strongly impressed with the need for a closing bottle (or bucket) with three qualifications not found in any model about which I had knowledge. These qualifications are: low cost, simple construction and operation and light weight. About three years ago I drew up a rough outline of a design which I thought might prove satisfactory.[1] Several months later I succeeded in getting the interest of the Braun Corporation (of Los Angeles) in the matter, and Mr. O. C. Beach, second vice-president in charge of their factory division, drew plans to cover technical details.

After some discussion of these plans by members of the scientific staff of the Scripps Institution it was finally decided by Director T. Wayland Vaughan to place an order for a trial model. This trial model has now been in more or less frequent use by the Scripps Institution for more than a year, and it has yielded some excellent results.

The most striking success has been in the boat work of the past summer (1926), in which more than forty series of subsurface catches at five meter intervals have been made, without a break in any series. This is the best record ever attained by this institution. The record is made still more impressive by consideration of the fact that two separate hauls were taken at each level, and combined, to constitute the catch. Two hauls at each level were made because of the small capacity of the trial model (five liters) which was kept small enough for use in a rowboat, without hoisting equipment. A ten liter capacity is preferable for plankton work where good hoisting equipment is available.

The fundamental features of the bottle are two in number, first, a cylinder for container, second, a sliding rod at the axis of the cylinder with plates (valves) attached at a distance apart suitable for closing the cylinder when the rod is pulled through to the correct position. Practically, there are several additional parts, notably a spider at each end of the cylinder to support and guide the valve rod, each spider set on an internal flange which gives an accurate, watertight seat for the valves. There are also suitable arrangements for attaching line or cable, and for drainage.

The bottle is sent down open, with the cable attached to the outer rim of the cylinder, so that the weight of the valves causes them to drop below their seats. A messenger sent down to a Nansen trip (or other releasing device) causes detachment at this point and the weight is thrown on to the valve rod, the upper end of which is attached to the cable. The weight of the cylinder brings the valve seats down to the valves, which then remain closed by its weight, or by a special holding device.

[1] Dr. E. G. Moberg afterward called my attention to the fact that Milne's modification of Meyer's bottle has the same fundamental method of construction. Milne's model was successfully used for some special work of the *Challenger Expedition*.

The simplicity of design is such that it seems certain that the shape and size of the bottle can be varied within rather wide limits for specific purposes. Thus, it might in one case be given the form of a long tube, or in another case it might be made up as a short, broad cylinder.

It is also probable that different materials could be used for manufacture, *e.g.*, pyrex, or other durable glass. For ordinary collecting of marine plankton diatoms brass is a satisfactory material. The trial model now in use (and an improved model in preparation) is constructed entirely of metal and the valves are so accurately seated that there is no leakage after months of usage. On this account it has recently been used for collecting samples for chemical analysis as well as for collecting phyto-plankton.

If insulation should be desired it could undoubtedly be provided at the time of manufacture at a material increase in cost.

For operation from a boat where there is considerable rolling and pitching Dr. E. G. Moberg, who has charge of boat work for the Scripps Institution, has been accustomed to use a stabilizer consisting of a window weight suspended from the bottom of the bottle by about fifty feet of line. Dr. Moberg and Mr. James Ross, mechanician, have also contributed valuable suggestions concerning certain details of construction of the bottle.

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SPECIAL ARTICLES

THE WIDTH OF THE BASILAR MEMBRANE

DATA upon both the actual and the relative dimensions of the basilar membrane are of fundamental importance in all considerations of possible functional performance. The measurements which I have made of the widths of the basilar membrane in the guinea pig (Cavia cobaya) have shown it to differ so essentially from the usual description for mammalia that it seems desirable to make a brief report in a journal which will reach the attention of the workers in the several fields of science who are concerned with the problems of hearing. A full report will be made later in one of the anatomical journals.

In the numerous works on theories of hearing in which some type of movement of the basilar membrane has been postulated this membrane has been regarded as always and continuously increasing in width from basal to apical ends. Many have gone so far as to use diagrams showing a uniformly rapid increase and have even constructed "models" on this assumption. The original data on which this usual conception of the basilar membrane are based are very meager, indeed, and none of them gives actual support to the idea of a uniform rate of increase in width. As an illustration of the insufficiency of the data is the fact that the very much quoted widths given by Retzius for the human in his great classic are the measurements for a single labyrinth only, and there is no way given of even estimating the linear distance between the three places measured. In all the previous data of which I am aware the nearer the apex of the cochlea the greater is the width of the basilar membrane; in almost all a single labyrinth only has been measured for each species; and for no species has a sufficient number of individuals been measured to give any idea of the range of variation. (Citations of literature will be given in the detailed report of this work.)

Good mid-modiolar orientation and good histologic preservation have been the criteria used in choosing from my collection the thirty-five series of sections of the labyrinth of the guinea pig in which I have measured the width of the basilar membrane. The histologic technique was identical in all, so that the effect of this was similar, at least. The measurements of all parts except the basal end (vestibular part) have been made for each membrane on the several parts included in a single section selected from each series as the nearest to the middle of the modiolar axis. Since in the guinea pig the cochlea has somewhat more than four full turns such a section strikes it in eight places. I have measured with a screw micrometer ocular and suitable objective the distance from the attachment of the basilar membrane at the edge of the spiral lamina (some have measured from the foramina nervosa) to its attachment to the spiral ligament; these are listed in the tables under the respective half-turns. The "lowest" end of the basilar membrane was measured in whatever section of the series it was located; the membrane under the "lowest" place where a distinct organ of Corti is present has been selected for the measurement of this narrow end of the vestibular part, and since the direction of this section is not "radial" the figures for this narrow end are doubtless all too large. These are the values listed under the heading "P.v." in the tables.

By means of the graphic reconstruction method (Guild, *Anat. Record,* Vol. 22) the lengths of each half-turn were determined for three cochleae, and from the averages of these three values a rough approximation has been made of the average distance between the places at which the widths were measured. The parts included in the horizontally oriented mid-modiolar sections used are about in the middle of their respective half-turns. By combining the width and length data a value is obtained for the "rate of change" in width in the various parts. While these values are not very accurate the differences are so great that they must at least indicate the order of the values for the several parts; and this is something which no previous work has attempted for any form. This rate of change has been expressed as a fraction with the denominator the number of units lengthwise of the basilar membrane required for a change of one unit in width. In the tables these fractions are placed on an intermediate level between the width measurements concerned. The plus and minus signs indicate respectively that the change is an increase or a decrease in width in the apical direction. Thus, in Table 1, the fraction "+1/77" means that between the middle of the first half-turn and the middle of the second half-turn there is on the average an increase in width of the basilar membrane of one unit for each seventy-seven units of length.

The guinea pigs used ranged in weight from 175 to 350 grams; age data were not available. Individual variations between the dimensions in animals of the same weight are so great as to render insignificant any possible growth effect which might be based

TABLE 1

WIDTHS IN MICRONS OF BASILAR MEMBRANE IN GUINEA PIGS

Half-turn	Minimum	Maximum	Average of 35	Av. rate of change
P.v.	49	73	62.3	
				+1/49
1st	124	143	131.6	
				+1/77
2nd	161	181	173.3	
				+1/519
3rd	160	188	178.3	
				+1/112
4th	180	206	196.6	
				+1/525
5th	181	217	200.0	
				+1/175
6th	194	227	209.1	
				=0
7th	192	228	209.3	
				−1/56
8th	169	219	189.4	

on this series. For example, it may be mentioned that the weights of animals 1, 2 and 3 of Table 2 were, respectively, 350, 320 and 340 grams.

The greatest width of the basilar membrane is located on the average in these thirty-five guinea pigs nearly a full turn below the apical end, which is always distinctly narrower than the widest part, and in fact is decreasing in width almost as rapidly as the basal end increases. Other points of particular interest in connection with functional theories are the great range of the actual and the relative widths in individuals (very noticeable upon inspection of the whole group of measurements); the wide departure from anything like a uniform rate of increase in width; and especially interesting is the fact that the width at the third half-turn and at the fifth half-turn is frequently less than or only equal to that of the half-turn below, while in many, although not in all, of the other individuals the rate of increase in width in these two regions is much less than in other parts. Thus for the guinea pig the usual description of width changes of the basilar membrane in mammalia must be completely revised, and may be briefly summarized as follows. Proceeding apicalward from a narrow basal end there is a relatively rapid increase in width which becomes less rapid toward the upper part of the basal turn and between the second and third half-turns the average increase is very slight and there may even be a zone of constant or of slowly decreasing width; above this is another region of more rapid increase in width for about a half-turn, followed by a second zone of slowly increasing or even of constant or slowly decreasing width as the middle of the fifth half-turn is approached; above this the membrane again increases definitely in width until a rather elongated part of greatest width is reached in the upper part of the third and lower part of the apical coils; above this widest zone there is always a rapid decrease in width as the apex is approached.

TABLE 2

EXAMPLES OF THE INDIVIDUAL VARIATIONS IN BASILAR MEMBRANES OF GUINEA PIGS

Half-turn	Animal 1		Animal 2		Animal 3	
	Width	Rate of change	Width	Rate of change	Width	Rate of change
P.v.	56		57		69	
		+1/44		+1/52		+1/46
1st	127		124		143	
		+1/61		+1/86		+1/107
2nd	177		161		173	
		-1/504		+1/196		+1/216
3rd	172		174		185	
		+1/78		+1/128		+1/107
4th	197		190		204	
		+1/425		-1/200		+1/357
5th	201		181		209	
		+1/167		+1/127		+1/123
6th	210		194		222	
		-1/665		+1/359		+1/1408
7th	208		198		223	
		-1/107		-1/66		-1/27
8th	198		180		182	

The fundamental bearing of such data upon possible functional performance is apparent at once to all who are familiar with the theories of hearing which have been based upon hypothetical movements of the basilar membrane. Since neither for the human nor for any other form has a sufficient number of labyrinths been measured it is of course impossible as yet to say whether or not the guinea pig is an exception or whether more data upon the other forms will disprove for them also the present descriptions. The guinea pig has been the most used animal in the sound injury experimental work and for this reason alone, if for no other, it is of importance to know whether it does differ sufficiently from other forms in this respect as to essentially affect the value of the conclusions drawn from these objective experiments.

It is of course well recognized that the width of the membrane itself is only one factor of the several that must influence the hypothetical responses of the basilar membrane to sound waves, and it may be that variations in width in an individual are compensated for by combinations of variations in the other factors. But of these other factors we have as yet an even more incomplete record than of the width of the basilar membrane. In my opinion the need at present for a better foundation of morphologic facts is much greater than for more theorizing on the problem of hearing.

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EXCYSTATION IN IODAMOEBA WILLIAMSI IN VIVO AND IN VITRO

IODAMOEBA WILLIAMSI is a human intestinal amoeba that apparently occurs in about 10 per cent. of the general population. Two stages are known in its life cycle, an active stage, the trophozoite, and a passive stage, the cyst. Infection of new hosts is supposed to be brought about by the ingestion of cysts which excyst in the human intestine. So far as is known, excystation in this species has never been reported.

Excystation in vivo: Washed cysts were inoculated into the stomach of guinea pigs and the animals sacri-