lating preparations do not invariably induce an increase in thyroid weight in doves and pigeons.

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Monophasic Electrical Response Produced by the Contraction of Injured Heart Muscle.

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The electrical responses produced by injured heart muscle are of great interest not only because of their important bearing upon the interpretation of the electrical phenomena exhibited by excitable tissues generally, but because of their relation to the electrocardiographic changes that follow coronary thrombosis in man. We here report briefly experiments relating to the electrical responses produced by the injured heart beating *in situ*.

When one of 2 non-polarizable electrodes connected to the terminals of the string galvanometer is placed in contact with a burned region on the epicardial surface of the exposed turtle's heart and the other in contact with the subcutaneous tissues at a point distant from the heart, the ventricular complex of the curve recorded is essentially monophasic in outline. The monophasic character of the response is due to the disappearance during systole of the injury current flowing during diastole. The direction of the deflection indicates that during ventricular systole the cardiac or exploring electrode is relatively positive with respect to the distant or indifferent electrode. Curves of the same type are obtained by leading from the exposed and freshly injured surface of the mammalian auricle or mammalian ventricle to a distant point. In all such experiments we have connected the electrodes to the galvanometer in such a way that relative negativity of the exploring electrode yields an upward deflection in the completed record. In the curves obtained by leading from an injured to a distant region, ventricular systole is, therefore, represented by a monophasic deflection directed downward.

If a monophasic response is obtained, in the manner described, from the ventral surface of the turtle's heart by means of an elec-

trode in which contact with the heart is made by a wick that extends 3 or 4 mm. beyond the insulated shaft of the electrode, flooding the heart with normal saline or with Ringer's solution so that the surface is immersed to a depth of 5 or 10 mm., greatly reduces the amplitude of the curve but does not materially alter its form. If the electrode is insulated to the tip the reduction in amplitude is very much less and may not exceed 50%. The form of curves obtained from the exposed heart is not therefore dependent upon the fact that the region from which the lead is made is bounded by a dielectric.

If the exploring electrode is placed on the heart at a considerable distance from the burned area the curve may be identical with that obtained from the same region before the injury was produced. In the great majority of instances, however, there is a very conspicuous upward displacement of the *RS-T* segment of the ventricular complex, and this displacement is often so pronounced that the curve is almost monophasic in character. In this case, however, the direction of the deflection indicates that the exploring electrode becomes relatively negative with respect to the distant electrode during ventricular systole.

We have pointed out[1] that in leads of the type employed the potential variations of the indifferent electrode are insignificant in comparison with the potential variations of the exploring electrode. The curves obtained are, therefore, essentially records of the potential variations produced by the heart beat at the point in contact with the latter. The monophasic responses obtained by leading from a burned region are consequently due to potential variations that occur within this region in response to electrical forces developed in its immediate neighborhood. The monophasic responses obtained by placing both electrodes in contact with the heart, one upon an injured and the other upon an uninjured region, have usually been attributed to potential variations occurring at the uninjured point, the potential of the injured area being regarded as constant throughout the cardiac cycle. This point of view may have advantages in the interpretation of the monophasic responses obtained from small strips of excitable tissue removed from the body and suspended in moist air. It is misleading when applied to curves obtained from the heart *in situ*. In the latter case the monophasic character of the curve obtained by leading from an uninjured to an injured region is due chiefly to potential variations of the electrode in contact with the injured tissue.

[1] Wilson, F. N., Macleod, A. G., and Barker, P. S., *Am. Heart J.*, 1932, **7**, 305.