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Cleve Backster
Director of Research
The Backster Research Foundation, Inc.

Stephen G. White
Research Associate
The Backster Research Foundation, Inc.

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Cleve Backster
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Abstract

In vitro oral leukocytes (white cells taken from the mouth) are electroded and monitored with EEG-type instrumentation. The human donor is placed in an environment in which selected categories of spontaneous, yet identifiable, stimuli can be expected. Stimuli interacting with the human donor are simultaneously videotaped along with the continuous chart recording of the in vitro leukocytes, utilizing split-screen technology. Examination is made relating to correlations between such stimuli and electrical potential changes of significant timeliness, amplitude and duration. Precise adherence to the comprehensive methodology prescribed allows for documented high quality observations indicating biocommunications capability at a distance between human donors and in vitro oral leukocytes. (Int J Biosocial Res., 7(2):132-146, 1985).

Introduction

On February 2, 1966 the senior author was observing a *Dracaena massangeana* to determine the rate of moisture ascent following watering of this plant. Part of that observation process entailed the utilization of the Wheatstone Bridge Circuit commonly used in the conventional polygraph, or lie detector. Contrary to expectation, the instrument tracing did not show the expected upward trending. Based upon extensive experience utilizing the poly-graph on humans [1,2], it was noted, surprisingly, that the exhibited graphic contours on the polygraph chart were strikingly similar to observed reactions from human subjects experiencing emotional stimulation. These contours were short duration patterns and appeared directly related to identifiable events occurring in the vicinity of the plant.

Correspondence address:
The Backster Research Foundation, Inc.
861 Sixth Avenue
San Diego, CA 92101 USA

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It was theorized that the above apparently interconnected events, if replicable, would tend to indicate the existence of a perception capability in plants that had yet to be identified. Utilizing research experience acquired in developing modern polygraphic technique [3-5], in subsequent months additional observations were made to include the monitoring of other house plants and also living tissue from both fruit and vegetables. An experiment was later conducted and the results were published in a 1968 report entitled "Evidence of a Primary Perception in Plant Life"[6]. Backster subsequently presented his results at a conference in Praque, Czechoslovakia[7], and in London, England[8].

Subsequently, electroencephalograph (EEG)-type instrumentation was employed and monitoring expanded to include bacterial cultures as well as the monitoring of selected animal cells, including human cells *in vitro*.

During the Symposium at the 1975 Annual Meeting of the American Association for the Advancement of Science[9], the senior author discussed his preliminary observations related to a possible biocommunication capability between human donors and their *in vitro* cells. Further research led to the development of a comprehensive methodology for exploring and documenting high quality observations of a biocommunications capability at a distance between human donors and their *in vitro* oral leukocytes (white cells taken from the mouth).

In the preliminary observations, human spermatazoa, scrapings from the roof of the mouth, and human cell clusters maintained in an incubator were monitored for electrical changes. During the initial research utilizing *in vitro* human cells substantial problems were encountered requiring specialized environments and collection supervision. Incubation was needed to maintain certain cells within a narrow temperature range. The longevity factor posed problems.

White cells provided an interesting prospect for monitoring. Originating in bone marrow, they have specialized functions as guardians fighting diverse kinds of infection and disease. However, their extraction from the body posed problems, as did the temperature sensitivity of most white corpuscles.

With the introduction to the Klinkhamer procedure for collecting oral leukocytes, these problems were resolved. The late Dr. James M. Klinkhamer, then Associate Professor of Oral Research at the University of Texas Dental Branch, developed his procedure in connection with research into new methods for the diagnosis of gingivitis.[10-13]

Because of their specialization, white cells taken from the mouth are tolerant of a wide temperature range. Although these cells do not multiply, they appear to have a usable *in vitro* life span of at least eight hours.

Research efforts developed a technology for electroding oral leukocytes collected by the Klinkhamer procedure. They could then be monitored with EEG-type instrumentation measuring their net electrical potential changes.

With the solution to these problems found, research efforts could then be applied to developing a comprehensive methodology for studying possible correlation between the electrical activity of human *in vitro* white cells and stimuli presented to their donors. It seemed potentially helpful in this regard that there was already an extensive catalog of correlations between various psychological stimuli and electrophysiological reactions in humans.

Several disciplines, including psychology and psychophysiology, are in general agreement that certain identifiable stimuli result in electrical potential changes in humans.[14] In our current research, differentiation among the various types of emotion is not necessary. Our concern herein is only that an identifiable psychological stimulus correlates with a reaction exhibiting electrophysiological characteristics of significant timeliness, amplitude and duration.

Preliminary observations provided indications that spontaneity is an important characteristic for stimuli when monitoring *in vitro* white cells. A systematic approach mandated that a videotaping system, enabling post-session analysis of correlations between such stimuli and reactions, become an essential component of the methodology under development. This also provided permanent documentation of a monitoring session.

Spontaneous stimuli should be within pre-selected general categories. Videotaping allowed for study of a given spontaneous stimulus, in regard to its distinctness and intensity, as it would relate to a reasonable norm of a predic-table classification of individuals.

The methodology then evolved to include confirmation by the donor of an emotional response to the stimulus, or by confirmation independent of the donor. Each stimulus/reaction is then examined for its correlation to the catalog of conventional human physiological reactions to comparable stimuli. This catalog has been established in the field of psychophysiology where sensors are directly attached to the body.

This report is intended to provide a summary of the methodology developed, not to describe all details necessary for understanding the delicate subtleties that explorations to date have revealed. However, precise adherence to the comprehensive methodology prescribed allows for documented high quality observations indicating biocommunications capability at a distance between human donors and *in vitro* oral leukocytes.

Methods

Collection of Oral Leukocytes

The objective of the collection procedure is to secure for electroding an adequate number of healthy white cells from the mouth. The specialized method used in the Klinkhamer procedure for the collection of oral leukocytes.[15]. The method involves a mouth rinsing solution of a specific salinity used under carefully regulated collection conditions which maximize

white cell migration from the gums. Selected samples of this solution are then centrifuged prior to transfer of the white cell yield to a 1 ml culture tube in preparation for electroding. This procedure can be readily accomplished if sound laboratory methodology is applied and prescribed steps are followed.

Electroding

The electroding technique, as refined during thiry-six white cell monitoring sessions over the past nine years, now prescribes the use of pure gold electrodes. Two 60 mm lengths of gold wire, diameter of 1 mm, are standard. One ml culture tubes with outside dimensions of 6 X 50 mm were utilized to contain the collected white cells. It is important that the culture tube and the top of the electrodes be firmly mounted. It is also important that the electrodes, when inserted in the culture tube, maintain separation.

Two flexible wire leads were attached to the top of the gold electrodes by means of small firmly gripping alligator clips. Due to the close proximity of the two gold electrodes, care must be taken that the alligator clips do not touch each other.[16]

Instrumentation

Net electrical potential activity of *in vitro* white cells was monitored through the use of EEG-type instrumentation.[17]

Electrical signals were fed from the electrode assembly, through a shielded cable, to the biological preamplifier. The preamplifier used was of a type suitable for EKG and EEG recordings. It was set for EEG sensitivity. Passband frequency settings were for a range of 0.2 Hz low and 50 Hz high.

The signal from the preamplifier was fed into a recording amplifier which provided a sensitivity control and a pen centering control. The output of the recording amplifier actuated the high frequency penmotor. The chart drive unit provided a continuous recording capability producing permanent ink tracings displayed on eight inch (approximately 20 cm) wide chart paper moving at the selected rate of six inches (approximately 15 cm) per minute.

This display provided a graphic read-out of net electrical potential changes from the oral leukocytes being monitored.

Videotaping

It is essential that split-screen video technology be utilized to permanently record, on the same videotape, the simultaneous video monitoring of the chart tracing and donor activities.[18]

A black and white video camera is mounted above the chart drive.[19] A color video camera is focused on donor activities.[20,21] On all except for one of the videotape examples, the session date/time-of-day was displayed on the videotape through use of a date-time generator.[22]

The videotaping methodology allowed for exact post-session analysis of stimulus/reaction correlations.

Stimuli

Categories of stimuli may be pre-selected by the researcher. These categories, which may consist of various lines of questioning and/or visual stimuli, should be broadly predictive of producing the occurrence of spontaneous stimuli with distinctness and intensity for the donor.[23] To ensure spontaneity, a specific stimulus should not be presented at a specific time.

Stimuli are more readily observable when they evoke emotions related to the negative effect on the well-being of the donor. Emotions related to positive effect on the well-being of the donor generally do not seem to be as easily observable.

Examination for Correlations Between Stimuli and Reactions

Stimuli are analyzed for characteristics of spontaneity, distinctness, and intensity within generally accepted standards for reasonable probability of evoking an emotional response in a human subject.

Stimuli with such characteristics are examined for correlation of timeliness, amplitude and duration of reactions.

Where possible, identifiable stimuli are confirmed by the donor in regard to the associated emotional responses.

Reactions are assessed, applying the same criteria that are used to evaluate psychophysiological tracings when the sensors are directly attached to the body.

Examples of Results

The twelve examples provided are derived from the monitoring of *in vitro* white cells from seven different donors during seven different monitoring sessions. Each session was conducted at night. All seven sessions involved monitoring within the laboratory, with *in vitro* oral leukocytes located approximately 5 meters from the donor. Three of the sessions also involved distance monitoring, using then currently aired television programming as a pre-selected stimuli category. Distances of approximately 1 to 12 km were involved.

In all sessions, high quality observations of correlations between identifiable stimuli and electrophysiological reactions of significant timeliness, amplitude and duration were found. Stimuli, within pre-selected general categories, were spontaneous and had distinctness and intensity.

Reactions in the following examples were confirmed by the donors themselves and correspond to what are generally accepted reactions to equivalent stimuli when human subjects are monitored with sensors directly attached.[24]

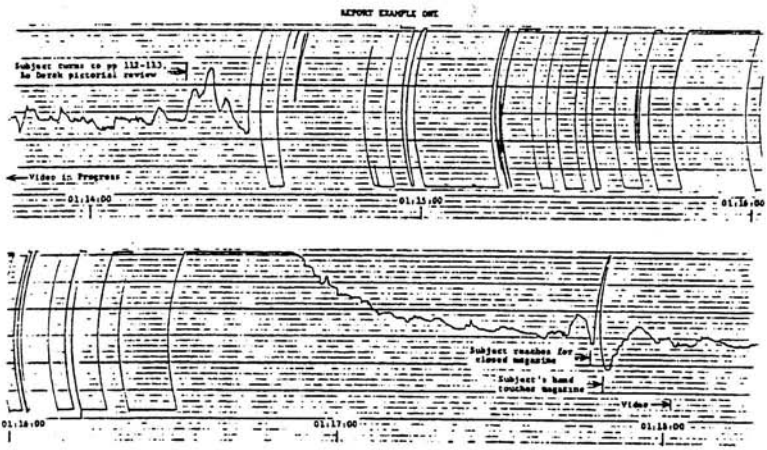

Fig. 1. Example 1. Donor male, age 25, was looking at an issue of *Playboy* magazine, when he came across a nude photograph of an extremely attractive woman. The photograph evoked an emotional response. The duration of reaction continued while donor's psychological set was focussed on the photograph, returning to a tracing average after closing the magazine. As the donor reached for the magazine, a second reaction to the same stimulus took place. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at points of reaction. Example shows two reactions to the same type of stimulus within the category of sexual imagery.

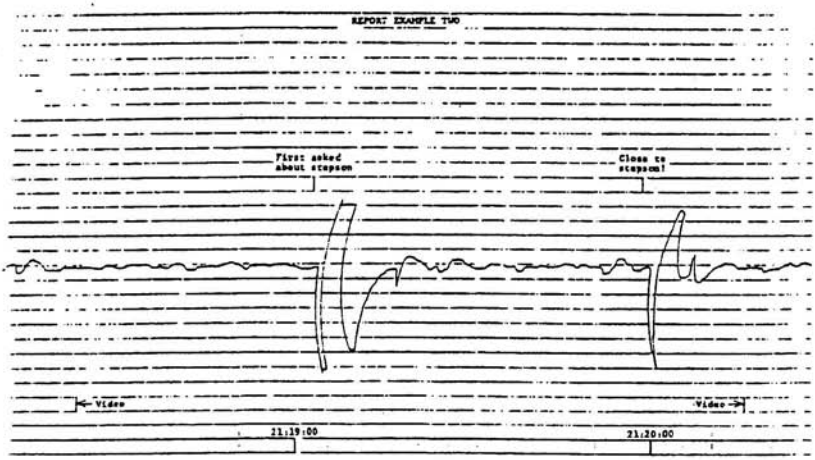

Fig. 2. Example 2. Donor female, age 32, raised her step-son for ten years, from his second year of childhood. She was divorced for a period of one year at the date of her monitoring session. On first mention of her step-

son a reaction displayed on the chart. Donor had just mentioned that in her youth she had owned a dog named "Duke," and when asked if her step-son wasn't also nick-named "Duke," donor's psychological set shifted to an emotionally sensitive area. Later in the same sequence donor's in vitro white cells reacted again at a question related to the present well-being of her step-son. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at points of reaction. Example shows two reactions to the same type of stimulus within the category of an emotionally charged family situation.

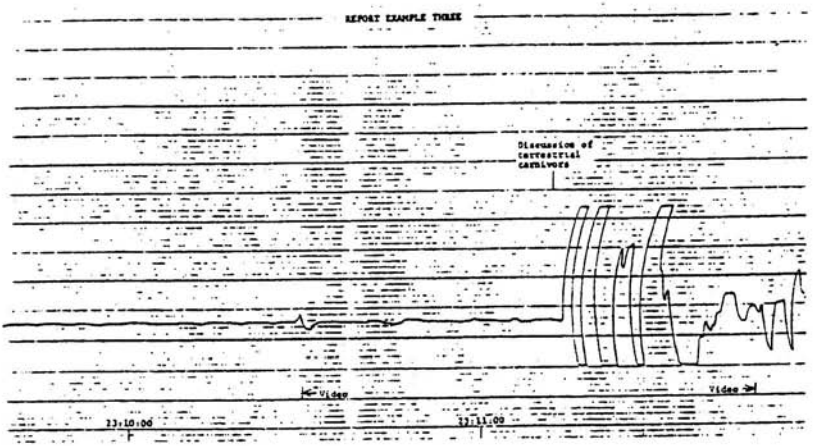

Fig. 3. Example 3. Donor male, age 27, is a professional animal trainer with a B.S. degree in biology. He has trained marine mammals for aquaria and is comfortable responding to a wide range of questions pertaining to his profession. He discussed working in close proximity to large predatory marine mammals (e.g. killer whale or leopard seal) without feeling emotional arousal regarding safety. When comparing such close proximity to marine mammals with the possible proximity to large terrestial predators (e.g. tigers or leopards), donor had significant reaction at the point of imagery. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at the point of reaction. Example shows reaction to a type of stimulus within the category of a perceived life threatening situation.

Fig. 4. (following page) Example 4. Donor male, age 37, is a clinical psychologist, Ph. D., with academic background in psychophysiological research. In discussing with him the stimulus/reaction correlation cited in Example 3, the donor's *in vitro* white cells reacted to the imagery relating to his own possible safety if in close proximity with both large predatory marine mammals (e.g. killer whales) and large predatory land mammals (e.g. tigers or leopards). Donor's *in vitro* oral leukocytes were being

monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at points of reaction. Example shows two reactions to a type of stimulus within the category of a perceived life threatening situation.

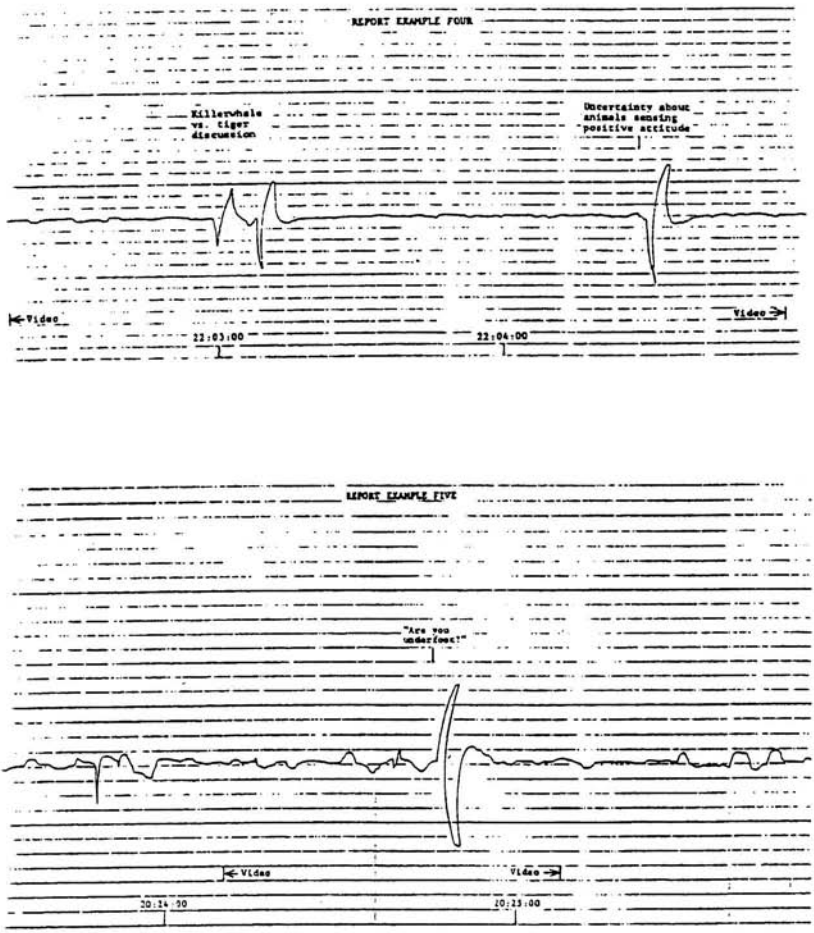

Fig. 5. Example 5. Donor male, age 63, is a retired police lieutenant and polygraph examiner with an academic degree in psychology. When discussing his approaching retirement, the donor shifted his psychological set to his wife's attitude concerning the question of being "underfoot" and his *in vitro* white cells displayed a reaction. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at point of reaction. Example shows a reaction to a type of stimulus within the category of an emotionally charged family situation.[25]

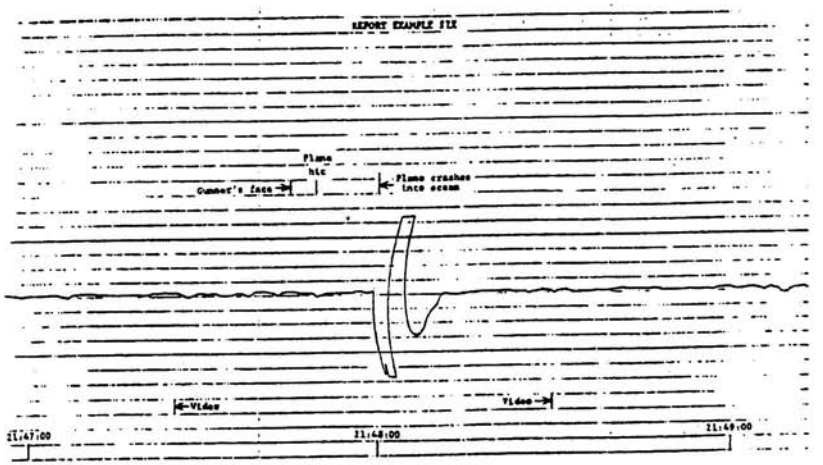

Fig. 6. Example 6. Donor, same as in Example 5, was in the U.S. Navy stationed at Pearl Harbor during the Japanese attack. He served as a gunner during his wartime Naval service. Donor watched a television program then being aired, entitled "The World At War," as a general stimuli category. Following the only facial close-up of a naval gunner in action against enemy aircraft, the donor's *in vitro* white cells reacted at the next occasion of downing of enemy aircraft. Donor did not react to all scenes of downing aircraft through naval gunfire, but only when he projected his past wartime experience into imagery. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 12 km. Donor confirmed his emotional arousal at the point of reaction. Example shows reaction to a type of stimulus within the category of a perceived life threatening situation.[25]

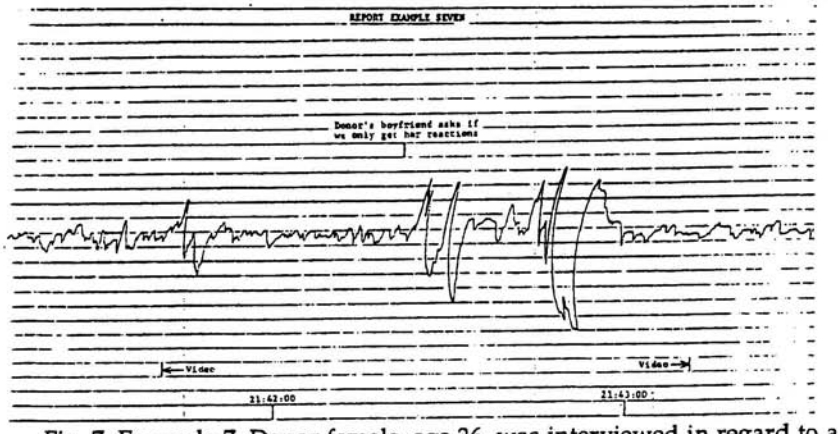

Fig. 7. Example 7. Donor female, age 26, was interviewed in regard to a television program she was to watch with a boyfriend later that evening. This program represented a general category of possible spontaneous

stimuli. At the mention of a possible romantic digression during television commercials of the selected program, the donor experienced sexually related imagery which correlated with reaction in her *in vitro* white cells. Donor's in vitro oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at the point of reaction. Example shows a reaction to a type of stimulus within the category of sexual imagery.

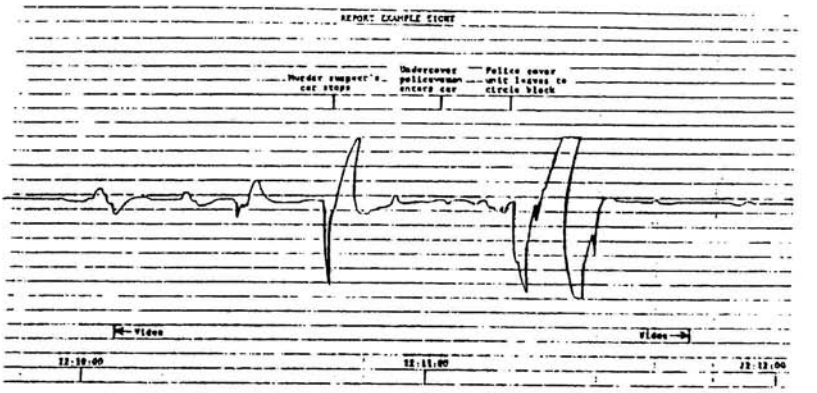

Fig 8. Example 8. Donor, same as in Example 7, viewed a television program pre-selected as a possible general stimuli category. The program selected was an episode of "Hill Street Blues." A scene early in the program depicted an undercover policewoman held in an automobile by a violent would-be rapist. The scene caused an emotional arousal in the donor that was reflected in the tracing of the monitoring of her *in vitro* white cells.In post-session interview the donor disclosed that at age 19 she had a similar experience herself; i.e., being trapped in an automobile by a would-be rapist, which has continued to evoke very strong emotionality even to this day. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 1 km. Donor confirmed emotional arousal at point of reaction. Example shows reaction to a type of stimulus within the category of a perceived life threatening situation.

Fig. 9. (following page) Example 9. Donor, same as in Examples 7 and 8, continued viewing the same television program cited in Example 8. A sequence of the program showed a policeman pretending to shoot another policeman as part of a practical joke. The weapon was fired with a blank and the other policeman fell to the floor as if he had been shot. Doner experienced emotional arousal in shocked indignation at such a sequence being included in a popular television program. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 1 km. Donor confirmed emotional arousal at point of reaction. Example shows a reaction to a type of stimulus within the category of rage.

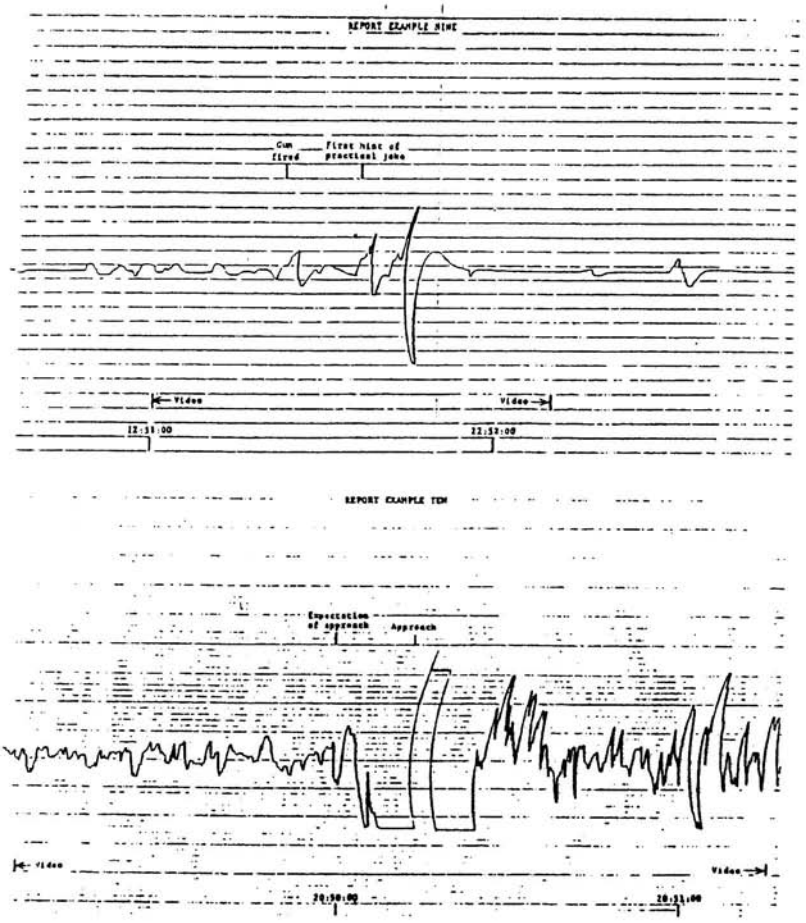

Fig. 10. Example 10. Donor male, age 61, was a Yugoslav partisan during World War II. Donor cited feelings of emotionality if anyone should come up behind him. He cited dangerous war experiences as the cause. During this session, his *in vitro* white cells reacted at the moment he first perceived someone approaching behind the chair in which he was seated. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at the point of reaction. Example shows a reaction to a type of stimulus within the category of a perceived life threatening situation.

Fig. 11. (following page) Example 11. Donor, same as in Example 10, recalled trauma since early youth related to a fear of sharks. Donor cited feeling of emotional stress when swimming in seawater with low visibility in which sharks could possibly approach. When subject projected fear into

present tense his oral leukocytes reacted. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 5 meters. Donor confirmed emotional arousal at the point of reaction. This shows the reaction to a type of stimulus in the category of a perceived life threatening situation.

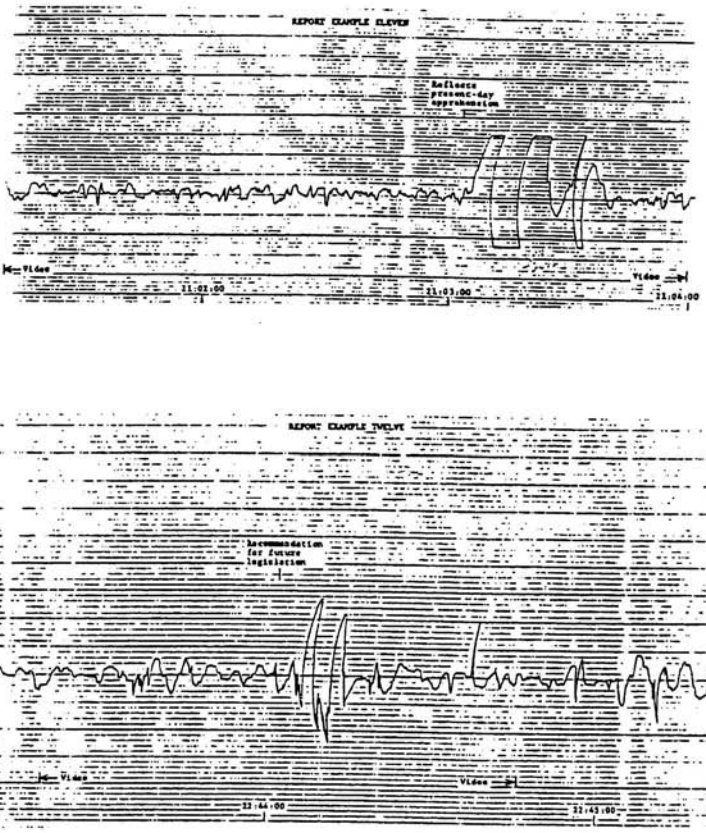

Fig. 12. Example 12. Donor, same as in Examples 10 and 11. Donor watched the then aired television news as a pre-selected general stimuli category. Donor was a businessman in a senior position with a large petrochemical concern. His *in vitro* oral leukocytes showed reaction accompanying his outrage when a news story reported U.S. Congressional hearings related to imposing additional bureaucratic control over the chemical industry. Donor's *in vitro* oral leukocytes were being monitored at a distance of approximately 1 km. Donor confirmed emotional arousal at the point of reaction. Example shows a reaction to a type of stimulus within the category of rage.

Suggestions for Further Research

The examples of results just cited would represent conventional psychophysiological reactions to conventional identifiable psychological stimuli were the sensors attached directly to the human body. That the reactions in these examples are produced by *in vitro* oral leukocytes while the stimuli are presented to the human donor has important implications suggestive of further research.

Research into this biocommunication phenomenon could possibly lead to new avenues of knowledge concerning genetics, immunology, the healing process and the mind-brain relationship.

Study of the signal itself could provide insight into new kinds of communication, or possibly a new form of energy.

At present, the biocommunication under discussion involves a signal about which there is still inadequate information. Scientific method would seem to prescribe exploration relating to the basic nature of this phenomenon, its fundamental characteristics, its geographical limits, its mode of transmission, its susceptibility to shielding, its influence on matter, its information retention capabilities, its stimuli discrimination capabilities, etc.

The aforementioned areas of research should be seriously undertaken by institutions with adequate facilities, equipment and personnel for the specialized areas involved.

Success in documenting meaningful correlations of this phenomenon dictates a learning period involving careful observations of both phenomena and instrumentation. This period is a must before a rigid experimental format is assumed.

Even within this limitation, it is possible to perform meaningful research related to the susceptibility to shielding and distance limitations. The introduction of cryogenic technology into the methodology could allow monitoring of *in vitro* white cells at considerable earth distances from their donor. Should there be meaningful observations at such distances, the same technology, with the addition of telemetry, would be justifiable as part of a space probe to deter-mine possible attenuation effect and time consumption of the signal.

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14. Due to the complexity of human subjects, in specialized areas of psychophysiology such as polygraph a sophisticated zone comparison technique is effectively related to a given shift in psychological set.
15. The Klinkhamer procedure for the collection of oral leukocytes requires close adherence to instructions clearly presented in Supplement A, which is available.
16. Supplement A contains suggested electroding configuration.
17. Stoelting Company instrumentation was utilized. This included a SA-1475 Biological Preamplifier, a SA-1472 Recording Amplifier module, a SA-1470 High Frequency Penmotor, and a Multigraphic Recorder accommodating 8 inch wide chart paper and providing four chart drive speeds. Ink fed high frequency recording pens were used.
18. Initially a SONY Seg-1A Special Effects Generator was utilized for split-screen video tape recording. Later research sessions utilized an ECHO lab Se/4 Generator.
19. A SONY Model AVC-3210 black and white video camera was used.
20. A RCA Model CC007 Newvicon color video camera was used.
21. Part of three research sessions involved focusing the color camera on a television program being aired. This program was also being remotely viewed by the white cell donor.
22. A Javelin J-312T video date-time generator was used.
23. Sessions should be scheduled at times of minimum extraneous human activities. Human activity could possibly introduce new variables into the explanation of observed correlations. Furthermore, such activity could possible interfere with communication between the donor and his in vitro white cells. The discrimination capability of oral leukocytes seems to primarily embrace their donor, but also may be affected by others within the immediate area of the in vitro cell monitoring.
24. Supplement B, documenting the Examples of Results, is available. It includes videotape split-screen documentation of each example.
25. During the session with the donor in Examples 5 and 6 a number of audible clicks were recorder on the laboratory videotape sound track. These clicks were caused by the actuation of a building security recorded located in the laboratory which videotaped ground floor lobby activity after 7:00 p.m. Later inspection of the security tape, which

also included a date/time-of-day generator, showed the lobby motion detector to have been actuated by a janitor working in the building lobby five floors below the laboratory.

Biograghical note:

The Backster Research Foundation, Inc., a nonprofit organization founded in 1965, wishes to express its deep gratitude to Mr. and Mrs. Robert E. Henson, whose dedicated efforts enabled the research to be performed. The Foundation wishes to extend its thanks to Mrs. Evelyn C. Leonard, for her initial financial assistance and J. Mattingly for donating specialized equipment for continuing oral leukocyte research. The authors wish to thank Captain Miles P. DuVal, U.S. Navy [Ret.] for providing a forum at the Cosmos Club for the initial presentation of this report.

Cleve Backster is a pioneer in the development and application of the polygraph technique with over thirty-eight years experience. During the past twenty years he has pursued research related to a possible primary perception including biocommunication capability at the cellular level in plant and animal life.

Stephen G. White received his Bachelor of Science degree in Biology in 1979 from San Diego State University. In addition to graduate studies he has received training and experience as a polygraph examiner and is currently a research associate at the Backster Research Foundation, Inc.