

An INDEX of the Authors Names.

- Robert Plot, *L. L. D. and F. R. S.* I. 589. II. 46, 360, 370, 462, 494, 553. III. 1, 636. * II. 366. III. 632.
- Leonard Plukenet, *M. D. F. R. S.* II. 753.
- Dr. Edward Pocock, * II. 254.
- Dr. Johannes Polenus, *R. S. S.* * IV. 449.
- Porphyrius, * I. 620.
- Joh. Dav. Portzius, *Phil. & Med. D.* * II. 759.
- Dr. Walter Pope, I. 280, 496. II. 580.
- M. Pothenot, I. 292.
- Joh. Potter, *Coll. Lincoln. Oxon.* * III. 398.
- Mr. Giles Pooley, of Wrington, II. 557.
- Tho. Povey, *Esq; F. R. S.* II. 568.
- The Reverend Mr. James Pound, F. R. S.* IV. 278, 303, 307, 308, 310, 318, 334.
- Le Sieur François Poupart, II. 766, 822.
- Mons. Poupart, V. [369.]
- Hen. Powle, *Esq;* II. 561.
- Dr. Cha. Preston, II. 851. III. 24, 32, 36, 142, 155, 214.
- Mr. Proby, of Dnblin, III. 163.
- Mr. Abr. de la Pryme, *Reader of Trinity-Church in Hull,* II. 428. III. 422, 428. IV. ii. 106, 107, 212, 218, 310. V. 366.
- Claudius Ptolomæus, * I. 620.
- Mr. Octavian Pulleyn, III. 448.
- Mr. Tho. Putland, V. ii. 31.
- Jacobus Pylarinus, *M. D.* V. 377.
- Q
- M.** De la Quintiny, II. 641.
- R
- R.** * I. 125.
- R.** M. B. R. II. 583.
- Mr. W. R. II. 175.
- Jo. de Ræi, *Phil. in Athenæo Amstelod. Prof. Prim.* * II. 254.
- Bernardinus Ramazzinus, *in Mutinensi Lyceo Med. Prof.* * II. 366.
- Dr. Ramazzini, ** V. 183.
- Dr. Tho. Rastel, of Droitwich, II. 356.
- Dr. Leonart Rauwolf, * III. 633.
- Mr. John Ray, *F. R. S.* II. 500, 508, 627, 638, 644, 645, 685, 768, 786, 791, 794, 799, 842, 849, 857. * II. 254, 255, 756, 757, 918. III. 632, 633. IV. 339. V. 184.
- Sir Rob. Redding, II. 464, 831.
- Sig. Francesco Redi *Academico della Crusca,* III. 339. * II. 253, 917, 918. III. 371.
- Rich. Reed, *Esq; at Lugwardine in Herefordshire,* II. 658, 659, 693, 778.
- Mons. Regnart, V. 53.
- Dr. Salomon Reifelius, *Chief Physician to the Duke of Wirtemburgh,* I. 538, 604.
- Jo. Reiskius, * I. 586.
- Dirick Rembrantz van Nicrop, III. 633.
- Mons. Reneoume, *R. Ac. Sc.* IV. ii. 323.
- Mauritius van Reverhorst, *Med. Cand. Lugd. nunc Profess. Anat. Hagæ Comitum,* * III. 228.
- Carew Reynel, *Esq;* * III. 686.
- Michael Angelo Ricci, * I. 126.
- Joh. Baptist. Riccioli, *S. J.* * I. 455.
- Mr. William Rice, V. ii. 43.
- Dr. Richardson, II. 423. IV. ii. 108. V. ii. 115.
- R. P. Richaud, *Profess. of Math. and Theol.* I. 294.
- M. Richelt, *Profess. Mathematicum Julius,* I. 320.
- Hen. Ridley, *M. D.* * III. 60. V. 201.
- S. Car. Rinaldini, *Philosoph. & Math. in the University of Padoua,* II. 164.
- M. Riquet, ** III. 683.
- Francis Roberts, *Esq; F. R. S.* I. 240, 607. III. 679. IV. 1.
- Tancred Robinson, *M. D. F. R. S.* I. 593. II. 320, 349, 533, 627, 853. III. 304. IV. ii. 168. V. ii. 142. * II. 757.
- M. Romer, of the Royal Academy of Sciences, I. 309, 316, 410, 422.
- M. Jaques Rohault, * II. 255.
- Mr. Rook, *F. R. S. Professor of Astronomy at Gresham-College,* I. 300. ** III. 631.
- Hen. Van Roonhuyse, *Physician in Ordinary at Amsterdam,* * III. 22, 296.
- Mr. J. Rose, *his Majesty's Gardener at his Royal Garden at St. James's.* * II. 759.
- Donato Rosetti, *S. T. D. Canon of Leghorn and Tutor in the Mathemat. to the Duke of Savoy,* * I. 456. * II. 257.
- Olaus Rudbeckius, *Profess. of Anat. and History at Upsal in Swetheland,* * III. 531. * V. ii. 110.
- Mr. Richard Ruffel, V. 220.
- Fredericus Ruyschius, *M. D. Botan. Profess.* * II. 757.
- Sir Paul Rycaut, *F. R. S.* II. 874.
- Wilhelmus ten Ryne, *M. D. Transfalano-Daventriensis,* III. 296.

S.

An INDEX of the Authors Names.

S.

J. S. M. D. *Physician in Ordinary to his Majesty,* * III. 633.
Sir P. S. III. 436.
Sir R. S. II. 180.
Mr. R. S. * III. 687.
Mr. John Sackette, IV. ii. 248.
Mr. John St. Clair, I. 598.
Dr. Robert St. Clair, II. 385. III. 635. * II. 366.
Cl. Salmasius, * II. 756.
Tho. Salmon, M. A. IV. 469. * I. 620.
Will. Salmon, Professor of Physick, * III. 371.
Sieur de Salnove, * III. 686.
Signior Pietro Salvetti of Florence, one of the Great Duke's Physicians, I. 213, 315, 618.
Aristarchus Samius, * II. 255.
Aylet Sammes, of Christ's-College in Cambridge, * III. 532.
Henry Sampson, M. D. III. 16, 20, 112, 211.
Sanctorius, * III. 23.
M. Christophorus Sandius, II. 830.
His Excellency Edward Earl of Sandwich, Ambassador-Extraordinary to the King of Spain, F. R. S. I. 281, 562. II. 185, 741. * II. 603.
D. Dominicus Sanguinetus, * V. 386.
Sig. Sarotti, the Venetian Resident, II. 148.
Mr. Tho. Savery, I. 543.
M. Saviard, Sworn Surgeon at Paris, III. 218.
Mrs. Anne Savile, III. 303.
Mr. R. Sault, I. 463.
Mr. Scarborough, II. 104.
M. Joh. Schefferus, Prof. in the Swedish University at Upsal, II. 152, 473, 856. * III. 633.
G. Ch. Schelhammer, M. D. * V. ii. 140.
John James Scheuchzer, M. D. Mathematical Professor at Zurich, and F. R. S. * V. ii. 216.
D. G. Schultius, I. 297.
Augustino Scilla, Pittore Academico della Fucina, * II. 256.
Jac. Sidelius, * III. 22.
Mr. Ab. Seller, * III. 532.
Mr. Sellers, II. 604.
R. P. Michael Seneschallus, S. J. * III. 531.
W. Sengwerdius, Math. & Physic. in Acad.

Altdorf, P. P. D. * II. 917.
Sig. Setalla, of Milan, I. 220. II. 425, 580.
Mr. Abr. Sharp, IV. 251.
Dr. Richard Sharrock, * II. 758.
Dr. Will. Sherard, I. 602.
Dr. William Sherard, F. R. S. late Consul at Smyrna, IV. ii. 319. V. ii. 196.
Edw. Sherburn, Esq; * I. 454.
Rob. Sherringham, Cantab. Coll. Gonvillii & Caii Socius, * III. 532.
Mr. B. Sherman, V. 54, 273, 388.
Mr. John Shipton, V. 275.
Dr. Tho. Shirley, Physic. in Ord. to his Majesty, II. 382. * II. 757.
Sir Robert Sibbald, Physician and Geographer to the King, and Fellow of the College of Physicians at Edinburgh, II. 325. III. 155, 156. V. 25. * II. 918. III. 632. ** II. 916.
M. Henricus Siferus, I. 277.
Dr. Peter Sylvester, F. R. S. III. 603. V. 303. ** II. 602.
George Sinclair, * II. 256.
Sir Philip Skippon, V. 306.
Fred. Slare, M. D. R. S. S. II. 462, 533, 873. III. 111, 151, 179, 180, 181, 230, 354, 357, 359, 667. IV. ii. 198, 201. V. 289. [356]
Hans Sloan, M. D. S. R. S. II. 410, 419, 431, 514, 643, 651, 662, 666, 668, 669, 672, 675, 752, 863. III. 94, 119, 212, 281, 542, 658. * II. 756. ** II. 252.
Sir Hans Sloan, Bart. Vice-President of the Royal Society, IV. ii. 256, 263. V. 264. * V. ii. 215.
Renatus Fran. Slufius, Canon of Liege, and Counsellor to his Electoral Highness of Cologn, I. 19, 22, 180, 182, 185, 189. * I. 126.
Francis Smethwick, Esq; F. R. S. I. 201, 284.
Tho. Smith, D. D. F. R. S. II. 288. III. 456. 465, 473. * III. 633.
Dr. Edw. Smith, F. R. S. II. 457, 458, 646.
Jo. Smith, M. D. * III. 308.
Mr. John Smith, Minister of the Royal African Company at Cabo Corso in Guinea, * II. 755.
John Smith, Gent. * III. 687.
Mr. Rich. Smithson, III. 614.
Mr. Edw. Smyth, Fellow of Trin. Coll. in Dublin, II. 324.
Theon Smyrnaeus, * I. 124.
Mr. William Somner, IV. ii. 222. * III. 532.

M. Du

An INDEX of the Authors Names.

- M. Du Sons, Mathematician, I. 201. II. 367.*
Capt. South., III. 665, 666, 667.
Sir Robert Southwel, F. R. S. I. 214, 222. II. 371, 626, 753, 903. III. 649, 656, 657, 658, 661, 662.
D. Andreas Spole, Astronom. Profess. in Acad. Upsaliensi, II. 200.
*M. Spon, M. D. of Lyons, * III. 532, 633.*
*Mr. Spotswood, Surgeon at Tangier, ** II. 752.*
*Dr. Tho. Sprat, * II. 252.*
Mr. Richard Stafford, of Bermudas, II. 268, 848.
Capt. Stanian, IV. 232, 251.
*Mr. Nicholas Staphurst, Chymical Operator for the Company of Apothecaries, * III. 371.*
*Christianus à Steenvelt, Surgeon to the Hospital at Leyden, * III. 229.*
*S. Nic. Steno, II. 819. * II. 255, 918, 919. III. 296.*
*Mr. Nicholas Stephenson, * I. 124, 455.*
Mr. James Sterling, IV. 141.
Mr. Strachan, IV. ii. 312. V. ii. 176, 179, 181.
John Strachey, Esq; IV. ii. 260.
*Ægidius Strauchius, * III. 531.*
Mr. Street, I. 307.
Dr. Alex. Stuart, IV. ii. 103. V. ii. 60.
Dr. Stubbs, III. 546.
William Stukely, M. D. R. S. S. IV. ii. 272.
Mr. John Sturdie, of Lancashire, II. 562.
*M. Joh. Christ. Sturmius, Profess. of Math. & Philos. at Altdorf in Germany, II. 252, 612. III. 354. * II. 253.*
Capt. Sam. Sturmy, II. 265, 370, 610.
S. Pietro Sufarte, S. J. Rector of Macao in the East-Indies, I. 439.
*Joh. Swammerdam, M. D. Amstelodamensis, II. 785. III. 119, 252. * II. 912. 913. III. 80. 224.*
*Tho. Sydenham, M. D. * III. 229, 289.*
*Joh. Bapt. Sylvaticus, * III. 22.*
*Franc. de la Bos Sylvius, * III. 22, 289.*
*William Sympson, M. D. * II. 336. III. 372.*
- T.
- M** *R. J. T. III. 160.*
Dr. John Tabor, V. ii. 63.
*Matth. Tachenius, M. D. * III. 371.*
Sir Gilb. Talbot, F. R. S. his Majesty's Envoy Extraord. in Denmark, II. 534.
*R. P. Andreas Taquet, S. J. * I. 124.*
*Joh. Baptist. Tavernier, Baron of Aubonne, * III. 633.*
*Brook Taylor, L. L. D. late Secretary to the Royal Society, IV. 46, 80, 86, 87, 138, 165, 171, 205, 384, 391, 423. IV. ii. 297. * IV. 205.*
- Mr. Rob. Taylor, Apoth. at Hitchin in Hertfordshire, II. 147.*
Capt. Silas Taylor, II. 814.
Padre Balthazer Tellez, Provincial of the Jesuits in Portugal, III. 634.
Mr. J. Templer, of Braybrook, in Northampt. II. 102, 103, 660, 763, 840, 867. III. 64, 69.
*Mr. Tennison, * III. 688.*
Mr. Edward Tennison, IV. ii. 309.
W. Tenon, I. 539.
Wilh. Ern. Tentzelius, Historiographus Ducalis Saxonicus, II. 438.
Theodosius, I. 117.
*M. Thevenot, * III. 633. ** II. 602, 916.*
*Mr. Alban Thomas, ** IV. ii. 286.*
Mr. David Thomas, II. 903.
Ralph Thoresby, Esq; F. R. S. II. 179. III. 11, 418, 421, 424, 426, 427. IV. ii. 109, 130, 131, 132, 134, 192, 211, 248, 274. V. 265, 280, 288. V. ii. 27, 30, 32, 34, 35, 37, 40, 41, 98, 220.
Major Edward Thornycroft, IV. 60.
John Thorpe, M. D. F. R. S. V. 16.
Dr. Sam. Threapland, of Hallifax, III. 161.
*Malachias Thrufton, M. D. * III. 80.*
*Edw. Thwaites, è Coll. Regin. Oxon. * I. 586.*
*Plato Tiburtinus, * I. 454.*
*Matth. Tillingius, M. D. * III. 371.*
M. Timmerman, Mathematician at Moscua, I. 340.
Dr. Emanuel Timone, V. 370.
Mr. Hugh Todd. F. of Univers. Coll. Oxon, and Chaplain to the Lord Bishop of Carlisle, II. 325, 333, 351.
Hugh Todd, D. D. V. ii. 47.
P. Alvarez de Toledo, a Franciscan Fryar, II. 410.
*Ez. Tonge, D. D. II. 276, 676, 684. ** II. 755.*
*Geo. Tonstal, M. D. * II. 366.*
Richard Townley, of Townley in Lancashire, Esq; I. 126, 225, 287. II. 9, 43, 44, 86.
Dr. Tho Towns, in Barbadoes, III. 560.
*Tho. Trapham, M. D. * III. 632.*
*Franc. Travaginus, Med. Venet. * II. 602. III. 371.*
Mr. Rob. Tredway, II. 345, 495.
*Johannes Trethemius, * III. 687.*
*Joh. Georgius Trumphius, Saxo. Med. Licentiat. * II. 603.*
Dr. Dawbeny Tuberville, of Salisbury, III. 34, 41.
- M. Pitton

An INDEX of the Authors Names.

M. Pitton Tournefort, *de l'Academie Royal des Sciences, Docteur en Medicine de la Faculté de Paris, & Professeur en Botanique au Jardin Royal des Plantes*, II. 757.

Mr. John Turner, *Surgeon*, III. 141, 210, 277.
 Edw. Tyson, M. D. F. R. S. II. 788, 800, 822, 876, 884. III. 14, 26, 27, 81, 122, 131, 134, 147, 148, 226. V. 4, 35, 178. * II. 918.

V.

V. V. I. 22.
 Ds. Josephus Valletta, *Nobilis Neapolitanus*, IV. ii. 207.

Ant. Maria Valsalva, *M. D. in Universitate Bononiensi Anatomicus Professor, & Nosocomii incurabilium Chirurgus*, * V. 213.

M. John Weichard Valvafox, *Liber Baro*. R. S. S. I. 599. II. 307.

Mr. Rob. Vans, *of Kilkenny in Ireland*, II. 143.

Sig. Gio. Michael Vansleblio, * III. 634.

Bernhardus Varenius, *M. D.* * I. 586.

M. Penoit Vassal, *Surgeon*, III. 209.

Dr. Francis Vaughan, *Physician in Ireland*, II. 644.

Mr. Henry Vaughan, V. 261, 272, 291.

M. Veay, *Physician at Tholouse*, III. 302.

Georgius Hieronimus Velshius, * II. 253.

Sir Philiberto Vernatti, *President in Java major*, II. 579, 817. III. 617.

M. Du Vernay, III. 57. * III. 60.

M. Verney, *Apothecary at Montpellier*, II. 768.

Franc. Vernis, * III. 371.

Mr. Francis Vernon, I. 564. III. 451. * III. 633.

Dr. Raymund Vieuffens, *of Montpellier, M. L. & S. R. S.* III. 43, 235. * III. 60.

M. De Vilette, *of Lyons*, I. 219, 220.

M. De Villermont, I. 778.

Dr. Nath. Vincent, *F. R. S.* I. 538.

Vitruvius, * I. 597.

Ds. Vincentio Viviani, *F. R. S.* * IV. 171.

Mr. Underhill, *of Worcester*, III. 93.

Dr. Goth. Voightius, * III. 372, 687.

Joh. George Volkamer, *M. D.* * II. 365. III. 634.

M. de la Voye, II. 790.

W.

J. W. Gent. II. 755, 756.

W. W. III. 438.

Joh. Jacobus Wagnerus, *M. D.* * III. 632.

Mr. Nicholas Waite, *Merchant of London*, II. 552.

Mr. Walker, *late of Brazen-Nose Coll. Oxon.* I. 504.

Dr. Wall, IV. ii. 275.

Dr. Jo. Wallace, *F. R. S.* III. 156, 165, 561. * III. 632.

Richard Waller, *Esq; F. R. S.* I. 601. II. 764, 821, 858, 874. * I. 587. II. 253. ** I. 605.

Richard Waller, *Esq; late Secretary to the Royal Society*, V. 55. V. ii. 219.

Johan. Wallis, *S. T. D. Geomet. Profess. Savilianus*, Oxon. & R. S. S. I. 29, 31, 61, 103, 104, 113, 233, 238, 265, 296, 457, 483, 572, 595, 598, 606, 612, 618. II. 2, 6, 14, 25, 32, 122, 152, 169, 177, 183, 200, 268, 275, 278, 283, 395, 699. III. 92, 388, 393, 405, 406, 661. * I. 124, 126, 454, 708. III. 397, 531. II. 252, 365. IV. ii. 227, 233, 286. V. 1, 9.

Mr. Humfry Wanley, *F. R. S.* V. ii. 1, 25.

Mr. Chr. Wase, * I. 597.

Mr. Tho. Watkins, *F. R. S.* V. ii. 243.

John Webb, *Esq; F. R. S.* * III. 398, 634.

Mr. John Webster, *Practitioner in Physick and Chirurgery*, * II. 603.

Georgius Wedelius, *M. D.* * III. 372.

M. Weighelius, *Profess. of the Math. in the Univers. of Jena in Upper Saxony*, I. 223, 596.

D. Christianus Ludovicus Welschius, * II. 756.

M. Casparus Wendland, *Chirurgion of the City of Dantzick*, III. 150.

Maur. Wheeler, *M. A. Rector of Sibbertoft in Northamptonshire*, I. 468.

Dr. Tobias Whitaker, *Physic. at Norwich*, * II. 366.

John Wilkins, *D. D. F. R. S.* * III. 397.

Mr. Joseph Williamson, IV. 394.

Mr. Wilson, IV. 199.

Mr. James Wilson, IV. ii. 283.

Thomas Willis, *M. D. in Univ. Oxon. Prof. Sedleianus, & S. R. S.* * II. 919. III. 60, 229, 371.

Joh. Valentine Willius, *Med. Reg. Castrensis Dan.* * III. 289.

Francis Willoughby, *of Middleton in Warw. Esq; F. R. S.* I. 280. II. 672, 685, 772, 776, 837. * II. 918.

Dr. Wincler, *Chief Physician of the Prince Palatine*, II. 873.

John

An INDEX of the Authors Names.

John Winthorp, *Esq; Governour of Connecticut in New-England*, II. 633, 836, 857. III. 564.
 Mr. Richard Wiseman, III. 248, 249.
 M. Nicholas Witsen, *one of the principal Burgo-masters at Amsterdam*, I. 570. II. 324, 829, 834. III. 527, 622. * I. 587, 597.
 Rob. Wittie, *M. D.* III. 152. * II. 366.
 Rob. Wood, *L. L. D. Master of the Mathematical School at Christ's Hospital*, I. 110. III. 409.
 Dr. Nath. Wood, *Physician at Kilkenny in Ireland*, II. 643, 644.
 Mr. Basil Wood, *Surgeon*, III. 188.
 John Woodward, *M. D. of the Coll. of Physic. Profess. of Physick in Gresham-College, and F. R. S.* II. 716. * II. 255.
 M. Jo. Phil. Wortzelbaur, I. 280, 297, 339, 361, 426.

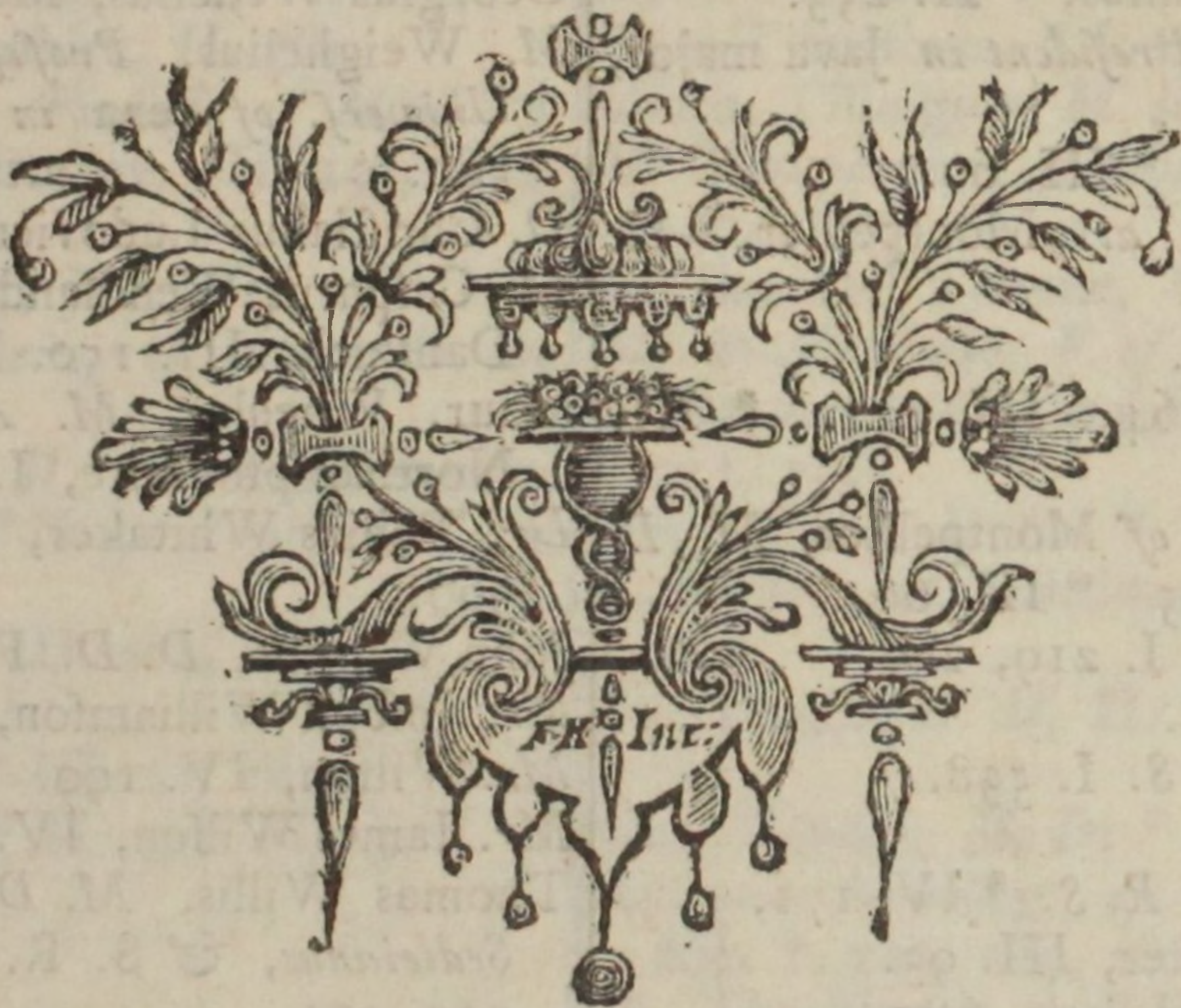
William Wotton, *B. D. F. R. S.* * III. 297.
 James Wright, *M. D.* V. 223.
 Sir Christopher Wren, *L. L. D. Regior. Aedificiorum Praefect.* R. S. S. I. 195, 196. 459.
 Tho. Wright, *Esq; of Downham Arenarum in Suffolk*, II. 455, 734.

Y.

A Andrew Yarranton, *Gent.* * III. 687.
 Mr. James Yonge, *F. R. S.* V. 199, 261, 284, 285, 286, 291, 292, 300, 309, 360, 405.

Z.

M. J. Jac. Zimmerman, I. 361.
 Joh. Zwelfer, *M. D.* * III. 371.






THE
 Philosophical Transactions
 A B R I D G ' D.

P A R T I.

CONTAINING THE
Anatomical and Medical PAPERS.

C H A P I.

Zoology, Anatomy of ANIMALS.

- I.  Remember to have read formerly in one of *Gassendus's* Epistles, a Suggestion of his (which he seems to espouse as his own Opinion) as if he thought it not (originally) natural for Man to feed on Flesh ; though by long Usage (at least ever since the *Flood*) we have been accustomed to it, and it is now familiar to us ; but rather on Plants, Roots, Fruits, Grain, &c.

On Man's feeding on Flesh, and of Carnivorous Animals, by Dr J. Wallis, No. 269. p. 769.

And I take it to be the Opinion of many Divines, that *before the Flood*, Men did not use to feed on Flesh, because of what we have in *Gen. ix. 3.* where God says to *Noah*, (after the *Flood*) *Every moving thing*

On Man's feeding on Flesh, and

thing that liveth, shall be Meat for you, even as the green Herb have I given you all Things : Compared with Gen. i. 29. where God says to Adam, I have given you every Herb bearing Seed, and every Tree in the which is the Fruit of a Tree, yielding Seed, to you it shall be for Meat ; but without any Intimation of his feeding on the *Flesh of Animals*, which seems to be an Insinuation to that Purpose, and is commonly taken so to be.

Yet, I confess, I have some Doubt therein remaining, seeing that we find, very clearly, that *Abel* was a *Keeper of Sheep*, as well as *Cain* a *Tiller of the Ground*, both Employments seeming equally in order to their Food and Sustenance. And their first *Cloathings* were the *Skins* of Animals. It may perhaps be thought, that these Animals were slain for *Sacrifice*, and the *Sheep* fed only for that Purpose, but even their *Sacrifices* seem to have been offered only as a *Portion* (or *First-Fruits*) of Things appointed for Food ; and that as *Cain* was not to sacrifice the whole Fruit of his *Tillage*, so neither was *Abel* the whole Product of his *Sheep*, but the best thereof (the *Firstlings* of his Flocks, and the *Fat* thereof) and reserving the rest for his own Use. And it cannot seem likely, that God would give to *Noah* after the Flood, a greater Dominion of other Animals, than had been given to *Adam* in Paradise before the Fall. And I should then consider this Permission to *Noah*, not as contra-distinct from that to *Adam* (as of what is now permitted, which before were not) ; but rather as introductory of the *Prohibition* which presently follows ; to wit, Though he might eat *Flesh*, even as the green Herb (so far as it might be wholesome Food) : Yet, not with the *Blood* thereof ; that is, not *raw Flesh* ; not *Carnem crudum*, or *Carnem cum cruore*. I add also, that the same Rule is given to other Animals, Gen. i. 30. as is to Man, at ver. 29. I have given them every green Herb for Meat : Yet there are, we know, many Carnivorous Animals, without any further Permission that we know of.

But (without disputing it as a Point in Divinity, whether Men before the Flood did, or might feed on *Flesh*, supposing it to be wholesome Nourishment) I shall consider it (with *Gassendus*) as a Question in Natural Philosophy, whether it be proper Food for Man.

The Consideration insisted upon by *Gassendus*, is from the Structure of the *Teeth*, (and, as I remember this only) that our *Teeth* are mostly either *Incisores*, or *Molitores* ; not such as (in Carnivorous Animals) are proper to *tear Flesh*, except only four, which are called *Canini* : As if Nature had rather furnished our *Teeth* for *cutting Herbs*, *Roots*, &c. and for bruising *Grain*, *Nuts*, and other hard *Fruits*, than for *tearing Flesh*, as Carnivorous Animals do, with their *Claws* and sharp *Teeth*. And, even when we feed on *Flesh*, it is not without a preparative *Cooktion*, by boiling, roasting, baking, &c. And, even so, we forbid it to Persons in a *Fever*, or other like *Distempers*, as of too hard *Digestion*. And *Children* (before their *Palates* are vitiated by *Custom*) are more fond of *Fruits* than of *Flesh-Meat*. And their breeding *Worms* is wont to be imputed to their *too early* feeding on *Flesh*.

This

of Carnivorous Animals.

3

This ingenious Conjecture of *Gassendus* did presently suggest to me another Speculation, which seems not less considerable.

There is in Swine, Sheep, Oxen, and, I think, in most Quadrupeds that feed on Herbs or Plants, a long *Colon* with a *Cæcum* at the upper End of it, or somewhat equivalent, which conveys the Food, by a long and large Progress, from the Stomach downwards, in order to a slower Passage, and longer Stay in the Intestines: But in Dogs of several Kinds, and I suppose in Foxes, Wolves, and divers other Animals, which are Carnivorous, such *Colon* is wanting; and, instead thereof, a more short and slender Gut, and quicker Passage through the Intestines.

Whether Carnivorous Animals have a Colon?

That which I would propose hereupon is, Whether it does generally hold, or how far, that Animals, which are not Carnivorous, have such *Colon*, or somewhat equivalent; and that those, which are Carnivorous, have it not. For if so, it seems to be a great Indication, that Nature, which may be reasonably presumed to adapt the Intestines to the different Sorts of Aliments that are to pass through them, doth accordingly inform us, to what Animals Flesh is proper Aliment, and to what it is not; and that from thence we may judge more solidly, than from the Structure of the Teeth only, whether or no Flesh were designed as proper Food for Man.

Now it is well known that in *Man*, and, I presume, in the Ape, Monkey, Baboon, &c. such *Colon* is very remarkable; and the like *Dr Tyson* observes in his Dissection of his *Homo Sylvestris*, which may therefore be thence conjectured, not to belong naturally to the Carnivorous Tribes, if that Rule hold. 'Tis true, that the *Cæcum* in Man is very small, and seems to be of little or no Use: But in a *Fœtus*, it is in Proportion much larger than in Persons adult. And 'tis possible, that our customary Change of Diet, as we grow up, from what originally would be more natural, may occasion it's shrinking into this contracted Posture.

But I add this also, that *Man's* being endued with *Reason*, doth supply the want of many Things, which to other Animals may be needful. Man is not covered with such Quantity of Hair or Feathers all over his Body, which to other Animals serve for Cloaths; but can, by his Use of Reason, supply himself with Cloaths suitable to every Climate, and different Seasons. He is not furnished with Claws, Hoofs, Horns, &c. which serve for Arms to other Animals; but can, by the Use of his Reason, supply himself with Weapons and other Instruments for different Occasions, to much better Advantage. And, in the present Case, though *raw Flesh* be not proper, as 'tis to some other Animals, he can, by preparative Coctions, and other Expedients, render it more agreeable. Nor is he wholly destitute of *Dentes Canini*, but is indeed furnished with all Sorts of Teeth, for all Sorts of wholesome Food.

On Man's feeding on Flesh.

I take the Sheep, the Goat, the Swine, the Ox, the Horse, the Ass, the Camel, the Elephant, the Hart, the Hare, the Rabbit, the Mouse, &c. not to be carnivorous; but the Dog, the Wolf, the Fox, the Cat, the Lion, the Leopard, the Tiger, &c. to be naturally carnivorous; which of all these have, or have not the *Colon*, or what other distinctive Mark may be observed between these different Tribes of Animals, I think may deserve a serious Consideration.

On the same,
by Dr Tyson,
Ibid.

2.] The Argument proposed by Dr *Wallis*, from the Conformation of the *Intestines*, why *Man* should not be *Carnivorous*, seems far more rational than that which *Gassendus* argues from the Structure of the *Teeth*. I first of all make this Remark, That had *Man* been designed by Nature not to have been a *Carnivorous Animal*, no doubt there would have been observed, in some Part of the World, Men which did not at all feed upon Flesh. But since no History (as I know of) furnishes us with such an Instance, I cannot but think what hath been done universally by the whole *Species*, must be *Natural* to them. What the *Pythagoreans* did, in *abstaining from Flesh*, was upon the Notion of a $\mu\epsilon\tau\epsilon\mu\psi\upsilon\chi\omega\sigma\iota\varsigma$ or *Transmigration of Souls*, a Mistake in their Philosophy, and not a Law of Nature. And though in some Countries Men feed more freely on Flesh, in others more sparingly, this is owing to their own Choice, from the Advantage they find thereby: Nature having given Mankind *Reason*, he can, or ought to elect what Food he finds most agreeable to him in the Climate he lives in, and is not determined to any one Sort, but has Liberty to all. And 'tis as probable, that the *Ante-diluvial* World had so likewise.

We shall therefore now consider it as a Question in *Natural Philosophy*; Whether, from the Observation of the Structure of the Parts in *Man*, we can find Reason to think Nature did, or did not, assign him to be *Carnivorous*? For I am of *Gassendus's* Opinion, *Licet ex conformatione Partium Corporis Humani, conjecturas desumere ad Functiones mere Naturales*. For, all the Knowledge we have of the *Uses* of the Parts in Animal Bodies, is by observing Nature's wonderful Contrivance in the Formation of them; who most wisely adapts them to the *Uses* they are designed for. Not because they are casually so and so formed, are they necessarily put to such and such *Uses*; but therefore they are so contrived, that they may perform such Offices in the Oeconomy of Animal Bodies, as Nature intended them for.

Dr *Wallis* having so fairly represented *Gassendus's* Opinion and Argument from the Structure of the *Teeth*, why *Man* should not be designed by Nature to be *Carnivorous*; and having likewise sufficiently, I think, answered his Reasons, I shall wholly pass that over at present; and shall only consider the Observation he has made of the different Formation of the *Intestines* in Carnivorous Animals, from those that are to be met with in such as do not feed upon Flesh, but other Food. And indeed this seems to me to be of far greater Weight, and

to carry more Strength in it, than any thing I have met with before ; and all the Instances he gives are very true.

I therefore first of all observe, that the *Ductus Alimentalis* (for so I call the *Gula*, the *Stomach*, and *Intestines* ; all which make but one continued *Canalis* or *Ductus*) is properly the true *Characteristick* of an Animal, or *Proprium quarto modo*. For there is no *Animal* but hath such a *Ductus* ; and whatsoever hath such a *Ductus*, may properly enough be ranged under the *Classis* of *Animals*. *Plants* receive their Nourishment by numerous *Fibres* of their *Roots*, but have no common *Receptacle* for the digesting the *Food* received, or *Vent* for carrying off the *Recrements* : But in all, even the lowest Degree of *Animal Life*, we may observe a *Stomach* and *Intestines*, even where we cannot perceive the least *Formation* of any *Organ* of the *Senses*, unless that common one of *Tactus*, as in an *Oyster*. Where also we may observe a sensible *Muscular Motion*, or *Contraction* ; though it would be difficult to assign what *Part* should be reckoned the *Brain*, or *Medulla Spinalis*, from whence the *Nerves* arise that give it so strong a *Motion*.

Now this *Ductus* being so principal a *Part* in an *Animal*, and it's *Use* being for the receiving and digesting the *Food*, and distributing the *Chyle* ; 'tis reasonable to suppose, that, according to the Difference of the *Food*, the *Structure* of the *Organ* should be also different ; or, where the *Organ* was the same, there the *Use* was the same too, for the receiving, digesting, and distributing the same Sort of *Food*. Man therefore having these *Parts* formed, not like *Carnivorous Animals*, but more resembling those that live on *Herbs*, *Roots*, *Fruits*, &c. it may seem reasonable to conclude, that *Nature* never designed him to live on *Flesh* ; but, that the *Wantonness* of his *Appetite*, and a depraved *Custom*, had inured him to it. For, as *Gassendus* remarks in the same *Epistle*, (*viz. Epist. Jo. Bapt. Helmont. operum, Tom. 6. pag. 19.*) *Custom* may make that seem natural to us, which *Nature* never intended. As he instances in a *Lamb* that was bred on *Ship-board*, which refused the green *Pasture* of the *Fields* for the *Diet* it was formerly used to. And I have often seen here in *London* (and it being a *Thing* so unusual, I take leave to mention it) a *Horse*, that with a great deal of *Pleasure* would eat *Oysters*, scranching them, *Shell* and all, between his *Teeth*, and swallowing them : And this he took to by *Accident*, being left at a *Tavern-Door*, where stood a *Tub* of *Oysters* ; and since hath frequently done it, whenever they were offered him. Now *Gassendus* observes, That *Children* (from whom he thinks we may better take the *Instincts* of *Nature*, than from our *Appetites* when depraved by *Custom*) are much fonder of *Fruit* than of any *Flesh* that is offered them ; and therefore he supposes it more natural to them.

The *Instance* *Dr Wallis* gives, wherein the *Structure* of the *Intestines* of *Carnivorous Animals* is different from that in *Men*, is, that the former want a *Colon* ; whereas in *Men* there is a very large one, which is not to be observed but in such *Animals* as live upon *Fruits*, *Roots*, *Herbs*,

Herbs, &c. The Point proposed is to consider, *Whether it does generally hold (or how far) that Animals that are not Carnivorous have such a Colon, (or somewhat equivalent) and those that are Carnivorous, have it not.*

Carnivorous
Animals
which have
no Colon.

I shall begin with those *Animals* that are *Carnivorous*, and have no *Colon*, or large *Cæcum*. For, though they may have the *Appendicula Vermiformis* (as some Anatomists call it) yet if that is not extended or filled with the *Fæces* which the other Guts contain, I think it not properly to be esteemed as a distinct Gut, or to come into that Number, since here it does not perform the Office of a Gut, in containing the Food or Excrement. So in a Man, in Dogs, and other Animals, when it is thus contracted, I exclude it out of the Number of the *Intestines*, though by Use and Custom (but I see no Reason for it) 'tis commonly reckoned one of the *Intestina crassa*.

Animals therefore that have no *Colon*, or large *Cæcum*, though some of them have this *Appendicula Vermiformis*, and are *Carnivorous*, I reckon,

1. The *Dog-kind*; under which, besides their own *Species*, may be included the *Fox*, the *Wolf*, the *Coati Mondi*, the *Badger*, the *Otter*, &c.

2. The *Vermin-kind*; as the *Weefel*, the *Fitchet*, the *Polecat*, the *Martin*, &c. Both these Kinds have a Bone in the *Penis*; have no *Colon* or *Cæcum*; some have the *Appendicula Vermiformis*; and are all *Carnivorous*.

3. The *Cat-kind*; to which may be reduced, besides their own *Species*, the *Lion*, the *Tyger*, the *Leopard*, the *Lynx*, the *Catamountain*, &c. 'Tis true, the *French Memoirs for the History of Animals*, tell us, That a *Lion* has a *Colon* 18 Inches long, and an *Appendicula Vermiformis* 3 Inches; and that in a *Lioness* the *Colon* was two Foot, and the *Cæcum* two Inches long. Now I question whether we may properly call this a *Colon* or no; for though the Gut about this Place may be more extended than in others, yet not having those *Ligaments* whereby the Gut is corrugated into *Cells*, as in a Human Body, I think strictly it does not deserve that Name. So in a *Cat*, the Intestine, at the Place of the *Colon*, is larger; but, for the same Reason, I shall not call it a *Colon*. And though a *Cat* has a small Projection of the Gut, which may be called a *Cæcum*, because it contains *Fæces*; yet, since 'tis so very short, we will not insist on it.

4. A *Bear* hath no *Colon* or *Cæcum*.

5. A *Mole*, which feeds on *Worms* and *Insects*, has no *Colon* or *Cæcum*.

Animals not
Carnivorous,
which have a
Colon.

In the next Place we will consider those *Animals* that are *not Carnivorous*, but live upon Herbs, Fruits, Roots, &c. all which have a *Colon*, or *Cæcum*, or both: For, as to the Point in question, I think it much the same, whether they have either one of these only, or both; provided that the Capacity of the Gut there be large and extended, and
do

do contain *Fæces*. I will enumerate first those Animals that have both a *Colon* and a *Cæcum*, or at least a *Colon*. As,

1. The *Horse-kind*; in which may be included the *Ass*, the *Mule*, &c. which have a large *Colon* and *Cæcum*.
2. The *Elephant* hath a great *Colon* and *Cæcum*.
3. The *Dromedary* and *Camel*, a long *Colon*.
4. The *Swine-kind*, whose *Species* is numerous, have a large *Cæcum* and *Colon*.
5. The *Guiney-Pig*, a *Colon* and *Cæcum*.
6. The *Castor* or *Beaver*, has a large *cellulated Colon* and *Cæcum*.
7. The *Hare-kind*, has a large *Colon* or *Cæcum*. The *Cæcum* in the *Rabbit* is very long, and in the Middle a *Cochlear Valve*.
8. The *Ape* and *Monkey-kind*, have a *cellulated Colon* and short *Cæcum*.

Now there are several Animals that have a large *Cæcum*, and no *Colon*, and these too are not Carnivorous, but live upon *Grass*, *Fruits*, *Roots*, &c. as,

1. The *Neat-kind*, as the *Ox*, the *Barbary Cow*, &c.
2. The *Sheep-kind*, which is numerous.
3. The *Stag-kind*, to which may be referred the *Elk*, the *Rane-Deer*, the *Stag of Canada*, &c.
4. The *Goat-kind*.
5. The *Gazella* or *Antelope*.
6. The *Squirrel-kind*.
7. The *Rat-kind*.

By all which Lists it is plain, there are many Animals that are *Carnivorous*, that have no *Colon* or *Cæcum* at all; and, on the other hand, how vast a Number are there that are *not Carnivorous*, that have either a *Colon*, or *Cæcum*, or both?

But notwithstanding all this, we may be mistaken in the Conclusion we may be apt to draw from hence; and may as well argue, That because the *Neat-kind*, the *Stag-kind*, the *Goat-kind*, and the *Sheep-kind*, that live on *Herbage*, have *four Stomachs*; therefore those that have not four *Stomachs*, were not designed by Nature to be *Graminivorous*. Now the *Horse-kind*, the *Hare-kind*, &c. have but one *Stomach*, and yet their Food is *Grass*. And the Case is here the more remarkable, because the *Stomach* is a Part more principally concerned in digesting the Food. The *Intestines* are for separating the *Chyle*, and carrying off the *Fæces*. Yet we observe even in Animals that live on the same Sort of Food, that their *Stomachs* are very different. One would therefore be more apt to think, that for digesting the Variety of Food, and what is of a different Nature, that the *Organ* that is to perform it should be different too. Yet we find the *Stomachs* of Animals that live upon *Flesh*, of others that live upon *Fruits*, and others that live upon *Grass*, &c. to be so much alike, that 'twould be difficult to assign any Difference between them. If therefore we cannot make a Conclusion from the Structure of the *Stomach*, what Food is most natu-
ral

ral to an Animal, much less, one would think, from the *Colon* or the *Cæcum*; those Parts of the *Ductus Alimentalis* that are remote from the Stomach; and being so, seem rather as a *Cloaca*, for the Reception of the *Fæces*, than otherwise of any great Concern in digesting the *Food*, or distributing the *Chyle*.

It would be infinite, should I expatiate upon *Nature's* great *Variety*, in the Formation of the Structure of this *Ductus Alimentalis* in different Animals; and even where we may observe much the same Sort of Food, yet we do not always find the same Structure, though her Intendment be the same, in digesting the Food, distributing the *Chyle*, and ejecting the *Fæces* in all of them. But herein she shews her great Wisdom, in attaining the same End, different Ways. Had *Chance* any Concern herein, we should not observe that constant Regularity in the same *Species*, nor *Variety* in different, where the Action is so much the same.

Since *Man* therefore hath all manner of *Teeth*, fit for Preparation of all Sorts of Food, before it be conveyed to the *Stomach*; I should rather think, that *Nature* did intend he should live upon *all*; or at least is so bountiful as not to deny him any, or stint him to one Sort only. So in like manner, since the *Organ* here in *Man* is fitly adapted for digesting all Sorts of Food; I should rather incline to conclude, that therefore *Nature* intended all Sorts for him: Which *God Almighty* assures us he did, *Gen. ix. ver. 3. Every moving thing that liveth shall be Meat for you, even as the green Herb have I given you all things.*

But perhaps it may be expected I should give you some Instances in *Brutes*, where it doth not hold, that all *Carnivorous* Animals have no *Colon* or *Cæcum*, though as to *Man* the Case may be different. Now the *Carigueya* or *Opossum* (whose *Anatomy* I have given in *Philosoph. Trans. N^o 239. **) had a long *Colon*, though not *cellulated*, and a large *Cæcum*, that received all the *Fæces* as they passed down: Yet this Animal feeds on *Poultry* and *Birds*. And I have a Male *Opossum* now by me, that feeds on nothing but *Flesh*. On the other hand, the *Hedge-Hog* or *Urchin*, that hath no *Colon* or *Cæcum*, and therefore by this Rule should be *Carnivorous*, feeds on *Roots*, *Fruits*, *Herbs*, &c. and not on *Flesh*. *Hogs* likewise, that have both a *Colon* and *Cæcum*, will feed upon *Flesh* greedily enough, when they can meet with it, though their ordinary Food be of another Kind. And a *Rat* or *Mouse*, that have a large *Cæcum*, but no *Colon*, feed upon *Bacon*, as well as *Bread* and *Cheese*. But if what *Ælian* tells us (*Hist. de Animal. lib. 17. cap. 45.*) can be relied upon, there is an Instance in the *Neat-kind* also: For he assures us, Ἀγριώτατοι ἐστὶν ἄρα ἥσαν τῶν ζῴων οἱ τῶν Αἰθιοπῶν ταῦροι, καὶ καλέμενοι σαρκοφάγοι. So likewise in the same Book, *cap. 25.* he mentions *Horses* and *Sheep* that feed upon *Fish*. But these Stories, I suppose, he hath taken up from the *Indian Historians*; whose Credit I have sufficiently examined in my *Discourse concerning the Pigmies of the Ancients*; and

* Vid. supr.
V. ii. C. VI.
S. CIX.

and shall therefore lay no Stress upon them. Dr *Wallis's* Observation therefore as to *Brutes*, tho' it may hold for the most part true, yet it is not universal; and, as all other Rules, may have some Exception.

3.] Dr *Tyson*, I think, is much of the same Opinion with me. I On the same,
by Dr Wallis,
Ibid. am inclined to believe, that all Nations (as well before as since the Deluge) have used to feed on *Flesh*. Which is a strong Presumption (as is well observed) that to feed on *Flesh* (*duly prepared*) is not wholly *unnatural* to Mankind. On the other hand, I believe Dr *Tyson* thinks (as I do) that *raw Flesh* is not *natural Food* for our Bodies. I do not know that any Nation have, of Choice, used to feed on *raw Flesh*, unless in Cases of *Extremity*, or when they have not the Convenience of *Preparing* it by previous *Coction*, or somewhat equivalent. For I put a great Difference between *raw Flesh* (which is the common Food of what we call *Carnivorous Animals*) and *Flesh duly prepared* for our Food. If any there be that (of Choice) feed on *raw Flesh*, I look upon it as a Case *Anomalous*; like that of the *Lamb* mentioned by *Gassendus*; and the *Horse* (Dr *Tyson* mentions) that *eats Oysters*. I may add, the *Rat* eating *Bacon*, for want of other Food, (which yet is not quite void of *Coction*; and the *Swine* sometimes eating *Poultry*. Which latter I do not take to be purely *Natural*, but rather the Effect of an *Appetite depraved* by Custom; because much of the *Hog-wash* we give to *Swine*, ariseth from the *Coction* of *Flesh* for our own Use; which doth inure the *Swine* (a voracious Animal) to the *Taste of Flesh*, and makes it familiar to them. But *Flesh, duly prepared for our Food*, I look upon as a thing very different from *raw Flesh*, and which may be proper Food for Man; if (and so far as) it agrees with our *Health*: Which Caution is to be observed, as to other Food, as well as *Flesh*. And this I refer to the Care of the *Physician* and the *Apothecary*, rather than the *Cook* and the *Confectioner*: For these do oft comply with the *Wantonness* of the *Palate*, rather than the *Health* of the *Body*.

I leave it to be considered, from what *Reason*, and for what *Use* the Passage of *Flesh* through the *Ductus Alimentalis*, should (ordinarily) be more *Quick*, and that of *Herbs* more *Slow*; (for that seems to be the Cause, the *Colon* making the Way *Longer*, and the Passage *Slower*;) and, in what Degree it is so. I say *Ordinarily*; because, in case of *Catharticks* (or what is equivalent) the Speed is quickened.

And, again; When as Nature seems to have (originally) designed, in Man, a large *Cæcum*, as in some other Animals (and which, if I mistake not, is, in the *Fætus*, larger, in Proportion to the rest of the Intestines, than in Persons Adult,) How it comes to pass that it is now of little or no Use, but shrinks up into an *Appendicula Vermiformis*; Whether or no this may partly proceed from our Feeding so much on *Flesh*, which will not admit so great a *Remora*, as a large *Cæcum* may occasion in other Animals.

Insects in
Spain; by Dr
J. P. Breynius.
n. 301. p.
2050.

An uncommon
Grass-Hopper.

Fig. 1.

Bruchus. Al-
drovand.

Fig. 2.

Mantes. Mou-
fet and John-
stone.

Fig. 3.

II. Out of an immense Number of *Locusts, Butterflies, Moths, Libellæ, and Snails, &c.* which I have observed in *Spain*, I shall pick only a few.

Figure 1. represents a *Locust*, which I don't know if Authors have described or not, but it appeared to me to be very singular. It was of a very beautiful green Colour, and of the same Size with the Figure. It moved slowly, having no Wings, but instead of them upon the Back, immediately below the Shoulders, two very small, roundish, clay-coloured Membranes. It's Head was adorned with very long Antennæ, green and jointed. I saw only one of these Insects, sitting upon an *Oleander*.

Figure 2. represents an Insect, which is described and painted by *Aldrovandus*, in his *History of Insects*, L. 4. T. 5. Fig. 2. and 3. under the Name of *Bruchus*, of an uncommon Figure; but his Description is lame, and the Figure by no Means accurate. The Head of this one I saw was oblong, crested above, and had two very short Antennæ before. The Body and Legs were very slender, the Tail broadish, articulated, curled in, and notched round it's Edges, with a Ridge of the same Kind along it's Middle. When it rested, the the Body was supported upon two fore Legs folded, and it used them too in walking; but they seemed to me to be principally designed by Way of a Pair of Forceps to lay hold of it's Food. It's Colour was something between that of Ashes and Clay, with blackish-brown Spots scattered here and there. I found only one of them amongst the *Grass*, which I kept alive ten Days without any Food, and at last killed it with a Needle. To this Species is likewise to be referred that represented by *Aldrovandus*, L. 4. T. 3. Fig. 9.

Figure 3. shews an Insect, which *Moufet* and *Johnstone* describe and delineate by the Name of *Mantes*. To which Species, in my own Opinion, belong those delineated by *Aldrovandus*, l. c. T. 1. F. 1. and 2. and T. 3. Fig. 10. and by *Johnstone* T. 13. F. 18, 21, 22. and besides all the walking Leaves, as they are called, brought from the *Indies*, which are by no Means the Leaves of Vegetables transformed into these Insects, as some have foolishly imagined, but Insects produced in the common natural Way, as will easily appear to any-body who considers the Thing accurately, and does not give a ready Ear to Prodigies, and fabulous Stories. This Insect then was exactly of the same Size as expressed in the Figure. It had four Wings, the two uppermost, which were full of Veins or Strings, had the Resemblance of dry Leaves (which is still more remarkable in those which come from the *Indies*, whence the Fable of their being produced from the Leaves of Plants arose) of a brownish yellow Colour; the lower ones were larger than the others, but more fine, yellowish, with black Spots, and not so full of Veins: So that the upper ones supply the Place of Sheaths for the others, as you may observe in Beetles. Farther, the Extremity of the Belly was bifurcated, the fore Legs thicker, and jagged, as in the preceding Insect, and likewise designed by
Nature

Nature for the same Purpose. The rest of the Body was of a brownish clay Colour.

Happening once to shew the Figures of the two last Insects to the famous *Vallisnerius*, out of the great Affection and Benevolence which he has always been ready to shew me, he was pleased to communicate to me the following Remarks taken out of his Collection of Observations; viz. that he had found them himself in *Italy* in the Hills of *Scandia*, *Reggio*, and *Coneglio*, and had them sent to him likewise by his Friends from *Marca Ancona*, *Maurata*, *Leghorn*, and *Florence*; and at last he bred them up in his Garden. That they were both of the same Species, only of different Sexes, viz. the Male is the one without Wings, Fig. 2. and the Female with Wings, as represented in Fig. 3. That by the *Spaniards* this Insect is called *Salta Monte*; by those of *Leghorn*, *Cavallo Verde*; by his Friend *D. Ceston*. *Grillo-Centaurus*; and by himself, the *Spider-Locust*. That he had seen some of them half as large again as mine, and the Female very frequently of a greenish Colour; whence the *Italians* call it *Cavallo Verde*. That besides they were Carnivorous, and it was a pretty Sight enough to observe them hunt their Prey, as *Flies*, *Crickets*, and *small Locusts*, which they catch with their fore Legs, raising their Body up, and frequently devour; which shews them not a little fierce and tyrannical. Further, that the Female builds her Nest in the Space of one Night (viz. eight Hours) doing the whole with her Tail lifted up, the rest of her Body remaining unmoved. That it is two Years before the Female is fit for Generation, and then the first Nest she makes is about the Size of a Filbeard; the next Year it is larger, and the next after that of the Bigness of two Filbeards. That the Time of building their Nests is Autumn, and the *May* or *June* thereafter the young Ones come out, of the same Figure with their Parents, but extremely small, for the most Part to the Number of an Hundred, and sometimes of two Hundred, according to the Largeness of the Nest, and the Age of the Mother.

Figure 4. represents the Figure of the *Nest*, taken from that which was given me by *Vallisnerius*. It is of a muddy Ash-Colour, and seems composed of a thick Humour from the Podex of the Female, which afterwards becomes hardened. Amongst the Peasants it is commonly called *Cicala secca* (or the dry Grasshopper) for they take it to be a dead Grasshopper dried.

Fig. 4.

Figures 5, and 6. represent a *Gally-Worm*, very frequent in the Earth, under the Leaves of Plants. It is of a white Colour, varied with black Rings, and Spots of the same Colour between each Ring. It's Head is black, as also it's Feet.

A Gally-worm.

Fig. 5, 6.

This is all I shall say of those Insects which I have observed in *Spain*; to which however, on Account of the Affinity of the Subject, I shall add three small Sea-Animals, which were found in the Month of *August*, by a Sailor who was swimming when the Sea was calm,

Small Marine Animals.

A Sea-Blubber.

Fig. 7.

not far from the Island of *Yvica* in the *Mediterranean*, and brought to me to examine. The first is a Kind of *Sea-Nettle*, as it is called by Authors, the upper Part of which is represented in Fig. 7. It's Skirts, which were somewhat hollow, were of a beautiful blue Colour, and it's Middle, which was rather convex, was very finely striped with circular and radial Streaks of the Colour of Silver. On it's upper Part there were eminent radiant Appendages, which it moved pretty quick like Oars upwards and downwards, of a faint blue Colour, and almost diaphanous, to the Extremities of which were attached, by very small Peduncles, little globular Bodies of a blackish blue Colour. These Appendages were very easily rubbed off, and thereby the whole Animal, being very soft and mucous, easily destroyed.

Fig. 8.

Figure 8. shews it's upper Part, which, besides the Appendages already described, was adorned with Filaments of two different Kinds. The first Kind, which surrounded the Skirt, was composed of short round Filaments, of a pale blue Colour, and smooth; the other, which occupied the Middle, had them likewise very short, but with a Kind of Orifice at their Extremities, and of a white Colour. By these, without Doubt, the little Animal adheres to other Bodies, and takes in it's Food.

Fig. 9.

Figure 9. shews one of it's Appendages, as it appears by a Microscope. All the other Figures are of the natural Magnitude of the Animal.

A Kind of Sea-Leech.

Fig. 10.

The second Species of Sea-Animals I saw, was a surprising Kind of *Sea-Leech*, pretty enough to look at. Figure 10. represents it's Back somewhat flat, elegantly painted with a longitudinal silver-coloured Streak in the Middle, with Lines somewhat blueish going out from it laterally. It's Fins too were of the same Colour mixed with Silver, and it moved them very quick in swimming. It's Sides were of a pale Blue, and it's Belly was white. It had a small oblong Head, with two Eyes, and a little double Beard. It's Mouth, with which it fastens itself to different Bodies, in order to suck them, as I imagine, was very small and round. On the left Side there was a very small Orifice, which I took to be the Anus. I saw two or three of these, which, being put into a Glass full of Water, died in a few Hours; and upon trying to preserve them in Spirits of Wine, they presently contracted very much, and their blue Colour was changed into a dirty rusty Colour.

A Sea-Snail.

Fig. 11, 12,

13.

The last of all was the *Snail*, (Fig. 11, 12, 13.) the Shell of which was more beautiful and singular in it's Colour, than it's Figure; for it was painted of a deep Blue, inclining, though but very little, to a rose Colour. It was extremely thin, very smooth and slippery, containing within it a little Animal represented Fig. 11. which spewed out a Liquor of the same Colour with the Shell, and there adhered to it a Kind of viscid Spume, by Means of which it swam upon the Surface of the Water. This same *Sea-Snail Shell* is so rare, upon Account of it's Colour, that I don't remember ever to have seen it either described,

described, or in the Collections of *Virtuosi*. And the Reverend and Learned Father *Bonanni*, in his Book called *Recreatione dell' Occhio, The Recreation of the Eyes, Par. 3. Probl. 35.* concludes from the same Argument, that there are not, nor cannot be, any such in Nature, for Reasons which he brings in there, and which you may see at full Length in the Place above-cited.

Besides these Sea-Animals all of a blue Colour, there appeared a great many other very beautiful little Animals called *Sea-Sails*, of a blue Colour like the others, which, although they well deserve to be accurately examined, I shall nevertheless here pass over in Silence.

III. About five or six Years since, I removed divers Elms, more than six Inches Diameter, which for the first two or three Years all thrived very well; but two or three Years ago there happening a very dry Time in *July* or *August*, I observed one of those Elms, which stood very shallow, and on pretty high Ground, looking very sick; the Leaves turned yellow, and began to fall off, which made me with a Knife examine the Bark. I found the Inside thereof not so green, but of a more reddish Colour than the others; and between it and the Tree not so moist, and the Bark sticking very close to the Wood: But what was most remarkable, I discerned a great many little black Flies of the Beetle Kind, (*viz.* having a hard Case, under which their thin long Wings were contracted, and therewith covered) between the Bark and the Tree: And looking more carefully, I observed these Flies had made their Way thither, by piercing the Bark in innumerable Places, easily discernable on the Out-side, and was about the Bigness of a large Pin-hole, or rather such as a large Pin's-head would go into; some I found just entering, who had not got quite thro' the Bark, others had made some Progress between the Tree and the Bark, which appeared as a Channel. I despaired of recovering the Tree; however, my Servants being watering others, I caused them to bestow about two Hogsheads on this Tree, with stirring the Earth about the Roots, and laying some half-rotten Litter thereon, to defend it from the scorching Rays of the Sun: Upon this the Tree in some manner recovered it's Verdure again that Year, and the next Year made very good Shoots, and so continued until this Year.

But this being a very dry Summer, I discerned divers of my Trees in the Beginning of *August* to look sick, and particularly the Tree formerly mentioned; I made the same Tryal on them all, and found the Bark sticking close to the Tree, with but little Moisture between, and vast Numbers of those little Flies, who had pierced the Bark in Multitudes of Places. I ordered the Earth about the Roots to be loosened as formerly, and about two Hogsheads of Water to be poured on each; and viewing them the next Morning, I found the Outside of the Tree almost covered with Bees and Wasps, and great black Flies, such as they usually call *Flesh-Flies*, who were all busy in fucking

Insects in the Barks of Elms and Ashes, by Sir Matth. Dudley. n. 296. p. 1859.

sucking the Juice or Sap, which plentifully run out at every Hole, that the little Flies formerly mentioned had made in the Bark, and which was very glutinous, and sweet as Honey. I again examined the Bark, and found it very moist between it and the Wood, and all those little Flies either gone, or drowned in their new Habitation, by the sudden Rise of the Sap: This Tree recovered.

Upon Examination of several Trees, which looked sicker than the rest, I found almost all Greenness had left the Bark, and there remained no Moisture between it and the Wood; but the Bark stuck so close to the Wood it was hardly to be parted: And throughout the whole Tree the Bark was pierced by the aforementioned little Flies, who, from the Hole at which they entred, had made each of them a strait perpendicular Channel from their Entrance upwards, about two Inches long, or something more, very little, if at all, bigger than just to move themselves strait forwards in; for I observed they all of them, if disturbed, came out backwards. All along on each Side this Channel, as close the one to the other as they well could, so as yet to be distinct, there were small Channels running horizontally from it, in every one of which, at the Extremity thereof, there was a Maggot, in Size just the Bigness of the small Channel, very lively, whitish, and almost transparent. These Trees, though well watered, received no Benefit thereby, but died.

It is to be observed, That in those Trees, whose Leaves looked green and healthful, there was none of these Flies to be found.

The Reason of which I presume to be, That whilst there was a sufficient Moisture in the Earth about the Roots to supply the Tree with a due Quantity of Sap, so thin and diluted, that it was proper and capable of being conveyed into the smallest Twigs and Leaf Vessels, the Leaves kept their Verdure, and the Tree flourished: But when, by reason of the dry Season, that Supply failed, and the Sun perpetually exhaling the thinnest and more watry Parts thereof through the Bark, the Sap already in the Tree became insufficient in Quantity, as well as improper, by reason of it's Thickness, to supply or enter into all those small Vessels. The Leaves lost their Greenness, and fell off, and the Sap became thick and very sweet (which I have found it is not, when it is duly diluted, and the Tree in good Health); this invited those Flies to make their Way to it, as a proper Nursery to bring up their young Ones, which I take those little Maggots to be. I presume also, that the Eggs were first laid in the great Channel (and it may be, regularly placed at their due Distances, in the Sides thereof) and after being hatched, made those small Channels themselves; since those small Channels are no way capable of receiving the old Fly, and that the Maggot was always found at the farther End of the little Channel, and the rest of the little Channel is perfectly filled with very small Particles, which, when dry, became fine Dust; and I conceive to be either the Excrements of the Worm, or Parts of the Bark ground
small

small by the Teeth of the Worm, to make it's Way forwards, and rejected as not proper Aliment, or both.

About the Middle of *October* I found those little white Maggots, and consequently their Channels, which they exactly filled, were grown much bigger, and had made their Progress from the Place where they were first hatched, which was close to, or upon, the very Wood of the Tree, almost to the very Outside of the Bark of the Elm, which is usually pretty thick; and in every one of those perpendicular Channels before-mentioned, I found the Mother-Fly lying dead, for the most Part towards the Entrance of the Channel.

These Observations put me upon viewing the Wood which lay in my Yard for Timber or Fuel, and in all the Elm which was felled last Spring, I found the Bark thereof as much pierced; the same Mother-Channel, which for Distinction sake I beg leave still, tho' improperly, to call Perpendicular (for these Trees lay on the Ground) and the same little (now as improperly called horizontal) Channel proceeding from the Mother-Channels full of Maggots, which Maggots had also made their Way, almost to the Outside of the Bark.

Observing some Elm which had lain much longer in the Yard, and taking off the Bark, I found the same Tracks both of Mother-Fly and Maggots; and that at the Extremities of almost all the horizontal Channels made by the Maggots, where they had subsisted long enough to come to any Perfection, the Bark was pierced quite through, by a Hole just the Bigness of the Channel, and nothing left remaining, but a Sort of a whitish pretty tough Skin, exactly the Colour and Size of the Maggot, and the Mouth of the Hole, and the rest of the forsaken Channel perfectly filled with what I formerly presumed to call the Excrement of the Maggot.

Then I examined the Ash-Wood, which had lain some time in the Yard, and at first Sight, it being young, and it's Bark pretty smooth, I perceived it full of small Holes; and on separating it from the Tree, I found just the same Sort of Work as in the Elm, and by the same Sort of Fly, having found several of the Mother-Flies dead in their Channels, and the same empty Skins at the Extremities of the other Channels; only with this Difference, that whereas in the Elm all the Mother-Channels were perpendicular, and the Maggot-Channels horizontal, here in the Ash it was just contrary, all the Mother-Channels were horizontal, and the Maggot-Channels perpendicular; this I at first thought might be accidental, and peculiar to that Piece of Wood, but on Examination of above 100 Pieces of Wood of different Trees, and felled at different Times, I found it exactly to hold true in them all.

I observed several Oak and Maple Trees, which had been felled, some in Winter, and some in Summer, and the Bark remaining thereon, but could find no such thing in either of them.

Fig. 14, 15,
16, 17, 18,
19, 20, 21,
22.

Fig. 14. Shows the Bark of Ash. Fig. 15. The Bark of Elm. Fig. 16. The Worm as big as the Life, lying on it's Back. Fig. 17. The Mother-Fly with it's Belly upwards, as big as the Life. Fig. 18. and 19. The Worm and the Fly with their Backs upward. Fig. 20. and 22. The Worm magnify'd. Fig. 21. The Mother-Fly magnify'd.

Worms in the
Heads of
Sheep, by Mr
J. Thorpe,
n. 295. p.
1800.

Fig. 23.

Fig. 24.

IV. I here send you the Delineation of a Worm, found in dissecting the Head of a Sheep, in the Cells formed between the *Laminae* of the *Os Frontis*: It is an *Apode*, and seems to be a Species of the *Eulæ*; tho' much different from the common Sort breeding in putrid Flesh. It is every-where of a pale fair Colour, excepting it's Tail, which ends a little obliquely in a Plane; on which are impressed two remarkable black Spots. (as in *Fig. 23.*) Besides two small white *Corniculæ*, it's Head is armed with a Pair of black, sharp, and crooked *Forcipes*, which in contracting and extending it's Body, it draws in, and puts out at Pleasure: With these it is, that in creeping it takes hold of the Surface of the Body on which it moves; and draws itself forward on pretty large, protuberant, and somewhat flattish *Toruli*, fewer in Number than those on it's Back (*vid. Fig. 24.*) which alternately swelled and relaxed, seem instrumental to it's Motion, and supply the Place of Feet. It looks of a clear, crystalline Substance, and almost transparent.

The Membrane that invested the Cavity of the Cells containing it, was very fat, and in most Places separated from the Bone; the Blood-Vessels appeared turgid and inflamed; whereas the Membrane of the opposite Cells, which have no Communication with these, was thin, pellucid, adherent, and no-way preternaturally affected.

I have given the more particular Description of this Worm, and the Cells it was found in, it not being described by any Author I have yet consulted. Mr *Bobart* informs me, "That some curious Gentle-
" men of the University, lately observed three Worms lodged in the
" same Parts of the Head of a Sheep, but in two distinct Cells: The
" largest apart by itself, the other two in the Cell adjoining; one of
" which was considerably less than the other, agreeing in Form with
" the fore-mentioned, of a whitish Colour in general, with two nota-
" ble Spots on the flat of the posterior Part, but a Shadow of Brown-
" ness from the Back down the Sides (especially of the riper one);
" roundly turgid on the Back, and flat underneath; divided with
" several *Annuli*, as these Creatures generally are; at the Extremity
" of which Protuberances, serving instead of Feet, there appears a
" little darkish brown Spot on each Side or Edge: As they faded and
" withered, they changed to a light Red, or Phœnicious Colour, and
" afterwards brown."

(a) *Moufet* mentions Worms yearly breeding in the Brain of Stags, Goats and Sheep (especially when fat) but supposing them generally known, gives no Description of them; unless from (b) *Benedictus* and (c) *Mathiolus*, that they are *Eulis maximis æquales, & ejusdem cum illis formæ*: Tho' the Worms meant by those two Authors are not found in the Brain, but (as they both agree) *sub lingua in concavo circiter vertebra, qua cervici innectitur caput.* (d) *Avicenna* asserting the possibility of Worms breeding in the Head, says expressly, *Multoties nascuntur in anteriore parte capitis super locum qui est in strictura narium*: To which (e) *Joubertus* adds, *Ubi oves, & capræ dicuntur perpetuò vermes habere, ut cervi in gutture.* This plainly shews the distinct Places of their generating in the Heads of Stags and Sheep, as well as describes the particular Cells, in which they are found in the *Os frontis* in the latter.

Trallian (f) relates a memorable Story from *Moschion*: *Democrates* the *Athenian* applying himself to the Oracle at *Delphos* for the *Epilepsy*, received the following Answer;

Μείζον' ἀειράμεν κεφαλῆς ποιμνηιον εὐλῆν
Μηκάδ' ἀγρονόμοιο, δέρας περικάμβαλε μήλα
'Ἐρπηλα πολύπλεκτον εὐρίνα ἀπὸ κόρσης.

Which *Guintorius Andernacus* renders thus;

*De grege sume capræ majores ruris alumnae,
Ex cerebro vermes, & ovis dato tergora circum
Multiplici vermi pecoris de fronte revulso.*

Democrates not comprehending the hidden Meaning of the Oracle, referred it to *Theognostes Democratus*; who, recollecting that the Head of a Goat near the *Basis* of the Brain is naturally impregnated with Worms, right sagely unfolded the Mystery; advising him, in pursuance to *Apollo's* Directions, to procure one or three of them (for, it seems, it must be an odd Number) by provoking the Animal to sneeze; and wear them about his Neck, in the Skin of a black Sheep, as an Amulet.

'Tis not to be imagined, how Worms seated at the *Basis* of the Brain, where *Trallian* places them, should be expelled by Sternutatories. The Words of the Oracle [*Εὐρίνα ἀπὸ κόρσης*] admit of a more favourable Construction, and distinctly express the Cavity over the Nose; from whence, by a Passage that opens into the Palate and Nostrils, they may easily be discharged by sneezing. By the same Passage they may as easily insinuate themselves, when small; or rather

(a) *Theatr. Insect. lib. 2. cap. 30.* (b) *Lib. 21. in proem.* (c) *Comment.*
in Dioscor. lib. 2. cap. 52. (d) *Lib. 3. sen. 1. cap. 3. tract. 2. cap. 3.* (e) *Cap. 9.*
de Cephalalgia. (f) *De Arte Med. lib. 1. cap. 15.*

be drawn up with the Breath in the State of Eggs, and deposited in those Cells: Where animated by the vital Heat, and nourished by preying on the Membrane in which they are included, they may more probably occasion the Epilepsy in Sheep and Goats (a Distemper (g) Hippocrates observes to be frequently incident to them, tho' he ascribes it to a different Cause) than cure it in Men.

From hence perhaps we may be allowed to account for those various Instances given by Medicinal Authors, of Worms ejected at the Nose by Men and Women. (h) *Benivenius*, (i) *Fernelius*, (k) *Zacutus Lusitanus*, (l) *Ronssens*, (m) *Trincavellius*, (n) *Hildanus*, (o) *Baptista Codronchus*, (p) *Tulpius*, (q) *Verzascha*, and (r) others, relate several Cases of this Kind; all agreeing that they were attended with extream Pains in the Head, *Mania's*, *Lypothimies*, &c. which immediately ceased at their Ejection.

It must be granted, (s) *Ægineta*, (t) *Gabucinus*, (u) *Forestus*, (w) *Borellus*, and particularly (x) *Fulvius Angelinus*, who wrote an entire Discourse *De Verme admirando per Nares egresso*, very rationally conclude, the Worms they treated of came from the Stomach, or Lungs, they not being attended with those Symptoms, nor affecting the Head; as in the Cases related by the Authors we have mentioned; particularly in that remarkable Instance in (y) *Hollerius* of a Worm evacuated at the Nose, *nullâ tussi, nullo vomitu antecedente*: Which, by the acute Pain it produced, plainly discovered where it lay concealed.

Whether Worms may generate in the Brain, or it's Teguments, I shall not determine: 'Tis sufficient (supposing it possible) that there is no Passage for them thence to the Nose; where they are often found, as we are assured by many credible Writers. *Angelinus* and *Alfarius à Cruce* place them *prope nasi colatoria in stricturâ narium*; both seeming to imply that *Sinus* more exactly described by (z) *Avicenna*: Which is to be understood of human Heads, not those of Brutes, but only as applied by *Joubertus*.

What terrible Symptoms, as *Cephalæa's*, *Deliriums*, *Epilepsies*, *Synco- pes*, *Convulsions*, &c. a Worm, with such sharp and piercing Weapons may raise, by continually preying and sporting on a Part so exquisitely sensible, and nearly situate to the Origin of Sensation, as the Membrane

(g) *De Morbo Sacro.* (h) *De abditis Morb. causis, cap. 100.* (i) *De Part. Morb. & Sympt. lib. 5. cap. 7.* (k) *Prax. Med. admir. lib. 1. obs. 7.* (l) *Miscell. Epis. Medicinal. 10.* (m) *De ratione curand. partic. hum. corp. affect. lib. 9. cap. 11.* (n) *Observat. cent. 1. obs. 8.* (o) *Epis. ad Fulv. Angelinum & Alfarium crucium: vid. Crucium de Quæsit. per Epis. cent. 3.* (p) *Observat. Med. lib. 4. cap. 11.* (q) *Observat. Med. Obs. 6.* (r) *Tho. Bartholin. Hist. Anatomic. cent. 1. Hist. 64. Epis. Med. cent. 2. Epis. 74, & 85. Ephem. German. Ann. 2. Obs. 147. Ann. 4. Obs. 37.* (s) *De Re med. lib. 4. cap. 57.* (t) *De Lumbric. cap. 8.* (u) *Observat. medicinal. lib. 21. Obs. 28.* (w) *Hist. & Observat. medic. cent. 2. Obs. 70.* (x) *Apud Alfari. Crucium de Quæsit. per Epis. cent. 3.* (y) *De Morb. intern. lib. 1. cap. 54. in Schol.* (z) *Loc. supra citat.*

that invests the Cavity of this *Sinus*, may be more easily imagined than explained.

V. These Experiments were made in *Chelsea-Park*, in the Months of *May*, *June* and *July* 1719.

April 27. I received a small Parcel of *Silk-Worms* Eggs from *Languedoc*.

May 6. Early in the Morning I found them hatched of themselves, the Wind shifting in the Night from *East Northberly*, to the *West Southberly*, changing the Air of a sudden to warm, two Days before the Change of the Moon.

After feeding and managing them according to Art, through the whole Course of their four Sicknesses, they were come to their State of Perfection, being then as thick as a Man's little Finger, and from four to five Inches long, of a yellowish Colour, and when held against the Light, they might be seen through, as you may an Egg, being of the same Colour and Consistence (filled with the Matter that makes the Silk). This is a certain Sign that they will begin to spin in 24 Hours, or less. They then forsake their Food (being very voracious before) and hunt about for a convenient Place to fix their Hold-fasts, for supporting the Balls or Cones that they are to make, which they do in a most wonderful Mathematical Manner, with a Mixture of a Gummy Substance that ties all together; and when the loose furzy Substance is taken off, and some of the Silk is wound off, the Remainder is so smooth and compact, shining like *Sattin*, that they are made use of for Artificial Flowers, and esteemed the best of any thing yet known for that Purpose, for which (only) they are generally kept in *Boarding-Schools*. I weighed many hundred of these Silk-Balls or Cones, which I found to weigh from 35 to 40 Grains, with their *Aurelia's* or *Chrysalis* within them.

June 27. They began to spin, having been hatched 7 Weeks and 3 Days; and in 4 or 5 Days finished their laborious and curious Work: But their Balls were not fit to be removed until 8 or 10 Days.

July 7. *Monf. Lachivre* began to wind off their Silk-Balls with a Machine that made great Dispatch, winding much fine Silk in a Day: I found that an Ounce of Silk-Balls would make about a Dram of fine Silk; but to be more certain, I weighed out to the Winder 12 Pounds of Silk-Balls at four Times, and told the Balls in every three Pounds as followeth, *viz.*

The first 3 Pounds contained 812 Balls

The second 3 Pounds contained 842

The third 3 Pounds contained 797

The fourth 3 Pounds contained 868

So that the whole 12 *lib.* Weight contained 3319 Balls.

Observations on Silk-Worms, and their Silk, by Mr H. Barham, n. 362. p. 1036.

Which when wound off, was found to yield and make one Pound and an Ounce, or 17 Ounces of fine Silk, and about 7 Ounces of coarse Refuse unwound, in all a Pound and half *Averdupois* Weight, or two Pounds *Troy*; which is as great, or greater making or yielding, as in any Part of the World, and the Silk as fine. I shewed it to a noted *Silk-Broker*, who said it was *Italian* Silk (not knowing it was made in *England*) and worth about 20 *Shillings* per Pound, if I had never so many Bales of it, &c.

Now upon this Experiment finding that 3319 *Silk-Balls* would make one Pound and one Ounce of fine Silk, I was desirous to know what Quantity of Silk might be expected from the Worms hatched from one Ounce of Eggs.

Of which to obtain the Knowledge, I made use of the following Method: By often weighing and telling, I found that one hundred Eggs weighed but one Grain, so that if one Grain contains 100, a Scruple must contain 2000, and a Dram 6000, and an Ounce, at 8 Drams to the Ounce, must contain 48000 Eggs. Now if every Egg hatch a Worm, and every Worm makes a *Silk-Ball*, there must be from one Ounce 48000 *Silk-Balls*; and if 3319 *Balls* will make one Pound and one Ounce of fine Silk (which by Experience I found they did) then 48000 *Silk-Balls* will make 15 Pounds and 6 Ounces of *Averdupois* Weight in fine Silk, or 18 Pounds and 8 Ounces of *Troy* Weight, which is very considerable. And in the same Proportion, one Pound of *Silk-Worms* Eggs will produce Worms sufficient to make above 180 Pounds of Silk. But allowing for Casualties, and supposing but 12 Pounds of fine Silk made from the Worms and their *Silk-Balls*, produced from an Ounce of *Silk-Worms* Eggs; it will be found much to exceed most Countries, according to *Augustino Gallo's* Computation: For he saith, that in the Southern Parts of *France*, viz. *Languedoc* and *Provence*, they make but 7 or 8 Pounds of Silk from *Silk-Worms* hatched from an Ounce of Eggs; and in *Brescia* in *Italy*, but 8, 9, or 10 Pounds of Silk from an Ounce; only in *Calabria*, where the *Silk-Worms* and their Eggs are larger, they make 11 or 12 Pounds of Silk from an Ounce of Eggs; which still doth not exceed, nay hardly comes up to what we make in *England*.

As to the Charge and Expences of making the aforefaid Quantity of Silk in *England*, different from that of other Places, I shall be able to give you a more particular Account in my next Experimental Observations.

I have only this to add, That Experience hath taught me how to hatch *Silk-Worms* twice in a Year, so as to have two Crops of Silk in one Year. And that the *Mulberry* Trees will have Leaves in *England* twice in a Year, without Prejudice to either Tree or Fruit, is most certainly true.

VI. It is not (I think) improper to give a general and cursory Account of the Spider, before I enter on the Description of it's Silk. I shall therefore reduce all the different Sorts of this Insect to two Principal Kinds, viz. such as have long Legs, and such as have short Ones: The latter of which furnishes the Silk I am going to speak of.

On the Silk of
Spiders, by
Mr Bon.
n. 325. p. 2.

In respect of their particular Differences, they are distinguished by their Colour, some being Black, others Brown, Yellow, Green, White, and others of all these Colours mixed together.

They differ likewise in the Number and Position of their Eyes; some having six, others eight, and others ten, differently placed upon the Top of the Head, as may easily be seen by the naked Eye, but much better by the Help of a Glass. These are the principal Differences, they being alike in other Respects, as their Body, which Nature has divided into two Parts: The Fore-Part is covered with a Shell, or hard Scale set with Hairs; it contains the Head and Breast, to which are fixed it's eight Legs, which may be called their Arms; and two Claws, armed with two crooked Nails, and joined by Articulations to the Extremity of the Head: With these Claws they kill the Insects they feed on, their Mouth being immediately underneath them. They have likewise two small Nails at the End of each Leg, and a spongy Substance between them, which undoubtedly is of Service to them when they go upon smooth Bodies.

The hinder Part of the Body of this Insect is joined to the Fore-Part only by a small Thread, and covered with a thin Skin, on which are Hairs of divers Colours; it contains the Back, Belly, Parts of Generations, and the *Anus*. I shall apply myself more particularly to the Description of the *Anus*, as being the Part from whence the Spiders draw their Silk; it not being my Design to give a general Description of this Insect, but only to speak of their Silk, and the Usefulness of it.

It is certain, that all Spiders spin their Thread from the *Anus*; about which there are five *Papillæ*, or small Nipples, which at first Sight one would take for so many Spindles that serve to form the Thread: I have found these *Papillæ* to be Muscular, and furnished with a Sphincter. A little within these I have observed two others, from the Middle of which issue several Threads, in a pretty large Quantity, sometimes more, and sometimes less, which the Spiders make use of after a very Mechanical Manner, when they have a mind to go from one Place to another. They hang themselves perpendicular by a Thread, and turning their Heads towards the Wind, they shoot several others from their *Anus*, like so many Darts: And if by chance the Wind, which spreads them abroad, fastens them to any solid Body (which they perceive by the Resistance they find in drawing them in from time to time with their Feet) they then make use of this Kind of Bridge to pass to the Place where their Threads are fixed.

On the Silk of Spiders.

fixed. But if these Threads meet with nothing to fix on, the Spiders continue to let them out further, until their great Length, and the Force with which the Wind drives them, surpassing the Weight of their Bodies, they find themselves to be strongly drawn; and then making the first Thread, which they hung by, they let themselves loose to be driven by the Wind, and flutter on their Backs in the Air, with their Legs stretched out. And by these two Ways it is, that they pass over Roads, Streets, and the largest Rivers.

One may himself wind up these Threads, which, by Reason of their being united together, seem to be but one, when they are about a Foot in Length; but I have distinguished them into 15 or 20 at their issuing from the *Anus*. What is further remarkable, is the Easiness with which this Insect moves it's *Anus*, every way, by means of the many Rings that border upon it. This is absolutely necessary for them, in order to wind up their Threads or Silk, which in the Female-Spider is of two Sorts; however, I believe this Insect to be Androgynous, having always found the Signs of a Male in such Spiders as lay Eggs.

The first Thread that they wind is weak, and serves them for no other Use than to make that Sort of Web, in which they catch Flies: The second is much stronger than the first; in this they wrap up their Eggs, and by this means preserve them from the Cold, and secure them from such Insects as would destroy them. These last Threads are wrapt very loosely about their Eggs, and resemble in Form the Bags of Silk-Worms, that have been prepared and loosened between the Fingers, in order to be put upon the Distaff. These Spiders Bags (if I may so call them) are of a grey Colour when they are new, but turn blackish when they have been long exposed to the Air. It is true, one may find several other Spiders Bags of different Colours, and that afford a better Silk, especially those of the *Tarantula*; but the Scarcity of them would render it very difficult to make Experiments upon them; so that we must confine ourselves to the Bags of such Spiders as are most common, which are the short-legg'd Ones. These always find out some Place, secure from the Wind and the Rain, to make their Bags in; as hollow Trees, the Corners of Windows or Vaults, or under the Eaves of Houses. And by getting together a great many of these Bags, it was that I made this new Silk, which is no-way inferior in Beauty to common Silk. It easily takes all Sorts of Colours; and one may as well make large Pieces of it, as the Stockings and Gloves which I have made. I shall next proceed to shew the Manner how I prepared the Bags to make the Silk.

After I had got together 12 or 13 Ounces of these Spiders Bags, I beat them well for some time with the Hand and a small Stick, to free them from Dust. Then I washed them in warm Water, till the Water that came from them was clear. After this, I let them steep in a
large

large Pot, with Soap, Saltpetre, and some Pieces of Gum-Arabick, and let the whole boil two or three Hours over a gentle Fire. Then I washed them again with warm Water, to free them from the Soap: And having let them dry for some Days, I loosened them a little between the Fingers, that they might be more easily carded by the common Silk-Carders, excepting that I caused them to use much finer Cards. By this means I had a Silk of a very particular Ash-colour, which is easy to be spun, and affords a Thread much stronger and finer than that of common Silk: Which shew, that all other Work may be made of it: And there is no Reason to fear but that it will endure any Trials of the Loom, after having passed that of the Stocking-Weavers.

Having already shewn the Usefulness and Possibility of making this Silk, the only Difficulty now lies in procuring a sufficient Quantity of Spiders Bags to make any considerable Work of it. And this would be no difficult Matter, if we could breed Spiders as they do Silk-Worms; for they multiply much more, and every Spider lays 6 or 700 Eggs; whereas the *Papilio's*, or Flies of Silk-Worms, lay but 100, or thereabouts: And of this Number we must abate at least half, on account of their being subject to several Diseases, and are so tender, that the least Matter hinders them from making their Bags. Whereas on the contrary, the Eggs of Spiders hatch of themselves, without any Care, in the Months of *August* and *September*, in 15 or 16 Days after they are laid; and the Spiders that laid them, die some time after. As for the young Spiders that are bred from these Eggs, they live 10 or 11 Months without Eating; and continue in their Bags, without growing either bigger or less, till the hot Weather forces them to come forth and seek Food. The Reason of this is plain and natural: For all Insects, and a great many other Animals, as Bears, Serpents, Mountain-Rats, &c. that lie hid during the Winter, abound with a viscid Matter, which is not easily put in Motion: So that it is not strange, that young Spiders should live in the Cold Weather upon their own Substance, without any Loss of Spirits. But as soon as the warm Weather comes, it puts in Motion this Matter, and forces them to spin, and run from Place to Place in Search of Food: And as soon as they begin to eat, one may perceive them to grow bigger and bigger every Day. From whence we may certainly conclude, that if we could find out a Way of breeding young Spiders in Rooms, they would furnish us with a much greater Quantity of Bags than Silk-Worms do: For I have always found, that of 7 or 800 young Spiders, there scarce died one in the Year; and, on the contrary, of an hundred young Silk-Worms, not forty lived to make their Bags.

I ordered to be brought to me all the large short-legg'd Spiders, that could be found in the Months of *August* and *September*. These I shut up in Papers, and put them into Pots, and covered the Pots with a Paper pricked full of Holes with a Pin, as were likewise the several
Papers

On the Silk of Spiders.

Papers that were in it, that the Spiders might have Air. I fed them with Flies ; and some time after found, that the greatest Part of them had made their Bags, of which I have now some by me.

But I more easily procured a great Quantity of them, by promising to pay the same Price for them by the Pound as for common Silk. This Advantage furnished me in a short Time with a large Quantity : And they assured me, they found no Difficulty in getting them ; and that if they were permitted to go into every House, where they saw these Spiders Bags in the Windows, they could furnish me with what I pleased. So that we may easily conclude, that there are Spiders Bags enough in the Kingdom, to make large Pieces of Work ; and that this new Silk which I propose, is not so scarce or dear as common Silk was at first. And so much the more, by reason Spiders Bags, in respect of their Lightness, afford much more Silk than the others ; as a Proof of which, 13 Ounces yield near 4 Ounces of clean Silk ; 3 Ounces of which will make a Pair of Stockings for the largest-sized Man. These which I have made weigh but two Ounces and a Quarter, and the Gloves about three Quarters of an Ounce ; whereas Stockings of common Silk weigh 7 or 8 Ounces.

Spiders not
Venomous.

I can assure you, that Spiders are not Venomous, having been very often bit by them myself without any ill Consequence. And as for their Silk, it is so far from having any Venom, that every-body makes use of it to stop Bleeding and heal Cuts ; and indeed it's natural *Gluten* is a Kind of Balsam, that cures small Wounds by defending them from the Air.

Their Silk is useful, not only in respect of the Manufacture it produces ; but it's Usefulness is much greater, and more essential, on Account of the Specifick Medicines that may be drawn from it. It yields by Distillation a large Quantity of Spirit and Volatile Salt ; and I have found by comparing, that it affords at least as much as common Silk, which of all mixed Bodies yields the most. This Salt and Volatile Spirit, which is drawn from the Spiders Bags, is very active, as may be judged by the following Experiments. It changes the Tincture of the Flowers of *Turnsole* into a beautiful green Emerald Colour. It congeals, and reduces to a Sort of Snow, the Dissolution of Corrosive Sublimate ; whereas the Volatile Alcalies, drawn from Human Scull, Hartshorn, and divers others mixed Bodies, only render it white or milky. So that this new Alkali which I propose, being prepared after the same Manner as that which is drawn from the Bags of *Silk-Worms*, in making the *English Drops*, so famous over all *Europe*, may serve to make other new Drops, which may deservedly be called *Drops of Montpellier* ; which we need not scruple to make use of, with much greater Success than the old ones, in Apoplexies, Lethargies, and all soporous Diseases, by reason of their Activity : And they will be taken with less Regret, because their Smell is not so fetid and disagreeable. I shall not enlarge further on this Subject, but recommend

to

to the Physicians and Chymists of this Society, the Care of inquiring into the other Uses which Spiders Bags, and the Principles that are to be drawn from them by a Chymical *Analysis*, may afford in Physick.

An Explanation of the FIGURES.

Fig. 25. Shews the Belly of a Spider, with the Anus, and five Papillæ, from whence the Threads issue. Fig. 25.

Fig. 26, 27. The Side and Fore-part of the Penis of a Spider, as magnify'd by a Microscope. Fig. 26, 27.

Fig. 28. The Follicle or Bag of a Field-Spider with a harder Shell, at the breaking of which the young Spiders come out mixed with the Silk. Fig. 28.

Fig. 29. The Follicle or Bag of an House-Spider with a softer Shell, in which the young Ones are inclosed. Fig. 29.

Fig. 30. A Spider hanging on the Branch of a Tree, with it's Head turned against the Wind, and spinning out it's Thread, till it finds that it adheres to some Body, (as to the Wall here represented) by which Kind of Bridge it passes over Rivers, &c. Fig. 30.

Fig. 31. A Spider having broke the first Thread, by which it hung, and let out several others, is carried by the Wind, and floats in the Air with it's Legs extended. Fig. 31.

VII. This curious Shell-Fish, Fig. 32. was sent by Mr Foster (a Regent in the College of *St Andrews*) to our College; several of them, he says, were taken upon the Sides of a Whale that was cast in there. Such another was cast into *Edinburgh Frith*, some 30 Years ago. I gave a rude Description of the Shell of that I got, in my *Auctarium Musæi Balfouriani*, published Anno 1697. but this hath the Animal in it. Of the Pediculus Ceti, by Sir R. Sibbald, n. 308. p. 2314. Fig. 32.

It is the *Balanus Balenæ cuidem Oceani Septentrionalis adhærens*, D. Mart. Listeri, *Hist. Conchil.* The *Pediculus Ceti Bocconi*, who, for ought I know, was the first that mentioned it, in his *Recherches & Observations Naturelles*. His Description of the Shell is better than the Figure he giveth of it.

The Shell approacheth to a Sexangular Figure, and consisteth of one Valve, in which Point it differeth from all the *Balani* I have seen: It hath no Spiral Circumvolutions nor Apex, but it openeth at both Ends; the Orifice of the upper End is narrower, and it is through it that it puts forth it's *Cirrhi* or *Brachia*. The Orifice of the lower End is much broader, and the Animal is lodged in it. The lower is divided, as *Boccone* observeth, into 18 Lines, which are raised, 12 of them are simple and streight, and the other 6 are branched: The last are so placed, that two streight Lines are betwixt each of them. There is a Cavity betwixt all of them, in which the *Cirrhi*, or Arms of the Animal, are probably placed, tho' in this Subject, they stood in the Middle of the upper Part of the Shell, with their Ends contracted, as the Figure sheweth them; for the upper Orifice is deeper than the lower.

They were altogether within it ; but we raised them with the Leg of a Compass to the Posture that they appear in the Figure. There is an Opening from the under Part to the upper, by which these *Cirrhi* mount from the Head of the Animal. The Orifice of the upper Part is narrow below, but wide in the Middle, and then again contracts somewhat. The Body of the Shell is Convex ; it hath 6 Divisions, each consisting of 4 Tubes exuberant, which are narrower at the upper End, but grow sensibly wider towards the lower End : The utmost of these Tubes are narrow, the Middle are broader, all of them have *Striæ* crossing them ; the Distances betwixt the Parts of the utmost smooth and appear hollow ; the Superficies of them are wider at the Top, and grow narrower sensibly towards the Bottom. All the Tubes are hollow in the Inside, making Cavities betwixt the Lines, both simple and branched, which compose them. They arise from the Orifice in the Middle of the inner Part of the Shell, and proceed toward the Sides of it, the branched Part is nearest the Side of the Shell. This is what I could observe of the Shell, upon both the outer and inner Side of it. To come now to the Animal : In the upper Part appeared something like a Mouth gaping ; the upper and lower Parts were both Semicircular, but narrower towards the Point of the Overture ; they were membraneous, and took their Rise from the Inside of the Shell. The upper Lip, if I may so call it, was altogether membraneous, the lower seemed of an osseous Consistence toward the Shell, and appeared like the *Dentes Molaries* : A little below the Mouth appeared the *Cirrhi*, which were continued with the rest of the Body of the Animal. I doubt not, but when the Animal is alive, the under Part below the *Cirrhi*, doth resemble the under Part of the *Mollusci*, of the Polypode Kind : This did resemble the *Parenchyma* of a *Buccinum*, but was much firmer, and when it was pressed, it yielded a fat Juice ; it was white without, but blackish where it adhered to the Shell ; it was all drawn up within the under Part of the Shell which it filled : It was somewhat exsiccated, and so I could not perceive any Distinction of Parts in it, tho' some are of Opinion, there may be *Viscera* and Vessels traced in it, when the Animal is newly taken. This is what I could observe of the *Parenchymous* Substance in the lower Part. You see in the Figure two sinewy Bodies, which arise from the Sides of the upper Part of the Shell, the one exactly opposite to the other ; they end as it were in two Claws ; by these, it is like, the Animal attacheth itself to any thing ; and by these it hung to the Whale ; it can dilate and contract them as it pleaseth : So it giveth us a new Sort of Creature of the *Polypus* Kind, which seemeth to be peculiar to some sort of Whales in our Seas, this being the second cast in upon our Shore in my Time.

On the Death-
Watch, by

VIII. Of these *Death-Watches* (or Insects which make a Noise like the Beats of a Watch) I have observed two Sorts. One of them I find
a very

a very exact and true Account of in *Philos. Trans.* N^o 245 †. The *Mr W. Der-*
 Insect there described being less shy, and much bigger than the other *ham, n. 271.*
 I discovered some Years ago. This Year I caught many in *May, in* *p. 832.*
 my Study: Two of which (a Male and Female) I kept alive in a little *† Vid. supr.*
 Box about 3 Weeks; and could make one of them beat whenever *V. II. C. VI.*
 I pleased, by imitating his beating. At last one died, the other *S. XXIX.*
 gnawed his Way out through the Side of the Box.

The Reason why I judge these to be Male and Female, is because I have often by my Ticking Noise, invited the Male to get upon the other in way of Coition. That which I took to be the Male, was somewhat lesser than the other, and was most free in answering my Beats. Before he got upon the other, he would beat very eagerly; and when he found that he was got up in vain, he would get off, and beat again eagerly, and then up again. From whence I guess these Pulsations to be the Way whereby these Insects wooe one another, and find out, and invite each other to Copulation.

This *Mr Allen* hath taken no Notice of in his Relation, and therefore I presume to add it to his accurate Account: From which I differ only in what he says concerning the Part with which the ticking Noise is made, which he says *is the extreme Edge of the Face, which may be called the Upper Lip.* But I observed the Insect always to draw back it's Mouth, and beat with it's Forehead.

The other *Death-Watch*, is an Insect, in Appearance, quite different from the last; which I lately discovered about the Beginning of this *July.* The other *Death-Watch* beateth only about 7 or 8 Strokes at a Time, and quicker: But this will beat some Hours together, without Intermiffion; and his Strokes are more leisurely, and like the Beats of a Watch. I have several Years observed these two sorts of Beating, but took it to be made by one and the same Animal.

The *Insect* which makes this long Beating, is a small, greyish Insect, much resembling a *Louse*, when looked on only with the naked Eye. For which Reason (for want of another Name) I call it *Pediculus Pulsatorius.* It is very nimble in running to seek it's Shelter when disturbed. It is very common in all Parts of the House, in the Summer Months.

They are extreamly shy of beating, when disturbed; but will beat freely enough before you, and also answer you when you beat, if you can view them without giving them Disturbance, or shaking the Place where they lie, &c.

I cannot tell whether they beat in any other thing, but I have heard their Noise only in, or near Paper.

Concerning their Noise, I am somewhat in doubt whether it be made by beating their Heads, or rather Snouts against the Paper: Or whether it be not made after some such Manner as *Grasshoppers* and *Crickets* make their Noise: I rather incline to the former Opinion. But my Reason of doubting is, because I have observed the Animal's

Body to shake, or give a sudden Jirk at every Stroke, but I could scarce perceive any Part of it's Body to touch the Paper. 'Tis possible it might beat the Paper, and I not perceive it, by reason it's Body is small, and near the Paper when it beateth, and it's Motion in beating is sudden, and swift. For which Reasons also, it is hard to perceive the Insect to beat, without a very severe Eye: And therefore I made use of a Convex-glass, which, by magnifying, gave me much better Opportunity of observing.

This ticking Noise, I judge (as before) a wooing Act; by reason I observed another (after much beating) to come, and make Offers to the Beating Insect; who (after some Offers) left off his Beating, and got up upon the Back of that other. When they had conjoined, he got off again, and they continued some Hours joined Tail to Tail, like Dog and Bitch in Coition. The Female (which I saw) was somewhat bigger than the Male, and lighter in Colour (inclining to a Yellow); but whether all are so, I know not.

I have often, heretofore, by the Noise, pursued the Makers of it; but have thought myself disappointed, when I found nothing but some of these *Pediculi*, which I did not perceive to beat, and which I little imagined could have made so sonorous a Noise, as I have heard some of them do, even as loud almost as the strongest Beats of a Pocket-Watch. But lately finding a Piece of Paper in my Study, in which I was sure the Beating was, and it being luckily loosely folded, so as to be viewed throughout, and also happening to lie in a good Light, I strictly viewed it, but could only see some of those *Pediculi*: And viewing them with a Convex-glass, I soon perceived some of them to beat, or make a Noise, with a sudden Shake of their Body, as hath been described. And I am now so used to, and skilful in the Matter, as to be able to see, and shew their Beating, almost when I please, by having a Paper with some of them in it conveniently placed, and imitating their Pulsations; which they will readily answer.

Whether this Insect changeth it's Shape, and becometh any other Animal, I know not, but I have some Cause (tho' very little) to suspect that it becometh a sort of Fly.

On the same,
by the same,
n. 291. p.
1586.

Fig. 33.

Fig. 34.

2.] The *Royal Society* having required my perfecting the History of this Insect, I think myself bound to comply, as far as I am able. And therefore I have procured a Draught to be made of that Insect, both as it appeareth to the naked Eye, and as magnified with a Microscope. *Fig. 33.* sheweth it as seen with the naked Eye: *Fig. 34.* as magnified.

These Figures, and only saying, it is very much like a *Louse* in Shape and Colour, but runneth more nimbly, may be a sufficient Description of an Insect common in every House in the warm Months. For in the cold Season of the Year, they hide themselves in dry obscure Places, and are seldom seen.

Some

Some time after their Copulation, they lay their Eggs in dry, dusty Places, where they meet with least Disturbance. For in such, and none else, I have found them. These Eggs are exceeding small, much smaller than the Nits of Lice; altho' Lice are not much bigger than our Insect is. These Eggs are white and shaped like Nits, but more transparent.

The Generation of the Death-Watch

These (as are the Eggs of all Insects, that have fallen under my Cognizance, by the Warmth of Weather) are hatched by the Warmth of the approaching Spring; which is to them all one as an Incubation. About the Beginning of *March*, or, if the Weather be warm, sooner, if cold and unseasonable, later, the Insect is fully hatched, and can creep about.

At the first leaving their Egg-shell, they are exceedingly small, so as scarce to be discerned by the sharpest Eye, without the Help of a Convex-glass. I have with a Microscope seen them crawling about, but could scarce perceive any Hairs, Feet, &c. But they rather looked like moving Eggs. I suppose they were covered with their Shells, and but just breaking out of them. At the first leaving their Shells, they are lesser than their Eggs, altho' the Eggs are scarce visible without a Microscope.

These young *Death-Watches* are perfectly like the Mites in Cheese, a few Hairs of the Breech only excepted. I could not perceive any Difference between them, when much magnified with a Microscope, but only that Mites have more Bristles about their Breech.

In this Shape they continue 6 Weeks, or 2 Months, feeding on divers Things they can meet with. They being so very like Mites, I cannot positively say, but have great reason to think, that they were Swarms of young *Death-Watches*, which I have seen feeding on dead Flies, and other Things in *March*, *April*, and *May*. These are a great Annoyance to me, in devouring or defacing my Specimens of Insects. And there are scarce any sorts escape these voracious, tho' minute Animals.

From this *Mite State*, they grow gradually to their more *perfect State*. When they become like the old ones, they are at first very small, and then can run about more swiftly than when Mites, in which *Mite-State* they creep but slowly.

Thus having traced the Generation of our Insect through it's several Stages, and finding it to be as solemn and regular as any in Nature, even of that of an human *Fætus* itself, I cannot easily pass over the Business of *Æquivocal Generation* without a Reflection. If this Insect was ever taken Notice of by the Ancients (as I do not find it was, either by them, and but little by the Moderns) they would, no doubt, have made it's Production to be (like that of other Insects, *viz.*) out of Dust, or some other Thing, in which it's Eggs were laid. But as in this, so in the Generation of all other Insects, yea, all Animals, it hath been observed, that Nature is very regular and uniform,

in deriving the Offspring, not from corrupted Matter, but from Animal Parents of the same Species. As for *Gnats*, 'tis wonderful to see in what curious and exact Order the several Species of *Gnats* lay their Spawns. The curious and ingenious *Swammerdam*, and other Authors, mention but two Kinds of *Gnats*; but I have collected near 30 distinct Species of them, and have observed one Species to lay it's Eggs in this, another in that, another in a third, and others in other Forms; and I could not but admire to see how artificially the Spawns are tied in the Water; how (after the Sun's Incubation, if I may so call it) the Spawn is dissolved, and the Eggs, with a Part of the Jelly in which they were inclosed, fall to the Bottom of the Water, and there stick on Stones and other Things; where they are hatched into *Nymphæ*, as various as the *Gnats* themselves, some being red, green, white, or other coloured Worms, some of a quite different Shape; and lastly, how the *Nymphæ* become *Aureliæ*, and the *Gnats*, both *Male* and *Female*, of every Species.

The Noise, or
Ticking, and
Copulation.

I have shewed their *Ticking* Noise to be a *wooing Act*, and that it is commonly about *July*. I scarce ever heard them beat but in *July*. But all, or the greatest Part of *July* they beat, and in the Beginning of *August*. I have heard them till *Aug. 16.* but never later. But they do not every Year beat alike; but sometimes sooner, sometimes later; sometimes much, sometimes little, according as the Year exciteth or favoureth, or hindereth their Venereal Inclinations: Of which we have sufficient Example in the last, and present Year. The last Year, 1702, they ticked very much, scarce ever ceasing either Day or Night. But this Year, 1703, as little. And I have observed as great a Difference in the Fertility of other Insects the last, and this present Year; and no doubt but the same befel our *Death-Watch*. The most remarkable Difference, or at least the most perceivable, was in Insects bred in the Waters; of which I shall say a little, because it serveth to illustrate what I am saying about the *Death-Watch*.

Now as to the Waters, it might be observed, that last Year they extremely abounded with Animalcules. You could hardly find any stagnating Water without many Animalcules of many sorts therein, visible even to the naked Eye. And if you viewed but a small Drop thereof with a good Microscope, you might see very many more; so that the Water looked in a manner as if alive.

But this Year I have found some, but very few of those Animalcules, either without or with a Microscope. The *Pediculi Aquatici* (which *Swammerdam* calls *Pulices Aquatici Arborescentes*) which are seldom barren, were for Instance less numerous in our Waters this last Summer, than the Summer before, by many Myriads, or at least less venereally inclined, or less pregnant, as I judge, from there being vastly less Numbers of them congregated together. For the Reason of their assembling in such vast Numbers, so as to discolour the Waters, I have discovered to be either for *Venery*, or to discharge their Young,

at

at least out of the Receptacles wherein they were lodged, or to cast their *Exuvia*, or Skins, or for all together. For I have seen all these Things performed at that time, if I mistook not.

Now as these most numerous fertile Insects, so our *Death-Watch*, in all Probability, had it's venereal Flames abated by the Indisposition of the present Year; and consequently have clicked but little this Year.

The Reason of all which I take to be the Wet of the Spring-Months, especially *May* and *June* last. In the former of which, there fell more Rain here at *Upminster*, than in any Month of any Year since 1696. This vast Wet might not only chill and spoil the Eggs of the Water-Insect, but also indispose the Air, and by some such Means affects all other Insects, and renders them less prolific.

And not only Insects, but even Corn itself, we have, to our Cost, found to be less fruitful than the Winter before gave us Hopes of.

After that they have spent some Time in *Ticking*, they *Copulate*. I do not remember that I ever found them in *Copulation*, till a Week or Fortnight after their *Ticking*. But 'tis very probable that they do copulate in the Time of their *Ticking*, as I have formerly shewn the *Scarabæus Death-Watch* to do.

I have already said, that the young *Death-Watches* feed upon dead *It's Food.* Insects, and the same I have seen the old ones do also, as also upon divers other Things, *viz.* Bisket, Tallow, &c. nay, *Dust* itself (altho' it may seem to us an improper Food for such *Animalcula*) doth not escape the Palate of our *Death-Watch*. For which Reason probably it is, that they delight most in dusty Places, not in all, but such as are fouled with light Dust, such as flieth in sweeping, and falls on Shelves, and other Places seldom brushed down.

But in this their eating *Dust*, there is one Thing I have observed, which to me seems very remarkable, *viz.* their Curiosity in choosing it. For they do not eat all that they meet with, but are very nice, and curious in selecting what best suiteth their Palate. I have seen them turn the Dust, and hunt among it with great Pains and Diligence.

From hence I conclude, that our *Death-Watch*, and other Creatures too that eat Dust, are not nourished by the pure terrene Particles of Dust, but rather by more nutritive Particles intermixed with Earth. For Dust contains very different Particles, some of Earth, some the Powder of Animals, some Crumbs of Bread, Cheese, and other Provisions reduced to Powder, some Particles of Fruits, or our Spittle, Snot, &c. dried and reduced in like manner into Powder. Now these very Particles of the Dust, are doubtless what the *Death-Watch* hunteth after (like Ducks in Mud) when he turneth up, and diveth among Heaps of Dust. Nay, so far probably is his Food from being corrupted, or fouled by the terrene Particles, that it is perhaps better prepared, by thus being in Dust. Before in a Mass, in the Body, it was more solid, and required the Trouble of being gnawed out and masticated; but being thus in Powder, it is ready subtilized, fit for Deglutition.

Deglutition. And altho' Dust to us seems to be nothing but Dirt pulverized, or if consisting of such Particles also as I have said, yet to be so blended and mixed with Dirt, as to be inseparable: But yet it is otherwise with our Insect. I have seen them through a Microscope select the Particles of Dust, and eat some, and reject many others: Which they can easily do, being small themselves, and having accurate Organs of Sight, Smelling and Feeling, as well accommodated to Dust, as the Organs of Ducks and Hogs are to find their Food in Dirt.

From this Account of the Food of the *Death-Watch*, I cannot forbear remarking on a common Error about the Food of such Creatures as have been, or are thought to live upon Things scarce nutritive of themselves. Thus the *Chamæleon* was thought to live upon the Air, when Flies are eaten by him: Fishes to live upon Water, or at least to satisfy a perpetual Thirst therewith; whereas their sucking Water is breathing, and their Food as little of Water perhaps, as other Creatures use. So *Earth-Worms* doubtless eat Earth, but in all Probability it is Earth made of rotted Roots, Plants, or such nutritive Things, not pure Earth. Nay, so necessary is good substantial Food to all Animals on this our Earth, that I am of Opinion (from I think very good Reason) that there is no Animal but what hath it's proper Food, even the most minute Insects whatsoever, and that also none of the four Elements, altho' therewith mixed. Concerning which, an Instance of mine may be found of the *Food of Water Animalcules*, which Mr *Ray* hath thought fit to publish this Year, in his late Edition of his excellent Book, *Of the Wisdom of God manifested in the Works of the Creation*, p. 431.

But to return to the Food of our *Death-Watch*, or rather the Time they abstain from Food; which I suppose they do all the cold Months. You may perceive them gone into their *Latilula* very soon; as soon, or sooner than the Swallows, where doubtless they live all the Winter, without Food, as many other Animals do.

I said before, they harbour all the Winter in dry obscure Places; I have found them lying deep in undisturbed Dust, but never in shallow Dust, as tho' they had a Foresight of the Danger and Inconveniencies of cold frosty Weather.

I met lately with a Passage in the *Athenian Oracle* (which I think myself obliged to take notice of) concerning the Noise of this *Pediculus Pulsatorius*. The Gentlemen of that Society say, They enquired into such a Noise, found a little Hole eaten in the Wall; that with a Paper-Trap they caught the Insect which they concluded made the Noise, and that it was a small sort of Spider. But I have been myself so often imposed upon in the same Nature, before I actually saw the Truth, that I assure myself those *Gentlemen* were so also. I have in hunting the Noise sometimes discovered a Spider near, sometimes the small *Scarabæus Lignivorus*, which eateth the little Holes in the Wood,
which

which hath been commonly taken for the *Death-Watch*. This I guess'd might make the *clicking* Noise, and therefore with all Nicety watched them; but found, that altho' the Beating continued, the Insects did not stir in the least, nor were any way affected: So with all Diligence I still pursued my Enquiry, which was the Cause of my discovering the real Thing. And I have so many Years acquainted myself with all the Noises of the *Death-Watch* kind, that I can assure every one, that there are but two Sorts of them in those Parts of *England* where I have been; viz. the few quick Beats of the *Scarabæus Sonicephalus* (as *Swammerdam* hath named it) describ'd by Mr *Allen*; and the longer and more leisurely Beats of that Insect I have been now speaking of. There are indeed *Scarabæi*, Grasshoppers, Crickets, &c. which make peculiar Noises. But there are no Creatures which make these regular clicking Noises (like the Beats of a Pocket-Watch) but only that *Scarabæus Sonicephalus*, and our *Pediculus Pulsatorius*.

IX. I would recommend it to the *Society*, that they would themselves, or procure their Friends to observe, in all Parts of the Kingdom, and note down the very Day they first see or hear of the Approach of any of the Migratory Birds. And it may be convenient also to observe how the Winds sit at the same time, especially towards the Sea-Coasts. From which Observations, when compared together, we may probably make a good Guess which way those Birds come, whether fromward the East, or any other Point. The *Jynx* or *Wryneck*, (for Instance) which I take to be undoubtedly a Bird of Passage, I first heard this Year on *March* 29. the Wind Southerly, South Westerly, that and the preceding Day; but Easterly before. The *Certhia* also, or Creeper, (which leaveth us in *Essex* until the Spring, but whether a Bird of Passage I can't tell) I saw first on *March* 13. the Winds that Day varying from S. to N. but blowing strongly the Day before from the Westward. Now if those Birds in the more Westerly, or any other Part, at 100, 200, or more Miles distance, should be discovered to come sooner or later, we might conclude, that accordingly they came fromward the East or West, or other Point, especially if about the same time the Winds seemed to favour their Flight. These are all the Migratory Birds I have seen as yet this Year. But for a farther Sample, I shall annex my Observations of last Year, viz. The *Swallow* came *March* 31, making a great Outcry at his Approach, as if he saw something strange. *April* the 1st. the *Jynx* first yelped here. *April* 4. I first espied the *Ruticilla*, or *Redstart*. The 5th, I saw the *Martin*. The 6th, the *Nightingale* first sang with us. The 7th the *Cuckow* I was told was heard, and the 9th I heard it myself. The 17th, I heard the *Swift* or *Black-Martin* squeek in a Hole in my House in which it hath quietly built for several years: But it being cold Weather, he did not fly abroad till some Days after. As to the Coast of the Winds about those times, they may be seen in my Tables.

Of the Migration of Birds, by Mr W. Derham. n. 315. p. 123.

A Monstrous Puppy and Calf.

*Strange Birds
in Wales, by
Mr E. Lhwyd,
n. 334. p. 464.*

X. There came in *May* 1696. into *Cardiganshire* two strange Birds (as I guess by the Description given of them) of the *Aquatick Fissiped* Tribe. They say they were almost two Yards tall, and of a whitish Colour, with the Tips of the Wings dark; I take them to be some sort of *Exotick Crane*.

In *September* 1694. there came a Flock of Birds (about an Hundred) to a Hemp-Yard, at a Place call'd *Lhan Dhewi Velfrey* in *Pembrokeshire*; and in one Afternoon destroyed all the Hemp-feed: They described the Cocks to be all over red as Scarlet; the Hens greenish above, and red underneath, about as big, or little less than Black-Birds; with Bills more stubbed and bigger than that of a Bull-Finch. I suspect these to have been *Virginia Nightingales*.

Ibid. p. 466.

It was *Mr Roberts* (who is mentioned in the last Edition of *Camden* in *Pembrokeshire*) that gave me the Account of these *Scarlet* Birds. He said they were extraordinary tame, or at least so intent upon their Feeding, that they being forced from their Places, they would not remove above 2 or 3 Yards. The Cocks, he says, were of a deep scarlet Colour, without any Distinction in the Feathers of their Wings, that they could discern, excepting that the Tail and the lower Part of their Belly, were a little paler. The Hen had a lovely scarlet Breast, her Head and Back grey. He is curious in Birds, and says, He never saw any that in the least resembled them as to their Colour.

*A Puppy re-
ceiving no
Nourishment
at the Mouth,
by Mr S. Bra-
dy, n. 304.
p. 2176.*

XI. This Puppy was whelp'd in *November* 1704. at it's full Growth, had no Appearance of a Mouth at all, and liv'd some time after it was parted from it's Dam: When the Skin was pull'd off the Head, there appear'd not the least Passage thro' it: The Head was one solid Bone without Sutures, somewhat round, as a Man's Scull, with a little Prominence in the Fore-part, resembling the *Os Nasi* of a Man, but without any Passage: It had no Place for Eyes, nor *Meatus* for Ears, only the outward Resemblance of one on each side unpenetrated, and placed lower than naturally: No *Jaw-Bone*, nor Conveyance to the Top of the *Larynx* and *Pharynx*, but from thence downward was natural. I stuffed the Skin for my own Satisfaction.

This is, I think, a Confirmation that the Nourishment of the *Fætus* in the Womb is perform'd by the *Umbilical Vessels* only, without the Assistance of the Mouth.

*Of a monstrous
Calf, by Dr
A. Adams. n.
311. p. 2414.*

XII. I have made what Search I could about that monstrous Calf, and I find that it's Dam was all that a poor Man had; who finding his *Cow* unable to cast her Young, employ'd his Neighbour to assist her; this Man not thinking of any such Rarity, us'd such violence upon the Monster, that He disfigur'd the Head in pulling it from the *Cow*; notwithstanding it lived three Hours, and in all Probability had lived till this Time, if the Assistant had made use of the best Method in that Case: Then it dy'd, and being ript up, was found, to the best

best of my Information, to be in all respects like any other of the same kind, excepting the Wings, which to me seem to be Bags formed out of the Membranes, torn and distended from the adjacent Parts, and by fresh Supplies from the circulating Fluids were enlarged to the Bigness you now see them in. Whether the Substance contained in these Bags was Fibrous and Muscular, or only a Heap of Vessels inclos'd in a *Cystis*, like the *Placenta*, the Assistant's Ignorance, and the Distance of Time and Place, it being three Years ago, make me incapable to account for: The Place is called *Wolterton* in *Norfolk*.

[The Skin of this Calf is now in the Repository of the Royal Society, given to the same by Dr Adams.]

XIII. A Butcher brought me in the Head of a monstrous Calf (which he had taken out of a Cow's Belly). The upper Jaw was divided into two Halfs, as far as to the *Dura Mater*: Each half had a distinct Eye and Nostril: And the Under Jaw was bent round so entirely, that it lay exactly between the two Halfs of the Upper Jaw. making the Tongue lie upon the Forehead, about two Inches above the Teeth of the Under Jaw, and in the Fissure of the Upper Jaw. This Preternatural Division of the Upper Jaw was not covered with Hair, but with a *Cutis* of a florid Colour. The Calf was come to it's full time, and made great strugglings when the Butcher knock'd the Cow on the Head; which by some Symptoms they judg'd would have dy'd in the Calving. It was so large a Calf, that an old experienc'd Butcher says, that he never saw but one so large at Calving: The Legs and Feet were as big as an ordinary Calf of six Weeks old. If the Butcher had had the Sense to have opened the Cow immediately upon killing her, in all Probability the Calf might have been saved alive.

*The Head of a
Monstrous
Calf, by Mr
J. Craig.
n. 333.
p. 429.
Fig. 35.*

I opened the Calf's Head, and after I had cut the Skin (for there was no *Cranium*) that was expanded over the fore-part of the Cavity containing the Brains, I was surpriz'd to find that there was very little Brains in it; I am sure not so much as in a Rabbet: The whole Cavity is not big enough to hold an ordinary Walnut. This to me is the most surprising *Phænomenon* of this monstrous Head. The Butcher thrusting his Finger rashly in, spoilt any Observation I could have made upon the Brains. I have made him cut all the Flesh off, and hung up the Bones in their natural Position.

P. S. I had almost forgot, that a Week before the Cow was kill'd (upon apprehending that she had the Dropsy) the Butcher cut a Hole in her Belly, a little above the Udder, and thrust in his Hand; but finding nothing extraordinary, sowed up the Hole, and the Cow eat her Hay, and was as well as before.

XIV. If we may justly infer an Identity of *Species* in Fishes, from the Likeness of their Fins, we have then some ground to conclude, that

*The Yellow
Gurnard &c.*

scribed by Dr
E. Tyson.
n. 293.
p. 1749.
Fig. 36.

that this Fish, (I am giving an Account of, and which has not hitherto been described by any as I know of) ought to be referred to the *Gurnard* kind. Not but that in many Particulars, and those very remarkable too, it differ'd from it. However, not finding any other *Species* it agreed with better, and that the Fishmonger that sent it to the *Royal Society*, not knowing any Name 'twas called by where taken, which was about *Hastings* in *Suffex*; I shall take Liberty to call it the *Yellow Gurnard*, or *Cuculus Lævis Caruleo-flavesceus, cui in supremo Capite Bronchiarum Opercula*; and that I had some Colour of Reason for doing this, will appear, when I have compared this Fish with the *Red Gurnard*, and shewn wherein they agreed or differ'd.

And first of all, as to the general Shape of their Bodies, I found an Agreement enough. In both, the Head was the biggest Part; the Body thence gradually still lessening and growing taperer, as it approached the Tail, where 'twas very small in both. The *Yellow Gurnard* measured eleven Inches in Length, whereof the Tail is two. The Girth of the Head was four Inches and a half.

The Fins, as to Number and Situation, or placing on the Body, were exactly the same in both; I shall therefore omit their Description, and only take notice wherein they differ'd in other Circumstances. As in the Fore-Fin on the Back of the *Yellow Gurnard*, there were four or five *Radii*, or Spines; whereof the first was six Inches long; the next about two; the others shorter: In the *Red Gurnard* in this Fin, were six strong bony Spines, sharp-pointed; whereof the second from the Head being the longest, was only a little above an Inch, and the rest not much shorter. Note, the *Red Gurnard* I had to compare with, was but small, and something lesser than the *Yellow* one.

In the hinder Fin of the Back of the *Yellow Gurnard* there were nine *Radii*; in the *Red Gurnard* fourteen: in both, the *Radii* near the Tail were the longest; those in the *Yellow Gurnard* being two Inches and a half long.

The Membrane that joined these *Radii* of the Back-Fins, as to Colour differ'd very much in these Fishes. For in both the Back Fins of the *Red Gurnard* this Membrane was all of a white transparent Colour. In the Fore-Fin of the *Yellow Gurnard*, the Membrane was yellowish, with blue Spots, and some edged with black, and the Membrane of the hinder Fin was of a faint bluish Colour, with four yellow Lifts or Streaks about a line broad, running the whole length, as in the Figure.

Fig. 36.

The *Pinne Bronchiales* (whereof there were two of each Side, and their Situation in both, the same, the uppermost being inserted Perpendicular, the lowermost Horizontal to the Body) differ'd likewise in Colour: For in the *Yellow Gurnard* the uppermost Fins were white; the lowermost of a dark blackish Colour with several beautiful long Spots of an Azure Blue. In the *Red Gurnard*, the uppermost Fins were of a dark reddish Colour, the lowermost white; but here between these

these two Fins I observed three naked *Cartilaginous Radii*, which are not in the *Yellow Gurnard*, and are well expressed in *Salvianus's* Figure of the *Red Gurnard*.

The Fin on the Belly was placed exactly alike in both. The *Yellow Gurnard* here had nine *Radii*, and it's Membrane of a darkish Blue Colour. The *Red Gurnard* had 17 or 18 *Radii* here, and it's Membrane transparent white. The Tail in both was much the same.

Over the *Anus* in the *Yellow Gurnard* was a slender pendulous Body, which was not observed in the *Red Gurnard*.

The Colour of the Body of these two Fishes differed likewise very much; and I know not, but that it may be a Property in this Species to vary in Colours more than other Fishes do. The Belly of the *Red Gurnard* was of a Silver Colour, and some Part of the Sides near the Belly: the rest, and the Back and the Head, were of a reddish Colour. In the Head there some small whitish Spots. The Belly of the *Yellow Gurnard* was white, but under the lower Jaw was black. The Sides and Back were yellowish; but between the Belly and Sides there ran a blue Streak or List about a Line and a half Broad from the Head to the Tail; and a little higher on the Sides, where was a Chain of blue Spots the Length of the Fish; for on the Sides of the Head I observed these blue Spots; only from the Eyes to the end of the *Rostrum* the Spots were of a deep yellow Colour. There being therefore so much of blue and yellow over the greatest Part of the Body of this Fish, I have given it the Epithet of *Ceruleo-flavescens*; for where the Ground is blue, the Spots are yellow, and where yellow, the Spots are blue.

Tho' hitherto there seems a tolerable Agreement between these two Fishes, yet in the Remarks I shall now add, the Disagreement will appear greater. For the *Yellow Gurnard* was without Scales, I therefore call it *Lævis*. The *Red Gurnard* had not only Scales on the Back, but likewise a Ridge of spiny Scales all along the Sides; as also of each Side the Back Fins were placed the like spiny Ridges or Scales. But the Belly seemed almost smooth, and had but few Scales, and those very fine; and indeed those on the Back were much smaller than those in most other Fishes. If Mr *Leeuwenhoek's* Observation be true, that even the *Anguillous* Kind are scaly, then the Difference will not be so great, the one having *Membranulous* Scales, the other *Bony*. Or it may be our Subject is an *intermediate Species* between the *Gurnard* Kind and some other.

And this I am the more apt to believe, because, tho' it has Gills of each Side, yet it had not those *Apertures* at the Sides of the Head that the *Red Gurnard* had, and is common to most Fishes but the *Cetaceous* Kind; but, like them, the *Yellow Gurnard* had two *Apertures*, or large *Foramina's* placed on the hinder Part of the Head, an Inch beyond the Eyes, at which it spouts out the Water. By blowing into these *Holes*, I extended the Cavities where the *Gills* lay; and observ'd that over these Cavities were placed a flat Bone, which by the Con-
traction

traction of it's Muscles might serve to force the Water out, and perhaps is assisted in this Action by another loose Bone that lies over it, whose Edges are jagged or indented, as in the *Figure*: At which Place, in the *Red Gurnard*, I observed a strong sharp Spine.

These *Foramina* in the Head of this Fish is a thing so very remarkable, that it may be looked upon as a *Characteristick*; nor do I know at present with what other Fish to parallel it: For the *Cetaceous* Kind, that have Spouts in their Heads, have not *Bronchiæ*, but *Lungs*. The better therefore to distinguish this Fish, I have added this Particular to it's name; and could wish, that instead of those silly Names that are given to most Fishes, others were found out, that might be more expressive; and that their *Classes* were so ordered by such *specifick* Differences, that one might better know where to range them, in as good Perfection as is now done in the *Vegetable* Kingdom that is more numerous.

But to conclude; I observed the Eyes in the *Yellow Gurnard* were placed more on the top of the Head, and the Skin here covered almost half of them, like an *Eye-lid*; which I did not observe in the *Red Gurnard*, whose Eyes were placed more at the Sides of the Head. The Head likewise of the *Red Gurnard* was more protuberant, in the *Yellow* flatter. The End of the *Rostrum*, the Teeth and Tongue in both were exactly alike; only in the Palate of the *Yellow Gurnard* I observed two *Cartilaginous* Bones, whose Edges were bended downwards, from the Palate, and did serve, as I supposed, for the hooking in and staying the Cartilage of the Tongue, when it makes a Compression for the forcing out the Water by the *Foramina* of the Head: Which Contrivance I did not find in the *Red Gurnard*, not having the like Occasion for them.

This Fish being stale, I had not Opportunity of dissecting it, and observing the *Viscera*: And shall only further add, that the Gills had four *Osseous Radii* of each Side. But of these more, if I happen to get another of this Sort.

Experiments
with Poisons
on Animals at
Montpelier,
by W. Courten,
Esq; n. 335.
p. 485.
With Dutch
Nightshade,
Hemlock,
Wolf's-Bane.

XV. In the Month of *July*, Anno 1678, we gave a Dog a piece of Bread, steep'd in two Ounces of the Juice of *Dutch Nightshade* [*Solanum Batavicum*] express'd from the green Plant, and mix'd with Cheese. As far as we could perceive, he did not seem to receive any manifest Damage from it.

The same Dose of the Juice of the Leaves of *Hemlock* [*Cicuta*] had no more effect. We gave also the same Dog a pretty large Root of *Wolf's-Bane* [*Aconitum Pardælianches*] together with the Leaves and Flowers of the same Plant bruised and mixed with Flesh; which did him no hurt.

White Hellebore.

Two Drachms of *White Hellebore* [*Helleborus albus*] very much disorder'd him, and caused Reachings, Suffocations, Vomiting, and voiding of Excrements. This Dog (as afterwards we often observed in others that had taken the like corrosive Medicines) whether because

he

he was not able to endure the Pain, or by Reason of any other Uneasiness, often scratched the Ground with his Feet: However he recover'd, and was well again.

He swallowed also five Roots of *Meadow Saffron* [*Colchicum Ephem-
rum*] dug fresh out of the Earth: With which he was violently tor-
mented, but did not die. *Meadow Saffron.*

At last he took two Drachms of *Opium*, which cast him into a deep *Opium.*
Sleep; but after vomiting and voiding foetid Excrements, he recovered by Degrees his former Briskness. So many, and those so notorious Poisons could not kill this Dog.

Some Weeks after, when the same Dog had recovered his former *Bite of a Vi-
per.*
Vigour, we tryed on him the force of a much stronger Poison. We caused him to be bit 3 or 4 times on the Belly, a little below the Navel, by an enraged Viper. There arose immediately little black Bladders containing a liquid blackish sort of Corruption; they were flaccid and tremulous, like the Gall-Bladder when it is about half full; and a livid Colour by Degrees spread over all the neighbouring Parts. The Venom propagated itself with wonderful Quickness, and weakened all, but more especially the Animal Functions; for notwithstanding the Diaphragm did still perform it's Office pretty strongly, tho' with some Disorder, and the Heart continued beating, tho' faintly and irregular; yet they seem'd to fare much better than the Brain, whose Strength was so weaken'd that it could not perform the Functions of Sense and Motion but very faintly; insomuch, that the Dog lay without any Strength or Sensation, as if he had been seized with a Lethargy or Apoplexy: Which kind of Stupidity we also observ'd, sometimes in a greater, and sometimes in a less Degree, in all other Dogs bit by a Viper. Being willing to save this Dog (tho' we had found by many Experiments, that much slighter Wounds made by a Viper had occasioned Death) we thought fit to have recourse to several Remedies; and therefore cupped and scarified the Part that was wounded, and applied Treacle [*Theriaca*]. After this we let him alone for about two Hours: But his Sleepiness increasing more and more, and his Vital and Animal Functions sinking, we were forced to have recourse to another Method of Cure. Wherefore to dispel his Sleepiness, we forced into his Throat half a Drachm of Volatile Salt of Hartshorn mixt in Broth: which we easily did, by reason of his Weakness. In a little time after, his Eyes, which before looked dead, began to revive, and he was able to stand on his Feet and walk. Whereupon we repeated the same Dose of the Volatile Salt, by which he was freed from his Sleepiness, and the Strength of his Heart recover'd; and notwithstanding he remained weak for three Days, yet he sensibly recover'd Strength, tho' he would eat nothing all that time: But he drank Water very plentifully and greedily; and on the second Day did not refuse cold Broth. After the third Day he began to eat solid Meats, and seem'd now out of Danger; only some large foul
Ulcers:

Ulcers remained on that Part of his Belly that was bit, of which he would scarce have died, had he not been kill'd by another Dog; which prevented us from seeing the Event of this Experiment.

Bite of a Viper in the Tongue.

But to try more fully the Force of the above mentioned Poison, it is necessary to make several Experiments of it: For tho' the Bite of a Viper, if it be but slight, may kill some Dogs; yet in the Month following, a large strong Dog, that was bit in the Tongue, which is a very dangerous Part, recovered without any Medicines. His Tongue indeed turned black, and swelled so much, that it could scarce be contained in his Mouth: he was stupid, as is usual from the Venom of a Viper, but not so much but that he could stand on his Feet. A few Hours after, his Sleepiness decreased; and the next Day he endeavoured to lap Water, but the Bigness of his Tongue prevented him. On the third Day he threatned to bite any Body that disturb'd him, and had recover'd so much Strength, as to be able to escape out of the Place where he was kept: and two Days after, was seen in the Streets; but what became of him afterwards we could not learn.

Root of Monks-Hood.

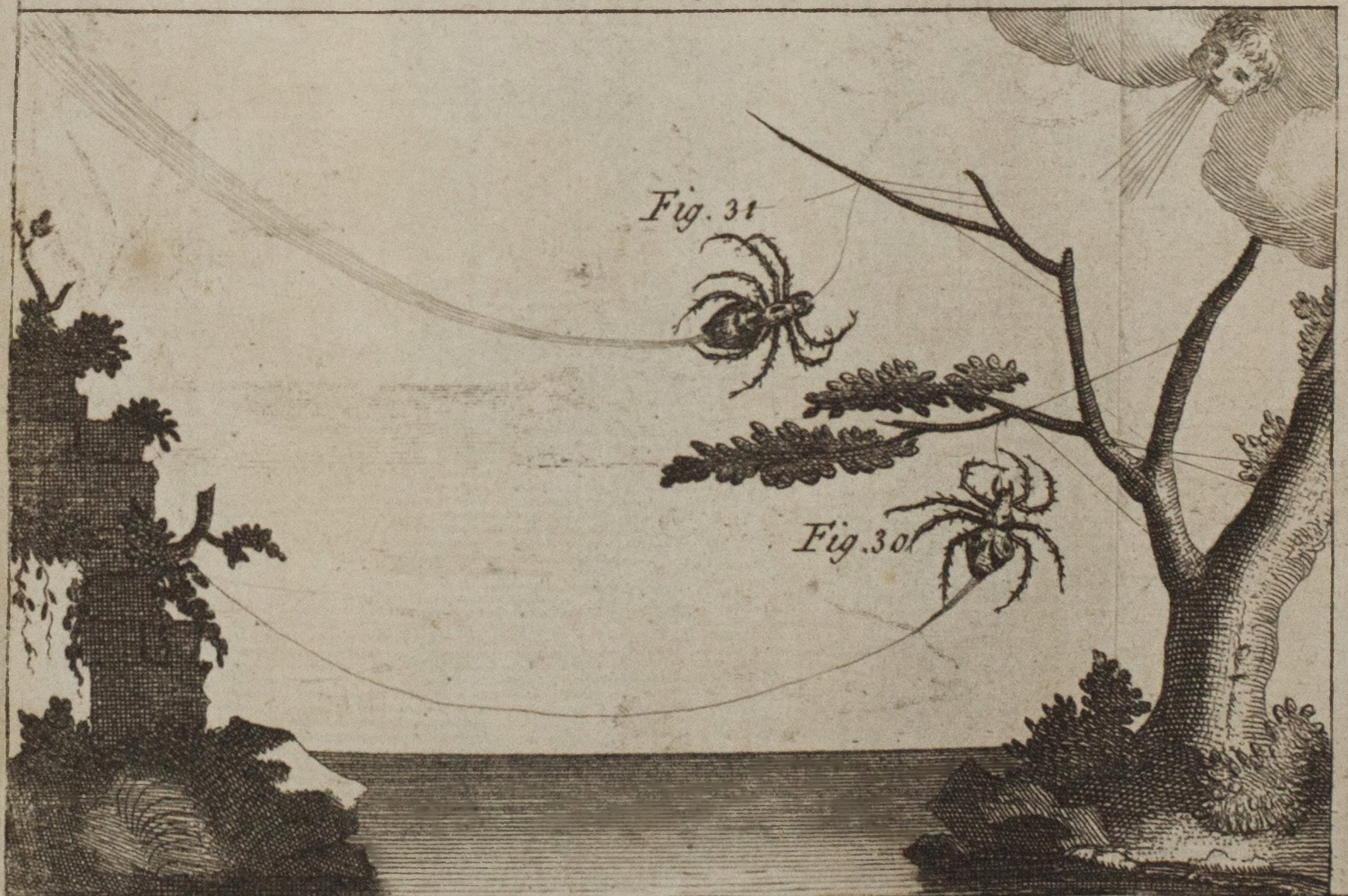
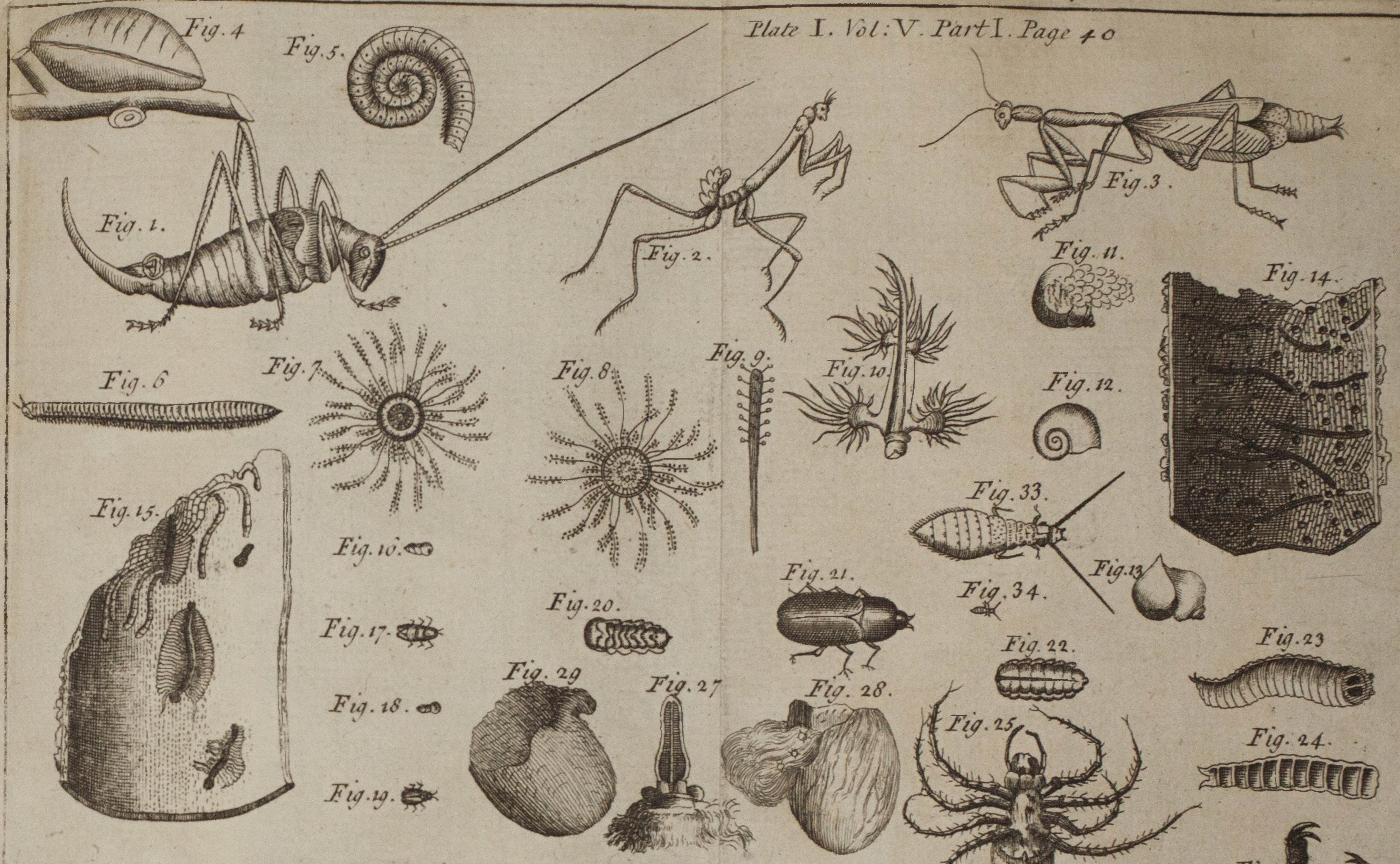
On the 17th of October, we gave a Dog 15 Grains of the dried Root of *Monks-Hood* [*Napellus*] powder'd, and mix'd with Flesh and Broth. He had no sooner taken it, but he was seized with a Difficulty of swallowing, or rather seemed as if he was like to be strangled. He immediately grew faint and restless, and dug the Ground with his Feet; but soon desisted, by reason of a fainting Fit, as we imagined, from the dull Colour of his Eyes, and a Weakness of all his Body. This Fainting was presently succeeded by a violent Vomiting, in which he threw up the Flesh that he had eaten, which was very little altered. His Fainting soon returning again, he laid himself on the Ground; but being seized with terrible Convulsions of the *Abdomen*, *Diaphragm*, and of almost the whole Body, he run from Place to Place, and vomited so great a Quantity of frothy Matter, that he was like to have been strangled. His Vomiting increased, with a kind of crying and sobbing, like broken Sighs, as if he had endeavour'd to bark at those that stood by. In this Manner he was miserably tormented for the Space of an Hour; at which time all his Symptoms remitted, and by Degrees he recovered,

In the Summer before, we gave a little Dog a Drachm of the Root of *Monks-Hood* [*Napellus*]: He was soon after seized with the same Symptoms, but they were longer and more violent; and he in like manner recovered.

In both these Dogs we particularly took Notice of these broken and interrupted Sighs, or kind of Sobbing; because we did not observe the like to be occasioned by any other Poison that we had made Trial of.

Leaves, Flowers, and Seed of Monks-Hood.

An Ounce of the Leaves, Flowers, and Seed of the *Napellus* when green, being bruised and given to a Dog, scarce disordered him any more than if he eaten so much Grass.



About the same time we made Tryal of the *Nux Vomica* on another Dog; not that we doubted of it's being a Poison, but that we might see the Effect of it on his Body when dead. The Dog accordingly dying in a short time, we found his Stomach and small Guts very red; and judg'd this Redness and Inflammation to be caused by the Corrosiveness of the Medicine.

On the 20th of *October*, we injected warm into the Jugular Vein of a strong lusty Dog an Ounce of Emetic Wine [*Vinum Emeticum*]. For a quarter of an Hour, after the Operation was over, and he was let loose, he continued pretty well, unless that he seem'd somewhat dejected; but afterwards he began to grow ill, and an unusual Agitation was manifest about the Diaphragm; this was followed by a continual Vomiting, and a little after by an Evacuation of some hard Excrements. By these Evacuations he seem'd to be somewhat relieved, but soon grew uneasy, moved from Place to Place, and vomited again. After this he laid himself down on the Ground pretty quietly; but his Vomiting returning again, disturb'd his Rest, and abated his Strength, which grew weaker and weaker; for in the Space of an Hour he vomited 12 times or more, and sometimes voided some liquid Excrements but in small Quantity; having frequent Inclinations to go Stool, but in vain, as in a *Tenesmus*. An Hour and a half after the Operation, he being so weak that he could not stand, his Eyes dull and looking as if he were half dead, we gave him some warm Broth thro' a Funnel. With this he was wonderfully refreshed immediately, and soon after could look about, stand on his Legs and walk; but by reason of his Weakness reel'd as if he had been drunk. We left him by himself in a warm Room, where he remained cold, and lay as if he had been dying; and in an Hour after, we forced him to take some more Broth, which revived him again: But in a little time, after some Agitation of his Body, he vomited, made Urine very plentifully, howl'd miserably and died convuls'd. Next Day in viewing his *Viscera*, we found two Things very observable (but neither of them occasioned by the Liquor that was injected); one of them was in the Heart, the other in the *Œsophagus*. In the Heart there were two *Polypus's*: That which possess'd the right Ventricle, stretch'd itself into the *Vena Cava*, and Pulmonary Artery; and that which was in the left Ventricle, sent Branches into the adjoining Vessels, and was less than that in the right Ventricle. The Substance of the *Polypus* was pretty firm, of a flesh Colour, somewhat pellucid, and being cut thro' the middle, was altogether of the same Colour and Consistence as on the Surface. To the *Œsophagus* there grew a remarkable Gland, which was hard, callous, and foul, and opened with a small, round, fleshy Orifice, into the Inside of the Stomach, where, upon pressing it, a little Corruption came forth. Upon opening this Gland, or Tubercle, we found in it a great many little Worms wrapt and entangled together, and moisten'd, with a corrupted Matter. Some of these Worms

- were above four Inches long, others less. Afterwards we found the like Glands full of Worms, in other Dogs, and in most we opened, but not so much corrupted as in this. We observ'd also the like foul Glands in the *Aorta descendens*, but in one only found a Worm like these, which was almost got out of it, thro' an Orifice, into the Cavity of the *Thorax*. After this we likewise observed more *Polypus*'s in Dogs.
- Sal Armoniac injected.** On the 27th of *October*, we injected warm into the Jugular Vein of a Dog, a Drachm and a half of *Sal Armoniac*, dissolved in an Ounce and half of Water. The Liquor had scarce arrived at the Heart, but the Dog presently fell into dreadful Convulsions over his whole Body; Wherefore we let him loose, but he dyed immediately.
- Bite of a Blind Worm.** On the 18th of *November*, we caused a Whelp to be bit in the lower Lip by a blind Worm [*Cæcilia*], so that the blood appeared in the Wound. The Whelp dy'd indeed the same Day; but because we had committed him to the Care of another Person, we could not be certain whether he dy'd of the Wound or not; and what increased our Suspicion, was, that there did not appear on the Part that was bit, any livid Colour.
- Salt of Tartar injected.** On the 12th of *December*, we injected into the Jugular Vein of a Dog a Drachm of *Salt of Tartar* dissolved in an Ounce of warm Water: He dy'd crying, and in Convulsions, almost immediately.
- On the 15th of *December*, we found a *Polypus* in both the Ventricles of the Heart of a Dog, each *Polypus* stretching itself with a double Root into the Vessels of the Ventricle it possessed. Afterwards we often observed the like *Polypus*'s in other Dogs.
- Urine injected.** On the 20th of *December*, we injected warm into the Jugular Vein of a Dog, an Ounce of Urine made by a Man fasting. The Dog was uneasy during the Injection, and while the Liquor passed to the Heart; but was not seized with any Convulsions or other ill Symptoms; and being let loose, eat Bread very greedily.
- Decoction of White Hellebore injected.** The same Day we made a gentle Decoction of two Drachms of *White Hellebore*, well powder'd, in Spring Water, and evaporated it away to nine Drachms and a half: and the next day injected all the Decoction, strongly pressed out and turbid, into the Jugular Vein of a Dog. At first some few Drops only passed to the Heart, some con- creted Blood obstructing the Passage; but those Drops very much affected the Dog, for he was seized immediately with convulsive Motions: but soon after, when the Liquor had removed what lay in it's way, and had enter'd the Heart, it killed the Dog as suddenly as if he had been shot thro' the Heart with a Bullet; for having loosened him presently, to see if any Life remain'd, he was quite dead and flac- cid, and hung like a Fleece in the Hand of the Person that held him.
- Vinegar injected.** On the 2d of *January*, 1679, *Vinegar* was injected warm into the Jugular Vein of a Dog, without doing him any manifest Harm.
- Sting of Scorpions.** The same Day we caused a *Whelp* to be stung in the Tongue by several *Scorpions*; but the Wounds made by the *Scorpions*, by reason of their

their Weakness, being but slight, and not penetrating deep, we made a small Incision on the *Abdomen*, and drawing aside the Skin, let the *Scorpions* make several Wounds on it; but without any Effect, tho' we often forced the Sting into the Wounds, and pressed the Bladder that is supposed to contain the Venom.

In like manner a *Pigeon* being several times stung by a *Scorpion*, remained unhurt,

January the 3d, two Drachms of *Sugar* dissolved in one Ounce of Water, was injected into the Jugular Vein of a Dog: he received no harm from the Injection, but continued well for the three Days after that we kept him. *Sugar injected.*

On the 4th of *January*, a Drachm and half of *Spirit of Salt*, diluted in an Ounce and half of Water, and injected into the Jugular Vein of a Dog, killed him immediately. In the right Ventricle of his Heart, we found the Blood partly grumous and concreted into harder Clots than ordinary, and partly frothy. In the same Dog that Gland that contains Worms, and is frequently found in the *Œsophagus*, opened with two Orifices into the Cavity of that Part, and in the *Sinus* of it there lay several small Worms. *Spirit of Salt injected.*

January the 5th, we gave a Dog 12 small Caterpillars of the Pine-Tree [*Pityocampe, vel Eruca Pini*] weighing half a Drachm, which we bruised alive and mixed with Flesh. The Dog, tho' he was but young, received no other hurt, than that now and then he seemed as if he endeavoured to swallow something, or was troubled with an Inclination to vomit; from whence we judged the Stomach and *Œsophagus* to be only lightly affected: but these Symptoms vanished in a few Hours. and the Dog continued brisk, and greedy of Meat all the rest of the Day. *Caterpillars of the Pine-Tree.*

The same Day we included a Rat in a large Glass with a *Scorpion*; but the *Scorpion* being dull, and benumb'd with the extream Coldness of the Weather, was able to wound the Rat but very weakly; with which however the Rat being provok'd, set upon the *Scorpion*, and gnawed off and devoured part of him keeping his Eyes shut all the while, that he might not be hurt by his Claws or Sting. The same Fate happened to another *Scorpion*, which we added to the former, but the Rat notwithstanding remained unhurt. *A Scorpion devoured by a Rat.*

January the 6th, we killed a Dog almost in a Moment, by injecting into his Jugular Vein an Ounce of *Spirit of Wine*, in which there was dissolv'd a Drachm of *Camphire*. *Spirit of Wine with Camphire injected.*

The same Day we injected warm into the Crural Vein of a Cat, 50 Grains of *Opium*, dissolved in an Ounce of Water. The Cat presently after the Injection seemed very much dejected, but did not cry: only made a low, interrupted, complaining Noise. After this followed Tremblings of her Limbs, convulsive motions of her Eyes, Ears, Lips. and almost all Parts of her Body, with violent Convulsions of her Breast; sometimes she would raise her Head, and seem to look

look about her, but her Eyes were very dull and deadish; and tho' she was let loose, and had nothing tied about her Head or Neck, yet her Mouth was so filled with Foam or Froth, that she was like to be strangled. At last, her convulsive Motions continuing, and being seized with a stretching of her Limbs, she dy'd within a Quarter of an Hour. Upon opening her Body, we did not find the Blood much alter'd from it's natural State.

February the 7th, we injected into the Crural Vein of a lusty Dog, a Drachm and half of *Opium*, dissolved in an Ounce and half of Water. The Dog immediately shewed the great Pain he endured, by a violent struggling of his whole Body, a loud Noise that he made, notwithstanding his Jaws were tied, a great Difficulty of Breathing and Palpitation of the Heart, with convulsive Motions of almost all Parts of his Body: In a little time all these remitted, and he was seized with a profound Sleep, as if he had been in a Lethargy or Apoplexy. Having let him loose, he lay upon the Ground without moving or making a Noise, in so deep a Sleep, that he would not move with beating. About half an Hour after, if we beat him, he would move a little, but presently lay down again. After an Hour, if we beat him, he would move a little more; and by degrees his Sleepiness a little decreasing, in an Hour and half, or two Hours time, when he was beat, he would make a Noise, and walk a little, but seemed very heavy and stupified, and reeled as he went; but as soon as we left off beating him, as if he had forgot every thing that had passed, he presently laid himself down again, and fell asleep. Next Day when we viewed the Place where he lay, we found a great Quantity of foetid Excrements, like corrupted Blood, or the diluted *Opium* that had been taken: But still his Drowsiness continued, and tho' we beat him with Whips, that he run crying about the Room, yet he presently forgot it, and immediatly fell asleep again. In this sleepy Condition he continued three Days, refusing whatsoever was offered him to eat, or rather not minding that or any thing else. On the fourth Day we found him dead: But perhaps he would not have dy'd of the stupifying Quality of the *Opium*, if (considering the extream Coldness of the Weather) we had put him in a warmer Place, and had forced him to have taken some Broth.

February the 8th, we found in the Bladder of a *Tortoise* adhering to it's Coat, a flat porous *Stone*, about twice as big as a Lentil.

Salt injected.

February the 9th, a Drachm and half of *Common Salt*, dissolved in an Ounce and half of Water, was injected into the Jugular Vein of a Dog. After the Injection, he was thirsty, and drank Water greedily; but in other Respects he seemed to be pretty well, and the next Day was quite recovered.

Oil of Olives injected.

February the 20th 1679, we injected into the Crural Vein of a little Dog, half an Ounce of warm *Oil of Olives*, which we did with a great deal of Difficulty, and very slowly, by reason of the smallness of the Vein and Thickness of the Liquor. For half a Quarter of an Hour that

that we were injecting the Liquor, the Dog did not seem to be uneasy or out of Order; but after that, he barked, cried, looked dejected, and fell presently into a deep Apoplexy, so that his Limbs were depriv'd of Sense and Motion, and were flexible any way at pleasure; his Respiration still continuing very strong, with a Snorting and Wheezing, and a thick, watry Humour flowing in great Quantity out of his Mouth, which was sometimes mixt with Blood. He lost all external Sense; his Eyes, tho' they continued open, were not sensible of any Objects that were put to them; and we touched and rubbed the *Cornea* (as sensible a Part as it is) without any more Sign of his being sensible of it, than if he had been dead. His Eyelids notwithstanding had a convulsive Motion; his Hearing was quite lost; and his Feeling, tho' at first he seemed to have some small Sense of it when we touched his Wound, yet afterwards it was so dull, that we pinched his Claws and Flesh with Pinchers, and bored Holes thro' his Ears, without his moving or seeming to be the least sensible of it. It is worth observing, that in the midst of his Sleep, being sometimes seized with a convulsive Motion of his Diaphragm and other Muscles that help Respiration, he would bark strongly as if he were awake, and in a little time would be quiet again: so that in less than a Quarter of an Hour his Rest would be disturbed three or four times with this violent Barking. And considering this more attentively, we found that at the very time he barked, he was as void of Sense as before; for we could neither make him bark nor leave off barking, by either beating or pricking him; but in a little time would leave off of himself, and return to it again some time after. Thus in three Hours after the Injection, spent in Sleeping and Barking, he dy'd; and having opened his Body after he was dead, we found the *Bronchia* of the Lungs filled with a thick Froth.

A few Days after we injected a large Quantity, viz. an Ounce, of *Oil of Olives* into the Jugular Vein of a Dog, which suffocated him the same Moment.

Afterwards the same Quantity of *Oil of Olives*, being injected into the Jugular Vein of a Dog, killed him in an Hour's time. He was seized with a great Sleepiness, Snorting and Wheezing, and a bloody Water run plentifully out of his Mouth. In this Dog, tho' he did not die immediately, we did not observe the Barking as in the former: But in all that were suffocated by Oil, we found their Lungs filled with a very thick Froth.

February the 27th, we injected 10 Drachms of highly rectified *Spirit of Wine* into the Crural Vein of a Dog. The Dog died in a very little time, very quietly, and as it were with Pleasure, licking his Jaws with his Tongue, and breathing quick, but easily, without barking, crying, or any convulsive Motion. In the *Vena Cava* and right Ventricle of the Heart, the Blood was concreted into a great many liquid hard Clots, which appeared yet more conspicuous and harder in some Blood.

*Spirit of Wine
rectified inject-
ed.*

Blood that flowed back from the Vein into the Syringe. In this Dog we found the Emulgent Artery of the Left Side to be double.

March the 2d, we injected three Drachms of rectified *Spirit of Vine* into the Crural Vein of a small Dog; which made him Apoplectic, and as if he were half dead. In a little time he recovered from his Apoplexy, but grew giddy; and when he endeavoured to go, reeled and fell down. Tho' his Strength increased by Degrees, yet his Drunkenness still continued: His Eyes were red and fiery, and his Sight so dull, that he did not seem to take notice of any thing, and when he was beat, would scarce move. However, in four Hours time he grew better, and would eat Bread when we gave it him. The next Day he was brisker, and seemed past all Danger.

In dissecting the same Dog some time after, we found in the small Guts two *Flat-Worms*; one of them about six Spans long, and the other about five. They had perforated the Gut: and one of them was got half out of it into the Cavity of the *Abdomen*.

About the same time we found in two Dogs a Worm of near a Foot in Length, out of the Intestines, in the Cavity of the *Abdomen*, the Intestines being no ways perforated, but remaining sound and whole. That we might be more certain of this, we separated them from the Mesentery, and viewed them very carefully. But in both these Dogs the *Omentum* was of an ill Colour, and putrefied; from whence we conjectured, that these Worms were bred from the Putrefaction of the *Omentum*.

White Wine
injected.

We injected into the Crural Vein of a Dog five Ounces of a strong *White Wine*; which made him very drunk, and little different from what a less Quantity of *Spirit of Wine* would have done: But in a few Hours his Drunkenness abated, and he recovered.

Decoction of
Tobacco in-
jected.

In the same Month of *March*, we injected into the Crural Vein of Dog, an Ounce of a strong Decoction of *Tobacco*. He was seized immediately with strange Convulsions of his whole Body. At first his Eyes look'd wild and distorted, his Jaws trembled, and in a little time he dy'd terribly convuls'd. This Experiment we repeated several times after, and always with the same Success.

Oil of Sage
with Sugar
injected.

Ten Drops of distill'd *Oil of Sage*, mix'd with half a Drachm of Sugar, and dissolv'd in an Ounce of Water, being injected into the Crural Vein of a Dog, did him no harm.

In a *Castrated* Dog we observed the *Peritonæum* and Spermatick Vessels to be covered with Fat, and scarce to be seen; and that he did not smell so rank and strong as other Dogs that had not been castrated.

A yellow streak'd *Lizard* [*Lacerta Chalcidica*] which had been kept all the Winter in a Glass with Bran, being exposed to the Sun to refresh it, on the contrary died in a few Hours. We have also often found, that Scorpions exposed to the hot Sun, especially in the Summer, died in a short time.

A Drachm of purified *White Vitriol*, injected into the Crural Vein of a Dog, killed him immediately. *Vitriol injected.*

Fifteen Grains of *Salt of Urine*, dissolv'd in an Ounce of Water, and injected into the Crural Vein of a Dog, cast him into such violent Convulsions, that we were afraid he would die under them. When he had recovered himself a little, we repeated the Injection with the same Quantity; but the Dog got the better of it, tho' with a great deal of Difficulty, and perfectly recovered. *Salt of Urine injected.*

April the 27th, we made a Decoction of two Drachms of *Senna* in Water, and injected warm three Ounces of it into the Crural Vein of a very fat, large, and strong Dog. He continued pretty quiet, without any Sign of Pain or Uneasiness, during the Operation; and when it was over, we let him loose, expecting the Event of it. He was melancholy and dejected, but easy and without sensible Commotion for the space of an Hour. After that, his Respiration grew quicker, he had a murmuring Noise in his Belly, with violent Commotions of the Muscles of his *Abdomen*, Diaphragm, Stomach and Intestines, and vomited plentifully a Bilious Matter. After his Vomiting he grew faint, and in a little time his Vomiting returned again; so that in an Hour and half he vomited four times. His Strength and Appetite were very weak, and he would eat nothing for three Days. But on the third Day his Appetite, Strength, and former Briskness returned, and he recover'd. *Decoction of Senna injected.*

Two Dogs, which had their *Recurrent Nerves* cut, lost their Barking and Voice. But doubting whether the Wound or Scar might not affect and Hurt the Motion of the Muscles, we performed the same Operation on another Dog, but without cutting the Nerves; and when the Wound was healed, he barked as freely as before. *The Recurrent Nerves of a Dog cut.*

A Dog that had the Nerves of the *Par Vagum* cut asunder, presently grew dejected and faint. He breathed very slowly, and with Sighs; for when he had drawn in his Breath leisurely and insensibly, it came forth again immediately very forcibly, and with a Sigh, as if it had been retained a long time in the Lungs. The Muscles of the *Abdomen* and the Diaphragm laboured hard, as if they were to supply the Defects of the Lungs, which were grown almost useless by being denied an Influx of Spirits by the Pneumonic Nerves. The Dog refused all kind of Meat; sometimes he vomited, or had an Inclination to vomit; and at last, in two Days time, he died. *Nerves of the Par Vagum cut.*

Another Dog, that had the Nerves of the *Par Vagum* only tied, lived ten Days. He vomited frequently, and would not eat, unless clandestinely: He breathed with Sighs, and was very faint.

A Dog that had the Trunk of the *Aorta descendens* tied hard a little above the Diaphragm, immediately lost the Use of his hind Legs; for when he stood on his four Legs, he would draw after him his hinder Legs, as if they had been dead: he grew weaker by Degrees, and died in five Hours. *Ligature on the Aorta.*

A Mole Stung
by a Scorpion.

July the 12th, a Mole being stung in the Side by a Scorpion, died immediately convulsed. In this we observed, that the *Intestinum Cæcum* is wanting in Moles.

An Account of
the Contagi-
ous Disease
amongst the
Cows, 1714.
Communicated
by Mr. T.
Bates.

n. 358. p. 872.

XVI. A Contagious Disease appear'd amongst the *Milch Cows*, about the middle of July 1714, at *Islington*; whereupon the *Lords Justices* order'd me to enquire into the Truth of the Report of it's being Contagious; Four *Justices* of the *Peace* were also appointed to make the necessary Examinations.

We went to *Islington*, and found that Mr *Ratcliff* had lost 120 out of 200; Mr *Rufford* 62 out of 72, and Mr *Pullen* 38 out of 87. They were very unwilling to own it, because so soon as it should be known, none would buy their Milk: but Mr *Ratcliff* at length gave us the following Account; *Viz.*

That at first the Cows refused their Food: the next Day had huskish Coughs, and voided Excrements like Clay; the Heads swelled, and sometimes their Bodies. In a Day or two more, there was a great Discharge of a Mucous Matter by the Nose, and their Breaths smelled offensively. Lastly, a severe Purging (sometimes Bloody) which terminated in Death. That some died in three Days, and others in five or six, but the Bulls lived eight or ten. That during the whole Illness they refused all manner of Food, and were very hot.

We then advised with several of the *Cow-leeches*, or Doctors, who all agreed that it was a Murrain, or rather a Plague; and that the Methods they had tried for a Cure, had proved unsuccessful.

We then ordered some of the sick Cows to be Houfed, and several sorts of Cattle to be kept with them, to see whether the Contagion would affect any other Species.

The next Day I made a Report to their Excellencies, and afterwards by their Order, drew up the following Proposals.

1. That all such Cows as are now in the Possession of Mr *Ratcliff*, *Rufford*, and *Pullen*, be Bought, Kill'd and Burnt: or, at least, that the Sick be burnt; and the Well kept and secured on the Grounds where they now are; that such of them as Sicken or Die of this Distemper may be burnt.

2. That the Houses in which those Sick Cows have stood, be washed very clean, and then smoaked by the burning of Pitch, Tar, and Wormwood, and be kept three Months at least, before any other Cows are put therein.

3. That the Fields where those Sick Cows have grazed, be kept two Months before any other Cows are suffered to stand or graze thereon.

4. That the Persons looking after such as are ill, should have no Communication with those that are well.

5. That the same Methods be observed if any one of the Cow-keepers should get this Distemper amongst them; and that as soon as they perceive any of their Cows to refuse their Meat; or have any
others

other Symptoms of this Distemper, that they immediately separate them from their others, that they may be burnt; and the Places where they have stood or grazed, to be ordered as before.

6. That the Cow-keepers be required to divide their Cows into small Parcels, not more than ten or twelve in a Field together.

The next Day their Excellencies consulted the four Gentlemen, and gave them Orders to comply with the preceding Proposals, and to allow *Forty Shillings* for every sick Cow which they burnt, that belonged to Mr *Ratcliff*, *Rufford*, and *Pullen*; but the free Intercourse which both Masters and Servants had had with each others Cows (before we were appointed) had spread the Contagion; and the Disease began soon to appear in several other neighbouring Places.

The Gentlemen then summoned all the Cow-keepers in the County, and acquainted them with the above-named Proposals, and offered them *Forty Shillings* for every Cow which they burnt, that had not been sick above twenty-four Hours; but for such as had been longer ill, or were dead, they would allow them only the Value of their Skins and Horns.

A great Obstacle at the first was the Cow-keepers not owning the Disease, till they had lost several of their Cows; for so soon as it was known that any Man had but one sick, none would buy his Milk; and to those who kept many Cows, that Loss was considerable.

Nor was there ever wanting one or other who gave them Hopes of a Cure.

I discoursed the *Cow-leeches* about the Customs and Diseases that Cows were subject to, and consulted such Books as treated of them; but concerning this Disease, I could gain but small Assistance from either.

I then made Dissections of sixteen Cows, in different Degrees of Infection; and found the Putrefaction of their *Viscera* to increase in proportion to the Time of their Illness.

The first five that I opened, had herded with those that were ill, and the Symptoms of this Distemper were just become visible; in these the Gall-bladders were larger than usual, and filled with Bile of a natural Taste and Smell, but of greener Colour. The *Pancreas's* were shrivelled, some of the Glands obstructed and tumified. Many of the Glands in their *Mesenteries* were twice or thrice their natural Bigness. Their Lungs were a little inflamed, and their Flesh felt hot. All other Parts of their *Viscera* appeared as in a healthful State.

The next six that I opened, had been ill about two Days; in them the Livers were blacker than usual, and in two of them, there were several Cyfts filled with a petrified Substance like Chalk, about the Bigness of a Pea. Their Gall-bladders were twice their usual Bigness, and filled with Bile of a natural Taste and Smell, but of a greener Colour than the first. Their *Pancreas's* were shrivelled, some of their Glands very large and hard, and of a blackish Colour. The Glands in their *Mesenteries* were many of them five times their natural Bigness, and of a blackish

Colour. Their Lungs were inflamed, with several small Cyfts forming. Their Intestines were full of red and black Spots. Their Flesh was very hot, tho' not altered in Colour.

The five last that I opened, were very near dying; in them I found the Liver to be blackish, much shrivelled and contracted, and in three of them there were several Cyfts as big as Nuts or Nutmegs, filled with a petrified Substance like Chalk. Their Gall-bladders were about three times their usual Bigness, and filled with Bile of a natural Taste and Smell, but of a deep green Colour. Their *Pancreas's* were shrivelled and contracted, many of their Glands very large and hard, and of a black Colour. The Glands in their *Mesenteries* were many of them distended to eight or ten times their natural Bigness, were very black, and in the *Pelvis* of most of those Glands in two Cows, there was a yellow Petrefaction, of the Consistence of a sandy Stone. Their Intestines were the Colour of a Snake, their inner Coat excoriated by Purgings. Their Lungs were much inflamed, with several Cyfts containing a yellow purulent Matter, many of them as big as a Nutmeg. Their Flesh was extream hot, tho' very little altered in Colour.

I have here only given a general Account of my Dissections, in the three different Stages of the Disease; for as the Difference was but small, and the Disease incurable, it is needless to give each particular Dissection at large; but the following Cases being very extraordinary, I cou'd not omit the mention of them, *viz.* In one of them the Bile was petrified in it's Vessels, and resembled a Tree of Coral, but of a dark yellow Colour, and brittle Substance.

In another there were several Inflammations on the Liver, some as large as a Half-Crown crack'd round the Edges, and appeared separating from the sound Part, like a Pestilential Carbuncle.

In a third, the Liquor contained in the *Pericardium*, (for lubricating the Heart in it's Motion) appear'd like the Subsiding of *Aqua Calcis*; and had excoriated, and given as yellow a Colour to the whole Surface of the Heart and *Pericardium*, as *Aqua Calcis* could possibly have done.

In giving my Opinion of this Distemper, I must beg leave to premise, that all Cows have naturally a Purgation by the *Anus* for five or six Weeks in the Spring, from (as Cow-keepers term it) the *Firmness* of the Grass; during which Time they are brisk and lively, their Milk becomes thinner, and of a bluish Colour, sweeter to the Taste, and in greater Plenty: But the Spring preceding this Distemper, was all over *Europe* so dry, that the like has not been known in the Memory of any one living; the Consequence of which was little Grass, and that so dry, and void of that *Firmness* which it has in other Years, that I could not hear of one Cow-keeper, who had observed his Cows to have that Purgation in the same degree as usual; and very few who had observed any at all. They all agreed that their Cows had not given above half so much Milk that Summer as they did in others; that

that some of them were almost dry; that the milk they did give was much thicker and yellower than in other Years. It was observed by the whole Town, that very little of the Milk they sold would boil without turning; and it is a known Truth, that the weakest of the common Purges you can give a Cow, entirely takes away her Milk: From all which Circumstances, I think it evident, that the Want of that natural Purgation was the sole Cause of this Disease; by producing those Obstructions which terminated in a Putrefaction, and made this Distemper contagious: Many more Circumstances of less moment occur'd, to confirm me in this Opinion.

Cows are likewise subject to a Purgation (though in a less degree) from the same Quality in the Grass, about the later End of *September*, which is called the latter Spring; and which I believe contributed not a little to the preventing the Increase of the Distemper; for this Purgation coming so soon after the Disease appeared, it is not unreasonable to suppose, that it freed such Cows as were not much injured, from the ill Effects of those Obstructions, occasioned by the Want of their Vernal Evacuations.

Several Physicians attempted the Cure, and made many Essays for that Purpose; but the Dissections convinced me of the Improbability of their succeeding. However, they having received the following *Recipe* and Directions from some in *Holland*, said to have been used there with good Success, gave me Orders to make Trial of it; but in very many Instances I was not sensible of the least Benefit.

℞ *Herb. Aristoloch. Rotundæ, Veronica, ana M. viij. Pulmonariæ, Hyssopi, Scordij, ana M. iv. Rad. Gentianæ, Angelicæ, Petasitidis, Tormentillæ, Carlinæ, ana ℥ ss. Bac. Lauri, Juniperi, ana ℥ xij. Miscæ fiat Pulv.*

This Powder is to be given in Water, one Ounce at a time, three or four Mornings successively; then rest four Days, and if the Disease continues, repeat the Powders in warm Water, as before.

I think there is no one Method in Practice, but what was tryed on this Occasion, tho' I cannot say that any of them was attended with an Appearance of Success, except that of bleeding plentifully, and giving great Quantities of cooling and diluting Liquids. But by this Method the Instances of Success were so few, that they do not deserve any further mention.

Their Excellencies being informed that the feeding Cows with Distillers Grains, was a new Custom, and was the Cause of this Disease, gave me Orders to examine into the Truth of it; but upon Enquiry, I found it to have been the Practice of several of the Cow-keepers above twenty Years, without the least Appearance of any Inconvenience; and that some of those Persons who had suffered most, had never given

any. Nor is there any Difference between those of Brewers and Distillers, only that the latter are the drier.

It was likewise said, that the Want of Water was the Cause of this Disease, for the Springs and Places where the People used to water their Cows, were almost every where dry; and that many were oblig'd to send them several Miles for Water. This might produce some Diseases, but such only as they got by the Fatigue of being driven so far; for Mr *Ratcliff*, Mr *Rufford*, and Mr *Pullen*, the three Persons where this Disease first appear'd, had the New River Water running thro' the very Grounds where their Cows constantly grazed, and could drink at their pleasure, and so had most of the Cow-keepers at *Issington*.

About the later End of *September*, the Disease increased, and the Numbers brought to be burnt were so great, that it could not be well executed; therefore it was judged proper to bury them fifteen or twenty foot deep; but first to make large Incisions in their most fleshy Parts, and to cover them with Quicklime.

At the same time, having notice that it was a Custom with the Cow-keepers, to send their Calves when a Week old to *Rumford*, &c. to be sold; and apprehending by this means that the Contagion might be carried into the Country, I required all such as had sick Cows, to bring their Calves to be buried; to which they readily consented, and were allow'd from *Five to Ten Shillings per Calf*.

In the Beginning of *October*, being informed that some of the Cows in *Norfolk*, *Suffolk*, and *Hertfordshire*, had got this Disease, and apprehending that it would become general; I gave in the following Report to a Committee of Council.

The Distemper among the Cattle increasing, and beginning to appear in several other Counties, I thought it my Duty to acquaint your Lordships with the Hazard that may attend their not being duly buried. It is the Opinion of all Authors in Physick, that treat of Contagious Diseases, as well as of several of the Physicians in Town, that a Putrefaction of so many Cows as there is reason to fear will die of this Distemper, may produce some contagious Disease among Men; unless they are buried so deep, that the infectious *Effluvia* cannot injure the Air, which I am certain has very seldom been complied with, except in the Counties of *Middlesex*, *Essex*, and *Surry*. It is affirmed by several now living, that there was a Mortality among the Cattle, a little before the last great Plague in the Year 1665. which was imputed to the want of a due Care in burying them. And it appears of what Importance it was judged by the King of *Prussia*, the States of *Holland*, and several other Princes and States, by the Care they took to publish Decrees and Placarts, commanding them to be buried upon Pain of Death, or other severe Penalties; and I conceive it would be necessary, not only to bury those which shall die, but that such as are already dead, may have the same Care; as also that they be buried nine or ten Foot deep at least.

These

These Regulations were not put in execution, for within three Weeks or a Month after, the following Particulars concurred to put an End to the Disease.

The Cows began their latter Purging, which contributed much to prevent the Disease from appearing in fresh Places; and the Cow-keepers were convinced that the Disease was incurable.

The Knowledge of the Disease was spread all over *England*, so that none wou'd buy a Cow in the Country; and the Gentlemen prevented their being kill'd in Town, by having the Markets examined daily; and such Meat condemned as appeared suspicious.

They now divided their Cows into small Parcels, by which they lost only that in which the Disease happen'd; whereas before that Method, when one Cow got this Disease, if she had herded with One, Two, or Three Hundred (the Contagion was such) scarce one did escape.

Those who had no sick Cows avoided all Communication with such as had.

They likewise found that the keeping their Cows so long when ill, had been the chief Cause of their Loss; they therefore now brought them to be buried on the first Appearance of the Disease, before the Contagion cou'd possibly have got to any great Height.

The Severity of this Disease in *England* did not last above three Months; tho' it was not entirely suppressed till about *Christmas*: But in several other Countries it continued two or three Years; and I am credibly assured, that in *Holland* it now rages with as much Violence as ever; that they have lost in Cows, Oxen, and Bulls, above three hundred Thousand.

The Providence of God has so disposed the Matter of Animal Bodies, as to render contagious Diseases very seldom infectious to different Species, but Experience demonstrates, that Contagions may be communicated to the same Species, by touching the Woollen, Linnen, &c. to which the infectious *Effluvia* of the Diseased had adhered, tho' the two Bodies should be at a very great distance; and I verily believe, that more Hundreds died from the Infection which was carried by the Intercourse that the Cow-keepers had with each other, than single ones by the original Putrefaction.

The Number of Bulls and Cows lost by this Disease, in the Counties of *Middlesex*, *Essex*, and *Surry*, were Five Thousand Four Hundred and Eighteen; and of Calves, Four Hundred and Thirty Nine.

XVII. In cutting the Stomach or Gizzard of a Fowl, I found something resisted my Knife; upon examining it farther, I discover'd it to be a Pin, which the Pullet had swallowed, and in all Probability had lain in her some time: For it had pierced thro' the Membrane on the Inside, and made a Passage into the thick Part, where it had form'd itself a Bed. It is observable, that the Head of the Pin had past thro' the

*A Pin in the
Gizzard of a
Fowl, by Mr.
N. Regnart.
n. 301.
p. 2055.*

the first shrivell'd Membrane, but stopt at the second, which seem'd more thick and nervous; so that the Head remained inclosed between the two Membranes, the Body of it having made it's way into the fleshy muscular Part. At the Point there was form'd a *Callus*, of the Bigness of a small Pea, which seem'd a Defence, that Nature had made to oppose it, as it was working itself farther.

It is not in the least strange that a Pin should lie in the fleshy Parts, since we see a Musquet-Ball will lie there a considerable Time, without much injuring the Part; but how it should pass thro' the Membranes of the Stomach, without obstructing it's Functions, and the Pullet thrive well after it, I leave it to others to determine.

Hydatides inclos'd with a Stony Crust in the Kidney of a Sheep, by Mr W. Cowper, n. 307. p. 2304. Fig. 37.

Fig 38.

Fig. 39.

Fig 40.

Fig 37.

Fig 38.

Fig. 39.

Fig. 40.

XVIII. In the *Sheep's Kidney*, which was order'd at a late Meeting of the Society, to be set aside for me to examine, I found a large whitish Body, inclining to yellow, and ting'd with red, as it lay under the Membrane of the *Kidney*. This was very hard, as is usual in Animal Petrifications, two Thirds of it lay within the Substance of the *Kidney*: It was inclos'd with a thick hard Membrane, that could not easily be separated from it, even with a Needle fix'd in the End of a Stick. The Branches of the emulgent Veins and Arteries lay between it and the *Pelvis* of the *Kidney*; all which *Vessels* were somewhat press'd by this petrified Body. As I was picking off it's thick strong membranous Inclosures, I found the Needle slip into a Cavity at an *Aperture*, Fig. 38. By this I was inform'd (of what I must confess, before I had no Suspicion of) that this hard and heavy *petrified Body* was hollow; whereupon I thought of dividing it with a *Saw*, but finding a membranous Interstice in it, B, I pull'd it asunder, Fig. 39. and found it's Inside divided by many *petrified Cells* C, or irregular Figures, and fill'd with *Hydatides*, some of which are represented Fig. 40.

Fig. 37. Represents the external Surface of the *Kidney* of a Sheep.

A. The petrified Body, as it appeared in it before Dissection.

Fig. 38. The inferior Surface of the same petrified Body, after the Membrane that inclos'd it was taken off.

a. The Hole by which it was discover'd to be hollow.

B. The Fissure by which it was divided, to shew it's Inside, express'd.

Fig. 39. C, It's petrified Cells that contain'd the *Hydatides*.

Fig. 40. D, The *Hydatides* of various Sizes and Figures, taken out.

The Bones of a dead Foetus taken out of the Uterus of a Cow, by Mr B. Sherman. n. 323. p. 450.

XIX. The Cow was very unthrifty, for which they gave her Cow-Physick, and such Drinks as they apprehended proper for her; notwithstanding which she grew worse, and continued a great while in a lean, pining, wasting Condition, and was reduced to so weak a State, that they concluded she would die; when on a sudden she began to eat her Meat, and did thrive so very fast, that in six or eight Months she was so fat as to be sold to the Butcher; who when he kill'd her, found

found these Bones in her *Uterus*, which were very dry, there being no manner of Moisture in the Bag (as he call'd it) in which the Bones were contained. The same digestive Humour, which dissolv'd the Skin and muscular Parts of the Calf, might (I presume) reasonably enough be supposed to dissolve the Cartilages, and (for ought I know) even Part of the Bones in a *Fœtus*. Of what Age the *Fœtus* was, or whether if the Cow had not been kill'd, there would have been a total Dissolution, I must leave to others to determine.

I am inform'd by some Physicians to whom I have shewn these Bones, that there are many such Instances in Anatomical Writers; and particularly one of a Woman, whose *Fœtus* dissolv'd so perfectly, that some of the Bones digested through her *Abdomen*, and (which I think is more strange) that the same Woman had Children afterwards.

XX. The *Picus Martius*, or Wood-Pecker, has several Particularities in the Structure and Mechanism of it's whole Body, which may deserve a nice and accurate Observation and Description: All which are wisely contrived and adapted, either for catching Food and Sustenance of the Individual, or continuing the Species.

A Description of the Wood-Pecker's Tongue, by Mr R. Waller, n. 350. p. 509.

That this Bird makes a round Hole even in found and hard Trees, such as the Oak, Horn-beam, Beech, and the like, is commonly observed; and that within these Holes, the Hollow being enlarged, the Nest is made, the Eggs laid and hatch'd; and the young Brood fed, as by other Birds.

For this purpose, that he may be enabled to perform such hard Work, the Muscles of his Neck, Breast, and Thighs, are exceeding strong in proportion to the Bigness of the Bird: He has also a very firm strong sharp Bill, his Legs are strengthen'd with very strong Tendons; and his Toes, which are two before and two behind, (as it is in some other Birds) are provided with sharp strong hooked Claws or Talons: Besides this, his Tail consists of ten very stiff large and strong Quills, firmly set into a robust strong *Uropygium*, or Rump; so that when he has fasten'd his Claws and Feet into the Clefts and Inequalities of the Bark of the Tree, he claps his strong Tail Feathers against the Body of the Tree; and so stands with his Head erect, to give the Strokes with his Bill with the greater Force.

That he is of the Insectiverous Kind is certain, and lives not only upon Insects catch'd creeping on the Outside of Trees, but also on such as are under the Bark, between the Bark and Wood, as likewise on those in rotten Wood; and, as I am very confident on Worms and other Insects in the Ground: For I have frequently observed the Roots of their Bills very dirty, as it is in *Crows* and *Rooks*, &c. Whence I suppose he strikes his long sharp Bill into the soft Earth to take the Worms out of it. I have also found their Craws full of small Ants.

But the Contrivance and Mechanism of the Tongue in this Bird, being the most remarkable, I shall give some few Remarks of this curious Contrivance of Nature.

This Bird is known to throw out a long, slender, round Tongue, to a considerable Distance beyond the End of his Bill; and to draw it in again very quick into his Mouth or Bill, with the caught Insect spitted on the Tip of it.

The *Chameleon* indeed darts out it's Tongue to a considerable Length; and having entangled the Fly in the glutinous Matter at the End of it, draws it into it's Mouth, together with the Prey; but the Mechanism in that Animal is wholly different from that of the present Subject; as may be seen by the Account the Gentlemen of the *Academy Royal* give thereof, in their *Memoirs* for a History of *Animals*.

The Protrusion therefore of the Tongue to the Length even of three or four Inches in this Bird, being very extraordinary, and the Mechanism of the several Parts for that End no less curious; several learned and diligent Enquirers have attempted to explain it; but I am of Opinion they have been, in some Particulars at least, mistaken. I shall mention some of these.

Monf. *Perault*, describes it after this manner*.

This long Tongue he throws out by the means of two small bony Cartilages, about seven Inches long, and of the Thickness each of a middling Pin, which are perfectly smooth and slippery. These two Cartilages are united at the End, and being in this Place cover'd with Flesh, make the Fore-part of the Tongue. The rest of these Cartilages are separated from each other, and pass turning round under the Ears; and then rising up behind the Head, where they meet again, they pass over the Top of the Head, and so extend themselves to the Root of the Beak. These Cartilages which make the Hinder-part of the Tongue, are also enclosed in a Channel fleshy on the Outside, and whose Inside is cover'd with a very smooth slippery Membrane.

Now these fleshy Channels, which encompass and keep in these Cartilages, are the Muscles by which the Tongue is mov'd; for having their Origin at the *Larynx*, and their Insertion at the Extremities of the Cartilages, it comes to pass, that when those Muscles of the two fleshy Channels, which make the Hinder-part of the Tongue, are shortened, they force the Fore-part of the Tongue out of the Beak, by drawing the posterior or farthest End nearer to the *Larynx*; and on the contrary, when the fleshy Channel which makes the anterior Part, acts, it draws the Fore-part of the Tongue into the Bill towards the *Larynx*.

This Mechanism of making a hard Part, such as the bony Cartilages are, to come out and return into another, such as the Canals

* *Essays de Physique*, Tom. 3. Part. 2. p. 148.

are, by the means of Cords drawing them, which are the Muscles, is made use of in Coaches to pull up the Glasses of the Doors for the String, being fasten'd to the lower Part of the Glas-Frame, makes it rise when drawn, which resembles that Action of the Muscles by which this Tongue is moved.

Of these Cartilages and other Parts, and of the Head of the Bird, Mr *Perault* gives the Figures; but either the Wood-Peckers in *France* are different from ours in *England*, or this Figure of the Head is very ill design'd; it being much too broad and large, and the Beak too short: Besides he makes the two Cartilages to come to the Root of the Beak separately, one on one Side, the other on the other Side of it; whereas in all the Wood-Peckers Heads I have met with, the two Cartilages join close together about the Top of the Head, and thence proceed join'd, tho' not fasten'd to one another, a little slanting towards the right Nose-Hole, where they end together.

Besides, upon viewing and examining several Subjects, I could not find them agree in divers Particulars with his Account and Explication. For the Muscles which are fastened to the End of the Cartilages at the Root of the Upper Beak, are not inserted at the *Larynx*, but pass on and are fastened to the lower Bill. This Pair I take to be the Muscles chiefly concern'd in forcing the Tongue out of the Bill. There is another Pair of Muscles, which being fasten'd to the Place where the two bony Cartilages are articulated with one single Bone in the Forepart of the Tongue (as is shewn in the 44th Figure) is, as I apprehend, the chief Pair concern'd in the drawing the Tongue with it's Prey into the Mouth. These proceeding from that Articulation of the Cartilages as far as the *Larynx*, (each of them sending a Branch to the *Cartilago Scutiformis*) from thence go on along with the Neck, (tho' not fasten'd to it) till they come within the Cavity of the *Thorax*, where they are inserted under the *Clavicula* or *Merry-thought-Bone*, as 'till called. This Pair is represented by *k. k.* in the 42d Figure; and by *q. q.* in the 41st.

There is likewise a very slender white Thread, (whether Tendon or Nerve, I am uncertain) which accompanies this Muscle it's whole Length; and which drawn gently, (for fear of breaking) pulls in with it the End of the Tongue. As there is such another all along the *Vagina* to the End at *c.*

Volker Coiterus, as he is mentioned by *Gerard Blasius*, in his *Anatome Animalium*, Cap. 24. p. 64. treating of the Tongue of this Bird, makes it to be made of three slender Bones, round, and, as he says, bound together, (*invicem colligatis*) which is a Mistake; for though reckoning the two bony Cartilages for *Officula* yet the third is not bound up with them, but articulated to the End of them. The same Person says the Tongue may be thrust out to the Length of an Inch and a half, whereas when drawn in, it is scarce half an Inch long; when,

The Wood-Pecker's Tongue.

in reality, it may be thrown out near four Inches; and I believe cannot be drawn in, so as to be less than an Inch and Quarter, *viz.* to that Place where the two Cartilages are articulated with the single Bone. Besides, he makes the Use of the long flat Muscle running over the Top of the Head, to be (if I rightly apprehend his Meaning) to draw the Tongue to the upper Jaw, whereas their use is for thrusting the Tongue out of the Bird's Mouth.

But this Person having given no Figures, has render'd what he says less intelligible; tho' indeed he mentions two Pair of Muscles, as there are so many chiefly concerned, yet there are at least two other Pair, that assist that Performance.

The Account given by *Alphonsus Borellus* in his *Treatise de Motu Animalium*, Part II. pag. 24. is in several Respects likewise unsatisfactory; and the Figure given by him to explain it, very defective and ill design'd.

He makes the Pair of Muscles concerned in thrusting the Tongue out, to be fastened indeed, as they are, to the lower Beak towards the Point; but then he makes their Insertion at their other End to be at the Extremities of the two *Ossa Hyoidea*; whereas they really reach to the very End of the long Cartilages that go round the Head: These by another Mistake, he makes to be the Retractors of the Tongue, and joins another Pair as Assistants in the same Action, which he makes to be twisted spirally about the *Trachea*. None of all which agree with the Subjects I have met with, as will be seen by the Descriptions of my *Figures*.

In the History of the *Academie Royale des Sciences*, publish'd in *Latin* by *Monf. du Hamel*, 1698. *Lib. 4. Cap. 5.* there is another Description of this admirable Contrivance of Nature, by *Monf. Mery*, read at a Meeting of the Academy, *November 16. 1695.*

In this he differs from both *Perault* and *Borelli*, taking the horny End and Bone to which it is join'd, to be only the Tongue properly so called, and that the next two Bones answer the *Hyoïdes* with the long Cartilages annexed to them. But even in this he seems to me not to be so clear; confounding, as I apprehend, the two Bones with the Cartilages. He describes the *Vagina*, in which the Bones and Part of the Cartilages are encompassed, and which is fasten'd to the horny End, and is protruded and drawn back with the Tongue: He takes notice of the little sharp Points or Prickles on the horny Part being moveable, and with their Points bending towards the Throat; but I apprehend it is a Mistake to make the mucous Matter glutinous, which is furnish'd by the two *Pyramidal Glands*; for I take the Use of that *Mucus* to be chiefly, if not only, to lubricate the the Passage in the *Vagina*, for the more easy slipping of the Cartilages therein.

He describes the Muscles for exerting the Tongue, and extends them from their Insertion at the lower Beak to the End of the springy *Ligaments*, as he terms what I call *Cartilages*; to which he adds another small Ligament capable of Extension, at the End of the other two next the Nose, which when the Tongue is thrust out, is relax'd and stretch'd. He also describes the Pair of Muscles fasten'd to the Root of the Tongue and *Os Hyoides*, serving to draw the Tongue into the Mouth: These he makes to be wound round about the *Aspera Arteria* once or twice, in which I think there is some Mistake; being of Opinion the Mechanism for this Action of drawing in of the Tongue, is different from what is here described. I now proceed to the Explication of the several Draughts I made, with what Exactness and Care I could, in eight or ten several Subjects.

Fig. 41. Represents the Head with Part of the Neck of this Bird, the Skin being taken off, in which, Fig. 41.

A. The Skull, having two shallow Grooves or Channels, or rather one broad one with a small Rising in the midst, on the *Sinciput* or Back-part, from each Side of the Neck to the Top of the Head, where they unite into one, which passes slanting towards the right Side, and ends at the Hole for the Nostril on that Side at *c*.

b. Is the Hole or Passage for Hearing.

d. A large white Gland, containing a glutinous Liquor almost like Cream as to Colour and Consistence, which empties itself into the Mouth; I suppose to lubricate the Cartilages.

e. The Eye, which has a bony Ring, encompassing the *Iris*.

f. Part of the Tongue, which in this Figure is represented as almost all drawn into the Mouth, of which more when I come to describe the Cartilages, &c. in the 42d Fig.

g. Part of the Neck, which is large and furnished with very strong Muscles.

h The *Oesophagus*, opening very wide at the *Fauces*, and wholly musculous.

i. i. i. A long, but thin and flat Muscle in respect of it's Breadth, which is about $\frac{1}{8}$ of an Inch, reaching from the End of the Cartilage at *c*, to the under Bill or Beak at *k*, to the Inside of which it is very firmly fasten'd; as is such another on the other Side.

k. The under Bill, very strong and sharp-pointed, articulated with the Skull a little behind the Ear-hole *b*.

l. l. l. The Cartilage on one Side, the other being exactly the same. This Cartilage is round, very smooth, even, and slippery, about the Size of a pretty large Pin; and reaches, when the Tongue is drawn in, and the Muscle *i. i.* relaxed, from the Root of the upper Beak at *c*, to the Root of the Tongue properly so called, or to the Bones of the Tongue where they are articulated, being bent like a Hoop, as in the Figure,

Figure, slipping very freely in a Sheath or membranous *Ductus* fasten'd on the outward or convex Edge of the flat Muscle *i. i. i.* which Muscle accompanies it from it's End at *c*, almost to the End of the Canal or Sheath, which opens at a Hole a little before the *Larynx*; (as will be shewn in the 43d Figure) and thence the Muscle proceeds to it's Infertion into the lower Beak at *k*. From the concave Edge of this Muscle, there is a thin and transparent, but very strong Membrane, strained like a Drum-head to the Skull at *m*, where it is very strongly fasten'd; this Membrane is furnish'd with capillary Veins and Arteries, and doubtless is nervous. *n, n,* represent this Membrane. This Cartilage, when the Tongue is exerted, parts above half an Inch from the Root of the Beak at *c*.

o. o. A pretty large Vein and Artery.

p. p. A Muscle reaching from one Jaw to the other, under the Throat, serving as a Bandage to keep in the Cartilages, and the Root and *Os Hyoides* of the Tongue, as I may call it, from starting out at that Part where are the Articulations of the Cartilages with the Bones, when by the Muscles inserted into the Sheath at or near *p*, and thence passing to the End of the Tongue, it is drawn into the Mouth.

q. q. One of the last-mention'd Muscles, which is round, and fasten'd to the Breast of the Bird, cut off at *r*.

s. The *Aspera Arteria*, consisting of perfect Rings.

t. t. A Muscle accompanying the *Aspera Arteria*.

Fig. 42.

Fig. 42. A. A. The under Part of the lower Bill.

B. b. The Tongue.

b. The Place where the two Cartilages and two Bones represented by *f. f.* in *Fig. 44.* are brought into and inclosed in one Tube or membranous Sheath.

C. C. Two Glands displaced in this Figure.

c. c. Two Muscles attending these Glands, and fasten'd near the End of the Bill.

d. d. The two bony Cartilages, bent, and passing on each Side of the Neck, but united at *b*.

eee, eee. The Pair of Muscles, one attending each Cartilage from the End of it at the upper Beak, and firmly adhering to the *Vagina*, in which it slips, till about *f. f.*

f. f. The Place where these Muscles leave the *Vagina*, and pass on to the Inside of the Bill, where they are inserted. Their Action is to thrust the Tongue forward, or out of the Mouth.

g. g. A Pair of Muscles fasten'd a little below the *Larynx*, to the musculous Part of the *Aspera Arteria* at *i*; the other End of them going up to the Place *b* at the Root of the Tongue, whence they go on encompassed by the *Vagina* to the Articulation of the Cartilages with

with

with the two Bones. I take their Action to be to draw the End of the Tongue towards the *Larynx*.

k. k. Two Muscles fasten'd at one End within the *Thorax*, under the Merry-thought or *Clavicula*; and at the other Ends to the Articulation of the Cartilages with the two Bones of the Tongue, mark'd *f. f.* in *Fig. 44*. These have the forementioned Nerves accompanying them. I take these to be chiefly concern'd in drawing in the Tongue; each of these sends a Branch to the Gristle at the Top of the *Aspera Arteria* at *n*.

l. l. l. l. Two Muscles running along, and fasten'd to the Sides of the *Aspera Arteria* from the *Thorax* to the Place where they are united, where each of them sends a Branch; which binding over the Bones and Cartilages, goes on to the *Fauces*, where they are inserted.

m. Part of the *Gula*.

n. A Cartilage at the Top of the *Aspera Arteria*.

o. o. The *Aspera Arteria*.

p. The Neck bending like an *S*. The Wind-pipe and *Gula* in this Bird pass always on the right Side of the Neck.

Fig. 43. A. A. The two long flat Muscles represented by *i. i.* in the 41st Figure. These join close to one another at the Top of the Head, and so pass on together to the End of the Cartilages; to the End of which, as I take it, they are fasten'd; from whence a slender weak kind of Ligament reaches to, and is inserted at the right Nose-hole, at the Root of the upper Beak. This Ligament is relax'd when the Tongue is thrust out.

Fig. 43.

b. b. The Cartilages running in their *Vagina* on the Outside of the said Muscles.

c. The *Larynx* or Passage to the *Aspera Arteria*. I observ'd no *Epi-glottis*.

d. d. Two Articulations or Joints in the under Beak or Bill.

e. The Hole or Passage, whereby the Tongue in it's *Vagina* comes out, and is drawn in again.

f. What I call the Tongue, in the Inside of which the two Cartilages are brought together, 'till they are both articulated to one single Bone, at the End of which is the horny barbed Tip.

g. One of the Pyramidal Glands.

h. The lower Bill.

Fig. 44. A. That Part which I think may most properly be called the Tongue; a small Bone running thro' it: This, as far as *c*, is flat and thin at the Sides. It is cut away at *d*, to shew the Bones within it.

Fig. 44.

b. The horny Tip of the Tongue, about a Quarter of an Inch long, strong and sharp, furnish'd with four or five Barbs on each Side; (not with

The Wood-Pecker's Tongue.

with an infinite Number, as *Coiterus* says.) These Barbs are sharp and moveable, like the small Teeth at the Root of the Tongue, and Beginning of the *Gula*, in the *Pike* and *Jack-Fishes*, in that of *Eagles* and the like; so as to let the Prey slip easily on, but not so easily get off again.

c. The End of the Bone of the Tongue where the two bony Cartilages are articulated.

d. The Place where the upper Part of the Tongue is cut away to shew the Bone.

e. Several small Tendons, or rather, as I take them to be, Nerves running through the Tongue. Of these some go to the End of the Cartilages, others accompany the Muscles to the Neck.

f. f. Two Bones or Cartilages, which in the Bird are united by a thin Membrane as far as the next Joint, so as to open asunder to some distance, but not to separate quite. These two Bones seem to answer the *Ossa Hyoidea* in other Creatures. At the Place marked *g. g.* the Muscle that draws the Tongue into the Mouth is fasten'd, or rather leaves the Tongue at that Place; it having it's Insertion near to the End of it: This Muscle is represented by *q. q.* in the 41st *Fig.*

b. b. The two bony and springy Cartilages running on each Side of the Neck; which being joined close together on the Top of the Head, pass so joined to the Nostril, or Nose-hole, on the right Side.

From the Consideration and comparing of these four Figures, the true Mechanism and Motion of the Tongue, seems to be in short thus: The two long Muscles inserted near the End of this lower Beak, and reaching to the End of the Cartilages, being contracted, the round Hoop of the Cartilages is drawn up from each Side of the Neck, close to the Pyramidal Glands; and at the same time the Muscles that draw the Tongue into the Mouth being relaxed, and the Articulation at *c.* and *g. g.* in the 44th Figure, brought near to a streight Line, the Tongue is thrown out the Length of 4 or 5 Inches.

But when those long Muscles are relaxed, the Pair of Muscles represented by *k. k.* in the 42d Figure, being contracted, draw the Articulations *g. g.* where they are fasten'd, down into the Throat or wide loose Skin of the Neck; and at the same time the Cartilages opening into a wide Hoop, the whole Tongue is drawn into the Mouth.

Fig. 45.

Fig. 45. *A.* The Skull. *b.* The shallow *Crena* or Groove for the Cartilages. *c.* The Place for their ending at the right Nose-hole. *d.* The Orbit of the Eye. *e.* The Hole for the Optic Nerve. *f.* A Hole or Passage thro' from one Orbit to the other. *g.* A Bone covering the Hole to the Ear. *h.* The lower Jaw and Bill. *i.* A Ridge or *Processus* in the Skull, beginning at the Root of the upper Bill, and keeping the two Ends of the bony Cartilages in their Place on the right Side. *k.* The *Os Jugale*. *l.* The upper Bill.

Fig.

Fig. 46. Represents the right Leg and Foot, in which there are two *Digiti* before, and two behind. The Strength, Largeness, and Sharpness of the hooked Claws or Talons are remarkable.

Fig. 46.

Fig. 47. *A.* The *Oesophagus*. *B.* The *Ingluvies*, or Crop, partly musculous, and lined with a glandulous Coat. This I found quite fill'd with small black Pismires; as also, *C.* the *Ventriculus* or Gizzard, which joined close to the *Ingluvies*. *d. d. d.* The Intestines nearly of the same Bigness for the whole Length. *e.* The Beginning of the *Rectum*. *f.* The *Pancreas*.

Fig. 47.

Fig. 48. One of the middle Pair of Feathers of the Tail, in which the great Strength of the Quill for so small a Feather, and it's bifurcate End, are very remarkable.

Fig. 48.

Fig. 49. The Roof of the Mouth, where 'tis observable, that the *Rima* or Passage for the Air to the Nostrils, is beset on each Side with a Row of 10 or 12 little sharp Teeth, with their Points standing inwards, towards the *Gula*. These take the Prey from the End of the Tongue, whose Barbs or Prickles are moveable, and are to keep it from going out of the Beak again with the Tongue, and from hence it is convey'd to the Swallow.

Fig. 49.

XXI. It was the Poet *Aristophanes*, that first makes mention of this Bird by the Name of $\Phi\omega\nu\iota\acute{\omicron}\nu\pi\lambda\epsilon\pi\omicron\varsigma$ (*a*), and not long after it is called $\delta\epsilon\upsilon\varsigma \Phi\omega\nu\iota\acute{\omicron}\nu\varsigma$ (*b*) by *Philostratus*, in his Life of *Apollonius Tyanæus*. *Apicius*, *Plinius*, *Suetonius*, *Juvenal*, and other Latin Writers, retain the Greek Word, and call it *Phœnicopterus*. *Bellonius* (*c*) says, That in French it is named *le Flement*, or *Flambant*. *Scaliger* affirms, that in Provence they call it *Flammant*: And (*d*) *Gesner* says, it may be called *Avis Rubra* per excellentiam. (*e*) *Aldrovandus* writes, that in *Sardinia* it goes by the Name of *Fiamingo*; and *de Laet* tells us, that the Spaniards in the *West-Indies* call it *Flamenco*. *Dr Charlton* and *Dr Grew* convert the Greek Appellation into English, naming it the *Phœcopter*: And *Sir Hans Sloane*, in his Catalogue of *Jamaica Birds*, annex'd to *Mr Ray's Synopsis Avium*, styles it the *Flamingo*. (*f*) *Du Tertre* calls it *le Flamand*, which differs but little from the Name given it by *Bellonius*: And to mention no more, (*g*) *Du Hamel* says, 'tis commonly call'd *Becharu* in France.

The Natural History of the Flamingo, &c. by Dr J. Douglas, N. 350. p. 523. It's Name.

All these differing Names may be easily accounted for, from the Colour most predominant in it's Wings. Thus *Martial* (Epigram 58. Lib. III.) says of this Bird:

Nomenque debet quæ rubentibus pennis.

(a) *Aristoph. Aves, Sc. 4* (b) *Philost. Lib. 8. Pag. 387. Edit. Paris. 1605. fol.*
 (c) *Bellon. Histoire des Oyseaux, Lib. 8. Cap. 8.* (d) *Gesner Hist. Anim. Lib. 3.* (e) *Aldrov. Ornithol. Tom. III. Lib. 20. Cap. 4.* (f) *Hist. des Isles, &c. p. 300.* (g) *Hist. de l'Acad. Royale, p. 213.*

And again (Epigr. 71. Lib. XIII.) he makes it give the true Derivation of it's own Name ;

Dat mihi penna rubens nomen.

The Greek Name is compounded of two, viz. Φοινίξ, *puniceus*, *ruber*, and πτερόν, *Ala*, a Wing, *quod sit rubentibus Alis* ; which Thing in different Words is express'd as follows, by the several Authors I have consulted. *Bellonius* says 'tis called in French, *Flambant*, not only from the Date-Colour of it's Wings, à *Dactylorum colore*, i. e. a Scarlet or light Red, like the Fruit of the *Palm* or *Date-Tree*, called in Greek Φοίνιξ ; but also from the Lustre of the Colour resembling Flame : Or, as *Aldrovandus* has it, *Quod velut ignis instar ejus rubedo emicit*. The Words of *Gesner* are, *Ego Gallicum nomen à rubro & flammeo rostri, crurum, pennarumque in aliquibus partibus colore inditum esse conjecerim ; aut forte quoniam ex Flandria hyeme ad Narbonensis Provinciae maritima volat ; nam Flandrum Galli Flammant appellant : vel à corporis proceritate, quales solent esse Flandri*. Mr *Willughby* (b) says the French name it thus rather from the flammeous Colour of the Wings and Feet, than that it comes in the Winter Time from *Flanders* : For he believes there was scarce ever seen in *Flanders* a Bird of that Kind ; so far are they from being common there, and flying from thence into other Countries. (i) Dr *Grew* believes it named in Greek from the Scarlet Colour of it's Wings ; and *Flamment* in French for the same Reason. *Du Hamel* explains it's Name *Becharu* by *Aratri-Rostrum*, (*quasi Bec-Char-rië*) *quoniam rostrum ejus aratri instar inflectitur*.

It's Genus.

All Authors, from *Aristophanes* down to *Aldrovandus*, have accounted the *Phœnicopteros* a Bird of the *Palmipede* or web-footed Kind ; and tho' this last-named Author will not allow it to be so, yet he is forced to own that it is not a true *Fissipede* or digitated Fowl ; *nam & membranæ digitos sepientis quoddam habet rudimentum*, are his own Words. Dr *Charlton* only, among all the later Natural Historians, has approved of his Division, and accordingly ranked the *Phœnicopter* in the Class of *Aquatick Fissipedes*. But that it is a Water-Fowl all agree ; *Aristophanes* calls it Λιμναῖ, i. e. *Palustris* ; and *Aldrovandus* says of it, *Avis est aquas amans* : not to mention others.

Species.

I find Authors are silent as to the different Sorts of this Bird, only *Aldrovandus* gives us two Figures thereof that are not alike.

It's Place of Birth.

This Bird is found in three of the principal Parts of the World, that is, in *Africa*, *America*, and *Europe*. *Heliodorus* (*Æthiop. Lib. 6.*) calls it Νειλώου Φοινικόπτερον, a Bird of the *Nile* ; and the old *Scholias*t upon *Juvenal* (*Sat. xi. ver. 139.*) affirms, that *abundans est in Africa* ; and *Du Hamel's* Words are, *Inter animantes quæ sua mole*

(b) *Ornithologiae, Lib. III. Sect. 2. Cap. 1.*

(i) *Museum Reg. Soc. p. 67.*

commendatur, *Avis illa ex Ægypto allata est, quam Veteres ob plumas in Alis rubeas Phœnicopterum dixerunt.* John de Laet writes, that there is an abundance of them in the Island of *Cuba*, as also at the Isle called *Rocca*, lying on the Coast of the Province of *Venezuela* in *South America*; and *Rochfort* says the same thing of the Island of *St Domingo*.

(l) *Dampier* saw some few of them at *Sal*, one of the *Cape Verde* Islands: He hath likewise seen some of them at *Rio la Hacha*; also at an Island near the Main of *America* right against *Querisao*, call'd by the Privateers *Flamingo Key*, from the Multitude of these Fowls that breed there; and he never saw of their Nests and Young but three only.

Though these winged Creatures live for the most part in those hot Countries, yet they sometimes visit us here in *Europe*, and so may be accounted among the Migratory Kind, or Birds of Passage, which is confirmed by the Testimonies of several Authors: For,

Bellonius told us long ago, *migrant ultrà mare*, and are often taken in *Italy*, and oftner in *Spain*.

(m) *Gassendus* says, they are frequently catch'd in the fenny Grounds and Marches about *Arles* in *Provence*, upon the *Rhone*.

Gesnerus. *Quidam mihi retulit avem hanc non procul à Monte-Pessulano capi.* He says in another Place, that they swim in Flocks not far from the Shore in *Mediterraneo Mari Gallico*.

Willughby writes, that in hard Weather in the Winter Time, it comes over to the Coast of *Provence* (and is often taken about *Martiques*, a Sea-Port Town in that Country) and in *Languedoc*, and is frequently found about *Montpelier*. But whence it comes, and where it is bred, to me, says he, is unknown. *N. B.* This Passage is not in the *Latin* Edition of his Works, but added to the *English*, which was published two Years after the first. However, he says positively that they don't come from *Flanders*, where they are so far from being common, as some alledge, that there never was one seen in that Country.

(n) *Dr Charlton* informs his Reader, that he was presented with the Skin of one of these Birds, well stuffed and dried, by a Gentleman at his Return from the University of *Montpelier*, near which Place it had been taken.

(o) *Dr Lister* says, *Frequens est Phœnicopterus in paludibus maritimis ad mare Mediterraneum Provinciæ & Languedociæ.*

Whether this Bird were known to *Aristotle* is a Question; for all our Writers of Natural History agree, that the *Phœnicopterus* is no where mentioned by Name by that Philosopher; yet they can hardly believe that he was ignorant of a Bird so clearly described by his Contemporary *Aristophanes*. *Mirum est*, says *Gesner*, *hujus tam pulchræ & eximiæ Avis*

(l) *Damp.* *New Voyage round the World*, p. 67. (m) *Gass.* *Vita Peiresc.* Lib. II. in fine.

(n) *Charlton de Differentiis & Nom. Animalium.* (o) *Lister Annot. in Apicium Cælium*, Lib. VI. Cap. 7.

nomen ab Aristotele taceri, cum Aristophanes, qui vixit eadem ætate, meminerit. Sed Græcis etiam raram esse hanc avem puto.

Bellonius thinks that Aristotle described this Bird under the Name of *Glottis* or *Lingulaca*, as Theodorus Gaza translates it. Aldrovandus is of the same Opinion, but Gesner and Scaliger are not; for the first says, *Ego verò iis quas Gallinulas aquaticas nostri vocant avibus Glottidem adnumero, quæ omnes fissipedes sunt*: And the latter in his Commentary upon this Passage says, *Glottis autem quæ sit nondum mihi constat. Ridiculum quod quidam de Phœnicoptero ausus est pronuntiare.*

It's Food, &c.

Gesner says, *circa lacus & paludes vegetat*, and that it feeds on Periwinkles and Fish: and by Dampier's Account we learn, that they delight to keep together in Flocks, and feed in Mud and Ponds, or in such Places where there is not much Water; that they are very shy, and therefore it is hard to shoot them; that they build their Nests in shallow Ponds, where there is much Mud, which they scrape together, making little Hillocks, like small Islands, appearing out of the Water, a Foot and an half from the Bottom: They make the Foundation of these Hillocks broad, bringing them up tapering to the Top, where they leave a small hollow Pit to lay their Eggs in. And when they either lay their Eggs or hatch them, they stand all the while, not on the Hillock, but over it, with the Legs on the Ground in the Water, resting themselves against the Hillock, and covering the hollow Nest upon it with their Wings: For their Legs are very long, and building thus, as they do, upon the Ground, they could neither draw their Legs conveniently into their Nests, nor sit down upon them otherwise than by resting their whole Bodies there, to the Prejudice of their Eggs or Young, were it not for this admirable Contrivance, which they have by natural Instinct. They never lay more than three Eggs, and seldom fewer. The young ones cannot fly till they are almost full grown; but will run prodigiously fast. Thus far Dampier.

Du Tertre in the History of the Isles, &c. gives these further Circumstances. *These Birds, says he, have such a strong Tone of Voice, that no Body who hears them, but would take them to be Trumpets sounding. They are always in Flocks, and while they have their Heads covered diving under Water for their Food, like Swans, they have always one upon the Watch, with his Neck stretch'd out, the Eye fully employed, and the Head turning perpetually from one Quarter to another: As soon as he perceives any Body a coming, he sounds the Trumpet, gives the Alarm, mounts first upon the Wing, and all the rest follow. They fly in Order like the Cranes; but if you can only surprize them, they are so easily killed that the least Wound makes them fall to the Ground. They are very rare, and hardly ever seen except near those Shores which are the least inhabited.*

They flea them, and make a kind of Fur of their Skins, which are said to be of great Use to People that are subject to Colds, and Weakness of the Stomach.

Rockfort

Rochfort (p) likewise informs us, That they have the Sense of Hearing, and Smelling to such a Degree, that they discover thereby the Hunters, and Fire-Arms, at a great Distance. And to avoid being surprized, they situate themselves in open Places, and in the middle of Marshes, from whence they can perceive their Enemies at a Distance, and there is always one of the Flock upon the Watch. They are fat, and their Flesh is very well tasted. The Skin, which is covered with a soft kind of Down, is preserved for the same purposes as those of the Swan and the Vulture.

De Laet observes, that these Birds are so accusom'd to Salt Water, that the Indians, when they tame them, mix Salt with the fresh Water for them; else they pine away and die. And though Aristophanes says it is ἡ τῶν ἠδαδῶν, or not used to be tame; yet Gassendus writes, that M. Varius, President of the Parliament at Aix in Provence, and a great Friend of M. Peiresc, used to divert himself with feeding them with Bread moistened with Water, which they commonly eat in the Night, and not in the Day-time. The same learned Person observed, that they could discern the Approach of cold Weather, and would come to the Fire, so as sometimes to burn their Feet; and that when one Foot pained them, they would go upon the other, using their Bill instead of the burnt Foot: That they slept standing upright on one Foot, with the other drawn up to their Breast amongst their Feathers: And lastly, that very little Sleep serv'd their turn.

This beautiful and scarce Bird was much esteemed by the Romans, *It's Use.* and chiefly made use of in their costly Sacrifices and sumptuous Entertainments. Thus Suetonius (q) describing the exquisite Sacrifices which were appointed by the mad Emperor Caligula to be offer'd to himself, as a Divinity, says of them, *Hostiæ erant Phœnicopteri, Pavones, Tetraones, Numidicæ, Meliagrides, Phasianæ, quæ generatim per singulos dies immolarentur.* And the same Historian relates further, (r) that this Emperor *pridiè quam periret sacrificans respersus est Phœnicopteri sanguine.*

That the Tongue of this Volatile was much commended, and in great Esteem, for it's excellent Taste and most delicious Relish, will appear from the following Quotations. And first we read in Pliny (s) that Apicius said the Tongue of this Bird was a delicious and favoury Bit, *Phœnicopteri linguam præcipui esse saporis Apicius docuit, nepotum omnium altissimus gurgis.*

The Poet Martial says the same thing in the aforesaid Epigram:

*Dat mihi penna rubens nomen: sed lingua gulosis
Nostra sapit.*

(p) *Histoire des Antilles.* (q) *Suetonii Caligula*, §. 22. (r) *Scalig.* §. 57. (s) *Plinii Nat. Hist. Lib. X. Cap. 48.*

And *Juvenal* (t) in that Satire where he exposes the extravagant Luxury and Gluttony of the *Romans*, mentions this Fowl, amongst some others equally rare, that they made use of in their Feasts.

Et Scythiæ volucres & Phœnicopterus ingens.

We read in *Suetonius* how the Emperor *Vitellius* had them often serv'd at his Table, with a great many more Varieties brought from the most distant Parts of the Universe; his Words are, (u) *In hâc Scarorum jecinera, Phasianorum cerebella, linguas Phœnicopterum, Murænarum lactes à Carpathio usque fretoque Hispaniæ per Navarchos ac Triremes petitarum commiscuit; hoc est, ab extremis imperii finibus Orientem versus & Occidentem.* And *Heliogabalus*, another of the *Roman Emperors*, as *Lampridius* writes, treated his Courtiers with sumptuous nice Dishes made of the Inwards and Brains of *Phœnicopters*, *exhibuit Palatinis ingentes dapes extis & cerebellis Phœnicopterorum refertas.*

What is related by *Gassendus*, in the Life of that learned Nobleman *Peireskius*, is no Argument against the excellent Relish of the Tongue of this Bird: For his Friend *Varius*, who therein seems to contradict the receiv'd Opinion, was at that Time just upon the Recovery from a long Illness; he had no Appetite, loath'd all Sorts of Meats, and mended but very slowly; so that 'tis no Wonder if he did not perceive all the Relish of that nice Bit, for which of old it was so much commended. Besides, his Answer is not as to the Tongue, which was own'd to be much sweeter than that of a Kid, but to the Flesh of this Bird (as will appear from the Original). *Rogatus subinde fuit de sapore carnis Phœnicopteri. Exceptit autem mirari se, cur illam Apicius apud Plinium, & Imperatores Caligula & Vitellius apud Suetonium, Heliogabalus apud Lampridium, & nonnulli alii tantis in deliciis habuissent. Esse enim eam injucundam, aut saporis certe non exquisiti, aquaticarum aliarum instar, cum etiam piscem oleat; unde à Provincialibus ut plurimum abjicitur, exuviaeque solum sunt usui in fastuosis conviviiis, carnibus aliarum avium obtegendis.*

The way to dress the *Phœnicopter*, and how to make a Sawce fit for it, we may read in *Apicius's* Book *de Obsoniis & Condimentis, seu de Arte Coquinariâ, Lib. VI. C. 7.*

Draw, wash, and boil the *Phœnicopter*; put it into a Pot, with a moderate Quantity of Salt and Vinegar; and when it is half boiled, put in a few Leeks, and a little Coriander Seed, when it is almost enough boiled, add *Defrutum* to Wine that has been boiled till a third Part is evaporated, and colour it, then add Pepper, Cummin Seeds, Coriander, the Root of *Laserpitium*, Mint, and Rue, all pounded in a Mortar. Stir it very well, pour some more Vinegar to it, and add some Carrot, then pour in some of it's own Broth, boil it again, thicken it with Starch, pour it off, and serve it up. Or, you may roast it, having stuffed it with round Pepper,

(t) *Juvenal. Sat. XI.*

(u) *Suetonii Vitell. §. 13.*

Lovage, the Seeds of Smallage, and Sesame, Defrutum, Parsley, Mint, dried Onions, and Carrot; with Honey, Wine, the Drippings of the Fowl, Vinegar, Oil, and Defrutum, for Sauce.

Philostratus reckons the Red Coloured Fowl, i. e. the Phœnicopter, amongst the delicious Dishes, *Lib. VIII. Vitæ Apoll.*

Wormius says (x), That the Tongue of this Fowl was extremely liked by the Ancient Romans, as Apicius and other Managers of Feasts relate.

Dr Grew. The Tongue of this Bird, as Apicius said, was a delicious Morsel amongst the Romans.

N. B. In the *Treatise de Obsoniis & Condimentis*, that goes under the Name of Apicius, there's no mention made of the Tongue of this Fowl: For, as Dr Lister well observes, *Apicius noster hic filet de linguæ præcipuo sapore.* Which is a pretty convincing Proof, that this Book *de Re Coquinaria*, is only a Collection made by some modern Roman; the Name of the old Apicius, that great Master of the Art of Eating, being only prefixed to it, for the Benefit of the Bookseller.

Dampier. The Flesh of both young and old is lean and black, yet very good Meat, tasting neither fishy nor unsavoury: A Dish of Flamingo's Tongues being fit for a Prince's Table. They are large, having a large Knob of Fat at the Root, which is an excellent Bit.

Du Tertre. *It's Flesh is excellent, though it smells a little of the Sea; but especially it's Tongue passes for the most delicious Morsel in the World.*

According to Bellonius this Bird is of the Bigness of the Fowl he calls *Elorius*, which is our Curlew. Description of it's Parts.

Scaliger compares it to the Heron, *magnitudo ei Ardeæ.* Magnitudo.

Gesner says it is as big as a Ciconia or Stork, or rather bigger.

Aldrovandus says, *I can assert nothing certain of the Size of this Fowl, for I never saw it.*

Dampier. The Flamingo is a sort of large Fowl much like the Heron in Shape, but bigger, and of a reddish Colour.

Du Tertre. *The Flamand is a Fowl as large as a Wild Goose.*

It hath an extraordinary long Neck, according to Mr Willughby. The Neck.

Du Tertre. *It has a red Neck, very short in Proportion to the Size of the Fowl, and about half a Toise in Length.*

Scaliger. *It has a very short Tail, and as it were cut off.* The Tail.

Scaliger writes, that the Bill of this Fowl is neither quite streight, nor altogether crooked, but rather resembles part of a Scythian Bow. The Head and Bill.

Gesner, who compares this Bird to the Crane for Bigness adds, *that it's Bill is about half as long again as the Bill of the Stork, thick above and rough with certain Tubercles.*

Aldrovandus commends the Account Scaliger gives of the Bill, and then adds, *In the Conformation of the Bill, Nature has varied not a little: For it is not flat, like that of Ducks and Geese, though it is somewhat*

(x) Musæum.

broad,

The Natural History of the Flamingo.

broad, neither is it streight and round, like that of the Heron, nor is it hooked like the Beaks of the Eagle or Hawk, or other Birds of Prey; though at the same Time it is crooked and bent a little downwards, but in the middle of the upper Jaw there is a remarkable Protuberance, six Finger's Breadth long, hollow within, and channelled in it's Middle. The upper Jaw is likewise longer than the lower one, and ends in a sharp Point; but, on the contrary, the lower is by far the thickest of the two.

Du Tertre. It has a small round Head, with a large Bill, four Inches long, half red and half black, and crooked in the manner of a Spoon.

Olaus Wormius gives the following Description of the Head and Bill of the Phœnicopter, which he had sent him from a Friend, viz.

The Head and Bill were upwards of eight Inches long, the Head itself without the Bill, three Inches. The Bill has the same Figure which Scaliger has given of it, pretty thick in the middle but hollow, and it's upper part channelled or grooved on each Side. At it's Origin it has two large Orifices for Smelling, it is hooked at it's Extremity, set round with Teeth internally, with a Spine or Eminence in it's Middle. It's lower Part is black, with a great many Streaks running towards it's Extremity, it is shorter than the other, but large and capacious, for receiving the large Tongue, which in this one had been taken out.

Dr Grew has obliged us with a very curious Account of the Bill of this Bird, for which he says it is most remarkable. The Figure of each Beak is truly Hyperbolic: The upper Jaw is ridged behind, before plain or flat, and pointed like a Sword, with the Extremity bended a little downwards: Within it hath an Angle or sharp Ridge, which runs all along the Middle, at the Top of the Hyperbole, not above a quarter of an Inch high: The lower Beak in the same Place above one Inch high, hollow, and the Margins strangely expanded inward, for the Breadth of above a quarter of an Inch, and somewhat convexly. They are both furnished with black Teeth, as I call them from their Use, of an unusual Figure, scil. slender, numerous, and parallel as in Ivory Combs; but also very short, scarce the eighth part of an Inch deep. An admirable Invention of Nature, by the Help of which and of the sharp Ridge abovemention'd, this Bird holds his slippery Prey the faster.

Mr Ray describes the Bill to be broadish, of a singular and unusual Figure, viz. the upper Jaw crooked, flat, and set round with Teeth, and the lower one thicker.

Menippus, the Cynick Philosopher, in a Fragment of his *de Homine* (which however at this Time is either lost, or at least hard to be come at) affirms this Bird to move it's upper Jaw, as we find him quoted by (y) Rondeletius, where he is talking of the Crocodile's moving that Mandible: But, says he, that is not peculiar to the Crocodile alone, for amongst Birds the Phœnicopter moves the upper part of his Bill, as Menippus the Philosopher has observed in his Book *de Homine*.

(y) Rondel. Lib. de Amphibiis. Cap. 5.

Gesner makes the same Quotation from *Rondeletius*.

Cardanus (y) repeats the same thing, without mentioning any Author; For some, says he, think that the Bird called the *Phœnicopter* moves the upper Jaw likewise; but adds however, that the Reason for it is not so plain in the Fowl as in the Crocodile.

Wormius is of the same Opinion; but with *Cardan*, he thinks the Cause is not so manifest as in the Crocodile.

Dr Charleton says, that it was *Cardanus* that first made that Observation.

Dr Grew argues for this Movement from the peculiar Structure of the *Rostrum*; alledging, however, that there can be no Determination of these matters, without Inspection into the Muscles, and the Articulation of the Bones. As for the *Phœnicopter*, says he, it must needs be said, that the Shape and Bigness of the upper Beak (which here, contrary to what it is in all other Birds that I have seen, is thinner and far less than the nether) speaks it to be the more fit for Motion, or to make the Appulse, and the nether to receive it.

Bellonius remarks, that the Legs of this Volatile are very long. And *Legs and Feet* on the contrary,

* *Scaliger* says, that the Legs and Thighs are so short, that as *Galen* reckons these Parts to be longest in Men, so he might reckon them the shortest in this of all Animals that we know. For which he is severely taxed by *Dr Charleton*, who says, Here occurs an egregious Error of *Scaliger*, which I cannot help taking notice of: For he in his Observations upon *Aristotle's History of Animals* (This is wrong quoted, the Place being in *Aristotle's Book de Generatione Animalium*) giving a prolix enough Description of the particular Marks of the *Phœnicopter*, makes both it's Thighs and Legs to be very short (in the Words above quoted) whereas this of all Fowls has these Parts the longest, as every Body who has seen them either alive or dead will testify. And who, I pray, has ever seen any of the Water-Fowls, that are cloven footed and live upon Fish, have short Legs? no Body, I am sure, neither is it reasonable to think, that those Fowls which live on Fishes which they catch in Lakes and Streams of Rivers, not by swimming, but rather wading, should be so ill provided with Legs fit for that purpose, and so absolutely necessary for procuring their Food. Besides, the Reason why it was called by *Juvenal* *Phœnicopterus ingens*, was because of the Largeness of it's Legs and Neck.

Dr Grew observes the same mistake, but in fewer Words, which are the following. When *Scaliger* therefore saith that this Bird hath the shortest Legs of any Animal yet known, he would have said the longest.

Gesner says, It has red Thighs larger than those of the Crane.

Du Tertre. It is the tallest Fowl I ever saw in my Life; it has red Legs, and the Feet half greenish or Sea-colour'd.

(y) *Cardan. de Varietate Rerum, Lib. 7. Cap. 37.* * *Scalig. Exercit. 233. §. 2. de Subtilitate, ad Cardanum.*

The Natural History of the Flamingo.

Rochfort. (z) Their Legs and Thighs are so tall, that their Body is full two Feet above the Ground.

Colour of the Wings.

Scaliger thus elegantly expresses the fine Colour of it's Wings. *Cinereum colorem nobilitant alarum puniceæ pennæ.* The Scarlet Feathers adorn it's Ash-colour'd Wings.

Aldrovandus. It is surprizing that Scaliger took no Notice of the black Colour of it's Wings. The rest of the Fowl is of an Ash-colour, mixed with purple and white.

Gesner says, that the lower Part of it is white, with red Feathers upon it's Neck, Breast, Belly, and Wings. And speaking of one taken near Montpelier, he tells us, that it was all white, except those Parts of the Wings which are black in Storks.

(*) De Laet observes that they differ in Colour; for while they are young their Feathers are white; afterwards as they grow up, they become more of a Rose Colour, and at last when they become old, they are quite red. There are some of these same Fowls near Montpelier, which have only the under Part of their Wings and Bodies red, and the upper Part black. There are likewise some of them in the Isles, which have a Mixture of white and black Feathers upon their Wings.

Du Tertre gives much the same Account. The young ones, says he, are a great deal whiter than the old ones, and they redden in proportion as they advance in Age. I have likewise seen some of them, which had a mixture of red, black, and white Feathers upon their Wings, and I believe these are the Males.

(†) Constantinus. The Bill, the Legs, and part of the Wings are of a red Colour.

Willughby says, the Neck and Body is white: The *Alarum Remiges*, or Quill-Feathers of the Wings, are black: but the *Vestitrices*, or Covert-Feathers, are wholly dyed with a most beautiful bright Purple, or Flame Colour, *unde ei nomen.*

Dampier. The young ones at first are of a light grey; and as their Wing-Feathers spring out, they grow darker, and never come to their right Colour, or any beautiful Shape, under ten or eleven Months old. When many of them are standing together by a Pond's Side, being half a Mile distant from a Man, they appear to him like a Brick Wall; their Feathers being of the Colour of a new red Brick: And they commonly stand right and single, one by one exactly in a Row, except when feeding, and close by each other.

Colour of the Feet.

All Authors agree in the red Colour of it's Legs and Feet. Thus Scaliger, the Legs and Feet are of the same Colour with the Wings.

Colour of the Bill.

Gesner says, It is of a red Colour like that of Blood.

Aldrovandus observes, That that Part which joins on to the Head is something between a white and a chesnut Colour, the rest is black.

Willughby

(z) *Hist. des Antilles*, Edit. Rotterd. p. 583. (*) *Hist. du Nouveau Monde*, Lib. 1. Cap. 9. & Lib. 18. Cap. 15 (†) *Constant. Lexicon Græco-Latin.*

Willughby affirms, that the Tip of the Bill is black, or of a dark blue.

The whole Fowl is delineated by Gesner and Aldrovandus; and Dr Grew has given us the Figure of the Head and Bill, as he found it amongst the Rarities in Gresham College. N. B. The Figure of the Phœnicopter in Willughby, is copied from the second of Aldrovandus. Gesner says, the Phœnicopterus, whence his Figure was taken, was sent to him by Rondeletius. Aldrovandus had the first of his Figures from Sardinia; and the second, which he calls Phœnicopterus alter rostro lato, was given him by that famous Botanist Carolus Crusius: He owns that he never saw the Bird himself.

The Figures given of it.

In de Rochfort, the Body and Neck of the Flammant is pretty well delineated; but the Legs are not, neither is the Bill, nor the Claws.

(a) Du Hamel gives a very exact Account of this Bird in the following Words, with which I'll close this tedious Description, collected from all the Authors that have made any mention of the Phœnicopter or Red-Wing. It has a long Neck and Legs, with a slender but firm Foot. It's Eyes are narrow and of a red Colour; and it's Gall-bladder hangs down from the lower part of the Liver, that Vessel which supports it, and by which it receives the Bile, is large, contrary to what is observed either in Man or Quadrupeds; for in them the Roots of the Gall-bladder are very slender. The Oesophagus at it's beginning is very narrow, and becoming gradually larger terminates in a large Bag, the Crop: The Stomach has almost the same Appearance with that of a Hen although it does not eat Grain, but only small Shell-Fish, which are rubbed by the Muscles of the Stomach the same as Grain. This Author tells us that the Phœnicopter was dissected by Monsieur Perault at Paris.

It's Wings being drawn out are of a Red Colour, whence it is commonly called Flamand, not upon account of it's being found in the Low-Countries, or Flanders, but because it's Feathers, when viewed through a pellucid Membrane, appear of a Flame Colour. There is hardly any Fowl larger than this; and it's Bill is crooked downwards on both Sides, which is peculiar to it alone; for it is bent like a Plough, and hence it is commonly called Becharruë, or Plough-Bill, from it's resemblance to a Plough. Thus far du Hamel.

I now proceed to the Explanation of the Figures, which were drawn from a Flamingo that was sent to Mr Botley to be stuffed.

Fig. 50. Gives a Side-view of the Head and Bill.

Fig. 50.

Fig. 51. In this is represented a Front-view of the same Parts.

Fig. 51.

Fig. 52. Exhibits the under-side of the Tongue next the under Bill.

Fig. 52.

In which *a* denotes a cartilaginous Substance that covers the Tip or Extremity of the Tongue; *b* a glandulous Substance at it's Basis; *c* the Horns of the Os Hyoides.

(a) Hist. Acad. Royale, Edit. Paris, p. 213.

Fig. 53.

Fig. 53. In this the upper-side of the *Tongue* is fairly delineated, upon which we see two Rows of strong *Papillæ Nervæ*; their *Apices* or Points turning inwards, for the better Retention of the Prey.

Fig. 54.

Fig. 54. In this the *Tongue* is drawn in a lateral View, that we may have a Prospect of the true Figure of these *Papillæ*, which being hooked and turn'd backwards prevent, in a great measure, the Return of any little Animal swallow'd alive, which they feed upon.

Fig. 55.

Fig. 55. The *Cornua* or Horns of the *Os Hyoidæum*.

The Anatomy
of the Heart
of Land-Tor-
toises of A-
merica. By
Mr P. Buf-
fiere, n. 328.
p. 170.

XXII. Mr *Mery* having (in the Memoirs of the Academy Royal of Sciences, Anno 1703.) endeavour'd to maintain his erroneous Opini- on, concerning the Use of the *Valves* which cover the *Foramen Ovale* in the Heart of an human *Fætus*; by the Comparison of the pretended *Valves*, which he imagines to be in the Heart of the *Land-Tortoises* of *America*, in the pretended *Ventricles* of the Heart of that Animal; and three *Commissaries* of Reputation, deputed by the *Academy*, having given an authentick Approbation to what is advanced by that Anato- mist; I took care to have some brought from *America*, to let the World know the true Structure of the Heart of this Animal, which, of all that might have been chosen, is the most proper to convince Mr *Mery* of his Mistake, and confirm the Use of the *Valve* of the *Foramen Ovale* in the Heart of an human *Fætus*, establish'd first by Dr *Harvey*, and confirmed and demonstrated by all Anatomists since his Time. The Structure of the Heart of this Animal being very simple, and the Use of the double *Valve*, which covers the two *Foramina* of the *Auricle*, in the *sole Ventricle* of the Heart, so plain and so manifest, that 'tis not possible to mistake, as it will be acknowledg'd by the Description of it's Parts and it's principal Vessels. I dissected three successively of the five I received from *Jamaica* in *September* last, being yet alive, in the Presence of Dr *Sloane*, Dr *Sylvestre*, Mr *Pujolas*, and Mr *Lafage*, an able Surgeon of *London*. The other two being dead by that time, I caused their Hearts to be taken out entire; one of which I sent to be dissected in *Paris*, and I kept the other, to satisfy the Curiosity of those who would see it.

A Description
of the Heart.

The Heart in this Animal is situated in the *anterior* Part of the Ca- pacity that maketh the *Abdomen*, separated from all the other *Viscera* by a large *Pericardium*, which encloseth it. This *Pericardium* is fasten'd by it's *superior* Part to the Spine of the Back, by the *anterior* to the Muscles of the Neck; which is the Cause that the Heart moveth forward when the Animal putteth forth his Head out of the Shell, and backward when he draws it in: By the *inferior* Part it adheres to the *Peritonæ- um*, which is fasten'd to the lower Shell; so that by all those Ligaments the *Pericardium* is kept distended sufficiently, that the Heart hath an entire Liberty in it.

In this *Pericardium* there is found a good Quantity of a very clear and transparent Water, which hath the same Use there, as that which is found in the *Pericardium* of other Animals.

'Tis