that the Flames rolled down Stairs. The Clap of *Thunder* which immediately followed ſeemed to all like the ſuddain Diſcharge of five or ſix Field-pieces, not with that rolling, deep noiſe *Thunder* uſually carries along with it: Indeed, for my part, I thought it had been Guns. The Second Flaſh and Clap followed within a few Minutes of the firſt, but not with that Violence as the former: Which Flaſh fir'd the *Steeple* I cannot ſay, but a piece of Wood to which the Lead of the Windows was nailed (the Windows being nothing but Lead cut full of Holes) was ſet on fire, and kindled very faſt, and might have done a great deal of Miſchief, had not the earlineſs of the Night, and timely help prevented it. This Storm ſeemed to run in a direct Courſe; for ſeveral of our ſide-Towns perceived little of it; and I believe it broke chiefly over us, for I hear of no Effects it had any where elſe, but only at *Kettering*, where one of their Bells, as ſome ſay, received ſome damage, and the Wires of the Chimes were twiſted one within another: The Wind was very bluſtering all the Night after.

Oundle, Apr. 22. 1693. *Yours, &c.*

VI. *Anatomical Obſervations in the Heads of Fowl made at ſeveral times. By the late* Allen Moulen, M. D. *S.R.S. Read before the Royal Society,* Feb. 1. 168⅞.

1. IN the Heads of all the Fowl that I had an opportunity to examine, I conſtantly found only one *Aquæductus*, or Paſſage from the Ears into the Pallat; whereas

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Whereas in Men, Quadrupedes, and ſome Amphibious Fiſh, there are always two, one on each ſide below the entrance of the Noſtrils into the Pallat, and opening towards the Noſtrils, for the more convenient reception of Air, as is ſuppoſed. This Paſſage in Fowl is exactly in the middle of the Pallat, below the entrance of the Noſtrils into it: It is a membranous Tube, capable of admitting a Ravens, if not a Gooſe Quill in larger Fowl, ſuch as Turkeys, Geeſe, *&c.* and reaches backward as far as the Communication from Ear to Ear, and hence it comes to ſerve both; whereas there is a neceſſity of two in thoſe Animals, whoſe Ears do not communicate.

2. I have purpoſely examined the Heads of all the Species of Fowl I could procure, and conſtantly found a hollow ſpace between the two Tables between the *Os Cuneiforme* reaching from Ear to Ear, and as far forward as the aforeſaid common *Aquæductus*, or rather *Ductus Aereus*, the contrivance of it ſeeming more to favour this than the former uſe. This Cavity in all Fowl (as far as I have obſerv'd) reaches above the *Labyrinthus* on each ſide, ſo that whatever impulſe is made on the *Tympanum* on the one ſide, may not only be very readily communicated by means of the internal Air to the *Labyrinthus* of the ſame, but alſo to that of the oppoſite ſide. Hence probably proceeds the quickneſs of Hearing and Vigilancy of Fowl, notwithſtanding their wanting a *Cochlea*, the defect of which ſeems to be by this Structure more than ſupplied, no other Creatures that we know of having any thing of it. It is not improbable that the oppoſite Ear to a Sound is altogether as much affected by it as that next it, if not more. There are ſeveral *Laminulæ* and Pillars of hard Bone between the two Tables in theſe Caveties, deſigned, as may be ſuppoſed, partly for their Maintenance at a convenient diſtance, and partly for breaking of the Air, ſo as to hinder Echoes

choes and confus'd repreſentations of Objects. In confirmation of which laſt Reaſon Sir *John Hoskins* did ingeniouſly obſerve, that Pillars in Churches very much prevented Ecchoes: And for the ſame reaſon theſe might alſo hinder them in the Heads of this particular Structure.

3. In the Heads of *Woodcocks*, beſides the paſſages now deſcrib'd, I found one on each ſide the Bone, making the Orbit of the Eye proceeding from the Ear, and reaching forward towards the ſetting on of the Beak, near which they join'd in one, and turn'd under the Skull in a ſmall paſſage leading to the Cavity, by which the Ears communicate, and which is above deſcrib'd, into which it enters. Theſe paſſages are alſo in the Heads of *Snites*; and moreover, one over the *Sinus Longitudinalis*, and another over the *Sinus Lateralis* of the Brain. Note, that in the killing of *Snites* and ſmaller Birds, if care be not taken that the Head be not bruis'd, theſe paſſages cannot be diſcover'd for Blood extravaſated in them. Note alſo, that the *Laminulæ* and bony Pillars are every where to be obſerv'd where there is a paſſage, excepting under the Skull, in the paſſage from the ſetting of the Bill to the firſt paſſage deſcrib'd.

4. In the Heads of *Parrots* and *Paroquets*, beſides the firſt deſcrib'd paſſage, I obſerv'd between the two Tables every where Cells opening into others, and thoſe into others, ſo that there was not any part ſcarcely of the Skull that was not taken up with them. And this did not only appear by pouring into one Ear freed from its Drum, the other alſo being removed, a Tincture of Cochinel, and then blowing of it into all theſe Cells, ſo that no part was free from Tincture, but it appeared alſo to the naked Eye, notwithſtanding that ſometimes it was difficult to trace the Communications of them by reaſon of numerouſneſs of the *Laminulæ* and Pillars aforeſaid.

5. In Singing Birds the Structure of theſe paſſages is like that of the *Parrot* and *Paroquett*, only that the Pillars and *Laminulæ* are leſs than they ſhould ſeem to be in proportion to the Heads. From whence it is probable, that theſe Birds are by this Structure enabled to diſtinguiſh Sounds and Notes, and alſo imitate them better, having a more muſical Ear.

6. In the Heads of *Pullets*, *Geeſe* and *Ducks* I found only the firſt deſcrib'd paſſage diſtinctly, but in *Pluvers*, *Buſtards*, and ſome other, I found another that went over the *Sinus Lateralis* of the Brain from Ear to Ear. This ſeems to be deſign'd to make them more watchful than Domeſtick Fowl, or yet thoſe that live much on the Water, becauſe they are liable to a great many Dangers that the others are exempt from. Note, that there are for the moſt part great varieties in the Structures of all Fowls Heads.

7. In the Ears of all the Fowl that I could examine, I never found any more than one Bone and a Cartilage, making a Joint with it that was eaſily moveable. The Cartilage had generally an Epiphiſe or two, one on each ſide, which were very flexible, as it ſelf was. The Bone was ſmall and very hard, having at the end of it a broad Plate of the ſame Subſtance very thin, upon which it reſted as on its *Baſis*. I got that of a Pullets Ear, repreſented in *Fig.* 4. where *a* is the main *Cartilage*, and *b b* the two *Epiphyſes*, *c* the ſmall Bone, and *d* the *Baſis* or broad end of it. Note, that in the Figure, part of the Drum ſticking to it is repreſented together with the Cartilages.

8. I obſerv'd three pair of *Nerves* in all the broad bill'd Birds that I could meet with, and in all ſuch as feel for their Food out of their ſight, as *Snites*, *Woodcocks*, *Curlews*, *Geeſe*, *Ducks*, *Teale*, *Widgeon*, &c. Theſe *Nerves* are very large, equalling almoſt the *Optick Nerve* in thickneſs; they begin a little more forward than the

Auditory

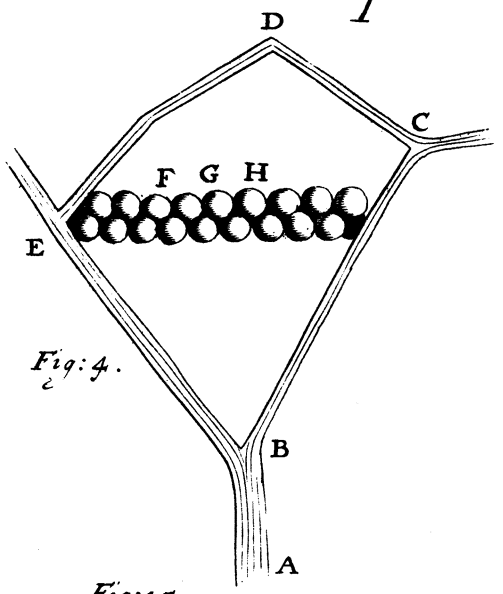
Auditory Nerve from a little Protuberance which ſeems to be made for them: One of them goes over the *Optick Nerve* in the Orbit of the Eye, the other two go under the Eye. Two are diſtributed nigh the end of the upper Bill, and are there very much expanded, paſſing through the Bone into the Membrane, lineing the Roof of the Mouth. The third Pair is diſtributed near the end of the lower Bill, and ſubdivided like the former. Note, that Birds that pick their Food where they can ſee it have not theſe *Nerves*, and that the Pair of Nerves belonging to the upper Bill is conſiderably ſmaller in proportion to the Fowls than thoſe obſerv'd above; whence it is probable that theſe *Nerves* were deſigned for ſome great uſe, both on the account of their number and their largeneſs; and that the uſe to be aſſign'd to them muſt be to enable them to diſtinguiſh (whether by taſting or feeling I will not now diſtinguiſh) their Food, there being a neceſſity of a more exquiſite Senſe in theſe Fowl, than in any other. *Fig.* 15. repreſents theſe in a Ducks Head, where *a a* expreſſes the Edge of the *Cranium*, which was in part remov'd for the more clear view of theſe Nerves, *b b* are the *Cells* about the Ear between the two Tables above deſcribed, *c c* the *Brain* laid bare with its Blood-Veſſels, *d d d* the three *Nerves* on one ſide, *e* the Optick Nerve, *f f f* the Skin and part of the Bone remov'd to bring the Nerve in view, *g g* the two Nerves expanded near the end of the upper Bill, *h h* that in the lower.

9. All the *Eyes* of Fowl and of *Fiſh* that I have examined were more or leſs *cartilaginous*; for the *Sclerotis* is a *Cartilago ſui generis*, eſpecially near the *Cornea* in all theſe Animals. And in the larger ſorts of both I remembred to have found the whole *Sclerotis* ſuch a kind of a *Cartilage*.

10. In the Eyes of Fiſh I obſerv'd that the *Proceſſus Ciliaris* is not faſtned to the joining of the *Cornea & Sclerotis*, as in all other Animals that I diſſected, ſo as to hinder the watery Humour to go any further backward. For I conſtantly obſerv'd that the *Humor Ciqueus* may move a good way backward in ſome, and in others almoſt as far as the *Optick Nerve*. I ſhall at another time make ſome Remarks on this.

11. I have in as many *Fiſh* as I could conveniently examine carefully, found a Membrane which cover'd the *Tunica Cornea*, ſo as not to let any Water come to it. This anſwers the *Membrana Nictitans* in Fowl, and reaches on all ſides to the *Cutis* of the Fiſh to which it is faſtned; this is tranſparent, and pretty thin, and ſo is alſo the *Cornea*, if compar'd to that of the Quadrupeds.

12. I have frequently obſerv'd in ſmaller Fowl, that the Membrane of the *Drum* was double; for I have by gently pulling away the Membrane lining the Tube of the *Ear*, I obſerv'd at the bottom of it a tranſparent Membrane, which at firſt I took to be the Membrane of the Drum, but upon Examination I found that the Membrane of the Drum was ſtill entire and in its proper place. I have ſometimes obſerved this in larger *Fowl*, in a *Seal*, and in ſome other Animals, and am apt to think from a caſe mentioned in *Du Verneyes* Book of the Ear, that it is ſo in Men; and if ſo, it is likely it may be ſo in moſt, if not in all Animals. The Obſervation was as followeth; A Perſon that was deaf for ſome time died, whoſe Ears Mr. *Du Verneye* examin'd, in order to find out the cauſe of his Deafneſs, which he found to be a thick Membrane growing in the Ear before the *Drum*, which hindred the Impulſes in the Air to be communicated to it. Now I take it to be more likely that the Membrane ſhould be double, and that the outward was preternaturally incraſſated, then that a Membrane ſhould grow in a place where the ſides do not touch.



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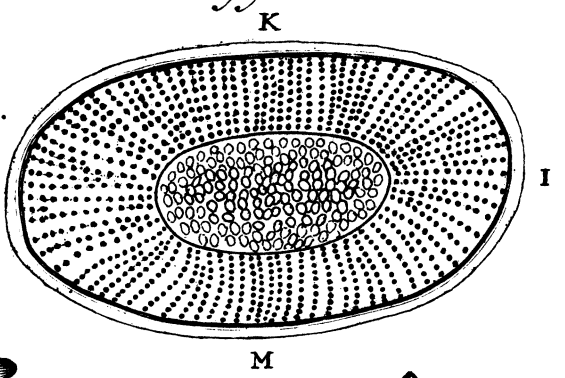

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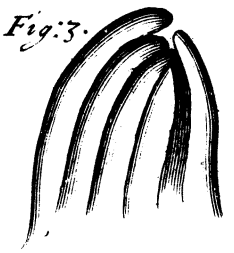

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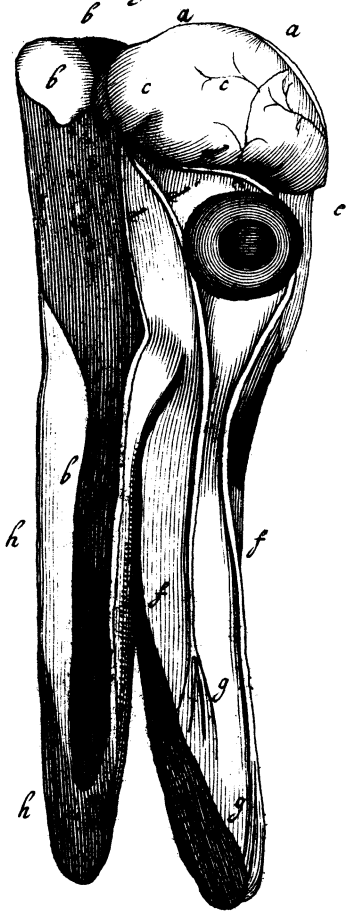

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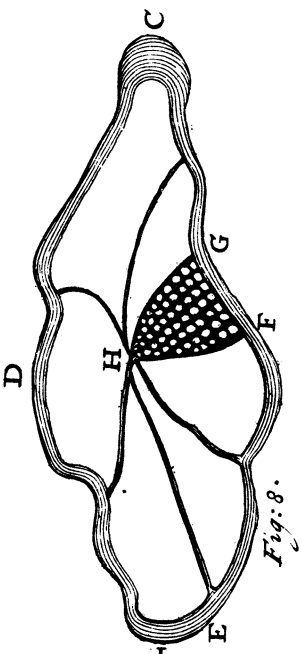

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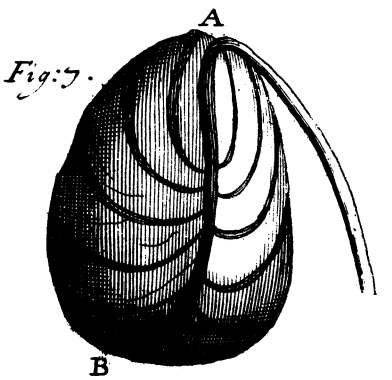

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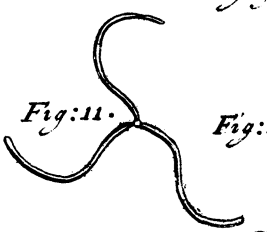

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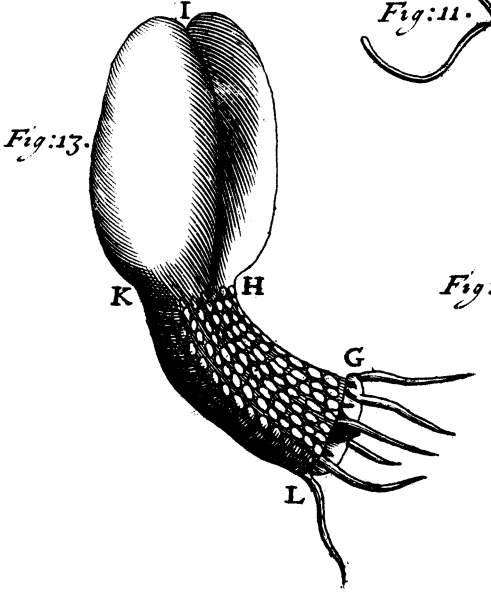

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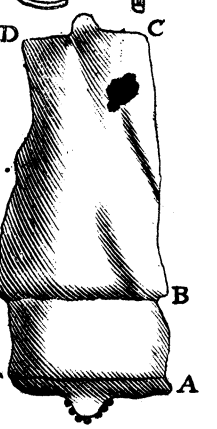

Fig: 12.