generally would have the best chance of surviving until tomorrow. For example, as different regions of the home range became productive, selective advantage probably would accrue to animals that developed and made repeated use of activity routines that effected systematic exploitation of the resources of these regions. Studies of old-field mice in the wild probably reveal some of these processes at work. Thus, the nightly wanderings of these mice were confined primarily to certain well-worn paths—usually to and from seasonal food sources, such as fruiting weeds and grasses (*11*). Most trips involved collecting food and transporting it to storage depots.

One also could make a strong case for the selective advantages of not holding to exactly the same space-time patterns of activity night after night, since predation and variability of environmental factors would lead to selection against absolute stereotypy. A balance would have to be struck between the advantages of adherence to stereotyped activity patterns as opposed to those of plasticity of behavior, with an animal being able to abandon stereotypy as required. However, even in an emergency, such as a predator encounter, a selective advantage probably would be conferred on an animal engaged in a familiar nightly routine.

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5. This animal was descended from wild stock captured by Dr. Paul Pearson in 1951 in the Ocala National Forest, Florida, and kindly made available to us by Dr. J. A. King.
6. The enclosure was similar in design to those described in (*1*) except that the wheel was 20 cm in diameter.
7. The light source was mounted to the east (*2*) and consisted of a cluster of four General Electric No. 44, miniature, 6.3-volt incandescent bulbs.
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29 July 1968

Determination of Lateral Pharyngeal Wall Motion during Connected Speech by Use of Pulsed Ultrasound

Abstract. *Variations in the position of a point on the lateral pharyngeal wall relative to the external neck wall can be monitored by time-motion display of pulsed ultrasound. Such a portrayal is used to evaluate the lateral pharyngeal wall motion in normal and pathologic speakers during connected discourse.*

In normal speech production the lateral pharyngeal walls contribute to closure of the velopharyngeal port. The integrity of this closure is dependent upon a complex flap-valve sphincter involving the velum and the posterior and lateral walls of the pharynx. In some individuals, notably those with cleft palates, inadequate velopharyngeal closure may result from minimal lateral pharyngeal wall (L.P.W.) motion. The consequence of inadequate closure of the velopharyngeal valve may include hypernasality and an inability to impound sufficient intraoral breath pressure for normal speech production.

We have been developing a procedure to measure the motion of the L.P.W. by the use of pulsed ultrasound. Such a procedure can provide information on articulatory changes within the pharyngeal tube during speech production without extraneous devices in the vocal tract or exposure to radiation. In our procedure a 2.25-Mhz ultrasonic generator is used to produce pulsed ultrasound. Pulses from a transducer 1 cm in diameter are directed toward the L.P.W. from a point on the external neck wall approximately 1 cm below the angle of the mandible. The same transducer is used to send and receive ultrasonic signals and is moved through small angles until a signal from the L.P.W. is obtained. Essentially all of the ultrasonic energy is reflected at the tissue-air interface of the L.P.W. because the transmission of ultrasound in air is negligible for frequencies greater than 1 Mhz. The information contained in the reflected ultrasound beam is recorded on a storage oscilloscope using a time-motion method of display (see Fig. 1). Such a display presents distances between reflecting interfaces as a function of time. Distance calibrations are made by using known displacements in a water bath. With our unit under typical operating conditions it is possible to observe displacements of less than 1 mm.

Simultaneous motion pictures of the L.P.W. and the time-motion display during passive and active displacement of the pharyngeal wall have demonstrated that the displacements actually arise from motion of the L.P.W. External wall motion has been assessed by using a specially constructed water path extender which permitted recording of both external neck wall and the L.P.W. positions. The actual contribution of external neck wall to the motion recorded by the time-motion display is probably less than 1 mm.

Small intrasubject differences in recorded time-motion data are expected, owing to variations in probe angulation and placement. Tests were conducted to investigate the reproducibility of the static pharyngeal wall data obtained with our procedure. Data were obtained from one subject on separate days over a period of 2 months. The mean depth of the static pharyngeal wall of this subject was 27.7 mm with a standard deviation of 1.8 mm. The relative standard deviation of less than 7 percent is interpreted as satisfactory reproducibility.

The effect of connected speech on L.P.W. motion was determined by measurements taken from Polaroid pictures of the time-motion display. Displacements during the production of each phoneme were measured from the static pharyngeal wall position defined as the average of the pre- and post-utterance measures. At the level monitored, L.P.W. displacements as great as 5 mm

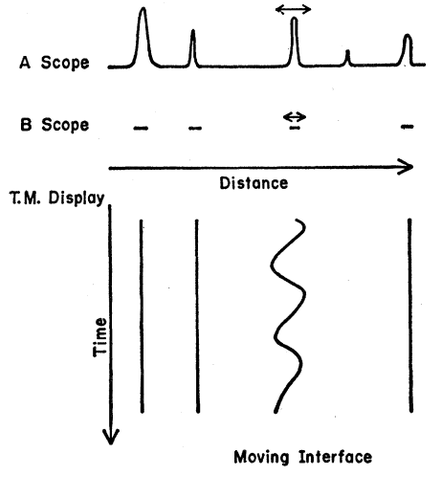

Fig. 1. Schematic representation of three types of ultrasonic display. Upper third of the figure illustrates the appearance of an A scope display, middle third shows a B scope display, and a time-motion display is presented in the lower third of the figure.

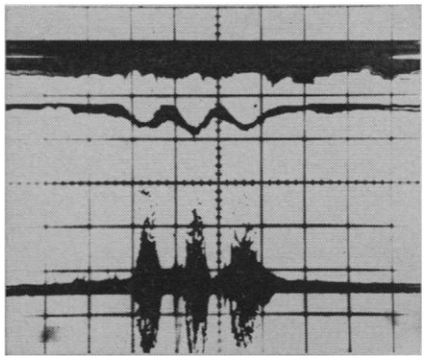

Fig. 2. Representative trace observed during the phrase [akaka].

were routinely observed during speech production. Thus, pharyngeal diameter changes of the order of a centimeter were common.

Figure 2 shows typical L.P.W. displacement during the production of the phrase [akaka] by a normal speaker. The top trace in Fig. 2 represents the external neck wall, which does not move. The middle trace arises from the lateral pharyngeal wall. A downward displacement of this trace represents movement of the L.P.W. toward the midline of the neck. The maximum displacement of the L.P.W. shown in Fig. 2 is 7 mm. The lower trace shows the synchronous audio signal. The time scale is 0.2 sec/cm. It is evident that each time the vowel [a] is produced the L.P.W. moves inward toward the midline, while during the consonant [k] the wall moves laterally. The L.P.W. moves toward the midline in anticipation of the initial vowel and does not return to its static position until after the cessation of phonation on the final vowel.

All films were measured by at least two individuals and the intermeasurer error was always less than 0.75 mm, except in rare cases of gross error which were readily detected. A typical correlation between two measurers is $r = .96$, indicating a high measurement reliability.

Time-motion ultrasound also provides a convenient tool for monitoring L.P.W. movement in patients with cleft palates or who have undergone laryngectomy.

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Lunar Soil: An Engineering Term

D. L. Johnson (*1*) requests that the term "soil" be applied to other bodies according to its usage on earth. Unfortunately, his request recognizes only one of at least two main meanings. He presents soil in the ecological sense—that is, soil as a result of or as a medium for plant growth. He ignores soil in the engineering sense—that is, soil as unconsolidated material, such as that found in the earth's crust. He is quite right about the term in the first sense [except that Nikiforoff's (*2*) article follows dogma untenable even before the article was published]. In the first sense, soil is widely used by soil scientists (pedologists), agriculturalists, ecologists, geographers, and others. Probably even more people, engineers and others, use soil in the second sense. In this sense, unconsolidated material on the moon is lunar soil.

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15 July 1968

National Motives and Psychogenic Death Rates

In a recent report (*1*), Rudin sought to establish that psychological motives might affect the mental health or incidence of psychological disorders in societies. As one part of his study he correlated the incidence of suicide and homicide in 16 nations with the need for achievement and the need for power as rated from an examination of the children's tales of a previous generation. The data only partially supported his prediction that the need for power would correlate with death rates from suicide and homicide. The incidence of suicide was correlated significantly with the need for power but the incidence of homicide was not significantly correlated with this need.

A separate test of Rudin's predictions is possible by using primitive societies rather than the developed nations used by Rudin. McClelland (*2*) rates 52 primitive societies on their need for achievement and need for power, as determined from their folk tales. Palmer (*3*) rates the incidence of suicide and homicide in 40 primitive societies. Seventeen societies appear in both these sources and these constitute the present sample (*4*).

Table 1. The patterns of correlations obtained in the present study (primitive societies) and in Rudin's study (developed nations). Abbreviations: n-ach, need for achievement; n-pow, need for power.

Behaviors and needs	Rho	
	Present study	Rudin's study
Suicide and homicide	0.45*	0.44*
Homicide and n-ach	−0.16	0.03
Homicide and n-pow	0.10	0.22
Suicide and n-ach	−0.02	−0.09
Suicide and n-pow	0.50*	0.52*

* One-tailed $P < 0.05$.

The incidence of suicide was significantly correlated with the incidence of homicide (rho = 0.449, one-tailed $P < 0.05$). The incidence of homicide was not significantly correlated with the need for achievement (rho = −0.164) nor with the need for power (rho = 0.103). The incidence of suicide was not significantly correlated with the need for achievement (rho = −0.020) but it was significantly correlated with the need for power (rho = 0.498, one-tailed $P < 0.05$). These results replicate Rudin's pattern of associations completely. The correlations from both studies are shown in Table 1.

The fact that the incidence of homicide does not correlate significantly with the need for power in either Rudin's study or the present study throws doubt on the particular conclusions that Rudin draws from the existence of such an association. His arguments demand the association of these two variables. However, it should be noted that Rudin does successfully predict several other associations.

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4. The societies used were Ainu, Ashanti, Azande, Chagga, Chukchee, Comanche, Hopi, Ifaluk, Kaska, Kwakiutl, Lepcha, Marquesan, Muria, Navaho, Papago, Thonga, and Zuñi. I am aware of the inadequacies of the present sample with regard to its randomness and possible historical connections between the societies. However, these inadequacies are shared also by Rudin's study. It should also be noted that Rudin compared children's tales with morbidity rates 25 years later. For the present data from primitive societies, the time interval depends on the particular anthropological expeditions, which differ for each society. In fact, the folk tales should show little variation over time in primitive societies and the problem of the time interval is of less importance if the primitive society is in a relatively static phase (for example, not experiencing stress from contact with more developed cultures).

16 July 1968