FM RADIO AS OBSERVATIONAL ACCESS TO WILDERNESS ENVIRONMENTS

bruce davis

Bruce Davis is a composer and researcher with the World Soundscape Project, based at Simon Fraser University; since 1971, he has worked at the Sonic Research Studio in Simon Fraser's Department of Communication Studies. He was co-author of the recent CBC Ideas series "Soundscapes of Canada."

SUMMARY

A radio service which "listens in" rather than "broadcasts out" is proposed. Microphones will monitor the ambient acoustic activity of a specially chosen protected wilderness environment. The stereophonic signal will be transmitted by microwave to CATV facilities, and broadcast on a subscription basis on the FM band. In providing observational access to a wilderness environment without significantly altering it in any way, the project would be unique; large numbers of people could experience the place without destroying it by their very presence. This radio service could, as an educational tool, begin a process of positive feedback between man and his natural environment that conceivably could alter for the better the perceptions and orientations of whole groups of people.

In 1973, the Canadian Radio-Television Commission (CRTC) proposed a new public policy for FM radio in Canada. In their brief, the Commission called generally for a more imaginative use of the FM medium, so as to "enlarge the concept of drama or documentary, to realize new programming techniques, and generally to expand acoustic horizons."[1] The following proposal is made with this emerging new policy in mind.

RADIO AS ARTIFICIAL ENVIRONMENT

To a culture which depends as heavily on vision to survive as ours does, it may be difficult at first to appreciate the depth to which it is possible to experience something simply by hearing it. Even music needs, for many people, to be "seen" (the performer, the score), or to belong to an established set of values and associations (historical period, performing personality) in order for them to listen to it.

The sound environment of today tends to form a mere background to experience, as our orientation has become increasingly visual. Psychologists estimate the ratio of dependency on visual to acoustic information in our society to be around 80-90% visual, 10-20% acoustic. Not surprisingly, people asked to choose between deafness and blindness as a preferred handicap opt for deafness by a significant majority, despite the fact that speech is still the primary mode of human communication. We have, it seems, lost trust in our ears.

Reflecting this attitude, commercial radio functions mostly as a soothing background to one's daily routine. One hears the radio, but does not actively listen to it. It is there. The only difference between AM and FM radio in this respect is that FM is just a little more soothing. Like the environmental sounds continually present which form a generally ignored accompaniment to daily activity, radio too provides an acoustic context to one's normal routine — in contrast to visual media, which contains specific items to which one directs more concentrated attention.

Radio has consequently developed certain formulae governing form and structure, more so than other commercial media. Just as an interior decorator will design a living room environment according to the "Colonial" or "Modern" styles, a radio station — itself an environment of a different kind — will be designed to similar stylistic formulae, because the function is essentially the same: contextual, decorative, back-

ground. The living room provides the physical context to activity within it; radio provides the aural context. The former shapes space; the latter shapes time.

Let us not forget that these prescribed patterns of structure and content are geared towards certain segments of the buying public. An audience must be maintained which responds favourably to commercial messages. One important way of holding an audience is to blur the distinction between commercial and regular programme content (e.g., musical commercials expertly arranged in the style of current popular music trends), and, in general, maintaining a steadily moving continuity of music, talk, and information which creates the illusion that time is flowing dynamically and meaningfully — in contrast to the rather tedious, humdrum routine of most listeners' day-to-day lives.

The one thing broadcasters fear most, therefore, is silence, because it destroys the continuity; a sagging VU metre causes engineers to worry and panic. In fact, they have invented sophisticated devices called "compressors" which keep the signal at a relatively constant level of intensity, locking it into an average level in which the louds and the softs are homogenized to a uniform volume. The amount of compression usually varies according to the station style; youth-oriented music stations push this technique to its limits, while the CBC uses only a limited amount of compression.[2]

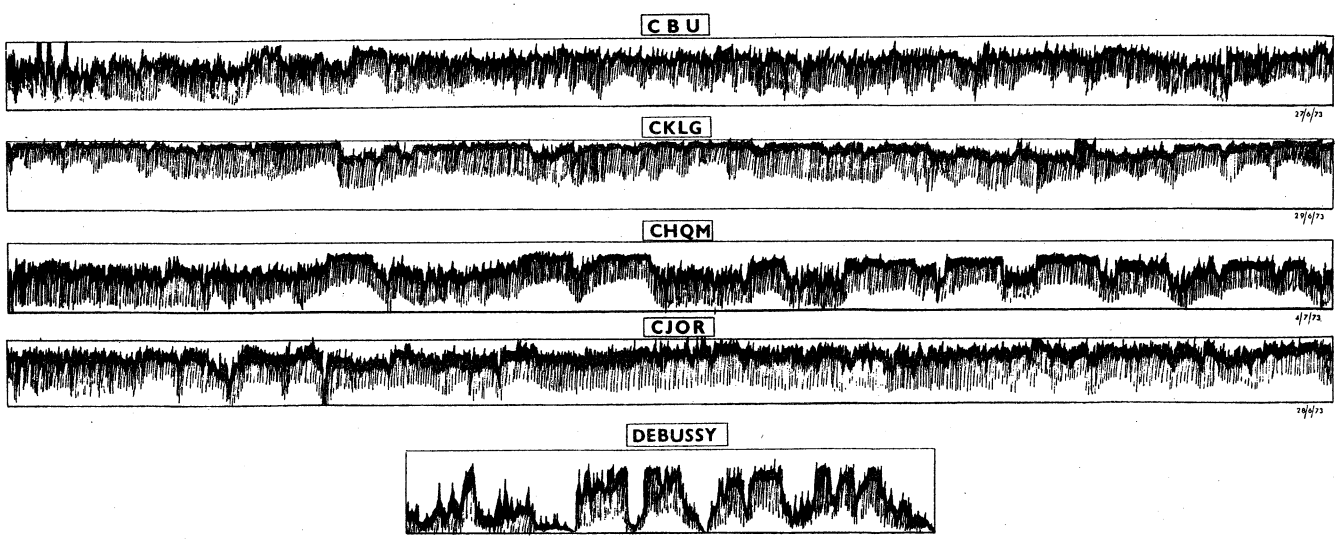
The emphasis in radio format design is always one tending toward smoothness and speed, with each station (or station type) having its own tempo, and — for want of a better word — rhythm. This includes such factors as the announcer's rate of speech, the number of items per hour, the way each item is joined together in time, and so on. One hesitates to call it a "rhythm", simply because there are few, if any, rests or pauses. Radio rarely breathes. It can't, because the artificial environment it creates works on a partially subliminal level of perception, and when broken, only emphasizes that which it is trying to hide. The listener, suddenly aware of himself and his situation, feels uncomfortable and switches to another station. Even stations programming a good deal of verbal material are careful not to let one subject go on for very long, because lengthy conversation of any kind becomes tedious when one is listening with only half an ear.

Without distractions, radio as we know it would probably fail.

AN ALTERNATIVE

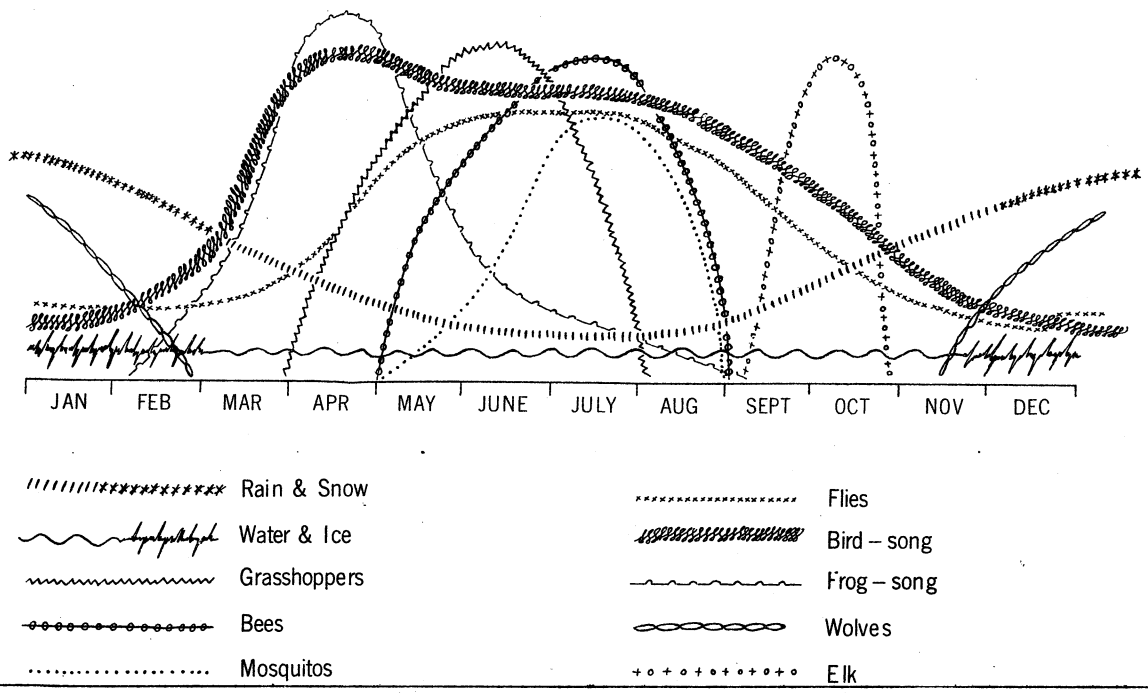
It was not solely out of concern for the state of present-day radio, however, that the following idea for a radio service was conceived. Rather, it arose from our experience in the field of environmental

FIG. 1



Level readings of the dynamic contour of four Vancouver radio stations for a one hour period, and an excerpt from the music of Debussy (broadcast over CBU). The rock station (CKLG) rides at the maximum level, with little variation, contrasting with the Debussy, which exhibits a continuously changing and intensely varied dynamic flow.[2]

FIG. 2 CYCLES OF THE NATURAL SOUNDSCAPE OF THE WEST COAST OF BRITISH COLUMBIA BY RELATIVE VOLUME OF SOUNDS (NO SCALE)



sound recording, and aims not only to improve the radio medium, but to provide an opportunity for a unique kind of listening experience. The foregoing critique of radio was meant to emphasize the passive nature of the radio listener in relation to the active role of the radio station, because the following proposal essentially reverses that relationship.

Briefly, the idea is to monitor the live wilderness ambience of a specially chosen remote environment (with special reference here to the provinces of B.C. and Alberta). A stereophonic radio signal would be transmitted from the site by microwave to urban areas, where it would be distributed on a special subscription basis, via the existing CATV facilities, on the FM band.

By regular, concentrated listening, once could make a virtually complete transition to the remote space and time scale of the wilderness region, especially through headphone listening. In contrast to normal radio content, the sounds would be broadcast not as a background, but as a potential route of access to a real environment...potential, because only by careful, sustained listening could one discover the sense, scale, order and meaning of the "programme".

For one thing, it would be a year long. It would be repeated, year after year. It would often be very quiet, with only the sounds of leaves gently rustling, or even less, if there were no breeze. There would be no guiding voice to narrate the passing day or night. Events would be spontaneous and unpredictable, and often unidentifiable.

One would have to listen long and hard, but over time one would come to know scales of change and rhythm richer and deeper by far than those of contemporary urban life, which are characteristically becoming shorter and more fragmented. The articulation of time in the natural environment is slow and the rhythm of its changes is subtle. It begins with the daily cycle: the chorus of birds each dawn and frogs at night; passing through the months: the commotion of the full moon; going on to seasons: the wetness of spring, dryness of autumn; and through the year: breeding and migration.

To hear the return of the swans and geese each spring, the call of bugling elk or wolves in fall or winter, or simply the awakening birds each morning, is to have them in your blood. The anticipation of such events and the experience of the various intervals separating them could guide the listener to an awareness of his own rhythms and to an experience of the danger as well as the beauty of the wilderness.

As Thoreau said, "we need to witness our own limits transgressed," and no more urgently than we do in today's demystified, rational spaceship earth. It is not only the natural environment that is threatened by man, but what little remains of the mysteries of this place as well. As the world grows smaller, more accessible and more known, it will become more and more important for one to know at some level of one's consciousness that there are still secret places where we no longer belong, but which are part of the dream from which we have long awakened — and without which we can no more survive than can the sleeper without his dreams.

ACOUSTIC SPACE

Mention was made earlier of radio compression techniques, referring to the practice of broadcasting sound at a relatively continuous level of intensity. The range of intensities is called "dynamic range", and it is measured in decibels (dB). The dynamic range of a typical AM radio station, measured on the average (rather than from high peaks to low peaks) will vary only 10 to 15 dB. The dynamic range of the ear varies enormously, however, from the threshold of hearing (0 dB) to the threshold of pain (about 130-140 dB), a pressure variation of ten trillion to one. Sounds in the natural environment vary from about 15 dB (the rustle of grass) to the 120 dB clap of nearby thunder. The preservation of as wide a dynamic range as possible would be one of the key criteria in the development of the system which would eventually carry this wilderness ambience from the source to the listener.

One important reason for this is to reproduce an accurate sense of acoustic space, the sensation of which would be essential for this kind of signal to be understood in all its subtlety. Another key factor, besides dynamic range, in preserving the spatial quality of the signal, involves the maintenance of a corresponding wide range of frequencies. Frequency range is measured in cycles per second, or "Hertz", and normally includes sounds of from 20 Hz or so, up to 18,000 or 20,000 Hz. Sounds in the high frequency range are especially important because, among other things, they help establish the quality and location of any sound (which is always composed of a mixture of frequencies, from high to low).

Of course, it is the fact that we have two ears which enables us to process this acoustic information spatially ("splitting the difference" between the two channels of information), to determine the location of a sound. An analogous process happens visually, but the perception of acoustic space (or "stereoacusis") is omni-directional, unlike the perception of visual space with its forward focus. The sensation of surrounding auditory space can be duplicated very convincingly with stereo reproduction, especially when heard with headphones. Not only can sounds be located along the horizontal -- azimuth location — from left to right, but also in depth, from near to far, preserving most of the spatial perspective of the original environment. The ambient sounds alone, heard in this way, communicate a spaciousness and sense of distance which would be almost as important an aspect of the "programme" as the discrete sound events that take place within this ambient context.

This feeling of space and privacy is second only to the sense of rhythm and time which could potentially be communicated by this kind of listening experience. It could conceivably begin a process of positive feedback between man and his natural environment that might significantly alter the perceptions and orientations of large numbers of people. In providing observational access to a wilderness environment without in any way altering it, this project is unique, for in no other way could the same number of people experience such an environment without destroying it by their very presence.

THE SITE AND THE SYSTEM

In order to realize such a project, a satisfactory site must be found and a suitable pick-up system engineered. (Transmission from the site is for the most part a matter of using existing microwave facilities, as is the cable distribution to individual receivers.)

The problem of finding the appropriate site will likely be the most difficult. It must be chosen for its remoteness, the variety of wildlife living, breeding and migrating within it, its ambient acoustic properties (such as the reverberant quality of a small, forested lake), and its climate. It should be in an area of controlled access and out of the range of aircraft.

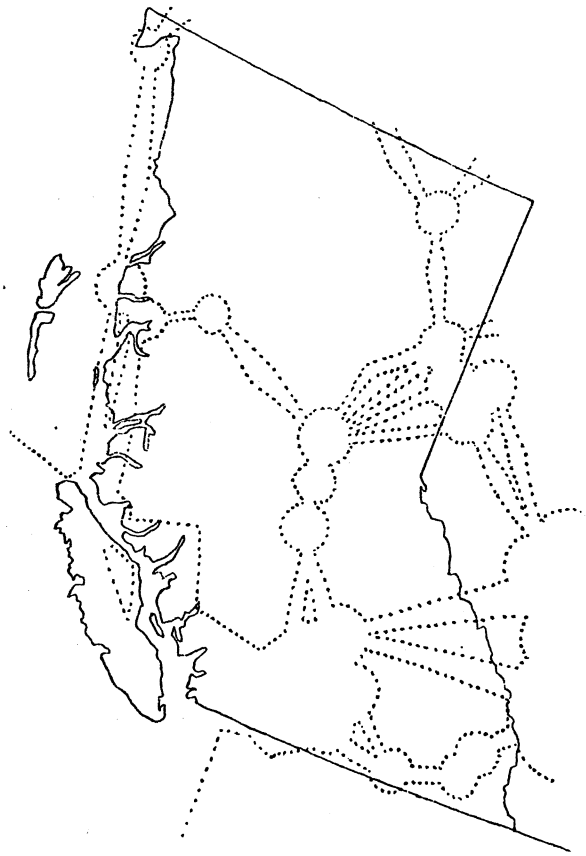
A glace at map 1 indicates just how limiting this last qualification can be, even in an area as sparsely populated as British Columbia. National or Provincial Parks would appear to be the best choice in terms of control of access, and these are shown in map 2. Only Tweedsmuir, Wells Gray, Bowron Lakes and Jasper Parks are clear of major aircraft flyways, further narrowing the possible choice. This choice is reduced even more by the availability of microwave transmission lines as shown in map 3.

The deciding factor would have to take into account the variety of wildlife native to the remaining areas. It would be desirable to have such vocally active animals as elk and wolf in the area (elk "bugle" from late August to October; wolf howl all the time, but especially in the winter breeding months, from December to February). Jasper National Park is the only area with both these animals as well as a great number of other wildlife and waterfowl, and so at the moment it seems the most feasible area to begin a serious search for the particular site.

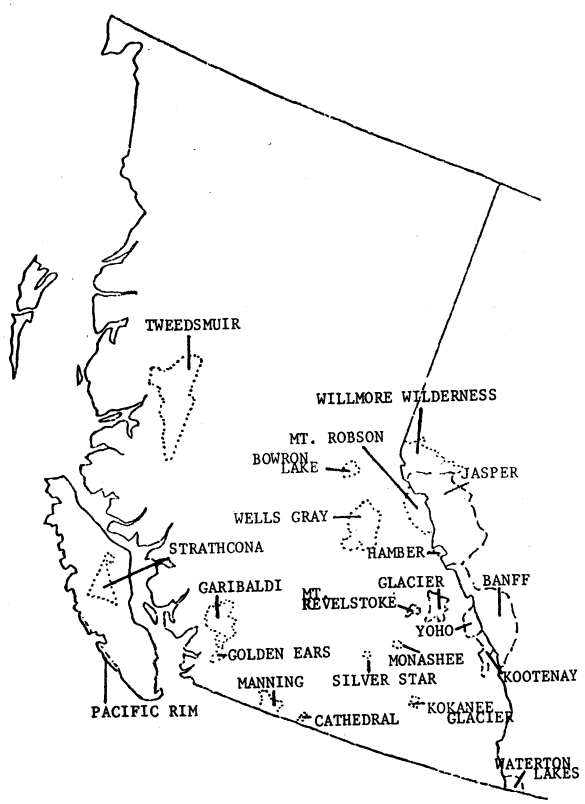
Once the site has been chosen, the microphone system will have to be designed for the environment. It must be capable of reproducing the sounds there as they would be heard by a person listening at the same spot. While it may be tempting to imagine whole batteries of microphones spread out over a large area, picking up a multitude of sounds at any given time, such an arrangement would in the long run be confusing. There would be no single point of reference for the listener; sounds would come and go every which way, over-lapping in space and time unnaturally. It would not be in the human scale of perception. Such arbitrary manipulations of the environment are to be avoided, and the signal should communicate the "simple" binaural experience.

Microphones have their limitations, however, and it will probably take a good deal of experimentation before the perfect mike combination is found. Figure 3 shows the directivity patterns of various two- and four-channel microphone arrangements.

The system should be engineered for ultimate four-channel quadrophonic reproduction, and so could involve a double pair of similarly arranged mikes.[3] For normal stereo purposes the four signals could be



Map 1 B.C. and Western Alberta air traffic patterns. (From the ICAO Information Publication GPH 206, August, 1974)



Map 2 National and Provincial Parks of B.C. and Western Alberta.

Map 3 Trans Canada Telephone System (TCTS) microwave network for B.C. and Western Alberta.

placed together, with the rear channels mixed between the front two. The possible lack of sensitivity of the mikes to distant sounds may have to be compensated for by the addition of directional microphones properly aimed, and operating at lower power levels (to avoid obvious imbalances resulting from their directional sensitivity) to pick up sounds in the extreme background that one would normally hear, but which the cardioid mikes could miss.

A simpler approach, however, may be to use a special binaural recording method which has been developed fairly recently. The simplicity of the method--which is designed for headphone listening--is very attractive: a pair of miniature microphones is implanted in a specially constructed artificial head. The arrangement provides a signal which, not surprisingly, has proved to be extremely realistic, in which the spatial field is very clearly defined.

One serious problem involves weatherproofing the microphones. Ideally, they should be capable of reproducing the sounds of violent storms, and so would have to be sheltered in an acoustically transparent housing. A possible arrangement could involve two separate systems, one for good weather, the other for bad weather. A preferable solution, of course, could be to design an all-weather housing, to avoid having to transfer from one to the other — a shelter in which the mikes could reproduce the sounds of rain and wind

without actually being struck by either. Naturally, the positioning of the mikes at the site could exploit natural shelters in the environment, such as trees or rock-faces.

A secondary problem is that of powering the mike system and the on-site transmitter relaying the signal to the microwave line. In an area with, presumably, no raw AC power, special long-lasting batteries ("Cypel" type) could be used along with other sources of power — even water power, if it is available. Whatever the power supply, it must be quiet and of course in no way must it intrude on or affect the environment.

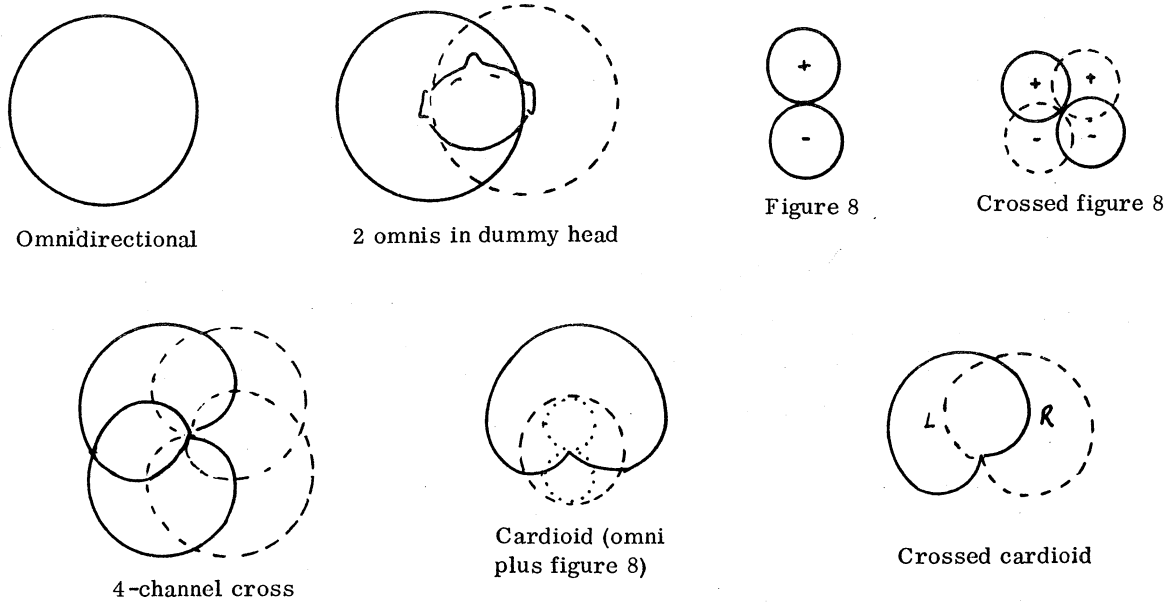
A final consideration involves the possible treatment of the original signal at the site to enable it to survive its long trip to the receiver with a minimum of signal loss or deterioration. Special equalization or Dolby-type noise reduction treatment of the frequency spectrum (such as boosting the high frequencies) may be necessary to help overcome any loss when and if the signal at some point of the transmission process, as in the link from microwave terminal to cable head-end, is fed through telephone lines, which have an upper limiting frequency of only 8,000 Hz.[4] In addition, system noise in the transmission process can be effectively reduced with devices called "companders", which, like compressors, squeeze the signal into a narrow dynamic range, but expand it again, at the end of the transmission, to its original range.

Whatever processing is done to the signal, and whatever system is eventually used for the pick-up, the original quality and the character of the environment must be faithfully maintained. Present-day sonics and electronics research and development can supply the necessary hardware without much difficulty; such equipment already exists, though applied to different situations and purposes. Essentially, the same technology that has given us run-at-the-mouth disc jockeys and spot commercials can also give us the call of the loon, the voice of the wind, or the cold winter crackling of the northern lights.

FINANCING

The greater problem, however, is that of overcoming the very considerable cost of microwave transmission — in other words, financing the project. Due to the unavailability of commercial air time, operating revenues will have to come from other sources. Private and corporate sponsorship is one possibility. Another would be to provide the service on a subscription basis through potential CATV channels. While these extra channel facilities exist — or can easily be acquired — cable operators have not until very recently (and then only because of overcrowding of presently available channels) been allowed to use them because it would require levying additional charges, something the Canadian Radio-Television Commission has forbidden the cable operators to do. The cable industry has yet to prove to the Commission's satisfaction that they would programme socially relevant (rather than financially lucrative) material. These channels can be used to carry radio as well as television waves. The viewer — or listener — simply inserts a special converter, in

FIG. 3



Omnidirectional

2 omnis in dummy head

Figure 8

Crossed figure 8

4-channel cross

Cardioid (omni plus figure 8)

Crossed cardioid

the shape of a punched card, into a box attached to the radio or TV set. For this he pays a special fee.

As a further means of support, a companion journal could be published for subscribers and the public, in which forecasts of wildlife activity appear along with general notes on the ecology of the area, with reference to its "sound ecology", photographs of the environment, listener's letters, and other communications and commercial advertisements. Sponsoring groups, corporations, and organizations could be listed here as well.

EPILOGUE

One of the few concrete proposals that came out of the United Nations Environment Conference in Stockholm in 1972 was the idea of a world environmental monitoring system, which would collect real-time data on, for instance, the mercury level of the world water system, the amount of lead and other pollutants in the earth's atmosphere, and so on. While the idea of monitoring sounds in a wilderness environment introduced here is for the sounds' sake, rather than functionally to register danger levels of any kind, it is nevertheless a related concept. With satellite transmission facilities, it would be possible to connect a network of such environments for purposes of study and research as well as for individual listening purposes.

The concept of developing radio services which listen in rather than broadcast out is a new one, but we think it should be pushed forward. It is contrary to everything radio has ever done, in that it is a passive process rather than an active one; for years radio has pumped its contents over larger and larger areas until now, like television, it covers the entire world. It is time now for some communication in the other direction. We stand to learn a great deal.

Surely an important question, now that we are successfully netting the earth and the mind with more and more information, is to decide what not to say; for we are all now sorcerer's apprentices. We are at the end of the old dream of freedom through power and control, and beginning the nightmare vision of death through self-satisfied, thoughtless sleep and neglect of the consequences of "our" creation. Information and communications systems are, if not out of technical control, beginning to work against themselves — i.e. against understanding — and by the overabundance of information they so promiscuously carry, are stunning people out of action and into cynicism. Now, but with no sorcerer to come to our rescue, we must stop ourselves, slow down, and learn how to keep silent and to listen.

NOTES

1. Canadian Radio Television Commission. A Proposal for an FM Radio Policy in the Private Sector (Ottawa: 1973), p.9.
2. Alec Nisbett, The Technique of the Sound Studio (3rd. ed.) (London: Focal Press, 1972), pp.417-437. This chapter contains a survey of compression techniques used by the BBC and other sound recording organizations.
3. For a discussion of the engineering questions of quadraphonic broadcasting, see the Panel Session on Quadraphonic FM Broadcast Systems in the IEEE Transactions of Broadcast and Television Receivers, vol. BTR - 19, no. 4, pp.816-822, Dec. 1972; also, Gibson, J.J., et al. "Compatible FM Broadcasting of Panoramic Sound," Journal of the Audio Engineering Society, vol. 20, no. 10, pp.277-322, Nov. 1973.
4. An exposition of the subject, by one of its pioneers, is to be found in R. M. Dolby, "An Audio Noise Reduction System," Journal of the Audio Engineering Society, vol. 15, pp.383-388, Oct. 1967.
5. Vinson Brown, Knowing the Outdoors in the Dark (Stackpole Books, 1972), chap. 9, pp.125-153.
6. Sigurd F. Olson, The Singing Wilderness (New York: Alfred A. Knopf, 1972).

---

camp wanapitei

As in 1973 and 1974, Alternatives and Camp Wanapitei are leading, outfitting and guiding an adult trip to James Bay via the Rupert River. This year the full Rupert will be travelled, with the trip beginning at Mistassini Poste in Northern Quebec. The trip proceeds through the beautiful and remote country that is the heart of the NBR portion (the as yet undeveloped portion) of the James Bay Development Project. Eight-day wilderness trips are also offered in the Temagami-Kipawa areas. Write for more information to Camp Wanapitei, c/o Alternatives.