## GIBSON-THE LIMITS OF KNOWLEDGE.

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tion of auricular and ventricular rhythm was carefully analysed by modern methods. This was followed by an excellent study, in which Vaquez and Bureau still more clearly emphasized the lack of harmony between the movements of the auricles and ventricles. These investigations have been followed by the results obtained by a large number of observers who, by means of clinical methods, have been able to demoustrate in the most complete manner that a partial or total disociation may take place. It may seem almost invidious to single out any names in this connection but it is only right that we should honour those who have been pioneers in this field and it is accordingly a pleasure to refer to the work of Moritz, His, Lichtheim, Mackenzic, Wenckebach, Hirschfelder, and Osler.

Besides obtaining such results in the investigation of the cardiac, arterial, and venous movements by the graphic method, it is full of interest to be able now to add that the sounds of auricular contraction have been over and over again heard by many observers in the intervals between the complete systole of the heart. These facts absolutely prove the correctness of Stokes' observations, and bring them into harmony with the physiological sounds described by Malet and myself.

Another addition to our knowledge of this interesting condition is due to Ritchie, Magee Finny, and Brouardel and Villaret, who, independently of each other, took advantage of the fluorescent screen in order to watch the movements of the heart. They published the interesting fact that the auricles can be seen beating in the intervals between ventricular systoles. During the last three years this observation has been frequently repeated by other observers, and is now well known.

Einthoven has taken advantage of the electronotive changes produced by the action of the heart, and by means of the string galvanometer has obtained beautiful tracings from cases of heart block, which demonstrate beyond the possibility of doubt that the electromotive changes caused by the action of the auricles may be seen entirely dissociated from those caused by auricular action. In ignorance of the important observations being made by Einthoven, the electromotive changes in heart block simultaneously engaged my attention. My investigations were carried out with Lippmann's capillary electrometer. The movements of the column of mercury, thrown upon the screen by means of a projection microscope, showed the ordinary oscillations caused by the electric changes attending the apex beat, but, between these, smaller waves were distinctly visible, and were undoubtedly produced by the contraction of the auricles.

One more clinical result obtained in this disease may be referred to before we pass on to the explanation of the condition. The arterial