

# GETTING WIRED

The EEG alpha rhythm is a regular wave pattern with a frequency of 8-13 Hz, deriving from the back of the head. With electrodes pasted gently to your scalp, they hook you up to a machine which monitors and amplifies your alpha, and sends it back to you in the form of a tone. And people have shown remarkably rapid progress in controlling that tone, i.e. in producing more or less alpha at will.

The implications of this voluntary control of brainwaves are great, and a number of psychologists more knowledgeable than myself have contributed a paper on that subject to this issue. I want to stick more closely to the actual experience of the alpha state which has gained much attention as an altered state of consciousness.

*Hugh Macdonald, alpha experimenter in the Department of Psychology, Stanford University: If you're always very much in the world, and somewhat paranoid, always using your eyes to kind of check things out, then you close your eyes, relax, and alpha blossoms. If you can learn to get into that state with your eyes open, it seems very weird to most people.*

*A person sits there and gets alpha and is in a very relaxed state, but he can't fall asleep. Fall asleep and alpha disappears. So in alpha feedback training, we give you a tone which keeps you awake and tuned into your alpha for an hour or so.*

*People who know nothing about it learn very quickly how to get into this state. They say it's like ballet or football or skating or playing billiards, something that's flowing and enjoyable. If they know it has to do with meditation, they say it's very meditative. But the longer they train, the more they say it's not that. It's essentially doing nothing, being awake but doing nothing. You let your mind go off and do what it wants.*

*Most of the effect, I think, is that for once people are sitting alone quiet with themselves. How many people just sit alone for an hour or so a day and just do nothing, unless they're meditating?*

S. S.: Do they say they like it?

*Hugh: Yes, but for how long? We did seven sessions in one study, and by the sixth and seventh session at least 50% of the people were starting to fall asleep. They weren't very interested any more. It had lost its appeal. Like meditation. At the beginning you get this high and then after a while, "Oh, so what?" Like eating butterscotch pudding every day.*

S. S.: Why do they fall asleep?

*Hugh: Wouldn't you? You feel nice and warm and cosy in front of a heater, and then you fall asleep.*

*Normal alpha isn't actively turning it on. It's just closing your eyes, really turning your eyes off. With eyes open in a feedback situation, people go from producing a little bit of alpha to a lot. But to actively get it above that lots of alpha stage to your normal eyes-closed alpha, from 70% to 90%, is very hard for people to learn. You have to really try. The medium highs, they have lots of alpha, it's all over the place and plenty enough for us, but pretty soon they're just doing nothing. And it gets boring. They want excitement, stimulation, more contact with the world. Conversely, if you give people alpha-off training, they want to relax and let go. Huge bursts of alpha follow alpha-off training.*

*Once again, it's like meditation, like everything, like all skills, and it is definitely a skill. We had only one guy who did alpha work with enough regularity to really get good at it, and he found that once you passed the boredom stage, things got extremely good. Meanwhile, it's tedious, painful, and takes a lot of effort.*

So the alpha state is a kind of high which takes a lot of work to get you very high. Some experimenters are trying to link alpha level with hypnotizability, or with psychic powers, but with no significant correlations yet. My friend Hugh measured 3 or 4 persons with naturally occurring psychic phenomena and they had no alpha rhythm at all. Blind people don't either, and neither do a small number of other people for reasons no one understands. Maybe they have a wholly different way of seeing. In any case, no one has found a way to increase alpha where there is none to begin with.

A relatively new field for research is lateral alpha activity. Generally, there is more alpha from the right side of the brain, long considered the center for processing music, imagery, spatial information, and gestalt tasks, than from the analytical, mathematical left side. Recent experiments (Ornstein & Galin, 1971, and Morgan, McDonald, & MacDonald, 1971) show that during analytical or logical problem solving alpha goes down on the left side, while during imaginative tasks it decreases on the right. These experiments add to the growing body of evidence for independent functioning of the two cranial hemispheres, as well as supporting the notion of alpha as a relaxed cortical state.

-S.S.



## Implications of Physiological Feedback Training

by Ralph Ezios

With the invaluable assistance of Barbara B. Brown, Eleanor Criswell, Lester Fehmi, Elmer Green, Joseph Hart, Joe Kamiya, Hugh Macdonald, David Nowlis, and Robert Ornstein.

from *The Proper Study of Man* by James Fadiman (New York: The MacMillan Company, 1971.) Copyright 1971, James Fadiman.

In a much-cited passage, Weston LaBarre explicates his idea of *evolution-by-prostheses* in the following way:

With human hands, the old-style evolution by body adaptation is obsolete. All previous animals had been subject to the *autoplasmic* evolution of their self-substance, committing their bodies to experimental adaptations in a blind genetic gamble for survival. The stakes in this game were high: life or death. Man's evolution, on the other hand, is through *alloplastic* experiments with objects outside his own body and is concerned only with the products of his hands, brains, and eyes — and not with his body itself. (1954, p. 90.)

As LaBarre implies, man's technological evolution so far has allowed him to gain better and better discrimination of, control over, and ability to communicate about all manner of events and processes in his environment.

Included in the ever increasing comprehension of the environment, with concomitant ability to manipulate it, through science man has come to learn more about all organisms' internal events and processes. However, man's ability to discriminate, control and communicate about his own personal internal events and processes has never been markedly aided by technological development, and thus the prosthetic evolution has primarily had its effect on man's external environment and only indirectly has it effected him internally.

Physiological feedback training is exciting in this context because it is a small beginning in expanding and changing the direction of *evolution-by-prosthesis* and for the first time making it possible for an individ-



ual man to use technology to come to know himself better. The basic mechanism employed in feedback training is an electronic system which amplifies and informs the person as to the on-going activity of a selected physiological process, thereby aiding the person in discriminating the presence of events or stages in the process, thereby enabling him to gain some degree of voluntary control over this process, and also allowing him to develop a degree of sophistication in communicating about the process previously out of his scope. Although it could be argued that the mirror and the bathroom scale are considerably earlier instruments designed to give personal feedback on intrapersonal processes, the type of feedback is useful primarily in monitoring internal processes only indirectly as they effect externally apparent aspects of a person using them.

## Therapeutic Applications: Biomedical and Psychological

Hart (in press) points out that feedback training tends to obscure somewhat the normal expert-patient relationship in therapy. Feedback devices allow a patient to know himself better, while allowing him to develop his own attitudes about what he finds out.

The development of inexpensive and portable devices to give feedback opens up a number of therapeutic possibilities. One may begin by considering some applications in the field of psychosomatic medicine. For example, Shapiro, *et al.* (1969) have shown that people can learn to lower their blood pressure. Thus patients with high blood pressure could be given small portable devices for checking themselves regularly against high blood pressure. If the blood pressure were unusually high, they could then employ techniques that they had previously learned to lower it, and could make sure that they had succeeded by checking themselves against the portable device. This procedure either could be used at bedside in the hospital, or the device could be rented or purchased to be used in the patients' regular daily life. Thus the physiological consequences of states of mind engendered by environments or actions which the patient would be likely to encounter could be better comprehended, thereby allowing the patient to get insight into the psychological component of his particular illness, and even providing an opportunity to learn to control the symptomatology after developing this insight. While the patient should not be led to overly high expectations about curing his illness, the ability to use such devices could well be morale boosting to the patient who otherwise feels he has no hand in combatting his own illness, and that his fate is in the hands of the experts alone.

Many variations on the theme exist. A portable device for monitoring psychogalvanic skin response is already in production. Similarly a device that has been built by Hugh Macdonald with integrated circuitry capable of giving feedback on EEG, EMG, heart rate, skin temperature, vasoconstriction, and GSR exists and could be mass produced for sale at very