

An Account of BOOKS.

- I. *Martini Lister, Exercitatio Anatomica in qua de Cochleis, maximè Terreſtribus, & Limacibus agitur. Omnium diſſectiones tabulis æneis, ad ipſas res affabre inciſis, illuſtrantur. Cui accedunt Digreſſiones de Reſpiratione, Generatione Androgynâ, Sapiâ, Loligine, & Polypo aliisque rebus naturalibus. Sumptibus Sam. Smith, & Benj. Walford, Societatis Regiæ Typographorum, ad Inſignia Principis, in Cœmeterio D. Pauli. 1694. Octavo.*

THE Author gives ſome Reaſons why he fell ſo late upon this ſort of Anatomy, which the Reader may ſee in the Preface.

You have here diſſected about Ten Species of Animals; ſix of which are Land-Snails, and four or five naked Snails, all of this laſt ſort which this Iſland affords. In this Comparative Anatomy, you have the *biggeſt* of our Land-Snails, known by the name of *Pomatia Gefneri*, diſſected, for an Example to the reſt.

The outward parts of Snails are firſt deſcribed; as the Skin, Horns, and the Eyes therein placed, the Head and Foot. Alſo the ſeveral openings and inlets to the Body. As, for the Mouth, for the *Anus* near it, for the *double Genitals*, &c.

The *Gills* and vaſt Cavity covering the Back, where the *Heart* alſo is placed. Here is alſo a ſort of Hypotheſis about Reſpiration offered. The *Guts* are alſo, with
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much accuracy, described; and that Parenchymatous part, called by the Greeks *Meconium* (see there also the Reason of that Name) asserted to be no Liver, but certain Appendicules or Ramifications of the small Guts.

The Vital Juice of Snails, circulated by the Heart in the Arteries and Veins, is ever liquid and thin, and so remains in the Cup after emission by Incision, yet easily coagulating by Fire, in like manner as the *Serum* of our Blood.

But the most Remarkable thing in this sort of Animals are the double Genitals, each Animal being both Male and Female. The first Observation of the thing is owing to the Learned Mr. *Ray*. The Author is very exact in the description and uses of these Parts; which cannot well be further insisted upon in the Vulgar Tongue, referring the Curious to the Book it self for particular Instruction. He concludes this small Tract with the Reasons why Snails can live all Winter, and even many Months in the Summer without Food.

All the *Anatomic Part* is illustrated with Exact and Curious *Figures*, designed by the Life.

To conclude, if the Philosophy pleases not, there is yet a *Lucriferous Project* offered to gratifie the Industrious, of *multiplying of Pearls*; by making Ponds for the Animals, which are apt to breed them, of Petrefying Waters, whether fresh or Salt.

II. *A Treatise of the Natural Grounds and Principles of Harmony.* By Will. Holder, D. D. &c. Lond. in Octavo. 1694.

IN the Introduction the Reverend Author Observes, that Sounds, the material part of Harmony, are Natural and Physical; but the disposing of them so as to delight the Hearing, is the formal part of it; both united make Harmony compleat, and may be either in Symphony, where many sounds are heard together, or Solitary, where the Ear finds the Agreements of single preceding with subsequent Harmonious Notes by expectation. The Physical Reason of this pleasing Agreement of Sounds is the design of this Tract. In order to which,

In the First Chapter he considers the Nature of Sounds in general, and therein agrees with the best Philosophers that Sound is made by a tremulous motion of some body which communicates it to the ambient Air, whence 'tis propagated in a Sphere by a Temporaneous progressive motion of the parts of the Air at the rate of 276 Paces in a second Minute of time, which is sometimes violent enough to break Glass Windows, and being reflected by resisting Objects makes Echoes. If the tremulous motion be uniform, it makes a Musical Note or Sound; if difform, a Noise; and the Musical Sounds are differenced by the respective quickness of their tremulous motions.

In the Second Chapter he more especially considers Harmonious Sounds, and shews that the quicker tremulous motions make the Musical Sound more acute, the slower, more grave. And from the proportions of these Motions to each other proceeds the Harmony or Discord

cord of them to each other : And from the continuation of the motion the same as to time till it cease is the cause of the continuance of the Tone the same. This Doctrine he explains by the Pendulum and other sensible vibrating Motions, as strings or Springs : From which visible *Phænomena* he concludes, that the Motions that cause Musical Sound are of the same Nature, tho' they cannot be distinguished by the sight. And in an Appendix to this Chapter he has farther explained the Doctrine, and resolved some Doubts and Objections concerning it ; and more particularly applies it to the explication of the tension, length, vibration, and velocity of Musical strings ; shewing that as shorter Pendulums and stronger Springs make quicker Vibrations, so shorter strings, and more strongly tended, make acuter Notes.

In the Third Chapter he speaks in general of Consonancy and Dissonancy, shewing it to be the Result of the Agreement or Disagreement of the undulated Motions of the Air, which he explains by the undulations on the Surface of Water or Quick-silver, though he doth not instance in them as exact to his purpose, but only as Illustrations ; to which purpose he also mentions some Experiments of the Agreement and Disagreement of some Musical sounds as they are made in the Air, which are more remarkable and notorious, and do very much please, or very much offend the hearing, explaining the Reasons of them by the same general Doctrine.

In the Fourth Chapter he more particularly shews and determines what the Harmonious Sounds which please the Ear (which is the Judge) are, and therein shews that the Ear approves of these Intervals, *i. e.* the 8th. the 5th. the 4th. then of the 3d. *major*, the 3d. *minor*, the 6th. *major*, the 6th. *minor* ; and of greater Intervals compounded of these with an 8th. as of a 10th. which is an 8th. and a 3d. of a 12th. which is an 8th. and a 5th. of a 15th. which is an 8th. and an 8th, &c This System

System of 8, consisting of 7 Intervals, or 8 Notes inclusive, is called *Diapason*, and every Octave or System above or below it ascends or descends by the same Intervals. Then he gives the Reason why they so please the Ear, and this he shews to be from the more frequent coincidence of their appropriate Vibrations. As the Unisons unite in every Vibration being perfectly Isochron; 8ths. every 2d. of the quicker, 5ths. every 3d. of the quicker, 4ths. every 4th. of the quicker, 3d. *majors* or *Ditons* every 5th. 3d. *minors* every 6th, &c. and two strings of equal bigness and tension will give these Intervals, if their lengths be in proportion to one another, as 1 to 2, 2 to 3, 3 to 4, 4 to 5, and 5 to 6. Upon the occasion of the difference of 3ds, and the difference of 6ths, he discourses which of them may be more properly made use of in movements of Consort-Musick, but only in *transitu*, as being not pertinent to his present Design, but to avoid ambiguity of Name, he has given a Table both of the several Intervals, and also of the several Names of each Interval, *pag. 66.*

In the Fifth Chapter he speaks somewhat of Proportion in general, and then of three kinds of it; Arithmetical, Geometrical, and Musical, which he in short defines and explains: Then he explains the several Denominations of Geometrical Rations, as Multiplex, Superparticular, Superpartient, &c. and then comes to shew how this Doctrine is useful and applicable to Harmony and Musick, and that the Philosophy thereof consists in the Rations or Proportion of the Bodies, of the Motions and of the Intervals of Sound, in the very Contemplation of which there is no less pleasure and satisfaction than in the hearing it self of good Musick: The Rations he shews to be found by Multiplications and Divisions, and thereby the Progressions and the Mediums may also be easily reduced to be expressible by whole Numbers. Thus adding of Rations is performed by

Multiplying the Antecedents together, and also the Consequents, and those two Products give the Compound Ration, as to add 4 to 3, and 6 to 5. $4 \times 6 = 24$, and $3 \times 5 = 15$. So 24 to 15, that is, 8 to 5 is the Sum of those two Rations; that is, a 3d. *minor* added to a 4th. makes a 6th. *minor*: Thus 3 to 2 added to 4 to 3 makes 2 to 1, that is, a *Diapente* added to a *Diateffaron* makes a *Diapason*. So Substraction of Rations one from another is performed by Division; that is, as Division of Fractions is performed by cross Multiplication, so also the doubling, trebling, quadrupling, &c. of Rations is performed by squaring, cubing, biquadrating, &c. of the terms. So the halving, trisection, quartering, &c. is performed by extracting the Square Root, the Cubick Biquadratic Roots, &c. of the Terms, or by Cross Multiplications, as in the dividing Fractions; by which Method he shews how 'twill be easie to find how many lesser Rations are contained in a greater, &c. as *Mersennus* found 50 $\frac{1}{2}$ *Comma's* in an *Octave*. But *Mercator* working by Logarithms finds 55 $\frac{1}{4}$. And supposing a *Comma* to be a 53d. part of a *Diapason*, he thereby accommodates the expressing of all the Intervals by *Comma's* pretty near, of which here is (p. 106.) a Table added. The Ancients owned only 8th. 5th. and 4th. for simple Consonant Intervals exprest by 12. 9. 8. and 6. whence 'twas said, *Mercurius his Lyre was strung with four Chords*. After this the Doctor shews an easie Method of finding Intermediate Rations, and expressing them in whole Numbers, and has in p. 122. given a Table of them, but observes that all the Intervals are not Harmonical.

In the Sixth Chapter he treats of Discords and Degrees, meaning thereby only such Discords as fall within the Degrees of the Scale of Musick (for there are infinite other, all proportions of Tones not Harmonick, being Discordant.) Now there are three varieties of these Degrees in the Scales of Musick, which are as in

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were three Ladders differently Runged, that is, the Rungs or steps placed at several distances. These Scales or Ladders thence have attained three differing Names, viz. Enharmonic, Chromatic, and Diatonic; of which the last is the most Natural and best way, and is that which is only now used. The other two were used by the Ancients, and therein lay their Varieties of Musick, though the Author thinks them insufficient to perform what is now done in Symphony by the Moderns with the Diatonic Scale, for they only owned 8ths, 5ths, and 4ths for Conords; and are supposed not to have used any Concord Musick, but only single Notes, which might make stronger impressions on the Fancy. The Ancients ascended either by two Tetrachords conjunct, which made a 7th. and a *Proslambanomenos*, which made the 8th. Or by two Tetrachords disjunct, the second Tetrachord taking its beginning at the Fifth. In the Diatonic the Degrees were *Tones* and *Semi-tones*, Intervals more Natural. In the Chromatic the Degrees were *Hemitones* and *Trihemitones*. But the Degrees in the Enharmonic were more unequal, being only *Dieses* and *Dittones*. Each of these Graduations he more particularly explains sufficient to make them intelligible, and to shew what were those Ancient Modes of Musick, called *Dorian*, *Lydian*, *Phrygian*, &c. Moods. From which proceeded so much Delight as they relate. However he thinks as it has not been for many Ages practised, so 'tis in a manner lost at present. He therefore leaving that, prosecutes his Speculations on the Diatonic Scale only in a short Digression (for gratifying his Readers Curiosity) has given the Proportions, Names, and Characters, as they were delivered by the Ancients, which I pass over, being in the Book it self Epitomized.

He shews then that there are in every Diatonic *Diapason* five whole Tones, and two half Tones, and accord-

ing as the order of placing the Intermediate with relation to the first and last of them is, so the differing cliffs are constituted. Of which he notes, that that order according to which we make our Rings of Bells is the most agreeable to all Ears; and this we most easily express with our Voice, either in rising or falling Notes, the half Tones being so properly and Naturally mixt. But he conceives a Ring of Bells tuned to Chromatick Intervals, would sound very uncouth and unpleasant to most Ears; and if tuned to the Enharmonick, would be intolerable, and the practice of it would be a violence upon Nature. But the Diatonick Intervals being more equal and uniform, are also more Natural. However these Intervals are not all alike, but are of three kinds, namely, Hemitone Major, Tone Minor, and Tone Major, called Degrees, Minor, Major, and Maxim. Each of which has its proper place in the Octave, and that is, such as compleats the Harmonick Intervals, whence in Organs and Harpsicords, where the Notes are fixt, the proper Ascent and Descent cannot be made but only beginning from some Keys, because the Flats or Half-notes to other Keys do not keep a due or fitting Proportion for that Cliff. He has given four Examples of these Scales, pag. 155. and explained them in the following Pages. He concludes this Discourse with a Table, containing all the Notes and Intervals, explaining how each of those in the Diatonick Scale are composed of those three Degrees, viz. *Minor, Major, and Maxim.*

In the Seventh Chapter he treats of Discords; that is, of such as are found in the Scales of our Musick in the Ascent or Descent in differing Cliffs, where the Degrees which are placed right for one Cliff, must necessarily be unfit for another Cliff, whence the Concords in these wrong Cliffs are found to have a Comma, a Diesis, and sometimes a Hemitone too much or too little: For the adjusting of which there will arise two other kinds

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of Seconds, and two other kinds of Thirds, and of Sixths, and of Sevenths. But among these two are most eminent, *i. e.* the *Tritone* or *false fourth*, made of two Tones *major*, and one Tone *minor*, being as 45 to 32. And the *false fifth*, or *Semidiapente*, made of a Fourth and *Hemitone major*, *i. e.* 64 to 45. These Discords, as also the Seconds and Sevenths are notwithstanding of great use in Musick for Delight when judiciously used. He reckons seven of these within the *Octave*, *i. e.* three Seconds, two Sevenths, and the *Tritone* and *Semidiapente*. And as many also in the second and third Diapasons. All these Proportions he particularly explains, and shews how they arise and are produced. He next Observes, that all Progressions by Concords, except by Eighths, produce Discord, as two Thirds *major*, two Thirds *minor*, two Fourths, two Fifths, two Sixths *minor*, two Sixths *major*, to which may be added two Tones *minor*, and two Tones *major*. And upon this Account he shews the best way how to have an Organ or Virginal tuned to make it more comprehensive and accommodate to divers Cliffs, though it be not strictly true to any, by Tuning certain Keys, either a little higher, or a little lower than the due pitch.

In the Eighth Chapter he speaks of Differences, or the several Intervals between any two Notes reduced to Proportion; as a Fifth differs from a Fourth by a Tone *major*; that is, the Proportion of 3 to 2 is greater than the Proportion of 4 to 3 by the Proportion of 9 to 8. And so of all other Proportions the Difference between any two of them is that which is here meant by Differences; however those which he here treats of are generally less than a Tone, they are all easily found by the Doctrine of Addition and Subtracting of Proportions, according to which he has given one Table of true Diatonick Intervals, and another of false Diatonick Intervals, wherein a Comma or Diesis is oft found
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abounding or deficient : And this is necessary, and cannot be avoided in any tuned Instrument, as Organ or Virginal, because the Intervals that are necessary to make one Cliff perfect, are thereby neither true nor truly placed in the other. Nor can there be found any tolerable kind of Division or proportioning of the Notes that will answer to all Cliffs, by reason that the grounds of Harmony depend on Proportions, and those Proportions require differing Intervals to be placed in a Determinate order between the Unison and the Octave, whence neither the Degrees, nor the Order, that is fitted for one Cliff can be accommodated for the other. He adds also some other Scales, in which he explains the Differences by enumerating the Tones, Hemitones, Diesis, or Comma's that are found in each ; and he adds three other Tables to explain the differences of the Differences, which are found by the same Method as the differences themselves, and he could have added many more, but that he thought those sufficient. I shall mention only one Example of his last Table of Differences, in which he Collects all the differences to be Nine, *i. e.* *Tone major, Tone minor, Hemitone max. Hemitone maj. Hemitone mid. Hemitone Pythag. Hemitone minor, Diesis, Comma* ; and the composition of each of these bigger of the smaller, as *Tone major*, contains, 1. *Tone minor* and *Comma*. 2. *Hemitone max.* and *Hemitone minor*. 3. *Hemitone major*, and *Hemitone med.* 4. Two *Hemitones minor*, one *Diesis*, one *Comma*.

In the Ninth Chapter is his Conclusion, where he has sum'd up his whole Doctrine ; that is, Bodies by Motion make Sound, found of Bodies fitly constituted make Tone or Tune ; Tune is acuter by swiftness, graver by slowness of vibrating Motions. The Proportions of these are best found by strings : If two Vibrations be commensurate within the Number 6, they produce Con-cords ; if incommensurate, they make Discords. Con-cords

cords are limited, Discords infinite. Among all which he has herein treated only of such as are useful in Musick, and given their several Proportions, Causes, Relations, and Compositions, by defined Numbers, wherein doth lye the Essence of Harmony and Musick. He therefore judged this much preferable to the *Aristoxenian* way of dividing a *Tone major* into Twelve equal Parts, of which 3 made a *Diesis*, 6 *Hemitone*, 30 *Diatefferon*, &c. For that neither this, nor Mr. *Mercator's*, nor any other like late Attempts could produce true Intervals, though they did approach them, nor give the true Grounds and Causes of Harmony, which are afforded by this Rational way of true Proportions. Nor could they without monstrous Difficulty be imitated by the Voice, but the Voice endeavouring at them will naturally fall into the true Intervals that are pretty near them; as the Voice endeavouring at the Ancient *Ditone* of two Tones major will fall into that of 5 to 4, or *Tone major* and *Tone minor*: Besides that 'tis unreasonable to measure Intervals by irrational Numbers, when they may so easily, naturally, and intelligibly be adjusted by smaller Numbers, and more easie to be comprehended.

It was not his Design to meddle with the Metrick part of Musick, concerning Composition, Air, and Humour (which afford infinite Curious Disquisitions concerning it; as to its Effects upon the Passions caused by different Scales of Tones, as flats and sharps; or different varieties of Times, as quicker or slower; or differences of Instruments for the productions of them, and why some are more adapt for the purposes than others) Nor to treat of the Receptive Faculties of Persons from the different Constitution of their Organs of Hearing; nor to shew why some have and others want Musical Ears; nor to treat of other curious Speculations concerning Musick, which will afford the acutest Philosopher

pher business even more than enough. But only to treat of this Ground-work of all, the true stating of the true Proportions of Musical Tones, both Harmonious and Discordant, such especially as are usually comprised in the Scales, and applyed and made use of in Musick. And above all he thinks we are bound to Bless God for giving Musick for the rejoycing of Mankind; and he thinks Musick so Essential to the Worship and Praise of God, that neither *Jewish*, *Christian*, *Mahometan*, nor *Pagan* Worship was at any time performed without some mixture of Musick.

E R R A T A. Numb. 207.

*T*estitudo passim pro *Tesudo*. Pag. 26. lino. 21. lege *Hemispherio*. Pag. 27. lino. 7. l. plenum. pag. 28. lino. 11. l. huic. lino. 28. l. *aequales snt quatuor semissibus eandem*, patet residuam superficiem hemisphericam ACB ablatiis quatuor. lino. 31. l. congruat. pag. 29. lino. 7. l. in recta BA. lino. 25. l. ni.

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