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to Natural Theology, Volume 1
Peter Mark Roget
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Animal and Vegetable Physiology

Under the terms of the will of the Oxford scholar Francis Henry, Earl of Bridgewater (1756-1829), a series of works was commissioned, designed to contribute to an understanding of the world as created by God. In 1834 Peter Roget, who was at the time compiling his celebrated Thesaurus, contributed two volumes to that controversial series, of which this is the first. He described in a manner designed to appeal to a wide audience the variety and complexity of the mechanical processes of the plant and animal kingdoms. Particular attention is given to those areas where animal life reveals something about human life and the man-made world, emphasising the magnificence of the all-encompassing creative process behind it. The plant kingdom is examined with the goal of establishing the mechanics behind the beauty of plant life as created by God.

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Peter Mark Roget
Frontmatter
[More information](#)

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Peter Mark Roget

Frontmatter

[More information](#)

Animal and Vegetable Physiology

Considered with Reference to Natural Theology

VOLUME 1

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to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

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Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

THE BRIDGEWATER TREATISES
ON THE POWER WISDOM AND GOODNESS OF GOD
AS MANIFESTED IN THE CREATION

TREATISE V

ANIMAL AND VEGETABLE PHYSIOLOGY CONSIDERED
WITH REFERENCE TO NATURAL THEOLOGY

BY PETER MARK ROGET, M. D.

SEC. R. S. ETC.

IN TWO VOLUMES

VOL I

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

“ ASK NOW THE BEASTS, AND THEY SHALL TEACH THEE; AND THE FOWLS OF THE AIR,
AND THEY SHALL TELL THEE:

“ OR SPEAK TO THE EARTH, AND IT SHALL TEACH THEE; AND THE FISHES OF THE SEA
SHALL DECLARE UNTO THEE.

“ WHO KNOWETH NOT IN ALL THESE THAT THE HAND OF THE LORD HATH WROUGHT
THIS.”

JOB, xii. 7, 8, 9.

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978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

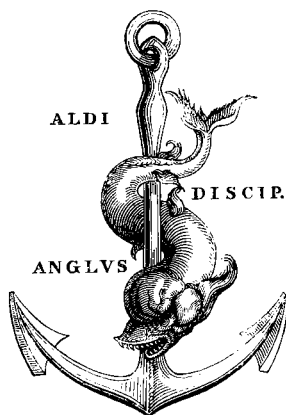
ANIMAL AND VEGETABLE PHYSIOLOGY
CONSIDERED WITH REFERENCE TO
NATURAL THEOLOGY

BY

PETER MARK ROGET, M. D.

SECRETARY TO THE ROYAL SOCIETY, FULLERIAN PROFESSOR OF PHYSIOLOGY IN THE ROYAL
INSTITUTION OF GREAT BRITAIN, VICE PRESIDENT OF THE SOCIETY OF ARTS,
FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, CONSULTING PHYSICIAN TO THE QUEEN
CHARLOTTE'S LYING-IN HOSPITAL, AND TO THE NORTHERN
DISPENSARY, ETC. ETC.

VOL I



LONDON
WILLIAM PICKERING
1834

Cambridge University Press

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to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

C. WHITTINGHAM, TOOKS COURT, CHANCERY LANE.

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

TO HIS ROYAL HIGHNESS
PRINCE AUGUSTUS FREDERICK,
DUKE OF SUSSEX, K. G.
PRESIDENT OF THE ROYAL SOCIETY,
&c. &c. &c. &c.
THIS TREATISE
IS, WITH PERMISSION, HUMBLY DEDICATED,
AS A TRIBUTE OF PROFOUND RESPECT AND GRATITUDE
FOR THE BENEFITS RESULTING TO
SCIENCE
AND ITS CULTIVATORS,
FROM HIS ILLUSTRIOUS PATRONAGE,
BY HIS DEVOTED, HUMBLE SERVANT,
P. M. ROGET.

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

PREFACE.

I PROBABLY never should have ventured to engage in the composition and publication of a work like the present, had not that task been assigned me by my nomination as one of the writers of the series of Bridgewater Treatises, and had I not deeply felt the honour done me by that appointment, as well as the importance of the duty which it imposed. The hope, in which I have indulged, that my labours might eventually be useful, has been my chief support in this arduous undertaking; the progress of which has throughout been seriously impeded by the various interruptions incident to my profession, by long protracted anxieties and afflictions, and by the almost overwhelming pressure of domestic calamity.

The object of this treatise is to enforce the

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

viii

PREFACE.

great truths of Natural Theology, by adducing those evidences of the power, wisdom, and goodness of God, which are manifested in the living creation. The scientific knowledge of the phenomena of life, as they are exhibited under the infinitely varied forms of organization, constitutes what is usually termed **PHYSIOLOGY**, a science of vast and almost boundless extent, since it comprehends within its range all the animal and vegetable beings on the globe. This ample field of inquiry has, of late years, been cultivated with extraordinary diligence and success by the naturalists of every country; and from their collective labours there has now been amassed an immense store of facts, and a rich harvest of valuable discoveries. But in the execution of my task this exuberance of materials was rather a source of difficulty; for it created the necessity of more careful selection and of a more extended plan.

In conformity with the original purpose of the work, which I have all along endeavoured to keep steadfastly in view, I have excluded

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

PREFACE.

ix

from it all those particulars of the natural history both of animals and of plants, and all description of those structures, of which the relation to final causes cannot be distinctly traced; and have admitted only such facts as afford manifest evidences of design. These facts I have studied to arrange in that methodized order, and to unite in those comprehensive generalizations, which not only conduce to their more ready acquisition and retention in the memory, but tend also to enlarge our views of their mutual connexions, and of their subordination to the general plan of creation. My endeavours have been directed to give to the subject that unity of design, and that scientific form, which are generally wanting in books professedly treating of Natural Theology, published prior to the present series; not excepting even the unrivalled and immortal work of Paley. By furnishing those general principles, on which all accurate and extensive knowledge must substantially be founded, I am not without a hope that this compendium may prove a

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

X

PREFACE.

useful introduction to the study of Natural History ; the pursuit of which will be found not only to supply inexhaustible sources of intellectual gratification, but also to furnish, to contemplative minds, a rich fountain of religious instruction. To render these benefits generally accessible, I have confined myself to such subjects as are adapted to every class of readers ; and, avoiding all unnecessary extension of the field of inquiry, have wholly abstained from entering into historical accounts of the progress of discovery ; contenting myself with an exposition of the present state of the science. I have also scrupulously refrained from treading in the paths, which have been prescribed to the other authors of these treatises ; and have accordingly omitted all consideration of the hand, the voice, the chemical theory of digestion, the habits and instincts of animals, and the structures of antediluvian races ; the extent of the field which remained, and which, with these few exceptions, embraces nearly the whole of the physiology of the two kingdoms of nature,

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

PREFACE.

xi

already affording ample occupation for a single labourer.

The catalogue of authors whose works have furnished me with the principal facts detailed in these volumes, is too long for insertion in this place. I have not encumbered the pages of the work by continual citations of authorities; but have given references to them only when they appeared to be particularly requisite, either as bearing testimony to facts not generally known, or as pointing out sources of more copious information. It may however be proper to mention, that I have more especially availed myself of the ample materials on Comparative Anatomy and Physiology contained in the works of Cuvier, Blumenbach, Carus, Home, Meckel, De Blainville, Latreille, and St. Hilaire, and in the volumes of the Philosophical Transactions, of the Mémoires and Annales du Muséum, and of the Annales des Sciences Naturelles. I should be ungrateful were I not also to acknowledge the instruction I have derived from my attendance on the lectures at the Royal

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

xii

PREFACE.

College of Surgeons, delivered successively, during many years, by the late Sir Everard Home, Sir Astley Cooper, Mr. Lawrence, Mr. Brodie, Mr. Green, and Sir Charles Bell; and also from those of Professor Grant, at the University of London.

I have likewise to return my thanks for the liberal manner in which the Board of Curators of the Hunterian Museum gave me permission to take such drawings of the preparations it contains, as I might want for the illustration of this work; and to Mr. Clift, the conservator, and Mr. Owen, the assistant conservator of the museum, for their obliging assistance on this occasion. Mere verbal description can never convey distinct ideas of the form and structure of parts, unless aided by figures; and these I have accordingly introduced very extensively in the course of the work.*

Being compelled, from the nature of my

* All the wood engravings have been executed by Mr. Byfield, and the drawings for them were, for the most part, made by Miss Catlow, whose assistance on this occasion has been most valuable to me.

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

PREFACE.

xiii

subject, and in order to avoid tedious and fatiguing circumlocution, to employ many terms of science, I have been careful to explain the meaning of each when first introduced: but as it might frequently happen that, on a subsequent occurrence, their signification may have been forgotten, the reader will generally find in the index, which I have, with this view, made very copious, a reference to the passage where the term is explained.

I beg, in this place, to express my deep sense of the obligation conferred on me by Mr. Davies Gilbert, the late president of the Royal Society, to whose kindness I owe my being appointed to write this treatise.

I also take this opportunity of conveying my best thanks to my friend and colleague, Mr. Children, of the British Museum, for his kind assistance in revising the sheets while the work was printing, and for his many valuable suggestions during its progress through the press.

A catalogue of the wood engravings has been subjoined; and also a tabular view of the

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

xiv

PREFACE.

classification of animals adopted by Cuvier in his “*Regne Animal*,” with familiar examples of animals included under each division ; both of which I conceived might prove useful for purposes of reference. The latter table is reprinted from that which I have given in my “*Introductory Lecture on Human and Comparative Physiology*,” published in 1826, with only such alterations as were required to make it correspond with the second and improved edition of Cuvier’s work.

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

NOTICE.

THE series of Treatises, of which the present is one, is published under the following circumstances :

The RIGHT HONOURABLE and REVEREND FRANCIS HENRY, EARL of BRIDGEWATER, died in the month of February, 1829; and by his last Will and Testament, bearing date the 25th of February, 1825, he directed certain Trustees therein named to invest in the public funds the sum of Eight thousand pounds sterling; this sum, with the accruing dividends thereon, to be held at the disposal of the President, for the time being, of the Royal Society of London, to be paid to the person or persons nominated by him. The Testator further directed, that the person or persons selected by the said President should be appointed to write, print, and publish one thousand copies of a work *On the Power, Wisdom, and Goodness of God, as manifested in the Creation; illustrating such work by all reasonable arguments, as for instance the variety and formation of God's creatures in the animal, vegetable, and mineral kingdoms; the effect of digestion, and thereby of conversion; the construction of the hand of man, and an infinite variety of other arguments; as also by discoveries ancient and modern, in arts, sciences, and the whole extent of literature.* He desired, moreover, that the profits arising from the sale of the works so published should be paid to the authors of the works.

Cambridge University Press
 978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
 to Natural Theology, Volume 1
 Peter Mark Roget
 Frontmatter
[More information](#)

xvi

The late President of the Royal Society, Davies Gilbert, Esq. requested the assistance of his Grace the Archbishop of Canterbury and of the Bishop of London, in determining upon the best mode of carrying into effect the intentions of the Testator. Acting with their advice, and with the concurrence of a nobleman immediately connected with the deceased, Mr. Davies Gilbert appointed the following eight gentlemen to write separate Treatises on the different branches of the subject as here stated :

THE REV. THOMAS CHALMERS, D. D.

PROFESSOR OF DIVINITY IN THE UNIVERSITY OF EDINBURGH.

ON THE POWER, WISDOM, AND GOODNESS OF GOD
 AS MANIFESTED IN THE ADAPTATION
 OF EXTERNAL NATURE TO THE MORAL AND
 INTELLECTUAL CONSTITUTION OF MAN.

JOHN KIDD, M. D. F. R. S.

REGIUS PROFESSOR OF MEDICINE IN THE UNIVERSITY OF OXFORD.

ON THE ADAPTATION OF EXTERNAL NATURE TO THE
 PHYSICAL CONDITION OF MAN.

THE REV. WILLIAM WHEWELL, M. A. F. R. S.

FELLOW OF TRINITY COLLEGE, CAMBRIDGE.

ASTRONOMY AND GENERAL PHYSICS CONSIDERED WITH
 REFERENCE TO NATURAL THEOLOGY.

SIR CHARLES BELL, K. G. H. F. R. S. L. & E.

THE HAND: ITS MECHANISM AND VITAL ENDOWMENTS
 AS EVINCING DESIGN.

PETER MARK ROGET, M. D.

FELLOW OF AND SECRETARY TO THE ROYAL SOCIETY.

ON ANIMAL AND VEGETABLE PHYSIOLOGY.

Cambridge University Press
978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1
Peter Mark Roget
Frontmatter
[More information](#)

xvii

THE REV. WILLIAM BUCKLAND, D. D. F. R. S.

CANON OF CHRIST CHURCH, AND PROFESSOR OF GEOLOGY IN THE
UNIVERSITY OF OXFORD.

ON GEOLOGY AND MINERALOGY.

THE REV. WILLIAM KIRBY, M. A. F. R. S.

ON THE HISTORY, HABITS, AND INSTINCTS OF ANIMALS.

WILLIAM PROUT, M. D. F. R. S.

CHEMISTRY, METEOROLOGY, AND THE FUNCTION OF
DIGESTION, CONSIDERED WITH REFERENCE TO
NATURAL THEOLOGY.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, President of the Royal Society, having desired that no unnecessary delay should take place in the publication of the above mentioned treatises, they will appear at short intervals, as they are ready for publication.

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

CONTENTS
OF THE FIRST VOLUME.

INTRODUCTION.

	Page
CHAPTER I.—FINAL CAUSES	1
II.—THE FUNCTIONS OF LIFE	34

PART I.—THE MECHANICAL FUNCTIONS.

CHAPTER I.—ORGANIC MECHANISM	59
§ 1. Organization in general	59
2. Vegetable Organization	65
3. Development of Vegetables	82
4. Animal Organization	96
5. Muscular Power	124
CHAPTER II.—THE MECHANICAL FUNCTIONS IN ZOO- PHYTES	142
§ 1. General Observations	142
2. Porifera, or Sponges	147
3. Polypifera	161
4. Infusoria	183
5. Acalepha	192
6. Echinodermata	199
CHAPTER III.—MOLLUSCA	213
§ 1. Mollusca in general	213
2. Acephala	217

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

XX	CONTENTS.	Page
§ 3.	Gasteropoda	227
4.	Structure and formation of the Shells of Mol- lusca	230
5.	Pteropoda	257
6.	Cephalopoda	258
CHAPTER IV.—ARTICULATA		268
§ 1.	Articulated animals in general	268
2.	Annelida	269
3.	Arachnida	282
4.	Crustacea	286
CHAPTER V.—INSECTS		296
§ 1.	Aptera	296
2.	Insecta alata	299
3.	Developement of Insects	302
4.	Aquatic Larvæ	309
5.	Terrestrial Larvæ	311
6.	Imago, or perfect Insect	317
7.	Aquatic Insects	335
8.	Progressive motion of Insects on land	338
9.	Flight of Insects	344
CHAPTER VI.—VERTEBRATA		361
§ 1.	Vertebrated Animals in general	361
2.	Structure and Composition of the Osseous Fabric	365
3.	Formation and developement of Bone	375
4.	Skeleton of the Vertebrata	386
CHAPTER VII.—FISHES		408
CHAPTER VIII.—REPTILIA		435
§ 1.	Terrestrial Vertebrata in general	435
2.	Batrachia	436
3.	Ophidia	447
4.	Sauria	457
5.	Chelonia	463

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

CONTENTS.

xxi

	Page
CHAPTER IX.—MAMMALIA	477
§ 1. Mammalia in general	477
2. Cetacea	482
3. Amphibia	487
4. Mammiferous Quadrupeds in general	487
5. Ruminantia	499
6. Solipeda	516
7. Pachydermata	518
8. Rodentia	523
9. Insectivora	525
10. Carnivora	528
11. Quadrumana	532
12. Man	536
CHAPTER X.—VERTEBRATA CAPABLE OF FLYING.....	545
§ 1. Vertebrata without feathers, formed for flying..	545
2. Birds	554

Cambridge University Press
 978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference
 to Natural Theology, Volume 1
 Peter Mark Roget
 Frontmatter
[More information](#)

LIST OF ENGRAVINGS.

VOLUME I.

Fig.		Page
1	<i>Rotifer redivivus</i> , (from Muller)	62
2	<i>Vibrio tritici</i> , (Bauer)	62
3	Simple vegetable cells, (Slack)	67
4	<i>Fucus vesiculosus</i> , transverse section, (De Candolle) ..	67
5	Ditto, longitudinal section, (id.)	67
6	Compressed cells of vegetables, (Slack)	67
7	Hexagonal and elongated cells, (id.)	67
8	Elongated cells, (id.)	67
9	Fibrous cells, (id.)	67
10	Reticulated cells, (id.)	67
12	Junction of cells to form a tube	67
13	Beaded vessels	73
14	Spiral vessels, or Tracheæ	73
15	Annular vessels	73
16	Punctuated vessels	73
17	Transitions of vessels from one class to another	73
18	Woody fibres	73
19	Nervures of a leaf	73
20	Cells composing the cuticle, (De Candolle)	79
21	Stomata magnified, (Amici)	79
22	Arrangement of stomata in cuticle, (De Candolle)	79
23	Roots terminated by spongioles, (id.)	79
24	Cells composing a spongiole, (id.)	79
25	Animal cellular substance	99
26	Blood vessel	103
27	Section of blood vessel, with the valves open	103
28	Ditto, with the valves closed	103
29	Striated surface of the scale of the <i>Cyprinus alburnus</i> , (Heisinger)	116

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

LIST OF ENGRAVINGS.

xxiii

Fig.		Page
30	Ditto of the <i>Perca fluviatilis</i> , (Carus)	116
31	Imbricated arrangement of the scales of fishes (Heisinger)	116
32	Section of the bulbs of hair, magnified	117
33	Quill of <i>Porcupine</i> , (F. Cuvier)	121
34	Transverse section of the same, (id.)	121
35	Longitudinal section of the root of ditto, (id.)	121
36	Capsule of bulb of ditto laid open, (id.)	121
37	Muscle in a state of relaxation	129
38	The same muscle contracted	129
39	Diagram illustrating the action of oblique muscles	129
40	Semi-penniform muscle	129
41	Penniform muscle	129
42	Complex muscle	129
43	Tendon of muscle	129
44	Trapezius muscle	129
45	Muscular structure of the Ear-drum, (Home)	136
46	Orbicular muscle of the Eye-lids, (Albinus)	136
47	Muscular structure of the Iris, (Home)	136
48	Muscular fibres of a sucking disk	136
49	Longitudinal muscular fibres of a blood-vessel	137
50	Transverse muscular fibres of ditto	137
51	Muscular fibres of the human stomach, (Cooper)	137
52	Muscular fibres of the Heart, (id.)	137
53	Magnified view of a <i>Sponge</i> , (Grant)	149
54	Spicula in the texture of a <i>Sponge</i> , (id.)	149
55	Gemmule of a <i>Sponge</i> , (id.)	149
56	<i>Lobularia. Alcyonium pelasgica</i> , (Deterville)	162
57	Detached polype of ditto, (id.)	162
58	<i>Zoanthus, (Actinia sociata)</i> , (Ellis)	162
59	<i>Hydra viridis</i> , (Trembley)	162
60	<i>Sertularia pelasgica</i> , (Deterville)	165
61	<i>Tubipora musica</i> , (Ellis)	165
62	Section and polypes of ditto, magnified, (id.)	165
63	<i>Flustra carbacea</i> , (id)	165
64	Cells of ditto, magnified, (id.)	165
65	<i>Corallium rubrum</i> , (id.)	166
66	Polypes of ditto, magnified, (id.)	166
67	Section of <i>Gorgonia Briareus</i> , (id.)	166

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

XXIV

LIST OF ENGRAVINGS.

Fig.		Page
68	<i>Isis hippuris</i> , (id.)	166
69	Polype of <i>Flustra carbacea</i> , (Grant)	166
70	Tentaculum of ditto, magnified, (id.)	166
71	<i>Pennatula phosphorea</i> , (Ellis)	174
72	Magnified view of the polypes of ditto, (id.)	174
73 to 76	Mode of progression of the <i>Hydra viridis</i> , (Trembley)	178
77	<i>Vorticella cyathina</i> , (Muller)	183
78	<i>Proteus diffluens</i> , (id.)	187
79	<i>Volvox globator</i> , (id.)	187
80	<i>Brachionus urceolaris</i> , (id.)	189
81	<i>Medusa pulmo</i> , (Macri)	192
82	<i>Beroe ovatus</i> , (Bruguiere)	194
83	<i>Beroe pileus</i> (id.)	194
84	<i>Velella limbosa</i> , (Guérin)	194
85	<i>Physalia atlantica</i> (id.)	194
86	<i>Actinia rufa</i> , (original)	198
87	Ditto expanded, (original)	198
88	<i>Asterias serrulata</i> (Bruguiere)	199
89	<i>Asterias regularis</i> , (id.)	199
90	<i>Echinus Ananchites ovata</i> , (id.)	199
91	<i>Clypeaster rosaceus</i> , (id.)	199
92	<i>Ophiura lacertosa</i> , (id.)	199
93	<i>Euryale muricatum</i> , (id.)	199
94	<i>Pentacrinus europæus</i> , (Thomson)	199
95	Ambulacra, and feet of <i>Asterias</i> , viewed from the under side, (Reaumur)	201
96	Ditto, viewed from the upper side, (id)	201
97	Vesicles appended to the feet of the <i>Asterias</i>	201
98	Polygonal pieces composing the test of the <i>Echinus</i>	204
99	Structure of a detached piece of ditto	204
100	Spine of the <i>Cidaris</i> , (Carus)	204
101	Shell of <i>Unio batava</i> , (Goldfuss)	217
102	Adductor muscle of Oyster, (Hunterian Museum)	218
103	Shell of <i>Pholas candida</i> , with abductor muscle, (Osler)	220
104	Foot of <i>Cardium edule</i> , (Reaumur)	221
105	<i>Planorbis cornutus</i> (Cuvier)	227
106	Magnified view of the striæ on the surface of Mother of Pearl, (Herschel)	232

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978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

LIST OF ENGRAVINGS.

XXV

Fig.		Page
107	Directions of the fibres in the component strata of shells	234
108	Shell of <i>Achatina zebra</i> , (De Blainville)	242
109	Longitudinal section of ditto, (id.)	242
110	Shell of <i>Pterocerus scorio</i> , at an early stage of growth, (id.)	246
111	Shell of the same when completely formed, (id.)	246
112	Shell of <i>Cypræa exanthema</i> at an early period of growth, (id.)	246
113	Shell of the same animal, when completed, (id.)	246
114	Transverse section of the shell of the <i>Cypræa exanthema</i> , (Huterian Museum)	248
115	Shell of <i>Conus</i>	248
116	Longitudinal section of the same, (original)	248
117	Transverse section of the same, (Bruguiere)	248
118	Inner surface of the Epiphragma of the <i>Helix pomatia</i> , (De Blainville)	253
119	Outer surface of the same, (id.)	253
120	<i>Clio borealis</i> , (Cuvier)	258
121	<i>Sepia loligo</i> , (De Blainville)	259
122	Suckers of the same (id.)	259
123	Suckers of the <i>Octopus</i> , (original)	260
124	Shell of <i>Spirula australis</i> , (De Blainville)	265
125	Longitudinal section of the same (id.)	265
126	Shell of <i>Nautilus pompilius</i> (id.)	265
127	Longitudinal section of the same (id.)	265
128	<i>Pontobdella muricata</i> , (Bruguiere)	271
129	<i>Nereis</i> , (id.)	271
130	<i>Erpobdella vulgaris</i> (Lam.) <i>Hirudo hyalina</i>	271
131	Diagram illustrating the rings and muscles of <i>Annelida</i> , (original)	271
132	<i>Gordius aquaticus</i>	276
133	<i>Serpula opercularia</i>	276
134	<i>Terebella conchilega</i> , (De Blainville)	276
135	<i>Arenicola piscatorum</i> , or <i>Lumbricus marinus</i>	276
136	<i>Aranea diadema</i> , (Rœsel)	283
137	Divisions of the limb of a Crustaceous animal	287
138	Mandible and palpus of <i>Mysis Fabricii</i> , (Bruguiere)	287

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

xxvi

LIST OF ENGRAVINGS.

Fig.	Page
139 to 141 Feet-jaws belonging to the first, second, and third pairs, (id.)	287
142 True foot, belonging to the first pair, (id.)	287
143 <i>Julus terrestris</i>	299
144 Muscles of the trunk of the <i>Melolontha vulgaris</i> , (Straus Durckheim)	300
145 Eggs of <i>Bombyx mori</i>	305
146 Larva of the same	305
147 Pupa of the same	305
148 Imago of the same	305
148* A Caterpillar of the <i>Phalena striaria</i> , (Hubner)	315
B The same in a rigid position, (Lyonet)	315
149 <i>Calosoma Sycophanta</i> , (Kirby and Spence)	320
150 Analysis of skeleton of the same, (Carus)	321
151 Hind view of the segment of the head in the same, (id.)	321
152 Suckers on the foot of the <i>Musca vomitoria</i> , expanded; magnified view, (Bauer)	333
153 Cushions on the foot of the <i>Cimbex lutea</i> , magnified, (id.)	333
154 Suckers on the under side of the foot of a male <i>Dytiscus marginalis</i> , (id.)	333
155 Cushions and sucker of the <i>Acridium biguttulum</i> , Latr. (id.)	333
156 <i>Dytiscus marginalis</i> , upper side, (Ræsel)	336
157 Lower side of the same insect, (id.)	336
158 <i>Notonecta glauca</i> , (Ræsel)	337
158* Fore leg of <i>Gryllotalpa</i> , (Kidd)	343
159 Wing of <i>Gryllus nasutus</i> . Orthoptera	350
160 Wing of <i>Libellula grandis</i> . Neuroptera	350
161 Wing of <i>Ichneumon persuasorius</i> . Hymenoptera ..	350
162 Wing of <i>Tipula oleracea</i> . Diptera	350
163 Sting of <i>Anthophora retusa</i> , (original)	350
164 Separate scales of the wing of <i>Hesperia Sloanus</i> , (original)	355
165 Arrangement of the scales in the wing of the same ..	355
172 Longitudinal section of the thigh-bone to show the cancellated structure, (Cheselden)	373
173 Longitudinal section of the humerus, (id.)	373
174 Ossification of the parietal bone, (id.)	379

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

LIST OF ENGRAVINGS.

XXVII

Fig.	Page
175 Early stage of ossification of the bones of the skull, (Cloquet)	379
176 The same in the adult, showing the sutures	379
177 Dorsal vertebra, human	388
178 Junction of vertebræ forming the spinal column	388
179 Longitudinal section of the same, showing the spinal canal.....	388
180 Elements of structure of a vertebra, (Carus)	303
181 Skeleton of Hog, (Pander and D'Alton)	402
182 Sternum, clavicle, and scapula; human.....	402
184 Skeleton of <i>Cyprinus carpio</i> , (Bonnaterre)	411
185 Diagram illustrating the progressive motion of Fishes	412
186 Front view of the vertebra of a Cod, (<i>Gadus morrhua</i>)	414
187 Side view of the same	414
188 Vertical and longitudinal section of a part of the spinal column in the same	414
189 A similar section, showing the gradation of structure .	414
190 Similar section in the <i>Squalus centrina</i> , (Carus)	414
191 Bones of the shoulder of the <i>Lophius piscatorius</i> , (id.)	422
192 Pectoral fin of the <i>Raia clavata</i> , (id.)	422
193 Belt of bones of the shoulder of a Ray, (id.)	423
194 Muscular system of <i>Cyprinus alburnus</i> , (id.)	425
195 Air bladder of <i>Cyprinus carpio</i> , (Blasius)	429
196 Eggs of the Frog.....	437
197 Side view of Tadpole magnified, (Rusconi)	437
198 Upper view of the same, (id.)	437
199 Adult Frog	437
200 Skeleton of Frog, (Cheselden).....	441
201 Skeleton of the Viper	447
202 Ribs and spine of <i>Boa constrictor</i> , (Home)	450
203 Bones of the foot of the same, (Mayer)	448
204 Muscles moving the claw of the same, (id.).....	448
205 Rudimental bones of the foot of the <i>Tortrix scytale</i> , (id.)	448
206 ——— of the <i>Tortrix corallinus</i> , (id.)	448
207 ——— of the <i>Anguis fragilis</i> , (id.)	448
208 ——— of the <i>Amphisbæna alba</i> , (id.)	448
209 ——— of the <i>Coluber pullutatus</i> , (id.)	448

Cambridge University Press

978-1-108-00006-2 - Animal and Vegetable Physiology: Considered with Reference to Natural Theology, Volume 1

Peter Mark Roget

Frontmatter

[More information](#)

xxviii

LIST OF ENGRAVINGS.

Fig.		Page
210	<i>Chalcides pentadactylus</i> , (Bonnaterre)	448
211	Under surface of the foot of the <i>Lacerta gecko</i> , magnified four times, (Bauer)	461
212	Side view of a longitudinal section of the same, (id.)	461
213	Skeleton of Tortoise, (Carus)	465
214	Section of the thigh bone of the same (id.)	465
215	Hind view of skull of <i>Testudo mydas</i> , (id.)	469
216	Bones sustaining the fin of the <i>Delphinus phocæna</i> , (Pander and D'Alton)	486
217	Fore part of the Skeleton of an Ox with the <i>Ligamentum nuchæ</i> , (original)	502
218	Skeleton of the Stag, (Cheselden)	507
218 ^{*A}	Longitudinal section of the horn of an Ox, (original)	515
	B. Ditto, of an Antelope, (original)	515
	C. Extremity of the same, (original)	515
219	Subcutaneous muscles of the Hedge-hog, relaxed, (Carus)	528
220	The same muscles contracted, and drawn over the body, (Cuvier)	528
221	Skeleton of the Lion, (Pander and D'Alton)	530
222	Skeleton of <i>Draco volans</i> , (Tiedemann)	550
223	Skeleton of <i>Vespertilio Molossus</i> , (Temmink)	551
224	Skeleton of the Swan, (Cheselden)	559
225	Lateral section of the cervical vertebra of the Ostrich, (original)	563
226	Fibrils of the vane of a feather, magnified, (original)	570
227	Edges of the fibres, magnified, (original)	570
228	Feather, showing its structure, (F. Cuvier)	575
229	Capsule, or Matrix of the feather, (id.)	575
230	View of the parts enclosed in the Capsule, when laid open, (id.)	575
231	Section of the stem, while growing, exhibiting the series of conical membranes, (id.)	575
233	Extensor muscles of the foot and toes of a bird, (Borelli)	589
234	Position of a bird in roosting, (id.)	589