PETRVS
DE
MONTAGNANA

2000 YEARS OF
SCIENCE
HIPPOCRATES
TO
LEONARDO

PETRUS DE MONTAGNANA LECTURING

From KETHAM, *Fasciculus Medicinae*, VENICE, 1493

IN HONOR of the quincentenary of the birth of Leonardo da Vinci, The Pierpont Morgan Library has arranged this exhibition of books important in the early history of science. Two thousand years of scientific thought are represented by mediaeval and renaissance manuscripts and the early printed volumes which have fortunately been preserved to our day. The period covered by the exhibition extends from the earliest concepts in the sixth century B.C. to what we may roughly call the beginnings of modern science. In viewing the exhibition, it is well to bear in mind that in large part the books and manuscripts displayed are *not* contemporaneous with the authors of the texts. No codices or papyri of the classical period, for example, are exhibited. Although occasional earlier examples may be cited, it is not until the fifteenth century that the volumes are regularly contemporaneous with the texts.

The arrangement of the exhibition is chronological rather than by branches of knowledge; this enables the visitor more easily to understand the distinct contributions of the several eras and of the separate national groups. Beginning with the age of classical antiquity, scientific thought was dominated for nearly a thousand years by the encyclopaedic learning of the ancient Greeks. After the downfall of the Roman Empire, the mantle of Hellenic supremacy fell upon the shoulders of the Muslim scientists. As the Greeks had controlled scientific thought in classical days, so the Arab men of science held sway

over the learning of the "Dark Ages." With the advent of the thirteenth century, Western Europe contributed its own original researchers. Though the promise held forth by this greatest of centuries was not fulfilled in the two succeeding ones, this brilliant era laid the foundations for the scientific thought of the sixteenth century from which all modern learning has stemmed in practically unbroken succession.

Since this exhibition itself provides a survey of what the several successive cultures produced, it may be well to refer briefly to certain disciplines as a whole. Some fields of knowledge were specially favored in these two thousand years; there is, for example, a remarkable continuity in the history and development of medicine and astronomy. Hardly a decade passed without some great discovery being made. With other sciences it was quite a different matter; chemistry (unless alchemy be included here) and physics made precious little progress from the theorizing of Empedocles or the practical application of theoretical principles by Archimedes until comparatively modern times.

Because it was a matter of major concern to every living being, one finds, not unexpectedly, that medicine showed the valid results of practical observation and constant experimentation at a very early stage of Western civilization. From the semi-mythical days of Aesculapius onwards, medicine (once it had been freed from magic by Hippocrates) speedily became one of the chief glories of Hellenic learning. In the hands either of skilled practitioners or of wise teachers (such as Aristotle, Theophrastus, Dioscorides, Galen and Paul of Aegina), Greek medicine laid the sturdy foundations for that continuous growth which was to last throughout two millenniums. On the other hand, surgery, which under the Romans had achieved a high degree of perfection (unequalled for the

next fifteen hundred years), fell upon evil days; from the era of Celsus (30 A.D.) to that of the great sixteenth-century French surgeon Ambroise Paré, the doctors (often as not, barber-surgeons) achieved few improvements in technique or theory; they were often, to the contrary, retrograde in their practices. With medicine it was fortunately quite different; without interruption the teachings of the Greek doctors were preserved and enlarged by the great Muslim scientists (Mesuë, Rhazes, and Avicenna) and their Hebrew colleagues (Moses Maimonides and Isaac Judaeus). During the lifetime of the "Islamic Aristotle" (Averroës) the great medical school at Salerno was founded, and with it came the advent of Western medicine.

A very similar story could be told for the history of astronomy and its popular (and, for that day, equally scientific) offspring, astrology. Apart from medicine and astronomy, however, the contribution of the Middle Ages to the universal store of knowledge was, relatively speaking, slight indeed. Until the arrival of that period which has been loosely but dramatically called "the Renaissance of the Thirteenth Century," it was largely the practice of learned men to compile encyclopaedias by the very simple process of picking the intellectual bones of earlier generations. Anatomy and botany claimed the attention of but few scholars—and none of these were gifted scientists by any reputable standard. Again, it was not until the seventeenth century that any really significant achievement can be recorded for either pure physics or chemistry; finally, with the researches of Galileo and Boyle, a new era was ushered in for these disciplines, and modern science, for better or worse, had its birth.

It is interesting, too, to note that certain skills were peculiarly adapted to specific groups, so that sporadic growth or

decline of some branches of learning accompanied the historical and social status of their practitioners. Under the aegis of Rome, geography flourished brilliantly, only to slumber for the next thousand years. It was not until the discoveries and explorations of the fifteenth and sixteenth centuries that any new information of real importance was added to the knowledge set forth by Mela, Pliny, Ptolemy, Solinus and Strabo. The Jews, in turn, were the great translators who provided the West with versions of Greek, Arabic and Hebrew learned texts intelligible to any person who could read Latin, in short to every literate man. The Muslim world supplied the facts and the terminology which still survive in our pharmacopoeias; we use Arabic words whenever we speak of alcohol, aldehyde, amber, julep, senna, syrup and countless other substances.

These historical facts are clearly set forth in the present exhibition. Most of the great names of two thousand years of science are represented by the books which have conferred honor upon these men. If some few distinguished scientists are not to be found in the exhibition, the explanation is usually quite simple; manuscripts of the great scientific works of such men of genius as Roger Bacon and Robert Grosseteste are very, very rare indeed and are mostly preserved as treasured possessions by the great European libraries. It is of historic interest, on the other hand, that many of the most important investigations by mediaeval scholars of the first rank were not put to press before the nineteenth century and are consequently only available in quite modern editions beyond the scope of the present exhibition. But as a whole the story of the growth of scientific knowledge from Hippocrates to Leonardo is amply illustrated by the books and manuscripts now on display.

The most profound and the most illuminating truth which the visitor may bear away with him is surely not to be found in the books at all, but in the lives of the men themselves. The significant fact is this—that the growth of scientific knowledge from the period of the advent of Christianity until the days of the Reformation was in no way accompanied by decline of a faith, both simple and devout, whether Christian, Jewish or Muslim. This spiritual attitude is epitomized in those words which Ambroise Paré (1517–1590), the greatest surgeon since Roman days and the father of modern surgery, was wont to apply to his patients: "Je le pansay, Dieu le guarist"—I treated him, God cured him.

C. F. B.

September 26, 1952

CHECK-LIST OF THE EXHIBITION

[All texts are in the language of the title, unless otherwise noted. Manuscripts are designated by M or MA numbers.]

CENTRAL CASE

[*Encyclopaedias*]

PLINIUS SECUNDUS, GAIUS (Pliny, the Elder, 23–79 A.D.)
Historia naturalis. Venice: Johannes de Spira, 1469

CAPELLA, MARTIANUS (fl. 410–429)
De nuptiis Philologiae et Mercurii. Vicenza: Henricus de Sancto Ursio, 16 Dec. 1499

ISIDORUS HISPALENSIS (Isidore of Seville, c.560–636)
Etymologiae. [Augsburg]: Günther Zainer, 19 Nov. 1472

HRABANUS MAURUS (c.776–856)
De sermonum proprietate. [Strassburg: R-Printer, b. 20 July 1467]

VINCENTIUS BELLOVACENSIS (Vincent of Beauvais, c.1195–1264)
Speculum naturale. [Strassburg: R-Printer, 1478]

VINCENTIUS BELLOVACENSIS (Vincent of Beauvais, c.1195–1264)
Imago mundi. English. [Westminster: William Caxton, 1481]

BARTHOLOMAEUS ANGLICUS (Bartholomew the Englishman, c.1200–1250)
De proprietatibus rerum. English. [Westminster: Wynkyn de Worde, 1495]

LATINI, BRUNETTO (c.1210–1295)
Li livres dou trésor. (M.814; written c.1330)

CECCO D'ASCOLI (1269–1327)
L'Acerba. (M.824; written c.1390)

CONRAD VON MEGENBERG (c.1309–1374)
Buch der Natur. Augsburg: Johann Bämler, 30 Oct. 1475

VERGILIUS, POLYDORUS (Polydore Vergil, c.1470–1555)
De inventoribus rerum. Venice: Christophorus de Pensis, 31 Aug. 1499

CASE 1
[*Classical Astronomy*]

ARATUS (fl. c.275 B.C.)
Phaenomena. (M.389; written 1469)

ARISTOTELES (Aristotle, 384–322 B.C.)
De coelo et mundo. Greek. Venice: Aldus Manutius, 1497

HYGINUS, GAIUS JULIUS (fl. 10 A.D.)
Poeticon astronomicon. Venice: Erhard Ratdolt, 22 Jan. 1485

MANILIUS, MARCUS (fl. 14 A.D.)
Astronomica. Nürnberg: Johann Müller, [1474]

PROCLUS (410–485)
Sphaera. Greek. Venice: Aldus Manutius, 1499

CASE 2
[*Classical Mathematics*]

BOETHIUS, ANICIUS MANLIUS SEVERINUS (c.480–524)
Arithmetica. Augsburg: Erhard Ratdolt, 20 May 1488

EUCLIDES (Euclid, fl. c.300 B.C.)
Elementa geometriae. Venice: Erhard Ratdolt, 25 May 1482

PLATO (c.429–347 B.C.)
Opera. Florence: Laurentius (Francisci) de Alopa, [1485]

PYTHAGORAS (fl. 532–496 B.C.)
Aurea verba. Venice: Aldus Manutius, 1497

CASE 3
[*Classical Geography*]

MELA, POMPONIUS (fl. 41 A.D.)
Cosmographia. Venice: Erhard Ratdolt, 18 July 1482

PTOLEMAEUS, CLAUDIUS (Ptolemy, fl. 121–151 A.D.)
Geographia. Ulm: Lienhart Holle, 16 July 1482

SOLINUS, CAIUS JULIUS (fl. 250 A.D.)
De mirabilibus mundi. Venice: Nicolaus Jenson, 1473

STRABO (B.C. 64–21 A.D.)
Geographia. Rome: Sweynheym and Pannartz, [1469]

CASE 4
[*Classical Physics*]

ARCHIMEDES (c.287–212 B.C.)
Opera nonnulla. Venice: Paul Manutius, 1558

ARISTOTELES (Aristotle, 384–322 B.C.)
Physica. [Padua: Laurentius Canozius, 1474]

LUCRETIUS CARUS, TITUS (c.94–55 B.C.)
De rerum natura. (M.482; written c.1450)

MACROBIUS, AMBROSIUS THEODOSIUS (fl. 400 A.D.)
In somnium Scipionis expositio. Venice: Nicolaus Jenson, 1472

CASE 5
[*Classical Medicine*]

CELSUS, AULUS CORNELIUS (14–37 A.D.)
Medicinae libri VIII. Venice: Aldus Manutius and Andreas Torresanus, 1528

GALENUS, CLAUDIUS (Galen, 129–199 A.D.)
Opera. Greek. Venice: Aldus Manutius and Andreas Torresanus, 1525

HIPPOCRATES (fl. c.469–399 B.C.)
Opera. Greek. Venice: Aldus Manutius and Andreas Torresanus, 1526

PAULUS AEGINETA (Paul of Aegina, fl. 640 A.D.)
Opera. Greek. Venice: Aldus Manutius and Andreas Torresanus, 1528

CASE 6
[*Classical Botany*]

COLUMELLA, LUCIUS JUNIUS MODERATUS (fl. c.50 A.D.)
De re rustica. (M.139; written in 1469)

DIOSCORIDES PEDANIUS (fl. c.50 A.D.)
De materia medica. Greek. (M.652; written c.890)

DIOSCORIDES PEDANIUS (fl. c.50 A.D.)
De materia medica. (M.760; written c.1150)

THEOPHRASTUS (372–285 B.C.)
De historia plantarum. (M.118; written c.1530)

CASE 7
[*Miscellaneous Classical Science*]

ARISTOTELES (Aristotle, 384–322 B.C.)
De animalibus. Venice: Colonia and Manthen, 1476

ARRIANUS, FLAVIUS (Arrian, 96–180 A.D.)
Periplus Ponti Euxini. Greek. Basel: Hieronymus Froben, 1533

DIONYSIUS PERIEGETES (fl. 81–96 A.D.)
Cosmographia. Venice: Maler, Ratdolt, and Löslein, 1477

SENECA, LUCIUS ANNAEUS (B.C. 4–65 A.D.)
Naturales quaestiones. Venice: Aldus Manutius and Andreas Torresanus, 1522

VITRUVIUS POLLIO, MARCUS (fl. 10 A.D.)
De architectura. [Rome: Eucharius Silber, 1486]

CASE 8
[*Early Christian Writers*]

APULEIUS BARBARUS (fl. 500)
Herbarium. [Rome: Joannes de Lignamine, 1483]

HONORIUS INCLUSUS (fl. c.1090)
De imagine mundi. [Nürnberg: Anton Koberger, 1472]

MACER FLORIDUS (c.1070)
De viribus herbarum. (MS. from Mrs. Morgan's collection; written c.1125)

MACER FLORIDUS (c.1070)
De viribus herbarum. [Geneva: Jean Bellot, 1500]

PHYSIOLOGUS (c.190 A.D.)
Manuscript. (M.81; written c.1170)

PSEUDO-ARISTOTLE (c.825)
Secreta secretorum. French. Paris: Antoine Vérard, 15 Sept. 1497

VEGETIUS, FLAVIUS RENATUS (fl. 379–395)
De re militari. (M.364; written c.1460)

CASE 9
[*Arabic Astrology and Medicine*]

ABÛ MA'SHAR (Albumasar, 786–886)
Flores astrologiae. Augsburg: Erhard Ratdolt, 18 Nov. 1488

AL-RÂZÎ (Rhazes, d.924)
Liber nonus Almansoris. [Milan: Philippus de Lavagnia, 1472]

IBN SÎNÂ (Avicenna, 980–1037)
Canon medicinae. Hebrew. (M.693; written c.1380)

MÂSAWAIH AL-MÂRDÎNÎ (Mesuë, 925–1015)
Opera. Naples: Conrad Guldenmund, 3 Jan. 1478

CASE 10
[*Arabic Astronomy and Physics*]

AL-FARGHÂNÎ (Alfraganus, fl. 861)
Compilatio astronomica. Ferrara: Andreas Belfortis, 3 Sept. 1493

AL-GHAZZÂLÎ (Algazel, 1058–1111)
Physica. (M.857; written c.1275)

AL-QABÎṢÎ (Alcabitius, fl. 950–970)
Libellus isagogicus. German. (M.722; written c.1435)

IBN RUSHD (Averroës, 1126–1198)
Expositio in Aristotelis Physica. (M.858; written c.1325)

CASE 11

[*Twelfth Century Miscellaneous*]

ADELARDUS BATHONIENSIS (Adelard of Bath, fl. 1110–1142)
Quaestiones naturales. [Louvain: Johann of Paderborn, 1475]

GERARDUS CREMONENSIS (Gerard of Cremona, 1114–1187)
Theorica planetarum. Venice: Adam de Rottweil, 10 Sept. 1478

JOANNES PRESBYTER (Prester John, fl. c.1165)
De ritu et moribus Indorum. French. [Poitiers: Bouyer and Bellesculée, 1491]

LEUPOLDUS, DUX AUSTRIAE (Leopold of Austria, 1157–1194)
Compilatio de astrorum scientia. Augsburg: Erhard Ratdolt, 9 Jan. 1489

REGIMEN SANITATIS SALERNITANUM (1150–1200)
Louvain: Johann of Paderborn, [1484]

CASE 12

[*Thirteenth Century Miscellaneous*]

AQUINAS, THOMAS (1225–1274)
Interpretatio in Metaphysicam Aristotelis. Pavia: Franciscus Girardengus, 15 Oct. 1480

JOANNES DE PECKHAM (d.1292)
Prospectiva communis. [Milan]: Petrus de Corneno, [1482]

JORDANUS NEMORARIUS (d.1237)
Arithmetica. Paris: Higman and Hopyl, 22 July 1496

LULLUS, RAYMUNDUS (Raymund Lully, 1232–1315)
Ars generalis ultima. Venice: Filippo di Pietro, 13 Nov. 1480

MARCO POLO (1254–1324)
Le livre des merveilles d'Asie. (M.723; written c.1410)

CASE 13

[*Thirteenth Century Astronomy and Botany*]

ALBERTUS MAGNUS (Albert the Great, 1193–1280)
Parva naturalia. Venice: [Locatellus] for the heirs of Scotus, 10 Mar. 1517

ALPHONSUS X, EL SABIO (Alfonso the Wise, d.1284)
Tabulae astronomicae. [Venice]: Erhard Ratdolt, 4 July 1483
Lent by Harrison D. Horblit, Esq.

BONATUS, GUIDO (d. c.1297)
Decem tractatus astronomiae. Augsburg: Erhard Ratdolt, 26 Mar. 1491
Lent by Harrison D. Horblit, Esq.

MICHAEL SCOTUS (d. c.1235)
Expositio super auctorem Spherae. Bologna: Justinianus de Ruberia, 16 Sept. 1495

SACRO BUSTO, JOHANNES DE (John Holywood, fl. 1230)
Sphaera mundi. Venice: Sanctis and Santritter, 31 Mar. 1488

CASE 14

[*Thirteenth Century Medicine*]

ALDOBRANDINO DA SIENA (d.1287)
Le régime du corps. (M.165; written c.1450)

BONIFACIO DI CALABRIA (fl. 1265–1282)
Thesauro di cavalli. (M.735; written c.1345)

GUGLIELMO DA SALICETO (c.1210–1280)
Chirurgia. French. Lyons: Matthias Huss, 16 Nov. 1492

PETRUS DE ABANO (c.1250–1316)
De venenis. (M.509; written c.1490)

PETRUS HISPANUS (Pope John XXI, d.1277)
Thesaurus pauperum. Italian. [Florence: Antonio di Bartolommeo Miscomini, 1494]

CASE 15

[*Fourteenth Century Miscellaneous*]

ASTROLOGICAL CALENDAR FOR THE YEARS 1386–1462
Manuscript. (M.355; written in 1386)

CRESCENTIIS, PETRUS DE (Pier de' Crescenzi, d.1320)
Ruralia commoda. French. (M.232; written c.1470)

JOHANNES ANGLICUS (John of Gaddesden, d.1361)
Rosa anglica. Pavia: [Girardengus and Birreta], 24 Jan. 1492

CASE 16

[*Fourteenth Century Miscellaneous*]

FERRIÈRES, HENRI DE (fl. 1350)
Le livre du Roy Modus et de la Reine Ratio. (M.820; written c.1460)

GASTON PHOEBUS (1331–1391)
Le livre de la chasse. Paris: Jean Trepperel, [1506]

LIBERI DA PREMARIACCO, FIORE DE' (c.1350–1420)
Fior di battaglia. (M.383; written c.1425)

MANDEVILLE, SIR JOHN (d.1372)
Itinerarius. German. [Basel: Bernhard Richel, 1481]

CASE 17

[*Fifteenth Century Astronomy*]

CONRADUS TURICENSIS (fl. 1472)
De cometis. [Beromünster: Helias Heliae, 1472]

REGIOMONTANUS, JOHANNES (Johann Müller, 1436–1476)
Calendarium. Venice: Maler, Ratdolt, and Löslein, 1476

REGIOMONTANUS, JOHANNES (Johann Müller, 1436–1476)
Epitoma in Almagestum Ptolemaei. Venice: Johannes Hamman, 31 Aug. 1496

CASE 18

[*Fifteenth Century Mathematics*]

ARTE DELL' ABBACO (c.1478)
Treviso: [Michael Manzolus], 10 Dec. 1478

BORGO, PIETRO (d. c.1495)
Aritmetica. Venice: Erhard Ratdolt, 2 Aug. 1484

CALANDRI, FILIPPO (fl. 1480)
Aritmetica. Florence: Morgiani and Petri,. 1 Jan. 1491

GAFURIUS, FRANCHINUS (1451–1522)
Practica musicae. Milan: Guillermus Le Signerre, 30 Sept. 1496

PACCIOLI DE BURGO, LUCAS (c.1445–1509)
Somma di aritmetica, geometria, proporzioni. Venice: Paganinus de Paganinis, 10–20 Nov. 1494

CASE 19

[*Fifteenth Century Medicine*]

BAGELLARDUS, PAULUS (d.1492)
De aegritudinibus et remediis infantium. [Padua]: Valdezoccho and de Septem Arboribus, 21 Apr. 1472

BRUNSCHWIG, HIERONYMUS (d. c.1512)
Destillirbuch. Strassburg: Johann Grüninger, 8 May 1500

GOVERNAL OF HEALTH (1489)
[Westminster: William Caxton, 1489]

HORTUS SANITATIS. GERMAN (1485)
Mainz: Peter Schöffer, 28 Mar. 1485

KETHAM, JOHANNES DE (fl. 1460)
Fasciculus medicinae. Italian. Venice: J. and G. de Gregoriis, 5 Feb. 1493

MARTIRE D' ANGHIERA, PIETRO (Peter Martyr, 1455–1526)
De orbe novo decades. Alcala: Arnaldus Guillelmus, 1516
Lent by Thomas W. Streeter, Esq.

VESPUCCI, AMERIGO (1451–1512)
Mundus novus. [Rome: Eucharius Silber, 1504]

CASE 23
[*Early American Exploration*]

CATTANIO, NOVELLO (spuriously dated 1533)
Un viaggio fatto alli paesi del continente nuovo 1531–1533. (M.555; written c.1710)

MONTALBODDO, FRACANZANO (fl. 1508)
Itinerarium Portugallensium. [Milan: Johannes Angelus Scinzenzeler, 1508]

VERRAZZANO, GIOVANNI DA (1486–1527)
Viaggio fatto nel 1524 all'America settentrionale. (MA. 776; written c.1575)

WALDSEEMÜLLER, MARTIN (c.1473–1522)
Cosmographiae introductio. St. Dié: Walter Lud, 29 Aug. 1507
Lent by Thomas W. Streeter, Esq.

CASE 24
[*Sixteenth Century Miscellaneous*]

FANTI, SIGISMONDO DE (fl. 1514–1527)
De modo scribendi. Venice: Johannes Rubeus, 1514

HELAIN, RICHARD (fl. 1500)
Anathomia ossium corporis humani. [Leipzig: Wolfgang Stöckel, 1501]

HUND, MAGNUS (1449–1519)
Anthropologium de hominis dignitate. Leipzig: Wolfgang Stöckel, 1501

RINGBÜCHLEIN (1512)
Die recht Kunst und Art des Ringens. [Strassburg: Matthias Hupfuff, 1512]

CASE 25

[*Sixteenth Century Miscellaneous*]

DÜRER, ALBRECHT (1471–1528)
Befestigung der Stett. Nürnberg: [Hieronymus Andreae], 1527

SCHREIBER, HEINRICH (fl. 1518)
Ein new künstlich Buch. Nürnberg: Johann Stuchs, 1518

VITRUVIUS POLLIO, MARCUS (fl. 10 A.D.)
De architectura. Italian. Como: Gotardus da Ponte, 1521

CASE 26

[*Twenty-five Years After the Death of Leonardo*]

COPERNICUS, NICOLAUS (1473–1543)
De revolutionibus orbium coelestium. Nürnberg: Johannes Petreius, 1543

FUCHS, LEONHARD (1501–1566)
De historia stirpium. Basel: Michael Isingrin, 1542

VESALIUS, ANDREAS (1514–1564)
De humani corporis fabrica. Basel: Johannes Oporinus, 1543.

ON THE WALLS

CODEX HUYGENS (c.1570)
A selection of leaves from this treatise on art theory (MA.1139), executed by an anonymous Milanese artist who had access to the note-books of Leonardo da Vinci.