

The  
American Historical Review

SCIENCE AT THE COURT OF THE EMPEROR  
FREDERICK II.

THE Emperor Frederick II. is a subject of perennial interest to the historian. The riddle of his many-sided personality, his place at the centre of one of the great struggles of European politics, the striking anticipation of more modern ideas and practices in his administration, the brilliant and precocious culture of his Sicilian kingdom, have attracted the attention of two generations of scholars without definitive results. We still lack a satisfactory biography and a survey of the governmental system, as well as annals for the later years of the reign,<sup>1</sup> while for its intellectual history nothing has superseded what was written by Amari<sup>2</sup> and Huillard-Bréholles<sup>3</sup> more than half a century ago. As regards vernacular literature, the limited body of extant material has so circumscribed the problem that we now understand fairly well the importance of the *magna curia* as the cradle of Italian poetry and the origin of particular forms like the sonnet.<sup>4</sup> The Latin literature of the South has been partially explored by Hampe and others, though its relations to intellectual movements in

<sup>1</sup> The best sketch is that of Karl Hampe, "Kaiser Friedrich II.", in *Historische Zeitschrift*, LXXXIII. 1-42 (1899). The newer materials for the study of the reign are noted in his *Deutsche Kaisergeschichte* (Leipzig, 1919), pp. 219 ff. E. Winkelmann's fundamental annals, *Kaiser Friedrich II.* (Leipzig, 1889-1897), stop with 1233.

<sup>2</sup> *Storia dei Musulmani di Sicilia* (Florence, 1854-1872), III. 655 ff.

<sup>3</sup> *Historia Diplomatica Friderici Secundi* (Paris, 1859-1861), introduction, especially pp. dxix-dlv.

<sup>4</sup> See particularly E. F. Langley, "The Extant Repertory of the Sicilian Poets", in *Publications of the Modern Language Association of America*, XXVIII. 454-520 (1913); and the important studies of Ernest H. Wilkins on the origin of the *canzone* and the sonnet, *Modern Philology*, XII. 135-166, XIII. 79-110 (1915). For Frederick's relations with Provençal poets, see the studies of De Bartholomaeis, in *Memorie of the Bologna Academy*, I. 69-124 (1911-1912); and Bertonio, *I Trovatori d'Italia* (Modena, 1915), pp. 25-27.

northern Italy and elsewhere require further investigation.<sup>5</sup> On the scientific side, while much remains to be done with the fragmentary materials, investigation has advanced to a point where it may be worth while to supplement and correct the older writers by a general survey of the present state of our knowledge. If the results do not greatly enlarge our acquaintance with the content of thirteenth-century science, they at least illustrate more fully its methods and the workings of one of the most remarkable minds of the later Middle Ages.

The intellectual life of Frederick's court cannot be regarded as an isolated or merely personal phenomenon. Lying between the Middle Ages and the Renaissance, it must be seen against the cosmopolitan background of Norman Sicily, the meeting-point of Greek, Arabic, and Latin culture, central in the history as in the geography of the Mediterranean lands. Frederick was not the first but the second of the "two baptized sultans" on the Sicilian throne,<sup>6</sup> and in intellectual matters as in legislation he followed in the direction of his grandfather Roger. King Roger's chief scientific interest was geography, pursued assiduously throughout the fifteen years of his reign. Finding the Arabian geographies and translations insufficient for his purpose, he called to his court famous travellers from many lands and subjected them to a close examination, accepting only the facts on which they were agreed, and recording the results upon a great silver map and in a volume of descriptive text in Arabic which Edrisi completed in 1154.<sup>7</sup> This method is not unlike that followed by Frederick in consulting experts on falconry, among whom he cites King Roger's falconer, William, who passed as one of the earliest writers on this subject.<sup>8</sup> Under Roger's immediate successors, William I. and William II., scientific activity took the form particularly of the translation of Greek works on mathematics and astronomy: the *Data*, *Optica*, and *Catoptrica* of Euclid, the *Pneumatica* of Hero of Alexandria, the *De Motu* of Proclus, even the *Almagest* of Ptolemy. Scientific observation, fed by the *Meteorology* of Aristotle, concerned itself with the phenomena of Etna.<sup>9</sup> At the same time Ptolemy's *Optics* was trans-

<sup>5</sup> This is the freshest part of the notable article of the late H. Niese, "Zur Geschichte des Geistigen Lebens am Hofe Kaiser Friedrichs II.", in *Historische Zeitschrift*, CVIII. 473-540 (1912). There are noteworthy essays by F. Novati in his *Freschi e Minii del Dugento* (Milan, 1908), especially pp. 103-142.

<sup>6</sup> The phrase is Amari's, *Musulmani*, III. 365.

<sup>7</sup> *L'Italia descritta nel "Libro del Re Ruggero"*, translated by Amari and Schiaparelli (Rome, 1883), pp. 4-8; Edrisi, translated by Reinaud (Paris, 1836), I. xviii-xxii. Pardi has recently argued that the final form of the work must be subsequent to 1154; *Rivista Geografica Italiana*, XXIV. 380 (1917).

<sup>8</sup> *English Historical Review*, XXXVI. 341, 347.

<sup>9</sup> See my article on "The Greek Element in the Renaissance of the Twelfth

lated from the Arabic, and the household of William II., as portrayed in the scenes of his death, comprised an Arab physician and an Arab astrologer.<sup>10</sup>

At the court of Frederick II. the Greek element is of little significance. Greek versions of his laws were issued, and Calabrian poets sang his praises in Greek verse, but the influence of Byzantium had declined with the fall of the Greek empire, and we hear little of Greek scholars or Greek translations in this period in the South.<sup>11</sup> On the other hand, Arabic influence was, if anything, stronger under Frederick, especially after his visit to the East, and was maintained by the political and commercial relations with Mohammedan countries, while his imperial interests fostered intercourse with northern Italy, Germany, and Provence. The chronicler who passes by the name of Nicholas of Iamsilla tells us that at Frederick's accession there were few or no scholars in the Sicilian kingdom, and that it was one of his principal tasks by means of liberal rewards to attract masters from various parts of the earth.<sup>12</sup> What scholars were thus drawn to the Sicilian court we know but imperfectly. The loss of the imperial registers, save for a fragment of 1239-1240,<sup>13</sup> makes it impossible to reconstruct in detail the organization and personnel of the household, and the scattered documents of the reign tell us almost nothing of the men who aided the emperor in his scientific inquiries. That they were chiefly officials of the *curia* seems altogether likely. Several of the Sicilian school of poets held official positions as notaries, judges, or falconers,<sup>14</sup> and we are not surprised to find Frederick's astrologer, Theodore, engaged in the same year in casting horoscopes, going on missions, making confectionery, drafting letters, and translating an Arabic work on falconry. In this busy court science, like literature, would seem to have been a matter for leisure hours, and its votaries could be no narrow specialists!

Two of Frederick's courtiers seem to have borne the official title of "philosopher", and in an age when philosophy and science were

Century", in *American Historical Review*, XXV. 603-615 (1920), and the earlier articles there cited.

<sup>10</sup> Petrus de Ebulo, *Liber ad Honorem Augusti*, plate 3.

<sup>11</sup> Niese, in *Historische Zeitschrift*, CVIII. 490 ff.; cf. Bresslau, *Urkundenlehre*, edition of 1915, II. 380 ff. Further investigation is needed respecting Greek in the South in the thirteenth century.

<sup>12</sup> Muratori, VIII. 496.

<sup>13</sup> On which see the recent studies of Niese, in *Archiv für Urkundenforschung*, V. 1-20 (1913); and Sthamer, in *Berlin Sitzungsberichte*, 1920, pp. 584 ff.

<sup>14</sup> See Langley's list in *Publications of the Modern Language Association*, XXVIII. 468 ff., and the references there cited, especially the researches of Scandone in *Studi di Letteratura Italiana*, V., VI.

inseparable these two were naturally the chief advisers of the emperor in scientific matters. The more famous of them, Michael Scot,<sup>15</sup> who hailed originally from Scotland, came to Sicily with a reputation gained chiefly in the schools of Spain. Appearing at Toledo as early as 1217, Michael there distinguished himself by translating al-Bitrogi *On the Sphere* and Aristotle *On Animals*, as well as the *De Caelo* and the *De Anima* with the commentaries of Averroes thereon. By 1220 he is in Italy, and from 1224 to 1227 he enjoys the favor of the pope and the grant of benefices in England and Scotland; but soon thereafter he is found in the emperor's service, in which, though not mentioned in any surviving official documents, he remained until his death, which occurred before 1236. His official position was that of court astrologer, but he made for the emperor a Latin summary of Avicenna's *De Animalibus* and busied himself with a series of writings on astrology, meteorology, and physiognomy, all dedicated to Frederick. These show acquaintance with medicine, music, and alchemy, as well as with the Aristotelian philosophy in general. We are told that he knew Hebrew as well as Arabic, but his linguistic attainments are the occasion of unfavorable comment on the part of Roger Bacon. Scot had a respectable knowledge of the Arabian astronomy and its applications, and prided himself on the accuracy of his observations and calculations. His faith in astrology does not, in his age, militate against his standing as a scientist, but his own writings show him to have been pretentious and boastful, with no clear sense of the limits of his knowledge, as well as tending to overstep the line, if line there be, between astrology and necromancy. At the same time he had an experimental habit of mind, and a final judgment as to his scientific attainments must await the more careful sifting of his extensive treatises on astrology, the *Liber Introductorius* and the *Liber Particularis*.

If Michael Scot represented the learning of Moorish Spain and Western Christendom, Master Theodore "the philosopher" seems to have maintained relations particularly with the East.<sup>16</sup> Greek, or perhaps Jewish,<sup>17</sup> by name, he is said to have been sent to Frederick by the Great Calif, probably the Sultan of Egypt, some time before

<sup>15</sup> Current statements concerning him are derived from the highly conjectural book of J. Wood Brown, *An Enquiry into the Life and Legend of Michael Scot* (Edinburgh, 1897). I have tried to fix the few facts we really know in an article on "Michael Scot and Frederick II.," to appear in *Isis*, IV., in 1922.

<sup>16</sup> See, in general, Amari, *Musulmani*, III. 692-695; Steinschneider, in Vienna *Sitzungsberichte*, CXLIX. 4, p. 79; Sudhoff, in *Archiv für die Geschichte der Medizin*, IX. 1-9 (1915).

<sup>17</sup> Renan, in *Histoire Littéraire de la France*, XXXI. 290.

1236.<sup>18</sup> If we may believe the prologue to the French romance of *Sidrach*, Theodore, here called "Todre li phylosophes", came from Antioch and remained in relations with its Latin patriarch.<sup>19</sup> In the autumn of 1238, at the siege of Brescia, he appears in the Dominican annals as silencing the friars in philosophical disputes until, challenged to public debate on any subject of philosophy with the doughty Roland of Cremona, he is triumphantly confuted, to the great glory of the order.<sup>20</sup> Probably succeeding Scot as court astrologer, Theodore casts the imperial horoscope at Padua in 1239, where he is ridiculed by the local chronicler for seeking a favorable conjunction impossible at the time and failing to search in Scorpio for the impending failure of the expedition.<sup>21</sup> In the register of 1239-1240 he is found drafting the emperor's Arabic letters to the King of Tunis and acting as his trusty messenger. In this same year he is busy compounding syrups and sugar of violet for the emperor and his household, with free credit in money and costly sugar for this purpose, and a box of the violet sugar is sent to Piero della Vigna during his recovery from an illness.<sup>22</sup> In 1240-1241 the emperor corrects his translation from the Arabic.<sup>23</sup> No further dates are known in Theodore's career, but he continued to enjoy imperial favor until his death not long before November, 1250, when Frederick regranted the extensive domains which "the late Theodore our philosopher held so long as he lived".<sup>24</sup>

<sup>18</sup> "Explicit liber novem iudicum quem missit soldanus Babilonie imperatori Federico tempore quo et magnus chalif misit magistrum Theodorum eidem imperatori Federico." British Museum, Royal MS. 12 G. VIII; cf. French version in Langlois, *La Connaissance de la Nature au Moyen Age* (1911), p. 191; Amari, III. 694. The *Liber Novem Iudicum* is cited by Michael Scot in his *Liber Introductorius* (Munich, cod. lat. 10268, f. 128), and must thus have reached Sicily before 1236. The phrase "magnus chalif" does not strengthen our faith in this colophon.

The references to Theodore in the writings of Leonard of Pisa may well be earlier, but the answers to Theodore's questions look like later additions to the original text of Leonard's *Flos* and *Liber Quadratorum*, so that they cannot be dated with certainty.

<sup>19</sup> H. L. D. Ward, *Catalogue of Romances in the British Museum*, I. 904 ff.; *Histoire Littéraire*, XXXI. 288-290; Langlois, p. 204.

<sup>20</sup> Quétif and Échard, *Scriptores Ordinis Praedicatorum*, I. 126, col. 2.

<sup>21</sup> Rolandini, in Muratori, VIII. 228 (new edition, VIII. 66); and in *Monumenta, Scriptores*, XIX. 73.

<sup>22</sup> Huillard-Bréholles, *Historia Diplomatica*, V. 556, 630, 727, 745, 750 ff.; *id.*, *Pierre de la Vigne*, p. 347.

<sup>23</sup> *English Historical Review*, XXXVI. 348.

<sup>24</sup> Original charter published by Schneider in *Quellen und Forschungen aus Italienischen Archiven*, XVI. 51 (1913); cf. the inquest of the Angevin period published by Scandone in *Studi di Letteratura Italiana*, V. 308 (1903). Theodore may well have been one of the astrologers lost in the defeat before Parma in 1248. Hartwig, in *Centralblatt für Bibliothekswesen*, III. 183.

While the biographical data are somewhat fuller in the case of Theodore than in that of Michael Scot, the evidence of his literary activity is much less. Apart from a doubtful connection with the transmission of the philosophical romance of *Sidrach*, Theodore is known only as the author of a treatise on hygiene extracted for the emperor's benefit from the *Secretum Secretorum* of the Pseudo-Aristotle,<sup>25</sup> and a Latin version of the work of Moamyn on the care of falcons and dogs.<sup>26</sup> His preface to this shows acquaintance with Aristotle, including the *Ethics* and the *Rhetoric*, such as a court philosopher should have, while he also exhibits medical knowledge. Mathematician as well as astrologer, he puts problems to Leonard of Pisa, and is addressed by him as "the supreme philosopher of the imperial court", whose cosmopolitan culture he well represents.<sup>27</sup>

Another court philosopher, John of Palermo, mentioned by Leonard of Pisa in 1225, is probably identical with the Master John the notary who acts as confidential agent of the emperor in 1240, but we know nothing of his scientific tastes beyond his interest in mathematics.<sup>28</sup> A Master Dominicus, perhaps a Spaniard, appears in the same connection.<sup>29</sup> The Sicilian Moslem who tutored Frederick in logic during his crusade remains anonymous,<sup>30</sup> with many other scholars who must have attended the court. One of these, for example, appears in correspondence on mathematical subjects with a learned Jew of Spain.<sup>31</sup>

The more literary members of the *magna curia*, such as Piero della Vigna, are silent respecting their scientific associates, save for such an exchange of compliments and sugar plums as has been cited. The interests of Piero, as of the other members of the Capuan school, were primarily literary, and his letters would not have become models of Latin style for the thirteenth century<sup>32</sup> had he not been first and foremost a phrasemaker who spoke "obscurely and in the grand manner".<sup>33</sup> The extant collections of correspondence which pass

<sup>25</sup> Ed. Sudhoff, in *Archiv für die Geschichte der Medizin*, IX. 4 (1915).

<sup>26</sup> *English Historical Review*, XXXVI. 348 ff.

<sup>27</sup> *Scritti di Leonardo Pisano*, ed. Boncompagni (Rome, 1857-1862), II. 247, 279.

<sup>28</sup> *Ib.*, II. 227, 253; Huillard-Bréholles, II. 185, V. 726 ff., 745, 928.

<sup>29</sup> Leonardo, *Scritti*, II. 1, 253; Cantor, *Vorlesungen über die Geschichte der Mathematik* (Leipzig, 1900), II. 35 ff., 41.

<sup>30</sup> Amari, *Biblioteca Arabo-Sicula*, II. 254.

<sup>31</sup> Steinschneider, *Hebräische Uebersetzungen*, p. 3.

<sup>32</sup> Critical edition lacking. See Huillard-Bréholles, *Pierre de la Vigne*, pp. 249 ff.; Hanauer, in *Mitteilungen des Instituts für Oesterreichische Geschichtsforschung*, XXI. 527-536 (1900).

<sup>33</sup> So Odofredus characterizes him, *Mitteilungen des Instituts*, XXX. 653, n. 1.

under his name were preserved for rhetorical rather than historical purposes, and there was no occasion for retaining in them whatever of the scientific life of the court the originals might have reflected. Nevertheless, some of his phrases suggest the other intellectual interests of the court, as when he borrows the language of the current cosmogony in the preface to the emperor's *Constitutions*,<sup>34</sup> or refers to the preoccupation of the friars with the form of the globe, the course of the sun in the zodiac, the squaring of the circle, or the conversion of triangles into quadrangles.<sup>35</sup> Piero's correspondence with the masters of Bologna and Naples and the *dictatores* of his native Campania runs parallel to the scientific correspondence of Frederick and his philosophers with scholars in Italy and Mohammedan lands.

So far as Italy is concerned, the outstanding scientific genius of the thirteenth century is undoubtedly the mathematician Leonard of Pisa.<sup>36</sup> Beyond the fact of his African education, and his "sovereign possession of the whole mathematical knowledge of his own and every preceding generation",<sup>37</sup> his personal history is unknown; but though he resided at Pisa, he was well known to Frederick and the philosophers of his court, to whom his extant works are in large measure dedicated. It is Michael Scot who in 1228 receives from Leonard's hands the revised edition of his epoch-making treatise on the *Abacus*, first issued in 1202.<sup>38</sup> Already Master John of Palermo had accompanied Leonard into the emperor's presence and proposed questions involving quadratic and cubic equations, the answers to which are found in the *Flos* and *Liber Quadratorum*.<sup>39</sup> Like the solutions of various problems submitted to Leonard by Master Theodore, these are designed to illustrate method rather than to form a systematic treatise. The *Liber Quadratorum* is directed to the emperor, who has himself deigned to read the treatise on the *Abacus* and to hear the discussion of subtle problems of arithmetic and geometry, such as those once propounded in his presence by Master John.<sup>40</sup> Relations

<sup>34</sup> Niese, in *Historische Zeitschrift*, CVIII. 501, 523. Those who doubt Piero's authorship of the original constitutions admit his influence on their style as we have them: e.g., Garufi, in *Studi Medioevali*, II. 105, note.

<sup>35</sup> Poem printed by Huillard-Bréholles, *Pierre de la Vigne*, p. 414.

<sup>36</sup> M. Cantor, *Vorlesungen*, II. cc. 41, 42; S. Günther, *Geschichte der Mathematik* (Leipzig, 1908), I. c. 15.

<sup>37</sup> Günther, p. 258.

<sup>38</sup> *Scritti*, I. 1.

<sup>39</sup> *Scritti*, II. 227-283. The date 1225 which heads the *Liber Quadratorum* has perplexed historians, since Frederick first visited Pisa in the following year. Eneström has tried to reconcile the difficulties by placing the first meeting elsewhere. *Bibliotheca Mathematica*, IX. 72 (1908).

<sup>40</sup> *Scritti*, II. 253.



with other scholars of northern Italy seem to have concerned chiefly matters of law or literature, as Niese has well brought out,<sup>41</sup> but we should not overlook the treatise on the hygiene of a crusading army dedicated to Frederick by Adam, chanter of Cremona, in 1227 and recently brought to light by Sudhoff.<sup>42</sup>

It is characteristic of Frederick's strongly personal policy that the intellectual life of his kingdom centres in his court rather than in universities, and that the southern universities in his reign show little vigor of life and leadership. His absolute and paternal ideas of government left no place for independent corporations of masters and students living the free and turbulent life of the northern *studia*. So Salerno, which had grown to eminence as a school of medicine without the aid of prince or pope, found itself tied down by royal statute in 1231 as part of a comprehensive regulation of the practice of medicine, surgery, and pharmacy throughout the kingdom of Sicily, issued in the interests of bureaucratic administration rather than of university development. The course of study is laid down by law, and royal officers are to be present at the examinations.<sup>43</sup> A similar bureaucratic purpose runs through the statutes establishing the University of Naples in 1224 and reforming it in 1234 and 1239. Frederick needed trained public servants, and he preferred to have them brought up in his own kingdom rather than in Bologna and other Guelfic cities of the North. Although the new university was to comprise all the fields of study then current, its strength lay in law and rhetorical composition, and it is no accident that the masters whose names have reached us are chiefly jurists and grammarians, closely connected with the judges and clerks of the royal *curia*.<sup>44</sup> Nevertheless we read of a

<sup>41</sup> *Historische Zeitschrift*, CVIII. 513 ff.

<sup>42</sup> F. Hönger, *Aertzliche Verhaltensmassregeln auf dem Heerzug ins Heilige Land für Kaiser Friedrich II. geschrieben von Adam von Cremona* (Leipzig diss., 1913).

<sup>43</sup> Constitutions in Huillard-Bréholles, IV. 150 ff., 235; Greek text, ed. Sudhoff, in *Mitteilungen zur Geschichte der Medizin*, XIII. 180 (1914). See Rashdall, *Universities*, I. 83 ff.; and the commentary of A. Bäumer, *Die Aertztegesetzgebung Kaiser Friedrichs II.* (Leipzig, 1911).

<sup>44</sup> See the principal documents concerning the beginnings of the university in Huillard-Bréholles, II. 450, IV. 497, V. 493-496; and the discussion in Denifle, *Die Universitäten*, I. 452-456. A much-needed study of its early history is promised by E. Sthamer. Two masters connected with the university in this period are the subjects of recent monographs: G. Ferretti, "Roffredo Epifanio da Benevento", in *Studi Medioevali*, III. 230-275 (1909); and F. Torraca, "Maestro Terrisio di Atina", in *Archivio Storico Napoletano*, XXXVI. 231-253 (1911). Another professor of grammar, Walter of Ascoli, has left an etymological cyclopaedia entitled *Dedignomion*, or *Summa Derivationum*, or *Speculum Artis Grammaticae*, based on Isidore and Hugutio. I have used MS. 449 at Laon



professor of natural philosophy, Master Arnold the Catalan, who taught the courses of the stars and the nature of the elements but was unable to predict his own sudden death, which occurred "as he was lecturing on the soul", very likely in the midst of a commentary on the *De Anima* of Aristotle.<sup>45</sup> No less a person than Thomas Aquinas began his study of natural philosophy at Naples, under an Irish master, one Petrus de Hibernia, who is later found holding a disputation at King Manfred's court.<sup>46</sup>

Frederick's patronage of learning was not limited to Christian scholars. The Jewish translator of the logical commentary of Averroes and Ptolemy's *Almagest*, Jacob Anatoli, praises this "friend of wisdom and its votaries" for pecuniary support, and even hopes the Messiah may come in this reign; his versions into Hebrew, begun in Provence, were continued at Naples in 1232 and brought him into relations with Michael Scot as well as the emperor.<sup>47</sup> A Spanish Jew, the encyclopedist Jehuda ben Solomon Cohen, was in correspondence with one of the court philosophers at the age of eighteen, coming later to Italy, where he met the emperor and is found in Tuscany in 1247.<sup>48</sup> Through these or others Frederick had some knowledge of Maimonides.<sup>49</sup>

Whether eminent Mohammedan scholars actually resided at Frederick and MS. Vat. lat. 1500 of the Vatican, both ca. 1300; there is a later copy at the University of Bologna, MS. 1515 (2832). The Laon manuscript was ascribed to Walter, archbishop of Palermo in the twelfth century (*Catalogue*, p. 238), but "Gualterius Hesculanus" appears clearly in the preface, and a further sentence printed by Morelli, *Codices MSS. Latini Bibliothecae Nanianae* (Venice, 1726), p. 160, states that the book was begun at Bologna in 1229 and afterward completed at Naples. Walter is probably the "Magister G[ualterius] grammaticus", professor at Naples, whose death is lamented in a letter of Piero della Vigna (*Epp.*, IV., no. 8; Huillard-Bréholles, *Pierre de la Vigne*, p. 394). In the Laon MS. the *Dedignomion* is followed by the notes of another southern grammarian, Anellus de Gaieta.

<sup>45</sup> See the letter of condolence of Master Terrisio, published by Paolucci in the *Atti* of the Palermo Academy, IV. 44 (1896); and by Torraca in the article just cited, p. 247.

<sup>46</sup> Denifle, *Universitäten*, I. 456 ff.; Bacumker, "Petrus de Hibernia", in Munich *Sitzungsberichte*, 1920; *infra*, n. 138.

<sup>47</sup> Renan, in *Histoire Littéraire*, XXVII. 580-589; Steinschneider, *Hebräische Uebersetzungen*, pp. 58-61, 523; Huillard-Bréholles, IV. 382, n.

<sup>48</sup> Steinschneider, *op. cit.*, pp. 1-3, 164, 507; *id.*, *Verzeichniss der Hebräischen Handschriften der Königlichen Bibliothek zu Berlin*, II. 121-126; and in *Zeitschrift für Mathematik und Physik*, XXXI., part 2, pp. 106 ff. On Jewish culture under Frederick, see M. Gudemann, *Geschichte des Erziehungswesens der Juden in Italien* (Vienna, 1884), pp. 101-107, 268 ff.; R. Straus, *Die Juden im Königreich Sizilien* (Heidelberg, 1910), pp. 79-91.

<sup>49</sup> Amari, III. 705 ff.; Steinschneider, in *Hebräische Bibliographie*, VII. 62-66 (1864); *id.*, *Hebräische Uebersetzungen*, p. 433.

erick's court, is a question which cannot be answered from the information at our disposal. His colony of Saracens at Lucera<sup>50</sup> and his well-known tolerance of the infidel combined with the environment of his youth and his semi-oriental habits of life to spread stories that he preferred to surround himself with Moslem rather than Christian influences, in learning as in everything else.<sup>51</sup> That he was friendly to the learning of Islam appears from the various questionnaires which, as we shall see, he sent out to Mohammedan rulers, partly as puzzles, partly in a real search for knowledge. His crusade led to political and commercial relations with the Sultan of Egypt which lasted throughout his reign, while the commercial treaty of 1231 with the ruler of Tunis was followed by the establishment of a Sicilian consulate at Tunis and a series of diplomatic missions of various sorts.<sup>52</sup> Such missions were regularly the occasion of an exchange of presents, and it was well understood that the emperor valued a book, a rare bird, or a cunning piece of workmanship more highly than mere objects of luxury. Thus in 1232 al-Ashraf, sultan of Damascus, sent him a wonderful *planetarium*, with figures of the sun and moon marking the hours on their appointed rounds; valued at 20,000 marks, this was kept with the royal treasure at Venosa.<sup>53</sup> Frederick gave in return a white bear and a white peacock which astonished the Oriental chroniclers, as their western contemporaries were impressed by "the marvellous beasts, such as the West had not seen or known", which Frederick had earlier received from Egypt.<sup>54</sup>

At the end of a series of such costly exchanges, Frederick, his treasury exhausted, propounded to the sultan problems of mathematics and philosophy, the solutions of which, due to a famous scholar of Egypt,<sup>55</sup> came back in the sultan's own hand. While in the East Frederick asked an interview with some one learned in astronomy,

<sup>50</sup> On which see now Egidi, in *Archivio Storico Napoletano*, XXXVI.-XXXIX.

<sup>51</sup> Current views of Frederick's relations with the Saracen world are illustrated by Matthew Paris, *Chronica Majora*, III. 520; IV. 268, 526, 567 ff., 635; V. 60 ff., 217.

<sup>52</sup> See, in general, Amari, *Musulmani*, III. 621-655; A. Schaube, *Handelsgeschichte der Romanischen Völker*, pp. 185, 302-304; Huillard-Bréholles, introduction, ch. 5; Mas Latrie, *Traité de Paix avec les Arabes de l'Afrique Septentrionale*, introduction, pp. 82 ff., 122-124; Blochet, "Les Relations Diplomatiques des Hohenstaufen avec les Sultans d'Égypte", in *Revue Historique*, LXXX. 51-64 (1902); and, under the several Mohammedan rulers, the indexes to the *Regesta Imperii* and Winkelmann, *Kaiser Friedrich II.*

<sup>53</sup> *Chronica Regia Coloniensis* (ed. Waitz, 1880), p. 263; Huillard-Bréholles, IV. 369; cf. Winkelmann, *Kaiser Friedrich II.*, II. 399 ff.; Wiedemann, in *Archiv für Kulturgeschichte*, XI. 485 (1914).

<sup>54</sup> *Scriptores*, XXVIII. 61.

<sup>55</sup> *Revue Historique*, LXXX. 60.

and in response Sultan Malek-Kamil sent him a most learned astronomer and mathematician surnamed al-Hanifi.<sup>56</sup> It will be recalled that Theodore the philosopher is said to have been first sent to the emperor by the "caliph", and it is he who drafts the Arabic letters to the ruler of Tunis.<sup>57</sup> There can be no doubt of the impression which Frederick made on the scholars of the East as one well versed in philosophy, mathematics, and the natural sciences in general;<sup>58</sup> but such reports, transmitted through later Arabic compilers, are too vague to throw much light on his relation to specific fields of science.

The list of scholars with whom Frederick was in contact fades into a penumbra of mythical attributions and romantic tales, interesting at least as showing the reputation which the emperor and his court acquired in the field of learning and literature.<sup>59</sup> Thus *Le Régime du Corps* of Aldebrandino of Siena, written in 1256 for Countess Beatrice of Provence, appears in certain later manuscripts as translated in 1234 "from Greek into Latin and from Latin into French" at the request of "Frederick formerly emperor of Rome".<sup>60</sup> The famous letter of Prester John concerning the marvels of the East, which in the Latin original is sent to the Greek emperor Manuel, is in its French form addressed to "Fedri l'empereur de Rome",<sup>61</sup> as the mythical account of Alexander's conquests in Central Asia is directed to his philosopher Theodore.<sup>62</sup> The French prophecies of Merlin profess to have been compiled at the desire of Frederick and then turned into Arabic as a present to the Sultan of Egypt,<sup>63</sup> while the romance of *Sidrach* purports to have been brought from Tunis for Frederick and turned into Latin by Friar Roger of Palermo.<sup>64</sup> A medical treatise is said to have been translated for the emperor in 1212 with the aid of Gerard of Cremona, who died twenty-five years earlier.<sup>65</sup>

<sup>56</sup> Tarih Mansuri, in *Archivio Storico Siciliano*, IX. 119.

<sup>57</sup> See note 22, above.

<sup>58</sup> See the passages cited by Röhricht, *Beiträge zur Geschichte der Kreuzzüge* (Berlin, 1874), I. 73 ff.; Winkelmann, *Kaiser Friedrich II.*, II. 137, n. 3.

<sup>59</sup> Cf. Langlois, *La Connaissance de la Nature au Moyen Age*, p. 191.

<sup>60</sup> *Le Régime du Corps de Maître Aldebrandin de Sienne*, ed. L. Landouzy and R. Pépin (Paris, 1911), pp. xxxii, lv.

<sup>61</sup> See, for the Latin text, the various studies of E. Zarncke; and, for the French version, Ruteboeuf, ed. Jubinal (1875), III. 355; P. Meyer, in *Romania*, XV. 177. The reference may be to Frederick Barbarossa (R. Köhler, *Romania*, V. 76).

<sup>62</sup> Sudhoff, in *Archiv für die Geschichte der Medizin*, IX. 9; Steinschneider, in *Hebräische Bibliographie*, VIII. 41.

<sup>63</sup> H. L. D. Ward, *Catalogue of Romances in the British Museum*, I. 371 ff., 905.

<sup>64</sup> *Ib.*, I. 904; *Histoire Littéraire*, XXXI. 288; Langlois, p. 204.

<sup>65</sup> Steinschneider, *Hebräische Uebersetzungen*, p. 793.

The nature of the scientific interests of Frederick's court has by this time become in some measure apparent. For one thing, he was deeply interested in all kinds of animals, collecting a menagerie which followed him about Italy and even into Germany. In November, 1231, he came to Ravenna "with many animals unknown to Italy: elephants, dromedaries, camels, panthers, gerfalcons, lions, leopards, white falcons, and bearded owls".<sup>66</sup> Five years later a similar procession passed through Parma, to the delight of a boy of fifteen later known as Salimbene.<sup>67</sup> The elephant, a present from the sultan, stayed in Ghibelline Cremona, where he was put through his paces for the Earl of Cornwall<sup>68</sup> and died thirteen years later "full of humors", amid the popular expectation that his bones would ultimately turn into ivory.<sup>69</sup> In 1245 the monks of Santo Zeno at Verona, in extending their hospitality to the emperor, had to entertain with him an elephant, five leopards, and twenty-four camels.<sup>70</sup> The camels were used for transport and were even taken over the Alps, with monkeys and leopards, to the wonder of the untravelled Germans.<sup>71</sup> Another marvel of the collection was a giraffe from the sultan, the first to appear in medieval Europe.<sup>72</sup> Throughout runs the motif of ivory, apes, and peacocks from the East, as old as Nineveh and Tyre and as new as the modern "Zoo", with the touch of the thirteenth century seen in the elephant which Matthew Paris thought rare enough to preserve in a special drawing in his history,<sup>73</sup> and the lion which Villard de Honnecourt saw on his travels and carefully labelled in his sketchbook, "drawn from life"! <sup>74</sup>

Frederick's menagerie illustrates various sides of his nature—his delight in magnificence and display, his fondness for the unusual and the exotic, his joy in hunting, for which he used coursing leopards<sup>75</sup> and panthers as well as hawks and falcons and the humbler compan-

<sup>66</sup> Scheffer-Boichorst, *Zur Geschichte des XII. und XIII. Jahrhunderts* (Berlin, 1897), pp. 282, 286.

<sup>67</sup> *Cronica*, ed. Holder-Egger, pp. 92 ff.

<sup>68</sup> Matthew Paris, *Chronica Majora*, IV. 166 ff.

<sup>69</sup> *Chronicon Placentinum*, ed. Huillard-Bréholles (Paris, 1856), p. 215.

<sup>70</sup> *Nuovo Archivio Veneto*, VI. 129.

<sup>71</sup> *Annals of Colmar, Scriptores*, XVII. 189; Böhmer-Ficker, nos. 2098a, 2973, 3475a.

<sup>72</sup> Albertus Magnus, *De Animalibus*, ed. Stadler, p. 1417; Michaud, *Bibliothèque des Croisades*, IV. 436.

<sup>73</sup> *Chronica Majora*, IV. 166, V. 489.

<sup>74</sup> "Et bien sacies que cis lions fu contrefais al vif." *Album de Villard de Honnecourt*, plates 47, 48; cf. 52, 53 (facsimile edition published by the Bibliothèque Nationale).

<sup>75</sup> Böhmer-Ficker, nos. 2661, 2783, 2883, 3029. Cf. the three leopards sent to Henry III., Matthew Paris, *Scriptores*, XXVIII. 131, 407, 409.

ions of the chase—but it also fed a genuine scientific interest in animals and their habits. His *De Arte Venandi cum Avibus*, of which more will be said below, not only deals comprehensively with all the practical phases of the art, but begins with a systematic and careful discussion of the species, structure, and habits of birds, for which the author utilizes the *De Animalibus* of Aristotle, such previous treatises as he could find on the subject, and the results of his own observation and inquiry.<sup>76</sup> A similar interest appears in the case of horses, to whose breeding the emperor gave special attention and concerning whose diseases he ordered one of his marshals, the Calabrian knight, Giordano Ruffo, to prepare under imperial supervision a treatise, which was not completed until after Frederick's death. The first western manual of the veterinary art, this was widely popular, especially in Italy, being translated into many languages and imitated by the writers of the next generation.<sup>77</sup> Frederick's reputation as a hunter, if not his personal inspiration to authorship, may also be seen in the little treatise on hunting of a certain Guicennas, "master in every kind of hunting by the testimony of the hunters of Lord Frederick, emperor of the Romans".<sup>78</sup>

<sup>76</sup> Frederick's collections of works on falconry are known from the manuscripts of those which he had translated from the Arabic (*English Historical Review*, XXXVI. 347–350), and from the mention of two large illustrated volumes on falcons and dogs and the art of hunting, adorned with gold and silver and "imperatorie maiestatis effigie decoratus", which Guillelmus Bottatus of Milan offered to Charles of Anjou before 1265 (Papon, *Histoire de Provence*, Paris, 1778, II., preuves, no. 74; on the date cf. R. Sternfeld, *Karl von Anjou*, p. 218). From the description it is plain that this *édition de luxe* included more than Frederick's *De Arte* in the form which has reached us, but the marginal illustrations must have resembled those in the Vatican codex of the emperor's work. Possibly the two volumes were acquired in the loot of the emperor's treasury in 1248, and their disappearance might explain the incompleteness of the *De Arte* as worked over in the South. This copy may thus be the source of the citations which cannot be found in the known manuscripts of the *De Arte*.

<sup>77</sup> Edited by Molin (Padua, 1818). For manuscripts and translations, see L. Moulé, *Histoire de la Médecine Vétérinaire* (Paris, 1898), II. 25–30, where some account will be found of the later Italian treatises. See further Huillard-Bréholles, introduction, p. dxxxvi; *Romania*, XXIII. 350, XL. 353; Steinschneider, *Hebräische Uebersetzungen*, p. 985. This author is probably the Jordanus de Calabria who was made castellan of Ceseno in 1239 (Richard of San Germano, *ad annum*).

<sup>78</sup> "Incipit liber Guicennatis de arte bersandi. Si quis scire desideret de arte bersandi, in hoc tractatu cognoscere poterit magistratum. Huius autem artis liber vocatur Guicennas et rationabiliter vocatur Guicennas nomine cuiusdam militis Teotonici qui appellabatur Guicennas qui huius artis et libri prebuit materiam. Iste vero dominus Guicennas Teotonicus fuit magister in omni venatione et insuper summus omnium venatorum et specialiter in arte bersandi, sicut testificabantur magni barones et principes de Allemannia et maxime venatores excel-

The medical interests of the court are well attested, though they are not known to have produced notable additions to medical knowledge. Thus Pietro da Eboli, early in the reign, dedicated to Frederick his poem on the baths of Pozzuoli,<sup>79</sup> whose healing qualities the emperor was to put to proof after his illness in 1227.<sup>80</sup> The treatise of Adam of Cremona on the hygiene of the crusading army has already been mentioned, as has also the series of hygienic precepts formulated for the emperor by Master Theodore.<sup>81</sup> Frederick seems to have shown some anxiety concerning paralysis, and a marvellous powder was current in his name, efficacious against many "chronic ailments of the head and the stomach".<sup>82</sup> An incantation for the healing of wounds was also ascribed to him.<sup>83</sup> Frederick gave careful attention to personal hygiene in such matters as blood-letting,<sup>84</sup> diet, and bathing; indeed his Sunday bath was a cause of much scandal to good Christians.<sup>85</sup> One is reminded of the slander on the Middle Ages as a thousand years without a bath!

Without astrologers Frederick's court would not have been an Italian court of the thirteenth century, when even the universities had their professors of astrology.<sup>86</sup> Guido of Montefeltro kept in his employ one of the most distinguished and successful of medieval astrologers, Guido Bonatti, who is said to have directed his master's military expeditions from a campanile with the precision of a fire alarm: first bell, to arms; second, to horse; third, off to battle.<sup>87</sup>

*lentis viri domini Frederici Romanorum imperatoris. . .*" Vatican, MS. Vat. lat. 5366, ff. 75v-78v (ca. 1300); MS. Reg. lat. 1227, ff. 66v-70 (fifteenth century). Guicennas, who is cited by writers on falconry, is identified with Avicenna by Werth but without any reasons given (*Zeitschrift für Romanische Philologie*, XIII. 10).

<sup>79</sup> For a discussion of the questions concerning this poem, see Ries, in *Mitteilungen des Instituts für Oesterreichische Geschichtsforschung*, XXXII. 576-593 (1911), and the works there cited.

<sup>80</sup> Winkelmann, I. 333.

<sup>81</sup> See notes 25 and 42, above. In the Rossi MSS. recently acquired by the Vatican there are (MS. XI. 7) a series of 953 prescriptions in the name of "Maestro Bene medico dell'imperadore Federigo"; and a *Libro de Consigli de Poveri Infermi* ascribed to Michael Scot (MS. XI. 144).

<sup>82</sup> Ed. Sudhoff, in *Archiv für die Geschichte der Medizin*, IX. 6, note.

<sup>83</sup> Huillard-Bréholles, introduction, p. dxxxviii.

<sup>84</sup> Michael Scot, Munich, cod. lat. 10268, f. 114v (*Isis*, IV.).

<sup>85</sup> John of Winterthur, ed. Wyss (Zurich, 1856), p. 8.

<sup>86</sup> Cf. T. O. Wedel, "The Mediaeval Attitude toward Astrology", *Yale Studies in English*, LX., ch. 5; Novati, *Freschi e Minii*, pp. 129-134. Gerard of Sabonetta has left a register of his consultations, 1256-1260; B. Boncompagni, in *Atti dell' Accademia Pontificia*, IV. 458 ff. (1851).

<sup>87</sup> Boncompagni, *Della Vita e delle Opere di Guido Bonatti* (Rome, 1851), pp. 6 ff.



Ezzelino da Romano also had Bonatti among his many astrologers, along with Master Salio, canon of Padua, Riprandino of Verona, and "a long-bearded Saracen named Paul, who came from Baldach on the confines of the far East, and by his origin, appearance, and actions deserved the name of a second Balaam".<sup>88</sup> There is no certain evidence that Guido Bonatti resided at Frederick's court, but he tells us that he discovered the conspiracy of 1247 by the stars at Forlì and sent timely word to the emperor at Grosseto.<sup>89</sup> Of the emperor's astrologers we know by name only Michael Scot and Theodore, but his enemies exulted over the troop of astrologers and magicians which this devotee of Beelzebub, Ashtaroth, and other demons lost in the great defeat before Parma.<sup>90</sup> It is plain that much reliance was placed on such advice, even in quite personal matters.<sup>91</sup> Scot prided himself on his successful predictions of campaigns and the avoidance of unfavorable seasons;<sup>92</sup> another astrologer guided the emperor through a breach in the wall at Vicenza in 1236;<sup>93</sup> and Theodore stood on the tower of Padua in 1239 seeking a fortunate conjunction for an expedition which was ultimately turned back by an eclipse.<sup>94</sup> Indeed the story ran that Frederick avoided Florence because of an astrologer's prediction, and recognized when it was too late that the obscure Fiorentino would be the scene of his death.<sup>95</sup> The literary output of the *magna curia* in this field is represented by Scot's three treatises, the *Physiognomy*, *Liber Introductorius*, and *Liber Particularis*, all dedicated to the emperor, the *Physiognomy* being designed to aid him directly in his judgment of men. Indeed Scot speaks of "the new astrology" as proudly as writers now speak of the new chemistry or the new history.<sup>96</sup>

With astrology there naturally went a considerable amount of

<sup>88</sup> *Ib.*, pp. 29-32; Muratori, VIII. 344, 705, XIV. 930.

<sup>89</sup> Boncompagni, *Guido*, p. 24; Guido Bonatti, *Decem Libri de Astronomia*, tractatus IV., cons. 58. I have used the Venice edition of 1506 in the Boston Public Library. The Augsburg edition of 1491 (Hain, 3461\*), listed as at Brown University in the *Census of Fifteenth Century Books owned in America*, seems to be an error. On the conspiracy of 1246, see Böhmer-Ficker, no. 3547a.

<sup>90</sup> Albert of Behaim, ed. Höfler, pp. 126, 128. On Frederick's devotion to astrology, see also Saba Malaspina, in Muratori, VIII. 788.

<sup>91</sup> Matthew Paris, in *Scriptores*, XXVIII. 131; cf. Scot's *Physiognomy*.

<sup>92</sup> Munich, cod. lat. 10648, ff. 114v, 118; MS. n. a. lat. 1401, f. 99v (in *Isis*, 1922). Cf. Salimbene, ed. Holder-Egger, pp. 353, 360, 512, 530; *Forschungen zur Deutschen Geschichte*, XVIII. 486.

<sup>93</sup> Antonio Godi, in Muratori, VIII. 83.

<sup>94</sup> *Ib.*, VIII. 228 ff.

<sup>95</sup> *Ib.*, VIII. 788.

<sup>96</sup> "Qui vero hos duos libros plene noverit ac sciverit operari nomen novi astrologi optinebit." *Liber Particularis*, Bodleian, MS. Canon. Misc. 555, f. 1v.



astronomy, for astrology is only applied astronomy, wrongly applied as we now believe, but a thoroughly practical subject in the eyes of the later Middle Ages. The works of Michael Scot show familiarity with Ptolemy and the principal Arabic writers on astronomy, already translated in the twelfth century; and the Hebrew versions of Ptolemy and his abbreviators by Jacob Anatoli are further evidence of attention to this science. The mathematical interests of the court reach their highest expression in the relations with Leonard of Pisa, in which, it will be remembered, the emperor himself took an active part. Frederick's own work shows an acquaintance with the fundamentals of geometry,<sup>97</sup> and while in the East he sought out the company of mathematicians and astronomers.<sup>98</sup> His castles show much interest in architecture, the towers at Capua being designed with his own hand;<sup>99</sup> indeed we are told that he was "skilled in all mechanical arts to which he gave himself".<sup>100</sup> No direct contributions to mathematical literature have, however, been connected with the Sicilian court.

The philosophical interests of the court were strongly marked. Frederick was well trained in logic, even taking a master of dialectic with him on the crusade, and his *De Arte* shows familiarity with scholastic terminology and classification. His mind, however, was in no sense formal but actively questioning, and the range of his inquiries touched far-reaching problems of the universe and the human soul, as we shall see from his questionnaires. The doctrines of Averroes were well known and often discussed at his court, so that Moham-medan writers considered him no Christian at heart;<sup>101</sup> and many European contemporaries shook their heads over the current stories of his scepticism and unbelief.<sup>102</sup>

How far the scientific life of Frederick's court was fed by new versions of the works of Aristotle and his commentators, it is not easy to say. By 1215 western Europe knew not only the logical treatises, but the *Metaphysics*, the *Ethics*, and the principal writings on natural philosophy. New versions, often with the commentaries of Averroes and Avicenna, continued to appear in the course of the thirteenth century, but few of these can be specifically connected with

<sup>97</sup> *English Historical Review*, XXXVI. 346.

<sup>98</sup> *Archivio Storico Siciliano*, IX. 119.

<sup>99</sup> Richard of San Germano, *Scriptores*, XIX. 372.

<sup>100</sup> Muratori, IX. 132, 661.

<sup>101</sup> Amari, *Biblioteca Arabo-Sicula*, II. 254; Michaud, *Histoire des Croisades*, VII. 810; Röhricht, *Beiträge*, I. 73 ff.

<sup>102</sup> *E.g.*, Matthew Paris, *Scriptores*, XXVIII. 147, 230, 416; Salimbene, p. 349.

Sicily.<sup>103</sup> Roger Bacon, it is true, speaks of the appearance of Michael Scot *ca.* 1230, hearing "certain parts of the natural philosophy and metaphysics with the authentic commentaries", as constituting a turning-point in Aristotelian studies;<sup>104</sup> but this seems to be one of the occasions when the friar is speaking loosely. The only work of Aristotle first translated by Scot was the *De Animalibus*, in a version made before he joined the Sicilian court, and the only new versions of texts already known which are certainly by him are the *De Caelo* and *De Anima*, with the commentary of Averroes.<sup>105</sup> To these should be added Scot's Latin abbreviation of Avicenna's commentary on the *De Animalibus*, which is dedicated to the emperor before 1232,<sup>106</sup> and the Hebrew versions of Averroes's commentary on the *Logic* made by Jacob Anatoli for Frederick in or about that year.<sup>107</sup> At the same time other works of the Stagyrte were freely used at the court. Thus Scot quotes the *Ethics* and draws largely on the *Meteorology*,<sup>108</sup> while Theodore the philosopher cites the *Rhetoric* and *Ethics*, as well as the *Secretum Secretorum*.<sup>109</sup> The emperor himself, in the *De Arte Venandi*, draws on the pseudo-Aristotelian *Mechanics* as well as on the *De Animalibus*.<sup>110</sup> Nevertheless what was new in all this was Averroes rather than Aristotle, nor can we be certain, as investigation now stands, that the Sicilian school did more than give wider currency to treatises and doctrines of Averroes which had already begun to spread from Spain.

Frederick has been called "an unrestrained admirer of Aristotle",<sup>111</sup> but his own writings are far from bearing this out. We

<sup>103</sup> See, in general, A. Jourdain, *Recherches Critiques sur l'Age et l'Origine des Traductions Latines d'Aristote* (Paris, 1843); and M. Grabmann, *Forschungen über die Lateinischen Aristotelesübersetzungen des XIII. Jahrhunderts* (Münster, 1916). For the *Logic*, see Haskins, "Mediaeval Versions of the Posterior Analytics", in *Harvard Studies in Classical Philology*, XXV. 87-105 (1914); and for the *Ethics*, A. Pelzer, "Les Versions Latines des Ouvrages de Morale conservés sous le Nom d'Aristote", in *Revue Néo-scholastique*, XXIII. 316-341, 378-400 (1921).

<sup>104</sup> *Opus Majus*, ed. Bridges, I. 55, III. 66; *Monumenta, Scriptores*, XXVIII. 571.

<sup>105</sup> Besides Grabmann, see my article on "Michael Scot", in *Isis*, IV. (1922).

<sup>106</sup> J. Wood Brown, *Michael Scot*, pp. 53 ff., corrected in *Isis*, 1922. The University of Michigan has a copy of the printed text of this version.

<sup>107</sup> See note 47, above.

<sup>108</sup> *Isis*, 1922; *Revue Néo-scholastique*, XXIII. 326, n. 2.

<sup>109</sup> *English Historical Review*, XXXVI. 349; *Archiv für die Geschichte der Medizin*, IX. 4-8. On the new version of the *Secretum Secretorum* attributed to Philip of Tripoli, see now Steele, *Opera hactenus inedita Rogeri Baconi*, V. xviii-xxii.

<sup>110</sup> *English Historical Review*, XXXVI. 345-347.

<sup>111</sup> Biehringer, *Kaiser Friedrich II.* (Berlin, 1912), p. 244. Frederick's devotion. AM. HIST. REV., VOL. XXVII.—46.

have, he says in the preface to the *De Arte*, followed the prince of philosophers where required, but not in all things, for we have learned by experience that at several points he deviates from the truth. Aristotle relies too much on hearsay, and has evidently "rarely or never had experience of falconry, which we have loved and practised all our life". More than once he must be directly corrected from the emperor's observation—*non sic se habet*.

It is this experimental habit of mind, the emperor's restless desire to see and know for himself, which lies behind those *superstitiones et curiositates* at which the good Salimbene holds up his hands.<sup>112</sup> There is the story of the man whom Frederick shut up in a wine-cask to prove that the soul died with the body, and the two men whom he disembowelled in order to show the respective effects of sleep and exercise on digestion. There were the children whom he caused to be brought up in silence in order to settle the question "whether they would speak Hebrew, which was the first language, or Greek or Latin or Arabic or at least the language of their parents; but he labored in vain, for the children all died". There was the diver, Nicholas, surnamed the Fish, hero of Schiller's *Der Taucher*, whom he sent repeatedly to explore the watery fastnesses of Scylla and Charybdis, and the memory of whose exploits was handed on by the Friars Minor of Messina,<sup>113</sup> not to mention the "other superstitions and curiosities and maledictions and incredulities and perversities and abuses" which the friar of Parma had set down in another chronicle now lost.<sup>114</sup> Such again was the story of the great pike brought to the Elector Palatine in 1497, in its gills a copper ring placed there by Frederick to test the longevity of fish, and still bearing the inscription in Greek, "I am that fish which Emperor Frederick II. placed in this lake with

tion to Aristotle has been argued from a letter ascribed to him which transmits new versions of Aristotle's work to some university, but I agree with most recent scholars in assigning this letter to Manfred and connecting it with the translations of the *Magna Moralia* and various pseudo-Aristotelian treatises made by his direction. See Jourdain, *Recherches*, p. 156, with French translation; Huillard-Bréholles, *Historia Diplomatica*, IV. 383; Denifle and Chatelain, *Chartularium Universitatis Parisiensis*, I., no. 394; Böhmer-Ficker, *Regesta*, no. 4750; Schirrmacher, *Die Letzten Hohenstaufen* (Göttingen, 1871), p. 624; Grabmann, *Aristotelesübersetzungen*, pp. 200–204, 237 ff.; Helene M. Arndt, *Studien zur Inneren Regierungsgeschichte Manfreds* (Heidelberg, 1911), p. 149; Pelzer, in *Revue Néo-scholastique*, XXIII. 319 ff.

<sup>112</sup> Ed. Holder-Egger, pp. 350–353.

<sup>113</sup> The story appears also in Francesco Pippini (Muratori, IX. 669), Riccobaldo of Ferrara (*ib.*, IX. 248), and Jacopo d'Acqui (*Neues Archiv*, XVII. 500).

<sup>114</sup> Salimbene, ed. Holder-Egger, p. 351. On Frederick's insatiable curiosity, see also Malaspina, in Muratori, VIII. 788.

his own hand the fifth day of October, 1230".<sup>115</sup> On another occasion Frederick is said to have sent messengers to Norway in order to verify the existence of a spring which turned to stone garments and other objects immersed therein.<sup>116</sup>

Whatever value these tales may have, the emperor's scientific habit of mind is seen best of all in his own writings. His treatise on falconry, *De Arte Venandi cum Avibus*,<sup>117</sup> is compact of personal observation of the habits of birds, especially falcons, carried on throughout a busy life of sport and study, and verified by birds and falconers brought from distant lands. Indeed, his systematic use for such inquiries of the resources of his royal administration constitutes an interesting example of the pursuit of research by governmental agencies. "Not without great expense", he tells us, "did we call to ourselves from afar those who were expert in this art, extracting from them whatever they knew best and committing to memory their sayings and practices." "When we crossed the sea we saw the Arabs using a hood in falconry, and their kings sent us those most skilled in this art, with many species of falcons." The emperor not only tested the artificial incubation of hens' eggs,<sup>118</sup> but, on hearing that ostrich eggs were hatched by the sun in Egypt, he had eggs and experts brought to Apulia that he might test the matter for himself. The fable that barnacle geese were hatched from barnacles he exploded by sending north for such barnacles, concluding that the story arose from ignorance of the actual nesting-places of the geese. Whether vultures find their food by sight or by smell he ascertained by seeling their eyes while their nostrils remained open. Nests, eggs, and birds were repeatedly brought to him for observation and note, and the minute accuracy of his descriptions attests the fidelity with which his observations were made. The whole of the practical portion of his *De Arte* is a setting down in systematic form of the results of actual practice of the art. The author's statements are supported by facts rather than by authority or mere personal opinion, and if information is lacking no conclusion is drawn. One who reads the *De Arte* through gets inevitably the impression of the work of a first-rate mind, open,

<sup>115</sup> A. Hauber, "Kaiser Friedrich der Staufer und der Langlebige Fisch", in *Archiv für Geschichte der Naturwissenschaften*, III. 315-329 (1911), brings together the various reports but shows that the date 1230 is impossible.

<sup>116</sup> The original has "in regione Armenie Norwegie". Extract from medieval encyclopaedia published by Delisle, in *Notices et Extraits des Manuscrits*, XXXII., part I., p. 48; *Monumenta, Scriptores*, XXVIII. 571.

<sup>117</sup> See my article in the *English Historical Review*, XXXVI. 334-355 (July, 1921). I have used the copy of Schneider's edition in the library of Columbia University.

<sup>118</sup> Michael Scot, Munich, cod. lat. 10268, f. 117 (*Isis*, IV.).

inquiring, realistic, trying to see things as they are without *parti pris*, and working throughout on the basis of systematized experience. To follow this up by a course of reading in the confused and pretentious astrology of Michael Scot is to realize how far the emperor was intellectually superior to those about him.

Observation and experiment on a large scale Frederick supplemented by the questionnaire, applied not only to the scholars of his court and the experts who came at his summons, but to savants of other lands whom he could not interrogate personally. The method seems to have been to draw up a list of questions upon which the emperor could get no final or satisfactory response at home, and to send them to other rulers, most naturally the Mohammedan princes, requesting that they be submitted to the leading local scholars for answer, a procedure which assumes autocratic governments like that which Frederick himself utilized to satisfy intellectual curiosity. Such was the practice followed in the most famous instance, the so-called Sicilian questions published by Amari many years ago.<sup>119</sup> According to the response which has reached us, Frederick, not long before 1242, sent a series of questions to be answered by Mohammedan philosophers in Egypt, Syria, Irak, Asia Minor, and Yemen, and later to the Almohad caliph of Morocco, ar-Rashid, by whom they were forwarded, with a sum of money as the emperor's reward, to Ibn Sabin, a Spanish philosopher then living at Ceuta. Refusing the money, Ibn Sabin answers at some length in terms of Mohammedan orthodoxy, expressing some contempt for Frederick's attainments as seen in his untechnical phraseology, and offering to set him right in a personal interview. The emperor's questions, as they are here cited in refutation, cover the eternity of matter and the immortality of the soul, the end and foundations of theology, and the number and nature of the categories—demanding always the proofs of the opinions advanced in reply. Thus: "Aristotle the sage in all his writings declares clearly the existence of the world from all eternity. If he demonstrates this, what are his arguments, and if not, what is the nature of his reasoning on this matter?" Plainly Frederick was familiar with the Aristotelian doctrines which agitated the Christian and Mohammedan worlds in the thirteenth century, indeed there was a legend that Averroes had lived at his court.<sup>120</sup> The very suggestion

<sup>119</sup> M. Amari, "Questions Philosophiques adressées aux Savants Musulmans par l'Empereur Frédéric II.", in *Journal Asiatique*, fifth ser., I. 240-274 (1853); *id.*, *Biblioteca Arabo-Sicula*, II. 414-419; more fully by A. F. Mehren, in *Journal Asiatique*, seventh ser., XIV. 341-454 (1879). Cf. the problems proposed by Chosroes, published by Quicherat, in *Bibliothèque de l'École des Chartes*, XIV. 248-263 (1853).

<sup>120</sup> Renan, *Averroès* (1869), pp. 254, 291.

of doubt respecting immortality was enough to justify the current belief that Frederick was one of those Epicurean heretics "who make the soul die with the body".

We hear also of geometrical and astronomical problems sent by the emperor as far as Mosul, and we have another series of geometrical questions sent by one of Frederick's philosophers, in Arabic, to the young Jehuda ben Solomon Cohen in Toledo, together with the replies, at which the emperor expressed much satisfaction.<sup>121</sup> Again we learn that in the time of al-Malik al-Kamil, sultan of Egypt (1218-1238), the emperor set seven hard problems in order to test Moslem scholars. Three of these, which concern optics, have been preserved with their answers: Why do objects partly covered by water appear bent? Why does Canopus appear bigger when near the horizon, whereas the absence of moisture in the southern deserts precludes that as an explanation? What is the cause of the illusion of spots before the eyes?<sup>122</sup>

Another and a less technical questionnaire has been handed down to us by Michael Scot; and as it does not appear to have been hitherto published or even cited by others, it may not be uninteresting to translate it as it stands in the manuscripts:<sup>123</sup>

When Frederick, emperor of Rome and always enlarger of the empire, had long meditated according to the order which he had established concerning the various things which are and appear to be on the earth, above, within, and beneath it, on a certain occasion he privately summoned me, Michael Scot, faithful to him among all astrologers, and secretly put to me at his pleasure a series of questions concerning the foundations of the earth and the marvels within it, as follows:

"My dearest master, we have often and in divers ways listened to questions and solutions from one and another concerning the heavenly bodies, that is the sun, moon, and fixed stars, the elements, the soul of the world, peoples pagan and Christian, and other creatures above and on the earth, such as plants and metals; yet we have heard nothing respecting those secrets which pertain to the delight of the spirit and the wisdom thereof, such as paradise, purgatory, hell, and the foundations and marvels of the earth. Wherefore we pray you, by your love of knowledge and the reverence you bear our crown, explain to us the foundations of the earth, that is to say how it is established over the abyss and how the abyss

<sup>121</sup> Steinschneider, in *Zeitschrift für Mathematik und Physik*, XXXI., part II., 106 ff. (1886); *id.*, *Hebräische Uebersetzungen*, p. 3; *id.*, *Verzeichniss der Hebräischen Handschriften der Königlichen Bibliothek zu Berlin*, II. 126 (1897).

<sup>122</sup> E. Wiedemann, "Fragen aus dem Gebiet der Naturwissenschaften, gestellt von Friedrich II.", in *Archiv für Kulturgeschichte*, XI. 483-485 (1914).

<sup>123</sup> *Liber Particularis*, in the Bodleian, MS. Canon. Misc. 555, f. 44v; the Ambrosian, MS. L. sup. 92, f. 69; Bibliothèque Nationale, MS. Lat. n. a. 1401, f. 156v, the only manuscript to give the portions in brackets. I have edited the Latin text from these manuscripts in the forthcoming number of *Isis* (1922). See also MS. Rossi IX. 111 in the Vatican, f. 37 (of the year 1308).



stands beneath the earth, and whether there is anything else than air and water which supports the earth, and whether it stands of itself or rests on the heavens beneath it. Also how many heavens there are and who are their rulers and principal inhabitants, and exactly how far one heaven is from another, and by how much one is greater than another, and what is beyond the last heaven if there are several; and in which heaven God is in the person of His divine majesty and how He sits on His throne, and how He is accompanied by angels and saints, and what these continually do before God. Tell us also how many abysses there are and the names of the spirits that dwell therein, and just where are hell, purgatory, and the heavenly paradise, whether under or on or above the earth [or above or in the abysses, and what is the difference between the souls who are daily borne thither and the spirits which fell from heaven; and whether one soul in the next world knows another and whether one can return to this life to speak and show one's self; and how many are the pains of hell.] Tell us also the measure of this earth by thickness and length, and the distance from the earth to the highest heaven and to the abyss, and whether there is one abyss or several; and if several how far one is from another; and whether the earth has empty spaces or is a solid body like a living stone; and how far it is from the surface of the earth down to the lower heaven.

"Likewise tell us how it happens that the waters of the sea are so bitter and the waters are salt in many places and some waters away from the sea are sweet although they all come from the living sea. Tell us too concerning the sweet waters how they continually gush forth from the earth and sometimes from stones and trees, as from vines when they are pruned in the springtime, where they have their source and how it is that certain waters come forth sweet and fresh, some clear, others turbid, others thick and gummy; for we greatly wonder at these things, knowing already that all waters come from the sea and passing through divers lands and cavities return to the sea, which is the bed and receptacle of all running waters. Hence we should like to know whether there is one place by itself which has sweet water only and one with salt water only, or if there is one place for both kinds, and in this case how the two kinds of water are so unlike, since by reason of difference of color, taste, and movement there would seem to be two places. So, if there are two places for these waters, we wish to be informed which is the greater and which the smaller, and how the running waters in all parts of the world seem to pour forth of their superabundance continually from their source, and although their flow is copious yet they do not increase as if more were added beyond the common measure but remain constant at a flow which is uniform or nearly so. We should like to know further whence come the salt and bitter waters which gush forth in some places, and the fetid waters in many baths and pools, whether they come of themselves or from elsewhere; likewise concerning those waters which come forth warm or hot or boiling as if in a caldron on a blazing fire, whence they come and how it is that some of them are always muddy and some always clear. Also we should like to know concerning the wind which issues from many parts of the earth, and the fire which bursts from plains as well as from mountains, and likewise what produces the smoke which appears now in one place and now in another, and what causes its blasts, as is seen in parts of Sicily and Messina, as Etna, Vulcano, Lipari, and Stromboli.



How comes it that a flaming fire appears not only from the earth but also in certain parts of the sea of India?

[“ And how is it that the soul of a living man which has passed away to another life than ours cannot be induced to return by first love or even by hate, just as if it had been nothing, nor does it seem to care at all for what it has left behind whether it be saved or lost?”]

A notable series of questions this, in spite of a certain amount of confusion and repetition which may be due to the less clear medium of Michael Scot through which they have been transmitted. Besides the previous discussions which they assume respecting astronomy, geography, and natural history, they cut to the heart of the current cosmology, which readers of Dante will recognize, with an insistent demand for exact and definite information. Just where are heaven and hell and purgatory; exactly how far is one heaven or one abyss from another; what is the structure of the earth and the explanation of its fires and waters—questions that might easily have cost Michael Scot his reputation, in spite of his boastful promise to answer them all, and may well have led him to seek to measure the distance to heaven by means of a church tower with an apparent exactness which seems to have imposed on the emperor.<sup>124</sup> Astronomy and cosmology cannot avoid theology: In which heaven is God to be found, and where are the souls of the departed, and why do they not communicate with us for love or even hate? “Or even hate”—a very human touch which shows us Frederick’s own passion in the midst of the eternal riddles and reminds us of that hatred for Viterbo which he would come back from Paradise to assuage.<sup>125</sup> And here as in the stories of Moslem writers we recognize the note of scepticism, the trace of that Epicurean heretic whose lurid figure haunts one of the thousand fiery tombs of the tenth canto of the *Inferno*.

The nature of Frederick’s ultimate religious opinions lies beyond the ken of the historian, for we have no direct statements of his own beyond his general assertions of orthodoxy, against many highly colored stories from his enemies. When, however, Gregory IX. accuses him of declaring that one should believe only in what is proved by the force and reason of nature,<sup>126</sup> the assertion falls in entirely with what we know of Frederick’s habit of mind. Profoundly rationalistic, he applied the test of reason and experience to affairs of state

<sup>124</sup> See the passage printed in *Isis*, IV.

<sup>125</sup> *Historische Zeitschrift*, LXXXIII. 30.

<sup>126</sup> Encyclical of July 1, 1239, in Huillard-Bréholles, V. 340; Böhmer-Ficker, no. 7245; Potthast, no. 10766. Frederick’s reply is in Huillard-Bréholles, V. 348 (Böhmer-Ficker, nos. 2454, 2455); see also the examination of his orthodoxy in 1246, *ib.*, VI. 426, 615 (Böhmer-Ficker, no. 3543).

as well as to matters of science, as the body of his Sicilian legislation abundantly testifies. When he abolishes the ordeal, his reason is that it is not in accord with nature and does not lead to truth.<sup>127</sup> In matters of commercial policy, "he was the first medieval ruler to use consistent economic principles as his standards".<sup>128</sup> *Immutator mirabilis*, he has none of the medieval horror of change. Yet it is scarcely historical to call him a modern, for he looks in both directions. He harks back to King Roger and the Mohammedan East, while in his many-sided patronage of learning and his free and critical spirit of inquiry he belongs rather to the Italian Renaissance. Only in part does he belong to the thirteenth century, and he was in no sense its type. He was above all an individual, *stupor mundi* to his own age, and a marvel still to ours.

Frederick's favorite son, Manfred, appears linked with his father in Dante's mention of the two illustrious heroes who, while fortune lasted, despised the merely brutal and followed humane pursuits.<sup>129</sup> Certainly Manfred inherited many of his father's tastes and something of the same habit of mind, and his court continued much of the scientific activity of the earlier reign.<sup>130</sup> He tells us that the masters of his father's court<sup>131</sup> taught him the nature of the world and the properties of both the transient and the eternal. At the age of twenty-five he fortified himself during a severe illness with the teachings of the treatise *De Pomo*,<sup>132</sup> then ascribed to Aristotle, and on his recovery had it translated from Hebrew into Latin. Latin versions of the *Magna Moralia* and pseudo-Aristotelian works, apparently those sent by the king to the students of Paris, were made directly from the Greek by an official translator, Bartholomew of Messina,<sup>133</sup> who also translated at Manfred's command the veterinary

<sup>127</sup> Hampe, in *Historische Zeitschrift*, LXXXIII. 14.

<sup>128</sup> Jastrow-Winter, *Deutsche Geschichte im Zeitalter der Hohenstaufen*, II. 549.

<sup>129</sup> *De Vulgari Eloquentia*, I. c. 12.

<sup>130</sup> See, in general, Schirrmacher, *Die Letzten Hohenstaufen*, pp. 209-216; Capasso, *Historia Diplomatica Regni Siciliae*, p. 324 ff.; Helene M. Arndt, *Studien zur Inneren Regierungsgeschichte Manfreds*, c. 4; O. Cartellieri, "König Manfred", in *Centenario Michele Amari* (Palermo, 1910), I. 116-138.

<sup>131</sup> The arguments of Hampe, *Neues Archiv*, XXXVI. 231 ff., and Arndt, pp. 146 ff., that Manfred was a student at Bologna and Paris, are to me unconvincing.

<sup>132</sup> Preface in Huillard-Bréholles, *Monuments de la Maison de Souabe*, p. 169; Schirrmacher, p. 622; Capasso, p. 112, note; Böhmer-Ficker, no. 4653. Cf. Steinschneider, *Hebräische Uebersetzungen*, p. 268, who thinks it unlikely that the king himself was the translator.

<sup>133</sup> *Supra*, note 111. Another translator, Nicholas of Sicily, may belong to this same group. Grabmann, p. 203.

treatise of Hierocles.<sup>134</sup> Translation from the Arabic is represented by an astrological treatise turned into Latin by Stephen of Messina and also dedicated to the king,<sup>135</sup> and by a set of astronomical and astrological tables translated by John "de Dumpno" and preserved in a fine codex at Madrid.<sup>136</sup> Manfred's knowledge of philosophy and mathematics, especially Euclid, as well as of languages, is praised by an Egyptian visitor, who dedicated to him a work on logic,<sup>137</sup> and a further illustration of his philosophical tastes is found in a disputation in which he asks whether members exist because of their functions or functions because of their members, the final "determination" of this scholastic dispute being made by that *gemma magistrorum et laurea morum*, Master Petrus de Hibernia.<sup>138</sup>

Like his father, Manfred had his menagerie, including a giraffe from the East,<sup>139</sup> and he also shared his father's devotion to astrology<sup>140</sup> and to sportsmanship. The *De Arte Venandi*, originally dedicated to Manfred, has come down to us as he revised it, with certain additions from his own observations but primarily with the aim of filling blanks in the original by the aid of his father's notes, reading and rereading the book with filial piety that he might obtain the full fruits of its science and that no scribal errors might be left to frustrate the author's purpose.<sup>141</sup> This was only one of the numerous books by many hands which filled the presses of the royal library,<sup>142</sup> including philosophical and mathematical works in Greek and Arabic, certain of which are believed to have gone as a present to the pope from the victorious Charles of Anjou,<sup>143</sup> and thus served to hand on

<sup>134</sup> MSS. at Pisa and Bologna: *Studi Italiani di Filologia Classica*, VIII. 395, XVII. 76; *Rheinisches Museum*, n.s., XLVI. 377 (1891).

<sup>135</sup> Steinschneider, in *Vienna Sitzungsberichte*, CXLIX. 4, p. 78; also in MS. Madrid 10009, f. 225.

<sup>136</sup> Biblioteca Nacional, MS. 10023, ff. 1-23: "Perfectus est interpretatio et translatio istarum portarum de arabico in latinum per Iohannem de Dumpno filium Philippi de Dumpno in civitate Panormi anno a nativitate domini nostri Ieso Christi 1262, sub laude et gloria omnipotentis Dei feliciter amen".

<sup>137</sup> Djemal-Edin, in Michaud, *Bibliothèque des Croisades*, VII. 367; *Revue Historique*, LXXX. 64.

<sup>138</sup> Text published by Baemker, "Petrus de Hibernia", in *Munich Sitzungsberichte*, 1920.

<sup>139</sup> Röhricht, *Beiträge*, I. 74.

<sup>140</sup> Huillard-Bréholles, introduction, p. dxxxii; Arndt, p. 151.

<sup>141</sup> *English Historical Review*, XXXVI. 338.

<sup>142</sup> "Librorum ergo volumina, quorum multifarie multisque modis distincta cyrographa diviciarum nostrarum armaria locupletant." *Chartularium Universitatis Parisiensis*, I., no. 394.

<sup>143</sup> Heiberg, in *Oversigt of the Danish Academy*, 1891, pp. 305-318; Ehrle, in *Festgabe Anton de Waal* (Rome, 1913), pp. 348-351.

something of the scientific interests of Manfred and of Frederick to a later age. At best, however, Manfred's court is but an echo of that of Frederick, and under the Angevins the intellectual history of Sicilian royalty enters upon a new and different period.<sup>144</sup>

CHARLES H. HASKINS.

<sup>144</sup> On translations under Charles of Anjou, see Amari, *La Guerra del Vespro Siciliano*, edition of 1886, III. 483-489; Hartwig, in *Centralblatt für Bibliothekswesen*, III. 185-188.

## THE DEVELOPMENT OF METROPOLITAN ECONOMY IN EUROPE AND AMERICA<sup>1</sup>

THERE are three questions raised by this paper: firstly, whether national economy has any real validity as a unit or organization in production; secondly, whether metropolitan economy, or the dominance of the large commercial city, should be put in its place; and thirdly, what evidence concerning metropolitan development is to be found in European and American history. From the framing of these questions, it is, of course, to be inferred that the thesis of this paper is that metropolitan economy should be substituted for national economy as the latest stage in general economic development.

The reality of the nation as a political unit has been so great for so long a time that no one, liking or disliking nationalism, could have any doubts about it. With the political side of the nation we have, however, little or nothing to do. It is rather the economic aspects of the national unit with which we are immediately concerned.

One of the various meanings of national economy is an organization for administering the economic affairs of the nation. The state administers in at least two important ways. First, it passes laws aiding business (*inter alia*), some of which set up standards such as weights and measures and quality of goods, while others establish limitations, for example, on prices and wages. Secondly, the state also administers directly by setting up a system of coinage, a judicial service, a post-office, and so on. An examination of such helps to business shows that they are not unlike the services performed by the state at various times for other human activities. The nation has enacted laws concerning the family, the health of cattle that can be marketed, and the practice of medicine. But who is there to say that for this reason we have a national family, national cattle, and a national medicine? And likewise who will maintain that, because the state performs important services for economic life, we have national economy in the sense of national production?

In time of war the nation's control of production may become complete. In a socialistic state, as in Russia to-day, state ownership may prevail. In Germany Hugo Stinnes may become more powerful than the Kaiser ever was, may conceivably own the whole nation or

<sup>1</sup> A paper read at the St. Louis meeting of the American Historical Association, Dec. 29, 1921.