from its normal creation of pressure fluctuation intermittently to maintaining a sustained pressure rise. This suggests the possibility that a rapid run of ventricular premature systoles could leave the heart more or less in sustained systole.

Summary. The recording of direct pressure curves, in which technical errors are reduced to a minimum, from the ventricular cavities of the heart in man emphasizes the great need of interpreting with care pressure curves obtained by other means in this newly expanded field of human physiology.

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17296. Spiral Arterial Structures in the Fetal Placenta.

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Spiraled arterial vessels are known to exist in the uterus[1,2] and ovary.[3,4] In the course of studying the fetal vascular components of the human placenta, the spiral nature of the primary branches of the allanto chorionic vessels has been noted for the first time. These appear to penetrate the substance of the placenta in much the same way as the radiate arteries do the myometrium of the uterus. The fetal spiral arteries arise from the major subchorionic vessels and represent the main vascular channels for the primary villus stem.

One hundred and twenty-five born placentae have been injected with several different masses and the vascular ramifications of the placental fetal vessels are being studied with a variety of technics. Each injection mass has been introduced via a cannulated umbilical artery shortly after the expulsion of the placenta. Fifty of these have been injected either with a 28% or 12% solution of vinyl acetate. The more concentrated solution was injected at 200-250 mm Hg while the more dilute monomer was injected at 120 mm Hg. The placentae were corroded in commercial concentrated hydrochloric acid for 24-48 hours and in turn washed with jets of tap water. The plastic cast of the fetal vessels which was subsequently recovered represented an accurate 3 dimensional model of the vasculature. Serial reconstruction by comparison is a time consuming, laborious task which does not yield as good a result.

The spiral features can be demonstrated more easily in preparations made with the more dilute vinyl acetate injected at physiological pressures. It is our impression that the greater pressure head which is required to completely inject the more concentrated solution straightens out some of the arterial coils. The remainder of the placental preparations, comprising 3 groups of 25 each, were injected at physiological pressures with radio opaque gelatin mass, liquid latex, and India ink, respectively. Each of these masses has advantages as well as distinct limitations. In the overall study, the desirable features of each has been utilized to reconstruct the details of the vascular pattern. The gelatin and India ink injected placentae have been cleared with a modified Spalteholtz technic and then selected areas have been serially sectioned for histologic detail. Liquid latex can be made to set within the vessel wall without distortion of the lumen, diameter, or calibre of the vessel. Such preparations permit a geometric

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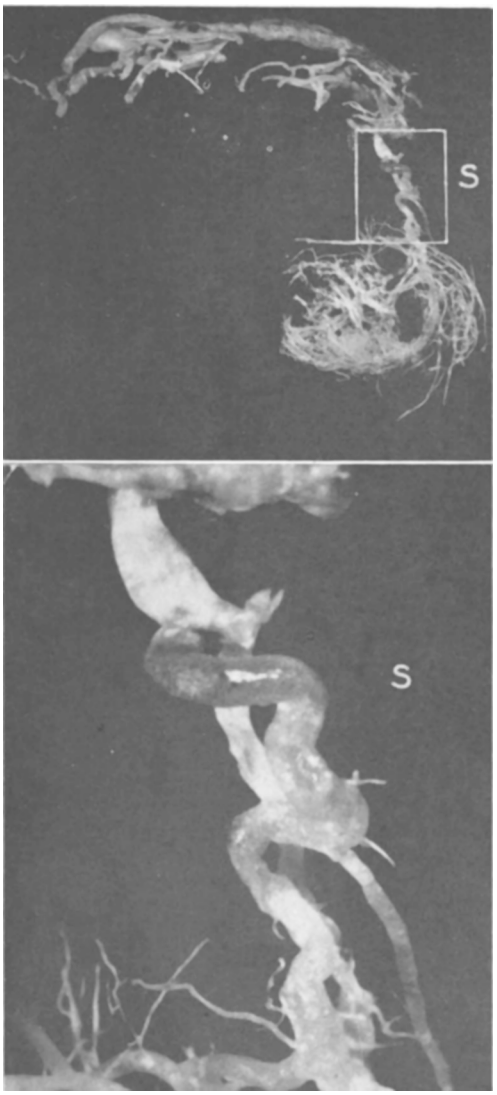

FIG. 1a (top).
Spiraled fetal placental vessels. A corroded plastic preparation revealing arterial coil and partly, paid out arterial coil of primary branch of chorio allantoic vessels. × 3.

FIG. 1b (bottom).
Magnified view of coiling and uncoiling of spiraled fetal vessel shown in area S (Fig. 1a). × 25.

analysis and provide some insight into the hemodynamics of the placental circulation.

All of the preparations reveal aspects of spiraling. Fig. 1 is a corroded plastic cast in which an attempt has been made to isolate by dissection a single allanto-chorionic vessel with its primary spiraled branch and terminal cotyledonary tuft. The spiraled primary villus vessel arises at a right angle to the chorionic plate from the large subchorionic vessels. It forms a helix of slowly diminishing diameter as it passes towards the decidual plate. The number of coils varies considerably averaging between 2 and 5. Some of these appear to be uncoiling and others almost completely paid out. There is a rather marked decrease in the relative diameters between the terminal spiraled segments and the delicate vascular components of the cotyledonary tuft.

Discussion. Physiologic considerations fail to support present concepts of morphologic adaptation of the utero-placental vasculature. Placental transfer is poorly understood, and what information is available fails to support a simple diffusion exchange.[5] A reinvestigation of the essential morphologic features of the fetal vasculature in the placenta has been initiated in order to reevaluate our present concepts. Spiraled arterial and arteriolar vessels in the uterus and ovary are considered to reflect a trophic response to the presence of steroid hormones.[6,7] The mechanism by which this particular morphologic feature of fetal placental arterial spiraling arises is not known. The human placenta is well known as a site of abundant formation of steroid hormones throughout the course of pregnancy.[8] The occurrence of similar spiraled vascular structures, in placental stroma, by analogy, may be attributable to a similar response.

The finding of a helical arrangement on the fetal aspect of the utero placental circulation draws attention to the spiral tuft arrangement of the maternal vessels which tap into the intervillous space. These were first described by Spanner,[9] who contended that this

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arrangement provided for a gradient of pressure which allowed for a continuous uninterrupted flow into the intervillous space. The fetal spiral arrangement suggests a similar functional adaptation which can provide for maximal fetal vascular exchange.

Based upon studies of hydrostatic conditions and maternal blood flow in rabbit uteri during pregnancy, Reynolds has elaborated a concept of uterine accommodation. In the last third of pregnancy the period of uterine growth is supplanted by a period of uterine stretching which follows upon an abrupt conversion of the conceptus from spherical to cylindrical form.[10-13] Ramsey has indicated that a transition is to be observed in the maternal vessels of the endometrium of the pregnant rhesus monkey beyond the 52nd gestational day. The coils of the arteries are paid out, corresponding to the period of uterine stretching.[14] The finding of partially uncoiled paid out spirals of placental fetal vessels in mature term placentae is consistent with these observations. The placental vessels must be subjected to the same hydrostatic conditions and mechanical stretching.

Summary. The spiral nature of the primary villus stem vessels has been described for the first time. The underlying mechanism suggests a trophic response to steroid hormones, comparable to the effect produced on vessels of the uterus and ovary. This spiral pattern provides a gradient of pressure which may slow fetal circulation through the placenta and allow for a more thorough exchange.

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17297. Effects of Intravenous Injection in Dogs of Staphylokinase and Dog Serum Fibrinolysin.*

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Utilizing methods described in previous reports,[1] we have studied the *in vivo* effects of staphylokinase and dog serum lysin (fibrinolysin, plasmin, tryptase) in dogs. Normal dog serum contains the inactive precursor, *prolysin*, of an active fibrinolytic enzyme, *lysin*, and substance(s), *antilysin*, capable of inhibiting this active lysin† Staphylokinase,[2,3] a material obtained from staphylococcal culture filtrates, is capable, *in vitro*, of activating dog prolysin to lysin. It seemed of some interest to determine the effects of this material injected intravenously, as well as those of a potent fibrinolytic enzyme solution, prepared from dog serum by fractionation at 25%

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† This terminology is used for brevity.

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