must of course be taken into account that though these systems are present in very small quantities the molecular weight of hemoglobin is 68,000 while the quinones are around 100, so that theoretically a concentration of only 20 mg. per 100 cc. of blood would be sufficient to turn the entire hemoglobin of the body into methemoglobin. The poising effect of the hemoglobin is sufficient for the normal physiological amounts formed in protein metabolism, but added amounts in aniline poisoning can and do cause the appearance of methemoglobin.

It is significant in this connection that the black pigment deposited in ochronosis is found entirely in the cartilages and sclera. These are the places where the poising effect of the hemoglobin must be absent. Hence the oxidized phase may form and this polymerizes instantly at body pH to form the melanin-like aggregates characteristic of the disease.

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Functional Heart Mechanisms.

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Studies on frogs, turtles, rabbits, cats, dogs, and man over more than 20 years and participated in by numerous associates, including Doctors Kruse, Waddel, Koenig, Criep, Hover, McLain, and Lauler have led to numerous conclusions:

I. Contraction normally begins in the superior vena cava and spreads to auricles and ventricles. The evidence and proof include: *a*. Direct observation. *b*. Simultaneous recording of contraction of veins, auricles, and ventricles alone and combined with galvanometric recording of electrical variation. (Fig. 1.) *c*. Sequence of recovery from vagus inhibition. (Fig. 2.) *d*. Transmission of premature venous contractions to auricles and ventricles. (Fig. 2.) *e*. Photographic (cinema) recording.

In man, the evidence is mainly derived from polygraphic and galvanometric records, the hitherto occasionally observed, but unexplained U-wave corresponding to the venous electrical variation observed in lower animals. It may be observed in most subjects by increasing galvanometer sensitivity as by slacking the fibre, and

FIG. 1.
Simultaneous mechanical and galvanometer record of terrapin sinus, auricle, and ventricle.

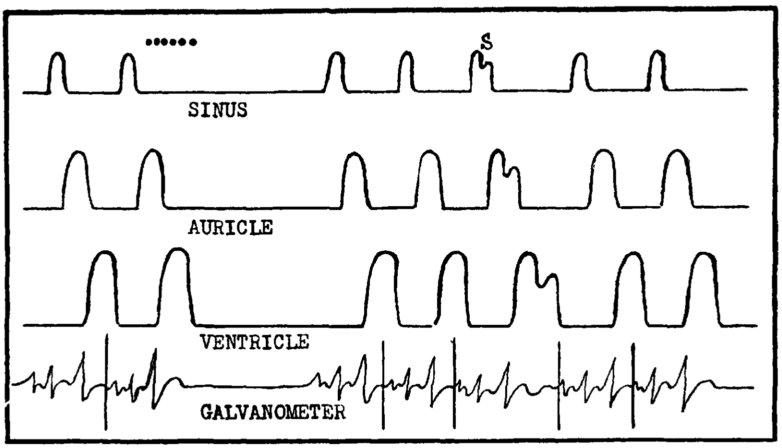

FIG. 2.
Diagram of evidence of origination of excitation in sinus of mammals.
..... = stimuli to vagus nerve. S = stimulus to sinus.

placing one electrode in the supra-sternal notch, right supra-clavicular fossa or in the mouth. Standard figures showing time relations of heart activities recorded simultaneously by different means as by polygraph and galvanometer are confirmatory.

II. Heart abnormalities and experimental irregularities as arhythmias, alternation, etc., are usually due to changes in fundamental properties of tissues or their time relations. Other cause, as failure of conduction or spread of excitation—"block" in the current sense—at most, is rare. Due regard to the composite character of gross manifestations, *i. e.*, the algebraic summation of unit or segmental response, is of utmost value in heart studies as in all other tissue studies.

III. Differences in different species studied are mainly, if not wholly, quantitative.

IV. Venous and auricular galvanometer records, when taken as entities, show form and characteristics very similar to ventricular ones, provided the galvanometer is adjusted for adequate sensitiveness.

V. Simple valves in veins and arteries adequately regulate flow, owing to the physical characteristics of those structures. Auricles and ventricles not possessing like characteristics require more complicated ones, *i. e.*, to withstand pressures to which they are subjected, the free edges of their valves are attached to the papillary muscles whose contractions seemingly are timed and regulated through the Purkinje or "bundle" tissues in hearts possessing such tissue.

These conclusions are based upon: (1) Direct observation. (2) Indirect observation: *a.* Mechanical registration of contraction. *b.* Galvanometric registration of electrical manifestations. *c.* Simultaneous coordinated observation and registration of contractile and electrical manifestations. (3) Controlled and coordinated observation and measurement of fundamental properties of venous, auricular, and ventricular tissues, as irritability, latent, contraction, relaxation, and refractory periods, normal and under changed conditions as temperature, drugs, etc.; and after mutilation as cutting, clamping, etc. (4) Cinema film.

Since the function of the heart is to circulate the blood and since this is wholly dependent upon contraction (Fig. 3), this has been

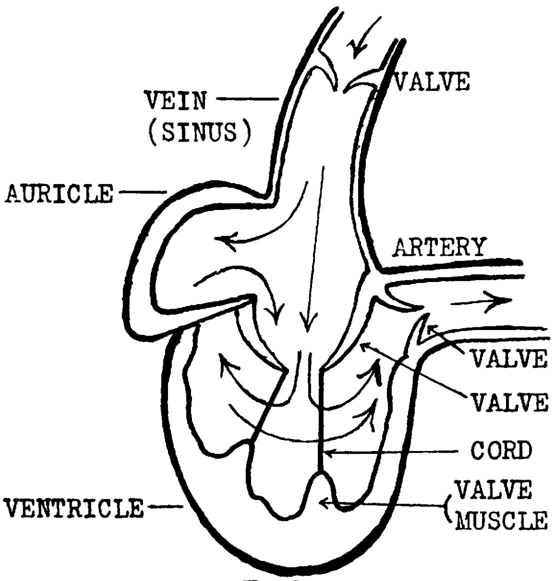

FIG. 3.

Diagram of functional, *i. e.*, blood-pumping unit of heart. The veins contract while the ventricles are relaxing, rushing blood into the auricles, which in turn contracting, discharge their contents into the ventricles, which in turn contract and expel their contents into the arteries, valves establishing one way flow.

the basic index for conclusions—electrical manifestations, etc., being evaluated and judged as concomitant and secondary phenomena and of significant practical value only insofar as their meaning is revealed by contractile phenomena.

These conclusions are more in line with the older observations and conclusions than with current beliefs and teachings.

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Observations on Behavior of the Anthocyan Pigment from Concord Grapes in the Animal Body.

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The anthocyans are not uncommon constituents of our diet. They are especially abundant in berries, grapes and grape products. Nevertheless, facts concerning the metabolism of these pigments are meager. In the following experiments we investigated both the alimentary and parenteral fate of the anthocyan from Concord grapes.

The anthocyan necessary for the experiments was prepared as the chloride according to the method described by Anderson.[1]

(A) 50 mg. of the pigment in saline solution, subcutaneously injected into large rats (450 gm.), resulted in the excretion of the dye in the urine. The specimen at the end of the first day was intensely colored, almost black; the next day's urine had a slightly bluish tinge. Proof of the presence of the dye was obtained by adding to the urines a drop of HCl, which changed the color to a deep red. Other tests confirmed the presence of the pigment. Apparently, a considerable portion of the pigment was excreted without undergoing any change.

(B) In order to determine whether or not the compound was absorbed from the intestine, quantities of 100 mg. of the anthocyan chloride were fed to starved rats by stomach tube. The pigment was not excreted in the urine over a period of 4 days, although the addition of 0.2% of pigment directly to the urine gave the mixture a decided pink color. Heating the urine with acid did not increase the pigmentation. At the same time, qualitative examination of the feces showed some pigment to be present.

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[1] Anderson, R. J., *J. Biol. Chem.*, 1924, **61**, 97.