Ultrasonic diagnostic methods have been accorded recognition by specialists in many branches of medicine in the course of the last few years.

Certain observations were made two years ago [1] on the prospective use of ultrasonic apparatuses in neurology and neurosurgery, and in obstetrics and gynecology.

During the last few years many hundreds of gynecological and obstetrical cases in obstetrical institutions of Moscow, requiring exact diagnosis, have been examined by ultrasonic methods [2-4]. In the United States, pregnant women at various stages of pregnancy constituted almost half (266) of the 600 examined by ultrasonic methods in the course of six months in 1966 [5].

Supplementary methods of examination are used infrequently in obstetrics, not because they are not required, but rather because of the limitations placed on their selection. The normal requirements in respect of reliability and safety, which instruments and apparatuses have to satisfy, are not sufficient for the examination of pregnant women.

All who have had clinical experience of the work or have carried out animal experiments stress the safety of ultrasonic diagnostic methods.

The present authors are of the opinion that it is easier to master ultrasonic than radiographic or electrocardiographic techniques, although much depends, of course, on the nature of the examination and the method used.

Only two-dimensional echograms will give a two-dimensional spatial or planar image of organs or tissues in the plane of their section by the traversing ultrasonic beam. It is only in this way that, for example, the different parts of the fetus can be visualized with ultrasound. Used in obstetrics, two-dimensional echography has the enormous advantage of providing immediate pictures, which are not unlike roentgenograms: the investigator "sees" the outlines of the head or pelvic parts of the fetus on the oscillograph screen. It is thus possible to diagnose the attitude, presentation, and position of the fetus, and also multiple pregnancies. It is also possible to identify the attachment of the placenta, the occurrence of hydramnios, and some fetal defects, as well as certain complications of pregnancy, such as nondeveloping pregnancy and hydatidiform mole. All this is very important for assessment of the obstetrical state, by which is meant a group of indices relating to the development of pregnancy, parturition, and the postpartum period.

Unidimensional ultrasonic examinations provide information in the form of "splashes" or signals of varying amplitude on the oscillogram. These "splashes" require interpretation. Unidimensional echography is, of course, not so "visual" as two-dimensional, and its technique is more complicated.

Recently published papers [6-8] have shown that unidimensional echography is a valuable method. While it is used to supplement two-dimensional echography, it nevertheless constitutes an independent form of ultrasonic examination, capable of solving a number of obstetrical problems, earlier thought accessible only by two-dimensional echography. Furthermore, the bitemporal diameter of the fetal head and the true conjugate of the woman's pelvis can only be measured by unidimensional echography. This is of extreme importance for settlement of one of the most vital problems in the conduct of labor, namely the size of the fetal head in relation to the pelvis. Unidimensional ultrasonic diagnostic apparatuses (echo-
encephalographs) are much more portable, considerably lighter, and much cheaper than apparatuses designed for two-dimensional echography.

The investigation of two-dimensional echography in neuropathology and neurosurgery began only a few years ago. Ultrasonic diagnosis in obstetrics began somewhat later, and then only the two-dimensional method, whereas both techniques were used in neuropathology and neurosurgery. Only after the two-dimensional method has been in use for three years did Donald et al. introduce the unidimensional method, and then only for measurement of the fetal head. Unidimensional echography has been used by many investigators for this purpose [9-14].

No special obstetrical unidimensional ultrasonic diagnostic instrument has yet been produced. For unidimensional echography in obstetrics the authors use mainly the already well-known UZD-5 and EKHO-11 instruments produced by this Institute.

In obstetrics the object for examination by unidimensional echography is the fetal head after the 29th or 30th week. Our experience indicates that the instruments used for echo-encephalography on adults are suitable for examination of the intrauterine fetus.

Certain special features of fetal echo-encephalography and measurement of the pelvis, however, necessitate adaptation of echo-encephalographs for obstetrical purposes by the creation of new forms of specialized diagnostic instruments, data units, etc.

On the basis of published data and their own practical experience, the authors consider the following to be the main indications for the use of unidimensional ultrasonic diagnostic instruments in obstetrics:

1) Determination of fetal attitude, presentation, position, and appearance.
2) Measurement of the bitemporal (large transverse) diameter of the fetal head.
3) Progressive observations of fetal development during pregnancy.*
4) Measurement of the true conjugate of the pelvis.
5) Observation of vital activity of fetus during pregnancy and parturition.†

The following are the main medico-technical requirements which should be satisfied by ultrasonic diagnostic unidimensional apparatuses, suitable for the above purposes:

1) The instrument must operate by the echo or location method, i.e., pulse generation and reception of ultrasonic signals.
2) The reflected signals should be viewed with an A type scan.
3) The instrument must be able to operate on two frequencies, 1.76 and 2.64 Mc/sec.
4) The instrument must be capable of supplying the information required in soft tissues from objects not less than 250 mm from the piezo converter plate of the data unit (with a frequency of 1.76 Mc/sec, three successive reflected signals should be obtained in an organic glass standard 9 cm high).
5) There should be provision for photographic recording of the echograms.
6) The amplification coefficient of the receiving apparatus should be not less than 100-150 dB with signal/noise ratios of 20 dB or better.‡

*These take the form of repeated (every 2-3 weeks or even more frequently) measurements of the fetal head. They provide information on the growth of the fetus and on the adequacy of placental function. Arrest of fetal growth (generally the result of severe nephropathy of pregnancy) established by echographic measurements is an indication for termination of pregnancy, and this may offer the only chance of saving the life of the fetus.
†Pulsations of large fetal vessels may be recorded in echograms in the last months of pregnancy. Such information may be useful for assessment of the vitality of the fetus, and may provide indications for some therapeutic measure or for obstetrical intervention (in the interest of the fetus).
‡The useful signal should pass through the entire amplifying tract without distortion of any kind (of amplitude or frequency). Experience has shown that this very important requirement is best satisfied by resonance rather than broad-band amplifiers.