



ANNUAL
BANQUET OF THE GOLDEN PLATE
OF THE
ACADEMY OF ACHIEVEMENT

DECEMBER 29, 1962
OCEANHOUSE · SAN DIEGO, CALIFORNIA

* PAT FLANAGAN

17-year-old inventor, Bellaire, Texas—"Pat is a unique and self-spurred teen-age boy who has forged his mind and body into the model of a mature and inquisitive scientist. He is already nipping at the heels of venerable 30- and 40-year-old scientists and inventors."

Pat is now a senior at Bellaire High, Bellaire, Tex. Has been prominent in the news for the past several months when his invention, the 'neurophone,' became known. His story appeared in Life magazine, Sept. 14 and he made an appearance on *I've Got a Secret*, Garry Moore's television program, Oct. 1.

He was born in Oklahoma City, Okla. and lived in several states before coming to Texas due to his father's job with Shell Oil Co. At age 11, he received his ham radio license. Later in Jr. Hi he originated and taught a ham club consisting of 15 members, all went on to become ham operators in their own right. He was class president in Jr. high and became a spectacular gymnast during that time.

Three months after moving to Texas, he entered a missile detector he designed in the Greater Houston Science Fair and walked away with 1st prize in Electronics and Grand Prize over the whole fair. The next year as a freshman, he won honorable mention in the Greater Houston Science fair with a transistorized muscle stimulator for outer space use. At 14, he got a full-time job 5 days week after school and all day Saturday as a radio and television repairman . . . working for the same shop for over 2½ years. While working, he bought a sports convertible and took up flying. Soloed on his 16th birthday and received his private pilot's license shortly after his 17th birthday. He's a member of



the Airplane Owner's and Pilot's Association and Sertoma International Club. He has paid for all these things himself from working. Also pays the insurance and upkeep on his car.

Besides being active at school in Bellaire Choral Group, he belongs to the Houston All City Chorus and attends the Methodist Church regularly.

He has one older brother, Mike who at 21 owns his business. Pat hopes to go on to college and become an electronic engineer, then go into research fulltime. His invention, the 'neurophone,' when perfected will be a boon to the deaf . . . allowing them to 'hear' by bypassing the ears, sending sound directly to the brain.

He's the son of Mr. and Mrs. Gil Flanagan.

Achievement Honorees Feted Before Big Salute



FIRST MEETING—Egyptian journalist Kamal Raouf shakes hand of Pat Flanagan, 18, Texas inventor, at an Academy of Achievement dinner last

night. Others are Mrs. Raouf and Dr. Wendell M. Stanley of Berkeley, University of California Nobel Prize winner in chemistry.—Photos by Al Sund

One Hails S.D. Climate At Preliminary Dinner

Men and women of world wide achievement are becoming acquainted with San Diego and its people today in a series of preliminaries to the Banquet of the Golden Plate.

They will receive Golden Plate awards in the second annual Salute to Excellence, which will highlight a banquet in the Ocean House at 8 p.m. tomorrow.

Seventy-four awardees are expected, the sponsoring Academy of Achievement announced last night after six others had said they will be unable to attend.

'Good for Community'

The visitors include newcomers and some persons who have been familiar with the city or its scientists, researchers and other achievers.

"This is good for our community," George A. Scott, hospitality committee chairman, said last night at an informal banquet attended by 145 persons at the Mission Bay resort hotel.

"It is good for your lives to touch ours," Scott, who was master of ceremonies, told the visitors.

S.D. Weather Praised

When Scott introduced the celebrities, Harry W. Morgan of Macalester College, St. Paul, Minn., responded by praising San Diego's pleasant year-end weather.

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THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

Resume' on the Neurophone

The Neurophone is an electronic device intended for stimulating the nervous system with an electric field to produce auditory sensations. It consists of electronic circuitry into which audio signals from a microphone, recorder, etc. may be fed, and a pair of metallic output electrodes, each surrounded by insulating material. In normal use the electrodes are placed at either side of the subject's head.

Tests of the Neurophone on more than 1000 persons, including some totally deaf subjects, have produced intelligible auditory sensations in all cases.

Neurophonic effects can be produced with electrodes placed at many areas on the body, generally where nerves are concentrated close to the skin. The upper frequency limit of auditory perception is extended, while low frequency perception is more difficult until after some practice in listening.

A number of experiments have been carried out in an attempt to define the channel through which the Neurophonic effect operates.

A. The most significant of these was designed to detect mechanical coupling to the ears.

It is well known and easily observed that two tones close together in frequency and of approximately the same magnitude produce strong beats when added acoustically. This effect can be produced by summing the output of two different oscillators into a pair of headphones. It is also well known that applying the output of the oscillators separate to the two ears does not produce the strong beats heard when the sounds are acoustically added. If the Neurophone

mechanically stimulates the eardrum, then applying the output of one oscillator to the headphones, and the output of the other oscillator to the Neurophone should produce strong mechanical beats when the individual subjective amplitudes are about the same. The experiment consisted of first adjusting the two oscillators to very near the same frequency and listening to first the acoustical sum and second the binaural result. Then one tone was applied to the Neurophone and the other to both headphones. The loudness of each was then adjusted by alternate comparison until they were about the same. Then both Neurophone and headphones were listened to simultaneously.

Two tones were used, the first at 460 Hz mean frequency, with a beat of about 3 seconds per cycle. The second tone was chosen at 1 KHz, with about the same beat rate. Of five observers, none reported mechanical beats. The reported sound was comparable to that of the binaural test condition. It is concluded that the effect is not mechanical.

B. Measurements were made which indicate that less than 10^{-4} watts of electrical energy need be absorbed by the body to produce Neurophonic effects when the electrodes are placed at the subject's temples.

C. A special electrode has been designed to concentrate the Neurophone output energy in a small area. Use of this electrode at various spots on the head and neck revealed that Neurophonic effects could be produced only when the electrode was placed within approximately one inch of a major nerve trunk.

With the special electrode placed at the left or right temple, sound is subjectively heard to originate from the left or right hand directions. Using one of these electrodes at each temple, stereophonic effects have been produced.

D. Sensations of odor, taste, touch and vision have been produced Neurophonically, but detailed procedures and rigorous experimental verification have not been developed as of this writing.

G. P. Flanagan

D. W. Batteau

S. L. Moshier

Listening, Incorporated
Arlington, Mass.
July, 1966