THE concept of listening to the electrocardiogram brings up an interesting question and one that most cardiologists, even ones with long experience in electrocardiography, have largely ignored. What would you expect to hear if any of the usual leads were amplified by a suitable electronic device and the output were connected to a loud speaker or to headphones? Since the QRS complexes are the only deflections in the electrocardiograms that are of high enough frequency to be in the audible range, one would expect to hear these complexes as short sounds, but the P and T waves, with their very low basic frequencies, would not in general be audible. Although there has been little interest in listening to QRS complexes, it is possible that with experience a physician might be able to suspect the presence of intraventricular block, especially if this is associated with an increase in high frequency components as often occurs in myocardial infarction and some types of diffuse myocardial disease. The reader, at this point, will no doubt think the above is nonsense and suggest that we stop wasting time and get an electrocardiogram. He is, of course, correct; but sometimes using another of our special senses (that of hearing) on a problem that was previously studied entirely in a visual fashion may lead to unexpected and valuable information. Suppose a technique could be developed which would make it possible to hear the atrial waves and the T waves, as well as the QRS complexes, and further that the instrument, capable of doing this, be relatively inexpensive and so simple that it can be put in operation in less than a minute. "The Electrocardiophone" described by Dr. Henry L. Green in this issue of Circulation is such an instrument.

The principle on which the electrocardiophone is based is simple and was employed several years ago by the writer to make low frequency (sub-audible) vibrations over the precordium audible. The instrument consists of an audio-frequency oscillator which produces a musical note which is heard from a small built-in speaker or with headphones. The electrocardiographic voltages are picked up by two knurled electrodes permanently fastened on the base of the device. A third electrode serves as a ground and provides stability when the instrument is placed on the precordium. The electrocardiographic voltages, after amplification, are used to modulate the audio-frequency oscillator, thus changing the pitch of the musical note. As one would expect, the QRS complex is easily recognized as an abrupt change of short duration (a sort of chirp), while the P and T waves usually cause less marked, but longer changes in pitch. Large upright or inverted T waves are quite easy to recognize, but P waves, unless they are large, are not so easily heard. Atrial waves in patients with flutter are easy to recognize as a rapid, regular variation in pitch, especially if there is 3:1 (or higher) atrioventricular block.

It must be emphasized that a new and quite unfamiliar technique of listening is involved in the use of the electrocardiophone. Some physicians, with good discrimination of pitch, should be able to recognize some of the more subtle electrocardiographic abnormalities, like differentiation between atrial and ventricular premature beats, after a relatively short period of experience with the instrument, while others might find the instrument of little value in situations of this kind. Fortunately, the arrhythmias in which the instrument should have its greatest value,
namely ventricular fibrillation and cardiac standstill, lead to easily recognized sounds. With the former there would be an irregular, wavering change in pitch with no QRS complexes (chirps), and with complete cardiac asystole no change in pitch would be heard.

As Dr. Green has emphasized in his paper, a good knowledge of electrocardiography is essential if the electrocardiophone is to be used intelligently and with diagnostic value. Only with this background can a physician anticipate what changes in the steady musical note will occur in subjects with normal hearts and in patients with many different types of abnormality in their electrocardiograms, including the arrhythmias. The electrocardiophone will never replace electrocardiograms but may provide an added stimulus for many physicians to learn more about them.

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Listening to the Electrocardiogram
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