and probable years of graduation, and it would seem that Virginia gets its fair share of these exceptional students; we then get proportionately more students of the next two age-years—the region of the mode (24.5-26.5); and a smaller proportion of those of more advanced years. The subnormal size of higher age class is explained by the ease in admission with advanced standing, but chiefly by the small number of men admitted who have passed their twenty-second birthday.

Noteworthy is the fact that 38 per cent. of our graduates had baccalaureate degrees, and 53 per cent. had three or more years of premedical college work; nevertheless, we have fewer of the greater age groups and proportionately more of the ages at which students would be expected to graduate. This is additional evidence of the slight effect of more extensive premedical preparation in raising the average age of graduation to its present figure.

It is to be hoped that other medical schools will collate and publish similar statistics.

**USE OF MICROPHONIC STETHOSCOPE IN DEMONSTRATION OF FETAL HEART TONES**

**A PRELIMINARY REPORT**

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The hearing and counting of the fetal heart beat is the most important criterion of the condition of the baby in utero. This has been accomplished by various means as the science of obstetrics has developed. The tones were first heard by Mayor 1 in 1818 with the unaided ear. With the development of the stethoscope, various forms of these instruments have been used. The ordinary forms of the stethoscope have the disadvantage that they are not easily used by an operator when scrubbed up for a delivery. This disadvantage has been overcome by the head stethoscope, which can be used by the operator without manipulation by the hands. The disadvantage of this instrument, however, is that it is tiresome to the head and ears when worn for some time, and it interferes somewhat with the hearing of the operator for other sounds in the room.

Furthermore, considerable practice is necessary for students and nurses to acquire the ability to hear and count the fetal heart tones. In certain patients even the experienced obstetrician may find difficulty in locating the heart tones, especially in obese subjects or in patients having an unusually large amount of amniotic fluid. It would therefore seem desirable if some mechanism could be devised to magnify the tones so that they could be easily heard by an inexperienced person with ordinarily good hearing. This would be still more valuable if it could be accomplished without the necessity of wearing a stethoscope.

With the advent of the loud speaker in connection with the amplification of radiotelephony, it occurred to one of us (F. H. F.), that the principles involved might well be employed in the amplification of the sound of the fetal heart tones, so that it would be possible to hear these tones throughout the delivery room even by inexperienced persons, or in patients in whom the fetal heart tones were difficult to hear. The obvious advantage of this would be that, during labor, accurate information might be obtained and transmitted to the obstetrician by even an inexperienced nurse or intern. During operations, the operator could hear at all times the fetal heart beat and note its rate, rhythm and quality, and would therefore have constantly before him, throughout the delivery, the best and almost the only available data concerning the condition of the baby.

It was with the hope of being able to accomplish this that the investigation was undertaken. In these experiments, as in the use of the ordinary stethoscope, the reproduction of the rate and volume of the fetal heart tones was aimed at rather than fine details of the tones themselves.

Preliminary investigations in the use of the telephone transmitter were made in October and November, 1922. In these tests, an ordinary commercial telephone transmitter was used in connection with a de Forest amplifier designed for telephone work, and a Magnavox loud speaker. Similar tests were also made with a super-sensitive carbon-ball type of microphone, such as is used for detective work or in radio broadcasting from a large room. It was at once evident that the basic problem to be met here was the elimination of extraneous noises from the transmitter and its circuits, since footsteps or other jarring noises in the room drowned out the heart tones. Trouble was also experienced with sound waves from the loud-speaking device acting on the transmitter a second time and setting up howling in the system. It was difficult to exclude these sounds from the transmitter. Experiments were also begun on the use of an ordinary Baldwin telephone receiver as a magnetic transmitter, but this was not followed up because of the small response given to the adult heart tones.

These experiments were abandoned on the reports of the success of Abbott 2 with the microphone transmitter of the carbon type in which all sounds of frequencies above that of the heart were damped out. This transmitter had been used successfully in amplifying the adult heart tones for audiences up to several hundred. Through the courtesy of Professor Abbott, one of these transmitters was secured and experiments were again resumed.3

Experiments in using the transmitter with the Western Electric type 7-A speech amplifier were unsuccessful because the energy level of the transmitter was too high for the amplifier. Experiments were then conducted with General Electric U V 201-A and C 301-A amplifying vacuum tubes in makeshift amplifiers, using several types of commercial audiofrequency amplifying transformers.

It was found that a two stage amplifier of this type gave sufficient response to adult heart beats for detection in a head set or Western Electric loud speaker, but was unable to register the fetal heart tones. The maternal pulse could be distinctly counted with the transmitter over the abdomen. A three stage amplifier revealed both heart beats, and, by experimentation in the selection of the position, it was possible to detect the fetal pulse beats intermittently, but so faintly that it would have been impossible to count them to determine the rate of the fetal heart. A five stage amplifier gave a distinct response in considerable volume to the fetal

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1. Mayor, quoted in Bibliothèque universelle de Genève, November, 1818.
3. In the Correspondence Department of the Journal (August 25, p. 679) we were credited with having used this apparatus for some time. Owing to an unfortunate delay in receiving the transmitter, it is only recently that we have been able to complete our experiments.
pulse, and it could be readily counted several feet from
the loud speaker. As a result of the tube noises, inher-
ent in this type of tube, maximum amplification could
not be employed.

At present, therefore, we are able to report that we
have been able to hear and count the fetal heart tones
in sufficient volume for clinical use by means of this
apparatus. Equipment has been ordered for a perma-
nent installation in our delivery room. This equipment
has been designed to eliminate much of the tube noises,
and to give a greater volume than previously. In addi-
tion, noncritical vacuum tubes will be employed, which
eliminate all current controls.

OPHTHALMIA MYIASIS EXTERNA, DUE
to Larvae of Oestrus Ovis *

H. H. STARK, M.D.
EL PASO, TEXAS

During the day’s work of ophthalmology, one
becomes so accustomed to common diseases of the eye
that diagnosis of any of the usual cases is a simple
procedure and it is only the rare cases that are dif-
cult. Therefore, anything adding to our knowledge
of rare cases should be of value, especially when it
widens the geographic field in which they are found.

I would hesitate to report a single case did it not
seem to have an exclusive place in American literature,
evidenced by the fact that I have found none like it
so far recorded.

REPORT OF CASE

F. D., a girl, aged 16, reported to her local physician,
L. H. Dunham of Las Cruces, N. M., in July, 1921, that for
two days she had had a burning itching of the right eye
and lid, with something passing in front of her sight, and
that several small white objects, which she thought were
worms, had been taken from her eye at home.

![Fig. 1.-Sheep-bot-fly, slightly larger than natural size.]

Inspection of the eye showed a marked degree of con-
junctivitis, and excessive lacrimation, with a number of
small white organisms, swimming with rapid movement
across the conjunctiva. When an attempt was made to
remove these organisms, they would apparently bury them-
selves in the conjunctiva, making their removal very difficult.
However, they were successfully removed by the physician,
and the use of liquid petrolatum was ordered.

Examination on the following morning showed that the
congestion had increased markedly; the patient complained
of disturbance of sight, having headache, vertigo and edema
of both lids. At this time she was brought to me, and Dr.
Dunham presented me with a bottle of physiologic sodium
chloride solution containing four small white objects which
he had removed from the eye, and which under the micro-
scope proved to be larvae of some character.

In going over the history, I found that about two days
previous to the attack, she had felt something hit her right
eye, which was thought to have been a gnat. The blow was
very slight and caused her no immediate discomfort.

Examination now showed marked edema of both lids, a
peculiar fiery red conjunctiva, and excessive lacrimation,
with but slight interference or disturbance of vision; but no
larvae could be found. A mild antiseptic was ordered, and
she returned home. During that night she slept very badly,
and about 1 a.m. had a convulsion lasting nearly twenty
minutes. This subsided with a hypodermic injection of mor-
phin, but she went without sleep practically the entire night.
The temperature and pulse were normal. The next night
she slept fairly well and there was some improvement in
the eye condition, which continued until, on the seventh day
following the attack, the eye was practically normal, and
has so remained.

The convulsion was possibly due to nervousness, rather
than any result of the eye condition.

![Fig. 2.—Larva of sheep-bot-fly, enlarged about 80 diameters.]

THE SHEEP-BOT

The larvae were sent to the Bureau of Entomology,
United States Department of Agriculture, for classi-
fication, and were of sufficient interest to attract the
attention of Dr. L. O. Howard. There was some
doubt as to the classification, and they were forwarded
to Mr. F. C. Bishop, Entomologist, Insects Affecting
Health of Animals, Dallas, Texas, who classified them
as the first stage larvae of Oestrus ovis, or larvae of the
common sheep-bot.

The history of the life cycle of the larva is that it is
deposited by the fly, while in motion, in the nostrils
of the sheep. It passes into the nasal sinuses, where it
slowly changes into the second stage of life, remaining
almost dormant through the winter months. In the
spring, development starts, the size increases, and it
passes into the third stage, when it becomes quite active,
causing symptoms of staggering, loss of weight, and,
frequently, the death of the host. On reaching maturity
it is expelled and reproduces the fly, which is more
prevalent during the warm months and whose move-
ments take place only during the warm part of the day.
A female fly may contain several hundred larvae,
but when these larvae are deposited voluntarily, there
may be only from eight to a dozen. The flies are widely
distributed over the country used for sheep raising,
and are causing a severe loss to sheep owners.

The subject is now under special investigation by the
Department of Agriculture.

Hoping to be able to carry on some animal experi-
ments, through the courtesy of Mr. O. G. Babcock,
Sonora, Texas (special field agent), I received twenty
flies; but, owing to the distance from which they were
sent, most of them were dead, and the living ones had
no larvae.

The most comprehensive article on this subject is by
I. A. Portchansky, a Russian, a translated abstract
of which was furnished me by the department. He
describes the larva as resembling the horse-bot in size
and shape. It reaches to 1 mm. in length, has an

* Read before the Section on Ophthalmology at the Seventy-Fourth
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