

Appendix I

Wallis on mathematical scepticism in *Truth Tried* (1643)

[pp. 40-41]: “But how this should anyway conferre to deciding of that question, whether *Quantity be divisible in semper divisibilia*: seems to me a greater mystery, then this Mystery that is to be cleared. For as long as *Mathematical Demonstrations* shall be thought worthy of credit, it shall *Never* be granted, that *Continuum constat ex indivisibilibus*. And however some Naturalists, that know little what belongs to the Nature of Quantity, make much ado to the contrary, and thereby betray their groste Ignorance in these things; Yet I am confident, that not any One *Mathematician* (deliberately, an in a Mathematical way) either *ever did*, or *ever will* assent to them. And I cannot without Indignation (or Pity rather) read sometimes how fondly and vainly some (otherwise) able Schollars think to shift off Mathematical Arguments in this and the like cases; which will not be so easily baffled by an empty Verbal Distinction, as some of their Idle Fallacies may. And if I make it not evident (to those that are acquainted with Mathematical terms) that a *Continuum* consists not of Indivisible Points, by as certain and infallible Mathematical Demonstrations, as That 2 and 2 make 4, I will hereafter turn *Sceptick*, and affirm confidently That we are sure of nothing.”

Wallis on mathematical scepticism in *Oratio*, orig. 1649, rep. in 1657, vol. I, p. 9:

Hoc saltem addam: Mathematicum studia non modo pro ea quam in se habent veritate colenda esse, (quae tamen ipsa, per se conspicua, & ultra Scepticorum litigia posita, animum reficiet valde & oblectabit;) sed & quod rerum aliarum cognitioni, nec id uno quidem nomine, conducant multum.

Appendix II

Hobbes on mathematical scepticism in 1656

[p. 184, what follows is the whole paragraph]: And where there is place for demonstration, if the first principles, that is to say, the definitions contain not the generation of the subject, there can be nothing demonstrated as it ought to be. And this in the three first definitions [of point, line and surface, my addition] of Euclid sufficiently appeareth. For seeing he maketh not, not could make any use off them in his demonstrations, they ought not to be numbered among the principles of geometry. And Sextus Empiricus maketh use of them (misunderstood, yet so understood as the said professors understand them) to the overthrow of that so much renowned evidence of geometry. In that part therefore of my book where I treat of geometry, I thought it necessary in my definitions to express those motions by which lines, superficies, solids and figures, were drawn and described, little expecting that any professor of geometry should find fault therewith, but on the contrary supposing I might thereby not only avoid the cavils of the sceptics, but also demonstrate divers propositions which on other principles are indemonstrable. And truly, if you shall find those my principles of motion made good, you shall find also that I have added something to that which was formerly extant in geometry.

[p. 317-8]: The cause why you have performed nothing in any of your books (saving that in your *Elenchus* you have spied a few negligences of mine, which I need not be ashamed of) is this, that you understood not what is *quantity, line, superficies, angle, and proportion*; without which you cannot have the science of any one proposition in geometry. From this one and first definition of Euclid, "*a point is that whereof there is no part*", understood by Sextus Empiricus, as you understand it, that is to say misunderstood, Sextus Empiricus had utterly destroyed most of the rest, and demonstrated, that in geometry there is no science, and by that means you have betrayed the most evident of the sciences to sceptics. But as I understand it for *that whereof no part is reckoned*, his arguments have no force at all, and geometry is redeemed. If a line have no latitude, how shall a cylinder rolling on a plane, which it toucheth not but in a line, describe a superficies? [...]

Hobbes on Sextus Empiricus in 1660, p. 3-4 (all brackets in the original)

A. [Mathematicum studia non modo pro ea quam in se habent veritate colenda esse, (quae tamen ipsa, per se conspicua, & ultra Scepticorum litigia posita, animum reficiet valde & oblectabit;) sed & quod rerum aliarum cognitioni, nec id uno quidem nomine, conducant multum.] Id quod de studio Mathematicae hic dicit, nonne tibi videtur dici etiam posse de studio Physicae vel Ethicae, vel Politicae, vel denique scientiae cuiuscunque?

B. Non. Nam Theoremata Physicae, quia actiones naturales pleraeque sensum fugiunt; Ethica propter voluntatis humanae inconstantiam; Politica propter Ethicae ignoracionem pauca possunt demonstrari. Praeterea, habet Mathematica certa quaedam & indubitata demonstrandi Principia; qualia sunt *Definitiones, Axiomata, Petitiones* quae non habet neque; Politca, neque; Ethica, neque; etiam Physica. Quare Mathematicam extra litigia Scepticorum solam eminere recte dicit.

A. Nonne etiam rationis lineae ad lineam, vel cuiuslibet magnitudinis ad aliam magnitudinem akeibeia sensum fugit? Potest tamen demonstrari. An non & verae Physicae sua inest veritas, que vel affirmative vel negative enuntiari potest? Nonne litigat cum Mathematicis non minus quam cum Dogmaticis Sextus Empiricus Scepticus? Praeterea non minum oblectat animum in Physicis, vel Ethicis, vel Politicis, inventa veritas, quam in Geometricis.

B. Imo magis, quanto scilicet in illis saepius erratur, quam in Geometria.

A. Etiam vocabula quibus in Physica, Ethica, Politica Philosopho utendum est, an definiiri non possunt?

B. Possunt.

A. Cur ergo in his magis quam in illis desideras principia? An si assumerentur in Physicis, Ethicis, & Politicis Postulata, Petitionesque; sicut in Euclidis Elementis Geometriae, eone firmiores fore demonstrationes esse iudicas? Si ita iudicas, toto coelo erras. Sunt enim eo infirmiores. Quicquid enim assumitur precario naturam tollit demonstrationis.

B. Intelligo iam quid dicendum *Wallisio*, si sententiam suam akribos voluisset explicare, nempe, scientiam unam altera neque; veriore, neque; evidentiore esse, sed Doctores alium alio peritiorem esse, id est; veritatem magis intelligere, melius demonstrare, a tricis verborum melius cavere, & in illas, si forte incidat, facilius se inde extricare posse.

Hobbes on Sextus Empiricus in 1660, English translation

A. Does it not seem to you that what he says about the study of mathematics holds true of the study of physics, or ethics, or politics or in the end of any other science?

B. Not at all. For little can be demonstrated concerning physics' theorems, given that most natural phenomena escape perception, ethics, owing to the fickleness of human will, and politics, given the lack of knowledge of ethics. Besides, mathematics possesses some undoubted principles of demonstration, namely definitions, axioms and assumptions, that politics, ethics and even physics lack. That's why he is right in saying that only mathematics stands out [NB. Both in the sense of "emerges untouched" and in the sense of "it is left untouched"] from the sceptics' disputes.

A. But isn't it the case that the precise ratio between two lines or indeed any two magnitudes escapes perception? And yet, they can be demonstrated. And is it not true that the actual truth of physics can be grasped, whether negatively or positively? And doesn't Sextus Empiricus the sceptic dispute with mathematicians no less than with dogmatic philosophers? So ascertained truth delights the mind no less in physics, in ethics and in politics than in geometry.

B. No indeed, even more. Certainly one often makes mistakes in those sciences as much as in geometry.

A. And even the technical vocabulary that a philosopher needs to use in physics, ethics and politics, can be accurately defined, can it not?

B. It can.

A. Why then do you miss principles more in his vocabulary than in geometry's? And if we introduce postulates and assumptions in physics, ethics, and politics, as we do in Euclid's Geometry, do you consider that their demonstrations will be more firm? If so, you are entirely mistaken. They are certainly less firm. But whatever is assumed to be doubtful loses the characteristics of being a demonstration.

B. I understand now what one should have said to Wallis, if one wanted to clarify what he means by "precision"; certainly, one science is no more true or certain than another, but the doctors have various degrees of expertise in one or another, that is they understand and demonstrate their truth better, and they better deal with their vocabulary, and if by chance they entangle themselves, they can easily extricate themselves.