41
72.	Merrill Courthouse	27	52
73.	Waupaca Courthouse	25	65
74.	Montello Courthouse	24	69
75.	Keshena Courthouse	24	31
76.	Chilton Courthouse	23	69
77.	Washburn Courthouse	22	76
78.	Hurley Courthouse	19	48
79.	Ladysmith Courthouse	19	69
80.	West Bend Courthouse Annex	16	34
81.	Friendship Courthouse	15	62
82.	Oshkosh Public Library	14	17
83.	Plymouth High School	14	55
84.	Florence Courthouse	6	10
85.	Marinette Campus of UW-GB	6	41
86.	Sturtevant Co. Office Bldg.	3	14
87.	Wausau Courthouse	3	21

The University of Wisconsin

TELEPHONE/RADIO CONFERENCES

1971-1972

For Physicians, Nurses, Pharmacists

and Allied Health Personnel

INTRODUCTION

During the coming academic year (September 1971-June 1972) physicians, nurses, pharmacists and allied health personnel in Wisconsin will again be able to participate in continuing education programs provided by University Extension over the Educational Telephone Network and Piggy-back FM Radio Channel.

This booklet is intended to give hospitals sufficient information to decide whether or not they wish to take part.

At this time we would like you to take the following action:

1. Decide if your hospital will participate during the 1971-1972 academic year.
2. Select the communications system you will use, either telephone or radio.
3. Return the enrollment form printed on the last page of the booklet.

We will then contact you by telephone concerning details of establishing your hospital station. Enrollment of individuals taking part in the various courses will take place at a later date.

COMMUNICATIONS METHODS

Conference stations, either telephone or radio, will be installed in participating hospitals. The Radio Network will only be available in certain geographical areas of Wisconsin where reception of good quality can be expected. Programming will be simultaneous over both networks.

Experience with the two circuits has indicated three major differences of importance to program participants:

1. Questions may be asked directly over the telephone circuit, but those listening by radio must place a collect telephone call to Madison to ask a question.
2. Long-range costs are lower for those receiving the programs by radio. Further details are available under section on registration fees.
3. There are more technical problems with the radio circuit.

EDUCATIONAL TELEPHONE NETWORK

A hospital on the Educational Telephone Network will have an installation consisting of a private telephone line, a telephone loudspeaker to amplify the incoming program, a telephone handset to communicate over the circuit, and slide projector and screen to show visuals.

All costs in connection with the initial telephone installaticn, rental and service are billed directly to and paid by the University. Changes in telephone location during the programming year, or installation of additional jacks, will be the responsibility of the hospital. The slide projector will be provided by the University, but the hospital is asked to provide a screen.

PIGGYBACK FM RADIO NETWORK

A hospital on the Piggyback FM Radio Network will be asked to purchase a special radio receiver ($144) and the associated antenna and loudspeaker (about $55), and provide a screen for projecting slides. A slide projector will be furnished by the University. Ownership, installation and maintenance of the radio equipment will be the responsibility of the hospital.

The University will assist in ordering the appropriate equipment and will privide technical advice on the best manner of installation of the antenna system.

COURSES OFFERED

Programming for the health professions is being expanded this year to include a number that were not served in previous years. A tentative listing of the courses follows, with detailed cirricula printed elsewhere in this booklet.

MEDICINE

General Medical Seminars - 27 Conferences
Pediatrics Journal Club - 12 Conferences

PHARMACY

Advances in Pharmacology - 7 Conferences

NURSING

Feelings in Patient Care - 8 Conferences
The Nursing Care of the Critically Ill - 8 Conferences
The Nursing Care of the Chronically Ill - 8 Conferences

ALLIED HEALTH

Food Service Administration - 8 Conferences
Hospital Administration - 9 Conferences
Housekeeping Seminars - 7 Conferences
Medical Librarians - 4 Conferences
Medical Record Librarians - 6 Conferences
Medical Technology - 8 Conferences
Postgraduate Seminars of Anesthesia - 9 Conferences
Occupational Therapy - 8 Conferences
Radiologic Technology - 8 Conferences

FEES

Hospitals may enroll in one of two ways:

1. Annual Fee to cover all personnel associated with the hospital for unlimited participation in the programs listed in this booklet, whether by radio or telephone. The Annual Fee covers all courses listed in this brochure. Included under this fee are all personnel on the staff or employed by the hospital; others from outside the hospital will be required to pay the individual fee to the University, even though they attend at your hospital station. There will be a number of programs for allied health personnel which will not be included under the Annual Fee, either because of a speical course structure or because the course is directed to personnel not primarily based in the hospital. These programs are not listed in this booklet.
2. Station Fee for joining the circuit, either radio or telephone, with each individual paying an enrollment fee to the University for each course he or she wishes to take.

ANNUAL FEES

The Annual Fee is prorated according to the number of beds in the hospital. Different fees apply to telephone and radio due to the difference in costs to the University.

Beds	Radio	Telephone
Below 50	$ 600	$ 800
50-100	700	900
101-200	850	1,050
201-300	1,050	1,250
301-400	1,200	1,400
401-500	1,350	1,550
Over 500	1,500	1,700

Those hospitals which enroll at the Annual Fee will have the alternative of paying the total fee at the beginning of the academic year, or paying in three segments during the programming period.

STATION FEE

Each hospital enrolled on the Station Fee basis will pay $200 as a registration fee, and the individual enrollment fee will be paid to the University by each person who enrolls in a specific course. These individual fees vary from one course to another and are listed with the curricula else where in this booklet. This individual fee is the same whether the program is received by telephone or radio.

Hospitals on the telephone network, enrolled on the Station Fee basis, must assure a total of $600 in individual fees during the academic year to insure that the station is self-supporting; there is no such requirement for hospitals on the radio network.

*** TELEPHONE/RADIO INFORMATION ***

For any information on registering your hospital for the Telephone/Radio Conference or more details regarding the Telephone/Radio Network, Contact

Ann Johnston, Coordinator, Postgraduate Medicine, 610 N.Walnut, Madison, Wisconsin, 53706 TELEPHONE 608-263-2854.

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GENERAL MEDICAL SEMINARS - 1971-1972

Tuesdays 7:30-8:30 A.M.
Replay 12:00-1:00 P.M.
Individual Registration Fee - $75.00

MANAGEMENT OF THE PATIENT IN SPECIAL SITUATIONS

Sept. 21	The Patient with Acute Athletic Injury
Sept. 28	The Patient with Urgent ENT Problems
Oct. 5	The Patient with Rectal Bleeding
Oct. 12	The Patient with Terminal Disease
Oct. 19	The Patient with a Thromboembolic Complication
Oct. 26	The Patient who Threatens or Attempts Suicide
Nov. 2	The Patient with Pneumothorax
Nov. 9	The Patient Requiring Resuscitation
Nov. 16	The Patient Requiring Central Venous Pressure Monitoring and/or Demand Pacing
Nov. 23	The Patient in the Special Care Unit - The Effects of Hazy Communications
Nov. 30	The Patient who Requires Hospital Care for Dermatological Conditions
Dec. 7	The Patient with Infection or in Danger of Infection
Dec. 14	The Patient with Urgent Urological Problems
Jan. 4	The Patient with Chronic Obstructive Pulmonary Disease
Jan. 11	The Patient in Coma

Quality of Care

Jan. 18	Problem Oriented Office Record
Jan. 25	Patient Care Evaluation
Feb. 1	The Pharmacist as a Member of the Health Team

Special Procedures

Feb. 8	Bone Marrow Sampling
Feb. 15	Blood and Blood Product Administration
Feb. 22	Cytological Specimen Collection
Feb. 29	Thorocentesis, Paracentesis, Pericardiocentesis and Joint Aspiration
Mar. 7	Liver Biopsy
Mar. 14	Instrumentation in G-I Tract
Mar. 21	The Lumbar Puncture
Mar. 28	Sampling of Blood and Body Fluids in Peidatrics
Apr. 4	Hazards of New Electronic Devices Used in Hospitals

MEDICINE

PEDIATRICS JOURNAL CLUB

Alternate Fridays, 12:30-1:30 P.M.
October 1 - March 31
Individual Enrollment Fee: $30.00

Current journals will be reviewed by Charles C. Lobeck, M.D., Chairman of the Department of Pediatrics, with assistance from the departmental faculty. One week prior to each session, registrants will receive a list of the articles to be discussed. Sessions will begin October 1 and be held every second week through March 31.

PHARMACY

ADVANCES IN PHARMACOLOGY: THE DEVELOPMENT OF A RATIONAL THERAPEUTICS

Tuesdays 8:00 - 10:00 P.M.
September 21-December 14
Individual Enrollment Fee - $20.00

Lecturer: Joseph M. Benforado, M.D.

Sept. 21	The Need for a Rational Therapeutics: "The Old Way is Not Always the Best Way"
Oct. 5	Chemotherapy: The Use of Antibiotics and Other Agents
Oct. 19	Psychotherapeutic Drugs: What do we know about the nervous system?
Nov. 2	The Cardiovascular System: New Drugs and New Knowledge About Old Drugs
Nov. 16	Fertility: The Pros and Cons of a Complex Problem
Nov. 30	Diuretics: Ways of Watering Down the Urine
Dec. 14	The Philosophy of the Therapeutic Nihilist: "Omnia in omnes".

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NURSING

NURSING SEMINARS

Individual Enrollment Fee for Total Classes: $30.00

SERIES A

FEELINGS IN PATIENT CARE

The First and Third Wednesday of Each Month
Replayed on the next 2 days following
the original program
Original program on Wednesday, 1:30-2:30 P.M.
Replay No. 1, Thursday, 3:30-4:30 P.M.
Replay No. 2, Friday, 9:45-10:45 P.M.
September 29-January 5
Individual Enrollment Fee - $11.25

Major Lecturer - Martha Mitchell, R.N., an Assistant Professor in the School of Nursing, The University of Wisconsin, Madison.

Sept. 29	Understanding Feelings - A Paradox or Possibility?
Oct. 6	What Place Have Feelings in Patient Care?
Oct. 20	The Sources and Shape of Patients' Feelings
Nov. 3	Problems in the Evaluation of Feelings
Nov. 17	Threatening Feelings: Hopelessness and Helplessness
Dec. 1	Positive Feelings in Nurse-Patient Relationships
Dec. 15	Helping Patients to Express Feelings
Jan. 5	The Use and Abuse of Feelings in Patient Care

NURSING

SERIES B

THE NURSING CARE OF THE CRITCALLY ILL

The Second Thursday of the Month
1:30-2:30 P.M.
October 15-May 11
Individual Enrollment Fee: $11.25

Part I - Katherine Bordicks, R.N., Associate Professor, University of West Virginia

Oct. 14	Introduction to Critical Illness
Nov. 11	Shock as a Critical Illness
Dec. 9	The Patient in Hemorrhagic Shock
Jan. 13	The Patient in Cardiogenic Shock

Part II - Margaret Anderson, R.N. - Cardiovascular Clinical Nursing Specialist

Feb. 10	The Patient with Myocardial Infarction
Mar. 9	The Patient with Congestive Heart Failure
Apr. 13	The Patient with a Pacemaker
May 11	The Patient with Pulmonary Embolism

SERIES C

THE NURSING CARE OF THE CHRONICALLY ILL

The First and Third Wednesday of Each Month
Replayed on the next 2 days following the original program
Original program on Wednesday, 1:30-2:30 P.M.
Replay No. 1, Thursday, 3:30-4:30 P.M.
Replay No. 2, Friday, 9:45-10:45 P.M.
January 19-May 3
Individual Enrollment Fee - $11.25

Faculty to be announced.

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FOOD SERVICE ADMINISTRATION SEMINARS

Fourth Wednesday of Each Month, 2:00-3:00 P.M.
September 22-May 24
Individual Enrollment Fee - $20.00

Sept. 22	Trends in Dietary Treatment
Oct. 27	Psychological Adaptations to Chronic Illness
Jan. 26	Nutrition and Growth
Feb. 23	New Food Products
Mar. 22	Maintaining a Wholesome Food Supply
Apr. 26	Modernizing Food Service Operations
May 10	Diet and the Prevention of Atherosclerosis
May 24	Diet and Gastro-intestinal Disease

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HOSPITAL ADMINISTRATION SEMINARS

Third Wednesday of Each Month, 9:00-10:00 A.M.
Replay 12:00-1:00 P.M.
September 22-May 17
Individual Enrollment Fee - $40.00

The 1971-1972 Hospital Administration Seminars will focus on the health care delivery system--its organization and its financing. Particular

Cont.

emphasis will be placed in the programs on the different arrangements of the health care delivery system that currently exists, such as the Kaiser Foundation Health Plan, and new systems that are being advocated such as the Health Maintenance Organization and the Health Care Corporation. Particular attention will also be paid to the financing of a reorganized health care delivery system, including prospective rate reimbursement and other systems of paying for health care.

Attention will also be directed to the pressures for controls utilizing the approaches of Certificate of Need Legislation, public utility regulation, etc.

These are times of great change and the health care field, and expecially hospitals, must be prepared to meet the challenges of these changes. The Seminars will focus on some of the aspects of the problems of change and the needed flexibility to cope with those changes.

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HOUSEKEEPING

HOUSEKEEPING SEMINARS

Second Wednesday each Month
1:30-2:30 P.M.
October 13-April 12
Individual Enrollment Fee -$15.00

Oct. 13	Proper Use of Fire Extinguishers
Nov. 10	Patient Evacuation
Dec. 8	Common Germicides: Their Selection and Use
Jan. 12	Operating Room Cleanliness
Feb. 9	To be announced
Mar. 8	To be announced
Apr. 12	To be announced

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MEDICAL LIBRARIANS

MEDICAL LIBRARY SEMINARS

Third Tuesday, Every Other Month
1:00-3:00 P.M.
November 16-May 16
Individual Enrollment Fee - $10.00

Nov. 16	The Place of Medical Libraries in the Statewide Library Network
Jan. 18	Planning or Remodeling the Hospital Library
Mar. 21	Money for Medical Libraries
May 16	Forum on Current Medical Library Problems

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MEDICAL RECORD LIBRARY SEMINARS

Fourth Thursday of Each Month, 1:00-2:30 P.M.
September 23-April 27
Individual Enrollment Fee: $20.00

Sept. 23	The Computer Applied to Medical Records -- PAS
Oct. 28	Nursing Home: Records and Problems - Health Discharge Study - Wisconsin 1968
Jan. 27	Record Management Problems -- How to prepare a budget - Writing Job Descriptions
Feb. 24	Psychiatric Records: Legal Aspects and Research
Mar. 23	Problem Oriented Records
Apr. 27	Standardization of Record: Uniformity from City to Nation

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MEDICAL TECHNOLOGY

MEDICAL TECHNOLOGY SEMINARS

Third Wednesday of Each Month, 7:00-8:00 P.M.
September 22-May 17
Individual Enrollment Fee: $20.00

The curriculum for the 1971-1972 Medical Technology Seminars is in the planning stages, awaiting further suggestion from program listeners.

It will be 8 lectures as in the past.

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ANESTHESIA

POSTGRADUATE SEMINARS IN ANESTHESIA*

Second Monday of Each Month 3:00-4:30 P.M.
September 20-May 8
Individual Enrollment Fee - $20.00

Sept. 20	Mechanics of Respiration Under Anthesia
Oct. 11	Anesthetic Systems - Heat, Accuracy, Moisture
Nov. 8	The Poisoned Patient
Dec. 13	Oxygen Therapy - Use and Dangers
Jan. 10	Anethetic Consideration in Tracheostomy, Bronchoscopy, Laparoscopy
Feb. 14	Drugs Before and After Anesthesia
Mar. 13	Blood Transfusion - The Anesthetics Role
Apr. 10	Shock
May 8	Malignant Hyperthermia

* By the Departments of Anesthesiology The University of Wisconsin Medical School and the Medical College of Wisconsin.

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OCCUPATIONAL THERAPY SEMINARS

Second Wednesday of Each Month 8:00-9:30 P.M.
October 13-May 10
Individual Enrollment Fee - $20.00

Oct.	13	Problems Encountered by the Physically Disabled Homemaker
Nov.	10	Principles of Work Simplification
Dec.	8	Determining Correct Work Heights and Storage Arrangements
Jan.	12	Special Problems of the One-handed Homemaker
Feb.	9	Helping the Homemaker with Arthritis
Mar.	8	Wheelchair Homemakers
Apr.	12	Aids for the Blind Homemaker
May	10	Barriers Inside and Outside the Home

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RADIOLOGIC TECHNOLOGY

First Wednesday of Each Month 8:00-9:15 P.M.
October 6 - May 3
Individual Enrollment Fee - $20.00

Oct.	6	The Point System of Radiographic Technique
Nov.	3	Neuro Radiography with the Mimer III
Dec.	1	Chest Radiography Using Air Gap Technique
Jan.	5	Application of Laser Holography to Diagnostic Radiology
Feb.	2	Radioisotope Labs, Function and Design
Mar.	1	Imaging Systems in Radiology
Apr.	5	Cine Studies of the Coronary Arteries, Pre and Post Operative
May	3	35mm Photograph of Radiographs

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SPECIAL NOTE

The University Extension departments of Postgraduate Medicine, Nursing, and Pharmacy have joined in an effort to place as many of their telephone/radio conferences as possible under the annual fee. However, there are some courses which will not be included under this fee for a variety of reasons--special course structure, content primarily directed to personnel based outside the hospital setting, etc. The annual fee rates are computed on the basis of the programming offered in this booklet.

FOR PROGRAM CONTENT INFORMATION

Thomas C. Meyer, M.D.
Department of Postgraduate Medicine
610 N. Walnut St.
Madison, Wisconsin 53706
Telephone: Area Code 608-263-2852

For detailed information on nursing programs, contact:

Mrs. Signe Cooper, R.N.
Department of Nursing
University Extension
Rm. 424, 610 Langdon St.
Madison, Wisconsin 53706
Telephone: Area Code 608-262-0566

For detailed information on pharmacy programs, contact:

Melvin Weinswig, Ph.D.
Extension Services in Pharmacy
University Extension
155 Pharmacy Building
425 North Charter Street
Madison, Wisconsin 53706
Telephone: Area Code 608-262-3130

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(Detach and Send in)

REGISTRATION FORM

Hospital ____________________

Street ____________________
City &
Zip Code ____________________ __________

1. Participation:

   _____Please enroll

   _____Not interested

2. Communications system:
   _____Telephone Network

   _____FM Radio Network

The person to contact for detailed arrangements is:

Name: ____________________

Telephone: ____________________

Return to:

Ann Johnston, Coordinator, Postgraduate Medicine, 610 N. Walnut St.
Madison, Wisconsin 53706

Report

of

SCA RELATIVE SIGNAL STRENGTH AND EQUIPMENT EVALUATION

Summer, 1971

Denton R. Jones
Otto K. Uyehara

20 September 1971

Report Sponsored by Controlled Communications Systems
Lorne A. Parker, Coordinator
Dennis A. Gilbertson, ETN-SCA Engineer

Facilities for the production of SCA programming are located at Radio Hall in Madison. From that point these signals travel via telephone line to the WHA-FM transmitter in Madison. It is there that the actual SCA radio signal is generated and passed on through a network of an over-the-air direct rebroadcast microwave system that links other member stations of the state FM network (see Table 2). By the time the SCA signal has reached these member stations it has already traveled many hundreds of miles. Its next journey is through the amplifying system of the local transmitting site, where it is re-modulated and finally sent to the transmission antenna and back out over the air waves, often for a second or third time. The actual receiver site is the last link between the SCA studio and clientele. A break in one of the links in this long chain of transmission and reproduction will cause a poor or unsatisfactory signal to be received by any individual receiver. This report is concerned primarily with the site itself and not the steps that preclude the final reception.

The second factor that affects reception of the SCA signal is found at the receiver site. It is the location of the unit, whether it is deep within a city five miles from the transmitter or high atop a hill 25 miles from the transmitter. The third factor is the type and location of the antenna. Usually the higher the gain of the antenna and the greater its altitude above the surrounding terrain, the better the reception. The fourth factor is the length, type and condition of the lead, or connection between the antenna and the receiver. The fifth factor affecting reception is the condition of the receiver itself. Normal adjustments, i.e. aligning of a receiver or re-orienting an antenna, were required at all but a few of the receiver sites visited. These factors limiting the reception that were not possible to eliminate due to our minor or normal adjustments are shown in Table 3.

Table 2

Station	Location	County	Began Operation	Frequency	Transmitter Power (watts)	Effective Radiated Power	Antenna Ht. above Ground (feet)	Antenna Ht. above Av. Terrain (feet)	Station from which Signal is Obtained	Method used to Receive Signal to be Re-broadcast *
WHA-FM	Madison	Dane	3/30/47	88.7	10,000	72,000	600	670	---	---
WHAD	Delafield	Waukesha	5/30/48	90.7	10,000	74,240	330	700	WHA	Re-broadcast feed (over air)
WHKW	Chilton	Calumet	1/1/49	89.3	10,000	51,700	454	740	WHA & WHAD	Re-broadcast and microwave
WHRM	Rib.Mt.	Marathon	6/10/49	91.9	10,000	74,760	535	1120	WHKW	Re-broadcast and microwave (to be completed)
WHWC	Colfax	Dunn	6/28/50	88.3	10,000	50,000	504	738	WHLA	Re-broadcast and microwave
WHLA	Holmen	La Crosse	11/21/50	90.3	7,500	38,300	404	840	WHHI	Re-broadcast and Microwave. (Re-broadcast & microwave link with WHA to be completed)
WHHI	Highland	Iowa	9/14/52	91.3	10,000	42,840	454	628	WHA	Re-broadcast and microwave (to be completed)
WHSA	Brule	Douglas	9/14/52	89.9	7,500 app.5,000 temporarily	Power reduced temporarily	361	551	WHWC	Re-broadcast and Microwave
WHMD	Suring	Oconto	6/12/65	91.5	5,000	37,000	340	9515	WHKW	Re-broadcast and Microwave

* A re-broadcast and microwave link is accomplished when the signal is received part way in its journey from station to station by a Microwave Transmission Station. There the signal is re-modulated at 950 mc. and sent the rest of the way to the next station on the network via microwave. Estimated completion date for these microwave links noted to be completed is 11/1/71.

Table 3

Sites Requiring Improvement

Site	Correction Necessary
Superior Courthouse	Improve signal from transmitter (Brule)
Washburn Courthouse	Improve signal from transmitter (Brule) & repair faulty receiver
Spooner County Bldg.	Improve signal from transmitter (Brule)
Ellsworth Courthouse	Replace crystal
Durand Courthouse	Erect outside (Yagi) antenna
Fond du Lac Post Office	Erect outside (Yagi) antenna
Manitowoc Courthouse Annex	Repair faulty receiver; more antenna to outside building
Milwaukee Civic Center	Thoroughly evaluate entire area to determine best location for SCA unit
Elkhorn Courthouse	Erect higher gain antenna (Yagi)
LaCrosse Courthouse	Erect outside (Yagi) antenna
Janesville Courthouse	Repair faulty receiver
Monroe Ag. Building	Repair faulty receiver
Middleton High School	Repair faulty receiver
Montello Courthouse	Erect outside (Yagi) antenna
Wisconsin Rapids Courthouse	Erect outside (Yagi) antenna
Marinette Courthouse	Erect outside (Yagi) antenna
Black River Falls	Extend length of antenna mast
Juneau High School	Reduce length & number of splices in coaxial cable
Horicon High School	Realign for Delafield
Waupun High School	Realign for Chilton

Physical Facilities of SCA Listening Sites:

The third purpose of this report is to give an idea of the physical facilities supplied by various county agents and high schools for their SCA unit. Generally SCA is established within the office of the County University of Wisconsin Extension Office and then extended through additional speakers to other rooms throughout the building. Often a room such as a conference room stores the SCA receiver and one speaker so that a small group of approximately 10-12 can listen to SCA without inconveniencing the agent at that particular location. At 42 of the 58 sites visited it was possible to combine the SCA listening area with the ETN station that was available at that site. If this was the case, then ETN could also be expanded and extended to other rooms throughout the building by extension jacks. Capacities ranged between service of an audience of four to an audience of over 400. The unit, which was portable such as the Educational receiver or an MR10 which was modified with rabbit ears and speaker attached could be carried to any room throughout the site, thus expanding the use of SCA and making it possible to combine ETN and SCA anywhere an ETN jack had been installed. On the following pages (see Table 4) I have listed the location or physical facilities of each particular SCA receiver site visited. That information includes the city; building in which the unit was installed; room number or room designation for the receiver itself; capacity of the listening room; telephone number of the phone nearest the SCA receiver; county in which the city was located; and the contact person, usually the county agent or in rare cases the high school science teacher. The capacity has been divided into two numbers. The first represents the set or established maximum number of audience; the second is the maximum number that the room or location will allow. That is to say that, if a room were somewhat movable, i.e. tables and desks could be moved and re-arranged, it was possible to estimate a maximum number of audience permissible at that particular site. If an ETN listening site could be combined with an SCA receiver site, the second number, or largest number, represents the maximum audience that could be listening to the two systems simultaneously. The second column in Table 4 lists the state FM network transmitter from which that particular receiver site receives its SCA signal. The third column illustrates reception. There were five categories from which we established the no signal, poor, acceptable, good and excellent reception rating. An unusable signal or no signal is one where cross-talk and noise make listening impossible. A poor signal represents a signal which is interfered with by cross-talk and a slight amount of noise that make listening difficult. An acceptable signal is one where cross-talk is present but the signal is listenable. A good signal has minimal cross-talk and minimal noise. An excellent signal has no cross-talk and is free of all noise. Noise in this case can be defined as static, crackling or some other kind of unprogrammed and unacceptable signal interference with the SCA transmission. Cross-talk is a second signal superimposed over the SCA signal so that a second program, other than the SCA program offered at that time, can be heard simultaneously. The second signal was most often the WHA Main Channel signal. Cross-talk is generally a fault that results at transmission of the signal rather than at the receiver site. The second portion of column 3 pertains to the relative signal strength found at each receiver site. An FSM-1 battery operated portable field strength meter supplied by Johnson Electronics was used to determine the relative field strength of the SCA signal and used in conjunction with aiming at the antenna for the transmitter offering the highest quality signal. The FSM-1 was not calibrated to give an accurate reading of field strength. It was used only to compare the relative signal strength at the site visited with the others included in this report. As you note in Table 4, the relative signal strength did not always correspond to the rating of that unit's reception. A high relative signal reading, one of .15 for example, could have produced good, acceptable, or even poor reception. Where relative signal strength reading was not available (see Table 4), this generally meant that a 300 ohm antenna lead had been utilized or the antenna that had been installed at the site was not accessible for a reading. The FSM-1 is equipped to accept only a 72 ohm antenna lead input. The fourth column indicates the equipment that was installed at each site. The antenna, type of lead from antenna to receiver, and the length of that lead is recorded in oneportion of this column; the receiver model (MR10, IC-20 or Educational) is noted in a second portion of this column and whether or not an ETN listening site can be combined with SCA at that site is noted in the third portion of the column. A fifth column was employed to include comments or suggestions pertaining to the improvement of the SCA reception at that particular site.

A map of Wisconsin showing all the sites visited this summer will be found on the last page of this report.

Quality o f SCA Signal:

Each site has been established as to its location in the state and the potential quality of SCA signal reception. The single parallel lines within the area suggested as the coverage area for a transmitter of the FM network corresponds to an acceptable reception rating. The double or perpendicular running lines in the circle closest to the transmitter site represent a good or excellent reception rating. Six receiver sites lie beyond the coverage age of any of the nine transmitters. These include Superior, Washburn, Spooner, Barron, Ellsworth and Montello. Those six that lie in the open area of the state free of any shadowing have a rating of poor or of no signal reception. The poor reception at the Brule receiver sites is due to poor transmission from the Brule transmitter. When the signal from the Brule transmitter was being evaluated for purposes of this report, the transmitter was operating at reduced power from a temporary antenna. Once this temporary state has been corrected, all three sites, Superior, Spooner and Washburn, should receive if not good then at least acceptable reception. The two sites receiving their SCA signal from the Colfax transmitter have two individual problems. The first, Barron, has no antenna. The second, Ellsworth, had the wrong crystal originally installed. Once these two problems are corrected, reception should be at least acceptable. The sixth site, Montello, which receives its SCA signal from the Madison transmitter, has been operating with a rabbit ears type of antenna, which does not supply sufficient gain at that distance from the transmitter to allow for acceptable reception. The Milwaukee Civic Center receiver site is another location that receives a poor signal, note of which will be made here. While visiting in Milwaukee at the site, it was impossible given the instruments and equipment that we had available to us to determine the exact cause of the lack of reception.

APPENDIX F

The Wisconsin Center
Summary of Events & Attendance
For Fiscal Year July 1, 1970 - June 30, 1971

	Conferences & Institutes			Classes & ETN			Committees			Miscellaneous			TOTAL		
	# EVENTS	# CONFEREES	CONFEREE DAYS	# EVENTS	# CONFEREES	CONFEREE DAYS	# EVENTS	# CONFEREES	CONFEREE DAYS	# EVENTS	# CONFEREES	CONFEREE DAYS	# EVENTS	# CONFEREES	CONFEREE DAYS
1 Day	271	17,447	17,447	34	859	859	604	11,880	11,880	257	19,504	19,504	1,166	49,690	49,690
2 Day	164	12,231	24,462				16	381	762	4	128	256	184	12,740	25,480
3 Day	169	7,679	23,037	6	182	546	5	153	459	6	1,020	3,060	186	9,034	27,102
4 Day	15	764	3,056	11	391	1,564	1	30	120				27	1,185	4,740
5 Day	58	2,484	12,420	6	160	800							64	2,644	13,220
6 Day	8	406	2,436	11	495	2,970				1	7	42	20	908	5,448
7 Day	4	610	4,270	1	25	175							5	635	4,445
8 Day	2	145	1,160	7	221	1,768							9	366	2,928
9 Day	3	82	738	2	152	1,368							5	234	2,106
10 Day	6	399	3,990	4	100	1,000							10	499	4,990
11 Day	1	45	495	3	55	605							4	100	1,100
12 Day				3	57	684							3	57	684
13 Day				2	27	351							2	27	351
14 Day				2	50	700							2	50	700
15 Day	5	132	1,980										5	132	1,980
16 Day				3	110	1,760							3	110	1,760
17 Day				1	35	595							1	35	595
18 Day				4	100	1,800							4	100	1,800
19 Day				1	20	180							1	20	180
20 Day	4	95	1,900										4	95	1,900
21 Day	1	45	945	2	36	756							3	81	1,701
23 Day				1	10	230							1	10	230
24 Day				1	30	720							1	30	720
27 Day	1	47	1,215	1	10	270							2	57	1,485
31 Day				1	8	248							1	8	248
32 Day				1	1	32							1	1	32
33 Day				1	8	264							1	8	264
34 Day				2	40	1,360							2	40	1,360
37 Day				1	15	555							1	15	555
42 Day				1	41	1,722							1	41	1,722
50 Day	1	22	1,100										1	22	1,100
78 Day	1	15	1,170										1	15	1,170
TOTAL	714	42,648	101,821	113	3,238	23,882	626	12,444	13,221	268	20,659	22,862	1,721	78,989	161,786

THE WISCONSIN CENTER
NUMBER OF EVENTS & ATTENDANCE
Fiscal Year July 1, 1970 - June 30, 1971

	EXTENSION			U.W.			STATE			OTHER			TOTALS		
	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS
1 Day	159	7793	7793	85	5861	5861	20	1493	1493	7	2300	2300	271	17,447	17,447
2 Day	105	7168	14,336	46	3135	6270	12	1301	2602	1	627	1254	164	12,231	24,462
3 Day	143	5985	17,955	19	1499	4497	5	169	507	2	26	78	169	7,679	23,037
4 Day	12	639	2,556	2	65	260	1	60	240	-	---	----	15	764	3,056
5 Day	48	1650	8,025	9	759	3795	1	120	600	-	---	----	58	2,484	12,420
6 Day	7	361	2,166	-	----	----	1	45	270	-	---	----	8	406	2,436
7 Day	3	110	770	1	500	3500	-	----	----	-	---	----	4	610	4,270
8 Day	1	115	920	-	----	----	1	30	240	-	---	----	2	145	1,160
9 Day	3	82	738	-	----	----	-	----	----	-	---	----	3	82	738
10 Day	4	170	1,700	2	229	229	-	----	----	-	---	----	6	399	3,990
11 Day	1	45	495	-	----	----	-	----	----	-	---	----	1	45	495
15 Day	2	41	615	3	91	1365	-	----	----	-	---	----	5	132	1,980
20 Day	4	95	1,900	-	----	----	-	----	----	-	---	----	4	95	1,900
21 Day	-	----	-----	1	45	945	-	----	----	-	---	----	1	45	945
27 Day	-	----	-----	1	47	1215	-	----	----	-	---	----	1	47	1,215
50 Day	1	22	1,100	-	----	----	-	----	----	-	---	----	1	27	1,100
78 Day	1	15	1,170	-	----	----	-	----	----	-	---	----	1	15	1,170
TOTAL	494	24,246	62,239	169	12,231	29,998	41	3218	5952	10	2953	3632	714	42,648	101,821

NUMBER OF EVENTS AND ATTENDANCE
AT THE WISCONSIN CENTER FOR EXTENSION CLASSES AND ETN CLASSES
For The Fiscal Year July 1, 1970 to June 30, 1971

	EXTENSION CLASSES			ETN			CUMULATIVE TOTAL		
	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS	NO. OF EVENTS	NO. OF CONFEREES	CONFEREE DAYS
1 Session	6	182	182	28	677	677	34	859	859
3 Session	3	102	306	3	80	240	6	182	546
4 Session	7	306	1224	4	85	340	11	391	1564
5 Session	4	110	550	2	50	250	6	160	800
6 Session	10	435	2610	1	60	360	11	495	2970
7 Session	1	25	175	---	----	---	1	25	175
8 Session	6	206	1648	1	15	120	7	221	1768
9 Session	1	150	1350	1	2	18	2	152	1368
10 Session	3	90	900	1	10	100	4	100	1000
11 Session	1	35	385	2	20	220	3	55	605
12 Session	3	57	684	---	----	---	3	57	684
13 Session	---	----	-----	2	27	351	2	27	351
14 Session	1	25	350	1	25	350	2	50	700
16 Session	2	70	1120	1	40	640	3	110	1760
17 Session	---	----	-----	1	35	595	1	35	595
18 Session	4	100	1800	---	----	---	4	100	1800
19 Session	1	20	180	---	----	---	1	20	180
21 Session	---	----	-----	2	36	756	2	36	756
23 Session	---	----	-----	1	10	230	1	10	230
24 Session	1	30	720	---	----	---	1	30	720
27 Session	---	----	-----	1	10	270	1	10	770
31 Session	---	----	-----	1	8	248	1	8	248
32 Session	---	----	-----	1	1	32	1	1	32
33 Session	---	----	-----	1	8	264	1	8	264
34 Session	1	30	1020	1	10	340	2	40	1360
37 Session	---	----	-----	1	15	555	1	15	555
42 Session	1	41	1722	---	----	---	1	41	1722
CUMULATIVE TOTAL	56	2014	16,926	57	1224	6956	113	3238	23,882

THE WISCONSIN CENTER
SUMMARY OF REPORTS OF USE
NUMBER OF EVENTS
1960-61 to 1970-71

	Conferences & Institutes		ETN* & Classes		Committee & Staff		Miscellaneous		TOTAL
	No.	%	No.	%	No.	%	No.	%	No.
1960-61	482	48.5			327	32.8	185	18.6	992
1961-62	478	42.0			441	39.7	194	17.4	1113
1962-63	505	43.7			437	37.9	212	18.4	1154
1963-64	571	56.3			222	21.9	222	21.9	1015
1964-65	780	63.5			225	18.3	225	18.3	1230
1965-66	1006	70.0			280	19.5	150	10.4	1436
1966-67	1204	75.8			226	14.2	158	9.9	1588
1967-68	1325	66.9			436	23.4	193	9.7	1981
1968-69	1268	57.9			618	28.2	305	13.9	2191
1969-70	727	43.0	137	8.1	620	36.7	207	12.2	1691
1970-71	714	41.5	113	6.6	626	36.4	268	15.5	1721

*ETN & Madison Classes were included in Conferences & Institutes previous to 1969-70 with each session counting as an event. Under old system Conferences & Institutes would have had 619 more events or 1346 instead of 727.

THE WISCONSIN CENTER
NUMBER OF EVENTS AND ATTENDANCE
MISCELLANEOUS EVENTS

For The Fiscal Year July 1, 1970 June 30, 1971

	MISCELLANEOUS									CUMULATIVE TOTAL		
	E. LECTURE			F. STUDENT			G. OTHER					
	# EVENTS	# CONFEREE	CONFEREE DAYS	# EVENTS	# CONFEREE	CONFEREE DAYS	# EVENTS	# CONFEREE	CONFEREE DAYS	# EVENTS	# CONFEREE	CONFEREE DAYS
1 Day	50	4,849	4,849	48	2,766	2,766	159	11,889	11,889	257	19,504	19,504
2 Day							4	128	256	4	128	256
3 Day				1	300	900	5	720	2,160	6	1,020	3,060
6 Day							1	7	42	1	7	42
TOTAL	50	4,849	4,849	49	3,066	3,666	169	12,744	14,347	268	20,659	22,862

THE WISCONSIN CENTER
SUMMARY OF REPORTS OF USE

NUMBER OF ENROLLEES
1960-61 to 1970-71

	Conferences & Institutes		ETN & Classes		Committee & Staff		Miscellaneous		TOTAL
	No.	%	No.	%	No.	%	No.	%	
1960-61	29,508	54.7			9,905	18.3	14,537	26.9	53,950
1961-62	30,053	57.8			10,007	19.2	11,955	23.0	52,015
1962-63	32,954	57.7			10,670	19.0	13,221	23.2	57,045
1963-64	33,884	55.5			8,238	13.5	18,862	30.9	60,984
1964-65	43,340	61.5			8,154	11.6	18,721	26.7	70,215
1965-66	59,605	70.5			13,311	15.8	11,722	13.8	84,638
1966-67	57,020	72.4			8,591	10.9	13,162	16.7	78,773
1967-68	64,063	70.2			11,572	12.7	15,956	17.5	91,206
1968-69	58,492	62.3			14,583	15.6	20,708	22.1	93,783
1969-70	47,047	59.3	3,773	4.8	10,994	13.9	18,084	22.8	79,369
1970-71	42,648	54.0	3,238	4.0	12,444	15.8	20,659	26.2	78,989

THE WISCONSIN CENTER
NUMBER OF EVENTS AND ATTENDANCE
COMMITTEE & STAFF MEETINGS

For The Fiscal Year July 1, 1970 June 30, 1971

	# EVENTS	# CONFEREES	CONFEREE DAYS
1 DAY	604	11,880	11,880
2 DAY	16	381	762
3 DAY	5	153	459
4 DAY	1	30	120
TOTAL	626	12,444	13,221

APPENDIX G

CABLE TELEVISION'S INTERACTIVE CAPABILITY: PRESENT STATUS AND POTENTIAL APPLICATIONS

LARRY W. CHAMBERS

OCTOBER, 1971

CABLE TELEVISION'S INTERACTIVE CAPABILITY: PRESENT STATUS AND POTENTIAL APPLICATIONS

> Within the past 20 years, a new communications medium has developed in the United States that will have a far-reaching impact on the social and economic structure of our society. It has been called by several names, starting out as Community Antenna Television (CATV), then Cable Television, and today some persons are beginning to use the words Broadband Communications Networks (BCN). Each name relates to a stage in the development of the industry: Beginning - Present - Future.[1]

An estimated 5.3 million homes in the nation are presently reached by cable systems.[2] That figure does not seem staggering when it is realized that cable firms have been in existence for approximately twenty years, but it must be understood that the development to date has taken place under stifling pressures from broadcasters and their representatives within the FCC. Cable systems have been relatively free to develop in low population rural areas, but since 1966 the FCC has halted their development in the nation's top 100 markets, while the commission deliberated on a comprehensive cable policy. This deliberation period is nearly over and indications point to the FCC's opening of the top 100 markets for distant signal importation as early as March 1, 1972. As cable firms expand into the top 100 markets, many of which already receive a substantial number of broadcast signals, it may become evident that the mere distribution of broadcast signals will not be the most profitable nor marketable service the cable firms can provide. The two-way broadband capability of CATV provides a means of experimenting with services yet untested in the majority of the nation's market areas.

The Federal Communications Commission in its letter of proposed rulemaking for CATV of 5 August 1971 stated:

> After studying the comments received and our own engineering estimates, we have decided to require that there be built into cable systems the capacity for two-way communication. This is apparently now feasible at a not inordinate additional cost, and its availability is essential for many of cable's public services. Such two-way communication, even if rudimentary in nature, can be useful in a host of ways -- for surveys, marketing services, burglar alarm devices, educational feedback, to name a few. Of course, viewers should also have a capability enabling them to choose whether or not the feedback is activated.[3]

This statement indicates that the FCC has realized the potential that exists within cable systems for providing new broadband two-way services, and is making an attempt to assure that this potential is not disregarded as new systems are constructed.

More than just becoming a collection point and means of distribution for broadcast signals, CATV has the potential of providing many services never before feasible using the current communication links of telephone lines and broadcast airwaves. The wiring of a community with coaxial cable will provide that community with a total communications link which could provide such services as teleconferencing,

> ...facsimile reproduction of newspapers, magazines, documents, etc.; electronic mail delivery; merchandising, business concern links to branch offices, primary customers or suppliers; access to computers, e.g., man to computer communications in the nature of inquiry and response (credit checks, airlines reservations, branch brnking, etc.) information retrieval (library and other reference material, etc.) and computer to computer communications; the furtherance of various government programs on a Federal, State and municipal level, e.g., employment services and manpower utilization, special communications systems to reach particular neighborhoods or ethnic groups within a community, and for municipal surveillance of public areas for protection against crime, fire detection, control of air pollution and traffic; various educational and training programs in the nature of "Project Headstart", and to enable professional groups such as doctors to keep abreast of developments in their fields; and the provision of a low cost outlet for political candidates, advertisers, amateur expression (e.g., community or university drama groups) and for other moderately funded organizations or persons desiring access to the community or particular segment of the community.[4]

The suggestion is not being made that all of these services will be immediately feasible as soon as cable firms have strung their cable throughout a city. The FCC's proposed rulemaking states that the services may be of "rudimentary" nature. Cable technology is still in the development stage and any premature unlimited broadband two-way requirements might detain present CATV development.

When considering unlimited two-way capability, more than a telephone grade channel in reverse direction, certain technical problems arise.

> If broadbands are to be dedicated to individual use, and if one sender is to be able to reach different receivers, probably it will be necessary to go to a circuit switched system analogous to the telephone, or at least a message switched system operated by store-and-forward computers. Both would be a substantial technological leap beyond (most) existing CATV systems. But without such switching capability it is difficult to conceive of the CATV distribution systems (in contrast to some of its interconnecting facilities) being used for some of the purposes frequently mentioned: data transmissions, and face-to-face or multi-party video conferences (for educational, marketing, financial or other purposes). For such purposes, and also for some of the purposes previously mentioned (notably ordering programs or information unique to each subscriber), a whole new generation of CATV systems will be required, probably involving separate cable pairs from each subscriber to a switching center (analogous to the present telephone network).[5]

Although many of the switched services do hinge on future technological developments that will increase the economic feasibility of providing such services, they still are possible and will in all likelihood be included in the proposed services of future franchise applicants. The implementation of limited rudimentary two-way services is immediately feasible and as proposed by the FCC will be a part of all newly constructed systems within the top 100 markets.

II

> The inherent potential of CATV systems comes from the very nature of the coaxial cable and its built-in economic incentive to spread throughout the community as the third wired system, after the electric power cables and telephone lines.[6]

The nature of the coaxial cable and the head-end equipment associated with it gives cable systems two characteristics, expanded channel capacity and wide bandwidth, that form the basis for the majority of cable television's future use predictions. The total number of channels provided by a cable system is not actually determined by the coaxial cable, but by the head-end equipment such as amplifiers, couplers, and dividers. At the present time, most cable systems being constructed have approximately a twenty channel capacity, but this is by no means a limit. A system is currently operating in Akron, Ohio with a channel capacity of sixty-four. Virtually any channel capacity desired can be achieved as is pointed out by Nathaniel Fledman --

> If four of the present cables were installed in a single duct in one operation, one could have a 48-channel TV distribution system tomorrow. Due to some economics of scale and some learning effects, the cost per mile of the operation is likely to be only 2 to 2.5 times as much as the cost of a single cable for the cheapest system, and much less than this factor for the most expensive systems, e.g., systems where the costs of trenching are high. In 10 to 20 years, a four-cable system could provide 400 channels of television.[7]

Coaxial cable has an approximate bandwidth approaching the 300 MHz level. "Nowhere else are bandwidths approaching the 300 MHz level available."[8] Telephone service into the home has an approximate bandwidth of .0035 MHz and even the so-called wide band microwave systems in no way approach cable's bandwidth.

> Present hardware is able to simultaneously carry frequencies up to approximately 300,000,000 cycles per second (300 MHz). The present telephone network, consisting of a randomly selected twisted pair, can handle only up to 3,500 cycles per second ... With higher grade preselected and dedicated lines, and with line equalizers and other sophisticated techniques, this can be extended to the 1.0 to 1.5 MHz range.[9]

A further idea of the increased bandwidth capacity of cable systems can be gained from the present FCC frequency assignments in this 0 to 300 MHz frequency band for over-the-air signal transmissions.

0 - 54 MHz	Fixed and mobile transmitters
54 - 88 MHz	TV channels 2 - 6
88 - 108 MHz	FM radio
108 - 174 MHz	Aeronautical radio navigation, air, land and maritime mobile
174 - 216 MHz	TV channels 7 - 13
216 - 300 MHz	Fixed and mobile radiolocation

The present head-end costs (excluding building rental and improvement) in a CATV system are approximately $1500 per channel.[10] Cable installation costs vary depending on the area in which the cable is being laid. In rural areas the cost is around $4000 per mile and in metropolitan areas the cost could range up to $50,000 per mile.[11] Factors such as whether the cables are to be laid underground or strung from poles greatly effect the price. The total cost of the average system ranges between $500,000 and $1,000,000.[12] Limited two-way services require an estimated incremental capital investment, including terminal and head-end modifications, by the cable operator of 50% to 100% more than the total cost of a one-way system.

In a study done by the National Education Association certain cost comparisons were made between cable, ITFS, and microwave transmissions for school use. Some of their figures might help to put cable costs in the proper perspective.

> If an ITFS transmission system were employed, costs would include approximately $18,000 for transmission equipment per channel and $1,800 per school for a receiving antenna, a down-converter, and a power supply unit. In some cases where one university wants to connect with another university, a point-to-point system is most economical. A point-to-point microwave system (not to be confused with ITFS) will cost approximately $11,000 for transmission equipment per channel and $7,250 for reception. The microwave system is limited to transmission from one location to another location, and additional transmitters and receivers would be required for each school. The ITFS transmitter, however, can be received at several locations at one time, as it is not a point-to-point system.[13]

III

> The thirty largest urban centers of the United States contain over 37 million telephones, one-third of all the telephones in the country. Approximately 65% of these are for residential use, the rest are for business, government and others. The usage is high -- the five million telephones connected to the common carrier network in New York City alone generate more than thirty million calls each business day. The accessibility is high -- over 90% of all residences in the country contain at least one telephone.[14]

The nature of the telephone network is that it is a switched-network, designed to optimize selective, two-way, user to user communications. Cable television in light of present technology is basically a one-way distribution system having the potential for limited return feedback to a central location. If future predictions regarding technological advances in the field of cable hardware are accurate, CATV may at one time be in competition with telephone service on a user to user basis, but for the present and near future, cable's two-way capacity will be limited to interaction between users and a central point. The user will need to be equipped with two devices in order to interact within a cable system; a television set and an interactive home terminal for response. One of the simplest interactive home terminals is the touch tone telephone. The interconnection of these devices to a central computer could provide limited two-way services presently not possible considering the devices separately.

In the initial stages, cable's principle two-way use will most likely be for polled digital subscriber response. Viewers could be asked to respond to a certain situation by punching one of a number of buttons on his home terminal. If the program happens to be a lecture or class, responses could be compiled by a computer to show the number and nature of the responses. This could give the lecturer some idea of how many people are comprehending the material, which could then determine the nature of how he presents the remainder of the lecture.

> The polled subscriber response system provides a basic tool for a wide variety of educational services, including both a restricted form of computer-assisted instruction and instructional TV with student participation via simple responses. In addition, it provides the basic mechanism that allows subscribers to call for other services as needed, such as the use of a private channel to a computer at the main studio, or access to a pay TV channel. It could also be designed to supply the subscriber-to-main studio channel at full teletype speed for a variety of interactive individual services such as interactive computer or interactive library services.[15]

In certain situations polled subscriber response may not provide enough detail to handle the problems that arise in a lecture or classroom situation. In some cases direct student participation may be required. The polled digital subscriber response system could then be used by the student to request an audio channel by pushing the right combination of buttons on his terminal unit. The teacher could then assign him an audio channel. By assigning one audio channel for each course being taught over the system, the channel requirement placed on the entire system would be kept to a minimum. One audio channel would be needed for each outgoing TV channel providing lectures or classes. Services such as polled digital response and requested audio channels will most likely characterize early two-way developments in cable systems. Within a relatively few number of years, advances in the electronic technology of home terminals, integrated circuits, and magnetic recording will make complex interactive home terminals technically and economically possible. These advances coupled with new developments in two-way switching will enable cable firms to offer a greater range of two-way services.

IV

There is now a pressing need for research into the feasibility of cable systems offering expanded two-way services. This research coupled with constant evaluation of existing cable systems will yield the maximum benefits from cable communications.

> Pilot projects involving cable TV systems will be constrained by the hardware and distribution systems presently in existence. However, it should be obvious that CATV pilot projects that require the simulated broadcast feature of the distribution networks can be tried immediately and directly on any of the many existing CATV systems. Thus experiments requiring the wide bandwidths for the

> information transfer, and taking advantage of the heavy consumer investment in TV sets are immediately implementable in existing CATV systems.[16]

Already there are at least three experimental interactive cable systems: one in Overland Park, Kansas, one in Los Angeles, California and another in Reston, Virginia. The Overland Park system is experimenting with two-way instruction for disabled children. With the aid of a touch tone type device and a small camera the student and the teacher are able to both see and converse with each other. If this Kansas experiment is successful, the school system will seek an educational grant to make two-way communication a permanent part of their educational program.[17]

The Hughes Aircraft Company is now involved in a multi-service, two-way system to be tested this fall in Los Angeles. This system is designed to include a device that prints incoming information on a continuous strip of paper.[18]

Certain users of Reston, Virginia's cable system are involved in an experiment utilizing user to computer communications.

> The MITRE Corporation of McLean, Virginia is presently testing the "...feasibility of combining its TICCIT (time-shared, interactive, computer-controlled, information television) system with a low-cost home terminal system of its own invention, which utilizes a standard television receiver as a display. During the tests, computer-generated information, including voice and still pictures, emanating from MITRE's to various locations in Reston by cable TV. Users at the various locations in

> Reston will communicate with the MITRE computer through their 12-button push-button phones. The Reston Transmission Company, a subsidiary of Continental Telephone Company, is cooperating with MITRE in the test by providing certain services, including the use of its cable TV system.
>
> Engineering tests of the system will begin in mid-May (1971), and early public demonstrations are planned for the first week of July.
>
> The goals of the Reston test are threefold: (1) to demonstrate a working engineering model of MITRE's low-cost computer-driven display in the home; (2) to demonstrate the feasibility of the hardware approach to operators of cable TV systems and manufacturers of video tape recorders; (3) to interest the social-science community in the tremendous near-term impact of this type of hardware, coupled with strong supporting software, will have on the lives of people.
>
> MITRE, a nonprofit Federal Contract Research Center formed to supply technical advice to various government agencies, is enjoined from producing and marketing the hardware associated with the TICCIT system to be tested in Reston and is carrying out the work wholly in the public interest.[19]

These three experimental cable systems demonstrate that various forms of two-way cable communication are indeed possible. Now it will be necessary to evaluate the technical and economic feasibility of extending these varied two-way capabilities to other cable systems. Although the FCC received comments from technical organizations before proposing that two-way services be required in all cable systems, the actual feasibility of those services will be determined through experiments such as the ones just described.

The impact of even the limited two-way capacity of cable television will be significant on both the educational community and the general public. Community groups will hopefully have at their disposal a means for interacting with their neighborhood or city, while educators will have a new tool for research into large scale education and the effectiveness of teaching methods such as the telelecture. As two-way experiments at the community and neighborhood level progress there will in all probability be a desire to extend such experiments to a statewide or even national level. For this a means of interconnection will be necessary.

For interconnecting systems in the same general area, possibly microwave or cable will be the most desireable means, however when interconnection is to be with distant locations, certain economic and technical factors render these methods undesireable. For distant interconnection the possibility exists that satellites will be found to be the most desireable means. Teleprompter's domestic satellite system application states that the only means of interconnection which complements the characteristics of CATV as a broadband distribution system is communication satellites. These thoughts of interconnection serve to enhance the potential and the impact of the interactive services possible within cable systems. In order to obtain the maximum benefit from both cable and satellite communications, further research into the feasibility of interactive services and systems interconnection is imperative.

FOOTNOTES

1. National Academy of Engineering, "Communications Technology for Urban Improvement," June 1971, p. 198.

2. Broadcasting, 5 July 1971, p. 17.

3. Federal Communications Commission, "Proposed CATV Rulemaking", 5 August 1971.

4. Federal Communications Commission, Docket No. 18397, Item I, Paragraph B.

5. State of New York Public Service Commission, Commissioner William K. Jones, "Regulation of CATV by the State of New York", December 1970, p. 179.

6. Op. cit., "Communications Technology for Urban Improvement", p. 198.

7. Feldman, Nathaniel E. "A Scenario for the Future of Cable Television Distribution". Proceedings of the IEEE International Convention Digest, March 23-26, 1970.

8. The IED/EIA Response to the FCC Docket 18397, Part 4. "The Future of Broadband Communications".

9. Op. cit., "Communications Technology for Urban Improvement", p. 20.

10. Mitchell, C. "Wide Area Transmission Costs". Preliminary Report from Stanford, 30 June 1971.

11. Op. cit., Broadcasting

12. Ibid.

13. National Association of Education, "Schools and Cable Television". 1971, p. 31.

14. Op. cit., "Communications Technology for Urban Improvement", p. 12.

15. Ibid., p. 202.

16. Ibid., p. 204.

17. Broadcasting, 21 June 1971, p. 26.

18. <u>New York Times</u>, 2 July 1971.

19. Volk, J. "The Reston, Virginia, Test of the MITRE Corporation's Interactive Television System", May 1971.

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