



Understanding Women

By JOHN C. STEINBERG

MAN'S traditional inability to understand women may have a basis of fact if one so wishes to interpret certain recent experiments in our Laboratories. By the same experiments, however, another popular judgment as to women is shown to be incorrect. Contrary to the usually accepted idea her soft voice speaks as loudly as a man's; and—even more unexpected—her enunciation of the fundamental sounds of speech is not clearer but is more difficult to understand.

The experiments which revealed this information were designed to measure the relative difficulty with which the fundamental sounds were perceived when uttered by male and female speakers. Each speaker uttered a hundred simple English words; and observers recorded the words in the usual manner of an articulation test. Half of the words involved differences of vowel, e.g., "bat, bait, but, bout" and the other half differences of consonant, e.g., "by, my, thy." The percentage of the various vowel and consonant sounds which were correctly perceived was thus ascertained for each of forty speakers.

At the same time the loudness with which the various sounds were spoken was automatically recorded. Each speaker addressed a transmitter; and the deflections of a sensitive galvanometer measured the several speech currents. These measurements for twenty men and twenty women

showed that on the average a woman's voice is as loud as that of a man although individuals differ widely in the loudness with which they speak. In the case of the women the enunciation, or articulation, of the vowels was on the average a few per cent less than for the men, and the consonant articulation was about ten per cent less. The decrease is brought about largely by the stop and fricative consonants. In the case of the women the most difficult consonants to perceive were the fricatives *s* and *z*, which, strange as it may seem, in the case of the men were among the easiest. The *f* and *th* sounds (unvoiced as in *thin*) were the next most difficult in woman's speech and the most difficult in man's speech. These were followed by the *v* and *th* (voiced as in *then*) and the stop consonants *p*, *k*, *t*, *b*, *d* and *g* in approximate order of difficulty.

Just why it is more difficult to interpret woman's speech than man's is not entirely clear. One difference which contributes to this state of affairs is that the chord tone, or fundamental, of a woman's voice is 250 cycles, whereas that of a man's voice is 125 cycles. Since the component frequencies in the sound waves are multiples of the fundamental there are only one-half as many components in a woman's voice to supply data for perception to the brain of a listener.

Contributing to the difference in voice of men and women is the fact that the frequency ranges which char-

acterize the consonant sounds are appreciably higher in the speech of women. Elimination of all frequencies above 5000 cycles affects only slightly the interpretation of masculine speech. For women's voices such elimination would produce considerable degradation in interpretation; and it is estimated that frequencies as high as 7000 must be transmitted to give possibilities of interpretation

corresponding to a man's voice with frequencies only up to 5000 cycles. These higher frequencies are more difficult to hear; when the speech is loud "auditory masking" occurs and these high frequencies are thus obliterated in the ear itself. It thus appears that nature has so designed woman's speech that it is always most effective when it is of soft and well modulated tone.



From Good to Worse

As it progresses from one newspaper to another, the truth assumes successive forms of which the last may be quite unlike the first. Of this, a story about the photoelectric cell is an amusing example. Originally written by Herbert E. Ives of our laboratories at the request of an organization which distributes scientific information to the popular press, it sketched the history of photo-electricity, and mentioned that the discoverer, Hertz, also laid the foundation of modern radio. After describing present-day applications, Dr. Ives said: "We may, by advancement in knowledge of photo-electricity master ultimately the utilization of solar radiation, although we may have to resort to the indirect method of nature."

Here enters the re-write man. Grasping for the spectacular, the news agency introduced the article thus: "Scientists may harness the sun when they know more about photoelectricity, the principle underlying radio." A head-line writer on Newspaper No. 1 captioned the item, naturally enough, "Sun may be Harnessed by Photo-Electricity." Newspaper No. 2 had it, "Radio Principle may Aid in Harnessing Sun." The climax was reached by Newspaper No. 3, which challenged the attention of its thoughtful readers by the line, "Radio may Say 'Giddap! Sun.' "

