6_{D.}

83 Illustrations & Tables

THE STORY OF CREATION



.EDWARD-CLODD

G:66 D6 001180

LIST PRESS ASSOCIATION, LIMITED, BY ARRANGEMENT WITH MESSRS. LONGMANS)

WATTS & Co., 17,4 JOHNSON'S COURT, FLEET STREET, LONDON, E.C.

ORY OF CREATION

A Plain Account of Evolution

BY

EDWARD CLODD

angement with Messrs. Longmans for the Rationalist Press Association, Limited]

WATTS & CO., HNSON'S COURT, FLEET STREET, LONDON, E.C. 1906

Next he passed therefrom into that of plants.

For years he lived as one of the plants,
Remembering nought of his inorganic state so different;
And when he passed from the vegetive to the animal state,
He had no remembrance of his state as a plant,
Except the inclination he felt to the world of plants,
Especially at the time of spring and sweet flowers;
Like the inclination of infants towards their mothers,
Which know not the cause of their inclination to the breast.
Again, the great Creator, as you know,
Drew man out of the animal into the human state.
Thus man passed from one order of nature to another,
Till he became wise and knowing and strong as he is now.
Of his first souls he has now no remembrance,
And he will be again changed from his present soul."

"First man appeared in the class of inorganic things,

BIBLIOGRAPHICAL NOTE.

Masnavi (Bk. IV.) of JALAL AD DÎN (13th Century).

First Edition January 1888; Reprinted March and July 1888, June 1890, March 1891; Revised Edition December 1893; Reprinted February 1896; April 1898; New Edition January 1901. First issued as R.P.A. Reprint (revised) 1904; reprinted 1906.

REFACE TO THE FIRST EDITION

to scope and purpose of this book are explained in the Introductory but the justification for its publication in these days of over-production e given.

is lies in the fact that, so far as I know, no work of the kind exists in brief and ompass; complete expositions of the theory of Evolution, foremost among inks Mr. Herbert Spencer's, being in bulky volumes with which few readers time or courage to grapple. In attempting to give a clear idea of the sm of the universe, I have felt the difficulty expressed years ago by such es as Sir W. R. Grove and Professor Tyndall, arising from the lack of in standard books on physics in the use of the terms "force" and "When talking over this matter with my friend Grant Allen, I was I to find that he had published (although privately) a pamphlet on the in which rigid and definite meanings are given to "force" and "energy" as bld and opposite forms of Motion manifest through Matter; and in that affording the reader a clearer conception of cosmic dynamics, those terms throughout this book. Mr. Allen has plunged me deeper in his debt by of reading my proof-sheets, a service which, to their further gain, has also ly rendered by my friend Mr. H. W. Bates, F.R.S.

chief authorities consulted in the preparation of this book are duly liged in foot-notes. As for the work as a whole, there is probably not a in it, but only an attempt to explain matters of abiding interest and deep be in as simple and untechnical a style as possible.

E. C.

IONT, TUFNELL PARK, LONDON, N.

December, 1887.

το GRANT ALLEN.

MY DEAR ALLEN,

The inscription of this little book to you, whose interest in it has been constant since its framework was shown you, enables me not only to repeat the obligations which are set down in the Preface, but also to say, what is more gratifying to me, how deeply I value your friendship.

Yours ever sincerely,

EDWARD CLODD.

CONTENTS

PAGE	CHAPTER PAGE
Introductory' 9	VII. ORIGIN OF LIFE 83
DADEL DECCRIPTIVE	Time: Place: Mode 83
PART I.—DESCRIPTIVE	VIII. ORIGIN OF LIFE-FORMS 87.
CHAPTER	Priority of Plant or Animal 87
I. THE UNIVERSE: ITS CONTENTS . 12	Cell-structure and Development, 89
I. Matter	Par 0
2. Motion	
a. Force	Argument:
b. Energy 15	. No two individuals of the
II. DISTRIBUTION OF MATTER IN SPACE	same species are alike;
SPACE	each tends to vary 93
The Earth: General Features 21	2. Variations are trans- mitted, and tend to
IV. THE PAST LIFE-HISTORY OF THE	
EARTH 24	become permanent 94 3. Man takes advantage
Character and Contents of Rocks	of them to produce new
of—	
1. Archæan Epoch 27	varieties 94 4. More organisms are
2. Primary Epoch 28	born than survive 95
3. Secondary Epoch 31	5. The result is a cease-
4. Tertiary Epoch 36	less struggle for food
5. Quaternary Epoch 40	and place 95
V. Present Life-Forms 44	6. Natural selection tends
Physical Constituents and Unity	tomaintain the balance
A. Plants 49	between living things
1. Flowerless 49	and their surroundings 98
2. Flowering 50	
B. Animals 56	X. PROOFS OF THE DERIVATION OF
I. Protozoa 56	SPECIES 105
2. Cœlenterata 59	1. Embryology 105
3. Echinodermata 61	2. Form 106
4. Annelida and Arthro-	3. Classification 106
poda 62	4. Succession in Time 107
5. Mollusca 66	5. Distribution in Space 107
6. Vertebrata 67	Objections
	XI. Social Evolution 113
PART II.—EXPLANATORY	L. Evolution of Mind 113
PART II.—EAFLANATURY	2. ,, Society , 115
VI. THE UNIVERSE: MODE OF ITS BE-	3 Language,
coming and Growth 78	Art, and Science 117
1. Inorganic Evolution	4. Evolution of Morals . 118
Stellar Systems 79	5. , Theology. 121
2. Solar System 80	Summary
3. Earth 82	INDEX
3	
•	
PET A TO	rò
TABI	LE3
PAGE	l h.cm
TABULAR STATEMENT OF MATTER AND	EXISTING PLANTS AND ANIMALS
MOTION	· · · · · · · · · · · · · · · · · · ·
GEOLOGICAL BPOCHS AND TYPICAL LIFE-	SUB-KINGDOMS OF ANIMALS 56
FORMS	CLASSES OF MAMMALS 74
SUCCESSION OF TYPICAL LIFE-FORMS 43	RACES OF MAN

ILLUSTRATIONS

1.1		<u>,</u> section of the section of th	·
FIG.		∤ Tight to the state of the st	PAGE
	NEBULA OF ORION Frontispiece	38. STRUCTURE OF SPONGE	60
	SUN-SPOTS 21	39. HYDRA	61
	LUNAR CRATER: COPERNICUS 22	40. JELLY-FISH	61
	FOOTPRINTS OF FOSSIL BIRDS 25	41. SECTION OF SEA-ANEMONE	61
4.	TABLE OF STRATIFIED SYSTEMS WITH	42. CORAL	62
	TYPICAL FOSSILS 26	43. SEA-CUCUMBER	62
	EOZOON CANADENSE 27	44. DIAGRAM OF ANNELID	63
	FORAMINIFER	45. SECTION OF WORM	63
- 2	SECTION OF GRAVESEND CHALK 28	46. ROTIFER OR WHEEL ANIMALCULE	64
	ORGANISMS IN ATLANTIC QUZE 28	47. PERIPATUS	64
-	DIATOMS	48. GENERALISED INSECT	65
	TRILOBITE 28	49. NERVOUS SYSTEM OF BEETLE	65
	FOSSIL AND LIVING GANOID FISH 29	50. SECTION OF EYE OF INSECT	65
	INSECTS IN AMBER 30	51. ANATOMY OF BIVALVE MOLLUSC	67
	FOSSIL PLANTS FROM COAL BEDS 32	52. SKELETON AND OUTLINE OF BAT	
•	BELEMNITES	53. BALANOGLOSSUS	69
	FOSSIL SEA-LIZARD: PLESIOSAURUS . 34	54. SEA-SQUIRT	69
16.	FOSSIL FLYING LIZARD: PTERO-	55. DIAGRAM OF SEA-SQUIRT	70
. 3	DACTYLUS	56. DIAGRAM OF LANCELET	- 70
	FOSSIL BIRD: ARCHÆOPTERYX 35	57. MUDFISH	71
18.	AMMONITE	58. GROWTH OF HAIR	72
19.	FOSSIL BONY FISH: PERCH AND SAL-	59. DUCKBILL	. 73
	MON	60. SPINY ANT-EATER	.74
20.	NUMMULITES FROM THE GREAT	61. SKELETONS OF MAN AND APES	75
	PYRAMID 37	62. DIAGRAM OF LIFE-DEVELOPMENT	77
	FEET OF ANCESTORS OF THE HORSE . 38	63. CHLOROPHYLL IN LEAF-CELLS	88
22.	STONE IMPLEMENTS: ANCIENT STONE	64. CELLS OF ROOT OF FRITILLARY	89
	AGE 39	65. CELL	90
23.	MAMMOTH, OR WOOLLY-HAIRED ELE-	66. STAGES OF CELL-DIVISION	90
	PHANT 40	67. MORULA OR MULBERRY-LIKE STAGE	91
	PREHISTORIC PICTURES 41	68. GASTRULA OR PRIMITIVE STOMACH	
25.	STONE IMPLEMENTS: NEWER STONE	STAGE	91
_	AGE 42	69. EMBRYO STAGE	91
	VENUS'S FLY-TRAP	70. EMBRYOS OF FISH, DOG, AND MAN	92
	DIAGRAM OF CELL 48	71. LEAF INSECT	97
28.	DIAGRAM OF CELL AND NUCLEI 48	72. WALKING-STICK INSECT	97
	DIAGRAM OF OVUM OF MAMMAL . : 49	73. GORILLA WALKING	101
	DIAGRAM OF FLOWER 51	74. BRAIN OF MAN AND CHIMPANZEE	102
	FERTILISATION OF PLANT 51	75. EMBRYOS OF DOG AND MAN	106
	CYCAD OR PALM-FERN 52	76. EMBRYO OF TORTOISE	106
	FERTILISATION OF FLOWER BY INSECT 53	77. ARM OF MAN, FORELEG OF DOG, AND	
34.	TRANSITION FROM STAMENS TO PETALS	WING OF BIRD	107
	IN WHITE LILY 54	78. FOSSIL BIRD-REPTILE: COMPSOG-	_
	MONERA	NATHUS	108
	AMŒBA 59	79. GIGANTIC FOSSIL WINGLESS BIRD OF	
37.	INFUSORIA 59	NEW ZEALAND	109

· INDEX

Abdomen, 64 Adinity, 14 Algæ, 49, 87 Allen, Grant, 55, 84, 88, 93, 96 Alpha Centauri, 18 Amber, 30 America, connection of, with Europe, *** Ammonites, 31, 33, 35 Amœba, 46, 47, 58, 63 Amphibians, 71 Amphioxus, 70 Ancestor-worship, 122 Anemone, 61 Angiosperms, 36, 51
Animals, chlorophyllian, 87
Animals and plants, priority of, 87; unity, 45, 46 Animism, 122 Annelida, 56, 62 Annulosa, 62 Ant, brain of, 66; high social stage Apes, man-like, 38, 75, tor Apes and man, brain of, 102; skeletons, 75 Aphis, increase of, 95 Aqueous action, 23, 37, 43 Archæan, 23, 27 Archeopteryx, 34 Arnold, Matthew, 49 Arthropoda, 56, 63 Artificial selection, 94 Arts, evolution of, 117 Ascidians, 69 Ascidians and vertebrates, 56 Asteroids, 20 Atmosphere, earth's, BI Atomic theory, 13
Atomic theory, 13
Atoms, 12, 16; divisibility of, 12;
unity, 13; weight and volume, 13
Australia, ancient life-forms of, 73, 109, 110 . Azoic, 83

B

Backbone, 68, 70 Bacon, Lord, 48 Balanoglossus, 56, 69 Balfour, F. M., 58 bali, 100 Bates, H. W., 34, 66, 96 Bats, 67; range of, 108
Bectless, 34, 55, 109
Belemnites, 33, 35
Bilateral symmetry, 62, 68
Birds, 39, 71, 72; as seed dispersers, 109; descent, 34; migration, 73, 121; reptile-like, 34, 35; wingless, 108
Blastosphere, 90
Blood, 59; salt in, 63
Body-cavity, 106
Brain, 46, 63, 66, 67, 70; and thought, 86
Brain of ant, 66; of man and apes, 102
Breathing, organs of, 63
Bronze, age of, 41
Bryophytes, 49
Buffon, 83
Butler, Samuel, 92
Butterflies, 34

C

Casar, 119
Calamite, 32
Cambrian system, 28
Carbon, 14, 30
Carbonic acid, 45, 47
Carbonicrous system, 31
Carlyle, 117
Carnivora, 38, 100
Carnivora, 98, 100
Carnivorous plants, 45
Carpenter, W. B., 27
Catkin-bearers, 52
Cell., 48, 50, 85, 89; division, 90; layers, 90; wall, 48
Cellulose, 70
Chalk, deposit of, 28
Charing Cross, fossils at, 40
Chemical attraction, 14
Chimpansee, 100
Chimpansee, 100
Chimpansee, 100
Chimpansee, 100
Classification, 100
Classification, 100
Cleveite, 20
Cliford, Prof. 119
Clib borealis, 67
Club-mosses, 89, 30, 50
Coal, nature of, 30
Cockroaches, 31
Cod, increase of, 95
Coeleuterata, 56

Cohesion, 14 Colonial animals, 59 Colour, nature of, 54; order of, in flowers, 55 Colouring, protective, 96 Comets, 19, 21 Compsognathus, 108 Conifers, 51 Conscience, 118 Consciousness, mystery of, 58, 86, Conservation of energy, 15, 112 Cook, Captain, 117 Cope, Prof., 67, 85 Copel, From, 07, 05
Coral, 45, 6t
Corolla, 52
Cotyledon, 5t
Crabs, 33
Cretaceous system, 35 37, 67 Crime, nature of, 120 Crocodiles, 38 Crown bearers, 52 Crust of the earth, 21 Crustacea, 29, 64 Cryptogams, 49
Crystals, formation and growth of,
85 Cuttle-fish, 33 Cycads, 33, 35, 51

D

Daisy, 52
Dalton, 13
Darwin, 9, 46, 66, 73, 74, 96, 100, 102, 105, 109, 111, 119
Darwin's theory, summary of, 104
Dawn's theory, summary of, 104
Dear, antiers of, 104
Deer, antiers of, 105
Degeneration, 70, 103
Descent of Man, 66, 101, 116, 119
Descent, 47; objections to theory of, 111
Desmids, 45, 49
Devonian system, 30, 50
Diamond, 55, 85
Diatoms, 28, 45, 59
Digestive organs, 45, 57, 58, 61, 69
Dipnoi, 71
Distribution of life-forms, 107
Dog, embryo of, 92, 106

agabill, 73 les, Thiselton, 84, 88 mve The V. to 3 age of, ro4; core of, 22; Testiny, 82; evolution, 82 hidna, 73 chinodermata, 56 gg, of mammal, 14; of man, 105 £lectrons, 12, 16 Elements, 12, 13; classification of, 13; common origin, 13; periodic law, Elephant, increase of, 05 Embryo stage, 90 Embryology, 105 Emerson, 10 107 Endogens, 36 Energy, 14, 78; active and passive, 15; definition of, 15, 78; molar and molecular, 79; tabular summary, т6 Eocene strata, 37 Eozoon Canadense, 27 Epochs, Geological, 23 Ether, 12, 14, 16
Ethereal medium, 16, 79
Europe, comection
America, 111 Evolution, conditions of, inorganic, 79; summary, 123, 124 Evolution of earth, 82; gods, 122; language, 117; man, 105; mind, 113; morals, 118; plant and animal, 84; society, 115; solar system, 80; stellar systems, 79; theology, 121 Exogens, 36 Eve. evolution of, 62; of Hatteria, 69; of sea-squirt, 70

Faraday, 13 Females, fights for, 97 Ferns, 30, 50, 51 Fernsilisation, 53 Fishes, 71; embryo of, 92 Fiske, 116 Flints, chipped, 39, 40 Flowers, earliest, 55; essential parts of, 53; fertilisation, 53; function, Fly, increase of, 95 Flying lizards, 34 Foraminifera, 27, 50 Force, definition of, 14, 78; tabular summary, 16 Fossils, 24, 25 Frog, 68, 69, 71, 108 Fruits, function of, 55 Fuegians, 103, 117 Fungi, 46, 50, 88

Galapagos Islands, q Ganapagos Isianus, 9 Ganglia, 62, 70 Ganoids, 20, 35 Gaseous state of matter, 12 Gases, solidifying of, 16 Gas-tar, products of, 31
Gastrula, 90
Gegenbaur, 98

Geikie, 22, 23, 27 Genunation, 48 Geological record, gaps in, 24, 20 Germ-cell, 48, 90 Gills, 71, 105 Gill-slits in man, 105; sea-squirts, 70 Glacial epoch, 36 Gods, evolution of, 122 Gorilla, 101 Gravitation, 14 Gymnosperms, so

Hæckel, 90, 111 Hair, 72 Hand, importance of, 101 Hatteria lizard, 69 Head, 63, 108 Heart. 63, 72 Helium, 20 Helmholtz, 11, 79 Heredity, 121 Hermaphrodite, 52 Honey, 53 Hooker, Sir J. D., 9, 84 Horse, ancestor of, 38, 107 Horsetails, 50
Huggins Sir W., 20, 81
Huxley, Prof., 10, 33, 47, 48, 75, 86, 82, 91, 101, 104, 113
Hybrids, 111 Hydra, 60 Hydrocarbon, 47, 55, 87 Hydrogen, 12, 13, 14, 15

Ice, action of, 39 Igneous rocks, 23 Infancy, period of, 66, 114, 116 Infanticide, 114 Infusoria, 59, 87 Inorganic evolution, 79 Insects, 30, 64, 66 Insect-fertilisation, 53 Instinct, 114 Intermediate forms, 34, 107 Invertebrates, 56 Iron, age of, 4: Islands, 108 108 Island Life, 100

Јарап, 108 Jeevine, 71 Jelly-fish. 60 Jolas, 118 upiter, 21, 81 upiter, 21, 81 urassic system, 33, 34, 37, 66

Khayyam, Omar, 123 Kinetic energy, forms of, 15, 16

Labyrinthodonts, 31 Lancelet, 56, 70 Language, evolution of, 127 Lankester, Prof. Ray, 70, 71, 87

Lattrentian system, 27 Laws, changes in, 119 Leaf-forests, age of, 23 Leaf-insects, 97 Lemuroids, 38 emurs, 77 Lichens, 50 Life, characteristics of, 86; chemistry, 85; mystery of origin, 85; regions, 38; unity, 45 Life-forms, present, 44; distribution of, 107; succession, 107 Light, 18, 54 Limbs, 63, 71 Limestone, 37 Liquids, compression of, 16 Littoral life-region, 87 Living things, composition of, 85; functions. 57 Lizards, flying, 33 Lazards, 119116, 35 Lobsters, 33 Lockyer, Sir J. Norman, 81 Lodge, Sir Oliver, 12 Lombock, 109 Lubbock, Sir John (Avebury, Lord), Lucretius, 102, 117 Lunar craters, 22 Lungs, development of, 71 Lyall, Sir A. C., 116

Laplace, 81

Maccabees, Book of, 21 Macdonald, G., 121 Madagascar, 109 Malic acid, 51 Maithus, 92
Mammals, 33, 49; age of, 37, 73
Mammoth, 40
Man, ancestors of, 73; development, nan, ancestors or, 73; development, 105; embryo, 92, 105, 106; erect position, 101; increase, 95; 'primitive,' 102; races, 75; remains, 30 Man, action of, on nature, 110; on species, 94 Man and apes, brain of, 102; skeleton. 75 Mankind, races of, 75; struggles, 115; unions, 116 Mars, 21 Marsh, G. P., 110 Marsupials, 33, 34, 74
Mates, fights for, 97
Matter, distribution of, 18; states of,
12; tabular summary, 16 Measuring, 118 Medusæ, 60 Mendelejeff, 13 Metamorphic rocks, 23, 32 Meteoritic theory, 81 Meteors, 21 Metazoa, 56 Micropyle, 51 Migration, 73, 111, 114 Mimicry, 96 Mind, evolution of, 113 Mind and body, connection of, 86 Miocene system, 38, 83 Molar energy, 79 Molecular attraction, 14; energy, 79 Molecules, 12, 14, 15, 16, 49; rate of motion, 15; size, 14; spaces between, Mollusca, 29, 56, 66; importance of fossil, 37

Moneron, 56, 63 Monotremes, 73
Moon, condition of, 21; craters of, 22
Morals, evolution of, 118 Morison, J. Cotter, 120 Morphology, 106 Morula, 91 Moseley, Prof., 64, 87 Moses, 50 Motion, 12, 14, 78 Mountains, origin of, 37 Mouth, 62 Mud-fish, 35 Musk-sheep, 113

N

Natural selection, 94-97; objections to, 111

Nature, action of man on, 94

Nautiluses, 67

Nebular theory, 79

Nebular, 19

Neck bones, 106

Neptune, discovery of, 13

Nerves, function of, 57; origin, 57

Nervous system, 45, 46, 58, 62, 67, 69, 98, 113

New Zealand, 108, 109

Newlands, 13

Newton, Sir I., 9, 16, 85

Nitrogen, 14, 24

North Polar regions, origin of life in, 25, 83, 110

Notochord, 70

Nucleolus, 48

Nucleus, 48, 89

Nummulites, 36

Nutrition, 67

0

Oceans, permanence of deep, 28
Old maids and clover, 96
Old Red Sandstone system, 30
Olid Sed Sandstone system, 30
Oligocene system, 38
Orbital motion, energy of, 79
Organic compounds, 65
Organiss, rate of increase of, 95
Organss, 48; prehensile, 101
Origin of Species, 9, 93, 95, 100, 103, 105, 117
Ornithorhynchus, 73
Ovary, 51
Owen, Sir R., 38
Oxygen, 14, 21, 45
Oysters, 31, 67

P

Paget, Sir J., 46
Parasites, 103
Pearl oyster, 67
Periodic law, 13
Peripatus, 64
Persistence of force, 15
Petals, 51
Phanerogams, 49, 50
Photosphere, 20
Photosphere, 20
Pines, 57
Pistils, 49, 51, 53
Placentals, 38, 74
Planets, orbits, 61, 20, 80; origin, 80
Plant-feeders, 100

Plants, action of seen, 30 tion of, to insects, 53; ca 45; defensive structures, 45; detensive structures, persal, rog; fossil coal, 31; increase, 95; locomotive, 45; one-seed-leaved, 51; sensation of, 44; sex in, 53; two-seed-leaved, 52 Plants or animals, priority of, 89; unity of, 45, 46 Pleistocene, 40
Plesiosaurus, 33
Pliocene gravels, flints-in, 39
Pular region, origin of life in, 25, 83, Pollen, 51, 52, 53 Polyps, 60 Porifera, 59 Post-Pliocene system, 74 Potential energy, 15 Pouch-bearers, 74 Poultry Compter, 126 Priests, 122 Primary Epoch, 23, 28, 30, 43 Primates, 38, 77, 100 Primordial element, 13 Proctor, R.A., 19, 81 Prohibitions, social, 119 Protein, 47 Protoplasm, 45, 47, 50, 58, 85 Protozoa, 56, 89 Prout, 13-Pseudopods, 57 Pteridophytes, 49 Pterodactyl, 34

v

Quaternary Epoch, 40 Quatrefages, M. de, 39

R

Radiant energy, 20
Radio-activity, 8z
Radium, 12, 13, 20, 8z
Reason, 114
Reflex action, 46, 114
Reproduction, 46
Reptiles, 31, 33, 7z
Rhinoceroses, 39
Right and wrong, 119
Rock, definition of, 23
Romola, 12z
Roscoe, Sir H., 45
Rotifers, 64
Rudimentary structures, 106

S

Sachs, 85, 87

St. Helena, 109
Saporta, Comte de, 83
Saturn, 80
Savage man, 102
Science, evolution of, 118
Science and theology, 128
Scorpions, 29, 31
Sea-cucumber, 61; — liliea, 29; — lizards, 23; — mats, 67; — mosses, 67; — squirts, 69; — urchins, 61
Secondary Epoch, 31, 43
Seeds, dispersal of, 109
Segments, 68
Selection, artificial, 24; — natural, 24
Tunicata, 69

~ vu 33; — in plants, Sexual selection, 97 Sharks, 35, 66 Shell-fish, 37 Sidereal system, structure of, ro Silures, 27 Silurian system, 20 Simple forms, persistence of, 27 Sin, rr8 Skin, evolution of nerves, &c., from, 58, 72 Skull, development of, 68 Soap-bubble, thickness of, 14 Social evolution, 113 Social instinct, growth of, 116 Society, evolution of, 115 Sodium, 12, 13 Solar system, contents of, 20; evolution of, 80 Sorby, H. C., 14 Soul. 86 Soul and brain, 86 Southern hemisphere, 84 Space, distribution of matter in, Species, origin of, 93-104 Spectrum of stars, 80 Spencer, Herbert, 11, 58, 92, 101, 117, Spencer, W. B., 69 Sperm-cell, 48, 90 Spider, 31; web of, 65 Spine, development of, 70 Spirits, belief in, 122 Sponges, structure of, 29, Sprengel, Conrad, 54 Strenens, 49, 52, 53
Star-fish, 61
Stars, conditions of, 18; distance of nearest, 18; double, 18; fixed, 18; structure of, 18 structure ot, 18
Stellar systems, evolution of, 79
Stone Age, Old, 41
Stone Age, Newer, 41
Stratz, thickness of, 23
Stratified rocks, 23, 26, 36
Structure, changes of, on Structure, changes of, 99 Structures, rudimentary, 106
Structures, rudimentary, 106
Struggle for life, 95, 97, 115
Succession of life-forms, 107
Sun, contents of, 20; rotation, 20; volume, 20, 81 Sundew, 46 Sun-spots, 20, 2r Sun and planets, common origin of,

Tadpole, 70, 78
Tapirs, 38
Teeth, 72
Teleost fishes, 38
Teritary Epoch, 36, 43
Thallophytes, 49
Theology, evolution of, 127
Theology and science, 122
Thorium, 81
Tissues, 48
Tortoise, embryo of, 106
Touch, 98, 173
Tree fern, 32
Trees, earliest true, 36
Triassics, 39, 31
Tribat conscience, 118
Tridacna, 67
Trilobites, 20, 31
Tulloch, Principal, 86
Tunicata, 69

T

Turtles, 38 Tyburn, 120	Varieties, 93 Venus's flower-basket, 59; — fly-trap,	Water in living matter, 60 Weismann, 99
υ	Vermes, 63,	Whales, 38; development of White's Selborne, 55, 96, 98
Ultimate causes, mystery of, 11,	Vertebrates, 45, 56, 64, 67 Volcanic action, 23, 37, 42	Whitney, W. D., 117
Ultra-gaseous state of matter,	Von Baer, 195	Wiedersheim, 91 Wind-fertilisation, 53
12 Unstratified rocks, 23 Uranium, 81 Use and disuse, 99	W	Wings, 65 Wolff, 54 Worm, segment of, 63
V Vallisneria spiralis, 52	Walking-stick insects, 97 Wallace, A. R., 81, 84, 96, 109 War, 116	. 1
Variations, 9x; transmission of, 94	Water, 12, 13, 14, 21, 63, 85, 87	Yellow stamens, 55

First Principles of the

THE following are the chief objects of the Rationalist Press Association, Limited, as formally stated in its Memorandum of Association:—

To stimulate freedom of thought and inquiry in reference to ethics, theology, philosophy, and kindred subjects.

To promote a secular system of education the main object of which shall be to cultivate in the young moral and intellectual fitness for social life.

To publish and distribute, either gratuitously or otherwise, books, pamphlets, and periodicals designed to further the above objects, or either of them, and generally to assist in the spread of Rationalist principles, especially in their bearing on human conduct.

The Memorandum proceeds:-

RATIONALISM MAY BE DEFINED AS THE MENTAL ATTITUDE WHICH UNRESERVEDLY ACCEPTS. THE SUPREMACY OF REASON AND AIMS AT ESTABLISHING A SYSTEM OF PHILOSOPHY AND ETHICS VERIFIABLE BY EXPERIENCE AND INDEPENDENT OF ALL ARBITRARY ASSUMPTIONS OR AUTHORITY.

According to the definition thus adopted by the Association, Rationalism may be summed up under two connected principles—(1) the supremacy of reason; (2) the need to base the whole structure of rational opinion on experience. The former is the watchword of all genuine philosophy. The latter is the guiding principle of all positive science and all fruitful theories of practice. The supremacy of reason involves the right of man to weigh the value of traditional opinions before accepting them, and to reject those that are found wanting. The dependence of reason on experience, at least for furnishing the materials

of thought, involves a corresponding duty—to trace our judgments, as far as may be, to natural and valid sources, either in our own observation and experiment, or in that reasoned digest of tested knowledge which is known as science. All who subscribe to these two general principles—the supremacy of reason and the need to seek a firm foundation in experience—are Rationalists in the general sense adopted by the Association.

The great bulk of religious dogmas cannot be justified except by denying the supremacy of reason, discrediting the appeal to ordinary experience, and setting up the fictitious standard of "revelation." To such dogmas and methods Rationalism inevitably opposes a destructive criticism. But Rationalism does not exist merely, or chiefly, to criticise. It is essentially constructive. It recognises that the emotions have played, and must play, a large part in the development of character, and it seeks so to co-ordinate emotion with reason that the one becomes the helpmeet of the other in the advance of the race towards fulfilment of the noblest ideals. And this aim the Association keeps in view in the publications through which it seeks chiefly to influence current beliefs.

The Members of the R. P. A. have, indeed, a faith, though not a set creed, of their own. They believe firmly that "moral and intellectual fitness for social life" may be attained independently of ecclesiastical guidance and of belief in things supernatural. means to this end they value the results of investigation in all departments, and welcome the conclusions of ripe scholarship, as well as the speculations sincere thinkers and the ideals capable and They are convinced that to devoted humanists. bring within reach of the multitude the literature which enshrines these elements of culture is to wield an immense influence for the good of our own and future generations.

CONDITIONS OF MEMBERSHIP OF THE RATIONALIST PRESS ASSOCIATION, LTD.

The R. P. A., Ltd., is a propagandist, not a commercial, undertaking. In order to secure the advantages of a legal status, it was incorporated in 1899 as "a Company Limited by Guarantee * and not having a Capital divided into shares.".

Any person above the age of twenty-one years may, with the consent of the Board, become a Member; on payment of a first annual subscription of not less than five shillings. (As subscribers of from 5s. to 10s. and more are entitled to receive back the whole value of their subscriptions in books, on which there is little, if any, profit made, the Association is dependent, for the capital required to carry out its objects, upon subscriptions of a larger amount and upon donations or bequests. Applications for Membership should be made on the forms provided, and should be accompanied by remittances.

Subscriptions are renewable in January of each year. Persons applying for Membership late in any year should remember this rule, and should notify the Secretary if they wish their Membership and subscriptions dated forward to the new year.

A Member may retire from the Association on giving one month's notice in writing to the Secretary.

Copies of the publications issued by the Association during any year are forwarded, post free, to each Member; provided that the total value of the publications thus forwarded does not exceed the amount of the Member's subscription for that year.

In the ordinary course, the new publications are despatched to Members at the Secretary's discretion. Those who prefer

^{*} Each Member conditionally guarantees a sum not exceeding one pound. He becomes liable only supposing (1st) that the Association should be wound up during the time that he is a Member, or within one year afterwards; (2nd) that the debts contracted before he ceased to be a Member and the expenses of winding up could not be defrayed from the ordinary assets of the Association. The last Annual Report and Balance Sheet (sent herewith, or free on application) will show that the prospect of winding up is quite remote, while the Association possesses a fairly substantial "Accumulated Fund," which would have to be exhausted before the amount guaranteed could be called for.

to make their own selections from the lists of new books which are issued from time to time should specify "Books by request." Those who do not wish to receive publications in return for their subscriptions should specify "No books."

Persons who apply for Membership late in any year are entitled to receive, on account of their subscriptions, copies of the books already published during that year. They should state whether they wish to do so.

Those who prefer to receive cloth-bound copies of the books (such as the *Cheap Reprints* and *Extra Series*) which are commonly sold in paper covers, but are, in most c issued in cloth as well, should give instructions to effect.

Special arrangements having been made with the roprietors of the *Literary Guide*, this periodical is supplimented at the reduced rate of 2s. per annum, poster (or 2d. per month for the remainder of any year, ending w. December issue).

Neither the *Literary Guide* nor any other publication is actually issued by the Association is supplied on accountable Membership subscriptions. Thus the minimum annual supplies scription to cover the periodical is 7s.

Members can make use, free of charge, of the Librard Reading Room at the offices of the Association, and borrow books through the post by payment of postage advance. See Rules of R. P. A. Library (free on application), and Library Catalogue, price 3d.

An Annual Meeting of Members is held in the modern February of each year. On this occasion the Annual for the previous year is submitted for the Members' appeared the election of two Directors and of the Auditors place.

The Board of Directors consists of not less that more than ten Members of the Association, two or retire annually. See latest Annual Report for its propositiution.

Address:—The Secretary,

The Rationalist Press Association, L.

Nos. 5 & 6, Johnson's Court,

Fleet Street, London, E.C.

*vi.-920 pp., cloth, 6s. net, by post 6s. 6d.; cheap edition, paper covers, 2s. 6d. net, by post 2s. 11d.

Supernatural Religion:

AN INQUIRY INTO THE REALITY OF DIVINE BEVELATION.

bughly Revised and brought up to date by the Author, in some cases entirely fresh sections being added.

"To say anything new, at this time of day, of the learning massed in Supernatural Religion ossible. Few of us, indeed, we enture to assume that our praise in such a case is good to count. For myself, I can say that I know of no great critical treatise which follows spose with such invincible industry, such all-regarding vigilance, such constant soundness tient, such perfect fairness and candour, and such complete command of the whole special of the subject. True to his early devotion of himself to the simple-hearted search for hor has revised his whole work, bringing it abreast of the latest developments of latest documentary discoveries."—J. M. Robertson, in "The Literary Guide."

Library Edition, 10s. net, by post 10s. 6d.

Cloth, 512 pp., 8s. 6d. net, by post os.

Courses of Study.

By JOHN M. ROBERTSON.

icyclopædic book of rather a new kind by a well-known scholar, and likely to be ofIt is very comprehensive, and it is difficult to think of any subject in the whole range of learning (apart from the practice of arts or professions) which is not included."—The Times.

"It to guide readers of little leisure and no academic training through the bewildering ern bibliography, and tells them what they ought to read in the various departments dge. It is not a case of selecting the best hundred books. The work does far since it classifies and indicates both the purport and value of an indefinite number of authors (tney must, on a rough estimate, come near three thousand). Nor is the book a mere bibliography, like the English Catalogue or some other well-known works mentioned in its own pages. It systematises knowledge, makes a general map of it from which a reader may find his where the subject of its own in every well-stocked library."—The Scotsman.

AGENTS FOR THE RATIONALIST PRESS ASSOCIATION, LIMITED: & CO, 17, JOHNSON'S COURT, FLEET STREET, LONDON, E.C.

', by post 2½d., or with Supplement (Jan ury, April, July, and October) 3d.
Annual Subscription, 2s. 8d. post free.

The Literary Guide

AND RATIONALIST REVIEW.

I- addition to reviews of the best books on Religion, Ethics, Science, and Philosophy, each Literary Guide contains articles expository of Rationalism, frequently from the nt writers.

Specimen Copy post free.

R.P.A. CHEAP REPRINTS

(WITH PORTRAIT IN EACH CASE.)

- 1. HUXLEY'S LECTURES AND ESSAYS.
 (A Selection.) With Autobiography.
- 2. THE PIONEERS OF EVOLUTION.

 By EDWARD CLODD.
- 3. MODERN SCIENCE AND MODERN THOUGHT. By SAMUEL LAING. With Illustrations.
- 4. LITERATURE AND DOGMA.
 MATTHEW ARNOLD.
- 5. THE RIDDLE OF THE UNIVERSE.

 By Professor ERNST HAECKEL.
- 6. EDUCATION: Intellectual, Moral, & Physical. By HERBERT SPENCER.
- 7. THE EVOLUTION OF THE IDEA OF GOD. By GRANT ALLEN.
- 8. HUMAN ORIGINS. By SAMUEL LAING.
- 9. THE SERVICE OF MAN. By J. COTTER MORISON.
- 10. TYNDALL'S LECTURES & ESSAYS.

 (A Selection.) With Biographical Sketch.
- 11. THE ORIGIN OF SPECIES. By CHARLES DARWIN.
- 12. EMERSON'S ADDRESSES & ESSAYS.
 With Introduction by Dr. STANTON COIT.

- 13. ON LIBERTY. By JOHN S
- 14. THE STORY OF CREEDWARD CLODD.
- 15. AN AGNOSTIC'S APOLO
- 16. THE LIFE OF JESUS.
- 17. A MODERN ZOROAST SAMUEL LAING.
- 18. AN INTRODUCTION TO T SOPHY OF HERBERT By Professor W. H. HUDSO
- 19. THREE ESSAYS ON REL
- 20. THE CREED OF CHRI
- 21. THE APOSTLES. By ERN
- 22. PROBLEMS OF THE FOR SAMUEL LAING.
- 23. THE WONDERS OF LII
 FESSOR ERNST HAECKEL
- 24. JESUS OF NAZARETH.

6d. each, by post 8d.; Nos. 1 to 24 post free 12s

Nos. 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, and 24 may be hat each, by post 1s. 3d.; or the 20 post paid, 20s. (To foreign parts 3d. extra each

R.P.A. EXTRA SERIES.

- 1. JESUS CHRIST: His Apostles and Disciples in the Twentieth Century. By COUNT CAMILLE DE RENESSE.
- 2. HAECKEL'S CRITICS ANSWERED.

 By JOSEPH McCABE.
- 3. SCIENCE AND SPECULATION. By
- 4. NEW LIGHT ON OLD PROBLEMS.

 By JOHN WILSON, M.A.
- 5. ETHICS OF THE GREAT RELIGIONS.
 By CHARLES T. GORHAM.
- 6. A NEW CATECHISM. By
- 7. THE RELIGION OF W
 JOSEPH McCABE, With
 Lady Florence Dixie.
- 8. THE FUNDAMENTAL F
 OF THE POSITIVE PH
 By AUGUSTE COMTE. W
 by Professor E. S. BEESLY.
- 9. ETHICAL RELIGION. By W. With Introduction by Dr. STANT

6d. each, by post 8d.; Cloth, 1s., by post 1s. 8d. (Nos. 1-9 post free, in paper covers, 4s. 6d.; cloth, 9s. To foreign parts 2d. or 3d. extr

AGENTS FOR THE RATIONALIST PRESS ASSOCIATION, LTD.:

WATTS & CO., 17, JOHNSON'S COURT, FLEET STREET, LON