

Notes to Chapter 5

(1) M.S. Cotton. Vitell. C.VII., f 310 et seq; printed Hearne's *Joannis Glastoniensis Chronica*, Vol. II, P. 490 ff., and *Chetham Miscellany I*, p. 46 ff. The date, Jan. 15, 1556 might suggest that the work was planned while Dee was still in Bonner's household. However, New Year's day was officially March 25th, though Dee does not seem uniformly to observe this usage, which would give the year as 1557 (M.S.) and there is no evidence as to how prolonged Dee's residence with Bonner was, though he remained associated with him for some little time (vide infra n. 3).

Dee does not mention this work in either of his lists of his writings (in the C.R. and *Letter Apologeticall*) though he includes items equally brief or occasional. It is possible that this omission sprung from the natural desire to avoid stressing his former contacts with the authorities under Mary's Catholic régime (with the exception of course of his imprisonment then).

(2) Thus on the fly leaf of a transcription (dated 155?) of a work of Lull's, he writes against an extraneous comment: "This is my scribe Christopher Cory his note...." (Kenelm Digby MS 197). Another MS is headed "Liber experimentorum Raymundi Lulli mihi Roma transmissus anno 1564. Joannes Dee"; and its colophon states: "Ego Blasius de Santulianhas librum scripsi pro D^{no}. meo Jo. Dee et consignari eam D^{no}. Guirando causa mittendi dicto D^{no}. meo Jo. Dee in presencia Dⁿⁱ. Mercurii Candrevila Rome die 28 Jun. anno 1564," which is followed by the note "J. Dee Recepti Antperpiae 1564 Feb. 28." See James, *Catalogue MSS Trinity College Cambridge*, 1403, 0.8.28. Various printed books Dee possessed reveal themselves as sent from abroad, e.g., to keep to the same author, Lull's *de Kabbalistico Auditu*, Venice, 1518 (Dee's copy in R.C.P.) has on its last leaf: "Aspice Domine de sede sãcta tua. Joannes Dee. Lond. Recepti a Roma 29 Aprili A° 1564 Antwerpiae."

(3) See note in James' *Catalogue Corpus Christi MSS* to No. 191; also James' *Catalogue Peterhouse MSS*, p. 364. They were borrowed 1556, due back 1558. Dee's memorandum concerning them is Corpus Christi MS. 191, f 97v. On f 82v. the borrowing of an MS from Queens Oxford on 12 May 1556 (six days after the borrowing from Peterhouse Cambridge) which contained three works of Archimedes, is recorded. Dee's continued friendship with Bonner is shown by the fact that he notes here that an Oxford doctor "et episcopus Londiniensis pro eiusdem voluminis redditione onus omne in se susciperunt."

(4) See James' *Catalogue MSS Trinity College*, No. 280, p. 360. The date of this transaction, and that previously noted, is almost the only evidence that Dee had any subsequent relations with the English universities after his departure from Cambridge in 1549.

(5) See Mallet, *History of Oxford University*, Vol. II, p. 91 ff, for an account of these conditions and phrases here quoted.

Corpus Christi MS 243 is a large folio volume containing various writings of Alexander Aphrodisias and Chalcidius on the *Timaeus*, *Meno*, and *Phaedo*. On the final leaf has been written "C'est livre est a moy Homfrey duc de Gloucestre....," below which Dee entered "Et a ceste heure voyre en l'an de notre signeur 1557 a moy, Jehan Dee, Angloys, quel ie achetai par le poys payant pour chacune livre un gros" (f 197).

Conditions in the university perhaps were also partly responsible for the dispersal among private persons--one of whom was Dee--of the library of Nicholas Kratzer who had formerly been mathematical lecturer in Oxford, and seems to have devoted himself not merely to astronomical theory but to instrument making, and various practical and utilitarian applications of mathematics. (See Wood, *Annals*, II, p. 837: Kratzer "lived to the year 1550, and dying soon after (in England I think) many of his books came into the hands of Dr. John Dee....")

(6) Printed *Cambridge Antiquarian Communications*, Vol. III, p. 157. Some of Dee's MSS have entries indicating how they were acquired; they fit in with this picture, but they are not as a rule very informative in themselves. Typical is "Joannes Dee 1576 Maii, bought upon a stall

in London" (inscription on MS Cotton Vesp. A.X.).

(7) *de Superficierum Divisionibus Liber*, +3^r, opening of prefatory letter to Commandine.

(8) For details see J.P. Gibson, *The Library of Henry Savile of Banke*, Bibl. Soc., Trans. Vol. IX, 1908, pp. 127-210; also C.E. Wright, *The Dispersal of the Monastic Libraries* (Transactions Camb. Bib. Soc. 3, 1951, pp. 208-237, esp. 209-212.

(9) Leland himself formed a considerable collection, some of which passed into Dee's hands. Thus Kenelm Digby MS 76, containing several works of Bacon, has Dee's signature, the date 1556, and the note "emi ex bibliotheca Lelandi."

(10) Gibson op. cit. (supra n. 8), p. 129, e.g., the Bodley, Parker and Cotton collections, but all these were private. Dee's scheme envisages a centralised and comparatively public collection. It is interesting to compare Dee's plans for this state library with Panciroli's views, who singles out its official public libraries as one of the excellencies of the ancient, and the lack of these as one of the most disgraceful features of the modern world. Imperial Rome, he claims, boasted twenty-nine; "but we want this conveniency nowadays," "There are but three only at this time in Italy"--the Vatican at Rome, the Medicean at Florence, and St. Marks, bequeathed by Cardinal Bessarion in Venice--"but there's no free admission for everyone into these" (*History of Many Memorable things in use among the Ancients but now lost*, Pt. II, Ch. 5, p. 68). Dee's proposals are of significance in also pointing to his place in the broader current of Renaissance humanism, in contrast to a more purely scientific intellectual tradition. Petrarch made an eloquent plea for public as against private collections of books in *De Remediis utriusque Fortunae*, and had been called the first to understand the value of such libraries; Palla degli Strozzi had collected books with the express purpose of founding a public library in Florence and Cosmo de Medici had directed his energies and resources to establishing institutions of this kind. (See J.A. Symonds, *Renaissance in Italy*, Vol. II, "The Revival of Learning," London, 1882, 2nd ed., pp. 74, 166 et seq, 173 et seq.) In connection with Archbishop Parker's scheme, Wright quotes a letter from the Privy Council to Bale, of 7 July, 1560, *Dispersal of the Monastic Libraries*, pp. 212-213 from Corp. Christi MS. 114 f. 49) which seems to echo Dee's proposals at a number of points. It speaks of the Queen's "care and zeale," for the "conversation of such ancient monuments" as deal with English history and had formerly been in the monasteries. All such MSS were to be submitted to the Archbishop of Canterbury after letters should have been sent to the present owners demanding their temporary surrender, but with the assurance "not meaning hereby in the use of such bookes for a tyme to withdrawe them from your ryghte & interest unto them but after a tyme of perusing of the same upon promise or bonde to make restitution of them againe safely into your handes to be safely kept hereafter, so as both when any neede shall require resort may be made for the testimonie that may be founde in them, and also by conference of them, the antiquitie of the state of these countreyes may be restored to the knowledge of the worlde." (Dibdin--apropos of Dee's proposals to Mary--*Bibliomania*, p. 251, describes a similar later project, from details given by Hearne: *Collection of Curious Discoveries of Antiquaries*, II, p. 324, for founding a national library "to be entitled THE LIBRARY OF QUEEN ELIZABETH, and the same to be well furnished with divers ancient books and rare monuments of antiquity."

(11) Vide infra Ch. 9, n. 202, p. 484; Ch. 10, p. 841; n. 73, p. 545a etc.

(12) 10 March 1575, C.R. Ch. IV, p. 17.

(13) Vide infra Ch. 7, p. 636 et seq, for an account of these proposals.

(14) *Ephemeris Anno 1557*, published Sept. 12th, 1556--A III r-v Feild's prefatory letter. On astronomy he writes here: "Tāta est autem tāqz admirabilis huius artis voluptas, vt nunquam possim sane desinere, vel suauiissimo hoc cibo humanitatis & scientiae. Animum meum

alere, vel immortales illi gratias agere, a quo primum huius disciplinae praeceptes imbutus sim & instrudus." He ends with the exhortation "deum precare ut fautores nobis huius scientiae et plures det et liberiores, quo impetrato, dubitandum sane nèn est, quin tam fructuosa brevi haec ars futura sit et honorato, quam inutilis iamdiu iacuit et neglecta." (Feild would seem to have been a learned and cultured man and no mere almanac maker. His preface is despatched "from his library," he supplied Bale with much rare bibliographical information and Bale calls him "vir hebraice grece ac Latine peritus." *Index of British Writers*, ed. Lane, Poole, p. 200. Tanner writes in *Bib. Britannico--Hibernica*, "Feild Johannes, Patria Loniniensis in academia Oxon. educatus, et ibi (ut videtur) gradu baccalaurei in artibus A.MDXX ornatus fuit. Post in patraim (sic) urbem reversus, astrohonus evasit per ea secula peritissimus." p. 275. He is possibly the John Feild who is one of the two learned instructors among the three interlocuters in Thomas Gale's important *Certaine Workes of Chirurgerie*, London, 1563, but should not be confused with the contemporary vicar of S. Aegidius, Cripplegate, who is, of course, the translator of Calvin's sermon on Jacob and Esau, in 1579 listed under John Feild in Maunsell's *Catalogue of English Printed Books*, 1595, p. 50.)

(15) *Ephemeris Anno, 1557* Ai^r-v.

(16) Pp. 164-165. See Johnson: *Astronomical Thought*, pp. 126-128, for quotation in full, and comment.

(17) Luther, *Colloquia Mensalia*, trans. H. Bell, London, 1652, Sect. LXX, p. 503. After denouncing astrology as blasphemous superstition, Luther said: "I am now advertised that a new Astrologer is risen, who presumeth to prove that the earth moveth and goeth about, not the Firmament, the Sun, Moon nor the stars, like as when one sitteth in a Coach, or in a Ship, and is moved thinketh he sitteth still and resteth, but the earth and the tress, go, run, and move themselves. Therefore thus it goeth when we wean ourselves to our own foolish fancies and conceits. This foole will turn the whole Art of Astronomie upside down, but the Scripture sheweth and teacheth him another lesson."

(18) *Coelii Calcagnini: Opera Aliquot*, pp. 388-394. Calcagnini displays no knowledge of mathematics, but they form the subject of one of his epistles (pp. 127-129) which is an encomion upon them since all true philosophers have recognised in their study an opening of a gateway to the divine.

(19) *Ephemerides Meteoregraphicae, Richardi Forsteri....1575* Giiij^v.

(20) Appended to his reissue of his father's *Prognostication Everlasting*, 1576. Reprinted and discussed by F.R. Johnson and S.V. Larkey, *Thomas Digges the Copernican system and the Idea of the Infinity of the Universe in 1576* (H.L.B. No. 5, April 1934, p. 69 et seq). Even, twenty years later in 1597, Galileo who was still teaching the Ptolemaic cosmography at Pisa--as the basis for his instructional work on the sphere; could still write to Kepler that he was afraid to publish his secret adherence to the Copernican doctrine, fearing the general ridicule and derision that would follow. (Fahie: *Galileo*, p. 40.) Dee is sometimes spoken of as a Copernican on the evidence of his preface to Feild's epemeris (e.g., E.B. Knobel, article on astronomy in *Shakespeare's England*, 1916. Dee in this letter "ranged himself with the supporters of Copernicus." *Recorde and Feild* are also claimed as believers in the heliocentric system, p. 447). But, as has been shown, Dee's own statements give no warrant for such an assertion.

(21) Vide infra Ch. 8, p. 705 et seq.

(22) *Narratio Prima*, trans. in *Three Copernican Treatises*, ed. Rosen, p. 122.

(23) E.g., Reyherns *Dissertatio de Nummis ex chemico metallis factis*, 1692, p. 122. "Qui cupit aliquid ex profundissima Chymiae scientia ad finem producere, opus est, up *corpora coelestia* benè considerat," after which he places a diagram of the planetary system on the

Copernican model with an exposition of it "Sol (or Gold) residet in medio, tanquam Imperator Planetarum totum Mundum, & coeteras Planetes potentissimè gubernans."

- (24) Vide infra Ch. 8, p. 666 et seq.
- (25) See B. Gunzberg, *The Scientific Value of the Copernican Induction* (Osiris I, 1936, pp. 303-314).
- (26) Wolf, *History of Science....in the 16th and 17th Centuries*, p. 21.
- (27) *Letter against Werner*, trans. Rosen (*Three Copernican Treatises*), pp. 99-100.
- (28) *De Revolutionibus Orbium Collestium*, lib. VI, p. 1543, Preface aj^v.
- (29) *Commentariolus*, trans. Rosen (*Three Copernican Treatises*), p. 81.
- (30) Brunschvicg, *L'Expérience Humaine*, p. 168.
- (31) *A Discourse concerning a new Planet*, Bk. II (*Works*, Vol. I, p. 219). On Copernicus' own Pythagoreanism, which ennobled the concept of sphericity into a mechanical cause, see H. Butterfield, *Origins of Modern Science*, London, 1950, p. 27 et seq.
- (32) The arguments favouring it today are largely of a type that in the 16th century militated strongly in favour of the Ptolemaic system--their force lying in the elimination of unnecessary hypotheses that result from its acceptance. Thus Poincaré writes (*La Valeur de la Science*, p. 273) "Le mouvement diurne apparent des étoiles, et le mouvement diurne des autres corps célestes....l'aplatissement de la Terre, la rotation du pendule de Foucault, la giration des cyclones, les vents alizés....Pour le Ptoleméen tous ces phénomènes n'ont entre eux aucun lien, pour le Copernicien ils sont engendrés par une même cause" etc. At the same time it may be noticed that as late as 1698 Leybourn in the *Cursus Mathematicus* (p. 345 et seq) when discussing astronomy still feels it necessary to give full expositions of a variety of possible systems--the Ptolemaic, Copernican, Tychoinic, Semi-Ptolemaic, Semi-Tychoinic and that of Riccioli--and forbears any absolute decision for or against any of them. However it would seem that he felt that of Copernicus to be most mathematically pleasing and its harmoniousness to be the strongest argument in its favour, for when he writes of the benefits of geometry he follows a similar passage in Dee's *Preface* almost to the letter, but makes one addition, though only one, to Dee's list of geometrical arts and applications, and that is the declaration that geometry "solveth the *Phenomena* of that heroick *Hypothesis* of Copernicus of the Stability of the Sun and motion of the Earth" (p. 205, Proem Bk. II, Pt. I).
- (33) *Old Arguments against the Motion of the Earth*, p. 11 (in *Companion to the Almanac*, 1836, pp. 3-30; it is unsigned but from the same hand as an article generally ascribed to de Morgan in the 1837 *Companion*).
- (34) *de Disc. Math (Opera*, Vol. I, p. 149).
- (35) *De Caelo*, II, 13, 293a.
- (36) *Descriptio Globis Intellectualis*, VI, Works, Vol. 2, p. 654.
- (37) *The New Planet, No Planet, or the Earth no wandring Star*, 1646, pp. 38 and 60. (Again, Aristotle's argument from the part to the whole, that a piece of earth displaced from the centre falls back to it, therefore the whole world would do so were it temporarily removed, is paralleled by Ross's variant of the stone dropping experiment along the mast of a ship, he has observed the smoke of a candle on a moving ship, and concludes triumphantly that if the ship in motion cannot carry a part of the air with it, how should the earth carry along the atmosphere, p.

71.) Despite this interpretation of Ross's arguments, it must nonetheless be admitted that he is an unpleasantly abusive and even dishonest controversialist. He seeks to discredit all the upholders of a heliocentric system by personal vituperation. Pythagoras, he declares, is proved to have been "a witch" by his very name, Cusanus was merely "a man that affected singularities," while he does not scruple to say of Galileo referring to his enforced recantation, that he "fell of from Copernicus" "being both ashamed and sorry that he had been so long bewitched with so ridiculous an opinion" (p. 9).

(38) Rep. Johnson, ed. Larkey, H.L.B. 5, p. 94 (*Prognostication Everlasting* O.3^r).

(39) *Works*, Vol. 1, p. 13.

(40) *Two Principal Systems*, Dial I, Salusbury trans. Vol. I, p. 22.

(41) *Ibid*, Dial 2, Vol. 1, p. 150.

(42) *Ibid*, Dial 3, Vol. 1, p. 301.

(43) See J.B. Hart, *Mechanical Inventions of Leonardo da Vinci*, London, 1925, pp. 85-86.

(44) See *Two Principal Systems*, Dial 3, Vol. I, p. 361.

(45) *Ibid*, Dial 2, Vol. I, p. 101.

(46) *Ibid*, Dial 1, Vol. I, p. 25.

(47) *A Dialogue Philosophicall Wherein Nature's secret closet is opened....tending to mount mans minde from Nature to Supernaturall and Celestial promotion*, 1612, p. 58. Tymme, who to some extent seems to have regarded himself as a disciple of Dee (vide infra Ch. 6), continues however that he will answer "With reasons not taken out of humane Philosophie which (as I have said) is uncertain," but from the Bible, eventually concluding "Let therefore these Divine Warranties and evidences of Sacred Scripture suffice to confound man's vaine invention and fond imagination concerning the stability of the Heavens and motion of the Earth."

(48) *Prognostication Everlasting* O 2^v (H.L.B. 5, pp. 93-94).

(49) *Two Principal Systems*, Dial. 2, Vol. I, pp. 123 and 157. Galileo goes on to deny the supposed result in the first case, which he could nevertheless account for were it a fact, on logical grounds without abandoning the earth's motion. He has not tried the experiment nor heard any of having done so, and seems to regard the trial as unnecessary since he claims to establish "the inevitable result" by reason. Digges seems to have been the first and perhaps only sixteenth century figure who may have actually performed what the Ptolemaicists regarded as an *experimentum crucis*, and he records that the plummet appears to drop in a right line down the mast and so must have a real motion "mixt of right and circular." (*Prognostication Everlasting* O 2^r H.L.B. 5, pp. 92-93). The next person who cites an observational result appears to be Gassendi, who in 1643 answering Morin who had instanced the "experiment" in defence of Ptolemy, stated that he had witnessed it at Marseilles and the result was as Galileo had predicted (Lenoble, *Mersenne*, p. 410).

(50) Galileo in *The Two Principle Systems* allows only one exception to this universality of circular movement, acceleration in "absolute space" takes place only along a rectilinear path and God, after creating the planets, allowed them to move in straight lines and increase in speed until they had reached that which he had ordained for them, when their motion was converted to circular, which persists at a constant speed for ever. This theory Galileo recurs to several times,

declaring it to be an invention of Plato's, and from which, using the actual velocities and positions of the planets as data, he himself has been able to calculate the position in space where their general creation took place (see Dial I, Vol. I, pp. 11-12).

(51) R. Guimaraës, *Pedro Nunex*, p. 50; referring particularly to *In Theorias Planetarum annotationes aliquot*, 1546.

(52) Discussed Dreyer, *Planetary Systems*, pp. 71-85. On Theophrastus and Plutarch see Johnson, *Astronomical Thought*, p. 58.

(53) A view maintained by Franck (*La Kabbale*) and de Pauly (*Le Zohar*) and criticised in Duhem, *Le Systeme du Monde*, Vol. V, pp. 143-147.

(54) Calcagnini, *Opera*, 1544, p. 395; Tymme, *A Dialogue Philosophical*, 1612, p. 88; Wilkins, *Works*, I, p. 46. Leybourn, *Cursus Mathematicus*, 1698, p. 433, begins by citing testimony from the ancients to prove the plausibility of the Copernican systems (particularly Seneca's *Natural Questions*, where it is proposed as a topic for discussion "to know whether the Earth standing still the Heavens be moved about it; or the Heavens standing still the Earth be carried round....It is a thing worthy Contemplation to be assured, says he, in what condition we are; whether in a seat of all others most slow, or the most swift: Whether God turns all things about us, or we ourselves are turned about); he then continues, "This System about two Ages since, was resuscitated from Oblivion and the Grave by *Cardinal Cusanus*, but imperfectly until Copernicus came and gave it perfect consummation."

(55) *de Revolutionibus*, I, 10.

(56) *de Arte Cyclognomica*, pt. II, pp. 212, 85-86, 54.

(57) See Johnson, *Astronomical Thought*, pp. 52-54.

(58) See summary of his commentaries in Appendix to Whittaker, *The Neo-Platonists*; also, Rosan, *Proclus*, p. 47 et seq, on the *Hypnotyposis*, his advanced treatise on astronomy: all explanations of the celestial motions have physical or philosophical objections therefore, they must be artificial constructs; but the simplest yet devised should be provisionally entertained.

(59) *de Revolutionibus*, preface §1V. Contemporary distrust or scorn of this apparent indifference or scepticism as regards physical truth, and subordinating its consideration to mathematical expediency is reflected in distich which this preface provoked, quoted Sherburne in his notice of Osiander (*A Catalogue of Astronomers*, p. 50, appended to *The Sphere of Marcus Manilius*):

"Quid tum si mihi Terra movetier, Solque quiescit
Et Coelum? Constat Calculus inde Mihi."

(60) E.g., in *Proemium Mathematicum*, Paris, 1567; *Scholarum Mathematicarum Lib XXXI*, Basle, 1569 (both are found on Dee's Library List). Freigius, *Petri Rami Vita*, p. 27, summarises Ramus' opinion by quotation and paraphrase, on this subject. He regarded the Ptolemaic system as incompatible with nature in its complexity and deplored the influence of Aristotelian endeavours to convert astronomy into a physical science prematurely; what, he enquired, was arrived at by attempting to proceed beyond the sure mathematical description? "Ø_s___a quae Aristoteli dicuntur, numerorum & magnitudinem mathematicis successère; ad Ptolemaei astrologiam se contulit, & ex ille coelesti opere unam difficultatis infinitae caussam libentissimè sustulisset, multitudin_ eccentricorum & epicyclorum naturae ipsi repugnantem...." He wished to refund the science purely on observation and experience guided by the principles of mathematics solely--"Esset enim Astrologia, si locum syderis cuiusqz & motum Geometricè: si motum et Tempus Arithmetice e nudis se simplicib experientijs (cuales Hipparchi, Eudoxi, Arat,

Eratosthenis fuefunt) metiatur: non multò difficilior mathemata tenenti quam quaevis historia: quod ipse perpetuò optavit, ut sublatis infinitarum tabularum centurijs notum astrologicum opus ad Geometricã radium et Arithmeticum calculum revocaretur...." It is of interest that Dee's acquaintance Blundeville, the mathematician, in a work on logic, considerably influenced by Ramus, chooses, to illustrate a fallacy he is discussing, with fine impartiality, physical statements from both the Copernican and Aristotelian systems. Thus, on the *petitio principii*, "when the proof is as little knowne as the thing that is to be proved," he instances the arguments "The Sunne moveth not but standeth still inthe midst of heaven, giving light to all the world: *Ergo* the earth is moveable; or thus: The Heavens are not made of Elementall matter subject to corruption, *Ergo*; the Heavens are incorruptible. Heere in both these examples the Antecedent is as doubtfull as the consequent, and therefore proveth nothing" (*Arte of Logik*, p. 195).

(61) *De Nuptijs Philological et Se tem Artibus Liberalibus*, Lib. VIII, ch. entitled "Quod Tellus non sit centrum omnibus planetis" (Lugduni 1539, p. 337). See Leybourn, *Cursus Mathematicus*, p. 432 et seq, who calls this "the Aegyptian System" followed by Vitruvius, Capella, Macrobius, Beda and Argol, among others.

(62) *de Architectura*, lib. XX, cap. 4. See Stimson, *The Gradual Acceptance of the Copernican Theory*, p. 14.

(63) Duhem, *Système du Monde*, Vol. III, p. 59.

(64) *Euclidis Optica et Catoptrica*, Pena, "de usu opticis praefatiss," 1557.

(65) Stimson, *The Gradual Acceptance of the Copernican Theory*, p. 38. This is only denied by those who are still decieved by Osiander's preface, e.g., E.B. Knobel declares Copernicus regarded his theory as no more than a workable hypothesis and quotes in proof of this the preface to *de Revolutionibus*, as though it were written by Copernicus himself (article on Astronomy in *Shakespeare's England*, p. 447).

(66) *Alae sue Scalae*, 1573, Operis Conclusio.

(67) Rosen, *Three Copernican Treatises*, p. 24.

(68) *De Docta Ignorantia*, II, 12.

(69) *Works*, I, p. 46. See also G. McColley, *The Seventeenth Century Doctrine of the Plurality of Worlds* (Annals of Science, Vol. I, No. 4, Oct. 1936). But Ronsard's denunciation of it *Hymne du Ciel* of 1555 suggests that already at that time it was a fairly current doctrine. References to it are frequent by the latter part of the century. The pupil in Daneua's *The Wonderful Workmanship of the Worlde*, translated by Dee's acquaintance Twyne, however, gets a very short answer when he raises the topic apropos of a discussion of Epicurus' views: "Are there indeede many worldes"? *Master*: "Fie upon this infinite or multitude of worlds: Ther is one and no moe."

(70) *Preface*, c¹.

(71) *Diversarium Speculationum*, 1585, f 195.

(72) Thus Bishop Godwin in his scientific pro-Copernican "novel" *The Man in the Moone* (1638) is careful to dispose of this problem in passing; his hero in his first astonishment at meeting the lunar inhabitants is made to cry out "Jesus Maria" and to cross himself, whereupon "Young and old fell all down upon their knees--at which I not a little rejoiced--holding up both their hands on high, and repeating all certain words which I understood not." (p. 73).

(73) This is Archimedes' interpretation of Aristarchus' actual words: that it bears the same proportion as the centre to the surface of the sphere (in *Sand Reckoner; Works*, ed. Heath, p. 221-222).

(74) Daneau, *The Wonderfull Woorkmanship of the Worlde*, feels its implications of the possible infinity of the universe a considerable reason for rejecting utterly the Copernican system, as this doctrine, he declares, is quite absurd for "Scripture has appointed heaven and earth to be extreme parts and endes of this worlde." "Moreover, what difference should be noted to be betweene the Creator and the Creature, if as hee is infinite, and without measure, the creature also should be infinite, diffuse and without measure. Finally there should be two infinites appoynted, which by no means can be indeede, or be defended" (pp. 27-28). He clearly suspects the view of being intimately associated with pantheism.

(75) E.g., *History of the World*, I, 1, 11, p. 14.

(76) H.L.B. 5, p. 78 (*Prognost. Everlasting*, M1^F).

(77) A striking example of ultimate cold disinterest in Copernican heavens, since they apparently lack moral or theological significance, is offered by Coventry Patmore's ungracious lines in the *Two Deserts*, i.e., the worlds of the telescope and microscope. (*Poems*, ed. Page, Oxford, 1949, p. 351, cp also *Legemtuam Dilexi*, p. 405 "The 'Infinite' word horrible! at feud/with life and the braced mood etc.")

"Not greatly moved with awe am I
To learn that we may spy
Five thousand firmaments beyond our own.
The best that's known
Of the heavenly bodies does them credit small" etc.

(78) Trans. Salusbury, Vol. I, pp. 433-434. It may be noted that Philo in his exegetical works frequently cited by Renaissance neo-Platonists, is often prepared wholly to discard the literal interpretation of a passage in order to preserve some more fundamental allegorical scheme it might otherwise express, and does not show much concern about the occurrence of such discordances. Dee's view is expressed in the *Preface* aiii^F where he claims a knowledge of mathematics is an essential preliminary to correct scriptural interpretation, "And, veryly, by my small Talent (from Aboue) I am hable to proue and testifie, that the literall Text, and order of our diuine Law, Oracles and Mysteries, require more skill in Numbers and Magnitudes: then (commonly) the expositions have vttered...And without the litteral, Grammaticall, Mathematicall or Naturall verities of such places, by good and certaine Arte, perceiued, no Spirituall sense (propre to those places, by Absolute *Theologie*) will thereon depend."

(79) Dee's interest is "non-geometrical"--that is, employing more than straight edge and compass--constructions appears in many passages in the *English Euclid*. Conjecture on the contents of his lost works is largely idle, but Dee appears from surviving papers to have practised the familiar method of approximately constructing circles by means of the family of tangents obtainable by joining up corresponding equal divisions made upon adjacent sides of a square in which the circle is to be inscribed. (The smaller such divisions the more close is the approximation to a true curve, and a mechanical device with moving parts allowing a continuous line to be described would be relatively simple to construct; if Dee's invention were of this type it might properly be called contrary to expectation as the circle would be generated not from the centre but from a frame outside the circumference.) The principle is of importance in conics, which Dee was studying at this time (vide infra, p. 457 et seq) allowing such sections to be considered as sets of lines consisting of the lines joining corresponding points in two projectively related ranges of points: it is deducible from Apollonius' construction of conics by tangents (*Conics* III, prop. 41-43. See Apollonius, *Works*, ed. Heath, Introd. Ch. 5, CXXX-CXXXVII). Interest reawakened in the sixteenth century in mechanical devices for drawing various curves. (See A.V. Braunmühl,

Historische Studie über die organische Erzeugung ebener Curven von den ältesten Zeiten bis zur Ende des achtzehnten Jahrhunderts... in *Katalog mathematisch-physicalischer Modelle Apparate und Instrumente*, ed. W. Dyck, Munich, 1892). Two such instruments are described in Dürers *Underdeysing der Messung mit dem Zirkel un richtscheyt*, 1525, on which Dee based his "Perspective" (vide infra p. 462 et seq) Dee regards them as, partly, a branch of "Trochilike," his drawings of parabolas indicate that perhaps he used one for this purpose, which curve, owing to its importance in the problem of doubling the cube, receiving much attention in this respect: Guido Ubaldi invented in 1579 elliptic compasses on the principle that if two points on a straight line move along the arms of a right angle any other point traces out an ellipse with semiaxes equal to the segments of the line between that point and the former two. (Like so many other Renaissance inventions, this has its ancient source: Proclus, *On Euclid*, 1, def. 4.) Kepler invented the familiar method by means of a string attached to the two foci in 1604, (Taylor, *Introd. to the Ancient and Modern Geometry of Conics*, 178, 114, 1v) but the true originator seems to have been Anthemius (van Eecke, *Les Opuscules Mathématiques...* Introduction) whose work Dee possible studied in M.S. (vide infra p. 489). (See Boutroux, *L'Idéale Scientifique*, p. 45 et seq on the more general important mathematical results of the revival of this interest, for while to the Greeks the study of conics had remained always only on the outer fringes of true "science," since such curves could not be drawn with only ruler and compass, the increasing attention they received throughout the sixteenth century contributed largely to form Descartes' central position that in geometry all lines were "mechanical" and therefore "c'est seulement la justesse du raisonnement que l'an recherche," and his consequent attempt to subordinate classical geometry to the more universal and abstract scheme of relations that algebra presented.)

(80) Salusbury trans. Vol. II, p. 288.

(81) *Architectura*, lib. X, Cap. 1.

(82) *Théâtre des Instrumens Mathématiques et Mécaniques 1579*. A popular work for Latin and French editions appeared in 1582 and a Spanish one in 1602. As though inspired by Archimedes' boast, a series of colossal, if fantastic, designs are presented, as, for instance, a system by which huge galleys may be propelled by paddle wheels all the motive power required being provided by one man turning a crank--for throughout the weight of the parts of a machine, and the frictional effect between them, however numerous they are, are left entirely out of account.

(83) E.g., 847b-848a. Where problems of the lever are considered, and the paradox that a weight a man cannot lift without one, he can do so using one, although he is now lifting the weight of the lever in addition. This marvel is "explained" merely by putting it down to the circle which is "the first of all marvels": "Now the original cause of all such phenomena is the circle; and this is natural for it is in no way strange that something remarkable should result from something more remarkable, and the most remarkable fact is the combination of opposites with each other." But the circle can be shown to be made up of such opposites: the circumference is convex and concave at the same time, when a circle rotates parts of it move, another (the centre) remains still, and no two parts travel at the same speed on any radius, while the whole "moves simultaneously in opposite directions." Consequently man should not be surprised at anything that depends on this synthesis of contradiction. (Trans. W.S. Hett in *Minor Works*, Loeb ed., 1936, p. 331 et seq.)

(84) Salusbury Trans., Vol. II, pp. 271-275.

(85) *Preface*, dj^r; ciii^v; Aj^v. Dee seems to have been the originator of the term Trochilihe for the science of rotatory movement. It was still being used by Leybourn in 1698 in his account of geometrical arts (*Cursus Mathematicus*, p. 205).

(86) Cotton MS Vitellius C.VII, f. 279-309. Part of each leaf has been charred or burnt away in the Cottonian fire.

- (87) Vide Infra Ch. VIII, n. 27, p. 388 et seq for Bourne's letter and refs. to Bacon's influence.
- (88) Cotton. Vesp. A.XI. Dee's signature and date. This work had however been printed by Gogova in 1542, who doubted Bacon's authorship.
- (89) E.g., *De Secretis Operibus Artis et Naturae*....cap. 5. *Op. Majus*, IV 2nd Dist. cap 2 (Vol. 1, 135 ff); V "Optics" (Vol. 11, 550 ff).
- (90) *Inventions or Devises*, 1578, p. 95, No. 100.
- (91) Cited in E.W. Hobson, *John Napier and the Invention of Logarithms*, Cambridge, 1914, pp. 10-11.
- (92) *Preface* djf. Tzetzes (*Histor. Chilius*, ed. Gerbelius, Basle, 1546) mentions Archimedes' use of them (lib. 2, No. 36, pp. 22-23). He states later (lib. 2, No. 457, p. 244) that he has read of them himself in Anthemius, and it is possible Dee merely suppresses this "mediate" source.
(Theon of Alexandria says that Archimedes wrote a treatise on these mirrors; the first mention of the legend of their use at the siege of Syracuse--of which Dee writes in the *Preface* is apparently Lucian's (?) "Hippias." See de Rochas' *La Science des Philosophes et l'Art des Thaumaturges dans l'Antiquité*, p. 27.)
- (93) Some listed Gibbon, *Decline and Fall*....Chap. XL (Chandos ed., London, Vol. III, pp. 61-65); Procopius, Agathius, Vitellio had spoken of them. Cp also De Rochas' *La Science des Philosophes*, p. 46.
- (94) Brought to light by M. Dupuy, *Fragment d'un ouvrage grec d'Anthemius sur des paradoxes de mécanique* (Mem. de l'Acad. des Insc. et Belles lettres T.42, Paris, 1786). It contains also apparently the first account of drawing an ellipse by means of a cord attached to the foci. None of the three 16th century MSS mentioned here can be shown to be connected with Dee however. (See also P. Van Eecke, *Les opuscules mathématiques de Didyme Diophore et Anthemius*, Paris, Bruges, 1940.)
- (95) Kircher previously claimed to have set fire to wood at a distance of 100 feet employing 5 plane mirrors. Buffon with 168 set fire to wood at 200 feet, melted lead at 120 feet, and silver at 50 feet. See Dupuy, op. cit. p. 3; de Rochas, op. cit. pp. 27-28. Porta, *Natural Magick*, XVII, 11, p. 309 et seq, claims to have melted lead and tin, and to have made gold and silver red hot with a paraboloid mirror, which he describes how to draw accurately; he mocks at Cardan's suggestion that a glass might be built to burn almost a mile off "which I think impossible to burn thirty foot off, for it would be of a wonderfull vastness" and the surface would have to be almost plane "and to receive any crookedness, it can hardly be made so great."
- (96) They first perhaps reappear in Valla's brief section in *de Expentendis et Fugiendis Rebus Opus*, Venice, 1501, lib. XIII, cap. 3. (The first codex of Apollonius had been brought to Italy however in 1427, *Enciclopedia Italiana*, art. on Apollonio Pergeo).
- (97) See F.L. Coolidge, *History of Conic Sections and Quadratic Surfaces*, Oxford, 1942, p. 28 et seq.
- (98) *Opera Apollonii Pergae*, trans. J.B. Meinum, Venice, 1537.
- (99) *Perspectiva Communis*, ed. Hartmann, 1542, lib. III, Prop. 6, f.Ojf. That a glass globe filled with water held to the sun would produce combustion was an experiment recorded by

Lactantius and frequently repeated thereafter (Gunther, *Early Science in Oxford*, Oxford, 1926, Vol. I, p. 267).

(100) From *Perspectiva*, lib. 9, cap. 43, p. 250^v, 1553 ed.

(101) *Ibid*, lib. 8, cap. 56, p. 228 et seq; cap. 34-44, p. 240 et seq.

(102) Some of these seem to indicate acquaintance with Apollonius' 5th book (in which he treats of the drawing of normals to a conic from arbitrary points in its plane, and evaluates the coordinates of centre of curvature at any point in a cone) which was not included in the 1537 edition which Dee possessed. He perhaps relied on Maurolyco (though his book list includes only the 1575 edition of the *Opera Mathematica*). He had certainly made good use of Pappus, in whom occur traces of the concepts of the directrix of a conic, and focus of a parabola, of which last it was of course reserved to Kepler to complete the theory.

Though the use of burning glasses was very ancient--the New Fire on Easter Eve was kindled by means of them in the Middle Ages (Gunther, *Early Science in Oxford*, Vol. I, p. 26)--it is only about this time that specific references to their theory in relation to the parabola became prominent. Interestingly, Digges, treating of the properties of "glasses concave and convex of circular and parabolical form," announces confidently that it is this last that "most perfectly doth unite beams and most vehemently burneth of all reflecting glasses." (*Pantometria*, rev. ed. 1591, Bk. 1, ch. 21.) Soon after the conclusion would seem to have become generally familiar. Arthur Hopton, for instance, in 1612 has a chapter on "To burne anything afarre of with the sunne's beames" (*Speculum Topographicum*, Ch. 9, p. 182), in the manner of Archimedes: "which to doe you must take a number of steele glasses, made of purpose, and well polished...But indeede there be certaine *parabolicall* glasses placed by the aid of Geometry more excellent for this purpose, having concaves and convexes, of which I cannot stand here to treat." (In the next chapter he speaks of employing one 16 or 17 inches broad for a telescopic instrument.)

(103) Cotton MS Vitell, C. VII, ff 15-25.

(104) *Preface*, dij^v and bj^f^v.

(105) Sextus Empiricus, *Against the Logicians*, I, 107 (*Works*, Vol. II, pp. 55-57).

(106) *Gorgias*, 465a.

(107) 288c.

(108) *Statesmen*, 284e. Various passages appeal to mathematics in the Laws for I, 844d (Vol. I, p. 67) states that "calculation" in man determines what is good and bad "and `calculation' when it has become the public decree of the State as named law." Justice is dealt by the application of various types of proportion--VI 757a et seq (Vol. I, p. 413 et seq), on these is based "a rule of symmetrical inequality" in the distribution of offices etc. 757c (Vol. I, p. 379, see also VIII 848c, Vol. II, p. 189).

(109) *Preface*, ciiij^f.

(110) *Ennead*, II, 9, 16; V, 9, 11.

(111) diij^f.

(112) *Architecture*, trans. Leoni, 1755, IX, 5; pp. 194, 196-197.

(113) *Preface*, dij^v and bj^f^v.

(114) See Panofsky, *Dürer*, Princeton NJ, 1943. On perspective, p. 247 et seq. (His work of 1525--revised 1538--is described as "the first literary document in which a strictly representational problem received strictly scientific treatment at the hands of a Northerner," p. 253.) Dee's work gives no hint of any novel departure or advance and is merely an abridged methodical rearrangement of Dürer's and Alberti's treatment.

(115) Dee overlooks or disregards Vitruvius' mention of it. (Apropos of stage painting, "scaenographia est frontis et laterum abscedentium ad circinique centrum omnium linearum responsus." *Architectura* I, 2, 2. Vol. I, p. 26, cp also VII, 11; Vol. II, p. 71 on Democritus and Anaxagoras as the first to write on the theoretical treatment of perspective.) He might also have cited of course Pliny's testimony (N.H. XXXV, 76) that Pamphilus, master of Apelles, was the first painter to be versed in geometry and arithmetic "sine quibus negabat artem perfici posse." Dee's knowledge of ancient painting was probably extremely limited, but he was perhaps aware that there "perspective" was applied almost only to the depiction of separated "objects," which are not situated in a single unified, geometrically constructed "space" from which they emerge, the devising of which Dee regards as the object of this science.

(116) For details and refs. see F.L. Coolidge's discussion of the perspective of Albertis and Franceschi in *The Mathematics of Great Amateurs*, Oxford, 1949, p. 30 et seq.

(117) *The Painting of...Alberti*, 1726, p. 7, quoted Coolidge op cit. p. 31.

(118) Thus De Hoghelande, *Historiae aliquot Transmutationes*, after speaking of attacks made on Lull, Arnoldus and Bacon writes (p. 51) "Pro Rogerio Bachone, in quem non minus debechatur Guibertus, Apologiam edicit Clariss. doctissimusque Philosophus Joannes Dee Londinus, qui in Monade sua hieroglyphica satis ostendet, neque bardum fuisse se, neque pecudem, sicut & ante cum Albertus Magnus...." A note to Selden's prefatory poem in Arthur Hopton's *Concordancy of Years*, 1612, mentions unjust attacks on Bacon's character, adding "but that great Clarke M.I. Dee long since promised his Apologie." Naudaeus greatly deplores the non-appearance and loss of the work, which would have made his own defence unnecessary, but now "I must imitate the grasshopper in Aelian and supply the want of this broken string" (*History of Magicke, by way of Apologie*, Ch. XVII, p. 229, earlier, Ch. V, p. 38 he had compared Dee himself, in the wrong done him by false charges of necromancy with "Pope Silvester, Bacon, Michael Scotus, Albertus Magnus"). Naudaeus' account is echoed by Arpe: *de prodigiosis Naturae*, 1717, p. 116, when after vindicating Bacon's activities he records "quod circa annum 1551 [sic] magno animo moliebatur Jo. Dee Londoniensio, Speculum unitatis promittens...." etc.

(119) *Illustrium Maioris Britanniae Scriptorum*, 1548 (ded. to Ed. VI), f. 114^v-115^v.

(120) *Ibid*, Basle ed., 1557, pp. 342-344.

(121) *Index of British and Other Writers*, ed. Lane Poole, pp. 393-398.

(122) *A Short Treatise declaring the detestable wickednesse of magicall Science* (n.d.) f 8^v-11^v. References to Bacon's "sorcery" are to be found for long after also in Catholic works on daemonology, in the spiritual tradition of the *Malleus Maleficarum*. Thus Guaccius in his *Compendium Maleficarum* (2nd ed., 1626)--even ascribes a daughter to Bacon, who was also a necromancer. For speaking of how demons will sustain witches without food, which feasts are taken sometimes for holy miracles by the simple he adds "Huius modi camsetur fuisse media in puella Anglicana Rogerii Baconi filia, quae ferunt viginti annis nihil comedisse," (I, 16, p. 105).

(123) *Pathway to Knowledge*, 1551, f.iii^v.

(124) *E.E.P.R.*, ed. Thoma, p. 302.

(125) E.g., in Samuel Daniel's *Defence of Rhyme*, 1603, he is one of those who "have left behinde them monuments of most profounde iudgement and learning in all sciences." Thomas Wright, *The Passions of the Minde in Generall*, 1630, boasts, "For what Country in any age did ever represent unto the World such excellent wits as *England*....what might I not say of *Ocams* of *Bacons* and of *Midletons*....our Country hath afforded most of the Masters....which at this time both *Scotish Reals* and *Nominals* doe follow either in Philosophie or in Divinite" (Pref. to Reader) (See *Renaissance Theory of Reaction against the Middle Ages*, H. Weisinger, *Speculum* 20, 1945, 461 ff.)

(126) E.g., Preface by "T.M." to Bacon's *Discovery of the Miracles of Art Nature and Magick. Faithfully translated out of Dr. Dee's own copy*, 1659, "Bacon's name may bring at the first an inconvenience to the Book, but Bacon's ingenuity will recompense it ere he be solidly read. This as an apology is an usher to his other workes which may happily breathe a more free air hereafter when once the World sees how clean he was, from loving *Negromancy*. Twas the *Popes* smooke which made the eyes of that age so sore, as they could not discern any open hearted and clearheaded *soul* from an *Heretical Phantasme*." He refers the reader to Vossius' "Book of four popular Arts," as full of Bacon's praises, and to Gabriel Powels' "Book of Antichrist" on Bacon as a protestant martyr.

(127) *De Aug. Scient.*, lib. 1 (*Works*, vol. II, p. 299) and *Opus Majus* I on excessive reverence for Authority as one of our "offendicula" preventing advance of knowledge.

(128) See E.H. Kantorowicz, *Plato in the Middle Ages* (*The Philosophical Review*, May 1942).

(129) *Opus Majus*, 1, 13 (vol. I, p. 29).

(130) Introd. to Bacon, *Opera hactenus inedita*, Facs. IX (ed. Little and Withington) p. XXXIII.

(131) Tymme, translator of Dee's *Monas*, thus merely asserts in his intended preface to it "Magic is an Art whereby men come to the knowledge of Elements, of their bodies, and of their hidden properties, vertues and operations" (Ashmole MS, 1459 f 472).

(132) Most of the sciences in which Dee was particularly interested might on occasion be considered highly suspicious occupations, his own arrest has been noted, similarly in Oxford, a Dr. Cooper who had been observed reading Baptista Porta "who wreyth of naturall magyge" was seized and the authorities directed to investigate "such bookes as [he]...hadde towching the art of estromancy, gematry and alcomistrye" (see W.H. Hart, *Documents relating to Magic in the reign of Queen Elizabeth*, *Archaeologia*, XL, 1866, 389-397). Such an attitude is in part responsible for the exaggerated estimates of the number and prevalence of sorcerers that are so common at this time. Thus Daneau, a protestant writer extremely hostile to the new sciences of the day and to secular learning generally when not based directly on the text of the scriptures, declares in his *Dialogue of Witches* (French ed. 1575, translated and published in England the same year) that "there is no order or degree of men whereof there are not some noted for this crime, first of nobilitie, both men and women, some also learned and such as are famous and in credite for their knowledge," they are so numerous that Daneau says that they boast that "if they could get any notable famous man to their captaine...they durst give open battail to any one king" (By^r-Bij^v).

(133) Cooper, *Mystery of Witchcraft*, 1617, p. 9, cp Kocher, *Marlowe*, p. 144 et seq for a discussion in connection with the Faust theme of the desire for knowledge as contemporarily regarded as a lure to necromancy. (He quotes from Daneau, *Dialogue*, Ch. 2, "By which meanes, many both of the honourable and learned sorte are seduced by Satan, as certen noblemen and women of worship and honour and many schollers.")

(134) *Four letters* (Works, ed. Grosart V, 299-300).

(135) *Religio Medici*, I, 31.

(136) E.g., Pompanazzi, *de Incantationibus*, cap. 6, p. 74 (attempting to limit the sphere of evil magic), all knowledge attained by man's own study or conveyed to him by good angels is allowable and commendable, only that is evil that results from invoking unclean spirits; however, knowledge of natural things gained in this last way is in itself true, and allowable, it is said to be forbidden "non quidem quantum ad rem cognitam, sed quantum ad modum cognoscendi seu acquirendi eam."

(137) Vide infra ch. 9 for a discussion of this in relation to Dee's own "spiritualist" practises.

(138) *Worthies*, ed. Nichols, 1911, Vol. I, p. 548.

(139) Thus Porta opens his *Natural Magic* with a distinction between two kinds, "the one is infamous and unhappie because it hath to do with foul spirits, and consists of Inchantments and Wicked curiosity; and that is called Sorcery; an art which all learned and good men detest; neither is it able to yeeld any truth of Reason or Nature, but stands meekly upon fancies and imaginations, such as vanish presently away, and leave nothing behind them [he quotes Iamblichus on this]...The other Magick is natural; which all excellent wise men do admit and embrace, and worship with great applause; neither is there anything more highly esteemed or better thought of by men of learning...[it] openeth unto us the properties and qualities of hidden things, and the knowledge of the whole cours of Nature; and it teacheth us by the agreement and disagreement of things, either so to sunder them, or else to lay them so together by the mutual and fit applying of one thing to another, as thereby we do strange works, such as the vulgar sort call miracles." (I, 2, pp. 1-2.) But beyond this Porta is unable to state their exact difference, as it is to be found in their respective methods and operations. It certainly does not lie in that the second can render a reasonable account of what it achieves, for he takes sympathy and antipathy, and the occult activities of "specific forms" to be the principles whereby *Nature* works in all particulars effects "whereof there can be rendred no probable reason, neither will any wise man seek after any other cause hereof but only this, That is is the pleasure of Nature to see it should be so..." (I, 7, p. 8).

Or again Delrio defines legitimate magic in general as "ars seu facultas, vi creatô, & non supernaturali quaedam mira, & insolita efficiens, quorum ratio sensum & communem hominum captum superat," while "prohibita Magia sic describi potest, Facultas seu ars, quâ vi pacti cum daemonibus mira quaedam, & communem hominum captum superantia efficiuntur" (*Disquisitionum Magicarum*, Vol. 1, I, 2, pp. 12-13) but for particular decisions he has to rely on other grounds, as when declaring that Picatrix, Abano, Paracelsus, and Agrippa, are pestilent and devilish, Alkindi, Bacon and Geber "Multis scatent superstitiosis," and Lull and Arnoldus contain many heresies for which they should not be read, I, 3, p. 32. Guaccius can do no better after laying down four species of Magic "una dicitur naturalis, alia physica, alia praestigiatrix & alia demoniaca," searching for a standard to distinguish their works, than simply to assert that when an effect "exceeds its cause" then it is produced preternaturally and is censorable magic. Thus Archytus' dove of wood he classes as a result of legitimate "artificial magic," but Alexander's speaking brass head as the work of a devil. (*Compendium Maleficarum* I, 2, p. 6--he divides divination upon this basis also, allowing "physiognomy" and "palmistry" as having some grounds in nature and condemning Cataptromancy since it lacks these, pp. 10-11.) This distinction based on whether a sufficient cause could be discovered could be of little use in large parts of Natural philosophy, at best could appeal there only to what might be conventionally, but without understanding, accepted as "cause," while even as regards purely mechanical phenomena. The usual level of accounts of these in discussions of magic, is hardly more "intelligible" than, for example, Agrippa's descriptions of the "natural" methods by which talismans and charms operate. Thus Daneau distinguishing the "natural" and the miraculous or devilish, takes a conventional example to illustrate the first and writes of it in "explanation" "when ye great and cunning workman, and also famous Philosopher *Archytas Tarentinus*, shewed openly to ye people a dove of wood which flue in the ayre, it was a wonderful thing but it was no miracle. For this motion

was caused in the wooden body, through certen equalitie of weight, and by meanes of certen lins and woorkmanship, and by so neare and narrow ioyning of them, if one drew forward another: so all that worke was but naturall." (*A Dialogue of Witches*, Ch. 4, Gij^v-Giiij^v.) Again, such a defence was all too readily extended to cover practises most generally condemned as witchcraft. Thus Cattan's *Geomancie* attacks the practises of wizards "For all these be so vain and false that their great abuse is quite contrarie unto our Christian Religion" but does not specify what these are, and indeed has classed as "sciences" almost every divinatory or necromatic art; of Geomancie itself (divination by the examination of dots made at random on paper) it is claimed "this Science is no Arte of Inchaunting as some suppose it to be, or of divination, which is made by Diabolike Invocation, but it is a part of naturall magicke, called of many worthy men, the daughter of Astrologie; and the abbreviation thereof" (Epistle Dedicatory A2^v and "Author's Preface" Cj^f). Consequently, in view of the inadequacy of such attempts to distinguish between the natural and preternatural as the frontier between necromancy and wholesome study, it would appear that Bodin who violently condemns all forms of magic is quite logical in adopting the position speaking of the magic of Pico and of those "qui pensent que par la force des choses naturelles on attivera, voire on forcera les puissances celestes" that the assertion "que la Magie Naturelle n'est que la pratique de la Physique" is merely "le filet auquel Satan attire les plus gentils esprits" (*Démonomanie*, I, 5, p. 90).

To conclude with an English example of the lack of any clear criterion of the legitimate as late as 1636, John Weenes (*A Treatise of the foure degenerate Sonnes, viz. the Atheist, the Magician, the Idolator and the Jew*, Pt. II, Sect. 5, p. 40) defines "A Magitian is he who uses midses which are onely proper to God either in curing of diseases or working other strange effects"; but many of these means he lists were claimed by the defenders of magic to be fully as explicable on natural grounds as any others, while Weemes himself is not able to produce any very good reason why they should be regarded as the sole prerogative of God. His list of forbidden "midses" is "Things appropriate to God are first to worke by his word onely. Secondly, to cure by number: Thirdly by order [e.g., Pool of Bethany]; Fourthly he workes sometimes onely by the situation of the body: Fifthly he works sometimes by figure and character: God's sixt priviledge is to use naturall meanes, which notwithstanding hath no force in working of the miracle. God's eight priviledge is when he useth one midse to produce contrary effects, so he useth artificiall midses, as the brazen serpent, *Rauls* girdle etc."

(140) P. 925 et seq.

(141) On the title page of his Ptolemy (in R.C.P.) Dee has writtenua quotation from Chrysippus: "Diviniatio est vis cognoscens et videre et explicare signa quae a diis hominibus portendantur."

(142) *Preface*, Aij^v-Aiiij^f.

(143) *History of Magicke*, Ch. 2, p. 13 et seq.

(144) *Preface*, Aij^v-Aijj^f.

(145) Such a belief perhaps accounts for the initial view of Marlowe's Faustus:

"He that is grounded in astrology,
Enrich'd with tonges, well seen in minerales
Hath all the principles magic doth require"

(ff. 167-169)

He conjures, armed with the works of Bacon and Albertus and although utilising the testament and religious symbols, regards much Christian dogma, such as immortality, as fictional, thinks "hell a fable"--despite Mephistopheles' claim regarding his own appearance that he is "an instance to prove the contrary" and takes the original appearance of the spirit as a result of the "virtue in my heavenly words":

"How pliant is this Mephistopheles
Full of obedience and humility

Such is the force of magic and my spells."

(146) *Ennead*, IV, 3, 43.

(147) E.g., by Alfarabi in *de Ortu Scientiarum* (Thorndyke, *History of Magic...* Vol. II, p. 744) (Nigromantia makes a more suspicious appearance as one of the "seven mechanical arts" and classed under Astronomy in the *Ars Notoria*, p. 621).

(148) Thus Guaccius can write "Magia naturalis per se bona est, & licita, sicut omnes artes bonae per se sunt, sed per accidens est illicita, scilicet, quando in malum finem refertur quando scandalum oritur, eo quod patentur, haec fieri ope daemonum." While that art, which aims to produce illusions merely to amuse or impose on the credulous is to be utterly condemned even when "sola desteritate & arte, vt si quid sostilegy admiscet, id agilitatis, & subtilitatis esse vidcatur. Amat diabolus homines ad risum provocare...." (*Compendium Maleficarum*, Ch. 2, pp. 6-7).

(149) The relation of magical effects to "Reality" in general, it may be noted here is one of the most usual, and ultimately one of the useful, bases for distinguishing them into good and bad, and the fruit of licit or illicit practice. It is founded on the doctrine that the activities of devils and evil spirits, invariably involve a large element of deception, nothing genuine could be gained by utilising their services, for they do not alter "reality" but only cast a "glamour" over it, for could they effect genuine transformation in God's creation it would introduce disorder into the universe. This may well have been a chief point in Dee's apology for Bacon's practical magic, however conventionally necromantic his recommended methods, Bacon insists that nothing of value can be done by means of unclean spirits. To take a single illustration of this doctrine, Daneau writes of werewolves "surely that cannot bee, that an evil spirite or a Divell can change our nature or being, as they call it. For this is ye only propertie and powere of God, that as he hath created the natures of things, so is he able to chaunge them: which Satan cannot doe by any meanes." A claim he illustrates by an anecdote from the *Vitae Patrum* "of a certayne father, who not in the night, nor in a dreame, but at middeday, and broade light, when he behelde with his eyes his owne daughter, it seemed to him that he saw a Cowe, whiche notwithstanding others and especially Macarius, acknowledged, and testified that it was a humane creature and a Virgin" (*Dialogue of Witches*, Ch. III, fi^v, Ch. IV, giiij^{r-v}). Similarly Boguet declares confidently that either the devil plays the wolf while the wizard dreams, or the latter acts as though metamorphosed "non pas qu'il soit transformé en loup, mais bien luy semble--il qu'il soit tel ce qui lui prouient de ce que le Diable luy represente on la fantaisie & imagination, ce qu'il luy plait." (*Discours*, Ch. 53, p. 354.) De Lancre adopts the same position (*Tableau de l'Inconstance des mauvais anges*, 1613, v. 1, p. 251). Bodin explains that God has created all things in such manner "que les malins esprits n'ont pas la puissance de changer la forme, att_du que la forme essentielle de l'homme ne change point, qui est la raison, ains seulement la figure" (*Démonomanie*, II, 6, p. 189) but he is very exceptional in making even this last admission, Delrio more orthodoxly puts all down to "Illusion" since one "form" or "soul" cannot occupy the organism proper to another, and over the form the devils have no power (*Disq. Magica*, II, Q.XVIII, "An Corpora ex unâ in aliam speciem magi queant transformare" p. 266). The ultimate source for this important doctrine is perhaps Augustin's discussion of the power of devils--"Nor can the devils create anything (whatever appearances of theirs produce these doubts) but only cast a changed shape over that which God has made, altering it only in show" etc. (*De Civ. Dei*, XVIII, 18, Vol. 2, p. 192).

(150) *Tractatus de Magis*, 1591, lib. I, cap. 2, p. 17, cap 8, Sections 3 & 11. (Paracelsus in whom Dee was deeply studied, and who denied to evil powers any significant role in nature, was frequently attacked for their unguarded statement--cp: Boquet, *Discours*, Ch. 41, p. 281, on "Cet impie & Maistre Sorcier Parocelse qui a osé maintessir qu'il estoit indifférent que le malade recut guerison de Dieu ou du Diable, des bons Anges ou bien des mauvais.)

(151) *De Hominis Dignitate*, 236^v-237^v (pp. 148-152, ed. Gavin). Similar attitudes to "true

magic" (e.g., Raleigh's defence of it as a "divine science" "and (as *Plato* affirmeth) the art of magicke is the art of worshipping God" (*History of the World*, I, XI, II: "Of the name *Magia* and that it was anciently far divers from Conjuring and Witchcraft" p. 171) derive from neo-Platonic sources (e.g., Apuleius' *Apology*, Ch. 25, p. 50 et seq: Magic is a "religion praised by Plato," "the magic of Zoroaster" is "the worship of the Gods") but apart from the piety accompanying them the practises derived from such sources might not differ much from conventional "magic." Thus, Proclus, Marinus records, "employed divine silent tops for strophalomancy" he conjured up an apparition of Hecate and conversed with it, and he cured Archiades' daughter by "magical prayers," though "whenever he did anything like this Proclus always avoided notoriety, so as not to give any occasion to those who wished to plot against him" (*Life*, Chs. XXVIII and XXIX, pp. 28-30).

(152) *Conclusiones nongental*, p. 145 (Conclusiones Magicae No. 3). This definition soon became a commonplace, e.g., Porta, *Natural Magicke*, I, 3, p. 3. Magic "is a practical part of Natural Philosophy" etc. Hence also Paracelsus' insistence that "Magic" is the true teacher of medicine and far preferable to all written books.

(153) Thus an Hermetic fragment states "He who has learnt to know himself ought not to set right by means of magic anything that is thought to be amiss, nor to use force to overcome necessity, but rather to let necessity go its own way according to nature" (*Hermetica* I, ed. Scott, p. 541, Fragment 21 from Zosimus i, 7).

(154) See Fessugiere (*La Révélation d'Hermes Trismegiste*, p. 189 et seq) for a thorough analysis from this standpoint, of Hellenistic and Graeco-Roman magical sciences and their invariable direction to practical ends (in contrast with the TE___a of a classical thought, which seeking knowledge only for itself, assumed forms incapable of practical applications) in which period "Si l'on contemple le ciel c'est pur y lire la destinés les hommes. Si l'on recueille les propriétés des bêtes, des herbes et des pierres, c'est pour en tirer des remèdes. Si l'on cherche le moyen de transmuter les métaux c'est pour trouver le secret de les changer tous en or le critère de l'utilité esi décisif, il marque au mieux la frontière ou se séparent deux mondes."

(155) *Metaphysics*, I, 14, 981c.

(156) Faustus' first raptures on the promises held out by magic "to the studious artisan," are all on this theme; they offer

"A world of profit and delight,
Of power of honour of omnipotence....
All things that move between the quiet poles
Shall be at my comman; emperors and kings
Are but obeyed in their several provinces....
But his dominion that exceeds in this
Stretcheth as far as doth the mind of man" (11. 81-89).

(157) W.E. Hocking, *Mind and Nature* (in the *Philosophy* of A.N. Whitehead, N.W. University, 1941, pp. 383-404) in a discussion of the dilemma presented by the emptiness of "homeotypal" and absurdity of "heterotypal" explanations.

(158) *iiij^r et seq.

(159) See Metzger, *Les Concepts Scientifiques*, p. 41 et seq on late chemical theories of Davidson and Stahl, based on these concepts. Sibley in 1794, makes an attempt to adapt magical theories of sympathy and antipathy to atomism, explaining them as the effects of subtle streams of particles that all bodies constantly emit. Thus he declares that the magnet's attraction is produced by some of the corpuscles it throws off entering the pores of the attracted metal while some which fail to enter are driven back to the magnet, but being "implicated and annexed" inextricably to those which

have penetrated, the metal is dragged back with them towards the magnets, other substances are not attracted since they either do not absorb or do not reflect the magnetic corpuscles (*A Key to Physic*, pp. 23-29).

(160) Thus Francis Bacon, in his first chart of "The Generall Distribution of Human Knowledge," divides "Natural Philosophy" into its "Speculative" part consisting of Metaphysics, Physics and Appendages to Physics, and its "Practical" part, which is exhausted by the two branches "Mechanics" and "Natural Magic," "which is that great liberty and latitude of operations which dependeth upon the knowledge of forms." It is, and suffers from similar deficiencies, the relative of Metaphysics, on which, he comments that while it is a vain pursuit to enquire into the form of a lion, an oak, of water or air, yet the forms of sense, of voluntary motion, of vegetation, of colours, of gravity and levity, of density and tenuity, of heat, of cold, and all other natures of qualities which like an alphabet are not many, and of which the essences, upheld by matter of all creatures to consist might well be discoverable. Though he disapproves of "Metaphysics" as resulting in "too untimely a departure and too remote a recess from particulars," and prefers "in particularities of physical causes," the philosophy of Democritus, "who did not suppose a mind or reason in the frame of things, but attributed the form thereof, able to maintain itself, to infinite essays or proofs of nature, which they term fortune," as "more real and better inquired of them than of Aristotle or Plato," he not only admits it and the dependent "magic" as valid if somewhat unsatisfactory sciences, but finds himself unable to dispense with them if a full account of nature and human knowledge is to be made, or deny their present importance (*Advancement of Learning*, Bk. II, *Works*, Vol. I, p. 75 et seq).

(161) A good example is the work *Veterum Sophorum Sigilla et Imagines Magicae* ascribed to Trithemius (Noudaeus, *History of Magicke*, XVII, p. 238, declares it an imposture, saying it has been known for 120 years before its publication in 1612). Here the potency of seals and talismans is shown to be as probable in itself as any other natural process by an analysis of causality showing it in all cases to depend on occult virtues of which anything evident is only a channel-- thus medicines do not cure because they are hot or moist or have any other determinable quality, men do not even know what hot or cold, moist and dry are in themselves, and the efficacy of the medicine lies in the unknown causes of these, or rather as in every other case, the miraculous power that is infused into them by God. It is argued (p. 47 et seq) "Deus per Prophetas solo prolato verbo hominum sonat, vivus si quidem Deus est, & vivi Dei vivum quoque nomen, & vivi nominis vivi quoque literae, vivit Deus propter nomen, vivit nomen ejus propter ipsum, & vivit literae propter nomen, & sicut vitam habet in se ipso Deus, sic etiam nomini suo dedit vitam habere in se ipso & nomen porro literis. Sunt igitur imagines seu characteras efficaces ratione virtutis seu officii a Deo vel natura ad tale nomen vel characterem ordinati: Nulla enim & virtus vel in caelo vel in terra, quae non descendit à deo: sic medicamenta sunt corpora visibilia, verba corpora invisibilia, sive herba, sive verbum sanet, in causa est Deus, id est spiritus Dei naturae, coadjuvatus per verbum Fiat. Vnde ipsa herba non est medicina, sed habo in illa latet ut invisibiliter à Deo videlicet insita."

(162) See Festugière, *La Révélation d'Hermès Trismégiste*, p. 90 et seq.

(163) E.g., Plotinus, *Ennead*, IV, 4, 41; Synesius, *de Insomnas*, ch. 3: it occurs in the third section of Ficino's *de Vita*, Dee also uses it, *Aphorisms*, No. 12, vide infra.

(164) Thomas Taylor, "Commentary on Orphic Hymns" (*Hymns of Orpheus*, 1792, pp. 70-71).

(165) *Ennead*, IV, 3, 40 and 43. An example of the action of this principle is Descartes' assertion in the *Compendium Musicae* of 1618 that the natural antipathy between wolf and sheep is so great that a tambourine made of wolf skin will break one of sheepskin if they are sounded together (Lenoble, *Mersenne*, p. 480, note). The same instance was used by Porta (*Natural Magicke*, I, 14, p. 20), it is curiously still produced in the eighteenth century by Derhem in his Boyle lectures, along with the claim that "hens will fly at the sound of a harp strung with fox gut strings" intermixed with observations of Kricher, Boyle, and himself of the vibration of objects at

the sound of organs and to particular notes (*Physico Theology*, IV, 3, p. 173) (as late as 1801 Barret asserts that the guts of a wolf and a sheep strung on the same harp will make no harmony, *The Magus*, p. 38).

(166) *Conclusiones*, pp. 145-146 (*Conclusiones Magicae*, nos. 13, 11, 5). Cp. Anagnini's claims (*Pic de la Mirandole*, p. 117 et seq) that Pico's magical theories "ont pour but réel de réhabiliter la nature, de rétablir l'idée du Cosmos vivant, d'en démontrer l'unité et l'harmonie formée de multiples nuances et de transitions imperceptibles."

(167) Avicenna, he says, "ponat intellectui bene dispositio & a materia elevato, omnia materialia obedire. Quare pluuiae grondines & relique huiuscemodi ab humana anima fieri possunt" (*de Incantationibus*, preface, p. 2; see also Ch. 4, p. 31, where Avicenna and Ficino are attacked for maintaining this doctrine).

(168) See Thorndyke, *History of Magic and Science*, Vol. II, p. 644.

(169) Cassirer, *Individuum und Cosmos*, p. 179; Feuckert, *Pansophie*, p. 474, cites other examples.

(170) E.g., Roger Bacon's master Orseme in the severely scientific and revolutionary treatise *De Configuratione Qualitatum*, for which he has been described as "the initiator of the conception that all natural phenomena may be mathematically reduced to magnitude, figure and motion" (for he attempts diagrammatic representation with coordinates of three dimensions, of the power, qualities, extension in time or space, of any entity) associates the performing of this schematisation with "magical" effects. (D.B. Durand, *Oresme and the Mediaeval Origins of Modern Science*, *Speculum*, 16, 1941, 167 ff). On the other hand, in the seventeenth century the section devoted to works on mathematics in W. London's *Catalogue of the most vendible Books in England*, 1656 (fDdi^r), still contains--between Scarborough's *Trigonometry*, and Euclid's *Elements* (this latter with a reprint of Dee's *Preface*) the entry "Cor. Agrippa, his occult philosophy, of Geomancy, Magicall elements of *P. de Abano*, The Nature of Spirits."

(171) *Friar Bacon his Discovery...translated our of Dr. Dee's own Copy by T.M....*, 1659, Ch. 8, p. 35.

(172) *Ibid*, Ch. I, pp. 3-4.

(173) *Ibid*, Ch. II, p. 4.

(174) *Ibid*, pp. 14-15.

(175) *Opus Tertium*, ed. Brewer, p. 95 ff.

(176) *Opus Majus*, III, 14, Vol. I, pp. 114-115.

(177) *Ibid*, IV, Vol. II, p. 110. It is notable that none of the works condemning magical practises in Dee's day deny the power of "Imaginative force," or that it is frequently operative as an efficient cause in natural processes. Delrio is almost singularly reserved in saying of this force that though certainly affecting the particular body in which dwells the mind producing it, he has great doubts about its power to act on external objects at a great distance, though he will admit it as probable that it may affect such objects if they are in the near vicinity and if the imagination be strong (*Disquisit. Magic*, I, 3, 3, Vol. I, p. 18 et seq).

(178) A. Lercheimer who recounts several of the slanderous legends about Agrippa, attributes to him a boast that he was able to have knowledge of anything that occurred anywhere in the world within twenty-four hours "by natural means"; without disputing this as a fact Lercheimer hotly

brands the last clause as a lie; Agrippa, he says, is trying to persuade us that evil spirits are angels (his account begins: "Obgemeldeter Abts [i.e., Trithemius] discipul war ein berumpter Schwartz Künstler mit namen Cornelius Agrippa/der den Teufel in eim schwarzen hunde mit ihm führete/der ihm anzeigt vnnd wirckte was er wolte/und was er/der Teufel könte." He comments on the claim mentioned above "welches dass er natürlicher weise solte zugehen/ist eine greifliche unverschampte lügen/die Leute zu bereden/dass schwartz weiss/und der böse Geist ein heiliger Engel sey." *Theatrum de Veneficiis*, Franckfurt, 1586, p. 276).

(179) *Of the Vanitie and Uncertaintie of Artes and Sciences*, trans. Ja. San. Gent. (i.e., James Sanford), 1569. Preface iij^r. Delrio's *Disquisitionum Magicarum*, 1593, gave wide currency to this view. Nash (*Terrors of the Night*, 1594, f F2^v-F2^r) relates stories of Agrippa's belief in his own magic feats. A typical attack is de Lancre's on "Of grand sorcier Agrippa...et Wier son disciple," (*Tableau de l'Inconstance des mauvais Anges*, Paris, 1613, p. 25 et seq); de Lancre (p. 376) declares Agrippa came to a miserable end, when hoping to become immortal, he ordered, at the devil's suggestion, his own head to be cut off; but the Devil thereupon merely mocked him, refused to restore him to life, and carried him down to Hell. Butler in the mid-seventeenth century finds it to be a distinguishing mark of Hermetic charlatans and necromancers that they have always "taken such pains to prove that magic is not conjuring, and that *Sir Henry Cornelius* was no conjuror, nor his dog a devil" (*Characters*, p. 102).

(180) E.g., Thorndyke's severe verdict (*History of Magic*...Vol. 5, pp. 127-139) that he was always "to a large extent a dabbler and a trifler," "an intellectual vagabond," and that the *Occult Philosophy* is a pretentious work of little significance since it is "vague, totally lacking in precision, and written in the pseudo-Platonic mooning stule of Iamblichus, Ficino and Reuchlin, rather than the direct, practical tone of Roger Bacon and Albertus Magnus."

(181) In a letter quoted Naudaeus, *History of Magick*, p. 285. Naudaeus also supplies (p. 190 et seq) an impressive number of testimonials to his learning, character, and purposes, made by prominent personal acquaintances of Agrippa's and other contemporary scholars.

(182) *De Occ. Phil.*, lib. I, cap. 70.

(183) *On the Vanitie...of Artes and Sciences*, Ch. 43.

(184) Ibid, Ch. 43, p. 56^r, cp *Preface* Aj^v. Dee claims to be quoting from Cassiodorus, but this omission, and the form of the quotation as compared with the original shows that Dee is simply reproducing Agrippa's version (an earlier quotation from Boethius' "Omnia quecunqz a primarum rerum natura constructa sunt, Numerorum videntur ratione formata" etc. *Preface* *j^r, is also used by Agrippa in *de Occ. Phil.*, II, 2).

(185) Ibid, Ch. 46.

(186) *Ars Notoria, quam creator altissimus Salomani revelavit*. Appended to Agrippa's *Opera*, Lubduni N.D. it is there claimed as being then first published. Dee possessed a manuscript copy however by 1556 (Corp. Chr. MS 191 f 77^v "Libri antiqui scripti quos habeo anno 1556"; on the list is the *Ars Notoria* bound with *Ars Sintrilla* and some works of Geber. This art was revealed to Solomon "ut per eam omnes scientias liberales mechanicas, exceptivas & earu facultates per breve spacium temporis posset subito acquirere & habere, & in proferendo mystica verba sanetorum orationum in omni sapientia penitus fundaretur" (p. 603).

(187) E.g., the spurious fourth book appended to Agrippa's *de Occ. Phil.*, after reproducing many characters of good spirits it declares "Characteres vero, qui per spirituum revelationem accipiuntur, exinde virtutem habent quia ipsi sunt signacula quaedam latentia, divinatis alicujus harmoniam constituentia: aut sunt signa infiti foederis & prominssae fidei, sen obedientiae: & ii

characteres nulla alia ratione possunt indagari."

(188) The tenet that consecrated images might possess "virtutes mirabiles" had been condemned at Paris in 1398 as "Error in fide & Philosophia naturali & astronomia vera" a verdict frequently reproduced in works on magic in the sixteenth century (e.g., Bodin, *Démonomanie*, p. 25). Dee however gives exact instructions on the size and proportion of his figure for those who want to employ it in this way. The use of words was more frequently defended; Trithemius argues that words must be of power since both good and bad Christians were able to do miracles by using the name of Christ, basing himself on the text "not all are of me that perform miracles in my name" (*Octo Questionum*, B8^r). Similar suggestions might be read into the effecting of transubstantiation by the service of the Mass though this was orthodoxly said to be due to an exercise of God's will following upon an act of faith and "was to be regarded as, in intent, nothing more wilful than prayer--though certainly prayer with a prerogative" (West, *The Invisible World*, p. 44, on its relations with ritual magic).

(189) Guaccius notes on this point how the memory image, even in the absence of the real object it imitates "excitat potentiam appetiuam, ad timorem, vel ad pudorem, vel ad irem, vel ad tristitiam, & cae affectiones sic hominem afficiunt, ut calore vel frigore, alteretur corpus, pallescat, vel rubescat, ut quasi exiliat efferatur vel torpescat sua deijciatur" (*Comp. Mal.*, p. 1).

(190) Discussed previously Ch. 3, p. 222, Dee seems to have cooperated in this work, which attempts to treat astrology inductively, a paragraph is headed (R2^v) "Regula facilis per quam exactius veriuqz revolution_ figurae constitutui possunt, quam per Alphonsina fundamenti per J.D. descripta."

(191) *Preface* biiij^v, concluding his description of the functions of Astrology and how all sublunar things depend on celestial influences "What shall be the heavenly Impression, the perfect and circumspecte Astrologien hath to Conclude. Not onely (by *Apotelesmes*) t_ __ but by Naturall and Mathematicall demonstration t_ _____. Whereunto, what Sciences are requisit (without exception) I partly have here warned: And in my *Propaedeumes* (besides other matter there disclosed) I have Mathematicall furnished up the whole Method: To this our age, not so carefully handled by any, that ever I saw, or heard of."

(192) That Dee had already discovered the "Monas" and was considering its virtues is clear not only from the title page but from Aphorism 82 (Biiij^{r-v}) where after writing of Catoptries he continues "Et est Arcan_ hoc, non minoris multo dignitatis, quam ipsa augustissima philosophorum *Astronomia Inferior* nuncupata: cuius insignia, in quodam inclusa monade, ae ex nostris Theoriis desumpta, tibi (i.e., Mercator) una cum isto libellus Multimus."

(193) +1^r-a1^r.

(194) In the revised letter of the 2nd ed. this last is replaced by *de Itinere Subterraneo*, 1560 and by *De Trigono Circinocqz Analogico*. *De Acribolgia Mathematica* is now graced with a Greek title, indicating that the text of his works of which he mentions Greek titles were not necessarily in that language (Aiiij^v).

(195) An important scientific principle, banishing in some measure the randomly miraculous from nature, implying the independent existence of the substance of things and the impossibility of the destruction or increase of the universe in part or whole in the natural course of events. It was by no means universally accepted. George Hakewill D.D. Archdeacon of Surrey later thought it necessary to write a very large work on this single theme. (*An Apologie or Declaration of the Power and Providence of God in the Government of the World*, 3rd ed. enlarged 1635.) It provoked much controversy but received testimonials from Henry Briggs, Savilean Professor of Geometry, Bainbridge, Savilean Professor of Astronomy, and Dee's friend Thomas Allen (who

wrote c2^r "Good Doctour Hakewill, I have ever beene of youre opinion...and now at fourescore and ten years of age I shall not easily be otherwise persuaded"). Its argument is that creation and ultimate destruction are accidents produced externally as far as the cosmos is concerned. "In the meantime, he [God] hath so ordained that the Elements of which all sublunary bodies are composed doe so beget all the other, and are againe, so begotten each from other, that while they seeme to dye, they become immortal" (unnumbered page facing title page). In the course of his argument he quotes Dee. Thus (I, 4, 1, p. 49) arguing that there is neither overall diminishing nor increase in the universe "Which is both in reason and by the consent of the Divines, as incommunicably the effect of a power divine, and above nature, as is the worke of the Creation itselfe, vt Deus ex nihilo contra rationis & naturae leges cuncta creavit: ita in nihilum abire rerum creaturum, aliqua, nunquam potest, nisi contra rationis naturaeque leges per super naturalem Dei potentiam fiat" (marginal acknowledgment to the *Aphorisms*). (Hakewill later quotes Dee again, Aphorism 12, on the world's construction imitating a lyre--II, 6, 5, pp. 172-173).

(196) aj^f. Between last two words 1568 ed (B1^r) inserts "ex pyronomia Institubis" adding finally "Naturam autem ego dico Rem Creatam quamcunqz."

(197) aj^v 1568 ed. adds term "conformitatem" Bij^f.

(198) a2^v 1568 ed. adds "Homo autem per se Mundanae isti Lyrae, omnino est analogus" B2^v.

(199) They are types rather than isolable substances--cp Elyot, *Castle of Health*, 1541, 3^{r-v}. "The Elementes be those originall thinges, unmyxt and uncompounde of whose temperace and mysture all other thynges hauynge corporall substaunce be compacte....It is to be remembred, that none of the sayd elementes be comonly sene or felt of mortal men, as they are in their originall being: but they whiche by our senses be perceived be corrupted with mutual mixture and be rather erthy, watry, airy, and fyry, than absolutely erth, water, ayre or fyre."

(200) a2^v. The 1568 ed. omits the four elements and substitutes a "cabalistic" variant without gaining in lucidity however. In singelis quatuor, Maioris Mundi magni Matricibus, sunt tres diverse partes: simul tamen concrete, conformataeqz & iustis suis contemperatae ponderibus: quasiam Notaricè, AOS, sive OSA sive SOA appellare libet (sic me enim Pyralogi intelligunt)." (Biii^f)

(201) "Complexiones siue Temperamento" is an addition of 1568, Biiij^f. This was a problem Alkindi gave much attention to solving mathematically, Dee deals with it at length in the *Preface*, basing himself on a tract of Bacon's (*ijj^f et seq).

(202) A3^v. Dee returns to this subject in the *Preface* (bij^v) where he makes a plea for the judgment of music by its mathematical structure rather than by ear, for this is the secret of its power and influence. He refers to Ptolemy's discussion of the harmony "to our spiritual part appropriate" (e.g., *Musica*, 111, 6, "Quomodo congruorum sonorum mutationes respondent circumstantibus animan mutationibus") (in *Tetrabiblos* 1, 13 Ptolemy applies musical ratios to astrology to determine which planetary relations are harmonious and beneficial and which discordant--maleficent). Dee cites non-existent works of Theophrastus and Democritus as authorities for the curative effects of music in disease (he probably takes over the reference to these works in Aulus Gellius IV, 13). This dogma formed the basis of some of Paracelsus' (whose works Dee studied with avidity) more humane experiments in curing lunatics. But it is a commonplace of the time. Cp. Gosson, *School of Abuse*, 1579 (Shakespeare Soc., 1841, pp. 15-16). "Homer with his musick cured the sick souldiers in the Grecians' camp and prgeth every mans tent of the plague. Thinke you that those miracles could be wrought without (sic=with) playing of daunces, dumpes, pavins, galiardes, measures, fancyes or newe streynes? They never came where this grew, nor knew what it ment."

(203) Lenoble writes of Paracelsus "nous trouvons chez lui, comme chez Pomponace et Chez

Cardan (il faudrait ajouter chez tous les naturalistes) le phénomène de l'aimant promu à la dignité d'exemple type de l'action causale" (*Mersenne*, p. 141).

(204) 1568 ed. (biiij^v) inserts the word "heavens." On Dee's view of the magnetic pole vide infra Ch. 7 n 85.

(205) 1568 ed. adds (biiij^v) "puncto quasi temporis." A few verbal changes of no moment also occur in XXVI.

(206) biv^f.

(207) Dee makes a passing reference to the use of the Monas figure here. In the 1568 ed. this is set in capitals with a reference to Dee's book on it.

(208) Cij^v.

(209) In 1568 ed. (lij^f).

(210) A few verbal alterations, omissions or corrections of spelling are made in LXXVI and XCV in the 1568 ed. In LXXXIX Dee adds a considerable passage after the statement that planetary influences vary in accordance with their distance from the earth: "Per Artificium autem Catoptricum quinqz planetarum Aliquam (idqz paucorum dierum Spacio) longissime a *Terra* distare facies. Et denuo (icta fere oculi) ad Perigeum quasi Novum, deducere possis. Quosdam me olim legisse memini, in Sole Lunaqz idem fuisse expertos opus. sed videtes .". The last words are from *Acts*, 4, 25--"why did the heathen age and the people imagine a vain thing?"; a quotation of *Psalms* w, 1, introduced apropos of the reaction to the "signs and wonders" performed by the apostles.

(211) e iii^f. His religious preoccupations, and the way he feels these are implied by any true physics, appear here (CVII); after describing the sun's effects he continues "Et pulchrum est considerare quo modo tandem sub ipsis Mundi Polis, ipse annus est nisi instar Diei unius naturalis. Aphorismum istum ad altiora traducas, et maximum secret_ habes, tu, qui Trinitatis in vnitatem, mysterio, tractas physica et ad Noctis multicoloris Nigredine, Opus involuendum tuam anhelas" (e iiij^v).

(212) e iiij^v. A position already asserted by Plotinus (*Enn.* V. 3), Avicenna and Pico (*Conclusiones*, p. 83, No. 7, "secundum Iamblichus"). "Nulla est vis coelestium astrorum quatum est in se maleficia." Paracelsus however, in whose teachings Dee had a lifelong interest, does not feel the need for any such reservation, and discusses the evil qualities of the stars which spread contamination and poisons. (See Stillman: *Paracelsus*, pp. 40-41.)

(213) Quoted Garin, *Pico*, p. 171, who says this "sembra divenire il tema di infinitae variazion nel mondo occidentale, arrivandosi di sempre nuove forze nel periodo umanistico."

(214) See Thorndyke, *History of Magic and Science*, Vol. VI, pp. 22-24.

(215) *Preface*, aiiij^f; ej^f.

(216) *Meno*, 76c.

(217) *Tetrabiblos*, I, 2.

(218) Thus Norton writes that different metals are formed and only to be found where "Virtue minerall" awaits such stimulation in veins...

"in certaine places of eligible ground,
Into which places the Heavenly Sphere
Sendeth his beames directly everie yeare"

(*Ordinall*, Ch. 3, in Ashmole, *Theatrum Chemicum*, p. 19).

(219) E.g., Julian, *Hymn to the Sun* speaks much of its emanations of a quasi-spiritual nature, light he represents as the "form" of the substance which is the substance of heavenly bodies and states "Now the doctrine of the Phoenicians who were wise and learned in sacred lore declared that the rays of light everywhere diffused are the undefiled incarnation of pure mind." (*Works*, II, p. 383.) Similarly, the *Hermetic* writings represent creation as beginning in Light from which arises a holy word which is "the voice of light," light equalling Mind, and its voice "the son of God" (*Poimanders*, Libellus I, 4-6; *Hermetica*, I, 115-117. They also declare that divine forces operate through the kosmos, as a whole which expresses these as radiations controlling the birth, growth and character of all material things Libellus X, p. 203). Cabalistic teachings present similarities, with their derivation of all things from *Ensoph*, the first light, through the ten Sephiroth or luminous circle. Pico wishing to reduce all the properties of the heavens to light and motion declares that Avicenna had taught they were all comprehended under the former "ut ipse scribet Avicenna solar est lux quae reliquas omnes virtutes de caelo vehit ad nos" (*Heptaplus*, p. 238, ed. Garin, who quotes in illustrations from Aquinas "Avicenna dicit...quod nulla actio est a corporibus superioribus in inferiora, nisi mediante luce"). Patrizzi's emanation theories in which light is that once the primary object of knowledge, the principle of cohesion in the Universe, and something capable of geometrical description, is a later instance than Dee of a very similar system being advanced by a neo-Platonic thinker (*Nova de Universis Philosophia*, Ferrara, 1591).

(221) E.g., Macrobius, *In Somn. Scip.* I, 17 (*Opera*, p. 193). The stars rule all things but the sun is in turn their sustainer and governor. Proclus' and Julian's Hymns to the Sun, are similarly, Hermetic texts; *Poimanders XVI: Hermetica* I, p. 271: "The Sun receives from God through the intelligible Kosmos, the influx of good [that is of life giving energy] with which he is supplied" etc. On paying it divine honours, see Anastos, *Plethos' Calendar*, p. 211. On Ficino, *De Sole*, "che sembrano in precludia ad una diferadell eliocentrismo," and Pico's similar sentiments, see Garin, *Pico*, p. 170.

(222) E.g., Hermetic texts: "Musicon vero nosse nihil aliud est nisi cunctarum [omnium] verum ordinem scire quaequae sit [omnes res] divina ratio sortita: ordo enim rerum singularum in unum omnium artificii ratione unlata[rum] concentrum quendam melo divino culcissimum verissimumque confice[e]t" (*Asclepius* I, *Hermetica* I, p. 310).

(223) On Alkindi--Abû Yûsuf Yâkûb ibn Ishâq ibn al-Sabbâh al-Kindi--most of whose known treatises have only recently been rediscovered, and still remain unedited-- see (in addition to briefer treatments cited below) particularly G. Flugel, *Al-Kindi gennant der Philosoph der Areber ein Vorbild seiner Zeit und seiner Volkes*, 1857 (Abhand. d. Deutsch, Morgenland, Gesellschaft Bd. 1, No. 2). O. Loth, *Alkindi als Astrolog* (Morgenland, Forsch, Festschrift Herrn Prof. Dr. H.L. Fleischer Leipzig, 1875, pp. 263-309), *Alkindi Tideas und Pseudo Euklid...* herausgeg. und erklärt rv. A.A. Bjornbo und Seb. Vogl (Leipzig u Berlin, 1912. Abhand. z Gesch.d. Mathemat. Wissenschaften. Heft XXVI, 3). A. Nagy, *Die philosophische Abhandlungen des Alkindi*, 1897 (Beit. z Gesch d. Phil. d. Mittelalt. II, 5). A transl. by E. Weidemann of the treatise *Wahl der Tage* in Archiv d. Gesch. d. Naturwiss. u. d. Technick Bd. 13, 1912, p. 224 et seq.

(224) Thus W.P. (William Perkins) in *Foure Greate Lyars* (1590) contemptuously lists among the tricks used to impress the vulgar by cozening prognosticators their continual citation of "Names of strage Authors: Proclus Alchindus, Messahala, Zoel, Albohazel, Haly, Albumacer....Trismegistus, with many other wodrous Doctors having a greate deale of small learnyng, and being farre borne as in *Caldea, Persia, Arabia, Jury.*"

(225) Corp. Chr. MS 191 f. 89^v. Dee notes the borrowing of "Alkindus de radius seu de causis reddendis" and "Alkindus de umbris et causis diversitatis aspectuum" from Peters Cambridge, 1556. Corp. Chr. MS 254, Item 9, f 191 is Alkindi's "liber de aspectibus"; Item 10, "Alkindi de umbris"; both copied out in Dee's hand.

(226) Carras de Vaux, *Les penseurs d'Islam*, 1921, Vol. IV, pp. 3-6.

(227) R. Walzer (*Arabic Transmission of Greek thought to Mediaeval Europe*, p. 19, Bulletin of John Rylands Library, Vol. 29, No. 1, July 1945) claims that Alkindi stresses the limitations of the intellect and of its sphere of possible operations, sharply and absolutely distinguishing it from the special and miraculous form of divine knowledge established by revelation to the prophets. The services to which he believed mathematics could be put however, include that of guidance in theological matters, thus Flugel *op. cit.* p. 9, "Auch in seines arithmetischen Schriften liev er nicht bei den strengen Grenzen dieser Wissenschaft steken, sondern er unterwarf die Zahl en sich in ihrer verschiedenen Anwendung mehrseitigen Forschunge. [He points out] dass die in der Politik des Plato (Buch 7) erwänten Zahlen seine besondere Augmersamkeit auf sich zogen; aber ebenso untersuchte ir ihre Zusammensetzung und erorterte die lehre von der Einheit Gottes hinsichtlich der Zahl und den Gebrauch und Einfluss der den Zahlen bei Deutung von Weissagungen (Z.B. beim Fälstechen), talismanisch oder magisch, und bei ihrer Anwendung zu allerhand kunstst_cher beigelegt wurde."

(228) C.A. Nallino, *Raccolta di Scritti editi e inediti*, Vol. 5 (Astrologia-Astronomia, Geographia), Roma, 1944, p. 20. Cp. Vogt discussion *op. cit.* p. 42, n. 2, "Alkindi trieb die Astrologie nicht als eine popularisierende Einkleidung der Astronomie sondern um ihrer selbst willen. Er hoehandelte sie nach mathematischen Methoden und angeblichen physickalischen Gesetzen und polemisierte beständig gegen den vulgaren Aberglauben."

(229) *Alkindi*, p. 12.

(230) *History of Magicke*, p. 169. His spiritual successors, Naudaeus suggests, were Abano and Pompanazzi.

(231) *De Causis diversitatum aspectes et dandis demonstrationibus geometricas superbas*, ed. cit. Bjornbo and Vogt, p. 43 etc.

(232) Naudaeus quotes Pico's statement that he knew but three men that had made the best advantages "of naturall and lawfull Magick, *Alchindus*, *Roger Bacon* and *William Bishop of Paris*." He himself compares Alkindi's rays with the Ideas of Plato (*History of Magicke*, pp. 68-69). Selden MS 79, a miscellany copied in part from Dee's MSS, begins with a transcript of "Alkyndus de projectione rador_" which contains a chapter "de vertute verbor_." An appended note (f 26^r) compares the work with those of Bacon and Agrippa. Dee is associated with Alkindi by Henry Fowler, rector of Minchinhampton, in a note of 1618 on a copy of Alkindi's "de gradibus compoticar_" (Royal MS 17, C. XV, Item 5 f 148^{r-v}): "He was the first that disclosed the misterie of the philosophers egge...He was the first that found out and discovered the Resultinge qualities in compound Electuaries and that found Doctor Dee, of Manchester first revealed it in mysticall manner ad filiis artis Angliae."

(233) *de causis diversitatum aspectas*, 10, p. 12.

(234) *de Temporum mutationibus...*ed. J. Hieronyma Scalingijs Paris, 1540, f1^v (B.M. copy contains notes by Gabriel Harvey, 1570).

(235) *de causis divers. aspect.*, prop. 22, p. 37.

(236) Alkindi's discussion here is perhaps a source for Kepler's discovery--or rather explicit enunciation--in *Ad Vitellionem Paralipomena*, 1604--of the "law of photometry" (that the intensity

of light varies with increase of distance from the source in inverse proportion to the surface of a sphere having the distance as radius). Kepler also shares with Alkindi the position that the propagation of light is immediate. (Kepler urges this because he regards it as "immaterial"--an obviously ambiguous term but possibly denoting a view not necessarily excluded by Alkindi's treatment of it as "a substance.")

(237) *Anatomie of Melancholie*, II, 2, 7, Vol. I, p. 383; in a series of questions on the stars, their numbers, sizes, influence, etc. Burton includes "An bene philosophentur R. Bacon, et J. Dee Aphorism de multiplicatione specierum."

(238) Grosseteste's influence on subsequent thinkers has been traced by Alexandre Birkenmajer: *Robert Grosseteste and Richard Fournival* (Medievalia et Humanistica, Fasc. 5, 36 et seq). On his interest in practical optics and physical theories see Thorndyke, *History of Magic and Science*, Vol. 5, p. 439 et seq.

(239) *Opus Majus*, III, 2, 1 to III, 4, 9. Vol. I, pp. 130-171.

(240) Landsdown MS 19, Item 34 f 69-75. Dee's letter contains a few general reflections not without interest: that he ascribes all things to the action of God (they are not therefore unsearchable, but rather simpler and more uniform than appearances suggest), he believes himself to be in receipt of divine assistance, and cherishes the hope that his studies may be of practical benefit to mankind (vide infra Ch. 7, n. 29 for a further account and details of other copies of this letter).

Of the present two works of Urso (which made one volume in the form he read them) Dee here writes (f 70^v) "Singulos Ursonis obiter avidissimeqz perlego. Statim animadverto opus ultra non esse, ut in Ursonis et neis Aphorismis admirandum ullum divinitusqz imissum suspicaremur consensensium...."

(241) Several appear in his MS list (printed Halliwell with the *Diaries*). Digby MS 71 f 27 et seq is a copy made by Dee between 30th May and 4th June, 1557, of Urso's *de effectibus qualitatum*. Dee possessed the copies of Urso's *Aphorisms* and *de Commixtionibus* listed by James in *Catalogue MSS Trinity College Cambridge*, Vol. 3, No. 1154, pp. 104-106. MS Corpus Christi 191 f 83^r (Dee's notes of books borrowed) shows that he borrowed these two, bound in one volume, from Queen's Oxford, 12 May, 1556. Most of Urso's known works--including one of the only two known copies (sometimes said to be the sole one but vide supra) of *de commixtionibus elementorum* (Digby MS 161), the *Aphorisms*; *de Anima*; *de diebus criticis*; *de effectibus medicinarum*, are represented in the Digby collection, and come probably from sources not inaccessible to Dee. (Bodley Cod. 1638, 1754, 1807, 2597, 1762, 1672, etc.)

(242) See principally R. Creutz, *Urso der letzte des Hochsalerno, Arzt, Philosoph Theologe*, Berlin, 1934 (Abhandl.z.Gesch. d.Med.u.d.Naturwiss.Heft 5). *Die Medizinisch-naturphilosophische Aphorismen und Kommentar des Magister Urso Salernitanus*, ed. R. Creutz mit ein führenden Worter v.P. Diepgen (Quellen u. Studien z. Gesch. d. Naturwiss. U.d. Med. Band 5, Berlin, 1936). C. Matthews, *Der Salernitaner Arzt Urso aus der 2 Hälfte des 12 Jahrhunderts und seine beiden Schriften, De effectibus qualitatum und de effectibus medicinarum*, Leipzig, 1918. (G.v. Jago, *Des Natur philosophische aus führlich kommentiern Aphorisme des Magister Urso.....*, Leipsig, 1924.)

(243) P.O. Kristeller, *The School of Salerno*, p. 161 (Bulletin Hist. Med. Vol. XVII, 1945).

(244) Diepgen, op. cit. (n. 242), p. 1, compares his synthesis with that of Arnoldus de Villa Nova, or Paracelsus, "Wie jene männer war Urso durch und durch von platonischer und neoplatonischer Gedanken erfüllt, und verkebe, wic jene seine religiöse Weltanschauung mit seinem naturwissenschaftlichen Weltbild."

(245) *Aphorism 25* (p. 12 ed. cit.) "Sopita virtus per spiritus excitatur, ut suam perficiat actionem, in quibus dispositio aut ab anima prima, aut a rei inascitur natura. His ergo mediis animae dispositio animalis corporis naturae presentatur sicque illud percipi cogitur" etc.

(246) E.g., Aphorism 39 and Gloss.

(247) *De commixt. element.*, Creutz trans. ed. cit. pp. 4-5.

(248) *Ibid*, p. 8, Aphorism No. 3-4, p. 10-11.

(249) E.g., *De Caelo*, III, 3, 302a.

(250) See esp. *de effect. Qualit.*, e.g., "Harum autem quatuor qualitatum duam faciunt motam de centro, et duae motum ad centrum. De centro ad circumferentiam faciunt motum caliditas at humiditas, caliditas dissolvendo vel elongando, humiditas relaxando et dilatando. Caliditas vero habet motum de centro elongando, dum dissolvendo terrestria in aquose et aquosa in aerea, aerea in ignes, inferiora et media reducit ad superiora. Quod autem in re inferius est, centrum dicitur vel medium....Duac vero qualitates motum ad centrum facientes scilicet frigidus et siccitas, aliter motum ad centrum faciunt, quia frigiditas constringendo vel incurtando, siccitas inspissando condempando vel rotunda...." etc. p. 170 et seq (Matthaes reprint op. cit., pp. 18-19). The theory that heat was only a form of motion was always frequent among Platonising scientists, seeking rational mechanical explanations for qualitative effects long before Francis Bacon performed his famous induction. In the 17th century the view gained favour as it had clear affinities with the tendencies of the new Newtonian science. (Hook denied the existence of frigorific particles and "atoms" of fire, heat "being nothing else byt a very Irish and vehement agitation of the parts of a body" all things therefore possessing some degree of heat and nothing being perfectly cold or without motion). It was not of course until Ramford's and Davy's experiments in the early nineteenth century which showed it might be generated indefinitely by mechanical work, that direct evidence could be produced against the view which many had continued to hold up to that time, that heat was a "substance."

(251) Creutz op. cit. (n. 242), p. 3.

(252) See Aphorism 32 and gloss (p. 13, 63-65) "Nulli dubium est superiora corpora, utpote quantitate majora, puritate, et loco digniora, virtute efficatora in inferioribus agere et secundum corporum complexionem variam, diversitate motus vel conjunctionis inferiora corpora et magis similia vol mutationi habilia multiformiter permutare" etc.

(253) It is the *Monas*, which, from the *Spiritual Diaries* and elsewhere he seems usually to have presented to patrons he wished to impress. A dedication copy of the *Aphorisms*, 1668 ed., given late in his life to Sir Julius Caesar is, however, extant (E.P. Goldschmidt, *Catalogue*, 84, p. 20, No. 105). Aubrey (who owned works of Dee, Leawitz, Digges, Commandine etc.) had a copy of the 1558 ed. given by Tho. Fludd (friend of Oughtred, and who had connections with Camden) (T.L.S. Jan. 13, 1950, p. 32).