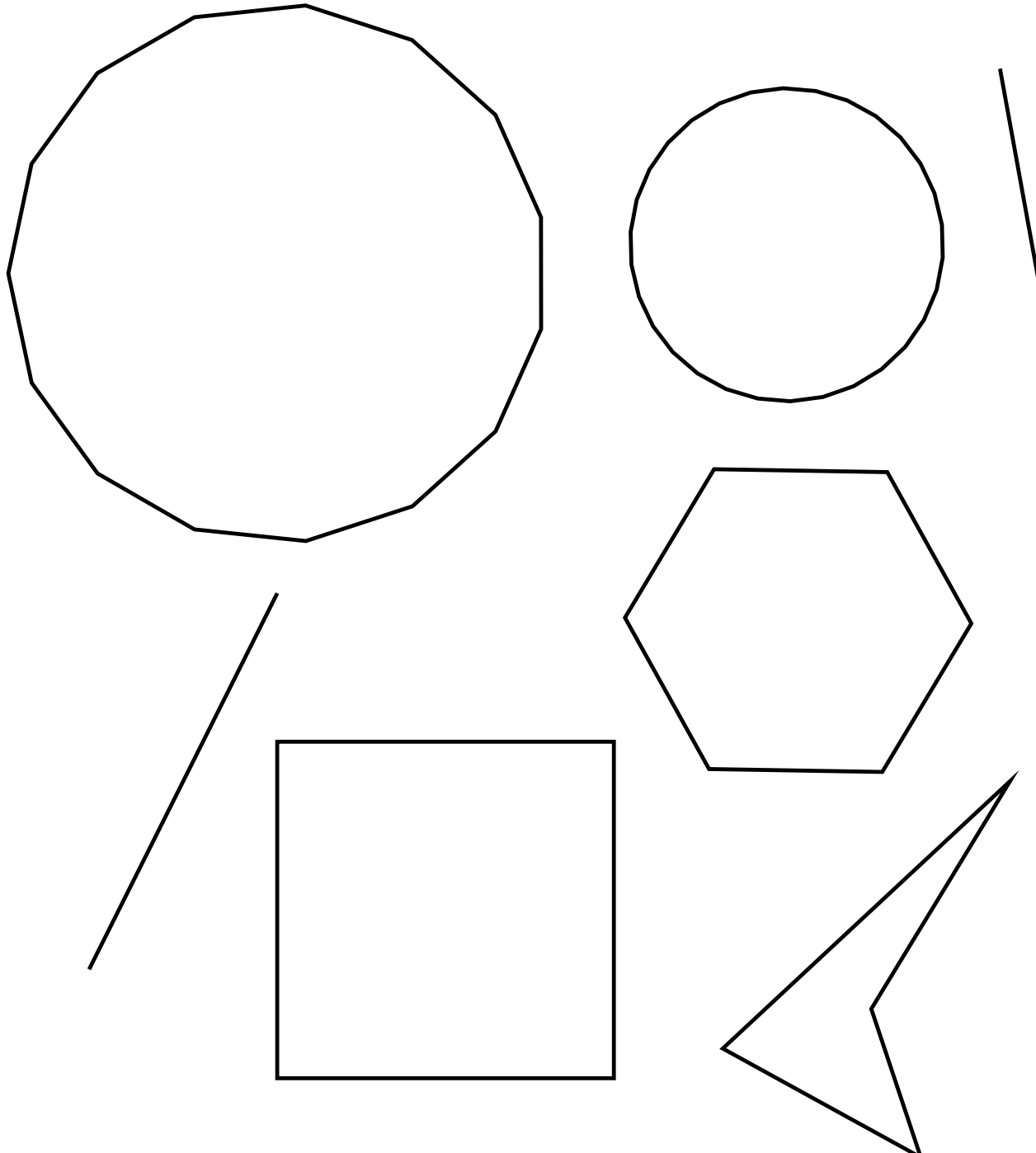


Flatland: Sections 1 - 5



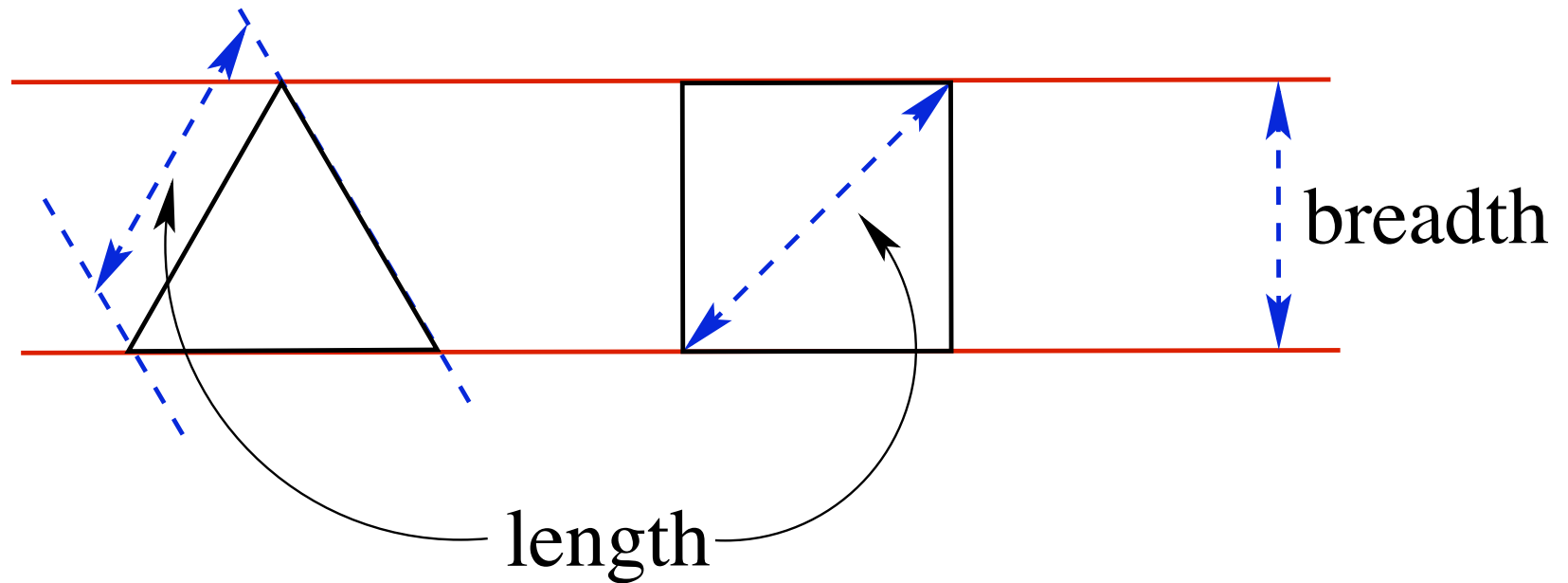
Some Shakespeare:

“O day and night, but this is
wondrous strange”

“Fie, fie, how frantically I square my talk”

“Be patient, for the world is broad and
wide”

The dimensions of a Flatland Male



Females in Flatland

Flatland p14: For whenever the temper of the Women is thus exasperated...

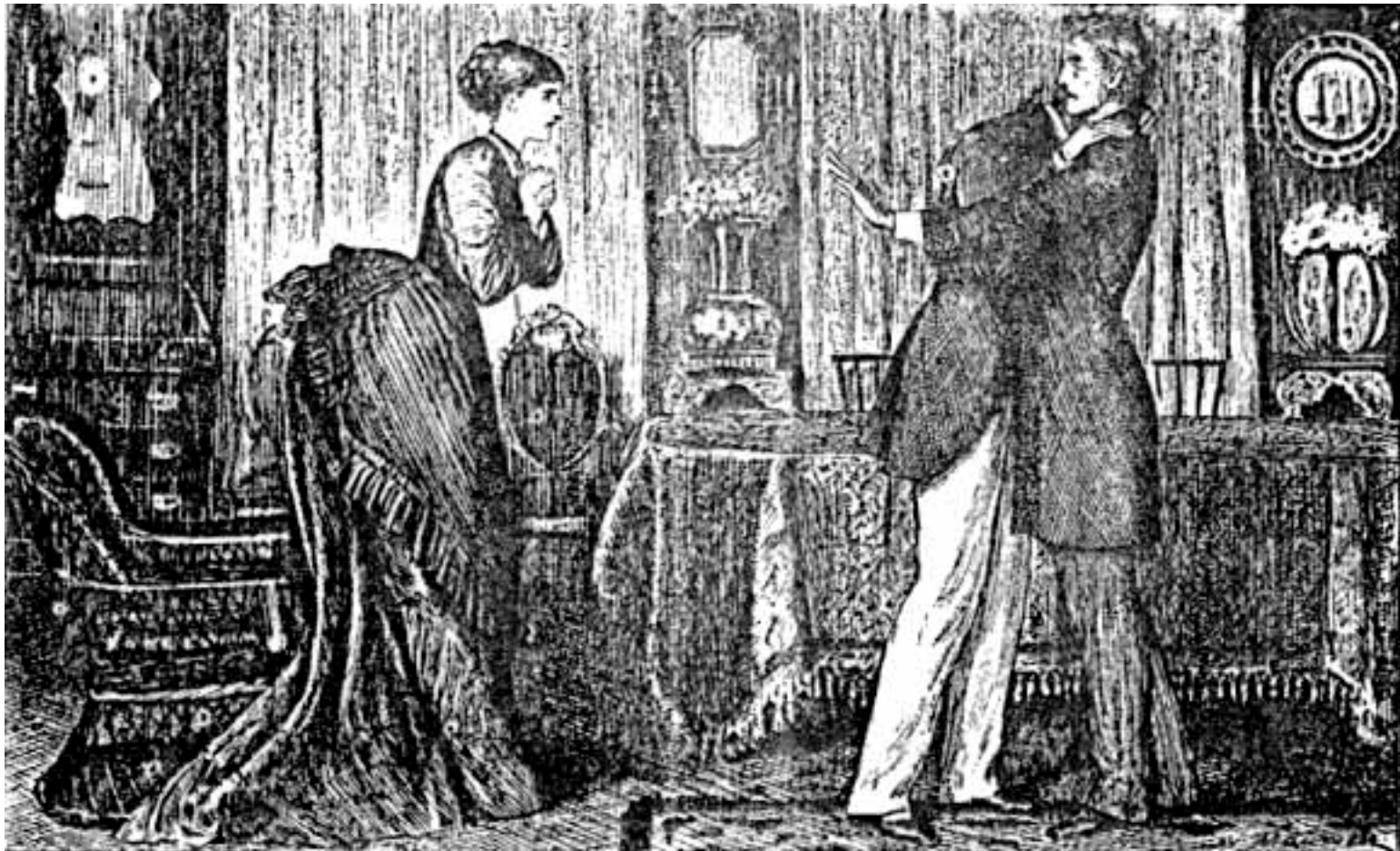
An appeal against female suffrage: Were women admitted to this struggle, their natural eagerness and quickness of temper would probably make them hotter partisans than men. as their political relations stand at present, they tend to check in them the disposition to partisanship, and to strengthen in them the qualities of sympathy and disinterestedness. We believe that their admission to the suffrage would precisely reverse this condition of things, and that the whole nation would suffer in consequence.

The Nineteenth Century June 1889

An appeal against female suffrage: Were women admitted to this struggle, their natural eagerness and quickness of temper would probably make them hotter partisans than men. as their political relations stand at present, they tend to check in them the disposition to partisanship, and to strengthen in them the qualities of sympathy and disinterestedness. We believe that their admission to the suffrage would precisely reverse this condition of things, and that the whole nation would suffer in consequence.

The Nineteenth Century June 1889

Flatland p14: ...[N]o female is suffered to stand in any public place without swaying her back from right to left ... The rhythmical and, if I may so say, well-modulated undulation of the back in our ladies of Circular rank is envied and imitated... *du Maurier 1889*



<http://www.victorianweb.org/art/costume/nunn9.html>

Acknowledgement:

Many of the notes on the text are taken from a forthcoming annotated *Flatland* by Banchoff and Lindgren.

Euclid in the 19th Century

But Mr. Stelling took no note of these things; he only observed that Tom's faculties failed him before the abstractions hideously symbolized to him in the pages of the Eton Grammar, and that he was in a state bordering on idiocy with regard to the demonstration that two given triangles must be equal, though he could discern with great promptitude and certainty the fact that they were equal. Whence Mr. Stelling concluded that Tom's brain, being peculiarly impervious to etymology and demonstrations, was peculiarly in need of being ploughed and harrowed by these patent implements; it was his favorite metaphor, that the classics and geometry constituted that culture of the mind which prepared it for the reception of any subsequent crop. I say nothing against Mr. Stelling's theory; if we are to have one regimen for all minds, his seems to me as good as any other. I only know it turned out as uncomfortably for Tom Tulliver as if he had been plied with cheese in order to remedy a gastric weakness which prevented him from digesting it.

The Mill on the Floss George Eliot 1860

In the course of my law reading I constantly came upon the word “demonstrate”. I thought at first that I understood its meaning, but soon became satisfied that I did not. I said to myself, What do I do when I demonstrate more than when I reason or prove? How does demonstration differ from any other proof?

I consulted Webster’s Dictionary. They told of ‘certain proof,’ ‘proof beyond the possibility of doubt’; but I could form no idea of what sort of proof that was. I thought a great many things were proved beyond the possibility of doubt, without recourse to any such extraordinary process of reasoning as I understood demonstration to be. I consulted all the dictionaries and books of reference I could find, but with no better results. You might as well have defined blue to a blind man.

At last I said,- Lincoln, you never can make a lawyer if you do not understand what demonstrate means; and I left my situation in Springfield, went home to my father’s house, and stayed there till I could give any proposition in the six books of Euclid at sight. I then found out what demonstrate means, and went back to my law studies.

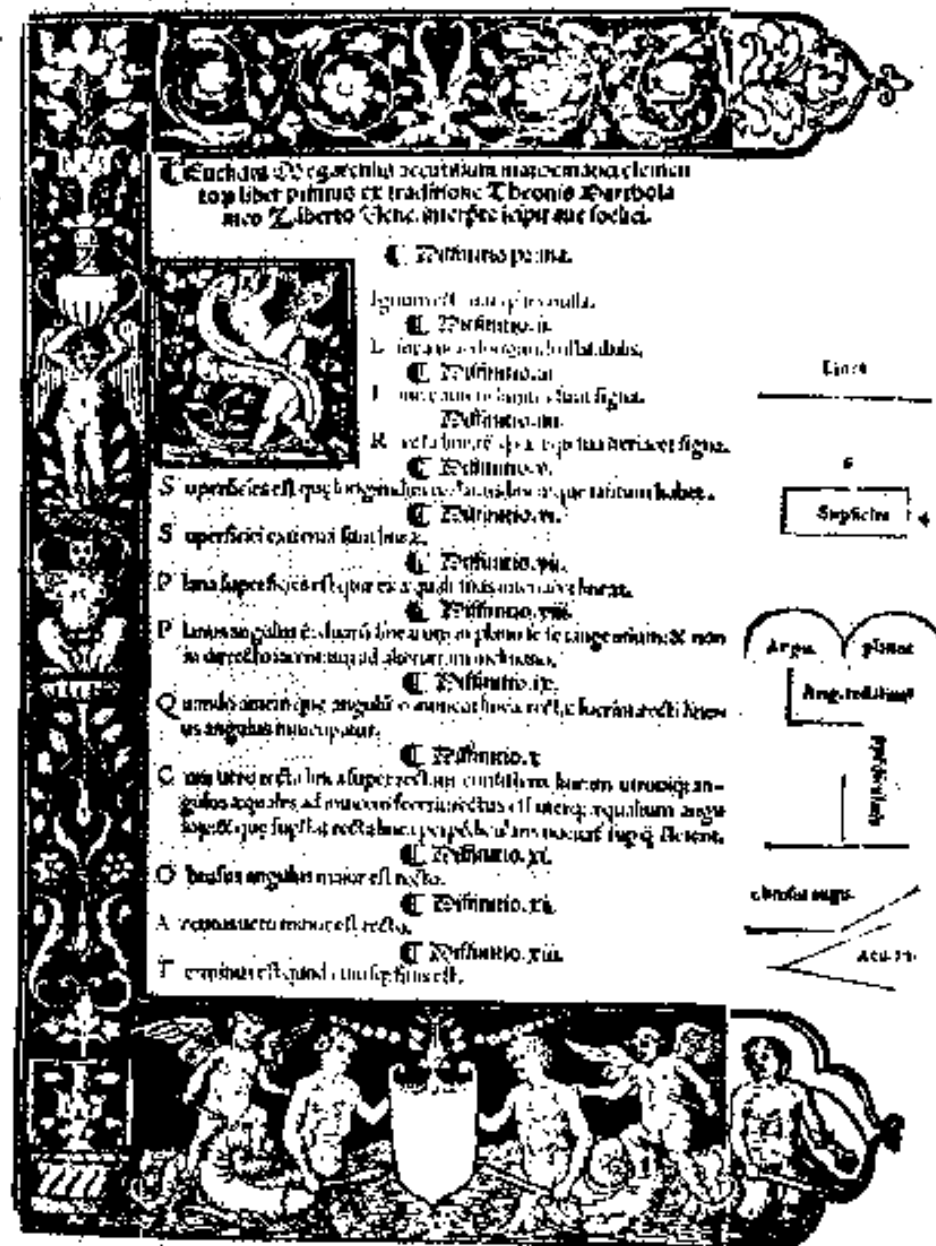
Abraham Lincoln

Euclid of Alexandria

- c. 300 BCE
- student of Plato's students
- started a school at Alexandria
- compiled the Elements
from theorems of Eudoxus,
Thaetetus, and others.

The Elements

Almost from the time of its writing and lasting almost to the present, the Elements has exerted a continuous and major influence on human affairs. It was the primary source of geometric reasoning, theorems, and methods at least until the advent of non-Euclidean geometry in the 19th century. It is sometimes said that, next to the Bible, the "Elements" may be the most translated, published, and studied of all the books produced in the Western world. -van der Waarden



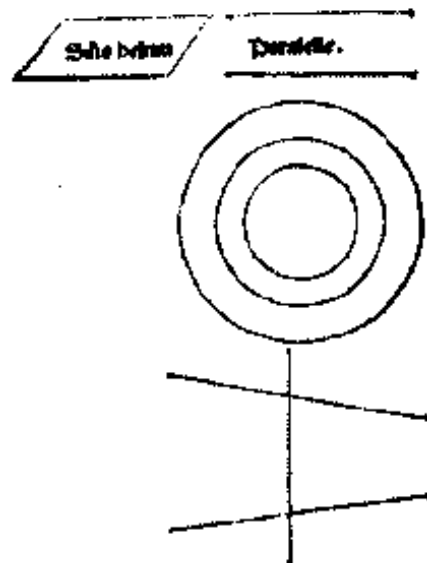
The structure of The Elements

Definitions

5 Postulates (Axioms)

5 Common Notions

Propositions



¶ Alia est similis belinaym que opposita latera habet equalia atq3 oppositos angulos equalis: idē tamen nec rectis angulis nec equis lateribus cōtinet: Propter has autē oēs quadrilaterę figure belinayripbe nominantur. ¶ Equidistantes linee sunt que in eadem superficiē collocatę atq3 in alternatam partem p̄tractę non conveniunt etiā si in infinitum protrahantur.

Postiones sunt quinq3: ¶ Al quolibet p̄cto in quēlibet punctum rectā lineā trahere atq3 lineā definitā in cōtinuū rectūq3 quālibet protrahere. ¶ Super centrū quodlibet quālibet occupando spaciū circulos designare. ¶ Omnes rectos angulos sibiinvicem esse equalis. ¶ Si linea recta sup duas lineas rectas ceciderit duosq3 anguli ex vna parte duob⁹ rectis angulis minores fuerint istas duas lineas in eadē p̄e p̄tractas p̄culdubio p̄dictim ire. ¶ Duas lineas rectas sufficiē nullam concludere.

Commones animi p̄ceptiones sunt hec: ¶ Que vni ⁊ eidē sunt equalia ⁊ sibiinvicē sunt equalia: ¶ Et si equalib⁹ equalia addant tota quoq3 fiēt equalia. ¶ Et si ab equalib⁹ equalia auferant que relinquūt erūt equalia. ¶ Et si ab ineq⁹lib⁹ equalia addas ipsa quoq3 fiēt ineq⁹alia. ¶ Si fuerint due res vni equalis ipse sibiinvicem erūt equalis. ¶ Si fuerint due res quax utraq3 vni⁹ eulde3 fuerit dimidiū utraq3 erit equalis alteri. ¶ Si aliqua res alicui superponat applicetq3 ei nec excedat altera alterā ille

The structure of The Elements

Definitions

Definition 1: A point is that which has no part.

Definition 15: A circle is a plane figure contained by one line such that all the straight lines falling upon it from one point among those lying within the figure equal one another.

The structure of The Elements

Postulates

1. To draw a straight line from any point to any other point.
2. To produce a finite straight line continuously in a straight line.
3. To describe a circle with any center and any radius.

The structure of The Elements

Postulates

4. That all right angles equal one another.

5. That if a straight line falling on two straight lines makes the two interior angles on the same side less than two right angles then the two straight lines produced indefinitely meet on the side having the two angles which are less than two right angles.

The structure of The Elements

Common Notions

1. Things which equal the same thing also equal each other.
2. If equals are added to equals, then the wholes are equal.
3. If equals are subtracted from equals, then the remainders are equal.
4. Things which coincide with one another equal one another.
5. The whole is greater than the part.

The structure of The Elements

Propositions

10. To bisect a given finite straight line.

18. In any triangle, the angle opposite the greater side is greater.

Geometry in Victorian England

- Leibniz notation for Calculus allowed on Tripos in 1819.
- c 1819 geometry deemphasized.
Reemphasized in 1848.
- 1839 mathematical suggestions by Gregory
corr. to higher dimensions.
- Some criticism of detail of The Elements

Geometry in Victorian England

Two Questions:

1. Are the higher dimensions suggested by analysis and algebra geometric entities?
2. Can geometries other than Euclid's be conceived? Is Euclidean geometry adequate for spatial reasoning?

Geometry in Victorian England

- 1860s mathematicians begin to consider non-Eucl. geometries of Bolyai and Lobachevsky (1820s)
- 1866 Riemann publishes. Discussed by Sylvester (1869), Helmholtz (1870), Clifford (1874).
- Projective Geometry popularized by Cayley beginning in 1859

But you must note this: if God exists and if He really did create the world, then, as we all know, He created it according to the geometry of Euclid and the human mind with the conception of only three dimensions in space. Yet there have been and still are geometricians and philosophers, and even some of the most distinguished, who doubt whether the whole universe, or to speak more widely, the whole of being, was only created in Euclid's geometry; they even dare to dream that two parallel lines, which according to Euclid can never meet on earth, may meet somewhere in infinity. I have come to the conclusion that, since I can't understand even that, I can't expect to understand about God. I acknowledge humbly that I have no faculty for settling such questions, I have a Euclidean earthly mind, and how could I solve problems that are not of this world? And I advise you never to think about it either, my dear Alyosha, especially about God, whether He exists or not. All such questions are utterly inappropriate for a mind created with an idea of only three dimensions.

The Brothers Karamazov Dostoevsky

Ultimately, all discussions about the nature of geometry are discussions about its foundations, whether they take place at the forefront of mathematical research or on the apparently mundane level of elementary teaching. This is nowhere clearer than in England in the 1870s and 1880s. during this period nearly all of England's mathematical enthusiasts were directly involved in considering the optimal form of elementary geometry textbooks.

1868: Wilson
publishes
alternative to The
Elements. Heavily
criticized by
de Morgan and
Dodgson (1879).

BOOKS I.—V.

CONTAINING

THE SUBJECTS OF EUCLID'S FIRST SIX BOOKS:

FOLLOWING THE SYLLABUS OF GEOMETRY PREPARED
BY THE GEOMETRICAL ASSOCIATION.

BY

J. M. WILSON, M.A.

LATE FELLOW OF ST JOHN'S COLLEGE, CAMBRIDGE,
AND MATHEMATICAL MASTER OF RUGBY SCHOOL.

FOURTH EDITION.



London :
MACMILLAN AND CO.

1878.

[The right of translation and reproduction is reserved.]

183 . 2 . 102 .