

60. *Ibid.*, p. 313.
61. *Ibid.*, pp. 301 sq.
62. *Ibid.*, p. 349.
63. *Ibid.*, p. 367.
64. *Ibid.*, p. 335.

Index

- Acceleration: 169
- Ancients: concept of universe, 5, 14, 16, 17, 24, 60, 112; explanation of gravity, 208, 297-98; theory of incomprehensibility of God, 198. *See also* Atomism
- Anselmian concept: 124
- Aristarchus of Samos: 28
- Aristotle: 28, 30, 35, 56, 59, 100, 101, 126, 149, 261, 290; concept of God as First Cause, 225; concept of universe, 11, 34, 60, 72, 86-87, 97, 139, 140; doctrines questioned, 24, 26, 31-32, 46-47, 55, 139, 161, 230, 285; theory of relativity of motion, 56, 279
- Arnauld, Antoine: attitude toward Malebranche, 158-59
- Atheism: causes, 138, 198, 234; refuted by Bentley, 179-80, 182-84, 186-89
- Atomic structure of universe: 113, 115, 182, 211, 254, 274, 277. *See also* Hardness
- Atomism: 5, 141, 145, 154, 172, 173, 208, 213, 278, 303
- Attraction, theory of Newton: 181, 207, 220, 234, 298; discussed, 174-79, 183-89, 209-16; inverse square law, 220, 228, 272; miraculous qualities imputed to, by Leibniz, and defense by Newton and Clarke, 223, 228, 229, 233, 234, 245-46, 248, 253, 258, 267-68, 271-72; ultimate modification of, 274. *See also* Gravity
- Attributes: substances implied by, 145-47
- Attributes of God: 124, 148-53, 155-56, 197
- Bacon, Francis: 1, 3, 243
- Bentley, Richard: 207, 223, 249, 295; accepts Bruno's concept of universe, 180; follows Newton's teachings, 179; misinterprets Newton's theory of gravity, 178-79; theory of influence of God in universe, 182-89
- Berkeley, George, Bishop of Cloyne: 207; attack on Newton's philosophy and response by Newton, 221-28
- Bodies, attraction of. *See* Attraction
- Bodies, qualities of: discussed by Newton, 173-75
- Body: definition by More, 128-130
- Boyle, Robert: 3, 215, 220, 278, 294
- Boyle Lectures: delivered by Bentley, 179; by Clarke, 300
- Brahe, Tycho: 3, 56, 92, 284, 286
- Bruce, Edward: 73, 287
- Bruno, Giordano: 58, 73, 75, 78, 96, 99, 102, 105, 114, 118, 119, 171, 241, 290; argument for change from sensual to intellectual perception, 44-46; assertion of infinite space, 46-49, 52, 53; attitude toward creative power of God, 42, 48-49, 52, 53; attitude toward Lucretian cos-

- mology, 6; attitude toward motion in universe, 39-40, 41, 44, 49-51; attitude toward Nicholas of Cusa, 6, 14, 18; biographical sketch, 282-83; burned at stake, 98, 283; concept of infinity of universe, 35, 39-54, 60-61, 180, 282; influence on contemporaries doubted, 54-55; principle of plenitude, 42, 44, 52; principle of sufficient reason, 44, 46, 52, 283
- Brutus. *See* Bruce, Edward
- Cabala: 126
- Cabalists: 148
- Cartesian philosophy. *See* Descartes
- Center of universe: concept of Nicholas of Cusa, 11-21 *passim*; earth removed from, 3, 29-30, 32-33, 43; existence disputed, 40, 41-42, 63, 64, 65, 67, 69, 96
- Centrifugal force: relation to circular motion, 167-71
- Centripetal force. *See* Attraction
- Chanut: 6
- Cheyne, Dr. George: 206, 274, 297
- Circumference of universe: concept of, 11, 12, 17, 18
- Clarke, Dr. Samuel: 207, 301; biographical sketch, 300; chosen by Newton to act as spokesman, 301; defense of Newton against attacks by Leibniz, 236-72, 273
- Copernicus, Nicholas: 3, 15, 56, 59, 61, 92, 95, 96, 97, 99, 105, 281, 284, 285, 286; concept of universe, 29-34, 36; condemnation of, 98; diagram of world replaced, 36-38; not influenced by Nicholas of Cusa, 8, 18, 280; sources of inspiration, 28
- Cosmos: destruction of conception of, 2, 24, 29, 43, 61
- Cotes, Roger: 230-32, 235-36, 274, 298-99
- Creation of universe by God: concept of Leibniz, 266, 269; concept of Newton and Clarke, 256-57, 269; not necessary to infinite universe, 275
- Cusa, Nicholas of. *See* Nicholas of Cusa
- Demetrius: 140
- Democritus: 3, 44, 73, 101, 112, 114, 126, 140, 141, 182, 238, 239, 278
- Descartes, René: 1, 52, 139-77 *passim*, 190-91, 197, 210-18 *passim*, 225, 231, 237, 252, 254, 264, 267, 272, 290, 294; concept of matter and space as identical, 99, 101-4; concept of universe as indefinite and God as infinite, 100, 104-9, 124, 153-54; denial of void space, 136, 141-43, 145, 232; exchange of letters with More, 110-24; explanation of gravity, 133; formulated principles of mathematical cosmology, 99; influence on philosophical development of More, 125, 289; interpretation of thought of Nicholas of Cusa, 6, 19; theory of extension, 101-4, 138, 126-27, 132, 145-47, 152, 162; use of hypotheses, 230; views of, disputed by More. *See* More, Henry, disputes views of Descartes
- Des Maiseaux: 301
- d'Etaples, Lefèvre: 18
- "Dieu fainéant": 276
- Digges, Leonard: 35
- Digges, Thomas: contribution to concep-

- cept of infinity of universe, 35-39; diagram of infinite universe, 36-38; influence on Gilbert, 55
- Diogenes Laertius: 5, 6
- Donne, John: quoted, 29
- Dortous de Mairan, J. J.: 159
- Duhem, Pierre: 169
- Duns Scotus, John: 124
- Duration. *See* Time
- Earth: comparison with rest of universe, 25, 38, 105; displacement from center of universe, 3, 29-30, 32-33, 43; low position assigned by traditional cosmology, denial of, 19-23; motion of, 40, 41, 55-56
- Ephantus: 28
- Einstein, Albert: 169
- Elasticity of bodies: theory of Newton, 215, 216-17
- Electricity. *See* Attraction
- Epicurus: 44, 112, 140, 178, 180, 238, 239, 278
- Ether, properties of: 132, 171-72, 207-8
- Experimentation. *See* Newton, Sir Isaac
- Extension. *See* Space
- Extension, spiritual: denial by Descartes, 138; distinction from space, 132; identification with God, 191-201; penetrates and is impenetrable, 195, 200; theories of 17th century, 130-31; theory of More, 111, 112, 116-23 *passim*, 126-27, 132, 138
- Ficino, Marsilio: 125
- Finite world. *See* Universe
- First Cause. *See* God
- Fixed stars: 12-13, 19; comparison with rest of universe, 21-22; concep-
- tion of Copernicus, 30-33; discoveries of Galileo through telescope, 72-76, 89-95; existence of sphere denied, 35, 56-57, 95-96; infinite extent of, 36-39, 40, 41, 48, 49, 51, 53; infinity denied, 60-87; position and dimensions, 30, 32, 62-85 *passim*, 104, 281; world in relation to, diagram of Kepler, 79. *See also* Universe
- Freedom of choice. *See* God
- Galileo Galilei: 40, 54, 55, 83, 84, 175, 176, 231, 277, 278; attitude toward gravity, 133; diagram of stars in Orion, 93; invention of telescope, influence of, 72-76, 81, 84, 88-95; lack of decision on infinity of universe, 95-99
- Gassendi, Pierre: 3, 114, 146, 278, 290, 294
- General Scholium: published by Newton, setting forth religious conceptions, 223-30, 234
- Gilbert, William: 73, 284-85; contribution to concept of infinity of universe, 55-57, 60-61; denial of existence of sphere of fixed stars, 56-57; discussion of earth's rotation, 55-56; influenced by Digges, 55; theory of magnetic forces, 131
- Glanvill, Joseph: 126
- God: absence from space, 275; attributes of, 124, 148-53, 155-56, 197; conception of Descartes criticized by More, 111-24, 138, 147; conception of Newton attacked by Leibniz and defended by Clarke, 235-72; considered only infinite being, 52, 100, 106, 107, 108, 109, 192-93; creator of universe, 42, 48-

- 49, 52, 53, 78, 100, 113, 119, 120, 121, 124, 157, 208-9, 217-20, 239-41, 256-57, 266, 269, 273, 275; decrease in position in universe, 276; freedom of choice, concept of Newton, 239-46, 250, 253, 257, 259, 260, 268-70, 272, 273; idea of, relation to idea of space, 135-36, 137-39; identification with immaterial extension, 155-56, 191-201; identification with space, 137, 147, 155, 222-23, 226; infinite extension of, distinguished from material extension, 156-58, 159; infinity of, 52, 100, 106, 107, 108, 109, 113, 116-24 *passim*, 140, 153-54, 192-93, 297; intervention needed to move universe, 183-89, 216, 224-25, 236-40 *passim*, 245, 248-49, 252, 254, 272, 276; participation in gravity, 134, 179, 207-20, 234, 298; power restricted by denial of void, 138, 232; relation of time and space to, by Newton, 161; religious conception of Newton, 223-28, 232-34; works of, discussed, 208-9; world an ordered expression of, 58, 286
- Gravity: 131, 133-34. *See also* Attraction, theory of Newton
- Gravity, specific: 172
- Greece. *See* Antients; Atomism
- Gregory, David: 297-98
- Guericke, Otto von: 3
- Hardness: a property of all matter, theory of Newton, 207, 210-12, 217-18, 254, 272, 274. *See also* Atomic structure of universe; Atomism
- Heavens. *See* Fixed stars; Universe
- Hebrews: concept of infinite, 195
- Hell: position of, 281
- Heraclides: 28
- Hermes: 126
- Herschell, Sir William: 280
- Hiketas: 28
- Hobbes, Thomas: 3, 133, 145, 198, 238
- Huygens, Christian: 3, 31, 169, 176, 230, 299
- Hypotheses: danger to experimental philosophy, 204-5, 208, 228-34
- Indefinite universe. *See* Universe
- Inertia: principle of Newton, 169, 173, 174, 175, 216, 218, 261, 302
- Infinite: definition of term, 72, 201
- Infinity. *See* God; Universe
- Isaiah: 201
- Johnson, Francis R.: 35
- Kant, Immanuel: 150, 180
- Keill, John: 301
- Kepler, Johannes: 55, 95, 96, 97, 102, 107, 171; diagram "M" of, 79; effect of telescopic discoveries on, 72-76; influenced by Nicholas of Cusa, 6, 19; supporter of Aristotle, 60, 72, 86-87; theories of, 58-87, 277
- Laplace, Marquis Pierre Simon de: 276
- Larkey, Sanford V.: 35
- "Learned ignorance": doctrine of Nicholas of Cusa, 6, 8, 9, 10, 17
- Leibniz, Gottfried Wilhelm von: 169, 207, 211, 290; concept of universe, 262-63, 266, 269, 273; death of, 273; distinction between motive and cause, 259; principle of observability of space, 261-62; principle

- of sufficient reason, 44, 46, 52, 61-62, 78, 239-42, 243-45, 246, 250, 253, 259, 262, 275, 283; theory of relativity of space, motion, and time, 245, 247-48, 249, 250-52, 254, 256, 262-63
- , attack on theories of Newton, and defense by Clarke: 300-1; atomic structure of universe, 207, 210-12, 254, 272, 274; concept of God, 232-72; concept of God's freedom of choice, 239-46, 250, 253, 257, 259, 260, 268-70, 272, 273; concept of motion, 245, 269, 272; concept of space, 235, 237, 239, 243-45, 247, 248, 251-52, 254-57, 259, 260, 263-67; concept of time, 256-57, 259, 263, 264-66, 269; contrast between materialism and mathematical philosophy, 208, 238, 241, 267, 271, 272; existence of void, 239, 241, 250-51, 254-55, 260, 264, 272; importance of matter in universe, 237, 239, 250; motion of universe, God's intervention required, 236, 237-38, 239-40, 245, 248-49, 252, 254, 272, 276; "sensorium" of God, 237, 239, 241, 242. *See also* Attraction
- Leucippus: 73, 140
- Light: and matter, 132, 207, 212, 297-98; behavior of, 131, 207, 212, 215; conception of Copernicus, 30, 33; conception of Palingenius, 26-27
- Locke, John: 235
- Locus. *See* Place
- Lovejoy, A. O.: 25, 34, 39, 42, 44, 52
- Lucretius: 46, 54, 101, 112, 114, 190, 210, 278, 290; assertion of infinity of space, 35, 282; *De rerum natura*, 5, 6, 283; influence on cosmological thinking, 6
- Mach, Ernst: 169
- Magnetism. *See* Attraction
- Malebranche, Father Nicolas: 149, 156-58, 159, 199
- Manilius, Marcus: 66, 287
- Manzoli, Pier Angelo. *See* Palingenius
- Mathematical philosophy: 19, 99, 205, 208, 215, 228-34, 238, 241, 267, 271, 272, 278
- Matter: atomic composition of, theory of Newton, 207, 209-13, 217-19, 254, 272, 274; conception of Descartes, 111-19 *passim*, 124; importance in universe, 237, 239; nature of, 101-2, 130, 172-75, 193, 194; not attribute of God, 193, 201; question of compressibility, 128; question of density, 207-8; relation to light, 132, 207, 212, 297-98. *See also* Attraction; Gravity; Space
- McColley, Grant: 31
- Mediaeval concept of space: 277
- Mediaeval concept of universe: 5, 6, 16, 24, 34, 281
- Melissos: 73
- Mendelsohn, Moses: 201
- Metrodorus: 140
- Milky Way: 69-70, 83, 89
- Montaigne, Michel de: 1
- More, Henry: 109, 156, 161, 163, 164, 165, 173, 176, 190, 195, 197, 201, 220, 248, 251, 252, 264, 274, 290, 291, 302-3; concept of space, 126-27, 132, 137-40, 145-47, 152, 155, 159, 160; concept of spirit and matter, 125, 127-32; concept of spiritual extension, 111, 112, 117-23 *passim*, 132, 138, 191-92; ex-

- change of letters with Descartes, 110-24; philosophy of, 125-26, 289; theories related to Newton's, 190
- , disputes views of Descartes: conception of God, 111-24; denial of existence of atoms, 112-13; denial of void, 112, 116, 120, 138, 139-40, 145, 191-92; identification of matter, extension, and space, 110-12, 115, 117-18, 124, 126-27, 132; indefinite extension of universe, 114-15, 117-22, 124, 152-54; opposition of spirit and matter, 110-12, 121, 125; relativity of motion, 142-45
- Motion: absolute, 163-71, 256, 272; circular, 18, 167-71; indistinguishable from rest, 166; of earth, 15, 20, 39-40, 55-56; of universe, 15, 19, 30-33, 41, 44, 49-51, 56-57, 183-89, 216, 224-25, 236-40 *passim*, 245, 248-49, 252, 254, 269, 272, 276; planetary, allied with force by which bodies fall, 229; principle of observability, 261-62; proof of existence of God, 191-95, 202-3, 216-17, 218; rectilinear, 166, 167-69; relative, 10-17 *passim*, 142-45, 161-71, 256, 261, 262, 269, 279; use in measuring time, 161-62
- Napoleon Bonaparte: 276
- Neoplatonic revival: 24, 113, 161, 277. *See also* Plato
- Newton, Sir Isaac: 3, 109, 180, 189, 278, 290, 294, 298; correspondence with Bentley *re* gravity and planetary motion, 178-89, 223; publication of *General Scholium*, setting forth religious conceptions, 223-30, 234; publication of "queries" *re* metaphysical problems, 206-7, 296; success of philosophy of, 274; support of phenomena against hypotheses, 205, 208, 228-34; theories related to those of More, 159, 160, 190; theory of finitude of universe, overcome, 274-75; world-view of, 207. *See also* Attraction; Inertia; Leibniz, attack on theories of Newton; Mathematical philosophy
- , concepts: God, 207-20, 223-28, 232-72, 274-76; light, 207, 212, 297-98; matter, 172-75, 207-8, 209-13, 217-19, 250, 254, 272, 274, 297-98; motion, 160-71, 213, 215-18, 221, 224, 236-40 *passim*, 245, 248-49, 252, 254, 256, 269, 272, 276; rare ether, 171-72, 207; space, 160-66, 168, 169, 171-72, 207, 221-28, 235-71 *passim*; time, 221-28, 256-57, 259, 263, 264-66, 269; void, 239, 241, 250-51, 254-55, 260, 264, 272
- Nicholas of Cusa, Cardinal: 6-24 *passim*, 29, 35, 42, 43, 44, 47, 52, 54, 96, 99, 106, 118, 282; belief in lack of precision in universe, 13, 16-18; biographical sketch, 278; comparison of inhabitants of parts of universe, 22-23; concept of motion, 15, 17, 18, 19; concept of universe, 8-24; conceptions disregarded by contemporaries, 18; denial of low position of earth, 19-23; forerunner of Copernicus and Kepler, 19, 280; influence on Palingenius, 24; "Learned ignorance," theory of, 6, 8, 9, 10, 17; rejects mediaeval concept of cosmos, 6; thought compared to that of Bruno, 41, 43
- Nullibists, nickname of Cartesians, 138, 201

- Orion, constellation of: discussed by Kepler, 63-64, 65-66, 81; shield and sword, as seen through telescope, 93
- Palingenius, Marcellus Stellatus: 28, 39; attitude toward Greek cosmologists, 24; biographical sketch, 280; conception of universe, 24-27; influenced by Nicholas of Cusa, 24; suspected of heresy, 280
- Parallaxes: theory of, applied by Kepler, 66, 68, 287
- Pascal, Blaise: 3, 43, 277, 283, 291
- Patrizzi, F.: 54
- Perspicillum. *See* Telescope
- Philolaos: 28
- Phoenicia: 208
- Place: absolute, distinguished from relative, 163-66; definition, 140, 163; relation to motion, 143-45. *See also* Space
- Planets: compared with fixed stars, 92; discoveries enabled by invention of telescope, 73-76, 89-90, 92; motion of, 31, 33, 49-51, 229; situation in universe, 73. *See also* Universe
- Plato: 3, 28, 54, 72, 123, 126, 140, 141. *See also* Neoplatonic revival
- Plenitude, principle of: 25, 42, 44, 52, 188, 275
- Plotinus: 290
- Plutarch: 141
- Poles of universe: 12, 14, 15, 16-17, 20; Copernicus' conception, 30; denial of existence by Bruno, 41
- Pre-Copernican diagram of universe: 7
- Princess of Wales: 235, 259, 263-64, 300
- Ptolemy: 28, 32, 34, 56, 95, 96
- Pythagoras: 28, 30, 59, 147
- Raleigh, Sir Walter: 34
- Raphson, Joseph: 206, 220, 221-23, 249, 295, 301; concept of infinity, 201-2; concept of space, 191-201; concept of universe, 202-4; influence of Spinoza on, 191; relations between theories of Newton and More pointed out by, 190-91
- Rectilinear motion. *See* Motion
- Relativity. *See* Motion; Space; Time
- Repulsion: theory of Newton, 213, 214-15
- Rest: status of, 164, 166
- Rheticus: 28
- Riccioli, Gianbattista: 31
- Rotational motion. *See* Motion
- St. Paul: 227, 270
- Scaliger, Julius: 119
- Scholastic tradition: 199, 230, 262, 264, 266, 267, 268
- Scotus, John Duns. *See* Duns Scotus, John
- Sense-perception: question of value in interpreting universe, 44-46, 59, 62, 85, 100, 111-12, 115, 160-62; scope increased by invention of telescope, 89
- Sensorium of God: concept of Newton, 237, 239, 241, 242, 301
- Sidereus Nuncius* of Galileo, announcing discoveries of telescope, importance of, 88, 90
- Socinianism: 239, 301-2
- Solar system. *See* Universe
- Space: absolute, 160-66, 168-69, 221-28, 243-45, 247, 274; attribute of God, 149-50, 155, 193-201, 247;

- change in concept of, 275, 277;
concept of More shared by Newton, 159, 160; concept of Newton attacked and defended, 235, 237, 239, 243-45, 247, 248, 251-52, 254-57, 259, 260, 263-67, 269, 270-71; distinction from extension, 132, 264, 265; distinction from matter, 127, 135-41 *passim*, 145-47, 152, 171-72, 194; existence acknowledged by ancients, 140-41; existence of, a precondition to all existence, 137-38; filled with ether, theory of Newton, 171-72, 207; identified with God, 114, 148-53, 197, 244, 247, 271; identified with matter, 99, 101-6, 110-12, 117-18, 124, 126-27, 155, 156, 191-92, 256-57, 269; indefiniteness of 152; infinity of, 46-49, 52, 53, 126, 140-41, 155-56, 194-202; intelligible distinguished from material, 156-58, 159; measurability of, 135-37, 139-40; nature of, 135-41, 145-54, 193-98; nonmeasurability of, 135-37; reality of, argued by More, 145-47; relative, 16, 162-63, 245, 247, 249, 250-52, 254, 262-63. *See also* Extension, spiritual; Void
- Specific gravity: 172
- Spenser, Edmund: quoted, 280-81
- Spheres. *See* Universe
- Spinoza, Benedict: 149, 159, 197, 201, 239; concept of extension, 155-56; identifies God with universe, 191, 192-93; identifies space with matter, 155, 156; influence on Raphson, 191
- Spirit: concept of More, 127-34
- Spissitude: theory of More, 129
- Stars. *See* Fixed stars; Universe
- Stoa: 126
- Stoics: 140-41
- Substances: implied by attributes, 145-47
- Sufficient reason, principle of. *See* Leibniz
- Sun. *See* Universe
- Syncretism: tendency of More toward, 125-26
- Telescope: astronomy before discovery of, 62, 64; influence on thought of Kepler, 72-76, 81; invention by Galileo, contribution of, 88-95; use of, 84
- Thought, human: imperfection of, 199-200
- Time: absolute, 160-62, 221, 223, 225-28; concept of Newton attacked and defended, 256-57, 259, 263, 264-66, 269; identified with duration, 161-62; relative, 160-62, 245, 247-48, 252, 254, 256, 262-63
- Torricelli, Evangelista: 277
- Tycho Brahe. *See* Brahe, Tycho
- Universe: comparison of component parts, 20-23; concept of ancients, 5, 14, 16, 17, 24, 60, 112; concept of Copernicus, importance to philosophy, 29; concept of Nicholas of Cusa, 8-24; constituted from same matted throughout, 105; corruption in, 23; finitude of: 24-27, 30-34, 58-87, 140-41, 153, 157-58, 159, 192, 202-4, 249, 256-57, 260; hierarchical structure undermined, 19-23, 29; importance of matter in, 237, 239; indefinite nature of, concept of Descartes, 8, 104-9, 114-24 *passim*, 140; lack of precision, 13, 16-18, 19; mediaeval

- concept, 5, 6, 16, 24, 34, 281; populated throughout, 22-23, 25; pre-Copernican, diagram of, 7; relation of God to, theory of More, 110-24; solar systems in, 49-51. *See also* Center of universe; God: creator of universe; Motion
- , infinity of: 2, 3, 5, 24, 34-35, 188, 275, 276; concepts of: Bentley, 180; Bruno, 39-54; Clarke, 256-57; Descartes, 104-9, 114-24 *passim*; Digges, 35-39; Galileo, 95-99; Gilbert, 55-57; Kepler, 58-87; Leibniz, 260, 262-63; More, 114-15, 118-21, 140, 153; Nicholas of Cusa, 6, 8, 19; Palingenius, 25-27
- Vacuum. *See* Void
- Void: 57, 277, 283; conception of ancients, 141; considered center of universe, 78, 81, 82, 83; immensity, 181-82; measurability, 139-40; position, 65, 69, 75; question of existence, 40-41, 46-48, 86, 87, 101-4, 112, 116, 120, 137-38, 145, 171, 180, 191-92, 207-8, 232, 239, 241, 250-51, 254-55, 260, 264, 272, 283; success of Newton's concept, 274
- Voltaire, François Marie Arouet de: 274
- von Leibniz. *See* Leibniz
- Vortices: theory of Descartes, 115, 118, 119, 290
- Wachherus. *See* Wackher von Wackenfels
- Wackher von Wackenfels, Mattheus: 73, 287
- Wales, Princess of: 235, 259, 263-64, 300
- World. *See* Universe
- Zodiac: 12