

which was placed on the far Side of the Monstrous Head, the other as usual in other Calfs. It breathed equally at both Mouths, and had Communication with the same Throat, but took its Nourishment only at the perfect Mouth: The under Jaw of the other being so weak, that the Mouth always stood open and drivell'd. It appeared on the Left side to be a perfect Calf, and look'd very lively, and was, at Three Days Old, as large and strong as other Calfs usually are at Ten Days or a Fortnight.

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IV. *A Question in Musick lately proposed to Dr. Wallis, concerning the Division of the Monochord, or Section of the Musical Canon: With his Answer to it.*

*Question.*

**T**AKE a String of any Musical Instrument, and divide the same into two equal Parts, and stop the String there; it shall be an Eighth, which consists of twelve Semi-tones.

Hence it appears, that the Frets are nearer to one another toward the Bridge, and wider toward the Nut or Head of a Viol. And that they decrease or proceed in a Geometrical Proportion.

*Quere,* How is it possible, from the foresaid Hypothesis, to divide the other 11 Semi-tones, in their due Proportion, and to demonstrate the same. And whether the other Distances assigned by *Simpson* in his *Compendium of Musick*. (and Chapter of Greater and lesser Semi-tones) are demonstrable from the said Hypothesis.

*Answer.*

Answer.

March 5. 1697.

WHAT Method is used by *Simfon* (in the Book mentioned) to divide a String or *Chord*, I know not: Nor have I the Book at Hand to consult.

That a String *open* (or at its full Length) will found (what we call) an *Octave* (or *Diapason*) to that of the same String *stopped in the Middle* (or at half its Length) is very true. And hence it is that we commonly assign, to an *Octave*, the *Duple* Proportion (or that of 2 to 1 :) because such is the Proportion of Lengths (taken in the same String) which give those Sounds.

And (upon a like Account) we assign to a *Fifth* (or *Diapente*) the *Sesqui-alter* Proportion (or that of 3 to 2 :) And, to a *Fourth* (or *Dia-tesseron*) the *Sesquitercian* (or that of 4 to 3 :) And to a *Tone* (which is the Difference of a *Fourth* and *Fifth*) The *Sesqui-octave* (or that of 9 to 8 :) Because Lengths (taken in the same String) in these Proportions, do give such Sounds.

And (universally) whatever Proportion of Lengths (taken in the same String, equally stretched) do give such and such sounds; such Proportions (of Gravity) we assign to the Sounds so given.

But when an *Eighth* (or *Octave*) is said (in common Speech) to consist of 12 *Hemi-tones*, or 6 *Tones*; this is not to be understood according to the utmost Rigour of Mathematical Exactness, (of such 6 *Tones*, as what they call the *Diazeutick Tone*, or that of *la mi*, which is the Difference of a *Fourth* and *Fifth*;) but, as exact enough for common Use. For Six such *Tones* (that is, the Proportion of 9 to 8 Six Times repeated) is somewhat *more* than that of an *Octave* (or the Proportion of 2 to 1 :) And, consequently, such an *Hemi-tone*, is somewhat *more* than the *Twelfth* Part of an *Eighth*, or *Octave*, or *Diapason*. But the Difference is so little, that the Ear can hardly distinguish it: And therefore (in common Speech) it is usual so to speak.

And, accordingly, when we are directed to take the Lengths (for what are called the 12 *Hemi-tones*) in Geometrical Proportion: it is to be understood (not, to be so in the utmost Strictness, but) to be accurate enough for common Use; for  
placing

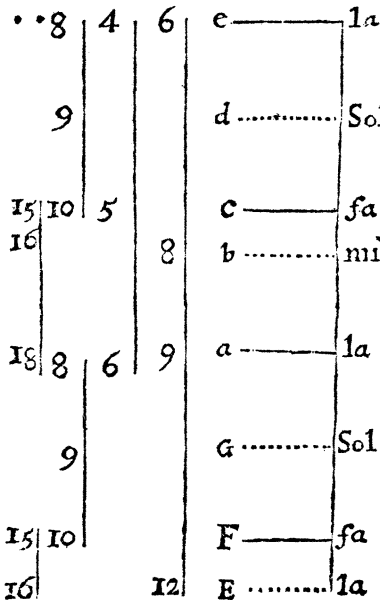
placing the Frets on the Neck of a Viol, or other Musical Instrument; wherein a greater Exactness is thought not necessary. And this is very convenient, because (thus) the Change of the Key (upon altering the Seat of *mi*) gives no new Trouble, for this doth indifferently serve any Key; and the Difference is so small, as not to offend the Ear.

But those who choose to treat of it with more exactness, go this way to work.

Presupposing the Proportion for an Octave (or *Dia-pason*) to be that of 2 to 1; they divide this into Two Proportions; not just *equal* (for that would fall upon *surd* Numbers, as of  $\sqrt{2}$  to 1;) but *near-equal* (so as to be expressed in small Numbers.) In order to which, instead of taking 2 to 1, they take (the double of these Numbers) 4 to 2; (which is the same Proportion as before;) and interpose the middle Number 3. And, of these Three Numbers, 4, 3, 2, that of 4 to 3, is the Proportion for a Fourth (or *Dia-tesseron*.) And that of 3 to 2, the Proportion for a Fifth (or *Dia-pente*.) And these Two put together, make up that of an Octave (or *Diapason*,) that of 4 to 2, (or 2 to 1.) And the Difference of those Two, that of a *Tone* or 9 to 8. As will plainly appear in the ordinary Method of Multiplying and Dividing Fractions. That is,  $\frac{4}{3} \times \frac{3}{2} = \frac{4}{2} = \frac{2}{1}$ . And  $\frac{4}{3} \div \frac{2}{3} = \frac{9}{8}$

Thus, in the common Scale (or *Gam-ut*) taking an Octave, in these Notes, *la, fa sol la, mi, fa sol la*; suppose, from *E* to *e*, (placing *mi*, in *b fa h mi*; which is called the *Natural Scale*;) the Lengths for the Extremes *la la*, an Octave, are as 2 to 1, or 12 to 6. Those for *la la* (in *la fa sol la*) or *mi la* (in *mi fa sol la*) a Fourth, as 4 to 3, or 12 to 9, or 8 to 6. Those for *la mi* (in *la fa sol la mi*) or *la la* (in *la mi fa sol la*) a Fifth, as 3 to 2, or 12 to 8, or 9 to 6. Those for *la mi*, the *Diazeuctick-Tone* (or difference of a Fourth and Fifth,) as 9 to 8. So have we for those Four Notes *la la mi la*, their Proportionate Length in the Numbers 12 9 8 6.

Then



Then, if we proceed in like manner, to divide a Fifth (or *Dia-pente*) *la fa sol la mi*, or *la mi fa sol la*, or the Proportion of 3 to 2, into *near-equals*, (taking double Numbers in the same Proportion, 6 4; and interposing the middle Number 5;) of these Three Numbers, 6 5 4; that of 6 to 5, is the Proportion of a lesser Third (called a *Tri hemitone*, or Tone and half,) as *la fa* (in *la mi fa*.) And that of 5 to 4, is the Proportion of the Greater Third (commonly called a *Ditone*, or Two Tones,) as *fa la* (in *fa sol la*) which Two put together, make a Fifth, as 3 to 2; That is  $\frac{6}{5} \times \frac{5}{4} = \frac{6}{4} = \frac{3}{2}$ . And their difference is as 25 to 24: That is  $\frac{6}{5} - \frac{5}{4} = \frac{24}{200} - \frac{25}{200} = \frac{1}{200}$ . So have we for these 3 Notes *la fa la*, their proportionate Lengths in Numbers, as 6 5 4.

In like manner, if we divide a *Ditone* (or Greater Third) as *fa la* (in *fa sol la*) whose Proportion is as 5 to 4 (or 10 to 8) into Two *near-equals* (by help of a middle Number 9;) then have we (in these Three Numbers 10 9 8) that of 10 to 9, for (what they call) the *Lesser Tone*: And that of 9 to 8, for (what they call) the *Greater Tone*.

But, whether *fa sol* shall be made the *Lesser* (as 10 to 9) and *sol la* the *Greater*, as 9 to 8;) or, This the *Lesser* (as 10 to 9) and That the *Greater* (as 9 to 8) or sometime This and sometime That, as there is occasion, (to avoid what they call a *Schism*;) is somewhat indifferent: For, either way, the Compound will be, as 5 to 4; and the Difference (which they call a *Comma*) as 81 to 80. That is,  $\frac{10}{9} \times \frac{9}{8} = \frac{10}{8} = \frac{5}{4}$  and  $\frac{10}{9} - \frac{9}{8} = \frac{80}{720} - \frac{81}{720} = \frac{1}{720}$ . And  $\frac{10}{9} \times \frac{9}{8} = \frac{10}{8} = \frac{5}{4}$ .

Lastly, It from that of the *Tri hemitone* (or Lesser Third) *la mi fa*; whose Proportion is as 6 to 5; we take that of the Tone *la mi* (which is the Difference of a Fourth and Fifth) as 9 to 8; There remains for the Hemi-tone *mi fa* (or *la fa*) that of 16 to 15. That is  $\frac{6}{5} \times \frac{5}{4} = \frac{6}{4} = \frac{3}{2}$  and  $\frac{3}{2} - \frac{9}{8} = \frac{12}{24} - \frac{9}{8} = \frac{12}{24} - \frac{27}{24} = \frac{1}{24}$ .

Or, the *Tri-hemitone* (or Lesser Third) whose Proportion is as 6 to 5; may be divided into Three *Near-equals*, (by taking Triple Numbers, in the same Proportion, 18 15; and interposing the Two Intermediates, 17 16;) which will therefore be as 18 to 17, and as 17 to 16, and as 16 to 15; That is,  $\frac{18}{17} \times \frac{17}{16} \times \frac{16}{15} = \frac{18}{15} = \frac{6}{5}$ .

Where also the *Greater Tone*, who's Proportion is as 9 to 8, or 18 to 16, is divided into its Two *Near-equals* (commonly called *Hemi-tones*;) that of 18 to 17, and that of 17 to 16: That is,  $\frac{18}{17} \times \frac{17}{16} = \frac{18}{16} = \frac{9}{8}$ . And

And the *Lesser Tone*, that of 10 to 9, or 20 to 18, may be in like manner divided into that of 20 to 19, and that of 19 to 18: That is,  $\frac{20}{19} \times \frac{19}{18} = \frac{20}{18} = \frac{10}{9}$ .

Which Divisions of the *Greater* and *Lesser Tone*, answer to what is wont to be designed by *Flats* and *Sharps*.

So that (by this Computation,) of these Eight Notes, *la, fa sol la, mi, fa sol la*; their Proportions stand thus; that of *la fa* (or *mi fa*) is as 16 to 15. That of *fa sol* as 10 to 9, and that of *sol la* as 9 to 8: (or else that of *fa sol* as 9 to 8, and that of *sol la* as 10 to 9,) That of *la mi* as 9 to 8. And if either of the Tones (*Greater* or *Lesser*) chance to be divided (by *Flats* or *Sharps*) into (what they call) *Hemi-tones*, their Proportions are to be such as is already mentioned.

There may be a like Division of a *Fourth* (or *Dia-tessaron*) into *Two Near equals*: And of some others of these, into *Three Near equals*. Which might be of use for (what they were wont to call) the *Chromatick* and *Enarmonick* Musick. But those Sorts of Musick, having been long since laid aside, there is now no need of these Divisions, as to the Musick now in use.

V. Part of a Letter from Mr. Ray, F. R. S.  
to Dr. Sloane, giving an Account of the Poy-  
sonous Qualities of Hemlock-Water-Drop-  
Wort.

I Shall now communicate to you, a Story or Two of the direful Effects of *Oenanthe aquatica*, *Cicutæ facie succo Viroso* of *Lobel*, which we may English *Hemlock-Water-Dropwort*, upon several Persons that eat of the Roots of it, sent me not long since in a Letter from Dr. Francis Vaughan, a Learned Physician in Ireland, living at *Clonmell*, in the County of *Tipperary*. This Gentleman observing me, notwithstanding what Dr. *Johnson* in his *Gerardus emaculatus*, and *Lobel* in his *Adversaria*