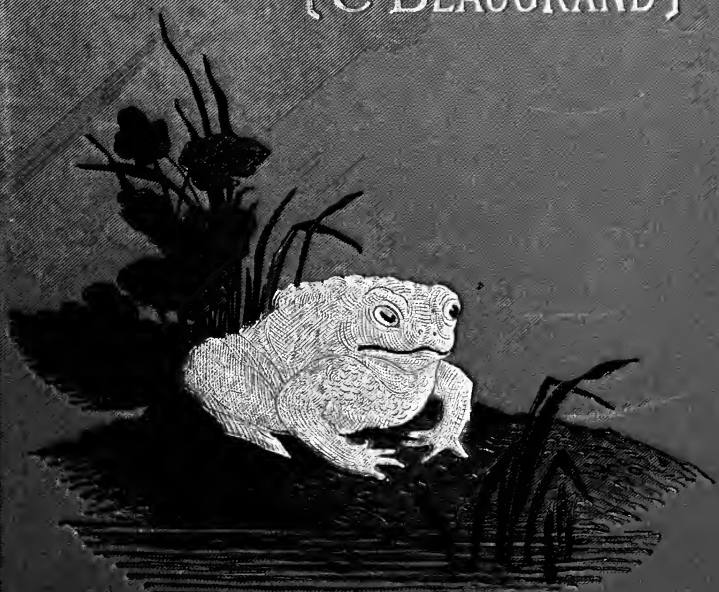


The
WALKS ABROAD
of
Two Young Naturalists
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[C. BEAUGRAND]



TRANSLATED & EDITED
BY

DAVID SHARP M.B.

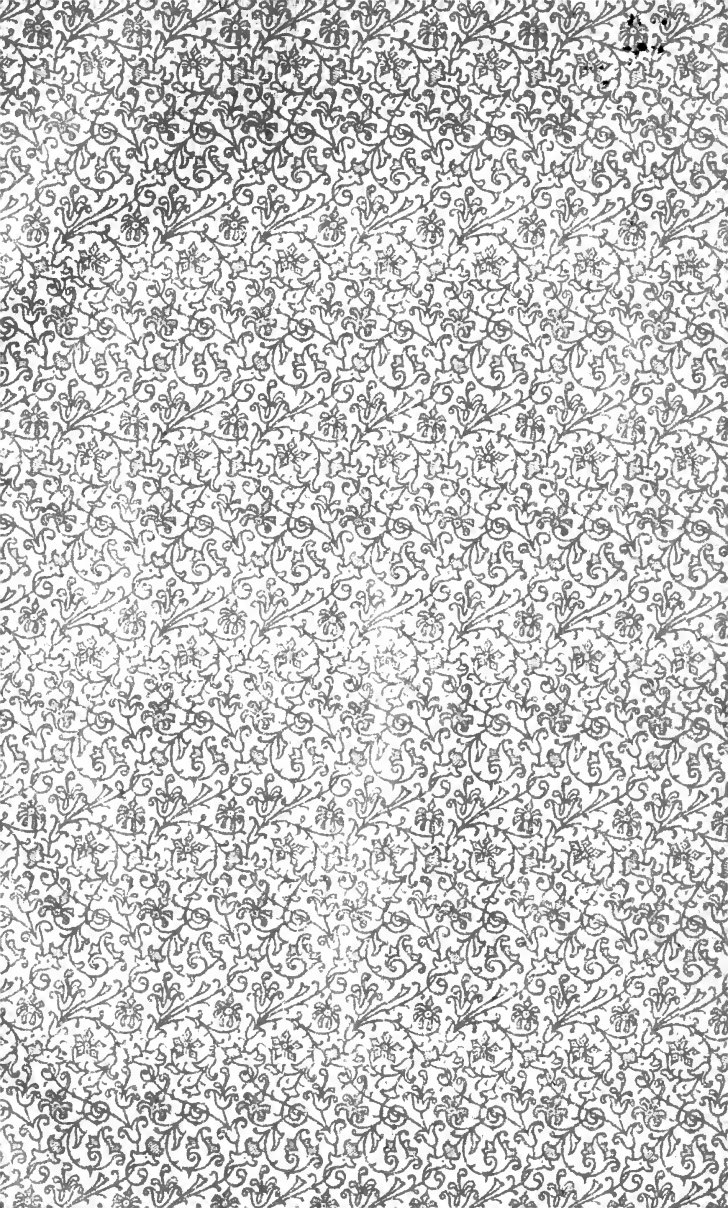
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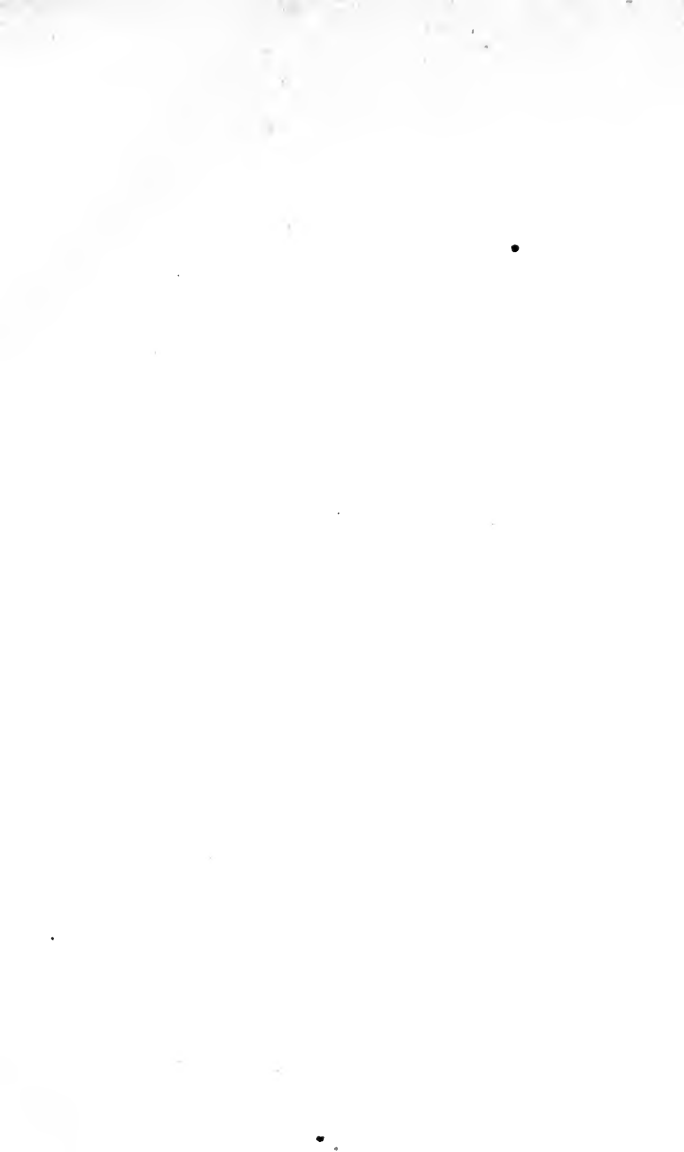


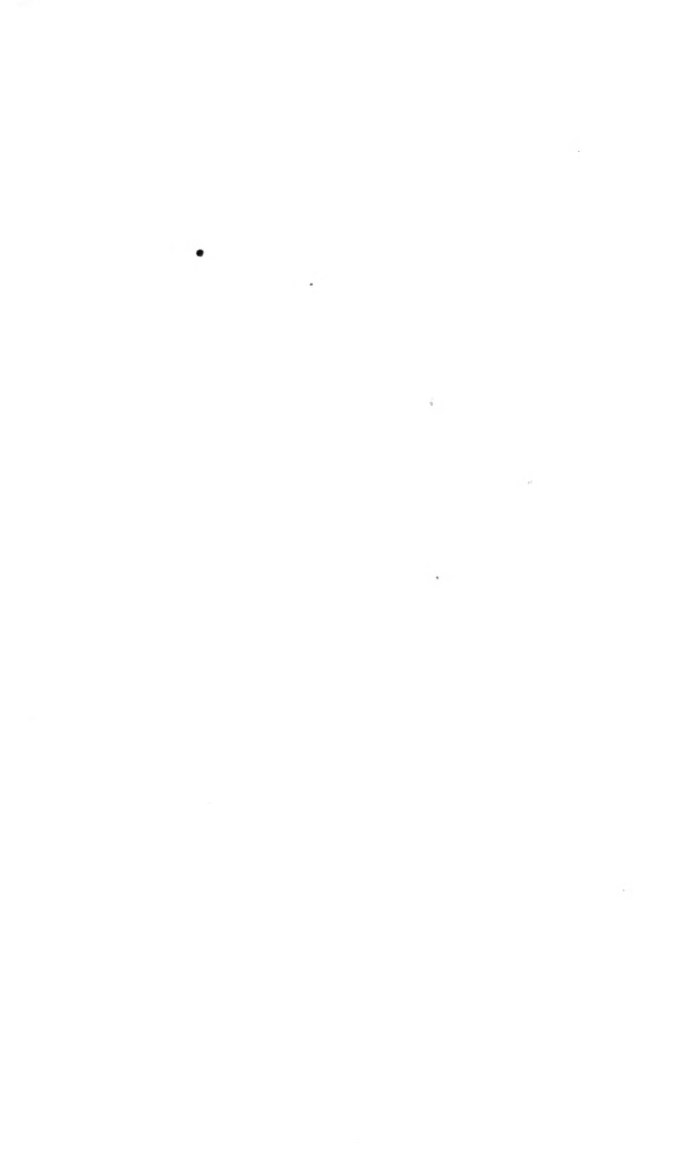
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THE WALKS ABROAD
OF
TWO YOUNG NATURALISTS

FROM THE FRENCH OF
CHARLES BEAUGRAND

BY
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SOCIETIES OF FRANCE, GERMANY, SWITZERLAND,
ETC., ETC.

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PREFACE.

THOUGH the majority of mankind are firmly convinced that "The proper study of mankind is man," yet they are also generally disposed to admit that some deviation from the various beaten tracks of existence is advantageous. Not very long ago one of the most accomplished of our medical men, Sir James Paget, in opening a session of the Working Men's College, delivered an address on "Recreation." In eloquent words he declared this to be an absolute necessity for our system, and he laid stress on the great value, in this capacity, of hunting fishing, shooting, and even of games of chance.

There is probably no change more recreative to the mind and body, fatigued by long continuance of daily routine, than natural history. In its pursuit, physical exertion in the fresh air vies with change of mental pabulum, and the wonderful variety of inexhaustible nature brings to the mind a feeling compounded of astonishment and satisfaction that is highly recreative.

Unfortunately, few can undertake the pursuit of natural history without some kind of assistance. A certain amount of book-knowledge is found to be indispensable, and yet, to the mind not accustomed to them, preliminary definitions and statements about unfamiliar objects are apt to prove so dry as to smother the nascent interest instead of stimulating and encouraging it.

The author of this book has endeavoured to meet this difficulty and to give a certain amount of introductory information in an attractive manner. Calling to his aid the interest we always feel in human character, he has attempted, by intertwining this with a certain amount of more or less authentic information on natural history subjects, to produce a book that shall foster an interest in zoology.

Without pretending that his *dramatis personæ* are equal to those of Shakespeare, or that his scientific attainments are on a par with those of Owen and Huxley, we think it will be admitted that he has succeeded, at any rate "indifferently well," in his task; and his book, which it appears has had a considerable success in France, has therefore been thought worthy of an introduction to the English reading public by means of a translation.

The "science" in the book is but slight, but it is hoped that it will be found sufficiently interesting to induce the reader to look for himself or herself at

some of the objects alluded to, to test by observation the truth of some of the statements, and to seek in other less elementary works additional and more precise information.

The classifications mentioned in the book are chiefly those of Cuvier, and though now somewhat old are still valuable, for the work of this renowned savant, though necessarily incomplete, was rarely erroneous. The translator has occasionally introduced information of a more recent date, and he has also ventured to alter a few passages that, in the original, appeared to him, for one reason or another, to be defective. For so doing he hopes he may receive pardon from the author and approval from the ever-gentle reader.

D. S. .

CONTENTS.

I.

	PAGE
The reader is introduced to several persons whom he will frequently meet with in this narrative—Doctor Bob and his son—Mutual anxieties—Léon and René ; dissimilar but affectionate—The arrival—Black—The cottage—The new comer promises to completely belie certain unpleasant anticipations	1

II.

Disenchantment—What one can do at Villers when there is nothing better—A new and peculiar definition of zoology—The laboratory—Chestnuts without chestnut-trees—A new arrangement in teeth—An individual with 3,840 feet—How to fish for the launce or sand-eel—A sea-worm and its mode of breathing—Animal plants—A very badly educated creature—The way one should adopt to grow—The four branches of the animal kingdom	9
--	---

III.

The beginning of conversion—The star-fish—A curious invasion—A way of eating and a way of running, by no means proper—Absorption, and afterwards—Numerous posterity—Animals that double themselves by division—What may be seen on a shell—An aquarium in miniature—Fairyland in a glass of water—What may be found in oyster-water—Uncle Bob himself asks to see—Excursion in a new world—A fantastic waltz—By what means the infinitely small manage to play an infinitely large part—A good thing from Michelet—The conversion becomes decided	27
---	----

IV.

	PAGE
A new character—How a man sometimes looks like a <i>Mister</i> —Father Lucas—His start in life—He had been several times round the world, without thinking much of it—Return to the native land—What Father Lucas calls his shepherd's round—Why Léon entertained so high an opinion of the old fisherman—Unexpected news—Uncle Bob does not say all he thinks	40

V.

A varied harvest—The sea-mouse—A microscopic array—Tricks of the chase and of war—Crustaceans and Kabyles—Changing armour—The danger of disarmament—Science disconcerted—Sacculina and its wonderful transformations—Ophiura—Holothuria—Chinese cookery—A suicide—The hermit-crab—An unedifying biography—An invitation	48
---	----

VI.

Start for the fishing—The surprise of Black—A chameleon of the waters—Two lines from <i>Déroulède</i> —The cuttle-fish's gift of tears—A strange locomotive apparatus—Black dyed afresh—An ink used for writing by the ancients—How Cuvier wrote and drew the figures of his " <i>Memoir on Cephalopoda</i> "—The cuttle-fish bone—classification of the Mollusca—The spoils of the net; sea-scorpion, fishing-frog—Stomach fishing—Twice eaten—A singularly placed carpenter's tool—Progressive wryneck—A demented one—Sad accident—René wounded.	61
--	----

VII.

Symptoms that may arise from the wound of the weever-fish—The poisonous structures of the weever—Classification of fishes—A fanciful etymology—A shark's breakfast, according to Muller—More strange names—Why fishes that live near the surface in the water cannot penetrate to great depths—Life in the abysses of the ocean—How a simple thread sufficed to overturn the theories of scientific men—Researches made by the English, Swedish, and Americans—Explorations of the <i>Travailleur</i> and <i>Talisman</i> —Surprising results—Remarks by René—The invalid's nightmare	78
---	----

VIII.

PAGE

An uninviting form of cookery—Light talking and good working—A constant sign—Curious anatomical point—An eye consisting of many thousand eyes—A magnificent preparation—Three stomachs to a single individual—The classification of insects—Queer names again—Aptera—A flea's jump—Unexpected maternal instinct—The reputation of the flea restored—Diptera—Number of strokes of a gnat's wing in a second—The bot-flies and Helophili—Transformations of a gnat—Hemiptera—Lepidoptera—Butterflies have feathers—Depredators—Neuroptera—Devastating hosts—White ants—Coleoptera—Our friends and enemies	110
---	-----

IX.

Congratulations are the order of the day—Ineffectual strategy—Some respectable insects—Ants and their flocks—Dairy-farms of blight—Men, women, and workers—To be an ant is no sinecure—Destruction of a home—An eastern legend—Tamerlane—In what way a mere ant may sometimes decide the fate of an empire—How Mr. Léon increased his collection on this occasion	127
---	-----

X.

More Hymenoptera—Republic and monarchy—Bees—Expulsion of the swarm—A swarm in a letter-box—Preparatory measures—House-cleaning and repairs—Propolis—Wax, honey—Saint Bartholomew's day in a hive—Egg-laying, larvæ—Regal food—A mortal duel—Orthoptera—Cockroaches, crickets, grasshoppers, &c.—Earwigs—Undeserved censure—Extraordinary increase of locusts and Blattæ—A supposed omission—Out of the ranks of insects—The <i>Epeira diadema</i> —How the spider spins his web—The trap-door spider, navvy, mason, and upholsterer—Argyroneta—A tent under water—The struggle for existence.	138
---	-----

XI.

A sailor's marriage at Villers—Titles of nobility—A strange vessel—Good folk—An acceptable gift—The <i>Albatross</i>	157
--	-----

XII.

A letter—Logical inferences—Pietro Franceschini—The Odysseus of a gendarme—An account of the acquaintance of Franceschini and Uncle Bob—The two barometers—A false prophet	163
--	-----

XIII.

	PAGE
The Road to Touques on a fair-day—Reptiles—An example to be imitated by the market-gardeners of France—Doubtful forms—A reptile with a strong anatomical resemblance to a bird—Birds provided with teeth—Uses of reptiles—Barometer No. 2 seems likely to be right	170

XIV.

A village inn at Touques in the year of grace, 1884—At the fair—The g-r-r-r-and menagerie—A trade truly requiring a natural calling—Two anecdotes of tamers	182
---	-----

XV.

Return to the cottage—Two or three words about mammalia—The stomach of a chewer of the cud—A well-applied mythological name—Terror of Dame Theresa—Disgusting! but a benefactor—Uncle Bob releases a criminal condemned to death	192
--	-----

XVI.

Continuance of bad weather—Mother Goose, lotto, or dominoes—A book of wonders—Rotifers—Artificial death and revival—Tardigrades, Kolpodes, Monads, and Vorticella—How to obtain a desired infusorian—Mineral, vegetable, or animal?—Diatomaceæ—To what the colour of some seas is due—Foraminifera—Polypes, Hydra—Experiments of du Tremblay—How a single animal may be made into several, and several into one—A naturalist never wearies	211
--	-----

XVII.

With Franceschini—Another barometer—"Good-day, Major!"—A mysterious voice—Uncle Bob begins to fancy the keeper's house must be haunted—Jacob—A fable of La Fontaine realised—The Norman character makes itself evident even in birds—René's classification—Honest men and brigands—Day thieves and nocturnal prowlers—The waders and web-feet—Climbers—Gallina-cæous birds—Passerine birds—Jacob sadly out of place—Franceschini insists on a new classification	222
--	-----

XVIII.

PAGE

Three great categories of birds—Injurious birds—Birds of mixed qualities—Useful birds—Certain birds not to be proscribed at first glance—Some conclusive facts—Frederick the Great and his cherries—Curious observation made in Paris—Those that eat insects—Some figures—An unjust and odious persecution—The worst enemy of rats, field-mice, and other rodents—Birds as protectors of sailors—An English law—Cormorant-fishing in China—A possible cure for the <i>Phylloxera</i> —A proposal from Franceschini	238
--	-----

XIX.

In the wood—Interment of a field-mouse—The population of an oak-tree—Gall-fly—The origin of gall-nuts—Parasites of parasites—The surprise prepared by the keeper—A park for insects—New treasures for the collection of Léon—Arrest of an assassin— <i>Ocypus olens</i> —A little-known way of butterfly hunting—Wedded couples should be well-matched—Saint Francis of Sales might have become an excellent entomologist—The grebe—A difficult problem solved by a bird—The return—A conjugal drama	253
--	-----

XX.

On board the cutter <i>Albatross</i> —At sea—Medusæ—René is again a "martyr of science"—Physalia—An old tale by Father Lucas—A sailor's fancy that cost its author dear—Phosphorescence of the sea—How the Medusæ grow—Alternation of generations—Arrival at Etretat	275
--	-----

XXI.

Villers and Etretat—The cliffs of Normandy—The power of a drop of water—How shingle beaches are formed—A "water-cat"—Way of getting rid of an octopus—Every nook occupied—The population of a rock—A new fauna—The various zones of the tidal region	283
--	-----

XXII.

PAGE

The return from Etretat—Inventory—A serious culprit—The worst foe of the Dutchman—A selfish rascal—The sponges of the Channel—Homeric combat between a negro and a sponge—Clams—A Chinaman in a shell—Signs of bad weather—A recollection of some martyrs of duty—Old mariner and true sailors	291
--	-----

XXIII.

Epilogue	300
--------------------	-----

LIST OF ILLUSTRATIONS.

	PAGE
"AN ANIMAL! THIS LITTLE BALL OF SPINES AN ANIMAL?"	14
SAND-EEL (<i>Ammodytes tobianus</i> , Cuv.)	17
LUG OR LOB-WORM (<i>Arenicola piscatorum</i>)	18
"THE SPINES OF THE SEA-URCHIN HAD FALLEN OFF"	21
SPIDER CRAB (<i>Maia squinado</i> , Lat.); PRAWN (<i>Palæmon serratus</i> , Penn.); SHRIMP (<i>Crangon vulgaris</i> , Fab.); HERMIT-CRAB (<i>Pagurus bernar-</i> <i>dus</i> , L.)	23
STAR-FISH (<i>Asterias</i>)	29
RADIATES (<i>Serpula</i> , <i>Ophiura</i> , <i>Rhizostoma</i> , <i>Star-fish</i> , <i>Sea-urchin</i>)	31
ZOOPHYTES (<i>Stony Coral</i> , <i>Sertularia</i> , <i>Cellularia</i>)	33
BRYOZOA (<i>Moss-animals</i>)	34
SERPULA	36
ANIMALCULE IN WATER	37
"QUITE A WORLD OF POLYPES ON THEIR CARAPACE"	50
DROMIA (<i>Dromia vulgaris</i> , Edw.)	51
SEA-CUCUMBER (<i>Holothuria</i>)	55
"A HYPOCRITICAL OLD FELLOW"	59
GASTEROPOD MOLLUSCA (<i>Murex</i> , <i>Halotis</i>)	68
ACEPHALOUS MOLLUSC. RAZOR-FISH (<i>Solen ensis</i>)	69
FISHING-FROG (<i>Lophius piscatorius</i> , Lin.)	70
THE PRAWN (<i>Palæmon serratus</i>)	72
COMMON CUTTLE-FISH (<i>Sepia officinalis</i> , Lin.)	73
COMMON SHRIMP (<i>Crangon vulgaris</i>)	75
WEEVER-FISH (<i>Trachinus draco</i> , Lin.)	76
GURNARD (<i>Trigla</i> , Cuv.)	77
HEAD OF THE WEEVER	80
SECTION THROUGH THE MIDDLE OF THE SPINE	80
SECTION OF SPINE AT THE BASE	80
COMMON STURGEON (<i>Acipenser sturio</i> , Lin.)	81
SEA-LAMPREY (<i>Petromyzon marinus</i> , Lin.)	83
SHARP-NOSED RAY (<i>Raja oxyrhynchus</i> , Lin.)	84
SWORD-FISH (<i>Xiphias gladius</i> , Lin.)	85

	PAGE
THE TUNNY (<i>Scomber thynnus</i> , Lin.)	86
THE RUFFE (<i>Perca cernua</i> , Cuv.)	87
COMMON CARP (<i>Cyprinus carpio</i> , Lin.)	88
SOLE (<i>Pleuronectes solea</i> , Lin.)	88
SEA-HORSES (<i>Hippocampus guttatus</i> , Cuv.)	89
PIPE-FISH (<i>Syngnathus æquoreus</i> , Lin.)	89
TURBOT (<i>Pleuronectes maximus</i> , Burbo.)	91
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . SPONGE (<i>Holtenia</i>)	92
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . SPONGE (<i>Askonema</i>)	93
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . <i>Eustomias obscurus</i> , DIS- COVERED AT A DEPTH OF 8,800 FEET	94
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . (<i>Macrurus australis</i>)	95
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . (<i>Macrurus globiceps</i>), FISHED FROM A DEPTH BETWEEN 4,500 AND 10,000 FEET	96
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . (<i>Euripharinx pelican- oides</i>). COAST OF MOROCCO, AT A DEPTH OF 8,000 FEET	97
SUBMARINE EXPLORATIONS OF THE <i>Talisman</i> . (<i>Melanocetus johnsoni</i>). BETWEEN THE AZORES AND EUROPE. DEPTH, 16,000 FEET	98
FOUR FACETS FROM THE EYE OF A COCKCHAFFER	105
DIGESTIVE SYSTEM OF A CARNIVOROUS INSECT (<i>Carabus</i>)	106
HEAD-LOUSE, MUCH MAGNIFIED	107
THE FLEA: NYMPH, PERFECT INSECT, AND LARVA	109
TWO-WINGED FLY (<i>Musca</i>)	112
RAT-TAILED WORMS (LARVÆ OF <i>Helophilus</i>). AND THE SAME INSECT IN THE PERFECT STATE	113
METAMORPHOSES OF A GNAT	114
UNDER SURFACE OF THE PHYLLOXERA OF THE VINE. WINGED FORM. MAGNIFIED ABOUT SIXTY TIMES	116
PEACOCK BUTTERFLY	118
SCALES FROM BUTTERFLIES' WINGS, GREATLY MAGNIFIED	119
DRAGON-FLY (<i>Libellula</i>)	121
MAY-FLY (<i>Ephemera</i>): NYMPH, PERFECT INSECT	120
WHITE ANTS (<i>Termites</i>): DIFFERENT FORMS	122
COLEOPTERA: THE BROAD DYTISCUS (<i>Dytiscus latissimus</i>), THE GREAT HYDROPHILUS (<i>Hydrophilus piceus</i>)	123
EGYPTIAN SACRED BEETLE (<i>Scarabæus</i>).	124
TURNIP-FLY: NATURAL SIZE AND MUCH MAGNIFIED	125
CORN-WEEVIL, MUCH MAGNIFIED	126
WIRE-WORM: LARVA AND PERFECT INSECT	126
DERMESTES LARDARIUS	126
ANT-LION IN ITS PIT: THE BORN ENEMY OF ANTS	130
RED ANT (<i>Formica rufa</i> , Latr.)	131
ANTS AND APHIDES	133
WASPS' NEST, WITH PART OF THE EXTERNAL COVERING REMOVED TO SHOW THE CELLS	136

	PAGE
SWARM OF BEES	139
FRAGMENT OF COMB, WITH BEES AT WORK ON IT	141
DRONE, OR MALE OF THE HONEY BEE	142
COMMON EARWIG	143
FIELD-CRICKET (<i>Gryllus campetris</i>)	144
A MIGRATION OF LOCUSTS. BENEATH ARE IMMATURE LOCUSTS	147
BLATTE (COCKROACHES), COMMONLY CALLED BLACK-BEETLES	148
TRAP-DOOR SPIDER (<i>Cteniza fodiens</i>) AND ITS NEST	151
ARGYRONETA AND ITS AQUATIC BALLOON	152
WATER-SPIDER	153
COBWEBS AND SPIDERS	154
A CHEAP BAROMETER	167
TORTOISE	173
FROGS' EGGS AND TADPOLES PARTIALLY DEVELOPED	175
MEXICAN AXOLOTL (<i>Siredon maculatus</i>)	177
CAPILLARY NETWORK OF THE FROG'S FOOT	179
AFRICAN LION	185
POLAR BEAR	189
QUADRUMANA: CAPUCHIN MONKEY	193
CHIROPTERA: LONG-EARED BATS	195
CARNIVORA: PANTHER OR LEOPARD	196
RODENTIA: SQUIRREL	196
MARSUPIALIA: TASMANIAN KANGAROO (<i>Macropus bennetti</i>)	197
SKULL OF A RODENT	199
TEETH OF AN INSECTIVOROUS ANIMAL	199
INSECTIVORA: SHREW-MICE	199
INSECTIVORA: HEDGEHOG	200
STOMACH OF RUMINANT	200
RUMINANTIA: ONE AND TWO-HUMPED CAMELS	201
BEAVERS AND THEIR DWELLINGS	203
PACHYDERMATA: ELEPHANT	204
EDENTATA: TATOU, OR ARMADILLO	205
CETACEA: GREENLAND, OR RIGHT WHALE	205
MONOTREMATA: SPINY ECHIDNA	206
EDENTATA: THE GREAT ANT-EATER	207
ORNITHORHYNCHUS ANATINUS. AUSTRALIA	209
THE TOAD. "SCARCELY VENOMOUS EVEN WHEN TOUCHED"	210
ROTIFER VULGARIS	213
KOLPODA CUCULLUS	214
BELL VORTICELLA (<i>V. convalaria</i>)	214
GROUP OF MONADS (<i>Monas crepusculum</i>)	215
<i>Enchelys pupa</i>	215
VEGETABLE INFUSORIAN (<i>Volvox globator</i>)	215
DIATOM, GREATLY MAGNIFIED	216

	PAGE
FORAMINIFERA, GREATLY MAGNIFIED	218
FRESH-WATER HYDRA	219
WADERS: WHITE STORK (<i>Ciconia alba</i> , Briss.), HERON (<i>Ardea cinerea</i> , Latr.), RARE HERON (<i>Ardea lineata</i> , Latr.), RED FLAMINGO (<i>Phœni- copterus ruber</i> , Lin.)	227
"THESE HOOKED BEAKS AND RAPACIOUS FIGURES"	230
WOODCOCK (<i>Scolopax rusticola</i> , Lin.)	231
GALLINÆ: REEVE'S PHEASANT, CURASSOW, SILVER PHEASANT, PEACOCK, GOLDEN PHEASANT	233
WADING BIRD: AVOCET (<i>Recurvirostra avocetta</i> , Lin.)	235
A DESTROYER DESTROYED	239
COAST BIRDS	242
STORK	243
PALMIPEDES: COMMON CORMORANT, PELICAN	245
LONG-EARED OWL (<i>Asio otus</i> , Lin.)	247
A TIT FAMILY	249
NECROPHORI	256
HEMIPTERON (<i>Pentatoma ornatula</i>)	257
THE PROCESSIONARY MOTH AND ITS LARVÆ, THE LATTER ATTACKED BY A BEETLE, <i>Calosoma sycophanta</i> , AND ITS LARVA	259
CYNIPS AND GALL-NUTS, OR OAK-APPLES	262
STAG-BEETLE (<i>Lucanus cervus</i>): LARVA, PUPA, AND MALE AND FEMALE OF THE PERFECT INSECT	263
CARNIVOROUS BEETLES	267
TIGER-BEETLES	270
COCKTAIL-BEETLE (<i>Ocypus olens</i>)	271
CICADA	273
JELLY-FISH (<i>Rhizostoma cœrulea</i>)	280
OCTOPUS OR POULPE (<i>Octopus vulgaris</i>)	285
LIMPET (<i>Patella vulgata</i> , Lamarck)	287
SEA-SNAIL (<i>Purpura lapillus</i> , Lamarck)	288
SUBMARINE FORMS OF LIFE FROM THE TROPICAL SEAS	293
PIECE OF WOOD PERFORATED BY SHIP-WORMS	296

THE WALKS ABROAD

OF

TWO YOUNG NATURALISTS.



I.

The reader is introduced to several persons whom he will frequently meet with in this narrative—Doctor Bob and his son—Mutual anxieties—Léon and René; dissimilar but affectionate—The arrival—Black—The cottage—The new comer promises to completely belie certain unpleasant anticipations.

“Is the train from Trouville signalled?”

“Not yet, Doctor, but the Paris express has reached Trouville, and in a quarter of an hour, or twenty minutes at most, your travellers will be here.”

“That will give me time to look at the cuttings you have just made, and perhaps I shall be able to find in them some interesting fossils neglected by the navvies; supposing, sir, that you have no objection,” said a young man who accompanied the doctor, and judging from the resemblance between them, evidently his son.

This conversation took place on the 18th of August.

1884, at six o'clock in the evening, close to the station, then in course of construction, of Villers-sur-Mer.

The station-master, smiling, made a bow of acquiescence, and returned to the duties of his office. The young man was on the point of availing himself of the permission he had obtained, but looking at his father he stopped at once. The doctor appeared to be suffering from some scarcely concealed anxiety, and understanding immediately the unspoken question conveyed by the eyes of his son, decided he would no longer restrain himself.

"You can scarcely understand, dear Léon, how impatient I am to see if what I have heard about your cousin René be not exaggerated. The attacks of intermittent fever have caused him to cease his studies abruptly some weeks before the holidays, and his unusual delay this year in coming to our sea-side abode causes me a good deal of anxiety about him."

And as Léon was about to reply he continued: "I know what you are going to say to me, and it is true that I examined him before I came away and found nothing seriously wrong. But then, unfortunately, a doctor's prognosis is by no means infallible, and in the weeks that have passed since then he may have got worse. However, in ten minutes we shall know what to think," he added, as if desirous of concluding, and

at the same time played with his walking-stick amongst the gravel where they were pacing.

Doctor Boberral, shortened to Uncle Bob by his family, and to "the Doctor" by the people of Villers, although there were at least eight doctors in the neighbourhood, is a fine specimen of an old gentleman : pale, with long white hair, scrupulously shaven chin, and a kindly but somewhat bantering expression. His very restless grey eyes sometimes gleamed with remarkable force through his bushy eyebrows, as if to interpret the soul of his patient and penetrate to the very seat of his malady, and sometimes by a sudden change melted into an expression of extreme sweetness. With a toilet always unexceptionable, he wears a hat with wide border, the usual white cravat wound three times round the neck before being tied, and in his button-hole the rosette of the Legion of Honour.

In fact he is the best and most benevolent man I know.

His visit to Villers for a short time every year, was looked upon in the neighbourhood as a real blessing.

Having been left a widower while still young, the doctor had devoted himself more entirely than ever to the cultivation of science and to the education of his son, and had by these means been able gradually to assuage his grief, though not to quite forget it. Considered one of the first practitioners in Paris, he now carried

on only a small practice so that he might be able to leave to his son a few select patients, whose number the latter might himself increase when sufficiently experienced to succeed him. At the same time Dr. Boberral did not stint his devotion when it was required. It is a matter of history that during the dreadful period of the siege of Paris in 1870, he arranged an ambulance for the wounded and also maintained a separate hospital for cases of fever. This charitable inclination had cost him much, but it had also procured for him the well-deserved distinction of the red ribbon, and contributed more than a little to the renown and confidence with which this really learned man was regarded.

Léon, who had withdrawn a few steps, in reality less to look for fossils than to compose his countenance, could not help sharing to some extent the fears expressed by the good doctor. He too had conceived a very great love for his cousin, perhaps because of the law of contrasts, for it would be difficult to imagine a greater difference than that which existed between these two young people. Léon was dark, thick-set, proud of his tender moustache. An unwearied worker, he had inherited the scientific tastes of his father, and was devoting to the study of natural history the few hours of repose that he could obtain from the serious studies required during the last year of preparation for his degree.

René, whom we shall soon see, fair and tall, and excessively slender, apparently only maintaining his upright position by some sort of permanent gymnastic feat,—Parisian to the soul, playing the sceptic, and careless by nature, was never so pleased as when “masters” and professors would allow him to work or dream in his own fashion, according to the caprice of the moment. He was quite unattracted by the study of either the exact or the natural sciences. According to a favourite expression of his own, he could not understand how any one could seek converse with plants, animals, or stones; and he preferred the boulevard to the country, a scene at the theatre to a beautiful view, and could disconcert with a single word his dear cousin, Léon, who had often tried in vain to convert him to his own ideas.

In the midst of the reflections of our two friends there was heard the long metallic note sounded by the horn of the distant signalman, repeated nearer and nearer like a reversed echo. Léon, the doctor, and others who had scattered themselves while waiting for the train, now gathered together with eagerness.

Soon a prolonged rumbling was heard, a cloud of smoke appeared in the cutting, spreading its broad grey flakes over the blue sky, the whistle sounded twice, and the train was in the station.

“Here I am at last,” cried a gay voice, and at the

same time two arms embraced the doctor. "This confounded train was delayed—an accident on the line near Lisieux—three-quarters of an hour's waiting in the middle of the fields. Are you really quite well, Uncle Bob?—by the bye, I have brought Black with me. And you, Leon, how are you? Are you always collecting and dissecting?"

It is unnecessary to say that this human hurricane, incessantly talking and gesticulating, was none other than our friend René, who was thus making up for his time of compulsory quiet and prolonged dumbness.

An old-fashioned omnibus with high wheels, and on its yellow and dusty exterior bearing, like so many others of its sort, as if it were the maker's name, this inscription: "*Correspondance du chemin de fer*," was waiting. Three places were reserved in this ancient vehicle; but the new comer having declared that he was "tired of being seated," the conductor, a colossus with rubicund visage, wearing, in spite of the season, a thick otter-skin cap, placed with a single effort the luggage under its cover, and the three friends quitted the station preceded by Black, a superb spaniel, who profited by his newly regained liberty to inspect as they went along the stock-grounds at the barriers, to run after and yelp at the fowls in the back yards, and to roll himself in the grass with thorough enjoyment.

The road from the railway station at Villers has fine trees on each side and forms a magnificent avenue extending as far as the commencement of the village. All three sauntered leisurely along it under the influence of that indefinable feeling of satisfaction that one experiences in the country on a fine evening, speaking of the absent friends in Paris that René had quitted only that morning. As they went by, the peasants leaning against their door-posts respectfully greeted them by lifting their hats. When they came to the houses Black went ahead like a dog who knows his whereabouts, and a few minutes afterwards they followed him into the cottage on the sea-shore.

"At last!" was the greeting of the old housekeeper Theresa, who knew from long experience that a dinner kept warm is never enjoyed. The table had long been spread, and showed an inviting display of brilliant crystal, and plates with blue flowers, while conspicuous in its centre was a capacious soup-dish of most appetizing appearance.

"Now," said the doctor, addressing his nephew, "take off your bag, and to table, young men, if you please." René wanted little pressing, and drew one after the other from his game-bag, a book, three papers, and (mothers are the same all the world over) the remains of a cake, which must have been of very respectable proportions when he started; and although it had greatly diminished this did not

prevent the young Parisian saying as he unfolded his serviette—

“I don’t know whether it is the country air, but I feel already most immensely hungry.”

“Ah! ah!” thought the old savant, as he rubbed his hands together, “he certainly is not so ill as I feared he might be.”

II.

Disenchantment—What one can do at Villers when there is nothing better—A new and peculiar definition of zoology—The laboratory—Chestnuts without chestnut-trees—A new arrangement in teeth—An individual with 3,840 feet—How to fish for the launce or sand-eel—A sea-worm and its mode of breathing—Animal-plants—A very badly educated creature—The way one should adopt to grow—The four branches of the animal kingdom.

THE following morning before René awoke the sun had long since cast its beams through the curtains of his apartment, but he soon arose with the contented air of one who has slept well, opened his window, and took a look at the sea.

There was already a considerable stir near the house and on the beach. An old sailor had fastened a net to some nails on a wall, and was mending its torn meshes with great strokes of a shuttle. Beyond was the immense expanse of blue water, infringed on near its edge by the fishers for shrimps, who went backwards and forwards in the water up to the middle of their bodies. Some fishing-boats, locally called "plates," were returning with difficulty, and with much assistance by oars and sails, to the port of Trouville. In

the far-off distance Cape Hève was seen, looming vaguely as if half-effaced by a purple mist. The young man from Paris, half-dressed, gazed on the scene and breathed freely the air impregnated with the saline odours wafted by the morning breeze. After a few minutes of speechless admiration, "Upon my word," said he, "I could almost believe one breathes more freely here than in Richelieu Street."

After a quarter of an hour he went downstairs to the breakfast-room. His uncle and Léon were there before him.

Naturally the question under discussion was, what is the best thing to do for the day?

"Suppose we make out our programme at once?" said René to his cousin. "First there is the casino, entertainments and farces, players from Paris. By the way, is the orchestra as alarming as it was last year?"

"The casino, or rather the wooden shanty you saw last year, is gone: it was demolished by a hurricane during winter. They are building another, which is intended to be superb, and will be opened in three years."

René's face grew serious.

"I hope our companions and the friends we knew last summer remain? Colonel D——, the unwearied maker of pigeon-shooting matches and of rally-papers; Count T——, the patron of polo and lawn-tennis; our

friends L——, with the ‘three charming young daughters,’ as we used to hear repeated regularly every Saturday by an ‘echo of the shore.’”

“No, all gone,” replied Léon. “The three charming young daughters are passing the season at Biarritz; Count T—— is detained in Paris by a domestic calamity and will not appear this year; and as for Colonel D——, we shall not see him again: he has been promoted and is gone to Tunis.”

The Parisian’s face became more and more serious.

“But your Villers is really a country of Hurons and Apaches, then!” But immediately aware of his rudeness he added: “Never mind that; we two are together—all three together,” he said, looking at his uncle. “We shall be sure to find something to do. Come now, make a proposal, you the elder. Mr. Léon,” added he with comic gravity, “I call on you!”

“Well, to tell the truth, I don’t see much, unless we occupy ourselves with natural history, zoology.”

On hearing this word the other started as if he had received an electric shock.

“Is that all you can think of?” cried he. “Zoology, natural history—that is you all over; and you think that is amusement! tardigrades, plantigrades, digitigrades, and other grades that I have forgotten. Now see, and I will give you once for all a definition of your science: Zoology is just like botany, which a

great writer, I forget who" (and as Léon could not help smiling), "yes, a great writer" (measuring his syllables with emphasis), "has defined botany as the 'art of calling plants names in Greek!'"

"Come, come!" said Léon, now laughing openly. "This is a regular philippic, a denouncement, an impeachment of us by the public prosecutor."

René was not disconcerted, on the contrary, he continued more confidently—

"I will allow you as much as this: suppose we were living in one of those far-off countries where extraordinary plants and wonderful animals are met with wherever one goes, then I would be your faithful companion, your Friday; but here we are only four hours from Paris—four hours, when the train is not delayed at Lisieux, be it understood. I really do not see what sort of studies you can even pretend to make here: I suppose you do not intend to demonstrate that at Villers there may be seen oxen, horses, dogs and cats, as specimens of domesticated animals, and as *feræ naturæ*, partridges, hares, and rabbits, until the shooting season commences, of course. You may add that the natives wear earrings and cotton hats, and I believe then your work is exhausted."

"And suppose I prove to you exactly the opposite," said Léon. "Suppose I show you that at only four hours' distance from Paris, yes, even at Paris itself,

there are things of much interest in natural history to see and to study ? ”

And as René made a gesture of thorough incredulity he added, “ Meanwhile we will take a turn on the shore. I take possession of you by authority, and we shall see who is right, who wrong. Allow me a couple of minutes to go to my laboratory and get my botanical box and some bottles.”

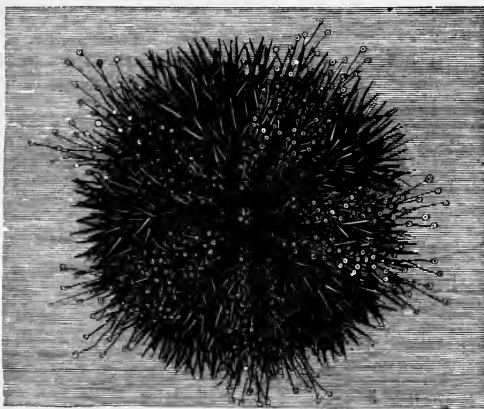
“ I go under compulsion,” said René, in a tone worthy of a martyr on the way to the stake.

Léon’s workshop, to which he gave the imposing name of laboratory, was a small square apartment, whitewashed and facing the garden ; on some tables various kinds of chemical and physiological apparatus, retorts, bottles, glass tubes of various sizes and dimensions glittered gaily in the rays of the sun. Farther on there were books, a series of carefully-labelled phials, specimens of the minerals and fossils of the district, and hanging on the wall here and there, boxes and bags, with quite an array of fishing-lines and butterfly-nets. In the middle of the room stood a large working-table with a microscope covered by its shade. A variety of nets were drying in front of the door, and Léon took possession of the first that was handy.

“ We shall not see much to-day ; the tide has been coming in for an hour already. However, we shall have been, shall have made a beginning.”

Two minutes brought them to the sands.

"Stop a minute, what is this?" René called all at once, as he was stooping down to pick up from the sand a little ball of the size of a sweet chestnut, and covered, like that fruit, with green spines. "So chestnuts grow in the sand at Villers!"



"AN ANIMAL! THIS LITTLE BALL OF SPINES AN ANIMAL?"

"Yes, chestnuts, but not chestnut-trees," said Leon. "And in fact you are not the first who has noticed the resemblance; almost everywhere this curious animal is called a sea-chestnut, though naturalists call it a sea-urchin."

"An animal! that an animal! a little ball covered with spines? Perhaps it is a fish. It might possibly

be so on the first of April. but this is not the time of year for such jokes. Moreover, if it be an animal, show me its mouth."

"Here it is," said Léon, pointing out in the middle of the flattened part of the urchin, a cavity closed by five little pointed bones interlocked in one another. "The jolly creature has good teeth, as you may see. It has indeed in this an advantage over ourselves, for its teeth, like those of the rodents, never wear out; or rather, they grow up from the root just in proportion as they wear away at the top."

"And so they have no need for dentists. Wonderful! And yet their lot does not appear to me an enviable one. To begin with, they cannot do much in the way of making excursions, as they have neither fins, nor legs, nor feet."

"Completely wrong again! Sea-urchins do have legs and feet, not quite after the same fashion as ourselves, certainly, for they have several hundred, distributed over all the surface of the body. On a moderate-sized urchin 3,840 feet have been counted by a patient naturalist, or rather, to use the scientific term 3,840 ambulacral feet." *

"Not more than that! But I sincerely pity the creature, for if I may judge from myself, who possess only a single pair, it must be impossible for it to remain quiet a single minute anywhere."

* The sea-urchins possess, moreover, "ambulacral brains."

“Their arrangement permits the urchin to progress in any direction. If it were still alive you would be able to see a multitude of contractile tubes terminated by a sucker. At the base of each tube there is a sac acting as a reservoir of water. If our urchin wishes to march, this sac contracts, the ambulacral foot is distended with water, something like the fingers of a glove if you blow into it; the sucker at the end is fixed on to the ground, the other ambulacral feet repeat the operation, and the urchin is out for a walk.

“I must not forget to add that this creature, so fragile in appearance, is nevertheless able, on rocky coasts where the surf is very violent, to pierce the hardest stones, and to excavate a lodging for itself even in granite.”

René had, without thinking, put the urchin in his pocket and was no longer listening.

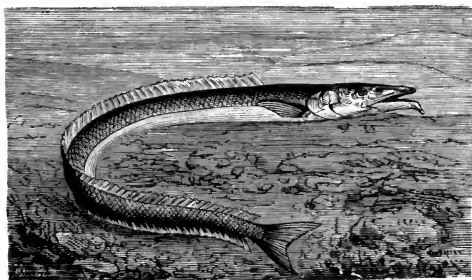
His attention for the last minute or two was directed to two fishers. One of them, armed with a fork having slender teeth, was walking backwards tracing a deep furrow in the sand, while the second, attentive, followed him step by step, then suddenly stooped down, and, capturing something, put it in a box.

“What a singular occupation! What can they be doing?” said René.

Then drawing a little nearer he saw that the box was filled with small fish of elongated form, like eels.

Directly one of these eels was brought to the surface, it again buried itself in the sand with incredible rapidity.

“These are sand-eels,” said Léon. “Their muzzle acts as a spade and digs for them retreats in the sand



SAND-EEL (*Ammodytes tobianus*, Cuv.).

where they are perfectly safe, supposing no fishermen come to dislodge them.”

“And is it edible?”

“Yes, you gourmand, it is edible when you can get enough of it. The fishers, however, prefer to use it as a bait for their lines.”

“And that old man yonder, making holes in the sand with a spade, surely he cannot get very much all alone? Ah, what a nasty worm! Perhaps that too is for fishing.”

A score or so of worms were wriggling in the old

man's receptacle. It was singular to notice that each one had a constriction near the middle of the body, and the second part was not so thick by one-half as the first part was. In fact, it looked like two worms, a large one and a small one, fastened together end to end.

"And what in your scientific jargon may be the name of this monster?" asked René.

"*Arenicola piscatorum*."

"A fine name, certainly—euphonious, and easily understood: *arenicola*, an inhabitant of the sand; *pisca-*



LUG OR LOB-WORM (*Arenicola piscatorum*).

torum, sent into the world for the special benefit of fishers. You see that at the proper moment I can be an etymologist. But tell me what are these tufts of small hairs disseminated over their bodies? It can scarcely be to prevent them from taking colds."

"No, the tufts of hairs are not the furs of the lob-worms; they are really their branchiæ, or respiratory organs, if you prefer that term."

"How droll! So that, according to you, these sea

worms breathe through the sides of their bodies and by means of their hairs ! ”

Léon might have replied that in many creatures, especially in worms and gasteropod mollusca, the respiratory organs are placed in most peculiar positions—in Tritonia, Glaucus, and Scyllæa, on the sides, in Aplysia on the back, and in Doris on the end opposite to the head. He would probably have made this learned dissertation, but was deterred by the fear of some ironical or sarcastic reply from his cousin.

But the latter was at the moment occupied with an interesting experiment. He had taken a worm from the fisherman and had placed it on the damp sand. The worm, extending its proboscis, rapidly buried it in the sand, then, by contracting the proboscis at the bottom of the hole, the rest of the body followed, and in a few seconds the worm had entirely disappeared.

“A pleasant journey to you ! ” said René. Then in a lower voice and with a sententious air he added, “And, really, it seems appropriate that an animal that buries itself by means of its proboscis should breathe through its sides.”

The rising tide was gradually covering the sands, driving the fishers before it. From under every stone little crabs made their appearance, directing their side-long courses towards their special element. René,

while walking, stooped from time to time to look at them, and, his curiosity being sharpened, he plied his cousin with questions.

“Are star-fishes animals?”

“Yes, of course.”

“And how do they live?”

“Come along, I will tell you afterwards.”

“And this pretty plant, without any stalk, with coloured petals, blossoming in this pool of water?”

“This plant is an animal, and the animal is called a sea anemone. But come along, or you will see that we shall be caught by the tide.”

“Really, really? Well, now, I have a great mind to pluck it.”

“Well, pluck it and see!”

But as he stretched out his hand to take it the anemone quickly closed itself, leaving externally only the appearance of a gelatinous shapeless mass, not, however, without having first squirted a jet of liquid into the face of the young inquirer.

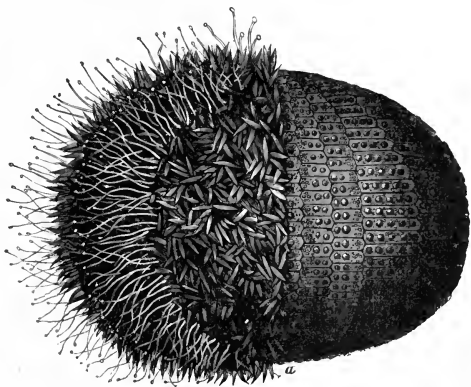
“Not polite, dear beast, not at all polite!” And laughing at his misfortune, the two young men quickly made their way towards home.

Uncle Bob was waiting for them at the door. “Eh, well, have you had a successful fishing to begin with?” he asked.

“A very poor one,” said René, “three crabs, one star-fish. Ah! but I was forgetting; we have also

captured a sea-urchin, a beast which possesses on its own account almost as many feet as a whole squadron of cavalry, horses included. Where the deuce have I put it? Oh, here it is, but the feet are left behind on the road."

And indeed, owing to the friction of the pocket, the



"THE SPINES OF THE SEA-URCHIN HAD FALLEN OFF."

spines had fallen off. At their point of attachment series of tubercles were left like lines radiating from the summit to the base of the creature.

The sea-urchin being itself a little smashed, some parts of its interior could be seen, formed of small pieces arranged side by side.

"It is an ill-wind that blows nobody good," said

the doctor. "This fracture will enable us to learn how sea-urchins are able to grow."

The two young men drew near with an air of curiosity.

"All these plates," said the old doctor, "are maintained, as you may see, by a very thin pellicle; this skin constantly secretes a calcareous substance round the plates, which on this account all increase in size together. It is by a similar, though much more complicated process, that the growth of animals and man is carried on. A small quantity is unceasingly being added to the existing material, and the young animal, or the young man, as the case may be, grows from one year to another without being aware of it."

"In my own case, I may frankly admit," said René, "I have hitherto grown somewhat after the same fashion as that in which M. Jourdain wrote prose—without knowing how."

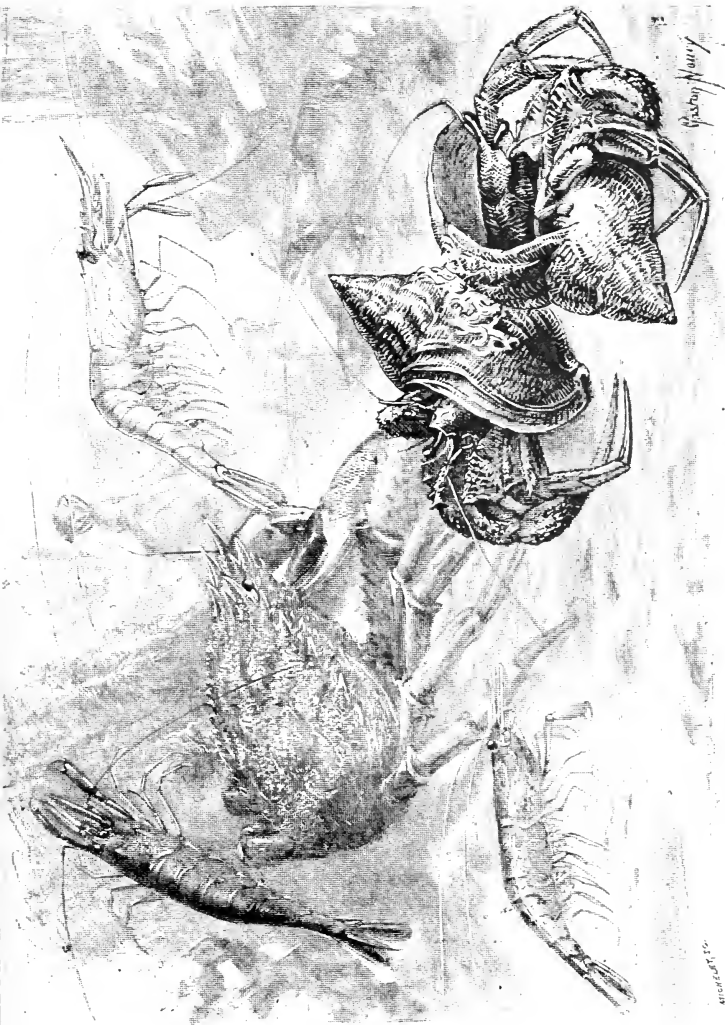
Léon, for some moments, had been meditating.

"What are you thinking of?" asked his cousin.

"Nothing of importance; a strange coincidence: we have seen in our short excursion the principal types of the animal kingdom."

"How, then?"

"You shall hear: the fishes, ourselves, and the sand-eel are representatives of the branch Vertebrata."



SPIDER CRAB (*Maia squinado*, Lat.).
SHRIMP (*Crangon vulgaris*, Fab.).

PRAWN (*Palaemon serratus*, Penn.).
HERMIT-CRAB (*Pagurus bernardus*, L.).

Gaston May

"Are the representatives!" cried René. "I really think you do the sand-eel a great honour."

"We have seen the Annulosa in two of their chief forms: crabs (*Crustacea*), marine worms (*Annelida*).

"The shells on which we walked, and which make up a large portion of the sands, belong to the Mollusca.

"Finally, the star-fish, the sea-urchin, and sea-anemone are clearly and unmistakably radiates. So that you see the collection is complete." *

"I see that I do not yet see. How are the radiates distinguished?"

"By the fact that their organs, instead of being arranged on either side of the body in pairs, are grouped round a central axis, so as to give rise to a radiate or globular form."

"Very good. And the Annulosa?"

"The Annulosa have a higher structure: their organs are arranged in pairs, they have no internal skeleton, but their body is made up of a series of rings placed one behind another, sometimes soft, as in the case of the worms, but more often hard (in insects), even shelly (in most of the Crustacea)."

* The four branches here indicated as composing the animal kingdom are those proposed by Cuvier, the great French naturalist. Modern zoologists have divided some of these groups, considering them not to be sufficiently natural, and nine primary divisions of the animal kingdom are now accepted, viz., Protozoa, Coelenterata, Echinodermata, Vermes, Arthropoda, Molluscoidea, Mollusca, Tunicata, and Vertebrata. Some, however, do not adopt the division of the Mollusca into three groups, and accept only seven sub-kindoms.—TRANSLATOR'S NOTE.

"The vertebrates, to which we ourselves have the honour to belong," added René himself, not wishing to pass for a complete ignoramus, "possess all of them an internal skeleton, of which the most important part is the vertebral column, or spine."

"All, or nearly all."

"What! are there then vertebrates that have no vertebræ?"

"Only one kind: an unfortunate little fish, the *Amphioxus*, is in this anomalous condition, as if to prove that all classifications are artificial—made, in fact, by learned men for their own convenience, and that in nature the transition from one type to another is never abrupt, but occurs in a gradual manner."

"As to Mollusca— But I am afraid we must not attempt to study them to-day, for want of examples."

"On the contrary, here are some splendid specimens," said Uncle Bob, opening the door of the dining-room, and pointing to a pyramid of oysters, with their ponderous shells, heaped upon the table.

III.

The beginning of conversion—The star-fish—A curious invasion—A way of eating and a way of running, by no means proper—Absorption and afterwards—Numerous posterity—Animals that double themselves by division—What may be seen on a shell—An aquarium in miniature—Fairyland in a glass of water—What may be found in oyster-water—Uncle Bob himself asks to see—Excursion in a new world—A fantastic waltz—By what means the infinitely small manage to play an infinitely large part—A good thing from Michelet—The conversion become decided.

DURING the repast René spoke but little. This strange world, of which he had just caught a glimpse, could not but more or less disturb his mind. A little ashamed of having hitherto scarcely even suspected its existence, he felt his usual carelessness opposed by the desire of knowing, and of being himself able to explain.

That unseen enigma, that insoluble problem—life, in its wondrous manifestations, was already attracting him with its mysterious power. There was then after all in natural history something more than a mere glossary of queer words, and it might be possible to inquire into the lives of the beings that surround us with the same sort of interest that one feels in following the plot of a play at the theatre.

"At any rate," he mentally concluded, "as there is nothing better to do I can but try it, and if it should prove that I have not in me the stuff of which a naturalist is made, I can forget it all when I enter the express train on my way back to Paris."

In this state of mind he went out into the garden, accompanied by his friend Léon.

Almost directly his foot touched the star-fish that they had recently brought from the shore, and that now lay motionless near the door of the workroom.

"You told me that this what-do-you-call-it was a radiate animal. Cannot you tell me something more about it?"

"Why trouble yourself about it?" said Léon, smiling. "You have already learned that it is not for eating."

"We do not eat it, I understand well, but I should suppose it must eat for itself."

"Undoubtedly, and in a most curious fashion."

"As if there could be fifty ways of eating. I am myself only acquainted with one—the true, the only way, as in point of fact we have just exemplified: putting food into the stomach by introducing it to the mouth, and if you are greedy or in a hurry, doing it by two mouthfuls at a time."

"The star-fishes know better. The stomach itself adopts the plan of coming to the food. Notice in the centre of the fish, in the white part, an opening. Press

a little. Good; there is the stomach. At first sight it has the appearance of a transparent mass divided into five equal parts; and yet I am not acquainted with a gizzard of greater power than it. Last year I had an opportunity of observing the devastation committed on a bed of mussels by star-fishes. They had settled on them by millions; all the rocks were covered with them, and from a little way off appeared quite



STAR-FISH (*Asterias*).

red. When an *Asterias* wanted its breakfast, it came dragging along by the aid of its ambulacral feet and rested its stomach on the hinge-joint of the shells of a mussel. In a few minutes, by the action of the gastric juices, the muscles of the hinge were dissolved, the stomach penetrated between the shells of the mussel and carried on there a suction so powerful that in a brief time nothing remained of the mussel. The foot itself, although so difficult to detach, shared the same

fate as the other parts. The stomach of the ogre then returned to its normal situation and the *Asterias* made a fresh move to satisfy its appetite. So thoroughly was this done, that in the course of a few days all the mussels in the locality were exterminated."

"What an appetite! This suggests to me another question, not a very delicate one. I understand now how they eat, but—what happens afterwards?"

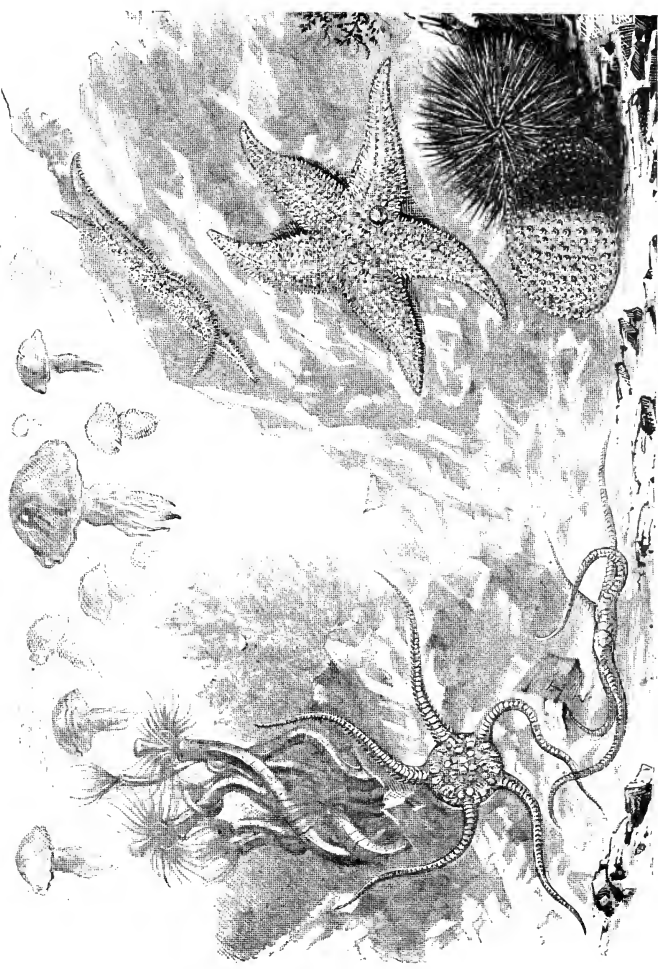
"The sequel is of primitive simplicity. The stomach having come out to take its meal, comes out again, when digestion is completed, to free itself from the residue. In this way it is never troubled by dyspepsia or digestive pains. The star-fishes, I may say in passing, have not taken out a patent for their digestive process, or the sea-anemones do the same thing. Another peculiarity I must show you: each star-fish is a real Mother Gigogne. Look," and with a stroke of his knife Léon opened one of the rays of the star-fish.

The inside was filled with eggs, not larger than a pin's head.

"How many eggs do you think there are in this one ray?" asked Léon.

"At least two or three thousand."

"About that; there are ten or fifteen thousand in the whole animal. But all the creatures of this kind have another and still more curious way of increasing their numbers. Sometimes one of the rays of the



RADIATES.

Serpula.

Ophiura.

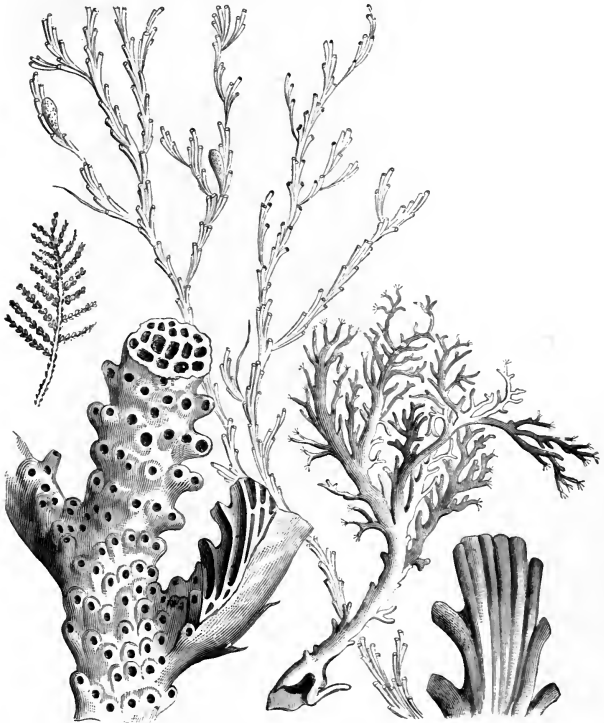
Rhizostoma.

Star-fish.

Sea-urchin.



Asterias becomes detached, or a portion of a sea-anemone is broken off. At the end of a short time the



Stony Coral.

ZOOPHYTES.
Sertularia.

Cellularia.

mone is broken off. At the end of a short time the

wound heals, a new ray is formed, and no trace of the accident remains. In due course the amputated part, instead of drying up, throws out buds, and completes itself so well that the end of the injured



BRYOZOA (*Moss-animals*).

Asterias is that it is replaced by two whole and healthy individuals.

“From this you may guess something of the prodigality of life in the bosom of the ocean. Do you wish another example of it? Here, then, is an entire aquarium formed by a simple shell.”

In a small glass vessel, the bottom of which was covered with sand, there was to be seen one of the valves of a St. James's shell. On its rough surface this shell bore a strange population: some Escharæ, like stony concretions of rounded form, projected their almost innumerable arms on every side, and these moved themselves in all directions in order to seize their unseen prey; sertularians and cellularians, with finely divided branches, erected their miniature fronds in the water, covered with polypes like little flowers; while fixed to the shell some of the tube-dwelling worms, twisted Spirorbis, Serpulæ of whimsical forms, displayed their many-coloured branchiæ at the extremities of their calcareous coverings.

Some other more fragile annelids were lodged in the sand—Terebellæ, Sabellæ; these had no calcareous covering, but grains of sand and fragments of shells agglutinated round their bodies formed a mosaic clothing that almost entirely concealed them. René, assisted by a powerful lens, examined all these details minutely.

"Do you know what I shall call that," said he. "It is really fairyland in a glass of water."

"Would you like to see now fairyland in a drop of water? Here is some water from the oysters that you found so good. Let us look for a little at what it contains after it has been kept a few days."

The microscope was brought out, and placed in a

properly lighted spot. Léon put a drop of water on a glass slide and arranged it under the object-glass.

“I also should like to see,” said the doctor, “for this is among the sights of which one never tires.”

It was indeed a marvellous exhibition. In this drop of water, scarcely larger than a pin’s head, there

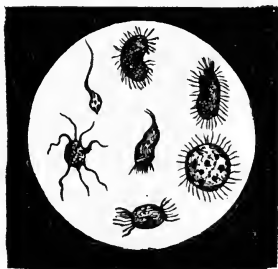


SERPULA.

was quite a world of animalculæ, in a state of activity like a Parisian crowd on the boulevards during a holiday. Owing to their transparent bodies, the organs of these singular animals could be seen, and these microscopic beings, veritable protei, constantly changed their shapes, sometimes elongating themselves extremely, and sometimes becoming as round as a ball, and the whole twisted and whirled about, with-

out apparent object, and as if engaged in a fantastic waltz.

“The infinitely small,” said the doctor, “perhaps more bewildering than the infinitely great. These are among the largest of the beings invisible to the naked eye; and what lies beyond them? However much our optical instruments are improved, however much the field of our investigations is extended, always and



ANIMALCULE IN WATER.

always new beings are discovered whose existence was before scarcely suspected, and we find ourselves still on the threshold of a world that we know not yet.

“And none the less this unknown universe surrounds us closely, penetrates into ourselves, and develops itself even within us. It sometimes forms the very ground we tread on. I was reading only to-day that

at Bilin, in Germany, they have discovered a bank of tripoli more than forty feet thick and extending over a considerable distance. Well, this tripoli is almost entirely made up of diatoms. Ehrenberg, the microscopist, has succeeded in measuring them, and calculates their number to be about forty millions in a cubic inch.

“That is something striking, is it not, my friends? Does it not almost make you dizzy, and affect your imagination with a sort of awe—the sentiment, in fact, expressed in this profound saying of Michelet: ‘In fathoming so profoundly the depths of life I expected to meet with physical necessities, but what I do find is justice, immortality, hope!’”

While speaking, the countenance of the doctor was gradually transfigured; his eyes beaming, his head slightly thrown back with the effort of thought, he was standing leaning on the table, not like a scientific man making an investigation, but rather a poet inspired.

Justice, hope, immortality! These, then, are the supreme lessons of nature. This sayant, who had so often contemplated the implacable working of death, still spoke of immortality; this aged man still spoke of hope! The two youths listened meditating, deeply affected by his tremulous voice.

A complete silence prevailed. Léon was the first to break it.

“And are you always longing for the casino or some pigeon-shooting?” said he to René.

“How soon shall we make our next excursion?” was the only reply.

Léon was on the point of speaking, when a violent ringing of the bell was heard at the garden gate.

VI.

A new character—How a man sometimes looks like a *Mister*—Father Lucas—His start in life—He had been several times round the world, without thinking much of it—Return to the native land—What Father Lucas calls his shepherd's round—Why Léon entertained so high an opinion of the old fisherman—Unexpected news—Uncle Bob does not say all he thinks.

A MAN past middle age, stout, and notwithstanding his years still hale, of serious aspect, and somewhat embarrassed in his movements, owing to his best Sunday costume, presented himself at the door.

The country folk, who are sometimes as apt as the professors themselves in distinguishing genera and species, are well aware of a profound distinction existing between a man and a sir or mister. The latter, who may be at once identified, even by an unskilled eye, usually wears a suit of cloth of more or less elegant cut, and is invariably crowned with a hat.

The equipment of the man, on the other hand, is made up of a blouse or stuff jacket, a cap flat or peaked, or a wideawake hat, wooden shoes or nailed boots, more or less thick according to his occupation.

Our new acquaintance might have been defined as “a *man* dressed like a *mister*.” His trousers of blue

cloth, far too large, flapped about his legs, which were kept wide apart from the habit of accommodating himself to the rolling of the ship, and under his dress coat, the large tails of which commenced almost at the shoulders, there could be seen a thick vest of brown wool.

He wore a felt hat pushed down as far as his ears, as if to guard against the wind, and his thick grey hair was coarse and rigid, like the coat of the wild boar.

Add to this, that, as a curious bit of vanity, he wore in his ears small gold rings, from each of which there was suspended a little anchor, and that his countenance, tanned by constant exposure to the sun, was surrounded by whiskers and a beard almost completely white, and you will have a tolerably faithful portrait of the new arrival.

The doctor took some steps towards him. "Father Lucas!" he said, and gave his hand to the old sailor as if to encourage him. "But you are rigged out in your best and got up in grand style! Something unusual and important must be going on."

"Yes, Mister Doctor," replied the old man, turning his hat round by twisting it between the fingers in which he now held it. "I would even venture to say, sir, by your permission, something very serious."

"Let me hear about it," and Uncle Bob opened the door of his study.

"Well, what I wanted to say—" The door then closed.

"Who is this old sea-wolf?" asked René, somewhat surprised at seeing his uncle receive a common sailor with so much familiarity.

"A brave and noble-hearted man," replied Léon.

This old sailor was indeed a brave man: on great occasions he wore on his breast several medals, dearly bought by his courageous acts.

A cabin-boy from his cradle, like the other sailors of this coast, and apprenticed amongst his father's crew, his earliest memories were those of a fisher's boat, where he slept amid the damp nets, the spare sails, or the empty hampers. At sixteen years he was perfectly familiar with the navigation of his native coasts, and when a little later he entered his country's navy, the bluejacket had soon become a thorough sailor.

Such countries as Australia and China, seemingly most likely to cause astonishment, had been seen by the young sailor with an uninterested eye and without any feeling of surprise. The old sailors, during their yarns in port on Sundays, or on evenings at sea, while the nets dragged slowly through the depths, had spoken of such things and many others. His education had begun and ended in the year of his confirmation. Naturally he had but little imagination. Thus the many nations, black, yellow, or bronzed, he

became acquainted with during his voyages interested him but little. "Skin, more or less dark, clothes of a little different fashion: except that, people like you and me," these were all his ethnographical ideas.

And yet, notwithstanding his apparently unemotional disposition, the love of his native soil had gradually made itself felt, and had ended, as is so frequently the case with sentiments of a painful nature, by becoming a fixed idea by which he was completely possessed. He continually remarked, "All that is not worth Trouville." In his childhood his curiosity made excursions into strange lands; now that he had the lands themselves before his eyes he saw them almost without notice. His thoughts went to and fro continually between Courseulles and the bay of the Seine, the two spots that he knew so well but should perhaps never revisit. Often and often, when he sailed amidst the verdant isles of the interior sea of Japan, some touch of landscape, some tree, some trifle, would lead him back to his favourite idea. If some pagoda reared in the distance the outline of its quaintly sculptured roof against the azure blue, it recalled to him the great tower of Ouistreham or the twin steeples of Delivrande, and instinctively his ear would endeavour to catch the sounds of the evening hymn that the land breeze wafts to the sailor's ear. And often of a night, during the long hours of his

watch, while the vessel, with lights aloft, cleaved with its prow the phosphorescent waves, and was followed in its wake by a track of fire, Quartermaster Lucas, his elbow resting on the stern, his eye losing itself in the distance, would seek the two white lights of Hève, that gleam each night sweet and clear like the looks of a friend.

With such ideas, it will be understood that our acquaintance would prolong his time in the navy no more than necessary, and in fact he hastened, when his dismissal was obtained, to cast off the blue jacket and the lettered cap, to take up as in the past his interrupted fishing, to marry and found a family of sailors: it would be strange to see a sailor's son who was not himself a sailor. His prayers, however, were not at first all granted. Lucas had to begin with five daughters, and only after ten years had he the great satisfaction of seeing at last a son and heir.

At the time our narrative commences the five daughters are all married to fishermen. The wily Norman has them all established in different localities, so that almost wherever the chances of his seafaring may take him he is sure to find a good lodging and supper, besides the pleasure of seeing his child. This he calls his "shepherd's round."

His son had terminated this very year his service to the State.

Léon sketched in a few words these details for his

cousin. He had certainly the best of reasons for holding the old fisherman in high esteem, having been himself brought back by Father Lucas one day when a treacherous current had carried him too far from shore. Although an excellent swimmer, Léon could no longer struggle, and was hastening, or rather floating, to a certain death, when Lucas in his clothes, just as he was, leaped into the water and brought him safely back, with considerable danger to himself. All the efforts of the doctor had not availed to induce the old sailor to accept any reward for "so natural a deed," but from this day forward the saviour of Léon had the free run of the cottage.

When the interview was over the doctor opened the door and Father Lucas said to Léon—

"By the bye, I have stranded my boat between the baths and the cliff, and I think you will find something to collect there. I was obliged to do it, for it is my last trip."

The young naturalist looking at him with an air of astonishment, he added, half closing his eyes :

"Yes, it is settled. I am to part with my business."

"Is it possible! And who is to be your successor?"

"My son, thank heaven!"

In this "thank heaven," there was an accent of fatherly pride as well as a touch of regret.

To give up after half a century of efforts his unceasing wanderings on the ocean, no more to leave the dry land, was a trying change of habits for the old sailor, and a sacrifice rather than a relief.

The poor old man seemed already to foresee that while his son would be afar off, and himself fixed at home like a useless being, he should often feel a longing for the sea, and would miss the waves with their spray striking his face and seasoning and hardening his countenance.

Again, and this not the least of his regrets, he must give up seeing so frequently the numerous descendants who loved to clamber on his knees, for paid voyages cost much, and by a strange anomaly there is no one in the world more stay-at-home than a sailor compelled to give up seafaring.

As soon as father Lucas was gone, the doctor made his way to the railway station at Trouville, while the young folks, following the advice of the fisherman, went on board the *Emily*, stranded on the shore, to obtain a supply of molluscs and crustaceans.

When the doctor returned in the evening, the two cousins were not a little surprised at hearing him make a long dissertation on the subject of fishing-boats, and at his explaining the differences between "a tub" and "a plate," a clincher-built yawl and a plain yawl, with the thoroughness of one to the manner born.

What can Uncle Bob be thinking of? Is it possible that the doctor has somewhat tardily decided, now that Father Lucas has retired from the sea, himself to leave the hospitals of Paris and drift along without any special occupation?



V.

A varied harvest—The sea-mouse—A microscopic array—Tricks of the chase and of war—Crustaceans and Kabyles—Changing armour—The danger of disarmament—Science disconcerted—Sacculina and its wonderful transformations—Ophiura—Holothuria—Chinese cookery—A suicide—The hermit-crab—An unedifying biography—An invitation.

THE collection made on board the boat had been superb, and in the receptacles that the cousins had taken care to provide themselves with, there accumulated one after another sea-mice with brilliant and silky fleeces, Chitons with imbricated carapaces, that is, coverings formed by scales arranged after the fashion of the tiles on a roof. Then various kinds of shell-fish: Oxyrhynchi with delicate bodies and spider-like legs; hermit crabs of greedy movements, only half covered by their shells; Dromiæ with grey and velvety shell and rosy claws; spider-crabs, whose curious carapace contains amongst the inequalities of its surface quite a world of seaweeds, of polypes, and of moss-animals—a marvellous sight when well examined with the aid of a glass; and in addition a strange collection of the lower animals. Holothurians, called by the fishermen sea-cucumbers, because of

their elongate shape ; radiates* masquerading in the form of molluscs ; ophiurians with long slender arms radiating from a central disc ; Solasters, great star-fishes with twelve broad rays, and of a yellow colour, thus looking like so many suns.

In less than a quarter of an hour their receptacles were filled, and, well-contented, they retraced their road to the laboratory.

A sea-mouse was the first specimen that found its way on to the table.

As René was examining its varied tints with much delight—

“ Look,” said Léon, “ how formidably this annelid is armed ! ”

And with a pair of curved scissors he cut off some hairs from the *Aphrodita*, and placed them under the object-glass of the microscope.

Everything in the way of harpoons, of pointed instruments, of straight and curved sabres, of cutting and perforating arms, that an armourer could imagine, was there represented—a microscopic panoply.

“ Your annelid is quite a walking arsenal,” cried René. “ But what a singular mania for a villainous grey crab ” (this far from flattering epithet related to the *Dromia*) “ to make himself an overcoat with seaweeds.”

* The sea-cucumbers belong to the Echinodermata, and are now, therefore, removed from the Radiata by naturalists, though they were united therewith by Cuvier.

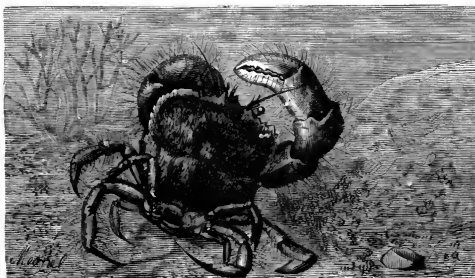
And in point of fact the Dromia, like the spider-crab,



“QUITE A WORLD OF POLYPES ON THEIR CARAPACE.”

is frequently covered with living animals and seaweed that it carries about on its shell. There is, how-

ever, this difference between the two: the *Dromia* is said to be provided with special claws for planting the creatures on its own back, where they grow and sometimes completely cover it, while in the spider-crab the growth may be due to natural causes. The result, however, is the same, and enables stratagem to supply the place of agility, for thus covered they are able



DROMIA (*Dromia vulgaris*, Edw.).

to remain concealed and motionless until some prey shall venture within reach of their claws.

In connection with this it will be recollected that during the conquest of Algeria the natives on several occasions made use of a similar stratagem, and that 'walking bushes' glided unharmed during the night into the midst of the advanced guard. These children of the desert were no doubt proud of their invention, and had no idea that they were merely imitators of the miserable crabs. There is nothing new under the sun !

René had been reflecting for a few minutes, and now made up his mind to speak.

"I was thinking— Ah ! but you know I am only a stupid fellow, and know nothing of these things. You won't laugh at me ?"

"Speak out, and you will see."

"Very well. Uncle Bob explained to us the other day the mode of growth of animals—of everybody, in fact. But how do the crustacea, as you call them, all this series of creatures with rigid carapace, clothed as it were in armour, manage about this. It strikes me they must feel remarkably uncomfortable when their costume becomes too small for them."

"And it so happens that these armour-bearers do not grow in the same manner as other animals. The metamorphoses of insects with their unyielding integuments, and of the crustaceans with their rigid carapaces, are in fact a peculiar mode of growth : they grow by stages.

"Thus the lobster before it becomes large enough to grace our tables, and to undergo the posthumous honour of *la mayonnaise*, has had to pass through about a score of moults. This is the reason why you have never met with a really infant lobster. Their appearance quite changes as they grow up ; indeed, this occurs to so great an extent, that up to the fourth moult they swim by whirling about, and they are thirty or forty days old when they first fall to the

bottom and become walk-about animals for the rest of their days. Other crustaceans, before attaining their final form, pass through analogous metamorphoses.

“The moulting time must be, I should think, a most disagreeable moment in the existence of these creatures. As a rule, the crustacean with his armour, like a knight of the Middle Ages, fears, so to say, no thing nor person. It sometimes happens that he leaves a claw or a leg on the field of battle, but he accepts his loss like a Stoic; it grows again, and he knows it. But as soon as he has shed his armour the position is quite different; while awaiting for his new cuirass to attain the necessary solidity, this creature, who was himself quite recently an insatiable Gargantua, becomes a dainty mouthful for all sorts of creatures, including occasionally some of his own kindred. Crustaceans have not the conscientious scruples of wolves, who, so they say, do not eat one another. It is worth seeing, at the moment of moulting, how carefully they conceal themselves for fear of having to submit to the same fate as that to which they have submitted so many others.”

“A fair requital, as things go here below,” said René philosophically. “If it were not for that the lot of a crustacean would be a too happy one.”

While saying this he was amusing himself by turning over on the table a great crab, whose hind-body was covered to a considerable extent by a sort of

transparent moss, something like agglomerated soap-bubbles.

"Sacculina," said Léon; "a singular parasite of the crab, and one that has for a long time defied the perspicacity of the learned. Indeed, it was only last year that its exact history was discovered."

"Something new, and yet true! Let me hear it."

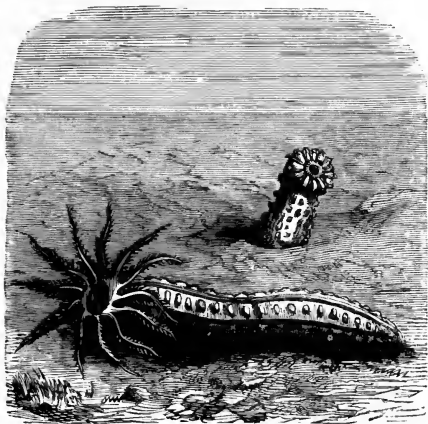
"With pleasure. The Sacculina, whose entire body is not represented by this moss that you see, commences by being a microscopic crustacean, a Cypris, who comes quietly, and as if meaning no ill, and fixes itself by one antenna to the still tender hind-body of the quite young crab."

"Capital! And what next?"

"Then it undergoes a change. As the habitation seems to suit it, and it has no desire to seek its fortune elsewhere, it establishes itself in this position, casts off its legs, no longer of any use to it, and replaces them by a hollow needle of peculiar structure. And it is by the aid of this organ, which is a perforator, though itself pliable, that the heretofore Cypris, turning its outside inside, like a glove or stocking, glides gradually into the interior of the crab.

"After this it can give up active life and live like a lord. It finds in the interior of its host both bed and breakfast, and this new arrangement suits it so well that you may almost see it waxing fat. This it does so thoroughly that its apartment soon becomes too

small for it, and it is obliged to leave some part of its person out of doors ; this part you see, and this is what the learned term Sacculina. I must not omit to mention that this discovery is due to a French pro-



SEA-CUCUMBER (*Holothuria*).

fessor, M. Delaage, and that it cost him three years of observation and experiment.

“Let us now pass to another ;” but as he was taking out of the box a magnificent *Ophiura*, the creature unfortunately all at once became broken.

“Confound the animal ! Would you believe,” added he, addressing his cousin, “that I have collected at least thirty specimens of this creature, and that I

have not yet secured an unbroken one. Sometimes a ray detaches itself, sometimes the disc breaks up. *Ophiura fragilis* is a well-applied name. Let us hope I shall do better with the Holothuria.

“This is another extraordinary being, with retractile feet and a mouth armed with tentacles disposed in star-like fashion. But the internal organisation is the most curious feature in this creature. For example, the digestive canal, in which the stomach is represented by a very slight swelling, ends in the Holothuria in a small bladder containing—you will never guess what—the breathing organs.

“In this country holothurians, or sea-cucumbers, are known only to fishermen and naturalists, and no one suspects that they are the objects of a considerable commerce in the far East.”

“Do you mean to say any one buys such a thing as that? And, gracious heavens, what for?”

“For the manufacture of confectionery that sells at improbable prices in China and Japan. It is a special feast of the yellow-faced mortals. But, between ourselves, even I must admit that, all things considered, I should prefer something else.”

While he was speaking, the cucumber, possibly disgusted at the depreciatory remarks that were being made about it, suddenly expelled with violence all the fluid it contained, as well as a portion of its alimentary canal.

“Alas, another suicide!” said Léon, “and I believe it was our last remaining specimen.”

But as he turned his botanical box over, a large hermit-crab concealed in a corner fell out of it on to the table.

“The last is the best,” said the young naturalist; and, taking hold of his captive by the shell, he continued: “Here we have the most depraved, the most immoral, the most cynical, of all the banditti and corsairs of the sea.”

“And yet bearing a venerated designation,” said René timidly.

“Yes, but very inapplicable, unless you are willing to imagine that the stolen shell it bears upon its back is a hermitage.”

“Stolen! Is the shell, then, not its own making?”

“It is completely incapable of making anything whatever. This hermit is the personification of laziness, and a shameless parasite, living at the expense of all about him. However, we must not forget (for justice is a good thing even in the case of shell-fish) that nature has been a little unkind to it. Its body is, in opposition to that of all its allies, soft and undefended by armour, except on the head, legs, and claws. Now look.”

And lighting a match he slightly warmed the shell. The effect of this proceeding was soon apparent: annoyed by the heat, the hermit hurriedly left its

abode and shuffled about on the table in a most awkward fashion.

"That is the best way of forcing it to give up possession," said Léon. "Treated in any other way it is so obstinate that it would allow itself to be torn in pieces rather than quit. Obstinacy, however, is one of the least of its faults.

"It makes its debut, when still young, by an assassination. Scarcely out of its cradle, it seeks a shell of fitting size and instals itself therein, after having as a fit preliminary devoured the owner. Then, undeterred by any remorse, it starts to seek its fortune, pillaging on all sides after the manner of the troopers and freebooters of the good old times."

"A hermit certainly very like a vagabond; but, when his shelter becomes too small, what happens?"

"He settles the matter at once by stealing another. Probably at first he took possession of a Turbo shell; now that he is stronger it is probably the shell of a whelk or Buccinum that he seizes. The hermit does not allow himself to be embarrassed by so trifling a matter. I am acquainted with a collection in which there is a hermit that was found in the tropics, and has taken up his abode in a great helmet shell, such as you may see in the window of a natural history dealer. The claws of this hermit measured more than eight inches.

"The animal is by no means one of restricted tastes,

and if you place at its disposal in an aquarium some snail-shells of suitable size, it will take advantage of the opportunity and instal itself in one of them without the least bashfulness. In the soundings made at great depths in the Atlantic, hermits were met with that, probably because they could do no better, had



“A HYPOCRITICAL OLD FELLOW.”

excavated lairs for themselves in the bodies of sea anemones.

“Now you have an account of these hypocritical old fellows, and you will admit it is far from edifying. So we will change the subject. To-morrow I propose that we make a party for some shrimp-fishing at low

water, and if Neptune and the west wind favour us, we shall have a harvest. I say no more at present."

Meanwhile Uncle Bob had entered, and with a happy face.

"All is going well," said he, as if talking to himself. "By the way, do you know what Father Lucas told me a little while ago? His son is to be married next Wednesday, and requests us in due and proper fashion to be present at the nuptial ceremony. You may be sure I have accepted for myself and for you too."

VI.

Start for the fishing—The surprise of Black—A chameleon of the waters—Two lines from *Déroulède*—The cuttle-fish's gift of tears—A strange locomotive apparatus—Black dyed afresh—An ink used for writing by the ancients—How Cuvier wrote and drew the figures of his "*Memoir on Cephalopoda*"—The cuttle-fish bone.—Classification of the mollusca—The spoils of the net: sea-scorpion, fishing-frog—Stomach-fishing—Twice eaten—A singularly placed carpenter's tool—Progressive wry-neck—A demented one—Sad accident—René wounded.

PUTTING into execution his project of the previous day, Léon, carrying a net, and taking with him his cousin who, like himself, carried a basket slung over the shoulder, gave the word for an early start. As they left the cottage, Black, without waiting to ask for leave, raced on in front and appeared to thoroughly approve of this morning-walk.

The two young men were dressed nearly alike: flat woollen cap, jacket closed in front, knickerbocker trousers—equipments showing, in fact, that their fishing intentions were of a serious nature.

A keen observer would not, however, have failed to notice an evident difference between them. Léon, looking browner than ever in his well-set-on red bonnet, was provided with a basket of refreshments,

and in addition, like a true naturalist, had not forgotten to take some large flasks, whose necks stuck out from the pockets of his jacket.

His somewhat heavy net was well constructed, "a net for a true fisherman," said Father Lucas, who had been entrusted with its manufacture; but our young enthusiast did not appear in the least encumbered by its weight.

René somewhat pale, in a blue bonnet, gave the idea of an operatic Masaniello, and to complete the resemblance, he carried by his side a very miniature fishing basket suspended by a red ribbon, and flourished about with grand gestures a net with long handle, but itself only about the size of one's hand, the smallest, in fact, that he could find.

The Parisian liked fishing but detested fatigue.

Suddenly Black who, as we have said, was somewhat in advance began to run round a small lake left by the ebbing tide, and to bark vehemently.

"What can the dog be doing?" said René, "can he too be making discoveries in natural history?"

They approached, and what they saw might well astonish any dog, or even one who was, like the owner of Black, in search of strange fish. In this novel aquarium there was an animal of strange form swimming about, and vainly endeavouring to find an exit to the open sea.

Figure to yourself a bag about three inches long,

surrounded by a broad border ; from this grey and gelatinous body a short tube came out, and above this a head of a shape defying definition, but recalling somewhat the head of an elephant, with two square eyes, whose iris gleamed like molten gold.

The trunk (if we may so call the curious appendage at the end of the animal) was abruptly divided, forming eight short elastic arms, furnished with suckers. Two other processes, longer and more slender than the rest of the arms, each terminated in a swelling or dilatation covered with suckers.

The animal was no doubt greatly disturbed by the evolutions and barking of Black, for it continually changed its colour in an abrupt manner, at once reminding René of the two well-known lines of *Déroulède*—

“ Il devint tout bleu, de bleu devint rouge,
De rouge violet, et de violet, mort ! ” *

“ This introduces you to the cuttle-fish or *Sepia*,” said Léon. “ It is, like its cousin the Octopus, a great destroyer of crabs and small fish. These it seizes with its suckers as they pass, or perhaps destroys them by the stroke of its two clubs. Its beak you cannot see at present, as it is concealed behind its arms, but it is very hard and cutting (I speak from experience), and in shape is not very different from the beak of a parrot.”

* “ He turned quite blue, from blue became red.
From red, violet, and from violet, dead ! ”

“Very good; but that does not explain by what means the Sepia can so change its colour.”

“The method is very simple. In the interstices of the skin there are globules of different colours. And in accordance with the impressions made on the animal, these globules are expanded or contracted, and so produce the strangest effects.

“But the most curious point is that not only can the Sepia become pale and change its colour, but it appears also to have the gift of tears. At any rate, their eyes, like our own, are well supplied with lachrymal glands; but as for telling you what sort of event would be likely to bring tears from the eye of a cuttlefish, I must admit I cannot, for I have no trustworthy information.

“The tube which ends at the edges of the sac serves— But wait a minute, the creature itself is going to show us its use.”

The Sepia was just then close to the edge, and Léon stooped as if to take it up, and seeing this the cephalopod contracted the tube and ejected the water it contained, and the rebound caused by this was sufficient to take it to the middle of the pool.

“A most singular way of walking backwards,” said René, and then going roundabout he adroitly caught the Sepia in his net and laid it on the sand.

Black, who had watched all his movements, at once ran two or three times round the quiescent creature,

then suddenly stretching his legs, he leaped forward in order to seize it.

But the Sepia, too quick for him, ejected by its tube a thick black ink, that completely inundated the unfortunate Black.

The dog fled howling away, and without looking to right or left, made straight as an arrow for home. The two cousins were ready to die with laughing.

"Ah, ah!" cried René, "a useful lesson. That shows what one may get by quarrelling with those one does not know! Poor Black, discomfited and dyed by a cuttle-fish. However, come here, doggy, and I will console you. Black, Black!"

But the dog did not hear him. Continuing his headlong course, he was already disappearing amongst the first houses.

"I must not say much about it," added his master, "for I must admit I might have been similarly taken in myself. Who could have guessed that such a creature contained in its inside a syringe full of ink, ready for use against any rash person? There must have been at least a shilling's-worth. But I should like to know whether one could write with it."

"So well," replied Léon, "that in point of fact, the ancients scarcely knew of any other ink. It is only since their time that the progress of chemistry has enabled us to obtain other means of a more accessible and less costly nature for use on paper. Cuvier, I

believe, was the last to put the sepia ink to an important use. As a fit whim for a scientific man, he made use of it to write his memoir on Cephalopoda, and to make the drawings. But I say, we are not making a bad bag to-day. I had already some calamaries and squids, cuttle-fish allied to the Sepia, in my collection, and this specimen, after it has been prepared so as to render the organs visible, and placed in alcohol, will make a splendid specimen. The only portion of a Sepia I previously possessed was their flat bone, with which you are no doubt acquainted."

"What! do you mean to tell me that the flat biscuits given to birds to sharpen their beaks on are obtained from these fish?"

"The Sepia is not a fish."

"And yet it is not a radiate; still less an annelid; nor a mollusc."

"Why not?"

"Well, because the Sepia is far too knowing a creature, and far too complicated in structure, to take a place in the family of oysters and mussels; as I am sure Black would confirm if he could speak. And besides, as you know, the cuttle-fish have no shells."

"That is true, but their near relatives, the argonauts, have. Moreover, on such grounds the great slugs would also not be mollusca."

"Quite so, although I admit that it did not occur to me before. But then you neglected to tell me the

other day how the mollusca may be recognised and into what categories they are divided."

"The mollusca are, as their name indicates, creatures with soft bodies and without either external or internal skeleton, for it would be going too far to call the one bone of the Cephalopoda a skeleton. Some of them are uncovered, others are protected by a shell. They are divided into four classes: first, the Cephalopoda, which have the feet placed around the head. To these belong the Octopus, the Sepia, the squid."

"These certainly ought to be the most fleet of animals," interrupted René.

"? ? ? ?"

"Because they have always their legs on their neck." *

"Is it impossible to induce you to be serious? The second class is that of Pteropoda, a not very numerous group of animals inhabiting the great seas, having a fin placed on each side of the mouth: examples, Clio and Hyale. We shall not meet with any of them in the waters of the Channel, so I pass them by.

"Finally, the last two classes are named respectively the Gasteropoda, from the mode of progression of the animals that compose the group, the lower part of the body forming a sort of sucker or fleshy foot, by the aid of which they drag themselves hither and thither.

* René's joke is lost in translation. To "have the legs on the neck" is in English to take to one's heels. Thus the Cephalopoda are, in French, always taking to their heels, but in English this is not the case.

To this belong snails, top-shells or trochi, the cowries, the helmet-shells, and the buccini or Triton's shells. It is in this group that we find the mollusca of greatest beauty and most varied forms. Lastly, the

*Murex.**Haliotis.*

GASTEROPOD MOLLUSCA.

Acephala,* or if you prefer it, the molluscs that have no head.”

“Animals without a head! How absurd.”

“I am not joking. Have you ever seen the head of a mussel or of an oyster?”

“You are right,” said the Parisian, a little abashed at his own boldness, “but I admit this did not occur

* The name *Acephala* has suffered many vicissitudes since the time of Cuvier, and the group of mollusca without heads is now usually termed *Lamellibranchiata*, or by some *Conchifera*.

to my mind before. For this reason the Acephala may really be the most molluscous, the most stupid of all the mollusca. And indeed to pass one's entire existence in a closed box can scarcely be productive of much intelligence. But we have lost a good quarter of an hour between our mollusca and the Sepia, and the shrimps await. Advance, and let us try the fortune of the net."

And the two young men, up to their waists in the water, plied their nets on the bottom. The first attempt was successful; René brought up from the



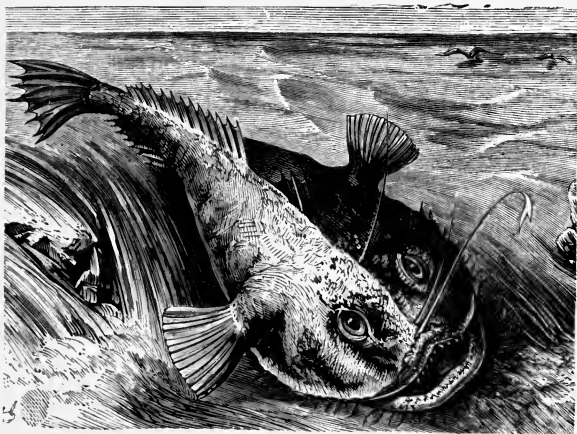
ACEPHALOUS MOLLUSC. RAZOR-FISH (*Solen ensis*).

bottom, besides a handful of lively, leaping shrimps, a fish with broad, spiny fins, and body covered with thorns. An enormous mouth was the accompaniment of an extremely broad head.

It was a bull-head, or sea-scorpion (*Cottus scorpius*), a veritable Quasimodo in the watery world. This fish is rejected by the French fishermen on account of its small size and very oily flesh. But in some parts of Norway, where the Cottus is very abundant, an oil is extracted from its liver, and is probably credited to the cod and sold as such.

Both in France and Norway the sea-scorpion, as

depraved in morals as it is unprepossessing in appearance, belongs to the detestable fraternity of loiterers and prowlers. Lying in ambush behind some bunch of seaweed, like the parties in question concealed in a doorway, it throws itself suddenly on some fish who may be passing near unsuspecting of any danger ; and



FISHING-FROG (*Lophius piscatorius*, Lin.).

its multitudinous misdeeds have earned for it the cognomen of sea-devil, a name which it shares, however, with the fishing-frog (*Lophius piscatorius*, L.).

“This again is another wily and knowing fellow. You must often have seen this large fish in the markets; it has a repulsive appearance, a very broad

body with an enormous mouth surmounted by two long filaments terminating above in bright, shining surfaces. Possibly even you may have asked yourself what means a fish of such awkward form and appearance could adopt to satisfy its hunger.

“Well, it is done by counting on the faults of other fish, in the same way as man himself only too often takes advantage of the vices of his kind. The fishing-frog spreads its snare, relying with good reason on the greediness and inquisitiveness of its neighbours. Buried in the mud, it vibrates the filaments above its head, until some fish thoughtlessly comes loitering around this novel bait. Then—you may guess the sequel. The capacious maw opens, entombs the victim, and the game is recommenced.

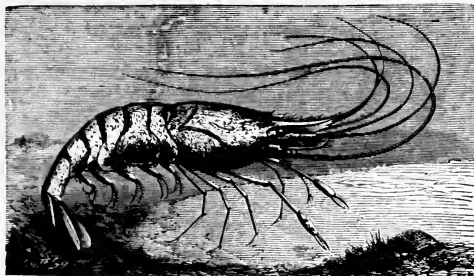
“The market-women sometimes speculate on the voracity of the fishing-frogs, and purchase them at a low price, on the strength of what they may contain. The fishing-frog swallows its prey in a gluttonous fashion without any mastication, and they often find in its stomach fish but little damaged, and sell them to customers who are not very observant.”

“And is this done frequently?” asked René, for the idea that he might have eaten a sole fished from the stomach of one of these rascals did not at all please him.

“Possibly oftener than you think,” replied his cousin. “But let us now see what my luck has been.

No doubt the bottom not far from here is rocky, for I have found a rock-shrimp, or as it is commonly called prawn, the scientific name being *Palæmon serratus*, the saw-bearing palæmon.

“You would never guess where the prawn carries his carpenter’s tool; it is, if you please, on its head, and does not use it as an instrument to work with, but as a defensive weapon. The saw is so placed that

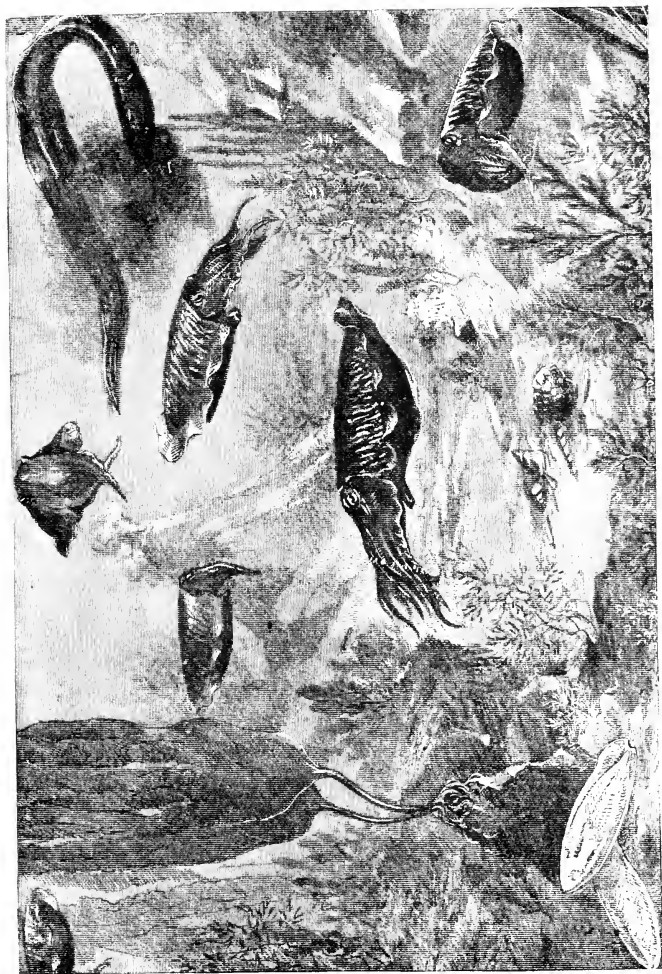


THE PRAWN (*Palæmon serratus*).

a fish cannot swallow the prawn head-first without running the risk of being choked. The Palæmon is well aware of this, and thus from fear he keeps his face to the enemy.”

Léon was on the point of dipping his net into the water again, when René stopped him by a gesture.

“Wretch, that you are; why, you are throwing away a whole dish of fish! I suppose, however, it would



COMMON CUTTLE-FISH (*Sepia officinalis*, Lin.)

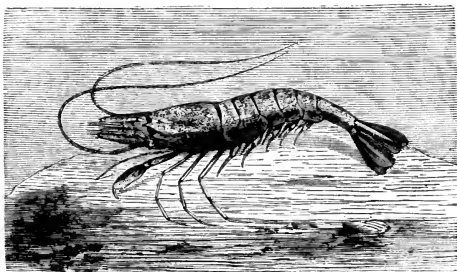


not be right to kill these little plaice and liliputian dab-fish, for a little fish grows to be a great one."

And he pointed with his finger to five or six little *Pleuronectes*, about half an inch long.

"Look at them well," said Léon, holding them in his hand, "and tell me how their eyes are placed."

"Like the eyes of other land-plaice—I beg pardon, I should say, other plaice from the sea. I fancy,



COMMON SHRIMP (*Crangon vulgaris*).

however, that these have their eyes placed in not quite so straight a line as their larger relatives. To what is that due?"

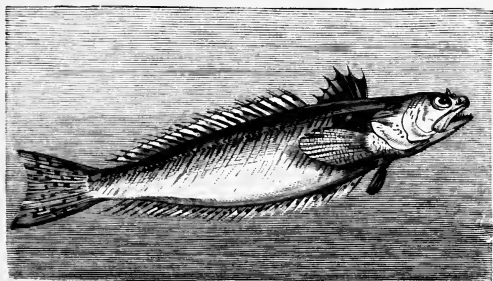
"To their peculiar habits. When born, they are symmetrical in shape, like other fish; then gradually the habit of resting on the sand compels the fish to carry the head on one side, which thus becomes deformed and then quite fixed."

"A sort of permanent wryneck, then! It is certainly very strange. But now it is my turn. Another

fish! It has a rather mischievous appearance, with its black spines, and its eyes on the top of its forehead. Is it also a devil of a third sort?"

"Let it go, let it go!" cried Léon. "It is a crazy fish." (The fishermen of the Boulogne region frequently designate the *Trachinus vipera*, or lesser weever, by this name.)

René, however, put his hand to the bottom of the



WEEVER FISH (*Trachinus draco*, Lin.).

net, but as soon as he touched the fish he rapidly withdrew it, uttering a cry of pain.

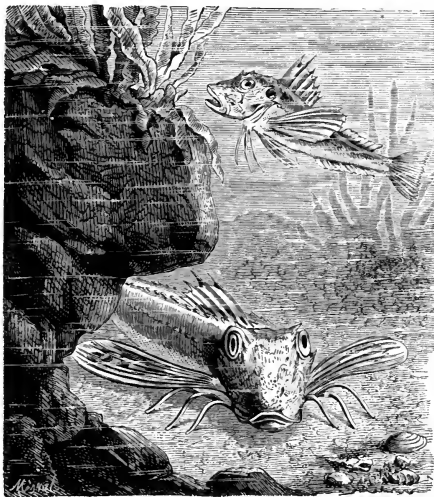
"Wounded! and I had warned you," said Léon. "Fortunately I have brought with me some ammonia, as I usually do."

And after rubbing the wound, he took his handkerchief and bound up the injured hand.

"It is of no importance," said René, making, how-

ever, a grimace that completely belied his words. "It is nothing."

But the pain, which was very acute, soon extended to his arm, and a nervous shivering caused his teeth to chatter, almost as if with intense cold.



GUENARD (*Trigla*, Cuv.).

"Let us get back as quickly as possible," said Léon; "it is the best thing we can do now."

And taking the two nets, with the wounded arm resting on his shoulder, and feeling seriously grieved, he followed the road that Black had traversed a little while before.

VII.

Symptoms that may arise from the wound of the weever-fish—The poisonous structures of the weever—Classification of fishes—A fanciful etymology—A shark's breakfast, according to Muller—More strange names—Why fishes that live near the surface in the water cannot penetrate to great depths—Life in the abysses of the ocean—How a simple thread sufficed to overturn the theories of scientific men.—Researches made by the English, Swedish, and Americans. Explorations of the *Travailleur* and *Talisman*—Surprising results—Remarks by René—The invalid's nightmare.

THE prick of the smaller weever-fish is not dangerous if cauterised at once. Nevertheless the doctor thought it advisable to slightly open the wound, and then, having dressed it, prescribed two or three days' rest for the patient. The seaside excursions were therefore for a time postponed.

"You may congratulate yourself on having escaped so easily," said the doctor, as he placed the last bandage in its position. "I have seen some cases, where the wound was deeper and not attended to in time, in which erysipelas and mortification ensued, and the injured finger required amputation."

The new naturalist made a rather awkward grimace.

"I suppose you are quite sure, Uncle Bob, that it will not come to that, this time?"

"Egad! If I were at all uneasy, do you think I should have said anything to you about it?"

René was soothed by this argument.

"Is it then a real poison, like that of the viper, that exists in the sting of this horrid creature, the *Trachinus vipera*?" said he.

"I know nothing on the subject," said Léon. "A good deal of inquiry has been devoted to it, but up to the present time, without very much result, I believe."

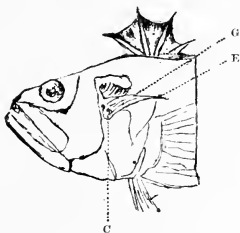
"But I know," said the doctor. "The poisonous instrument of the weever is now understood, but it is only quite recently; * for until now its delicate structure had caused it to escape the researches of investigators."

The worthy gentleman then placed his glasses in position on his nose, took up a pencil and a large sheet of white paper, so as to be able to complete his demonstration by an off-hand sketch, and commenced as follows:—

"The apparatus in question consists of a very strong spine, divided internally into two channels, and covered at its extremity by a membrane. This membrane is apparently arranged in such a manner as to prevent the escape of the poison under ordinary

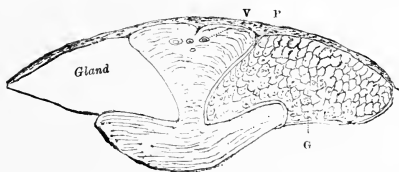
* "Recherches faites au Laboratoire de Physiologie maritime du Havre," par M. A. Bottard, présentées, comme thèse inaugurale, par M. A. Gressin, et éditées sous le titre: *Contribution à l'étude de l'appareil à venin chez les poissons du genre Vire*. A. Davy éditeur.

circumstances. Each of these channels terminates at its base in a sort of conical cavity, filled by a whitish sub-



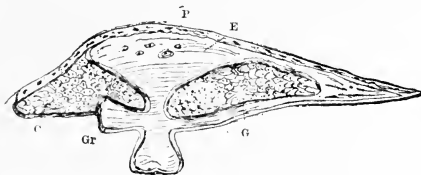
HEAD OF THE WEEVER.

G, Sheath of the spine. E, Spine. C, Follicle with gland.



SECTION THROUGH THE MIDDLE OF THE SPINE.

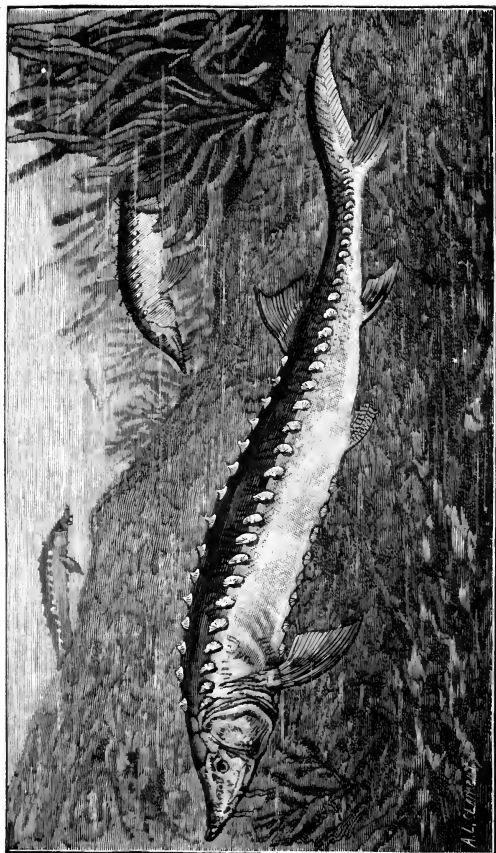
V, Blood-vessels. P, Skin and connective tissue. G, Prolongation of gland.



SECTION OF SPINE AT THE BASE.

P, Skin. E, Cartilage. C, Gland-cells. Gr, Granular part. G, Gland with epithelial contents and connective envelope, in the cartilage.

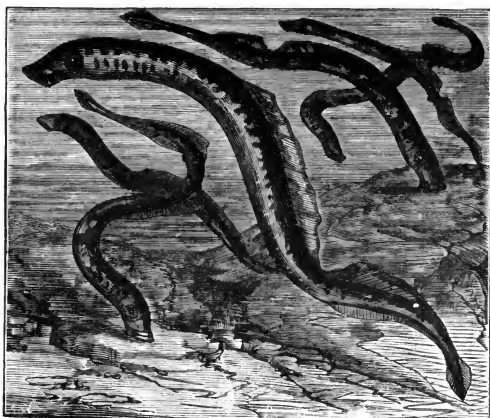
stance—a sort of gland formed by cells. Some of these are very large, and some have the appearance of having



COMMON STURGEON (*Acipenser sturio*, Lin.).

been ruptured by the pressure of the liquid within them.

"This liquid is the poison. If one touches the extremity of the spine with the finger" (René here made a gesture indicating that to have done it once was quite sufficient) "one soon sees exude at the tip



SEA-LAMPREY (*Petromyzon marinus*, Lin.).

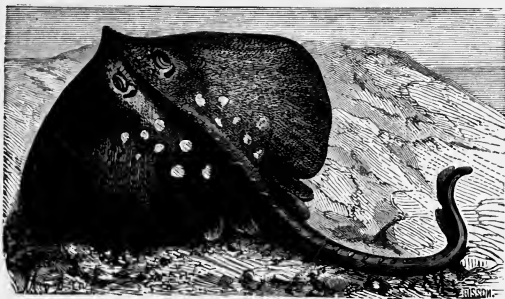
a limpid drop, of a bluish colour when the animal is living, but opalescent after it has been dead some hours. As to the nature of the poison, there is reason for believing that it produces nervous spasms."

"How annoying! And I, too, who was taking so well to zoology! However, I have now the right to consider myself a martyr to science; and meanwhile

I request that I may be instructed in the method of the classification and determination of fishes, that a similar misfortune shall not happen to me again."

"With pleasure," said Léon. "Fishes are divided into two great classes, the bony fishes, and the cartilaginous fishes."

"So that in order to recognise them one must first



SHARP-NOSED RAY (*Raja oxyrinchus*, Lin.).

dissect them? Not a convenient method at all. However, let us continue."

"The cartilaginous fishes are themselves divided into three orders:—

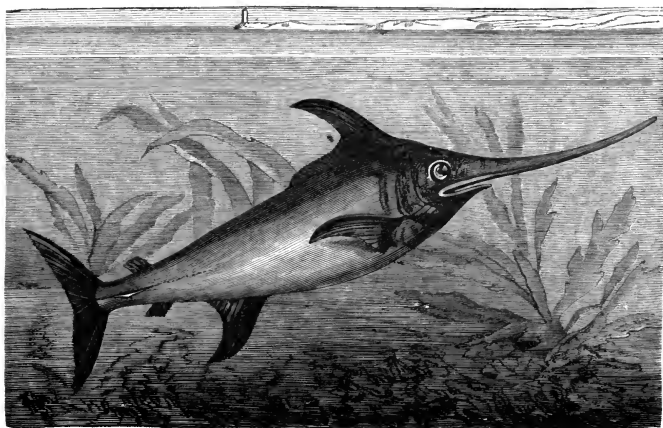
"1. The sturgeons.

"2. The Cyclostomi, or suckers, in which the mouth is suctorial. Type, the lamprey.

"3. The selachian fishes (rays, sharks, sea-hounds): a family essentially voracious, and great feeders."

“By the way, do you know what is the etymology of the word *requin*?” (the French for shark).

“Well, it is from the Latin word *requiem*, because when a man falls into the sea near a shark, the requiem or office for the dead may be said for him. These fishes are not epicures, and their voracity, as



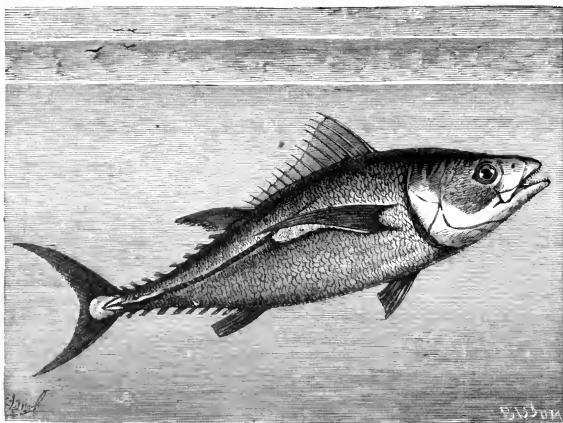
SWORD-FISH (*Xiphias gladius*, Lin.).

everybody knows, induces them to seize on all kinds of food. And as may be supposed, many tales, more or less improbable, have arisen from this. For instance, the Danish naturalist, Müller, gravely states that in the Mediterranean, near St. Margaret's Isle, a shark was captured weighing more than fifteen hun-

dred pounds, and in the body of the said shark there was the corpse of a horse quite entire."

"With the four shoes on the feet? That appears to me rather difficult of digestion."

"However that may be, the cartilaginous fishes comprise the sharks, sturgeons, and lampreys."

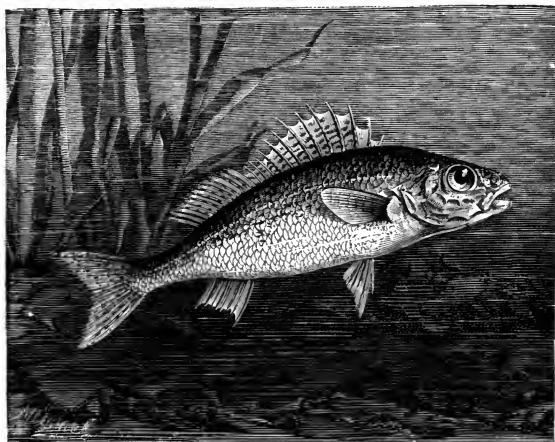


THE TUNNY (*Scomber thynnus*, Lin.).

"And how do you distinguish the bony fishes?"

"By the position of the fins and of the gills, and the form of the jaws. And it is from these that their uncouth names are derived, almost enough to make you shudder: to begin with, the Acanthopterygii, the dorsal fin of which is furnished with spiny rays: examples, the garnard, the tunny, the sword-fish. Next

the Malacopterygii, which, according as their ventral fins are placed more or less backwards, are called *abdominales* (carp, pike, salmon, herrings), *subbranchii* (cod, whiting, flat-fish); if these fins are altogether absent, as in the eels, they are called Apodes. Finally we come to the Lophobranchii, with the gills placed in



THE RUFF (*Perca cernua*, Cuv.).

tufts (Hippocampus, or sea-horses), and the Plectognathi, a small family of fish with the maxillary and intermaxillary bones united: examples, the Diodon, or porcupine fish. That is the end of the puzzle.”

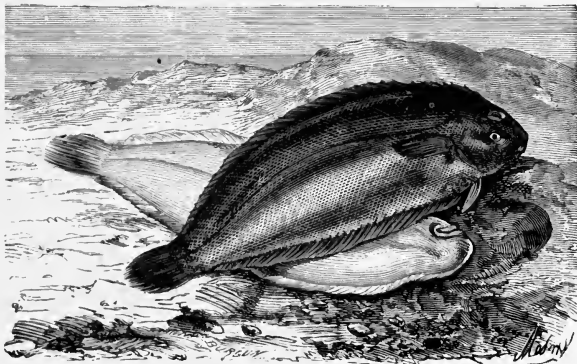
“Really, you are not too exacting. But the jargon is not merely Greek, it is Kirghise or Cossack—such

words as acanthopt . . , and malacopt . . ; and as in the matter of all foreign languages my education has been



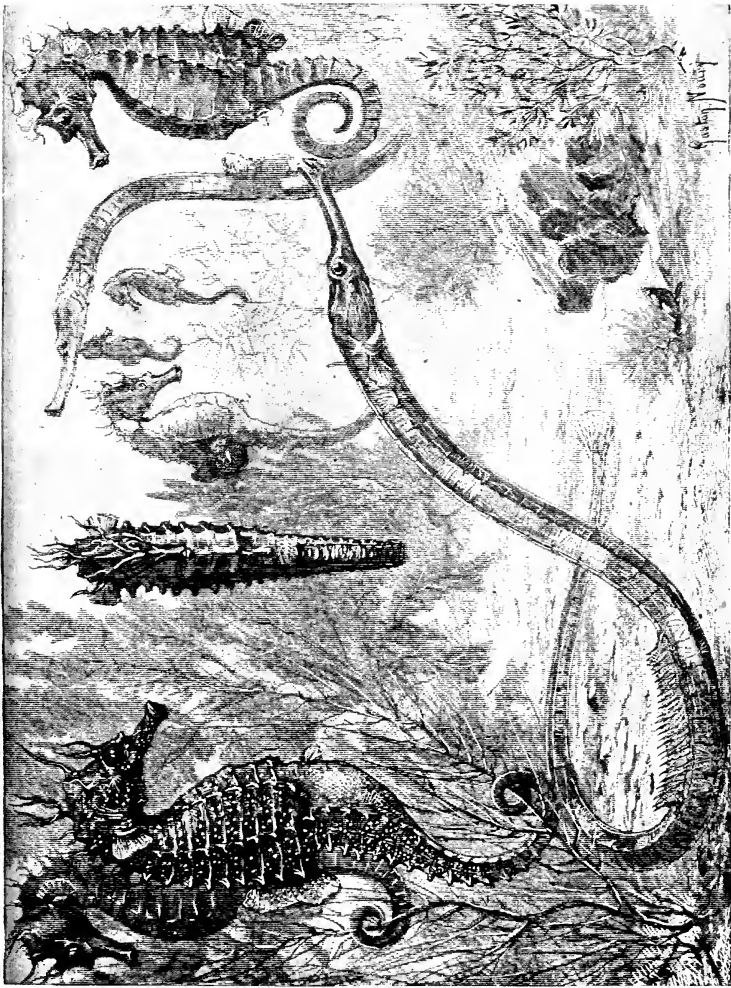
COMMON CARP (*Cyprinus carpio*, Lin.).

equally neglected, please talk to me of marine animals for the future in my own tongue. Happy fishes !”



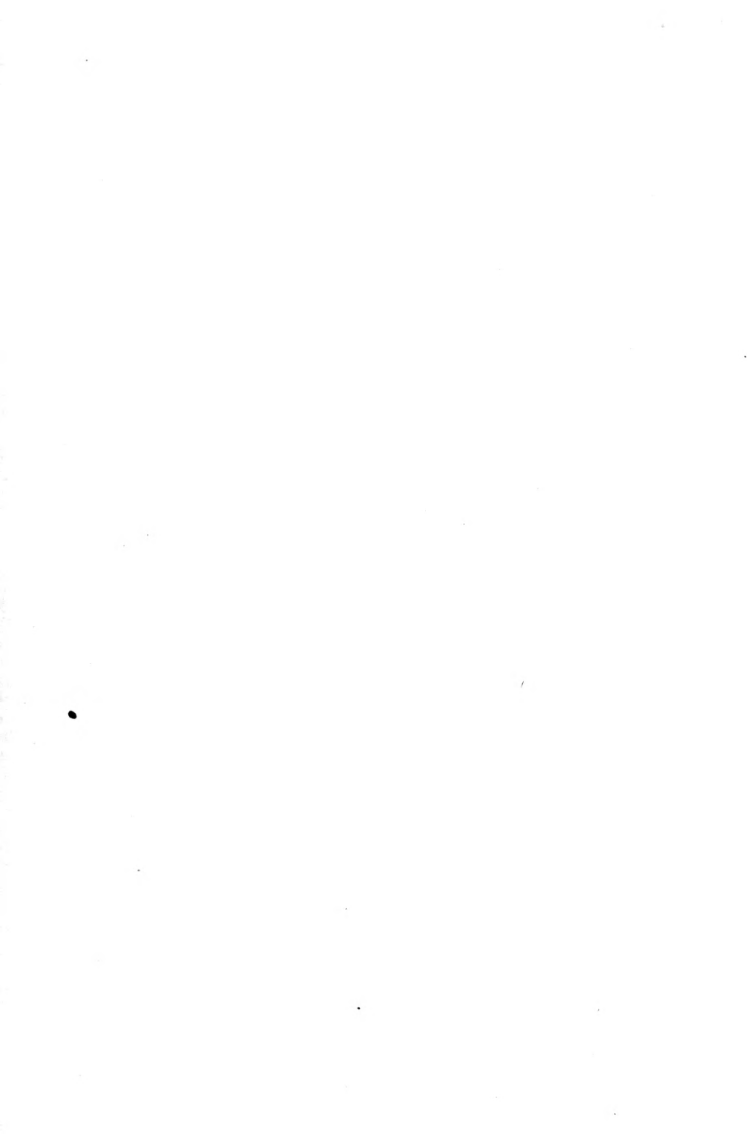
SOLE (*Pleuronectes solea*, Lin.).

added he with a sigh of envy, “they have indeed plenty of elbow-room, and must be able to make magnificent excursions in their immense domain.”

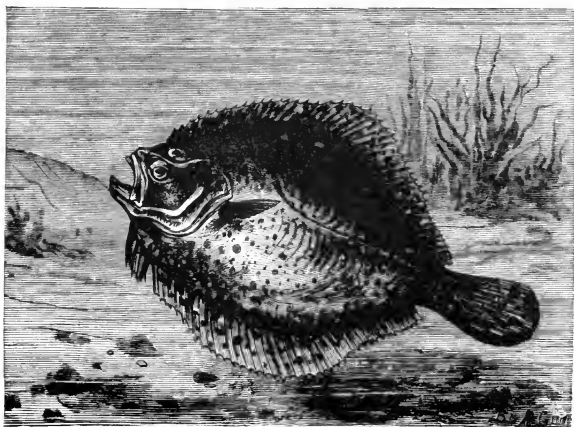


SEA-HORSES (*Hippocampus guttatus*, Cuv.), PIPE-FISH (*Syngnathus aquoreus*, Lin.).

Gosling, 1847



“Much less than you suppose,” said Uncle Bob. “Each kind of fish, like the terrestrial animals, has its area of distribution, beyond which it cannot pass. In the case of many species the great currents of the ocean form an impassable barrier. Here is an instance of it. Formerly the shoals of herring came by way



TURBOT (*Pleuronectes maximus*, Burbo.).

of the North Sea, along the coasts as far as the mouth of the Seine, but at present they scarcely come beyond Etretat. Some imperceptible change in the condition of the bottom, in the composition of the water, or perhaps in the direction of the currents, and these innumerable hosts at once quit their old habits and change their route.”

“But probably they obtain their compensation by making some fresh excursions at greater depths. There must be scattered over the ocean some immensely deep places; and when a fish is tired of the surface, I imagine there is nothing to prevent his



SUBMARINE EXPLORATIONS OF THE "TALISMAN." SPONGE (*Holtenia*).

going lower down and ruralising at a depth of say eight or ten thousand feet."

"No, no! This very year some curious observations have been made on this subject. Without being a great physicist, you may be aware that the pressure increases in proportion to the depth. Well, it was desired to find out how fish behave at pressures of

two hundred, three hundred, and even five hundred atmospheres. The result of the experiments proved that fish that live near the surface can only descend to a comparatively slight depth; under an increased pressure they die; and—this is very remarkable—the water being forced into their tissues, their body

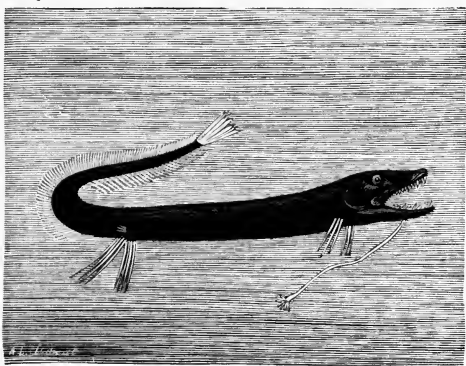


SUBMARINE EXPLORATIONS OF THE "TALISMAN." SPONGE (*Askonema*).

becomes rigid and brittle as glass. Naturally, the simpler the organisation of the creatures, the greater is their power of resistance, and a pressure that is sufficiently great to kill a fish only stuns a crab, and apparently does not produce much effect on a radiate or a mollusc."

“Under such conditions life must be fearfully monotonous at these great depths. A dreadful darkness, a solemn silence, and the only inhabitants two pallid star-fish and three colourless anemones. Pheugh! it makes me shudder only to think of it.”

“Until the last few years every one would have agreed with you, including even the most accomplished

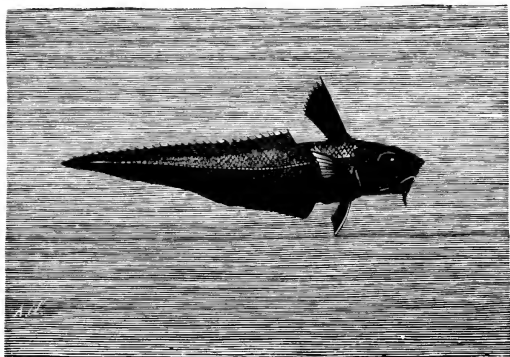


SUBMARINE EXPLORATIONS OF THE “TALISMAN.” *Eustomias obscurus*.
DISCOVERED AT A DEPTH OF 8,800 FEET.

naturalists. Judging from what they could see, they had decided that life was impossible at great depths, and had anyone ventured to say the contrary, they would, in a professional and mathematical manner, have proved that he knew nothing about it and was a fool.”

“Ignorant men of knowledge! But who, then, demonstrated their error?”

“A thread. In 1861 the submarine cable laid between Sardinia and Algeria broke, at a depth of more than 6,500 feet. It was fished up, and you may imagine the astonishment of naturalists when there was found adhering to this cable a whole colony of polypes, of annelids, and of shells. Some of the species thus discovered were unknown in the Mediter-



SUBMARINE EXPLORATIONS OF THE “TALISMAN.” *Macrurus australis*.

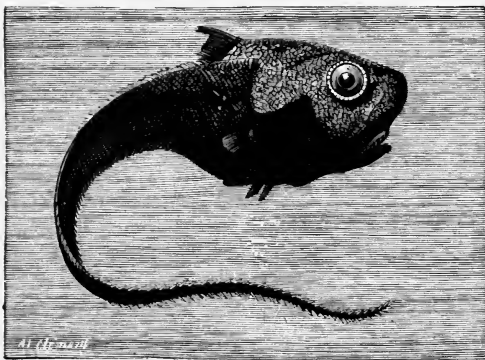
anean waters, and others had been met with previously only in the state of fossils. So that this was greeted as a happy revelation, and Milne-Edwards,* to whom the pieces of the cable had been confided, went so far as to say that ‘such discoveries were well

* Milne-Edwards, one of the chief of the naturalists of France, has recently died, and the author of the original work has inserted a note announcing the fact, and expressing the respect and esteem in which he was held, as well as the regret felt at his loss.

worth a cable broken, and that it was to be hoped that similar accidents would occur again.'

"Since this occurrence the English, Swedish, and American peoples have fitted out ships for sounding and dredging, with the object of revealing the wonderful secrets of the ocean depths.

"The Government of France has held it a point of



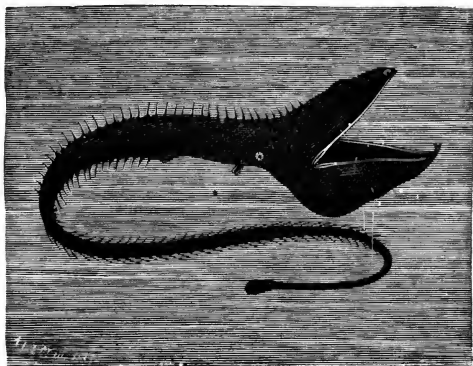
SUBMARINE EXPLORATIONS OF THE ' TALISMAN.' *Macrurus globiceps*.
FISHED FROM A DEPTH BETWEEN 4,500 AND 10,000 FEET.

honour not to be left behind, and in 1880 a despatch-boat, the *Travailleur*, made its first voyage for this purpose in the Bay of Biscay. The results obtained were so satisfactory that it was decided to make a second campaign in the Mediterranean Sea, and then a third in the neighbourhood of the Canary Islands. And quite recently the *Travailleur* and the *Talisman*

made an exploration in the Atlantic, and the spoils they obtained were exhibited in one of the galleries of the Museum of Natural History at Paris.

“No doubt you, who though so mocking are yet of an inquiring turn of mind, visited this exhibition. It was the fashion in Paris to go there.

“There were some true marvels, and the species that had been previously known only in a fossil state,



SUBMARINE EXPLORATIONS OF THE "TALISMAN." *Euripharinx pelecanoidea*.
COAST OF MAROCCO, AT A DEPTH OF 8,000 FEET.

were in variety of form and beauty of colouring not a whit behind those that were already familiar to naturalists.

“There were siliceous sponges, *Holtenia*, that might have been taken for birds'-nests, or cups made with braided threads of glass. Other sponges, by the

strange shape of their skeletons, recalled the comb made by bees. And farther on, side by side with dense copses of corals, there were Echinodermata, star-fishes, radiates of all sizes, forms, and colours, such as naturalist had never seen even in dreams before. And no doubt among the numerous horde of crustaceans, you noticed a collection of shrimps of a



SUBMARINE EXPLORATIONS OF THE "TALISMAN." *Melaneocetus johnsoni*.
BETWEEN THE AZORES AND EUROPE. DEPTH, 16,000 FEET.

carmine colour, some of which measured no less than eight inches in length?"

"Certainly," said René, "and I can admit freely that it was these shrimps that most impressed me, for I could not help thinking of the splendid effect they would produce in the window of one of the restaurants of the Palais Royal."

“And the savants of the expedition, rumour says, did not think it necessary to abstain from tasting them. Whether this was actually the case or not, the collection did not suffer from it, and the materials brought back by the expedition will require at least ten years of study to work them out.

“You remarked a little while since that the depths of the sea must be absolutely dark. Well, the fish overcome this difficulty by lighting it themselves, and by carrying their lamps about with them. Many fish are furnished with luminous plates, and almost all the inferior forms are phosphorescent: for instance, the *Brisingia*, a magnificent star-fish which derives its name from the favourite darling of a Scandinavian divinity.”

“What a strange world! Is the *Trachinus vipera* found among these fishes? I mean, are the fishes like those we are acquainted with?”

“Not altogether so,” said the doctor. “Indeed this was one of the things that caused some surprise to the naturalists of the expedition. The fishes found at great depths are soft, without rigidity. To obtain the necessary firmness they require to be submitted to a pressure of several hundred atmospheres. When relieved of this pressure, they decompose and pass into the condition of a gelatinous mass.”

“It is certainly a great pity,” said René, “that we cannot actually study these things for ourselves on

the spot, like the Captain Nemo of Jules Verne. However, seeing the constant progress made by science, I shall not be surprised if we succeed in doing this some day."

The following day, a feverish attack, induced to some extent by the venom of the *Trachinus vipera* brought a singular dream to the young Parisian. Having been shot violently into space, he was revolving through unknown abysses. In the midst of phosphorescent monsters great star-fishes vibrated their arms, lighted up as if by some electric light; strange Echinodermata were seen, scattered here and there, as if portions of heraldic designs belonging to another world; while, partly concealed in shadow, gigantic lobsters awaited his passing with open claws and menacing antennæ!

VIII.

An uninviting form of cookery—Light talking and good working—A constant sign—Curious anatomical point—An eye consisting of many thousand eyes—A magnificent preparation—Three stomachs to a single individual—The classification of insects—Queer names again—Aptera—A flea's jump—Unexpected maternal instinct—The reputation of the flea restored—Diptera—Number of strokes of a gnat's wing in a second—The bot-flies and Helophili—Transformations of a gnat—Hemiptera—Lepidoptera—Butterflies have feathers—Depredators—Neuroptera—Devastating hosts—White ants—Coleoptera—Our friends and enemies.

RENÉ's prejudices against zoology had gradually, and without he himself being aware of it, been dissipated. Certainly he would have been very surprised if any one had told him that since his arrival at Villers science had gained an additional devotee; but it was nevertheless the case, and Uncle Bob noted it each day with pleasure.

René, at first an uninterested listener, now gave to these interesting demonstrations a more sustained attention than might have been anticipated from his natural disposition, and he not only listened but actually inquired.

He had, in fact, become a valuable assistant, almost a true disciple, to Léon. And the doctor's son derived

a feeling of genuine satisfaction from this change, for he had good reason for believing that it was largely due to his own influence.

But something of the careless scholar of former days still survived in the young disciple of the present time, and as a proof of this, René took advantage of the excellent excuse afforded by his wounded hand for sleeping through the best part of the morning, and coming down very late to breakfast.

As he was taking his place in the breakfast room, Léon entered, diffusing around him a strong odour of essence of turpentine and of benzine, and wearing a large white apron over his clothes.

“Good day, lazy man!” he laughingly said.

“Good hail, you dreadful poisoner!” replied René, offering his sound hand to his cousin. “But what calling are you engaged in this morning? Have you become apprentice to a dyer, or are you only practising the art of painting in oil?”

“Neither one nor the other. I am arranging my collection and endeavouring to protect it from becoming greasy.”

The Parisian now looked at him with an air of unaffected surprise. Evidently he did not at all understand.

“Becoming greasy?” he repeated. “Then it is neither dyeing nor painting, but it must be cooking. And what are you getting ready?”

"My collection of insects. I am preventing it from spoiling. Perhaps you would like to help me."

"With pleasure, if my wounded hand will allow me. But, as fair exchange is no robbery, you must tell me about your insects and give me some knowledge concerning them, and I shall assist you in your efforts to prevent their becoming fat."

So, after having breakfasted very heartily for a sick man, he went to his cousin's workroom.

"To begin with," said he, looking at the boxes opened and displayed on the tables, "I see quite a bewildering series of different forms, although the little creatures have a certain air of family likeness that I can perceive without being able to define. Tell me, if you please, what are the characters that constitute an insect?"

"Insects are characterised by having the body divided into three parts—head, thorax, and abdomen, the latter being formed by several rings or segments placed one behind another. All, when they have arrived at their perfect state, have three pairs of legs, and undergo one or more, more or less abrupt, transformations, passing the greater part of the period of their existence in the condition of larvæ, then becoming nymphs or chrysalides, and then in the form of perfect insects reproducing their kind.

"There is nothing more wonderful than the anatomy of these liliputian beings. Thus they breathe by

means of tubes opening on the sides of their bodies, and called tracheæ; these tubes terminate externally in orifices called stigmata."

"And are these organs numerous?"

"Very numerous. A patient entomologist has counted one thousand five hundred and sixty-four on the caterpillar of the willow.* But this is only one of the remarkable peculiarities of insects: many have compound eyes divided into facets."

"Perhaps like diamonds after they have been cut?"

"Yes, but with the difference that the facets are much more numerous. They have counted, I believe, four thousand in the house-fly."

"!"

"About six thousand, two hundred in the silkworm moth."

"! !"

"Twelve thousand, five hundred and forty-four in a dragon-fly."†

"What you are telling me sounds almost incredible! I shall become a St. Thomas, and ask you to show me that I may believe."

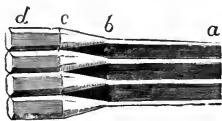
* There is here some error of memory or of pen. The stigmata in insects are never more than twenty in number; on the other hand, the tracheæ are so numerous, distributed as they are to all parts of the body, and ramifying in a fine network around and amongst all the organs, as to defy counting. Possibly he refers to the number of muscles, of which Lyonnet counted 4,061 in the caterpillar of *Cossus ligniperda*.—*Translator*.

† And twenty-five thousand and eighty-eight in a beetle (*Mordella*).—*Translator*.

"Nothing is easier; here is a large grasshopper, and here is an excellent glass; see then, and believe."

"Indeed it is true!" said René, who had laid aside his brush in order to take the lens that his cousin offered to him. "One ought to look at everything in an insect, for all is remarkable, not only the eyes, but the jaws, the antennæ, the legs," and as he was speaking he passed the glass over the various parts of the body of the grasshopper. "Really, you should have made me acquainted with all this before."

"It is never too late to mend. Take a good lens,



FOUR FACETS FROM THE EYE OF A COCKCHAFER.
a, b, Retina. c, Crystalline cone. d, Corneal facet.

or a microscope, and any insect whatever, and you find in it a field of study almost unlimited, especially if you are of a mind to examine its anatomy and dissect it. I happen to have, on this glass slide, a splendid specimen: it is the digestive system of a *Carabus*, that my father has been occupying himself with preparing."

This beautiful preparation had demanded for its execution the utmost patience and all the skill of a practised and accomplished hand. The three dilata-

tions that form, as it were, three different stomachs, the œsophagus, the gizzard, and the true stomach, were



DIGESTIVE SYSTEM OF A CARNIVOROUS INSECT (*Carabus*).

perfectly distinct; and around the canal were still attached the fine tubes that are called malpighian vessels, whose function is not yet very definitely

ascertained, but which have been supposed to be biliary vessels.

“This is really superb,” said the Parisian, as he shifted the preparation from place to place under the object glass, so as to seize all its details. “But before commencing the study of the internal anatomy of insects, I think it will be advisable to learn to distinguish them from one another; for without some sort of classification this must be, as you say, by no



HEAD-LOUSE, MUCH MAGNIFIED.

means an easy affair, seeing how numerous are their kinds.”

“Numerous indeed. Of all animals they are by far the most numerous; of ants alone there are known about fifteen hundred different kinds. And so, in order to keep from being lost in such a labyrinth, several divisions have been adopted, and eight different orders are recognised, based on the number and nature of the wings. They are—

“1. Aptera, destitute of wings.

"2. Diptera, having two wings.

"All the other orders have four; they are—

"3. Lepidoptera, whose wings are covered with scales.

"4. Hymenoptera, the veins of whose wings form large meshes.

"5. Neuroptera, the meshes of whose wings are numerous and small.

"6. Hemiptera, suctorial insects having usually one pair of wings, in part harder than the other.

"7. Orthoptera, with somewhat thickened upper wings, and with the under wings folding in longitudinal plaits.

"8. Coleoptera, with hard wings called elytra, usually united along the back by a straight suture, and with the under wings folding transversely.*

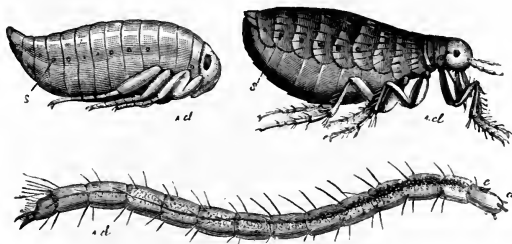
"With these summary indications you will readily be able to find your way for a little in the intricacies of entomological classification."

René made rather a wry face; and clearly Coleoptera, Orthoptera, and the rest had as much difficulty in making themselves at home in his mind as had the *Acanthopterygii* and *Malacopterygii* of the fishes.

* The number of orders of insects is still a matter of discussion and not unfrequently a larger number than the above are adopted. The Neuroptera are by some naturalists divided into two or three orders; some separate the Thysanura as distinct; and others so treat the fleas, giving them the name of Aphaniptera. The order Aptera, on the other hand, is now usually abandoned, the true lice being placed in the Rhynchota or Hemiptera, and the bird lice in the Orthoptera.—*Translator*.

"It is easy, very easy," he muttered; "probably quite easy when you have seized the clue, and this clue— Stop! as you have already done so much, point out to me an example of each of these eight orders."

"Very well," said Léon, laying down his brushes and forceps; "I can see that we shall not do much at the preservation of my collection to-day. But I do



THE FLEA: NYMPH, PERFECT INSECT, AND LARVA. *s* INDICATES THE POSITION OF THE STIGMATA.

not regret it, as I am glad you are overcoming your prepossessions.

"The principal components of the order Aptera are the lice and the fleas."

"A most disagreeable and villainous set, to commence with! You do not keep any in your collection, I hope?"

"One must have them represented, and I make my collection as complete as possible. Only in the case

of these infamous creatures, I keep them separately, mounted between two glass plates, and we will look at them under the microscope. Here, to begin with, is the common louse."

"Oh, horror! And well it justifies the common saying: 'As ugly as a louse!'"

"And here now, on this other slide, is quite a collection of fleas: the human flea, the cat flea, the dog flea, the flea of the chicken, and that of the pigeon, with the complete arrangement of lances that serves as their stock in trade. You see that the lord of the creation, man, has by no means a monopoly of these pests."

"Do not let me look longer at these disgusting creatures, the mere sight of them makes me itch. They are all of them, if animals at all, destitute of physical and mental powers."

"This is certainly not true in the case of the fleas. For instance, they have remarkable physical powers, extraordinary strength and agility, so that they make leaps of one thousand or fifteen hundred times their own length. If a man could perform a proportional feat he would be able to clear Mont Blanc with two or three bounds."

"Then, according to you, the most hyperbolic of compliments to an athlete would be to say to him, 'You are as capable as a flea.' And their moral qualities?"

"They certainly possess one—maternal affection."

René now looked at his cousin with an expression

that seemed to ask if he were joking or had become crazy.

"I am speaking quite seriously," he affirmed in reply to this unspoken interrogatory, which he perfectly understood; "fleas have a tender and provident affection for their young. Their eggs are frequently placed in the cracks of floors or amongst old furniture, and almost always, side by side with the eggs, there are found small black granulations that, when examined with the microscope, are seen to be specks of desiccated blood; so that the young flea on its entry into the world finds provisions ready for its use.

"This first stock being exhausted (and this soon happens, for the flea from its very birth is endowed with a voracious appetite), the mother flea brings to her offspring the blood with which she has gorged herself, somewhat in the same way as birds give beakfuls of food to their little ones. So that you see these degraded insects are not so bad as uninstructed people suppose."

"Kind fleas, honourable fleas!" cried René, partially convinced; "nothing less than this could have made me respect them. I make my bow, and out of respect for their good feelings I pardon them the injuries they have inflicted on me."

"Now let us turn to some of the others. After the fleas that have no wings, tell me about the insects that have two."

“In the insects that have two wings, *Diptera*, the mouth forms a proboscis composed of four parts—a sheath, a suctorial apparatus, and two palpi. If you examine, even with a slight magnifying power, the head of a fly, you will be able to recognise these different pieces. Moreover, as they have only two wings, and as it would not be right that they should have fair grounds for being jealous of the better endowed insects, they have instead of the second pair



TWO-WINGED FLY (*Musca*).

of wings—what do you suppose? Balancers or halteres.”

“Like the rope-dancers at a circus. And what is the use of these organs to them?”

“Exactly the same;* and these little instruments are even of more service to them than those of the performers you have mentioned. Have you any idea of the number of strokes a common fly makes with its wings in a second?”

“No doubt many; here is one on the table, suppose we ask it?” and stretching out his hand

* This is not established.--Translator.

he captured the fly with his finger and thumb. "Now we can see: say thirty, perhaps forty."

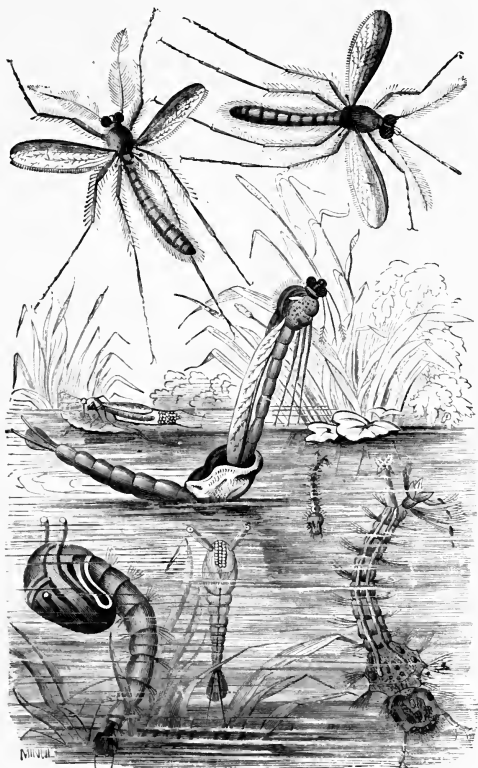
"You are very far out. The number of strokes of the wings of a fly is about six hundred per second, and may reach as many as three thousand six hundred during rapid flight; is not that surprising?"



RAT-TAILED WORMS (LARVÆ OF *Helophi. us*), AND THE SAME INSECT IN THE PERFECT STATE.

"Here are some other kinds of Diptera: Volucella, a wild creature resembling a humble-bee, and who moreover takes advantage of this to obtain entrance into the nest of the bee, where it deposits its eggs, which when hatched devour those of its host; the Helophili, whose larvæ were named by Réaumur 'rat-

tailed worms,' because of a singular appendage,



METAMORPHOSES OF A GNAT.

arranged after the fashion of the tubes of a telescope,

so that the creature is able, when at the bottom of the water, to breathe the air at the surface. *Gastrophilus*, belonging to the *Œstridæ*; these lay their eggs amongst the hairs of horses, and the animal, when licking the spot, detaches them and swallows them, and the larvæ, developing in the stomach, are well known under the name of bots. And here are the gnats, with whose annoying bites you have been long familiar.

“Here, too, is a preparation exhibiting the very complicated instruments they use for this purpose. But still more wonderful are the metamorphoses of these creatures.

“Before becoming an ærial animal, the gnat, or rather its larva, is a little worm of strange form, with a complex arrangement of bristles, and inhabiting pools and stagnant waters.

“When undergoing its final transformation the pupa rises to the surface of the water, and remains there until the swollen part of its outer skin dries and splits; the perfect insect then raises itself into an erect position by gradually dragging itself out of the skin, which meanwhile floats and serves as a boat, the erect insect being like a little mast and its wings like sails: truly a wonderful and fragile skiff.

“In addition to great skill the creature requires good fortune to bring this delicate operation to a

successful conclusion. At this moment when it is ceasing to be an inhabitant of the water, contact with the water that has hitherto been its proper element is fatal to it, by preventing it from taking flight, so that in rough weather many of these living barks are shipwrecked, and the unfortunate insect perishes without having been able to fly at all."



UNDER SURFACE OF THE PHYLLOXERA OF THE VINE, WINGED FORM.
MAGNIFIED ABOUT SIXTY TIMES.

"I must admit," said René, "that the examples of the two orders you have told me about are wonderful. Indeed, I suspect you made a judicious choice on purpose to interest me. Was it not so?"

"Certainly not; the choice of these two instances was entirely unpremeditated, and in point of fact, any insect taken by itself affords astonishment to one

who studies it. What is already known about insects would fill large volumes, and to these every day, as new observations are made, new chapters must be added. But I promised to introduce you to a few examples of each of the orders of insects. We have interviewed the Apteræ and Dipteræ, and will now continue the series.

“To the Hemiptera or Rhynchota belong the Pentatomæ, some of which may be met with in great quantities in autumn on the raspberries and the flowers of the mullein, and may be recognised by their very strong and disagreeable odour.

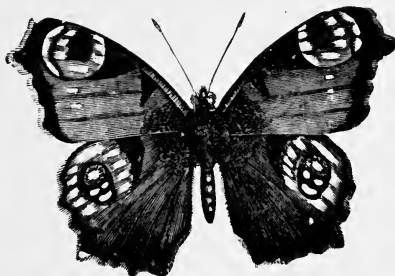
“This order also includes bugs; the Reduviæ, who disguise themselves with a covering of dirt, so as to approach, without being perceived, the little creatures they feed on, a proceeding analogous to that of the spider-crabs that I have already told you about; the Cicada, the Aphides or green-fly, the pest of our gardens and trees; and the Phylloxera, the ravager of the vines, called *vastatrix* by the men of science (these latter, by the way, have not succeeded in doing it any other harm); and finally many aquatic forms—the Notonecta, or water boatman, the Corixa, Nepæ, or water-scorpions, and the Ranatræ.

“Now we come to the representatives of an order with which you are well acquainted—the butterflies, in the naturalist’s language, Lepidoptera, or scaled-wings, a name that is perfectly well selected.”

And taking a preparation on a glass he placed it under the microscope.

“What! these wonderful petals, these delicate flowers, they are only the feathers of the butterfly? You would never have supposed it.”

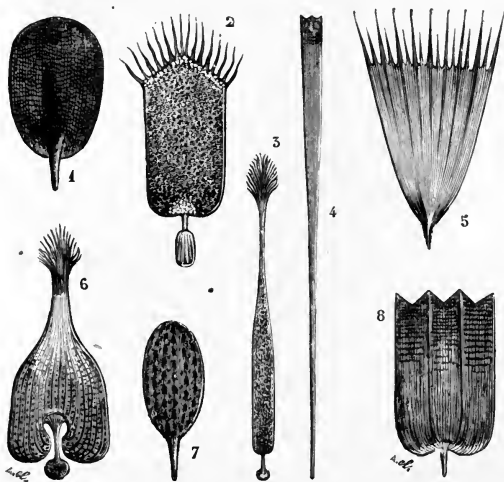
Then, noticing that his cousin was admiringly contemplating this iridescent display, where all colours, from the delicate tints of the pearl to the fervid



PEACOCK BUTTERFLY.

brilliancy of the ruby, were represented, Léon added: “It is a great pity that these beautiful creatures should be so injurious. There is scarcely a plant that is not subject to the depredations of one or more species, from the humble and prosaic cabbage, whose leaves are consumed to the very ribs by the white butterfly or *Pieris*, to the oak, whose leaves serve as the nourishment of several species. The vegetable world

has no more determined enemies, even among the hordes of insects, than the Lepidoptera. It is true that it is not the butterflies themselves that do the harm, but the caterpillars; however, as the butterflies produce the caterpillars, and the caterpillars



SCALES FROM BUTTERFLIES' WINGS, GREATLY MAGNIFIED.

the butterflies, it is much the same thing to the vegetables."

"And I, who thought them incapable of the slightest misdeed," said René, "confiding in their beautiful adornments and their innocent movements! You

will, however, I hope, make an exception in favour of the silkworm. Though I admit that at present insects inspire me only with a most limited confidence ; including even this beautiful dragon-fly with transparent wings, that belongs, I presume, to the same order."

"Not at all : it belongs to the order Neuroptera, among which we have also many enemies ; and



DRAGON-FLY (*Libellula*).

though the dragon-flies and the may-flies do us no harm, though the ant-lion destroys only ants, there are other species that are not so scrupulous in respect to us. The white ants, or Termites, especially have a deplorable habit of excavating their habitations or concealed galleries in furniture and other articles constructed of wood. So well do they accomplish this, that sometimes they leave only a thin crust of wood, and directly this is touched——"

“Crack ! it goes. It must be funny to see the face of the owner under such circumstances. These destroying and annoying insects must, however, be very rare, for I do not recollect ever to have met with any of them.”

“Certainly they are rare with us,* though very



MAY-FLY (*Ephemera*).



Perfect Insect.

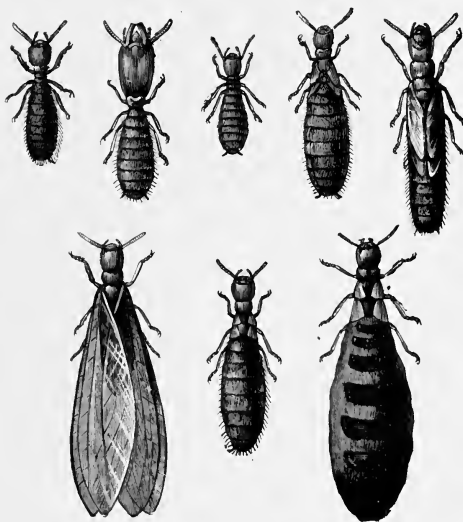
common in some maritime towns, where they do an immense amount of damage. This is especially the case at Rochefort, where the insect has been introduced,

* In Britain there are no white ants, and they only occur in a few spots in France, in the south ; but in North America they are more common.—

Translator

though it is not quite known at what date, and by whom."

"Probably by some furniture maker, or carpenter, by virtue of the maxim: 'Is fecit cui prodest.' It

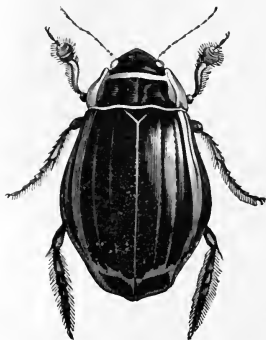


WHITE ANTS (*Termites*): DIFFERENT FORMS.

seems, then, we may conclude that such insects as are not valuable friends are dangerous enemies. And this long series of Coleoptera, are they friends or enemies?"

"Some are the one, some the other, as in most of

the remaining orders that are numerous in species. Amongst the Coleoptera we have many allies; the carnivorous beetles are especially useful, as they destroy many injurious insects. I have placed them all together." And opening a large box: "Here



THE BROAD DYTISCUS
(*Dytiscus latissimus*).



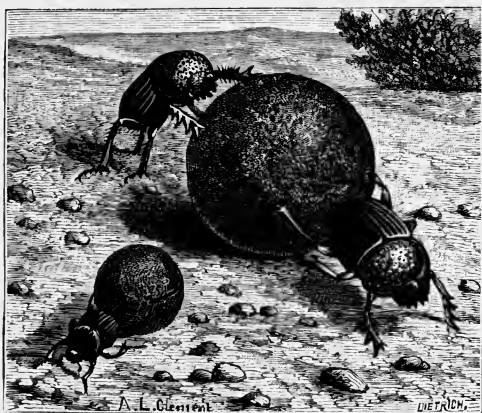
THE GREAT HYDROPHILUS
(*Hydrophilus piccus*).

COLEOPTERA.

are our friends," added Léon; "in the first place the numerous family of the Carabidæ: Carabus with metallic colours; Procrustes, with a skin like leather in appearance; the Cicindelæ, called tiger-beetles by Linnæus; the Feroniæ and the Harpali. Then the glow-worm tribe, that destroy snails and perhaps caterpillars; the Telephori, with silky appear-

ance; and also the Coccinellæ, called in France *bêtes à bon Dieu*, great destroyers of the Aphides or green-fly.

“The burying beetles are also useful to us, their office being to dispose of offensive remains; the Staphylinidæ, one species being said to destroy the

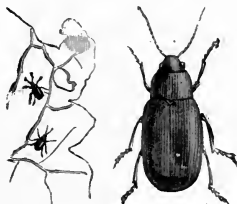


EGYPTIAN SACRED BEETLE (*Scarabæus*).

larvæ of flies; the Silphæ, some of which wage war against snails; the dung-beetles, with their disgusting food. This, by the way, did not prevent the ancient Egyptians from treating them as sacred; the Necrophori, already mentioned, which have the habit of interring the bodies of smaller animals, possibly with

the intention of preserving them till they become 'high,' but more probably to provide a store for their future offspring. Some day we shall see them at their work, and then I can assure you that you will not regret the time spent in watching them. And now, shall we look at the injurious beetles?"

With this he opened a box, in which were to be seen transfixed by long pins many Coleoptera, as if condemned and expiating their sins. First of all the



TURNIP-FLY : NATURAL SIZE AND MUCH MAGNIFIED.

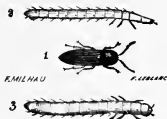
chafers, who perhaps died regretting their juicy leaves; the Dermestidæ, which frequently cause serious injury to the finest furs; the weevils, and the corn-weevils, dreadful scourges to our stores of grain in barns and granaries; Halticidæ, so small that it had been necessary to gum them on pieces of cardboard; and in addition a rear-guard of the destroyers that devour roots, wither the young shoots, or perforate the leaves.

"All these sorts," said Léon, "I abandon to you ;

wherever you meet with them you may destroy, smash, kill, or massacre, I absolve you in advance."



CORN-WEEVIL, MUCH
MAGNIFIED.



WIRE WORM: LARVA
AND PERFECT INSECT.



DERMESTES LARDARIUS.

The dinner bell, violently rung by an impatient servant, brought to an end the instructive conversation of the young friends.

IX.

Congratulations are the order of the day—Ineffectual strategy—Some respectable insects—Ants and their flocks—Dairy-farms of blight—Men, women, and workers—To be an ant is no sinecure—Destruction of a home—An eastern legend—Tamerlane—In what way a mere ant may sometimes decide the fate of an empire—How Mr. Léon increased his collection on this occasion.

As the meal was concluding, "Suppose we take our coffee in the garden?" said the doctor. "Nothing is better than the open air for promoting and facilitating digestion."

Uncle Bob's proposal was cheerfully and unanimously accepted, and our three friends, having installed themselves comfortably under the arbour, the aromatic mocha was brought thither to them.

"Now, my dear nephew," said the kind savant as he dispensed the pleasant refreshment, "can you imagine what rumour is saying abroad? I have heard that one of the greatest traducers of natural history has recently been led into the right path on the shore at Villers; that the aforesaid traducer, having already passed the grade of martyr, thanks to the wound of a certain *Trachinus vipera*, has none the less been seen,

this very day, in the flagrant misdemeanour of entomology, and this too under the fallacious pretext of giving to the insects a necessary cleansing—which they still await.”

René, reddened at this direct attack, but he met it thus—

“It is not my fault; Léon is in the habit of studying animals in our native tongue. He makes as little use as possible of those long words that seem to have been invented on purpose to provoke. It is he, and he alone, that should be reproached.”

“Or rather congratulated, and this I do most heartily. Pass me the sugar-basin, if you please.”

Uncle Bob selected a lump, but as he was putting it in his cup he suddenly made a gesture of annoyance.

“These detestable creatures again,” he muttered. “My instructions have been neglected.”

The kitchen and dining-room of the cottage were, in fact, infested by ants—by those large red ants that intrude themselves wherever provisions are to be found—active, and apparently countless, coming one knows not whence, and returning, eagerly occupied, incessantly seeking supplies.

If a bowl of milk were left for only ten minutes on the kitchen table, one might have been sure of finding at least three or four of these adventurers struggling half-drowned in the useful liquid, like the famous Duke of Clarence in his butt of Malmsey wine.

The sugar-basin, to them a precipitous fortress, was a special object for repeated assaults from these hungry little creatures. Unfortunately for them, the doctor, who much preferred sugar to formic acid, had resolved to make an energetic defence of his goods, and as the ants, in spite of all his precautions, always found some way of slipping under the cover, he had surrounded the fortress with a large moat filled with water. This strategic moat was nothing less than a plate.

Uncle Bob was as proud of his invention as a general would be of a successful, unexpected manœuvre. Ants, it must be admitted, have no aquatic capacities, so that when he discovered that his precautions had been frustrated, he did not attempt to disguise his surprise and annoyance, and his first impulse was to lay the blame on the cook.

"So you have neglected my instructions!"

Dame Theresa, however, would not admit this, and made the most solemn asseverations that the sugar-basin had, like a true fortification, never for a single moment been without its surrounding zone of water.

"I am unable to understand it," said the savant.

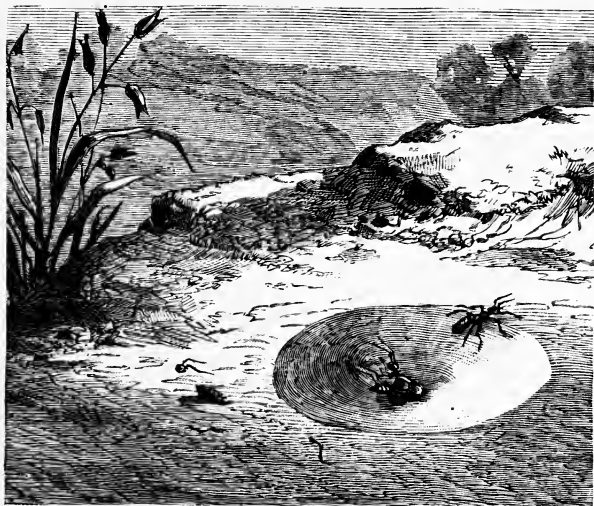
"I think I can explain it," said René. "The sugar-basin was, I believe, in the middle of the dumb-waiter on the second shelf?"

"Yes, well?"

"Well, this morning, I observed two or three ants walking about on the under side of the third shelf,

just above the basin. The place being invincible from below, they attacked it from above; then, having entered the basin, and not being able to get out again, they have calmly awaited the turn of events."

The good doctor laughed most heartily.



ANT-LION IN ITS PIT: THE BORN ENEMY OF ANTS.

"So that it is I that am out-generaled; it is I, an educated, certificated medallist, that am duped by these impertinent Hymenoptera! After this, one may well boast of being a man, and of passing as a learned one! However," he added, with an air of consoling

himself, "since it was destined that I was to receive a lesson in strategy from some insects, it was well that it should be from some of good reputation, known to be clever, keeping a house of their own."

"And herds besides," added Léon.

His cousin looked at him with an expression of incredulity.

"Herds!" he repeated; "have you then another history to narrate?"

"Yes, and a true one. You have had an illustration



RED ANT (*Formica rufa*, Latr.).

of the great love ants have for sugar. Now, as perhaps you are aware, it is a curious fact that the aphides, of which we have already spoken, have the faculty of exuding a sugary substance. The watchful ants, always busy, long since discovered the existence of this natural source of sweetness, and as timidity is one of the last of their defects, they calmly go and milk the aphides, without, however, doing them any harm. Naturally the latter, good-natured and feeble creatures, allow them to do it, not being able, in fact, to prevent it, so that the aphides in question become actually the milch cows of the ants.

"There is still more; the ants have made a further development quite as knowing in its way. 'We lose an enormous amount of time,' they said, 'in going about here and there to milk our cattle, and, for busy ants, time is money.' You will guess the sequel: aphides established in, dwelling in, the nests of the ants, where they are well taken care of, fed, fattened, kept clean, petted, and so on, with the result that there is always a supply of sugar at hand. Without doing ourselves any injustice, can you suggest any way by which we ourselves could have improved on this?"

"No, indeed. But why should they be included in the order Hymenoptera, seeing that these, as you told me, are characterised by the possession of four membranous wings with large meshes? Ants, so far as I know, have no wings at all."

"Yes, they have; but in most cases they are only provided with them for a short time at the period when they are occupied with laying their eggs, and even then not all of them, but only the males and females."

"Your 'only' is very strange. Are there then ants that are neither male nor female? Are there Auvergnats among them?"

"Exactly, and these Auvergnats are the most interesting of all the members of the ant tribe. They are the workers, and on them devolve all the house-

hold operations. The males live like landlords ; the females lay the eggs, and nothing more is asked of them. As for the workers, their occupations are



ANTS AND APHIDES.

much more varied ; in the first place it is they who construct the house."

"In fact, they are at once architects, bricklayers, labourers, and miners. What next?"

"They take care of and milk the aphides."

"Dairymen."

“On them also falls the duty of feeding the males and females, and what is even more essential, the larvæ. These they fatten with truly maternal solicitude.”

“Foster-mothers.”

“And of carrying the latter into the sun when it is warm, or moving them from one chamber to another warmer when it is cold.”

“Nursemaids.”

“And also of keeping watch over all the inlets and exits, and of defending the community in case of attack.”

“And soldiers. Really to be an ant is by no means a sinecure.”

“It is an occupation that few men would be equal to. But, without going far, we can see for ourselves some ants in their home. I noticed yesterday at the bottom of the garden a large stone, and many ants were assembled there. Probably by lifting it——” And without waiting for the end of the sentence, the three friends directed their way to a distant part of the garden.

The stone was raised. Léon had not been deceived. There was at once apparent a confused multitude of tawny bodies, and a great interlacement of feet, as well as a moving and running about in all directions. Then gradually order was seen to be prevailing in the midst of this disorder. The soil forming the floor of

the ants' nest was pierced by many little orifices; one by one the ants entered into these and disappeared from sight. The larvæ and pupæ (frequently called ant-eggs) being unable to walk, were carried by their guardians, three or four of whom sometimes joined in a common effort in order to carry these precious burdens out of the way of danger as speedily as possible.

"These little creatures are really wanting in nothing," murmured the doctor. "Intelligence, devotion—to say nothing of the fact that their perseverance is celebrated in one of the best anecdotes I know as coming from the East, though whether it be Persian, Tartar, or Mongol I do not now recollect; but this, however, is of little importance."

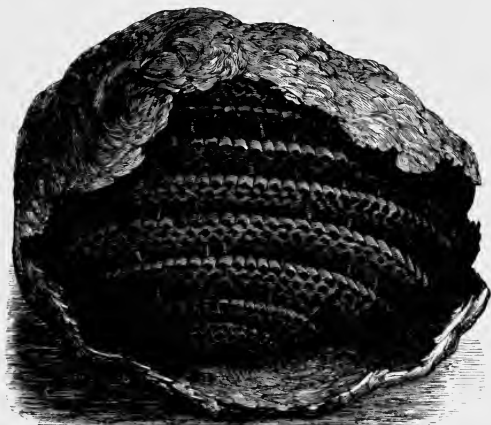
The word anecdote nearly always rouses the attention and excites the expectations of an audience. On this occasion Uncle Bob did not wait to be pressed, but continued—

"It was at the time when Tamerlane was about to commence his career as a conqueror. One day, his forces having been overwhelmed, almost annihilated by a disastrous defeat, he had been obliged to beat a retreat, which, as you may well suppose, had put him into a very bad humour.

"The next day, secluded in his tent, he was asking himself what was now to be done, when he noticed an ant climbing with much effort the canvas of the

tent. With a fillip he made the intrusive creature fall to the ground.

“The ant again ascended; a second fillip from Tamerlane, followed by a third and a fourth, and



WASPS' NEST; WITH PART OF THE EXTERNAL COVERING REMOVED TO
SHOW THE CELLS.

each time the ant again mounted the canvas, not appearing in any way discouraged.

“History is silent as to the number of times this was repeated. But all at once, Tamerlane, striking his forehead, a gesture which among all nations signifies that an idea has occurred to a man: ‘This example should be followed,’ cried he; ‘the future

belongs to the persevering.' And leaving the ant to continue its career, Tamerlane went out, and became—Tamerlane. And thus a little ant once decided the fate of a great empire."

While the doctor was telling this, the last of the ants had disappeared, and the three observers had already turned away from the nest, when they noticed, a few paces away in the alley, a child approaching them, carrying a large parcel. At the sight of the doctor he stopped short as if dumbfounded.

"What do you want, my little one?" said Uncle Bob, patting him kindly on the cheek.

"It is a bumble-bee's nest that I have found and brought to you, sir," said he, offering the parcel to Léon.

X.

More Hymenoptera—Republic and monarchy—Bees—Expulsion of the swarm—A swarm in a letter-box—Preparatory measures—House-cleaning and repairs—Propolis—Wax, honey—Saint Bartholomew's day in a hive—Egg-laying, larvæ—Regal food—A mortal duel—Orthoptera—Cockroaches, crickets, grasshoppers, &c.—Earwigs—Undeserved censure—Extraordinary increase of locusts and Blattæ—A supposed omission—Out of the ranks of insects—The *Epeïra diadema*—How the spider spins his web—The trap-door spider, navvy, mason, and upholsterer—Argyroneta—A tent under water—The struggle for existence.

LEON took a shining new silver coin from his purse, and gave it to the child, who ran gambolling away.

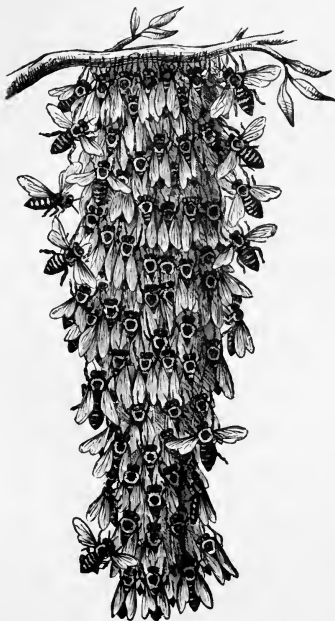
"This is an opportune purchase," said the young naturalist, as he located the great nest in his work-room. "Next to the ants among the Hymenoptera, we shall study the bees, for bees, humble-bees, wasps, and hornets are all of one kindred, or nearly allied."

"They are first cousins, and the ants their second cousins," said René. "Well done! I like families so well arranged. I have no doubt we shall find the bee-republic another model."

"A republic! But it is not one. The ants are democrats; the bees live under a monarchy, and moreover, appear neither better nor worse off for so doing.

"The hive is made up of a queen, of five hundred

to twelve hundred males, and of fifty to thirty thousand sterile workers. In this little world each one



SWARM OF BEES.

has his appointed place. If we follow the movements of a young swarm from the moment when, being sufficiently strong to shift for itself, it is expelled

from the paternal abode, we shall see the bees, like a little buzzing cloud, wandering about from tree to tree, sometimes stopping and clustering together in a dense mass, until a new home is found, or one is provided by some bee-keeper. When they escape being thus appropriated, the new home is usually in a hollow tree trunk, an old wall, or some similar shelter. I have known bees to take up their abode at the top of a steeple. Quite recently, in some village of the Lower Seine whose name I have forgotten, an inexperienced swarm found no better course than to install itself in the letter-box of the post-office.

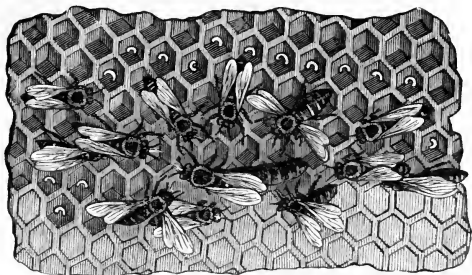
“The dwelling place being selected, the bees cleanse and prepare it; they close accurately all its openings except one, and they cement the interior by means of a varnish called propolis. This substance is also used for another purpose. If, by some chance, an intruder should find its way into the habitation, they expel it, either living or dead, when it is not of too great a size for their powers. But sometimes it proves to be too heavy to be ejected, and what then is to be done? With such a carcass within it the dwelling would not be habitable.

“The bees are not embarrassed by such an affair. They procure a supply of propolis, make use of it to enshroud the body, and so, by this novel mode of embalming prevent the access of air to it, after which there is no further reason for apprehension: a sort of

mausoleum or monument, standing in the middle of the hive, remains the sole vestige of the deceased enemy."

"Certainly very ingenious. But now, about wax and honey?"

"I am coming to that. As soon as the abode is made habitable the workers in wax begin to fabricate the hexagonal cells with which you are familiar, and



FRAGMENT OF COMB, WITH BEES AT WORK ON IT.

which serve the double purpose of storehouses for provisions and of cradles for the future posterity.

"This wax is secreted by the bees. Formerly it was supposed to be gathered from flowers, but it is now known that it is secreted by means of a special structure on the hinder part of the body, and that it is not pollen, kneaded or altered by working.

"With regard to honey, it appears that they in

the first place obtain it from flowers, from which they abstract it by suction, and disgorge it into the cells of the comb. When everything is prepared, the queen leaves the hive, takes a flight in the air, and returns to lay her eggs. After this moment all the males are massacred without any mercy."

"Without sparing any? I think this detracts much from the idyl of the bee. I was inclined to fancy them models of all the virtues! You were saying that the queen returns to lay—"

"An egg in each cell; but, like a prudent manager,



DRONE, OR MALE OF THE HONEY BEE.

she proceeds in a recognised order: first the eggs of workers, then the eggs that are to produce males, and lastly, in much larger cells, eggs from which queens are to arise, these latter at intervals of some days, in order that several queens shall not be born together, for this would probably give rise to fatal disturbances."

"Such a proceeding may be called the perfection of foresight. Offspring, and the future tranquillity of the

society are definitely assured, supposing, as you say, that the eggs for queens do not fail."

"This latter contingency has been provided for as well as the others. The larvæ appear after two or three days, and are fed by the attendants of the hive for five or six days. Then they cease to eat, spin a cocoon, and in this temporary shroud await the moment when they also shall become perfect bees.

"One of the most curious facts is that the eggs and

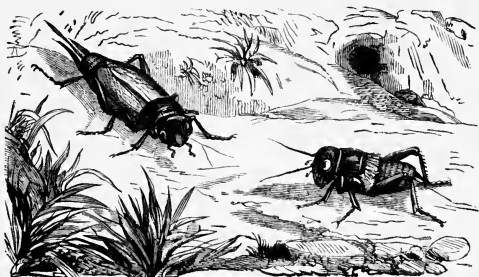


COMMON EARWIG.

larvæ that are to become queens are the same as the eggs to produce the larvæ of workers. It is the nutriment given to them that differs: while the workers receive only a rather thin paste, the future queens are nourished by means of a much more substantial jelly. So that if, as the result of some unfortunate event, they should be deprived of their queen, they select a well-to-do larva of a worker, and this,

by virtue of the more substantial and efficacious food, becomes a queen capable of affording eggs. Besides being nourished with this superior food, the queens also are reared in royal cells, of a larger size and different form.

“Sometimes it happens that, in spite of all the precautions that have been taken, two queens attain at the same time their complete development in the



FIELD-CRICKET. (*Gryllus campestris*).

hive. Then there arises a fatal duel, and only one of the two may remain in the domain. The bees, though such industrious little creatures, are very jealous and intolerant. But suppose we return to the garden for a little ? ”

It was now about four o'clock in the afternoon, and the crickets and grasshoppers concealed in the herbage commenced their deafening noise.

“These belong to the order Orthoptera,” said Léon; “the only one we have not discussed. They are injurious and destructive creatures, both those that run, like the Blattæ, Mantides, and Forficulæ (earwigs), and those that leap, as the grasshoppers, the locusts, the crickets, and the mole-crickets.”

“How, then! Is the familiar cricket an injurious creature? If so, there is another belief the less, and Lamartine was not correct when he wrote the verse that you no doubt are acquainted with—

“ ‘Solitary cricket,
A voice from underground,
Arouse thyself and sing
A song for me.’* ”

“As we are speaking of Orthoptera, can you tell me if earwigs really have the habit popularly attributed to them of entering the ears of people and making their lodging there?”

“Certainly not; they have never been known to do such a thing. It is a mistake that is probably connected with their name. This is perhaps derived from the form of the appendages that terminate the body, or from the shape of the wings when they are unfolded. Their pincers are said to somewhat resemble in form the instrument that jewellers formerly made use of

* “Grillon solitaire,
Voix qui sors de terre,
Ah! réveille-toi
Pour moi.”

to pierce the ears of young people. The popular error has perhaps arisen from some misconception thus suggested.

“The statements made to the effect that in Algeria the attacks of locusts are a most serious scourge to the inhabitants are, however, no error, but unfortunately are only too true. The whole of the vegetation, even to the last leaf, is destroyed and every green blade has disappeared after the visit of one of these immense clouds. They are so dense and consist of such enormous numbers that in 1874 the railway in the province of Algeria was blocked by them.

“Indeed, the greater part of the insects of this order are very prolific. Ships have been infested with *Blattæ* to such an extent that it has been found necessary to have recourse to organised fumigations to destroy them, and they were afterwards taken away by bushels.*

“We have now, I believe, passed in review all the orders of insects.”

“All, all?” asked René, with a mysterious intonation, something like that which the sphinx of Thebes must have adopted when, according to legend, he proposed his charades to those passing by.

* In Cyprus, during the autumn and winter of 1881, 1,330 tons of the eggs of locusts were destroyed at the instigation of the British Government.—*Translator.*

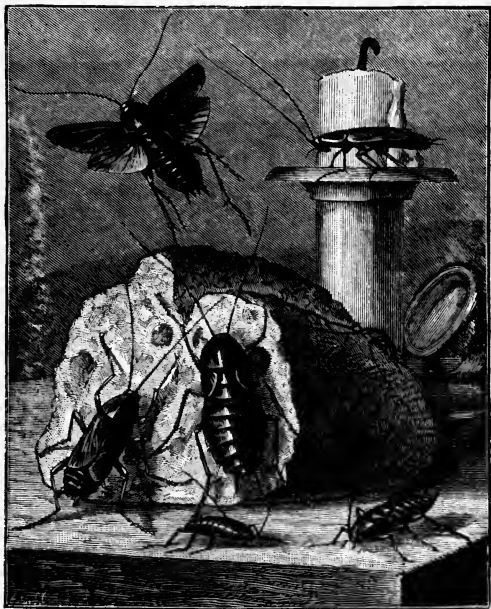


A MIGRATION OF LOCUSTS. BENEATH ARE IMMATURE LOCUSTS.

“Yes each one, all. Are you not yet satisfied?”

“Well,” said the Parisian, who in point of fact was not at all sorry that he was able to catch his cousin

tripping in connection with his favourite science,
“by some curious inadvertence you have forgotten



BLATTÆ (COCKROACHES), COMMONLY CALLED BLACK-BEETLES.

an important group—one, too, that is not the least
interesting of them.”

“What can that be?”

“Look there!”

Held by a thread between two branches of some bushes there was a large spider, *Epeira diadema*, which, quite unaffected by being the subject of conversation, was calmly taking the preliminary steps towards the formation of its net.

"You are both right and wrong," said Léon. "You are right, for I had no recollection of the spiders; but you are wrong, inasmuch as spiders are not insects. They are out of the category, as they possess eight legs, and also lungs. The Myriapoda (centipedes and thousand legs) also form a separate class. The first of these two classes is named Arachnida. The ordinary equivalent of this scientific term may be given as the 'class of spiders'; the second, Myriapoda, which means, 'myriad feet.' Now we shall see how the spinning spiders construct their web." *

The spider, at the moment when the young men arrived, had already fastened the end of its thread to a twig, then letting itself fall, it attached the other end a little lower down. This preliminary part of the work being accomplished, it several times re-

* Those who dislike the spiders found in our houses should not on that account allow themselves to be prejudiced against those that live in our fields and gardens. These latter are in reality valuable friends to us because of the little insects they devour as food. A friend of ours, who lives in Mauritius, has furnished us with the following striking example of this: "In some portions of the island the plantations were formerly surrounded by large trees, where numerous spiders made their webs. In every place where these trees have been felled and the spiders destroyed, little insects, chiefly Diptera, have directly appeared in unexampled abundance."

traced its steps, making use of this slender thread as a bridge, and adding a new thread as required. Then when this portion appeared to it to be sufficiently strong, it prepared the other radiating lines in a similar manner, adding finally the concentric threads. There then only remained for construction the hiding-place in which the proprietor of the web lies in ambush to await the course of events. This den, made out of a leaf that the spider is able, by means of its silk, to roll into the form of a cylinder, is arranged in such a manner that the creature in it is made aware of the slightest shock that may be communicated to the web, and also so that it can run out at the first indication and pierce with its venomous jaws any unfortunate insect that has allowed itself to be captured.

The spider's web is not in reality formed by weaving: it is simply gummed, and Léon did not fail to point this out. "The substance of which the silk is formed is," he said, "a sort of viscous gum, secreted by a gland, and issuing by four mammillæ, pierced by a multitude of little holes. Each thread, although it appears single to the naked eye, is in fact a bunch of threads soldered or gummed together, and drying on contact with the air, after having been secured to the other threads forming the structure of the web.

"Each species, moreover, has its own way of work-

ing, and constructs its web, as well as forms its den, in its special manner. The trap-door spider, very common in the south of France, excavates in the earth a well, or pit, of about one or two feet in

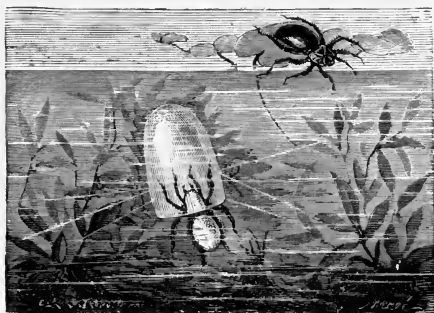


TRAP-DOOR SPIDER (*Cteniza fodiens*) AND ITS NEST.

depth, and carefully lined. Like a wise animal, it closes its dwelling by a lid, a true door, kept in place by a hinge, and closed with a latch, the latch being the spider itself. The inner side of the door has

attached to it some strong threads, by means of which the spider, holding on to the sides and the lid, at the same time lock and lock-maker, keeps its house safely shut up, and without having any fear of losing the door-key.

“But of all the spiders, the most extraordinary is perhaps the *Argyroneta*, which has the excessively



ARGYRONETA AND ITS AQUATIC BALLOON.

odd peculiarity of constructing its house under the water.

“It is perhaps even more curious that this water-spider does not possess any special organs, that would enable it to breathe and live at large in the midst of the liquid element ; the *Argyroneta*, in fact, breathes air like other spiders. When it is on the point of establishing a home, it begins by choosing a leaf at

the surface of the water, in order to form with this a protection for the edifice. The *Argyroneta* being covered with hairs and pubescence, air adheres to its body, giving it a silvery appearance when in the water, and it is thus enabled to live for some time beneath the surface. Being thus provided with a temporary supply of air, it constructs a web something like in size and shape to a thimble, secured by threads to neighbouring plants. It then ascends to



WATER-SPIDER.

the surface, and again descending carries with it a supply of air, which it discharges into the silken web, and repeats this operation until this novel kind of balloon is sufficiently inflated, when it takes up its abode therein and makes excursions in search of prey, which when captured it carries back to its subaquatic balloon and devours at leisure.

“Father de Lignac states, moreover, that he was acquainted with a case that appears almost incredible,

namely that two *Argyronetæ* of different sexes, having their nests placed at some little distance from one another, had actually established a silken gallery of communication between them.

“I think you will admit that, however, extraor-



COBWEBS AND SPIDERS.

dinary may be the natural history of the ants and bees, that of the spiders is also not without its interest, and may induce us to try to overcome the feeling of repugnance that is entertained for these creatures by many people. I might add that it is

said that spiders are not insensible to the charms of music. Although it is so well known, I may remind you that Pellisson, when he was in the Bastille——”

Léon suddenly stopped. Another spider, with enormous legs and hungry aspect, had suddenly descended on the newly stretched threads. Possibly his web had been destroyed, and he had not at the time the material in his possession that would enable him to construct another, so that no resource remained to him except to establish himself, by the right of the strongest, on the territory of the other.

The legitimate proprietor fled in alarm. At first it endeavoured for a few moments to resist, but soon perceiving that the struggle was an unequal one, it pitifully retired and left the place.

René, who had watched in an attentive manner all the phases of this drama, wished to crush the usurper, but Léon prevented him.

“Why destroy it?” said he. “It is but obeying the mandate of its nature. Everyone must live, and if the first spider retired so promptly it was probably that it felt itself able to construct a new web. Moreover, have we men the right to show ourselves so severe?”

The face of the Parisian grew serious, and his memory carrying him back several years, René re-

called the fact that if spiders impelled by hunger sometimes usurp the place of others in order to live, there were also men who had allowed to escape from their lips these words whose shamefulness should not permit them to be forgotten—

“Might is greater than right.”

XI.

A sailor's marriage at Villers—Titles of nobility—A strange vessel—Good folk—An acceptable gift—The *Albatross*.

It will be recollected that Father Lucas had given an invitation for a certain Wednesday, and this had now come. This very day the fisherman's daughter was to be married, and the doctor had promised to be present with his friends at the ceremony.

Uncle Bob's young guest, who was not himself attached to the old fisher by any tie, was delighted with the prospect of being present—he, a Parisian!—at a ceremony so different from one of the kind at Paris. “A sailor's wedding, fancy that! No doubt it will be a funny affair,” but the mocking remarks and ironical commentaries at the tip of his tongue were arrested beforehand by a rather stern glance from the doctor. It must not, however, be supposed that René was of a malicious disposition; it was rather that he was very young, and a little rash and hare-brained. And it was somewhat in this state of mind that he entered the church, and awaited with some curiosity the arrival of the affianced pair and their friends.

He had not long to wait. Soon the noise of measured steps was heard on the pavement, and gravely and slowly the parents and friends advanced.

Father Lucas was superb. On his ample breast were displayed, glistening in the sun, two tiers of medals, all earned by saving the lives of his fellows at the risk of his own. And yet in point of fact the number of rescues he had made far exceeded that of the rewards obtained.

Amongst the surrounding group of relatives, of friends, and of the companions of his toils, there were also many bearing these tokens of courage and devotion, which on the breast of a common sailor figure as true proofs of undoubted deeds of courage, not as the baubles of a puerile vanity.

The Parisian could not but be impressed and he smiled no more.

The ceremony was performed in the presence of a considerable assembly of the rough and simple natives of the locality, who are too familiar with the perils of the deep to neglect the prayers of the church. Afterwards the wedded pair again crossed the threshold of the church, and Father Lucas was on the point of again entering his home, when he felt a friendly hand placed on his shoulder. He turned and saw it was the doctor.

"Can you speak with me for two minutes?" said the latter.

"Willingly," and the pair receded a few steps in the direction of the beach.

As the two cousins remained behind at a discreet distance, "You may come with us," called Uncle Bob; "you will not be in the way."

The two young people followed with some eagerness, for their curiosity was now aroused. Those invited to the wedding were for the most part now gone home to get themselves ready for the festivity usual in such cases, so that no one else noticed the incident. The little group had reached the strand, when all at once the fisherman placed his open hand above his eyes, so that he might see better when not inconvenienced by the rays of the sun.

"Do not know it," he muttered as if speaking to himself. "It is very strange. Don't know it."

Uncle Bob laughed in his sleeve.

"You don't know it! What is it, then?" he remarked.

"Good gracious! Do you not see yon white bark, cutter-rigged, stranded below there on the sand, and with a quite new flag flying at the top of the mast? I know every vessel of this coast—know them all, but that I don't know at all. I cannot recollect it—unless it is some pleasure-boat. But no, that is out of the question: it is in too good a state and then it is rigged for fishing."

They went a few steps nearer, the sailor keeping his eyes steadily fixed on it. Then, his surprise may

be guessed when he saw the boat salute by lowering its flag.

"It must be some decent people—very polite folk," cried the good man. "I don't know them, but it's all the same; I shall go and have a look at their boat and tell them what an old sailor thinks about them."

"This boat is for you," said the doctor. "It is my wedding-present. You will be able to go about with it, take friends for excursions, go and see your children, make your shepherd's round according to your own desire. How do you like the rigging?"

The sailor was standing open-mouthed and quite dumb-founded—stupefied, in fact, by such a piece of good fortune, which it would never have occurred to him even to hope for.

"Is it true—is it really true, what you are telling me? You are not joking? It is really for me, this fine boat, and all its rigging and tools? Well, well, and I accept it on two conditions. One is, that Mr. Léon shall be its godfather, and that we make the first voyage together. And if you ever want to make a journey to Caen, to Courseulles, to Etretat, or anywhere else, say the word, give only a sign, and old Lucas will take the tiller for you."

And then, to emphasize the sincerity of his words, he seized the doctor's hands with his own. The fingers of the scholar almost cracked beneath his hearty grasp, but he made no sign of complaint.

Then the boat must be examined. Lucas poked it about and investigated it with the thorough attention of a craftsman. It was in fact quite new, and had been brought from a building-yard at Trouville by some sailors according to a plan arranged beforehand. It was large enough to carry five or six persons, but at the same time was so fitted out as to be capable of being handled by one man. An orlop extending to the stern both increased its stability and assisted in keeping out the seas, and in case of severe weather was capable even of protecting the passengers. As fittings there were a table, some folding chairs, and two berths arranged on each side. The storage-place for the sails and ropes was covered by the planking.

"Everything is as it should be," said the sailor after a minute inspection. "In fair weather I could cross the Channel in it." Then suddenly recollecting the business of the moment, he added, "And my mates, I was forgetting them. Won't they be surprised when I show them your present after we have done breakfast!"

After having again pressed the hand of the doctor, he hurried away as fast as his old legs would carry him.

The two young men were thoroughly pleased without any pretence. Uncle Bob had in fact made three happy by one stroke, for if Father Lucas was

the owner of the boat, it was quite evident, that they would get the use of it. So the doctor's nephew was able to say with reason—

“What name shall we give to *our* vessel?”

“That, my dear boys,” interrupted the donor, “I have been obliged to attend to myself already. I am sorry for it, for I should have preferred the pleasure left to you. But our law in France is as imperative in demanding a recognised name for a boat taking the sea as for a child who has come into the world. I have therefore brought our new acquisition into harmony with the official regulations by giving it a name of my own choice. Read and confirm.”

On the stern of the vessel the young men saw, on inspection, a carved figure of a white bird standing out in bold relief, with its wings unfolded, while above it in gilded letters, and just then brilliant in the rays of the sun was the name—

THE ALBATROSS.

XII.

A letter—Logical inferences.—Pietro Franceschini—The Odysseus of a gendarme—An account of the acquaintance of Franceschini and Uncle Bob—The two barometers—A false prophet.

“MR. LEON—

“DEAR SIR,

“My labels are completed, my collection of forest birds and animals is mounted and varnished. You kindly promised to classify them for me. Thanking you again for your consideration, I have the honour to inform you that you will find me at home Thursday, Friday, and Saturday, from two till four in the afternoon. If any of my duplicates should be of use to you, it will give me great pleasure to place them at your disposal.

“I am, Sir,

“Your very true and obedient servant,

“PIETRO FRANCESCHINI.

“Keeper.

“P.S. My obedient compliments, if you please, to your father, Dr. Boberral.”

A correct logician, or even a police magistrate, (happily the two are sometimes combined in one

person) into whose hands this letter might have come, would undoubtedly have drawn certain inferences from it, such as—

1. That the writer of this letter was a gamekeeper. Not a difficult inference this, seeing that he announced it himself.

2. That the keeper was a Corsican. At least his name, which was very Italian, pointed to this.

3. That this Corsican gamekeeper was a retired gendarme. This might be gathered from the style of his letter, which while striving to be as polite as possible, still retained an official smack, and something of the formal and precise manner of a legal document.

4. That the aforesaid Corsican, keeper, ex-gendarme, employed his spare time in the formation of a collection of the animals of the locality, and that he had not, from lack of the requisite knowledge, been able to arrange it himself.

5. Lastly, if he were acquainted with the good reputation of Uncle Bob, that this Corsican, ex-gendarme, presently gamekeeper and natural history collector, had been the recipient of kind offices from the learned doctor.

A logician who should have made all these inferences would not have been in error.

Pietro Franceschini, after having patrolled on horseback various parts of France under the insignia of the

well-known cocked hat, had just attained the somewhat fabulous position of non-commissioned officer, when the war between France and Germany was declared in 1870.

Slightly wounded at Wissemburg, he had been able, thanks to his thorough knowledge of the district, to escape the clutches of the Prussians, and after a multitude of wanderings, a veritable Odysseus, he had succeeded in reaching Paris a few days before the siege, just in time to be enlisted as non-commissioned officer in a company of pioneers.

This hazardous and adventurous life was exactly to his taste. Frequently at night-fall with his men he quitted the besieged city, and came into contact with the advanced guard of the Germans, harassing them, and letting them see, as he said, some of the dodges of a gendarme. As hardy as a real Corsican, and cunning as a fox, he invariably brought these nocturnal expeditions to a satisfactory conclusion, and when he returned at daybreak within the line of the fortifications, he contrived to bring with him one or more prisoners, as he did not wish "to get rid of a good habit."

But, as says an old proverb, "The pitcher goes often to the well." As the result of taking so many others by surprise, he had one night been taken by surprise himself. In the skirmish he had received a formidable slash across the face, and at the same moment a huge demon of a Uhlan pierced his shoulder by

a thrust with his lance. In this pitiable condition he was rescued with difficulty by his comrades, and brought, they said mortally wounded, to the ambulance of Uncle Bob.

Interested by the difficulty of the case, the surgeon set himself, whether or no, to save him from his desperate state. He spared none of his skill or pains in dressing his wounds, and rendering him a whole man. Franceschini, too, performed his part of the task by deciding with the obstinacy peculiar to a man of his nature and calling, that he would not die as long as there was the slightest chance of living. It is scarcely necessary to add that he vowed eternal thanks to the good surgeon for his almost miraculous cure.

Two or three years afterwards, a keeper's place in the forest of Touques being vacant, the gendarme, who, in spite of his wounds, was still whole of eye and of foot, easily obtained it on the recommendation of his kind saviour.

At the moment when our acquaintance with him commences Franceschini is a man of about fifty years, thin, of nervous temperament and military bearing, with hair closely cropped in conformity with the regulation cut, and heavy, white, hanging moustache. His wound, usually not very conspicuous on his parchment-like skin, sometimes becomes, in certain states of the weather, more conspicuous, and then appears in the

form of a violet line extending from the left eye to the upper lip.

The day after the receipt of his letter, the doctor pleased with the prospect of again seeing "the old lion," engaged a phaeton for the afternoon, it being four good leagues from Villers to the keeper's house,



A CHEAP BAROMETER.

and the doctor having left his horses and carriage in Paris, in order to oblige himself to take walking exercise.

The day was ushered in with every appearance of becoming very warm.

"We shall want sunshades rather than umbrellas,"

said René, as they were getting themselves ready for a start.

"Let us see what our barometers say," replied Léon; and he entered his workroom. "First let us look at No. 1."

No. 1 was a dial-faced aneroid barometer hanging on the wall. Léon gently tapped it with his finger. The needle did not move.

"The barometer is not rising," said he.

"But it is not falling," answered René, "and why should you expect it to rise? It is already standing nearly at fine weather."

"Let us look at No. 2."

No. 2 was a very different instrument. The case of a barometer was replaced by a vase three-parts filled with water and covered with a piece of muslin, the graduated scale by a genuine ladder of wood, and the needle by a green frog with brilliant reflections, and which at this moment had chosen to locate itself at the bottom of the receptacle.

"Hum!" said Léon, "this barometer is very low; which seems to show—"

"That your frog is silly enough to like the water," replied René, who was determined to start, come what might.

A lively cracking of whips interrupted the conversation. It was the doctor, who, as he was not going to walk, was determined at any rate to have the pleasure of driving the party himself.

There was no further expectation of a disappointment, for the carriage was at the door. René turned to the vase, saying with an air of most withering contempt—

“Adieu, false prophet.”

The frog did not see any necessity for a reply. He contented himself with crouching more determinedly than ever at the bottom of his receptacle, while René agilely mounted next to his cousin. Black, nose in the air, installed himself between the legs of his master. The carriage disappeared.

XIII.

The Road to Touques on a fair-day—Reptiles—An example to be imitated by the market-gardeners of France—Doubtful forms—A reptile with a strong anatomical resemblance to a bird—Birds provided with teeth—Uses of reptiles—Barometer No. 2 seems likely to be right.

AT Touques it was the day of the fair, and the road to the town, though usually rather deserted, was on this occasion traversed by many of the country people.

Milk-carts quite covered with mud, their usual complement of tin cans replaced for the time being by children rolling about in the straw; tilburys driven by heavy brazen-faced farmers, wearing blouses and silk hats; cabriolets, whose leathern hood, reddened by long exposure to the storms, tottered and groaned, the iron springs supporting it being old and rusty; in short all sorts and sizes of vehicles, known and unknown, probable and improbable, had apparently been brought into use, and raised thick clouds of dust which almost blinded the travellers on foot.

Occasionally there might be seen groups of lasses in their Sunday best, going in little parties together, hand in hand, their important business being to select

from the wares of the hawkers at the fair a few gaudy ribbons and perhaps some jewellery of brass or gilt.

Here and there, in the distance, might be distinguished some rather denser cloud of dust, and as it was approached it proved to be a herd of oxen, driven probably by a boy in a serge blouse and wooden shoes, and armed with a large stick. Now and again the weapon would fall with a dull thud on one of the tawny rumps, and the enormous beast, shaking his head and neck, would break for a few seconds into a lumbering trot and again relapse into his lazy progress.

The heat was stifling ; occasionally the horse would shake its mane and neck with impatience, hoping to get rid of some of the flies that harassed it ; and under the burning rays of the sun the varnish of the vehicle cracked and melted, burning and staining the fingers that touched it.

Under such conditions conversation was not likely to be very animated ; the travellers wiped their brows, the dog panted and hung out its tongue.

René was the first to break the silence. Turning round to Léon :

“Do you still believe in your——”

“Reptile,” replied his cousin who was dropping off to sleep.

“Reptile ! So be it. I thought, however, that reptiles had no legs. Probably you will tell me that there are several classes of them ?”

Just then the carriage was passing through an avenue of large trees; and the cool shade a little refreshed the young naturalist, who thereupon decided that he would give the information asked from him.

“Here, in a few words, is a summary of it. There are four distinct orders of reptiles—*

“The Ophidia, or serpents.

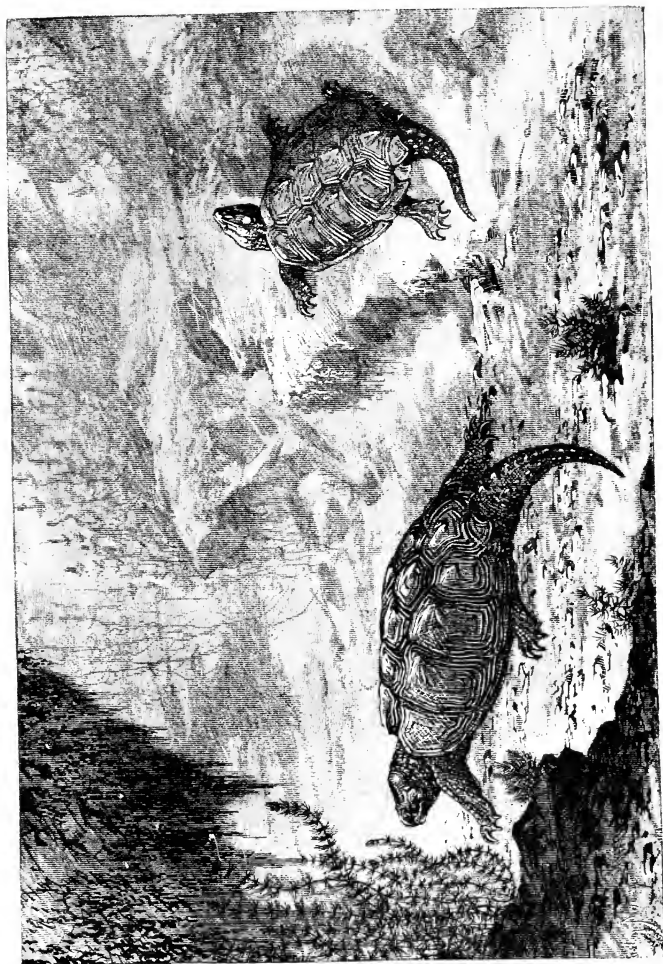
“The Saurians, or lizards.

“The Batrachians, or frogs.

“The Chelonians, or tortoises.

“With the possible exception of the viper (and in Normandy the bite of the viper is not usually very dangerous), all our reptiles are valuable friends to the agriculturist. Although we are destitute of tortoises in the north of France, yet the lizards and frogs destroy a great quantity of slugs and little insects. The toad himself, the hideous and repulsive toad, is of such real utility that the English market-gardeners, who in this respect, it would appear, are better informed than our own, are said to purchase them every year, in Paris, in enormous quantities, and pay as much as a penny apiece for them. On the other hand, it must be admitted that in several other countries the

* At the present time the frogs or Batrachia, are not classed with reptiles, but are considered to belong to another class called Amphibia. As, however, the crocodiles are, by many naturalists, separated from the Sauria as a distinct order, the number of orders of reptiles may still be said to be four.—*Translator.*



TORTOISE.

reptile world is represented by crocodiles, alligators,



FROGS' EGGS AND TADPOLES PARTIALLY DEVELOPED.

snakes, and other creatures of very bad reputation. In a certain sense reptiles may be termed hybrids,

or rather animals of transition. Frogs, toads, and salamanders undergo metamorphoses, something like insects, and serpents change their skins in a similar way to the Crustacea.

“By the conformation of their legs and of their skeleton, the Batrachians, the Saurians, and the Tortoises approach the mammalia, while the cloaca of the intestine, and their mode of reproduction by eggs, are points of relationship with birds. On the other hand, serpents and eels (members of the fish tribe) have an air of resemblance or kindred that cannot be ignored. By the way,” added Léon, who had become quite wide-awake, “do you know which of the reptiles it is that anatomically most resembles a bird?”

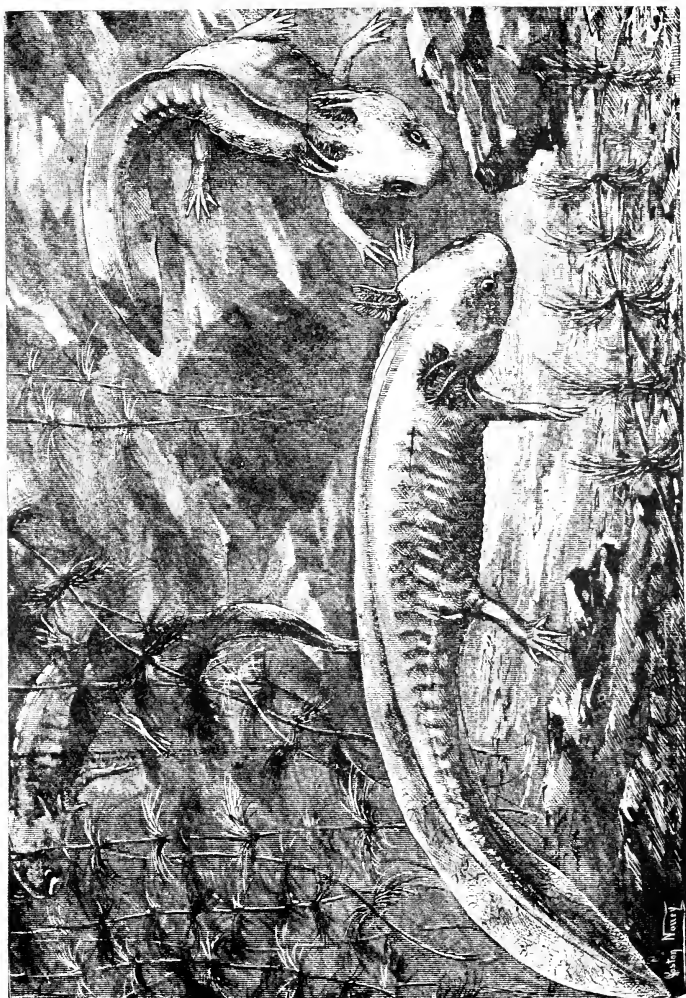
“No.”

“Well, it is the tortoise: the mandibles, the consolidated breastbones—” *

“A bird and a tortoise! What a pair of anatomical relatives! However much the sternum may be soldered, I shall wait to admit the resemblance until chickens have teeth.”

“At present they have not teeth,” said the doctor; “but they have had them; certainly not chickens exactly, but some fossil birds discovered a few years ago by the American geologists. And it may be mentioned as a coincidence that tortoises with teeth

* The breast or plastron of the tortoise is not now considered homologous with the breastbone of birds.

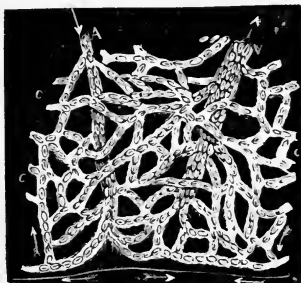


MEXICAN AXOLOTL (*Sireh macleatus*).

have been discovered in the formations of the Tertiary epoch. But to return to our native reptiles: I shall remind you of the lizards, literally our friends, for they are easily tamed."

"I should think so!" exclaimed René; "I kept a whole tribe of them in my desk at school."

"The so-called salamanders, to which in old days wonderful properties were attributed. amongst others



CAPILLARY NETWORK OF THE FROG'S FOOT: A, ARTERY;
C, CAPILLARY; V, VEIN.

that they could withstand fire. Speaking of that, I often wonder what fables the ancients might have manufactured about the axolotls, the strange reptiles that are imported here from Mexico, and are beginning to replace in aquariums the gold-fish now become rather too commonplace. Finally come the frogs, already alluded to. They supply us also with a ready means of observing the circulation of the blood. This

can be seen with a good magnifying power in the transparent web or membrane uniting their toes. And we must not forget the green frogs, whose duty it is to act as cheap barometers."

"And who are worth about as little as they cost," ejaculated René who still entertained a malicious feeling towards barometer No. 2.

Just then a prolonged rumbling was heard in the distance; and while the doctor and Leon were listening with eagerness, "It is some heavily laden vehicle going by," added the Parisian. There was, however, no further possibility of mistake: a few minutes afterwards the first gleams of lightning, precursors of an approaching storm, were seen behind the great trees.

"Look, obstinate man!" said Leon. "These, I presume, are the lamps of your vehicle!"

The storm rapidly increased; the cloud, at first distant and almost imperceptible in the blue sky, increased, and soon the azure firmament was covered as if with an immense dark veil of slatey grey.

For a moment the little caravan stopped discomfited. But as they were less than a mile from Touques, it was decided to push on to there, and take shelter in the meantime.

The doctor drove on the equipage with a heavy stroke or two of the whip, and a few minutes afterwards they reached one of the first houses. It was an inn,

placed at the beginning of the village, as is usual in country places.

Feeling thankful for this usage, our four travellers, Black being included, hurried to enter the shelter that so opportunely presented itself.

XIV.

A village inn at Touques in the year of grace, 1884—At the fair—The g-r-r-r-and menagerie—A trade truly requiring a natural calling—Two anecdotes of tamers.

It was none too soon. Just as our travellers entered the tap-room, the storm burst forth with fury, accompanied by torrents of rain and hail, which rattled like a fusillade and rebounded from the windows.

Leon, René, and the doctor took up a position in a corner, while the ostler took charge of the horse and carriage, and placed them under shelter.

The room into which our friends had just entered was a large square apartment. The walls were covered with a flowered paper, and on them were displayed three framed engravings, one representing some Arabs overthrown by a sort of lion; another some Indians in process of being devoured by an animal that was supposed to be a tiger. The third was the capture of, probably, Sebastopol. Interspersed between these three artistic efforts were portraits, one halfpenny each, of distinguished persons and celebrated criminals,

alternating with bills, blue, yellow, red, announcing the wonderful properties of divers new elixirs and little known liquors, with the names and addresses of the makers in letters of gold.

At the end, a gigantic yellow bill announcing the times of departure and arrival of the trains of the Western Railway Co., served in lieu of a curtain. Such was the establishment, and many like it may be found quite near to some fashionable bathing-places—a village alehouse endeavouring to assume the appearance of a town hotel, on account of the wandering tourists who occasionally find their way to it.

The peasants, excited by the native cider, the intoxicating beverage made from the apples of the district, and possibly also by the unusual incidents of the day, smoked, vociferated, and shouted, each at the top of his voice, and rattled down their dominoes on the marble tables with noisy emphasis.

The doctor, as well as his two companions, found himself ill at ease in so numerous and boisterous an assembly, so that as the first violence of the storm had passed, the downpour of thunder-showers and hail being succeeded by a steady rain, he hastened to get out and find some other shelter.

A few paces farther on there was the outskirts of the fair, with its rifle-shooting at a target of pipes, its peripatetic pastrycooks, whose small establishments diffused for some distance around them odours of the

dripping-pan and burning fat; its bowling-places with their grotesque announcements; the dealers in sweets, arrayed in the guise of Turks, and continually tintinabulating their little bells; lotteries where children always gain prizes of indigestible gingerbread, and their parents, occasionally, of glassware and knickknacks of a nature supposed to be artistic, that might well arouse the cupidity of the negroes in Africa.

Still farther on, side by side with the caravans painted in yellow, and doing double duty as dwelling-places and as temples of the travelling fortune-tellers, conjurors, intelligent mesmeric, all sorts of other exhibitions were drawn up: deformed dwarfs, very ugly giants, with huge painted canvases, explanatory announcements, and occasionally a chained monkey, rickety, angry, and grimacing at the door.

Uncle Bob cast glances right and left in search of some respectable entertainment where they could decently await the cessation of the rain, and soon perceived a large canvas structure. On the front of this edifice appeared an inscription some twenty feet in length—

“GRAND ASIATIC MENAGERIE.”

They entered immediately, the only delay being caused by Black, to whom the odour of lions appeared to be but doubtfully attractive.

The menagerie was arranged, like others of the sort,



AFRICAN LION.

with the cages placed side by side. Behind the thick iron bars were some lanky panthers and rheumatic lions, dozing, or looking with a stupid air at the visitors who were waiting the "description."

Occasionally a lion or other beast of prey, would give utterance to a dull growling, and the blue long-tailed parrots, the yellow-crested cockatoos, hanging to their perches like trapezes, replied by discordant shrieks.

A somewhat good-looking young woman, in a green velvet bodice with silver embroidery, skin tights and riding-boots, commenced the descriptive speech.

"Ladies and gentlemen, this is the terrible lion of Nubia. His thick mane, his enormous strength, his majestic gait, the echoing thunder of his voice, have rightly procured for him the title of king of the animals.

"With a single stroke of his tail he prostrates the strongest and most powerful man, and by the strength of his terrible jaw he conquers the largest animals."

All this was said in one note, with a shrill and gabbling utterance, something after the fashion of a child rapidly repeating a lesson.

Then changing her tone and striking the bars of the cage with her pointing-stick, "Get up, Sultan!"

The awkward animal raised itself in a reluctant manner, and the tamer continued.

"Here is the crocodile" (she pronounced it *crro-*

ccodille), "also called the alligator, of the river Nile, whose proverbial ferocity has been related by many travellers."

"Another mistake," muttered Léon; "crocodile and alligator are two very distinct creatures."

"In these distant countries, woe to whoever allows himself to be surprised by this terrible amphibian! For the crocodile of the Nile seizes its prey between its fearful jaws, and dives to the depths of the waters to devour it."

Then, in the same voice with which she had addressed the lion, "Come now, give us a laugh," she said, and struck the terrific jaws with her stick.

The saurian moved a little in its bath, opened its eyes, and commenced to yawn, making a noise something like a steam-engine letting off steam. This was all that the most persevering scholastic efforts of the tamers had been able to teach it.

The girl rapidly covered up the bath with some planks, and turning her back to this not very fascinating subject, continued her description.

"After the animals of the torrid zone, we come to the bear of the polar regions. Captured on an iceberg."

"Come away," said the doctor.

They made their exit, leaving the tamer to celebrate in hyperbolic fashion the proverbial ferocity of the polar bear.

The rain was nearly over.

“What an occupation!” said Léon; “What a life, to be a tamer of wild beasts!”

“Truly,” his cousin replied, “to have before one every morning the prospect of finishing the day as a snack in the stomach of a lion or the bowels of a tiger, and never be able for five minutes to feel sure that one



POLAR BEAR.

is not partly eaten! Faugh! I should want to be well paid if I were to accept such a position.”

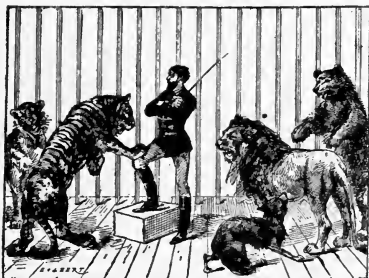
“But they probably would not be anxious to take you,” said the doctor. “The very danger must have some sort of fascination for these people, and keep them to their wild beasts; and the proof of this is that many of them are quite able, if they wished it, to pursue a less dangerous calling.

“Indeed, there is more than this. If they have the good luck to possess enough to retire on when they are getting old, it is only with the greatest reluctance that they will consent to forsake their beasts. I knew a very rich, retired tamer, who kept most of his menagerie at his own private residence. He himself took care of the wild beasts, and never failed each morning to go and smoke his pipe and read his paper in the society of ‘his lions.’ And when his neighbours, who could not reconcile themselves to his friends, compelled him to part with them, the unfortunate old fellow was ready to die of grief.

“Moreover, danger is among the things to which one grows quite accustomed, as you may learn by inquiring from soldiers and sailors, or doctors and the officials of hospitals. To return to the tamers, once when I was house-surgeon at the hospital, they brought under my care an unfortunate devil who had been mauled by a tiger. His body was simply a mass of wounds; it was something horrible! He survived it, however, though how I can scarcely imagine. A little time afterwards, as I was crossing the courtyard of the hospital, my patient came up to me, still enveloped in his bandages, almost like an Egyptian mummy, and said, ‘Do you think I shall be in a condition to make my reappearance at the fair at Rouen, in three weeks’ time?’

“He was positively wearying to be at it again;

and as I expressed my astonishment, 'This accident was entirely owing to my own stupidity,' he added. 'A tamer who keeps a sharp look-out is never bitten by his animals.' And, heaven pardon me! but I believe he added, 'Besides, you see, we never die of it.' "



XV.

Return to the cottage—Two or three words about mammalia—The stomach of a chewer of the cud—A well-applied mythological name—Terror of Dame Theresa—Disgusting! but a benefactor—Uncle Bob releases a criminal condemned to death.

OUR friends had returned to the inn. Although the clouds were still very threatening, they nevertheless promised to leave an hour or two of fine weather, and the doctor took advantage of this to order the horse to be put to, pay the score, and start again, with a smart trot, on the road back to Villers.

The rain had not produced a deep mud, though it had drenched the ground and laid the dust. And the road now displayed itself in an ochreous-red colour, while the foliage, washed and refreshed by the moisture, had regained a greener tint.

A few breezy gusts from time to time shook the branches of the trees over the heads of our tourists, sprinkling them as they passed with some drops of cool water, and in the neighbouring marshes the frogs, rejoicing in the renewed humidity, intoned a triumphal croaking.

“If we are ever to discuss the Mammalia, this is our chance,” said René to his cousin at the very spot where, on going, they had talked about the reptiles.

“What do you suppose I can tell you about them that you do not already know?” asked Léon. “It



QUADRUMANA: CAPUCHIN MONKEY.

is now recognised that there are at least twelve orders* of Mammalia, viz.—

“1. The Bimana, to which we ourselves have the honour to belong.

“2. The Quadrumana (monkeys).

* The number of orders of Mammalia is still a matter of some uncertainty. Cuvier recognised only nine, while Claus, one of the latest authorities adopts fourteen, without including man.—*Translator*.

" 3. The Chiroptera (bats). These in our country live on insects, and help us to get rid of many injurious creatures.

" 4. The Insectivora (hedgehogs, shrews, moles, &c.).

" 5. The Carnivora (types: the bear, dog, cat, lion, hyæna, seal).

" 6. The Rodentia (beaver, squirrel, rabbit, rats, mice).

" 7. The Edentata, none of which are found in Europe (armadillos, ant-eaters, pangolins).

" 8. The Pachydermata (elephant, hippopotamus, rhinoceros, tapir, horse, pig).

" 9. The Ruminantia (oxen, deer, sheep).

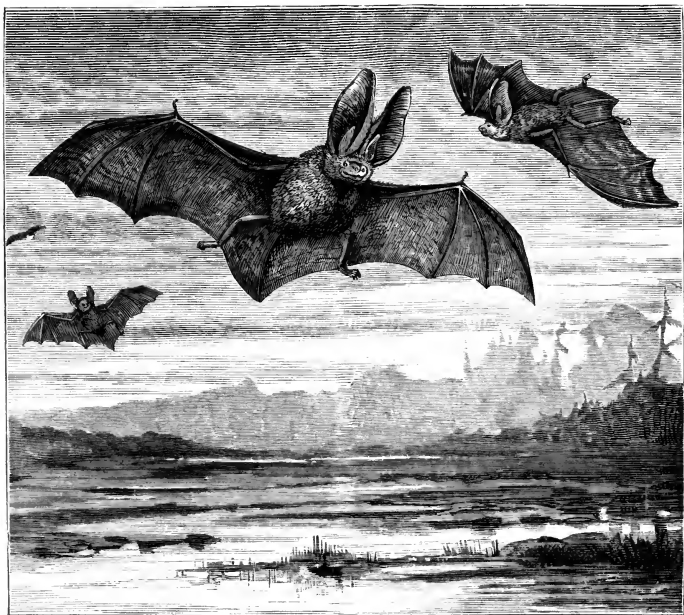
" 10. The Cetacea (whales, dolphins, narwhal).

" Lastly, 11th, the Marsupialia (kangaroos and opossums); and 12th, the Monotremata (Echidna and Ornithorhynchus), peculiar to Australia.

" I only give you this list as a reminder, and the few mammalia of our own country are so well known that it seems almost unnecessary to allude to them. Still, there is always something of interest to relate about them, and we can, if you please, chat in a familiar manner concerning a few of them.

" Take, for instance, the bats and the hedgehogs, which you probably have an objection to. Well, both of them are insectivorous, and in this capacity are useful to us and claim our respect, although the

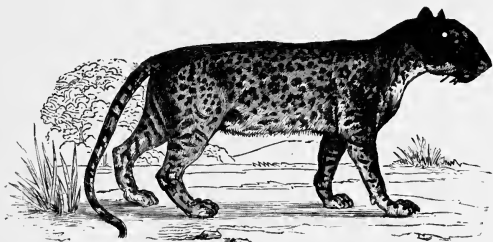
second of them is suspected by many, rightly or wrongly, of having a too great fondness for apples. Squirrels, on the other hand, you probably think



CHIROPTERA: LONG-EARED BATS.

charming. And yet they are injurious animals, like almost all the rodents. But they may be pardoned, if as some say, they are made into delicious pies in New

York. Another rodent, one too that is amongst the worst of our enemies, has been utilised in another



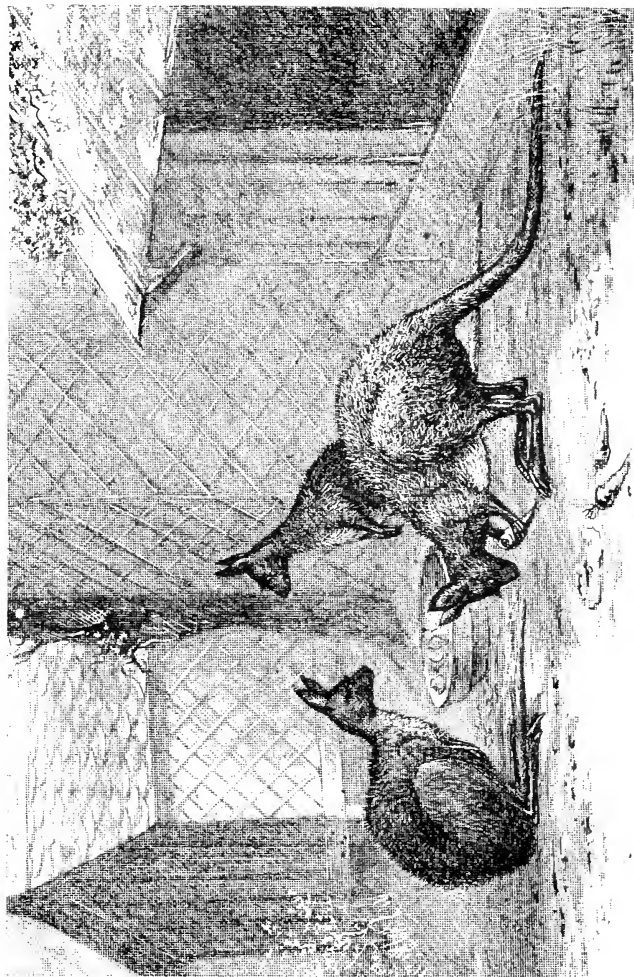
CARNIVORA : PANTHER OR LEOPARD.

fashion and while alive, a certain manufacturer in England, an ingenious engineer, having invented a machine for winding, turned by an apparatus kept in

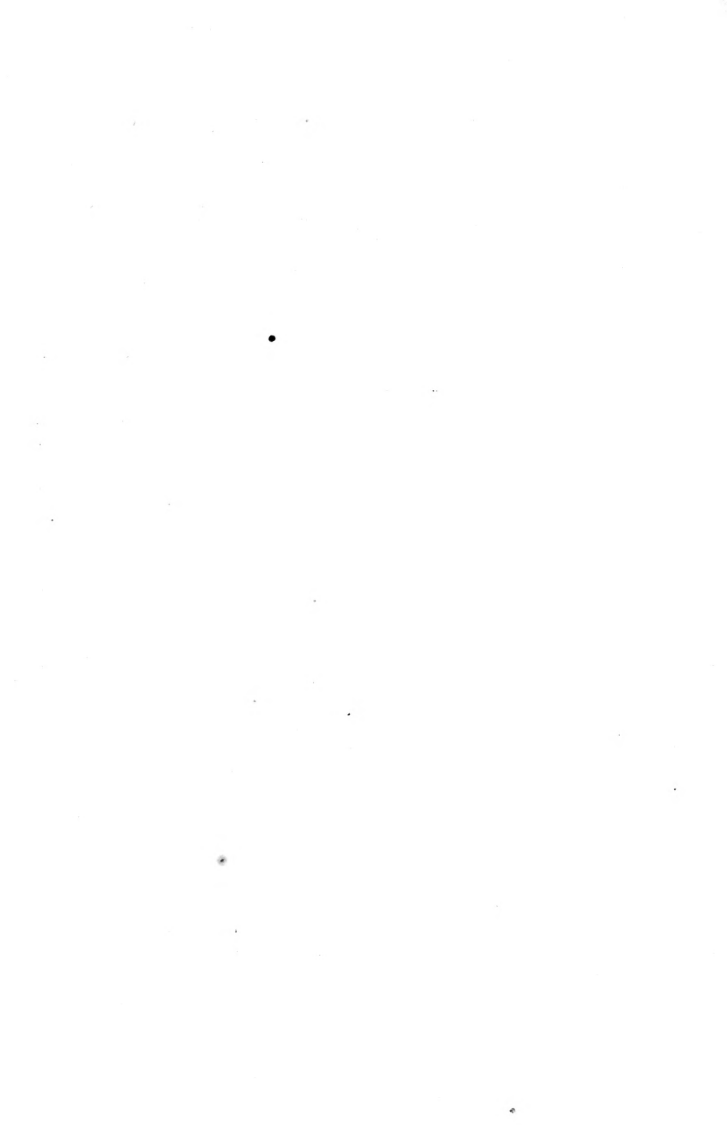


RODENTIA : SQUIRREL.

motion by mice. I have not heard, however, whether this curious attempt has proved successful.



MAESUPIALIA: TASMANIAN KANGAROO (*Macropus bennetti*).



“Speaking of apparatus, no doubt you are acquainted with the arrangement of the stomach of the ruminants,



SKULL OF A RODENT.



TEETH OF AN INSECTIVOROUS ANIMAL.

or animals that chew the cud. This stomach consists of four separate parts : 1, the rumen, or paunch ; 2,



INSECTIVORA : SHREW-MICE.

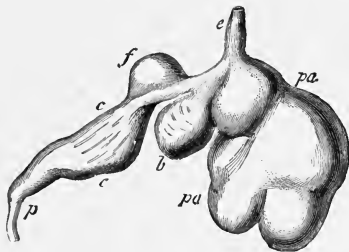
the reticulum, or honeycomb bag ; 3, the psalterium, or manyplies ; 4, the abomasum, or rennet-stomach.

“ The paunch and the manyplies each communicate directly with the œsophagus, which is provided with a deep groove running from the first to the third stomach.



INSECTIVORA : HEDGEHOG.

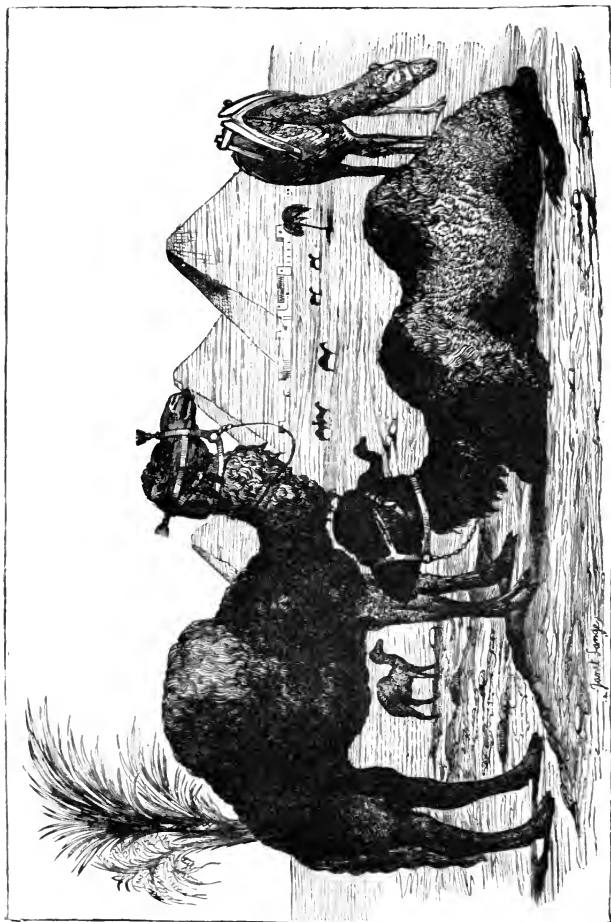
When the food is in a solid condition, it is passed from the paunch into the honeycomb bag, where it is formed into a ball and regurgitated. After being again chewed it is swallowed, but being soft does not open the tube



STOMACH OF RUMINANT.

e, ŒSOPHAGUS ; *pa*, PAUNCH ; *b*, HONEYCOMB BAG ; *f*, MANYPLIES ;
c, RENNET ; *p*, PYLORUS.

going to the honeycomb bag, but passes on into the third and fourth stomachs, and so into the intestinal canal.



RUMINANTIA: ONE AND TWO-HUMPED CAMELS.



"You already knew this, so that, as I said, I have really not much to teach you about the mammalia."

They now reached Villers, and the horse and carriage, pretty well bespattered with mud, were returned



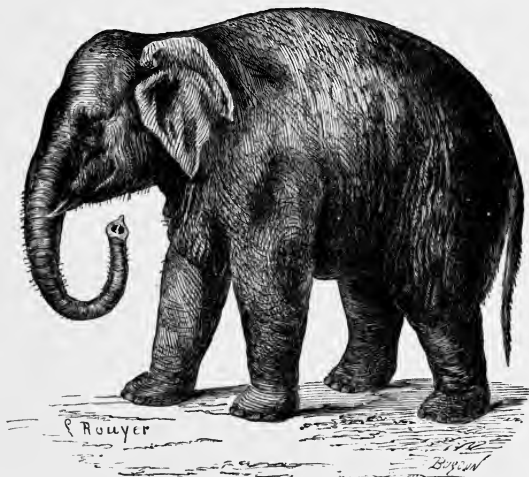
BEAVERS AND THEIR DWELLINGS.

to their owner, and our friends at once went back to the cottage.

Through the open window of the workroom they perceived barometer No. 2, which, it will be recollected, had been an object of mockery and vituperation to René when they were starting.

“I have found a name for your Batrachian,” said the latter to Léon—“a mythological name, suited to its sinister and alas! only too true predictions. By your permission we will in future call it Cassandra.”

“We will hope that Cassandra will not be always a



PACHYDERMATA : ELEPHANT.

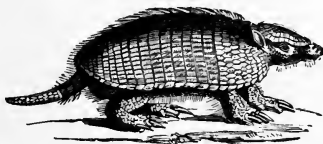
prophet of ill, and that to-morrow we may be able to complete our interrupted excursion.”

The servant was just then at the bottom of the garden, occupied in picking some vegetables for the

evening meal, and suddenly she gave utterance to a piercing scream.

The doctor and the young men, in alarm, ran as fast as they could.

“There, there, sir!” and with a trembling finger



EDENTATA : TATOU, OR ARMADILLO.

she pointed out a small dark object motionless in the middle of the path.



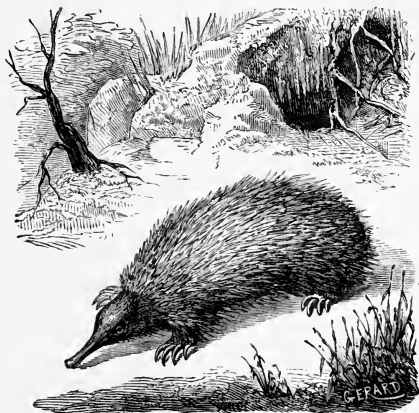
CETACEA : GREENLAND, OR RIGHT WHALE.

It was an enormous toad, warty and horrible, which, by the rain and cool air, had been brought into a mood for wandering through the damp grass, and so was composedly taking his turn round the garden.

Alarmed by the piercing cry, it had come to a standstill, and remained there calmly, as if contemplating the terrified domestic.

"Oh, sir, you do not see it," added Dame Theresa.
"The beast, the venomous beast!" *

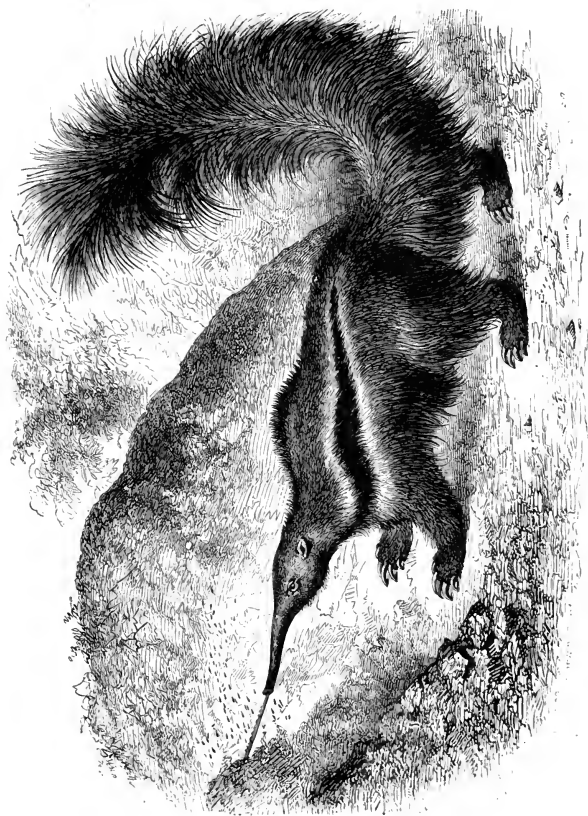
"No, no, you cockney, no," the doctor said in a



MONOTREMATA : SPINY ECHIDNA.

paternal manner; "toads are only slightly venomous, even when handled, and when not actually touched are

* According to the experiments of Professor Vulpian, the poison of the toad, secreted by certain cutaneous glands, can only be active when it is inoculated. This inoculation may induce death in animals of small size, especially in rats and guinea-pigs. Death in such cases seems due to stoppage of the action of the heart.—*Author's note.*



EDENTATA : THE GREAT ANT-EATER.

no degree injurious; and if this one has given you a good fright, it is clear you have done the same to it."

"But it is horrible! these creatures are frightful. Kill it, smash it at once, Mr. Léon."

"Where should we stop, if we were to kill



ORNITHORHYNCHUS ANATINUS. AUSTRALIA.

everything that is ugly and repulsive?" said the old doctor. And pushing it out of the way with the end of his stick into a row of raspberry canes: "Go your way, little creature; it is not yet dusk enough for you to be about. The world," he added with a kindly smile, "is quite large enough for all three of us."

From this time forward Dame Theresa always avoided going into this part of the garden after sunset.



THE TOAD. "SCARCELY VENOMOUS EVEN WHEN TOUCHED."

XVI.

Continuance of bad weather—Mother Goose, loto, or dominoes—A book of wonders—Rotifers—Artificial death and revival—Tardigrades, Kolpodes, Monads, and Vorticella—How to obtain a desired infusorian—Mineral, vegetable, or animal?—Diatomaceæ—To what the colour of some seas is due—Foraminifera—Polypes, Hydra—Experiments of du Tremblay—How a single animal may be made into several, and several into one—A naturalist never wearies.

WHEN they awoke the next morning the friends at the cottage had no need to open the windows in order to convince themselves that their proposed visit to the keeper was again to be put off.

The sullen sky did not, as yesterday, send joyous rays into their rooms; rain was falling thickly and steadily against the dripping panes, and these, lashed at intervals by squalls, gave forth dull sounds like muffled drums.

“It will go on till evening,” said Father Lucas, who had come to have a conference with the doctor.

Every sailor is a meteorologist whether he knows it or not, and his weather forecasts are but rarely deceptive. The friends were obliged therefore to resign themselves to the idea of keeping the house all day. Though this had scarcely begun, the two young

men were already, by glances, inquiring from one another what was to be done. From time to time René went into the workroom to consult Cassandra.

Cassandra gave no indication of rising.

"Mother Goose, loto, or dominoes?" said Léon, without preface, to his cousin.

"A truce to unpleasant joking," said the Parisian. "Certainly it is not worth while being a learned man if you have nothing to amuse your friends with on wet days, except some games borrowed from the ancient Greeks, and by the Greeks very probably from the Bœotians. I am surprised you do not make the absurd proposal of showing me some toys or picture books."

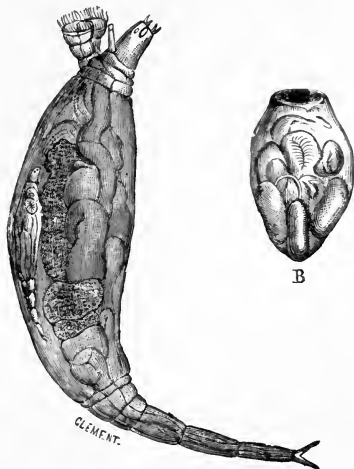
"Exactly! Why not?" cried Léon, pretending that an idea had all at once occurred to him, though the sly fellow had been thinking of it for at least ten minutes. "Fortunately I have quite handy a book very curious to read, and all the more amusing inasmuch as both text and illustrations can be constantly varied.

"Here it is: the microscope. With a good microscope and appliances, and some knowledge of their use, one may ensure never being lonely, even were one in an out-of-the-way place in the country, and rain should fall during forty days successively, as in the time of the Deluge."

The microscope was taken out of its case.

"Here is the first chapter," said Léon, taking up with a pipette a drop of water, which he placed under the object-glass of the instrument. "I offer you the book ; read for yourself."

In the middle of the liquid some apparently great



ROTIFER VULGARIS.

A, THE ANIMAL IN WATER ; B, THE SAME DRIED.

creatures were rolling about their fusiform bodies : they were some rotifers that Léon had found without difficulty in the water-gutter of the cottage.

"All very well when there is water in the gutter, as there is to-day," said René, with an air of opposition ; "but supposing it were dry weather ?"

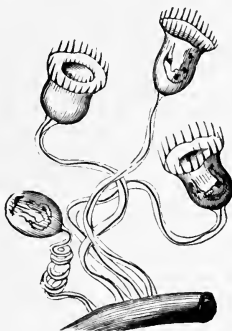
“Then the rotifers, too, dry up, and await with resignation better times. Should a little rain come they will revive—they or their posterity. This time I



KOLPODA CUCULLUS.

have played the part of Nature, by the help of a few drops of water, and the rotifers have returned to activity.”

Then they viewed in succession: Tardigrades,



BELL VORTICELLA (*V. convallaria*).

degraded, creeping, repulsive creatures; Kolpoda, in form like a little leech; and Monads, the most microscopic of microscopic beings, and to be found by

myriads in filthy water; Vorticellæ, posing their globose bodies and open mouth, at the end of a long twisted stalk, something after the fashion of a spiral spring.

For each demonstration, Léon had recourse to a



GROUP OF MONADS
(*Monas crepusculum*).

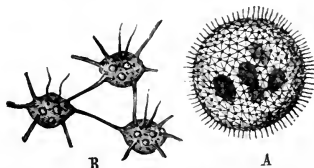


Enchelys pupa.

new receptacle for his drop of water, and this was noticed by his cousin who remarked—

“Do you, then, keep all these kinds separately?”

“It is easier to study them when they are so. Different sorts of infusions or decoctions are more



VEGETABLE INFUSORIAN (*Volvox globator*).
A, THE ORGANISM; B, DETACHED ZOOSPORES.

specially resorted to by certain animalcules. For instance, one finds more particularly—

“Volvox and Vorticellæ in infusions of hemp-seed.

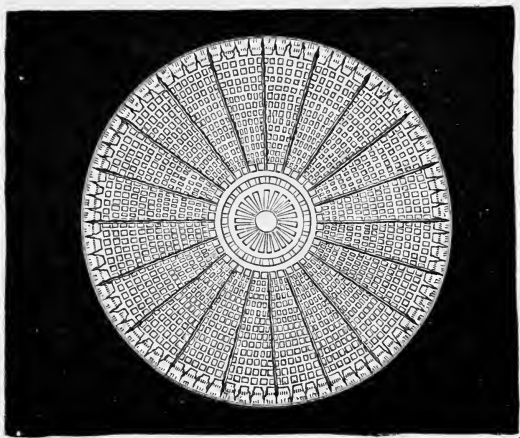
“The species of Enchelys in infusions of hay or grass.

“The Kolpodæ also in infusions of grass or hempseed that have been kept for a long time.

“The species of *Gonium* in infusion of pears.

“Rotifers and some *Vorticellæ* in little shells in fresh water, and about the remains of aquatic insects.

“Monads in infusions of mushrooms.



DIATOM, GREATLY MAGNIFIED.

“*Anguillulidæ*, paste or vinegar eels, in the substances denoted by their names.

“But many of the species may be found in abundance in pools of water. So that sometimes a single drop of stagnant water is inhabited by quite a miniature menagerie.

“Moreover one finds other things besides animals in pools of water. Here, for instance, is something else.”

There was then displayed to the eyes of the astonished pupil a whole collection of beings that can scarcely be defined, of regular and geometric forms : discs piled one on the other ; cubes, sometimes united end to end, sometimes soldered by one of their angles ; spindles, fans, wheels—what more shall I say !”

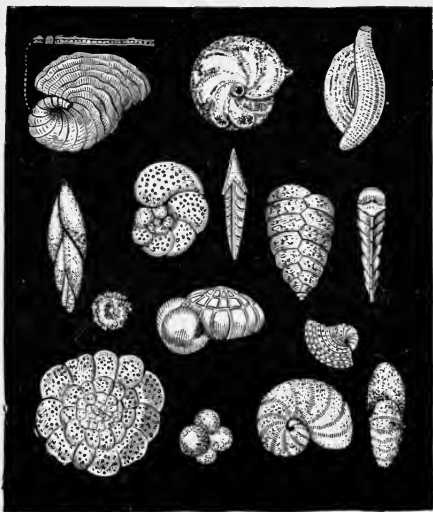
“Well, this is really too extraordinary ! Animal, vegetable, or mineral, I cannot for the life of me say which I suppose them to be. Is it possible that it is an assemblage of the three kingdoms, bound together in one volume ?”

“These,” said Léon, “are diatoms. They have treated them as algæ, not being able to do anything better ; but the truth is that in the case of these curious productions, the words vegetable and animal have no longer their peculiar meaning.

“These beings with their silicious skeletons, which are apparently nearly indestructible, increase themselves by segmentation and division. They are met with everywhere—in the water, in the air ; in fresh-water, and in the ocean. Sometimes these infinitely small atoms, massed in millions and billions, even alter the colour of the sea : hence the names, Red Sea, Yellow Sea, Vermilion Bay. Be sure to recollect that the largest of these diatoms measures only some

few hundredths of a millimetre in diameter, there being 2,500 one-hundredths of a millimetre in a single inch.

“Many live after the fashion of parasites ; almost all, if not actually all, aquatic plants are covered



FORAMINIFERA, GREATLY MAGNIFIED.

with them. A simple washing with sulphuric acid is generally sufficient to detach them. And, just as if they were nevertheless in difficulty to find room, these microscopic beings actually take lodgings in the stomachs and on the scales of fishes.

“In the seas, there is another class of creatures scarcely less numerous and ubiquitous, though often of somewhat larger bulk, that form as it were a sort of complement to the diatoms: the Foraminifera, whose forms are varied almost to infinity, are found in large accumulations on the floors of the ocean, and their skeleton is pierced in all directions by little



FRESHWATER HYDRA.

holes, from which project great numbers of vibratile ciliae. Thus, besides infinitely small diatoms, there are other infinitely small beings, and these also help to make up the structure of worlds.”

To assist him in his microscopic work, Léon had established in a glass globe a sort of small artificial pond with some mud, several plants and insects, and on its surface some pieces of duckweed. Tired of

looking through the microscope, René was engaged in examining this.

“There are cuttle-fish in your pond,” said he all at once, pointing out a mass of gelatinous arms in constant movement near the surface of the liquid.

What he mistook for cuttle-fish was merely a colony of hydras, freshwater polypes—creatures which may vie with any others in tenacity of life, according to the celebrated experiments made by du Tremblay.

Du Tremblay, when he made these observations, was a schoolmaster in some little town, I have forgotten which, in Holland, lost in the midst of marshes. These marshes were peopled by many of the freshwater polyps called hydras, and, in the absence of other amusements, this naturalist found a pleasure in studying them. He first noticed that these animals can be multiplied by division, and that to obtain two hydras, it was sufficient to cut one Hydra into two pieces. Having settled this point, he examined their organisation. It is certainly not very complicated. The body of a Hydra consists simply of a bag, the inside of which forms the stomach. By exercising skill and patience du Tremblay managed to turn one of these polyps inside out, somewhat like a glove, so that what was stomach became outside and *vice versa*. The experiment was a success: the polyp seemed quite comfortable notwithstanding this remarkable change in his personality.

Du Tremblay did not with this end his interesting discoveries. "Since out of one Hydra you can make two," he sagely reasoned, "out of two probably one can be made." This was both said and done, and the patient naturalist, after some unsuccessful efforts, succeeded in fastening together several hydras, end to end, in such a way as to merge their several individualities in one.

And thus we see that in the most unfavourable localities the naturalist need never weary.

XVII.

With Franceschini—Another barometer—"Good-day, Major!"—A mysterious voice—Uncle Bob begins to fancy the keeper's house must be haunted—Jacob—A fable of La Fontaine realised—The Norman character makes itself evident even in birds—René's classification—Honest men and brigands—Day thieves and nocturnal prowlers—The waders and web-feet—Climbers—Gallinaceous birds—Passerine birds—Jacob sadly out of place—Franceschini insists on a new classification.

At last the clouds were scattered, and the barometer, the Cassandra-barometer as well, indicated "set fair." Again they put to, started, and arrived at Touques, this time without any noteworthy incident.

The keeper, with a very short clay pipe between his teeth, was quietly taking his ease on a bench outside the door, when the rumbling of the vehicle roused him from his quiescence.

He rose, laid down the pipe on his seat, advanced in military style, and in a superb bass voice saluted with the words—

"Good day, Major!"

Uncle Bob certainly had never been major; but no doubt, in the opinion of the ex-gendarme, the rosette of the legion of honour in his buttonhole was a sufficient justification for the flattering title, which

conferred on him the dignity, certainly well merited, of a position in the permanent army of duty's volunteers.

"Tush!" he said, but nevertheless with an evident air of satisfaction; "no usurpation of rank, if you please. I have at least never been more than a simple soldier in the ranks of duty, and it ought to be I that should present arms to you, Mr. Sergeant. As, however, I do not carry any, I can only offer you my apologies for not having come before this. We started the day before yesterday, but we beat a cowardly retreat, being conquered by the rain."

"I am to blame," cried Franceschini. "Triple blockhead that I am! I might have foreseen that change of weather. When I wrote my letter to you everything indicated that we should have a storm: everything, even my scar, which became violet, like a bishop's cassock. I ought to have observed this, but somehow or other when one has as villainous a phiz as mine, one does not waste much time at the looking-glass."

They entered the house, and found there was already set out for them a snack prepared on the spur of the moment by Madame Franceschini, the wife of the keeper—he having, as we ought previously to have explained, taken a wife very soon after coming to the district, in order that he might take better root.

There is one thing that country people have never been able to understand, and that probably they never will understand. It is that others cannot have such good appetites as themselves. On this occasion the fruits were superb, the bread excellent, the butter and the cider such as are only to be found in Normandy. The three guests did honour in their best style to this impromptu collation, discussing at the same time the object of their visit.

"All the birds are ticketed with the names given to them in the district," said the keeper, as he was uncorking in a most careful manner a bottle of the wine of the district. "But it still remains to classify them according to their regiments, in proper battle array. That you will be able to do, and I have the most complete confidence in your ability."

"Must see," replied, from behind the door of the next room, a sharp voice seeming to come almost from beneath the ground.

The two young men looked quite astonished. Someone, then, was listening to their conversation! Franceschini bit and twisted his moustache.

The doctor also heard it, but thinking it was the trick of some ill-bred child, paid no attention. Léon thought it well to do the same as his father.

"Very well, we will classify the collection," said he, "and if I cannot do it all myself, I am sure my cousin will not refuse to lend me a hand."

"Certainly, cerrrr-tainly," replied the voice.

"Yes certainly," said René, in a way to be heard by the mysterious interlocutor. "I must admit I am no ornithologist; I know that well, but I can at any rate give a piece of good advice when necessary. It is not well to mock me."

"Per-haps, well, must see!" replied the voice, drawling in an unmerciful manner.

This time Uncle Bob no longer kept silence.

"One of two things: either I am getting silly or some ill-mannered person is mocking us; unless, indeed, we may be in some haunted house," he added, in the tone of a man who is very sceptical about such kinds of witchcraft.

"Neither one nor the other, Major," said the keeper by way of excuse. "I had put Jacob out of the way, and now he is taking his revenge. The best thing I can do is to introduce the culprit to you."

He opened the door.

"Now then, come along, Jacob; come in, come in," and through the half-open door there hopped in a magnificent raven, of a deep blue-black colour.

A triple burst of laughter greeted his entrance.

"But it is really a learned bird, a phenomenal creature, and worth more than all the menagerie at Touques! Come here, Jacob, come here, then!"

And each "come here" was accompanied by a

shower of crumbs and scraps. Jacob, who never in his bird's memory recollected such a feast, came and picked them up without fear, even at the feet of the visitors. Then, when his appetite was satisfied, he hopped familiarly on to the shoulder of his master.

"He is a foundling," said this latter. "It was during some most fearful weather that I discovered Jacob in the forest. A gale had dislodged him from the nest; he was half-frozen, and three-parts drowned by the rain—quite moribund, in fact. Instinctively I picked him up, without intending to keep him, possibly thinking he might have a more gentle death. When I reached home I placed him near the fire in a blanket.

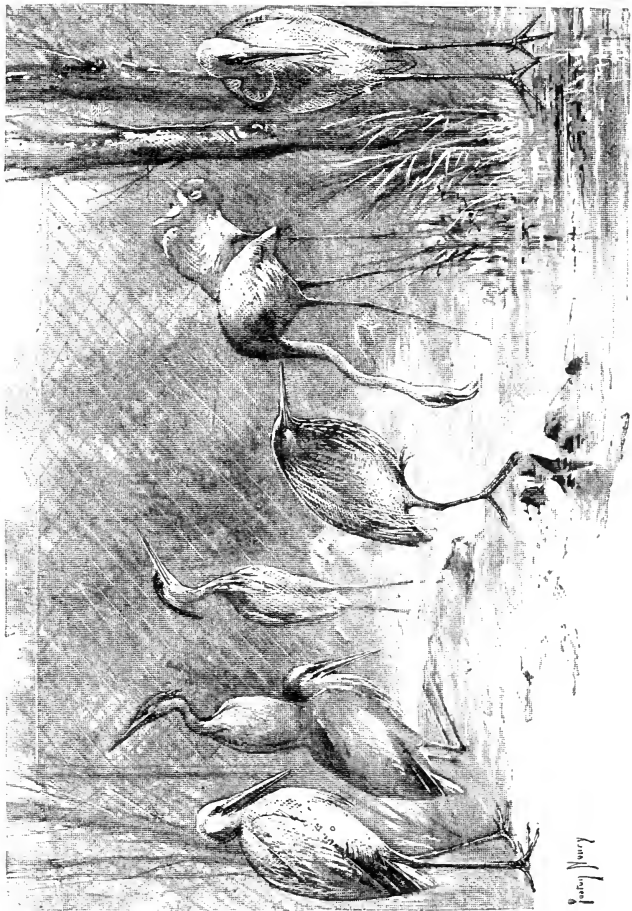
"‘You would have done better to have left him where he was,’ my wife said to me, ‘for he was past suffering.’

"And indeed I thought I was only prolonging his agony. The next morning, to my great surprise, he still lived. ‘Suppose he should recover!’ said I, still without believing it.

"He did, however, recover; and in spite of our predictions I believe the rascal is now likely to outlive us all."

"And how did you teach him?" asked René. "Until now I have not seen any talking ravens except in the fables of La Fontaine."

"His learning was done almost entirely by him-



WHITE STORK.
(*Ciconia alba*, Briss.)

HERON.
(*Ardea cinerea*, Latr.)

RARE HERON.
(*Ardea lineata*, Latr.)

RED FLAMINGO.
(*Phaenicopterus ruber*, Lin.)

WADERS.

self. He hears the country people talk, and amuses himself by imitating them. It is because of this that hesitating expressions such as, 'Well!' 'Perhaps so!' and 'Must see!' are his favourite phrases. On the other hand, I never recollect hearing him say 'Yes' or 'No,' these words being very little used in Normandy."

They rose from table and entered the room in which the keeper had arranged his museum, as he called it.

The furnishings were of military simplicity: a desk made of deal, covered with papers and books, three chairs, and the arms and accoutrements of the soldier's military period, arranged as a sort of trophy between the white muslin curtains of the two windows. The rest of the apartment was devoted to the birds. These were to be seen in all directions—on the desk, on shelves, under glass shades. The beams of the ceiling served as supports for some scutcheons of varnished wood, bearing branches of trees, on which were placed the larger birds, with spread-out wings, as if about to take flight.

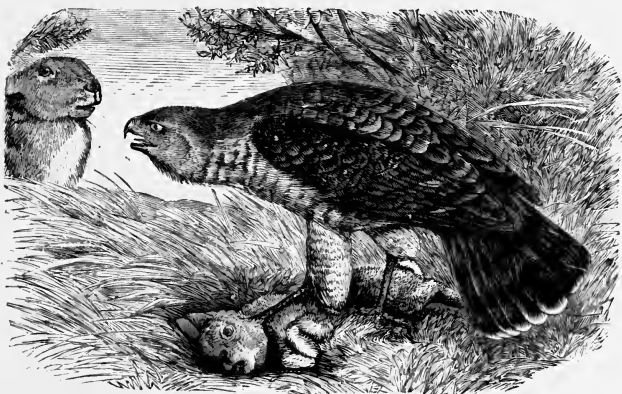
"We must proceed in due order," said Léon; and turning to René, "You were just saying that we ought not to despise you. Let us see, then; how would you commence?"

"I should begin by leaving all the respectable kinds together, and by putting in one corner all these

hooked beaks and rapacious figures." And René with his finger pointed out a large owl and a kestrel falcon, which in truth had very much the appearance of two brigands.

The rapacious forms were placed together on one side.

"We will call them *Raptatores*," said Léon, "the



"THESE HOOKED BEAKS AND RAPACIOUS FIGURES."

name used in our system of classification. Now that we have them all together, do you not think they may be made into two groups?"

"Undoubtedly. There are evidently two distinct classes—first the brigands that carry on their operations in daylight, and next the owls and other prowlers who do their work at night."

“In other words, then, diurnal and nocturnal Raptatores.”

“Very good. But now let us turn our attention to the honest kinds.”

The classification was now a more difficult matter, for the honest kinds are so numerous, amongst birds at any rate. However, René was not discouraged.

“First we will use two or three shelves for those with very long beaks, most of them, too, having also



WOODCOCK (*Scolopax rusticola*, Lin.).

long necks. At any rate, that will be some out of the way.”

And speedily, the bustards, plovers, peewits, snipe, curlews, sandpipers, cranes, herons, storks, rails, water-hens—all the *waders* in fact—were brought together, forming one group of allied kinds.

“Let us now make a finish of the water birds,” said Léon. “Side by side with their long-legged friends, let us place the web-footed kinds.”

And so the *web-feet* were next arranged. As they were very numerous, and as, if the feet were left out of consideration, they were not very similar to one another, it was necessary to make several subdivisions of them, the most important being, the grebes, the sea-gulls, the cormorants, and the ducks.

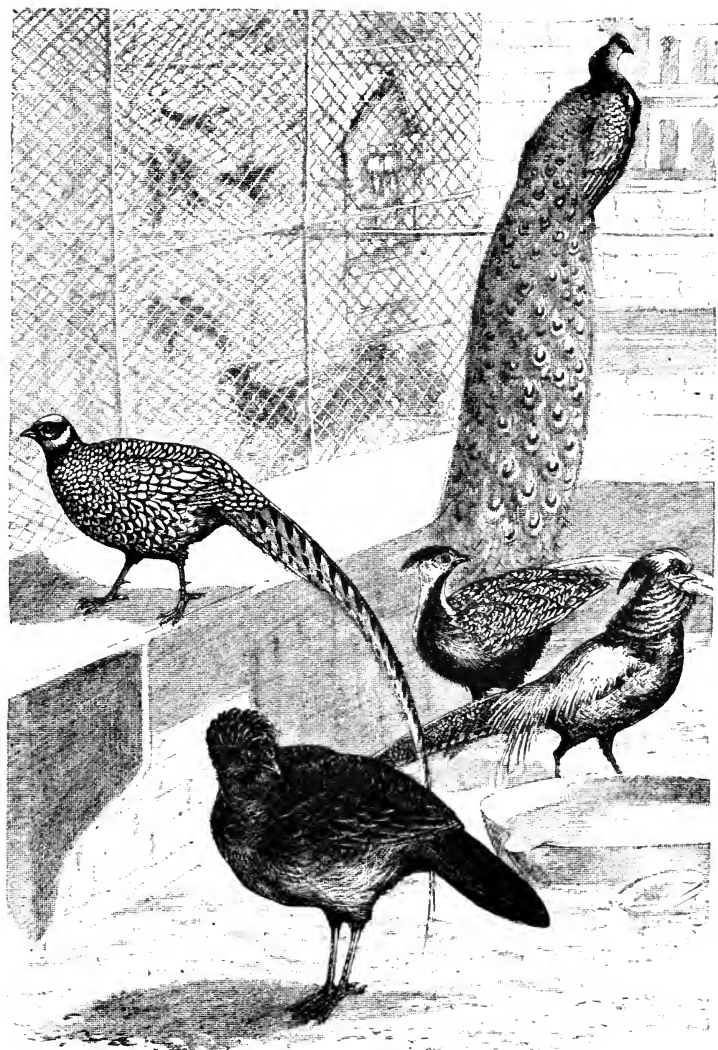
"Now for the fourth order," said Léon. But seeing that his cousin was now in difficulties he concluded the classification himself.

"First the *climbers*, the born protectors of our forests, frequenting the trunks of the trees in search of insects: woodpeckers, wrynecks, cuckoos, and creepers.

"Then the Gallinæ or *game birds*, the edible order *par excellence*, created, one might suppose, for the particular satisfaction of the lovers of the table: partridges, quail, pigeons, grouse, pheasants, &c., to say nothing of our domestic fowls.

"We have progressed by a process of elimination," continued the young naturalist; "and now nothing remains for our consideration but the *perchers* or *Passeres*."

"Now then," cried Réne, "about Jacob, the magniloquent and voluminous Jacob. Would you place him in the same order as the wrens, the finches, or the tits? If I were him and had so clever a tongue I should protest against this."



GALLINÆ.

REEVE'S PHEASANT.

CURASSOW.

SILVER PHEASANT.

PEACOCK.

GOLDEN PHEASANT.

"Certainly, cerrr-tainly!" hissed the bird, who appeared to know that they were talking about him, and to wish to assume a part in this protest.

"Where would you enrol him? The order of perchers is a negative one, without any real distinctive



WADING-BIRD: AVOCET (*Recurvirostra avocetta*, Lin.).

character of its own, a sort of naturalist's chaos, where everything that is not web-foot, wader, rapacious, climber, nor game-bird, is thrown into the general mass. Some subdivisions of it have been formed, which are chiefly based on the form of the

beak and the arrangement of the toes. This is all that has been accomplished. *

"And now," he added, addressing himself to the keeper, "I must compliment you on your collection, of which you have indeed every right to be proud, for there are many amateurs who would plume themselves on it. I hope the classification of it, now that it is finished, will meet with approval."

Franceschini rubbed his ear with the air of a man who does not think "Yes," but does not like to say "No."

"Perhaps you had thought of some other way of arranging it," said the doctor, who apparently divined his thoughts.

"Well, yes! I should like to have it settled what are the injurious species we ought to destroy, and which are useful, so that we should protect them. If this were only indicated by some mark or word on the label by the side of the name of the species, it would be sufficient. Perhaps, Major, you would kindly undertake this?"

The "Major" smiled at this new proof of confidence.

"Yes, but, yes, but—but that is extremely difficult. The question is a very complicated one; and appa-

* Since the time of Cuvier, several fresh classifications of birds have been made; but naturalists are not at all agreed on the subject, and the *Passeres* are always a great difficulty.—*Translator*.

rently all the more intricate because torrents of ink have been poured out with a view of settling it. However, as you seem to desire it, and as I am now in the saddle, I will give you my own opinion."

Here follows, very carefully reported, the opinion of Uncle Bob on this subject.

XVIII.

Three great categories of birds—Injurious birds—Birds of mixed qualities—Useful birds—Certain birds not to be proscribed at first glance—Some conclusive facts—Frederick the Great and his cherries—Curious observation made in Paris—Those that eat insects—Some figures—An unjust and odious persecution—The worst enemy of rats, field-mice, and other rodents—Birds as protectors of sailors—An English law—Cormorant-fishing in China—A possible cure for the Phylloxera—A proposal from Franceschini.

“THREE classes may be distinguished amongst birds: injurious birds, birds of mixed qualities who do both good and harm, and useful birds.

“Some birds are injurious by destroying game and useful animals. As instances, the eagles and falcons, and also the jays and magpies, who are constantly on the look-out for the eggs and young of other birds. Others, like the kingfisher, affect the fish and fry of our rivers. To the injurious class also belong certain birds that eat the fruit or other parts of plants—the grosbeaks, the bullfinches, the thrushes, and even, though we say it with regret, the pigeons. These do harm by their depredations on our fruit-trees and in our gardens.

“Thus it is fair that these destroyers should be themselves destroyed, though it will be well under-

stood that some at any rate should not be exterminated: pigeons, for instance, that are domesticated and used as food.

“As for the birds of mixed qualities, it is difficult to give any decided opinion as to how they should be



A DESTROYER DESTROYED.

treated. For instance, the buzzards and the shrikes destroy an enormous quantity of small rodents; but they also wage war against the birds that destroy insects.

“The blackbirds, warblers, sparrows, and redbreasts

are also great insect-hunters, though their well-known weakness for cherries and other sweet fruits makes us sometimes look upon them as very troublesome friends.

“The same may be said of crows, partridges, gold-finches and other finches, though there is a difference, as these birds attack grains or seeds rather than fruits.

“To sum up, we must conclude that in the case of these birds of mixed qualities it is as dangerous to acquit them entirely as it is to condemn them without appeal. And it is all the more difficult to decide, as many of these granivorous birds not only eat insects themselves but also feed their young ones with them.

“Here are some conclusive proofs.

“In Prussia, Frederick the Great observing one day that the sparrows were far too familiar with his cherry-trees at Potsdam, resolved to exact a full penalty for their wrongdoing—high treason I presume we ought to call it. A price was set on the heads of the pilferers. Two years afterwards not a sparrow remained in the country, but on the other hand there also remained no cherries in the royal gardens, the whole region being devastated by caterpillars and other insects. Complaints arriving from all quarters, the king himself recognised his mistake, and the sparrows were reinstated at a very great expense. A little more, indeed, and apologies would have been offered to them.

“In Hungary, and in the Grand Duchy of Baden, the destruction of birds produced similar results.*

“Even in Normandy, at Montville, in the department of the Seine Inférieure the idea of destroying the crows was adopted, and it was found by experience that their ravages were not to be compared with the evils they prevented, and the crow was rehabilitated.†

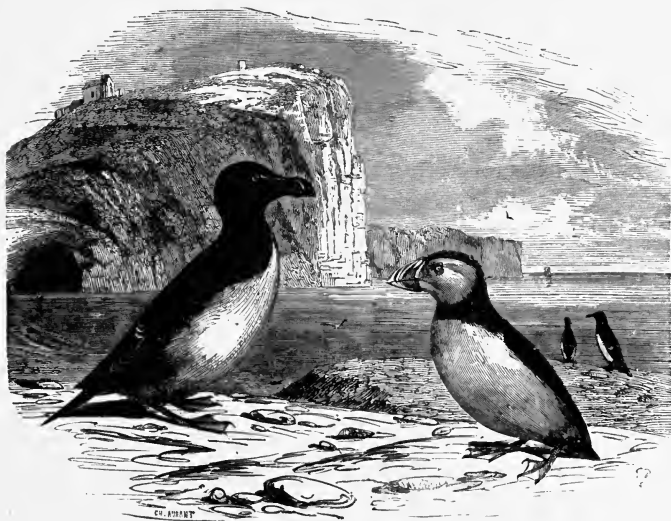
“A last instance. In the middle of Paris, in the Rue Vivienne, there was one day discovered round a nest of sparrows one thousand four hundred wings of cock-chafers. So that at the very least seven hundred chafers, each one an enemy, were destroyed for a single brood.

“To the aid of these kinds, whose services we, on the whole, pay for pretty cheaply, come some powerful assistants whom we are not required to pay at all, and whom therefore we ought at all times and in all places to protect. In the realm of nature there exists only one serious enemy of the insect, only one capable of efficiently opposing its ravages. This is the bird—an implacable enemy, pursuing the insect at all times and in all its stages. Each insectivorous bird has, too, its speciality. The woodpeckers and the climbers, guided by some mysterious instinct or unknown signs, seek

* Baron Dumast, quoted in “Bulletin de la Société d’Acclimatation de Nancy,” 1857, pp. 10, 11.

† Address read to the Senate, 24th June, 1861, by President Bonjean, on the preservation of birds.

insects under the bark and in the wood of trees, where they are carrying on their ravages unseen. The cuckoo attacks hairy caterpillars that other birds refuse to swallow ; the European rollers, grasshoppers and



COAST BIRDS.

locusts ; the hedge-sparrows, snails and larvæ, assisted in this task on the banks of the rivers by the godwits, sandpipers, snipe, and indeed by the waders generally.

“Pursuing another system of tactics, the swallow,

the martin, and the goatsucker hunt on the wing. In the stomachs of eighteen martins killed at different times, the naturalist Florent Prevost, who set himself to make a systematic study of the food of birds, found the remains of six thousand eight hundred and ninety one insects, being about an average of four hundred



STORK.

insects for each bird, and that for a single meal. Such figures require no comment.

“It is difficult to form an idea of the enormous amount of larvæ of insects destroyed by small birds such as tits, wrens, warblers, wagtails, fly-catchers, pipits. It has been calculated that the wren, the tiny

wren, in the course of a year causes three millions of eggs of butterflies and other insects to disappear; the blue tit about six millions and a half. As each pair of tits produces about six young ones, we may consider that each family of this little bird destroys at least twenty-four millions of insects." *

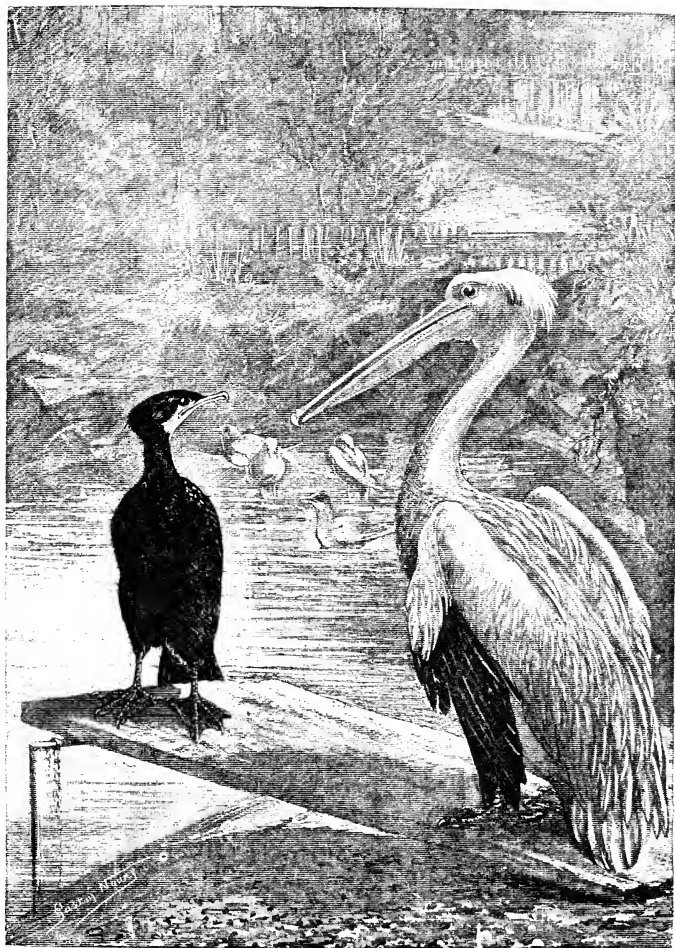
"Poor little birds, so frequently and ruthlessly massacred, when they are actually occupied in working for us!"

"The screech-owl, and other owls—in fact, all the nocturnal raptatores—should be protected, for a single one exterminates more little rodents than a whole regiment of cats would.

"The cat, supposed to be a great 'ridder,' is a consummate sycophant, and knows that he can always depend on the larder in case of necessity. He hunts, in fact, in amateur fashion. Hunting is in reality for him a pastime and amusement, a healthful sport, that gives him a good appetite after the long hours passed lazily in the sun or on the hearthrug. But as for the owl, it hunts to live, and to procure food for a whole brood of hungry beaks, who cry famine if they have to pass only a short time without being gorged with nutriment. A large quantity of bodies of rats and voles are required for the support of such a family.

"The sea-birds, guillemots and others, that nest in

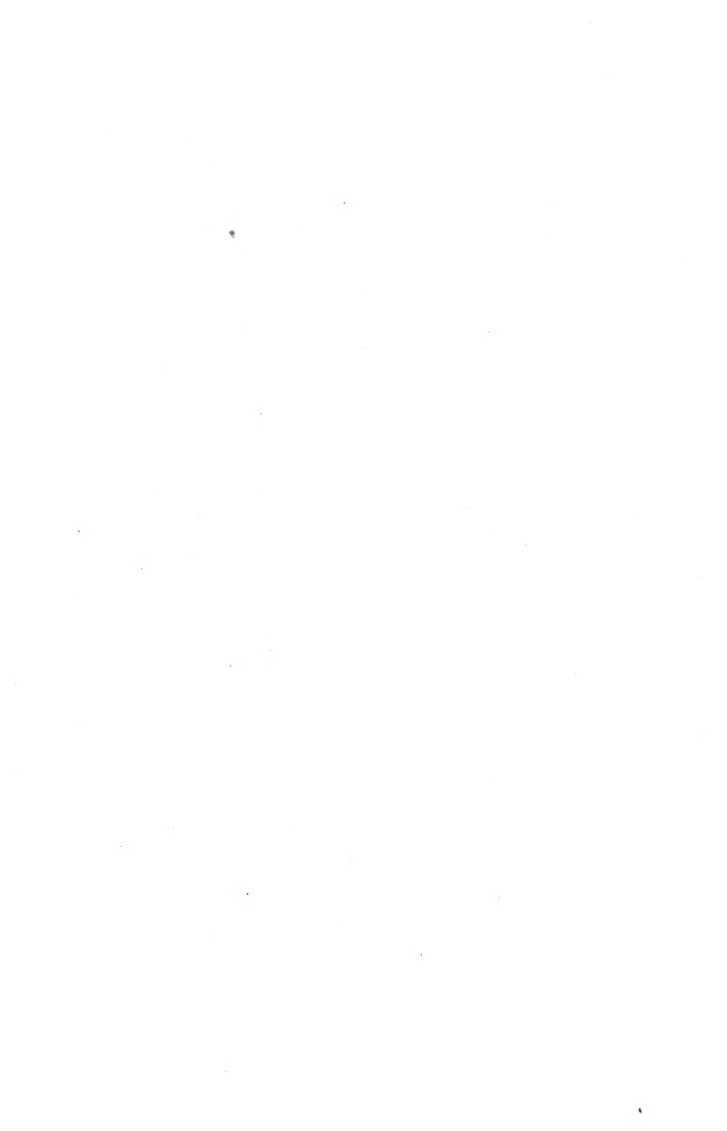
* See on this subject an excellent work, "Useful and Injurious Birds," by H. de la Blanchère.



PALMIFEDES.

COMMON CORMORANT.

PELICAN.



the cliffs, and in hazy weather by their cries and screams warn the sailors of their proximity to the coast, must on this account be also considered as among our allies.



LONG-EARED OWL (*Asio otus*, Lin.).

In England severe penalties are inflicted on destroyers of guillemots; and heaven only knows how many shipwrecks have been prevented by the agency of these

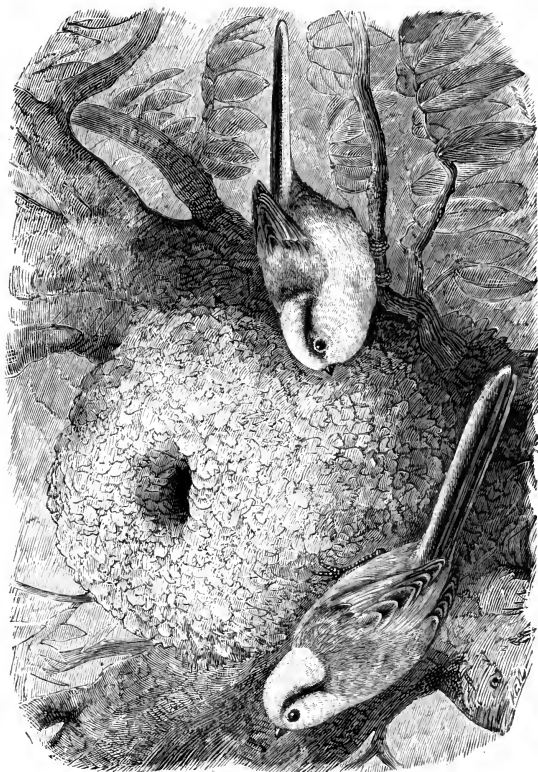
birds. In France, the race of guillemots has been nearly destroyed, the birds having been shot without any mercy by sportsmen desirous of proving their own skill and the excellence of their weapons by bringing down their game, which though inedible, offers a difficult mark to the gun."

"Brave bravery, in truth!"

"The Chinese (we always return to the Chinese) hunt the cormorant, but with a more practical object in view. They train them for fishing, in a manner similar to that in which falcons were trained in the middle ages for hunting birds.

"It appears that these palmipedes, after their training has been completed, bring a great profit to their owners, and are sold for a high price in the markets of the Celestial Empire.

"I am surprised that no ingenious sportsman should have yet entertained the idea of introducing this method of fishing among ourselves; its success would be certain. And, as we are now touching on subjects that closely concern agricultural economy (for there is no greater economy in agriculture than to protect our friends and destroy our foes), perhaps you would like to know my true opinion on a pest, a veritable Egyptian plague, that costs many millions to France every year—the phylloxera. With a view to arresting its ravages, considerable sums are expended on chemicals and complicated apparatus, only an inade-



A TIT FAMILY.

quate result being, however, usually derived from their use. In some cases, indeed, the best that can be said is that these heroic remedies only destroy the disease by killing the patient. According to my ideas, there is but one preservative whose action is likely to be really efficacious, and of which no one apparently dreams: it is the bird.

“There should exist, probably there actually exists, in the countries from which the phylloxera came to us, some bird the born enemy, the patent destroyer, of this insect; a bird that searches for it without truce round the roots where it lurks among the leaves it attacks, and hinders it from multiplying itself indefinitely. Let this foe of the phylloxera be sought for, and an attempt made to acclimatise it in France. On the day when it shall have been discovered and set to work at its duty, more will have been done towards the destruction of this dreadful insect than all the chemicals in the world could do in fifty years.”

After the collection was fully arranged Franceschini contemplated it with pride. He could now, without blushing, do the honours of it, when occasion should arise, even to “the scientific men of Paris.”

The good man never pronounced these five words without an accent of profound respect. To him it was a supreme ideal. Fancy it! “Men of science of Paris!”

The great heat of the day was now gone by. Close

at hand were the outskirts of the forest of Touques, with its lofty trees, which apparently extended their waves of foliage without interruption as far as the horizon. The keeper proposed a stroll in the wood.

“Are you still making a collection of insects?” he added, turning to Léon.

And as the latter signified an affirmative—

“Ah, well, I know a spot. I have in fact made certain arrangements. But come along, I think you will not be disappointed.”

XIX.

In the wood—Interment of a field-mouse—The population of an oak-tree—Gall-fly—The origin of gall-nuts—Parasites of parasites—The surprise prepared by the keeper—A park for insects—New treasures for the collection of Léon—Arrest of an assassin—*Ocypus olens*—A little-known way of butterfly-hunting—Wedded couples should be well-matched—Saint Francis of Sales might have become an excellent entomologist—The grebe—A difficult problem solved by a bird—The return—A conjugal drama.

OUR friends asked themselves with some curiosity what could be the keeper's meaning, and how he intended to secure for them the rich harvest of insects he alluded to in such enigmatical fashion. But Franceschini, in spite of their inquiring glances, thought proper in a roguish manner to keep the secret of his surprise.

They provided themselves with the implements necessary for the purpose of catching and preserving insects, some of which Léon always carried with him during his excursions: boxes, butterfly-nets, and of course the umbrella that is held inverted under the trees to catch the insects that are made to fall by beating or tapping the foliage with a stick. Then the little party proceeded along a path in the wood, headed by Franceschini, proud of doing the honours of his

domain, as he pompously called it, to his friends. With legs covered by long gaiters of yellow leather, he led the way and directed the little expedition.

They advanced slowly, the path being bordered at the sides by the deep ruts left by the waggons of the woodmen, filled in places by muddy water which had stagnated there since the last rains, while between the ruts the horses had deeply imprinted their footmarks in the soft earth.

The light was becoming more slanting, and across the leaves of the hazels scattered golden spots on the foliage, and striped rays of glittering beauty on the sombre turf that bordered the path.

At the first turning in the road a bird flew away with heavy flight only two paces from the tourists, and at the same moment René cried out:

“Gentlemen, I announce the decease of a field-mouse.”

I do not know whether the reader may share my impression, but in the country I never see without a certain feeling of melancholy the body of a tiny rodent. In vain I reason with myself, recalling that during its little life it was an injurious beast, and that the carcase of a foe smells always sweet, if we may believe a Roman emperor of gloomy reputation (and in the matters of foes and carcasses this emperor might well have been an authority). But fruitlessly! The shrivelled legs, with their extremities pale and

naked, like the hands of infants, and appearing to stretch themselves out in a supplicating manner; the delicate moustache of bristles; the lips drawn out as if by a last agony; in short, this despised creature, a body of the size of the finger, now the sport of the infinite, death! all this gives me a feeling of sadness, and I find myself murmuring some words of pity, if not of regret, for the defunct little animal.

Our promenaders possibly experienced something of this feeling but did not dwell on it; and Léon, who in fact did not like to lose anything that could be of assistance to him in his favourite studies, at once proposed to carry off the little corpse.

"Take it away? You must surely be joking," replied his cousin. "It is already in full process of decomposition. A very little longer, and it will walk without any assistance."

As if to prove the truth of what René had just said, the little carcase, to his great astonishment, commenced to shift its position.

"Attention!" called the doctor, "the funeral ceremonies have already commenced."

Five large beetles, of a black colour, as is befitting to every respectable undertaker, with some yellow bands like belts of leather on their elytra, had thrust themselves beneath the body of the rodent, and had commenced their sinister duty. They had already, in fact, disappeared from sight, and it was only by a

somewhat penetrating odour, like that of musk, that



NECROPHORI: 3, *N. germanicus*; 4, *N. fossator*; 4', LARVA; 4'', PUPA.
SILPHA: 1, *S. thoracica*; 2, *quadripunctata*.

their presence was revealed. A few paces from the

spot, the earth, being there lighter, could be more easily stirred. The Necrophori having discovered this beforehand had chosen this position, and their burden had to be removed to it. There, with their front legs, which supplied the place of pick and shovel, they commenced to dig the grave, throwing the earth on either side as they carried on their work.

Little by little the body was seen to get lower. When it had descended to the required depth the



HEMIPTERON (*Pentatomia ornatula*).

Necrophori commenced to cover it with earth. After this it only remained for them to wait till it was in a fit state for them to deposit their eggs there.

“Not badly done. A very good sort of funeral for beings of that sort,” said René. “But this is not filling our boxes.”

And as he spoke, with a sudden access of industry, he began with his beating-stick to beat in an unmerciful manner the branches of a young oak-tree.

The leaves fell around as thick as hail, bringing down with them an abundant supply of spiders, caterpillars, earwigs, and insects of all sorts, which rapidly took to flight in various directions, being fortunate if the young collector did not arrest them in their flight, and place them in his box as if in a prison.

It is surprising what a world may be found on an oak-tree; and each species and variety of the tree has on its various parts its special guests, to give the list of whose names would, however, carry us too far. But in the first place there is the numerous host of beetles or Coleoptera; the stag-beetles whose larvæ live in the old wood of large trees; and the Anobia; also Orchestes, which, less ambitious, contents itself with the twigs and leaves; *Balaninus glandium*, to which the acorns serve as food and abode; some Chrysomelidæ, that attack the young shoots; while nearer to the ground and on the underwood, Silphæ and Calosomatae carry on a war of extermination against the processionary caterpillars.

In the world of Lepidoptera the frequenters of the oak may be said to be legion. Many amongst them are so intimately connected with this tree, and belong so entirely to it, as to receive their names from it: *Thecla quercus*, *Bombyx quercus*, *Tortrix quercus*, and others.

But of all these denizens the most surprising in its

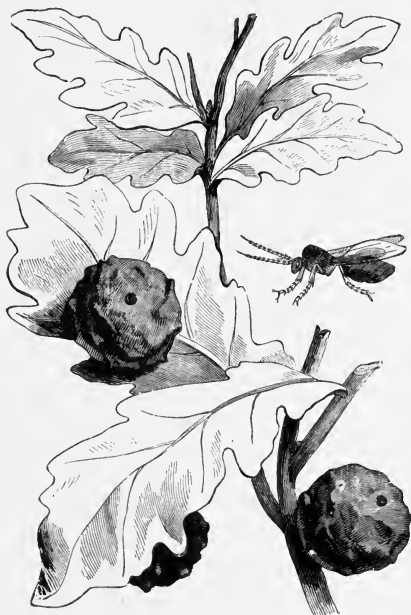


THE PROCESSIONARY MOTH AND ITS LARVÆ, THE LATTER ATTACKED BY A
BEETLE, *Calosoma sycophanta*, AND ITS LARVÆ.

way of working is without doubt the Cynips, although it is little known to the ordinary observer. This Hymenopteron is completely associated with the tree, and locates itself thereon at a fixed spot that it has itself selected, and there causes a habitation to grow up in which it establishes its posterity. You have no doubt often noticed on the leaves, along the ribs, or at the base of the stalk, some peculiar objects, some fleshy excrescences, that resemble aborted apples. These are the productions of the Cynips or gall-fly. Its piercing apparatus, by penetrating into the plant, sets up some peculiar affluence of sap, and thus is formed an excrescence that gradually increases in size. In this the offspring is produced, and hidden in it, after the manner of La Fontaine's rat retired from the world in the cheese, it grows up to its full size as a grub or maggot, and comes out in the winged form to carry on the continuance of the species.

It is to a Cynips of an oak of the forests of the East, the *Quercus infectoria*, that we owe the gall-nuts whose use is so widely diffused by commerce, and which form one of the ingredients of writing ink ; so that large numbers of people devote their industry to, and obtain the means of existence from, this tiny creature. And, wonderful fact ! this pigmy living on a giant tree has its own pigmies devoted to it ; this guest is itself the host of parasites. The little habitation of the Cynips frequently gives shelter to a num-

ber of tiny Chalcidiens, insects so small that many of them can scarcely be perceived, and these devour the Cynips, having discovered some means of entering



CYNIPS, AND GALL-NUTS, OR OAK-APPLES.

its abode and of there depositing their eggs. Some of these tiny parasites live within the bodies, or even in the eggs, of other insects. And it is indeed possible



STAG-BEETLE (*Lucanus cervus*): LARVA, PUPA, AND MALE AND FEMALE OF THE PERFECT INSECT.

that this is not the last of the parasitism : these Chalcidiens may be themselves attacked by other still more minute insects ! Each creature is a means of livelihood to others, and the smallest is a microcosm, quite a universe in miniature.

Such were the meditations that Dr. Boberral for a while abandoned himself to. All at once he seemed to awake from his dream : “Come,” said he, “this is strange sort of speculation for a doctor ! But we must attribute it to the oak-tree itself, the weird tree with which the Greeks and Druids long, long before my time associated their mythical conceptions. My nephew, better advised, contents himself with utilising it as a means for obtaining the objects of his naturalist’s desire.”

Just then Franceschini, thinking it time to satisfy the ardour of the young man, invited him to come on a little farther.

“Come along,” said he, with a mysterious smile, “my insect park is only a few steps from here, and without taking so much trouble as this we shall find many more there. Come !”

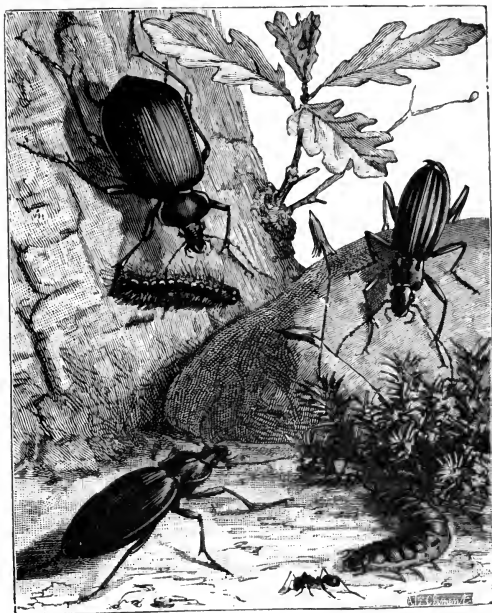
An insect park ! What could he mean by that ? Neither René, Léon, nor the doctor himself could guess ; but they started off with fresh enthusiasm, and soon reached a clearing. In the middle of it might still be seen the remains of a wooden hut, erected there by a workman some years before as a temporary

shelter during the period of summer. The grass and moss were now regaining the ground from which they had been banished for awhile, and were reappearing on the trodden soil that had formed the floor of the habitation. Outside the ruined hut were some disconnected boards, covered with moss; formerly they had probably formed part of the door of the cabin but were now overthrown and scattered hither and thither.

“This is my park,” said the keeper; “and it is here that I have placed my baits: some earthworms, some portions of snails, and a spoonful or two of molasses spread on the boards. We shall see if my devices have proved successful.”

The planks were turned over, and a crowd of insects of several kinds were immediately discovered—ants, Carabidæ with brilliant armour, and sunshine beetles, or Amarae. It was a sort of miniature Noah’s ark; each kind had attracted others. In the same way as, on the foliage they consume, caterpillars are pursued by their ferocious enemies, the Calosomata, the Feroniæ, the tiger-beetles, so the woodlice and little snails that had come there in the hope of quietly awaiting the arrival of the freshness of evening, had not failed to attract the unwelcome visits of Procrustes, Silphæ, and Staphylinidæ. The arrival of our friends produced a general stampede among both the slaughterers and their victims.

Léon had scarcely ever before met with so grand a chance. The boxes and receptacles at once began to



CARNIVOROUS BEETLES.

ABOVE, *Calosoma sycophanta* ; TO THE RIGHT, *Carabus auratus* AND
LAEVA ; BELOW, *Carabus purpurascens*.

fill. By this one stroke his modest collection of insects would be increased by many specimens, perhaps by some of fresh sorts. And he collected and collected,

almost by handfuls, without discrimination, without remorse. At last, wearied of the slaughter, the boxes were put away, and our four friends prepared to continue their ramble.

“Shall we not take this one?” said René, pointing with his finger to a superb granulated Carabus.

“It is no good; we have already ten or a dozen of it, and it is a useful insect. We shall acclimatise some of his brethren in our garden at the cottage, and as for this one we may leave it in peace.”

But fate had decided otherwise. A great Staphylinus concealed behind a root suddenly made a sortie from its ambush and bore down on the unhappy carabe. With a stroke of its mandibles the insect was almost decapitated. All this was done in less time than it takes to tell it; a flash of lightning would have been almost sufficient to have illuminated the transactions of this little tragedy.

“But you, my good fellow, you shall perish miserably.” And stooping down René seized the Staphylinus, and unflinchingly detained it, notwithstanding the disagreeable odour of nitrous ether that the insect spread around it—an odour which has procured for it the name of *Ocypus olens*.

As the Parisian was on the point of shutting it up with the others—

“Mind what you are about,” said the doctor; “before night all our captives will be massacred and

torn to pieces. Here is a tube containing already a male *Ocypus* ; yours is, I think, a female : it will be better to keep them by themselves."

He offered the tube to René, who hastened to avail himself of the good advice, humming a well-known song—

"Il faut des époux assortis,
Dans les liens du mariage."*

"You see my plan is a very simple one," said the keeper, who, however, was none the less proud of the find. "Lepidoptera may be captured by a similar method. You place on the trunks of the trees a mixture of sugar or molasses with some beer, and these gay ones come and cannot forsake it. You know the proverb that says you may capture more flies with a drop of honey than with a pint of vinegar."

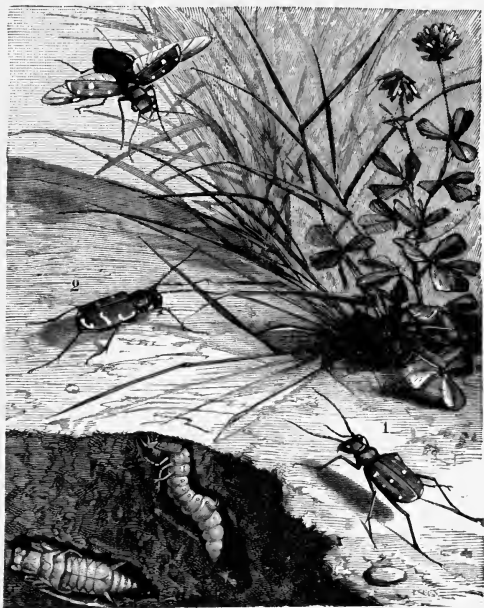
"Yes," the doctor laughingly replied. "And evidently Saint Francis of Sales, to whom the authorship is attributed, might have become an eminent entomologist if he had not been a great saint."

They returned through the marshes that exist on either side of the river Touques. In a creek a bird, called the little grebe, was sporting about. The moment it saw our friends it dived and disappeared.

"Can it be drowned?" said René, who after two

* Spouses should be well assorted
For the bonds of holy wedlock.

minutes of waiting was surprised that it did not rise to the surface. There was, however, not the least need for anxiety on this point: the grebe was simply



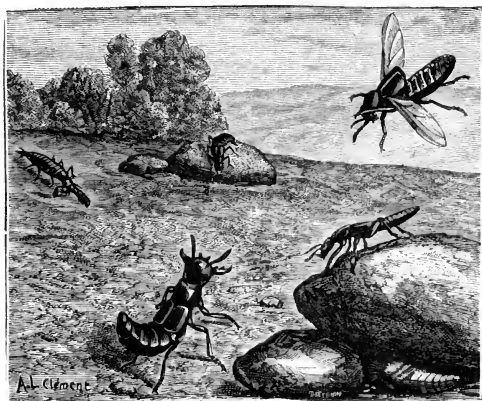
TIGER-BEETLES.

1, *Cicindela campestris* ; 2, *Cicindela sylvatica*.

concealed under some foliage. Its body was entirely covered by water, with the exception only of the beak, at the extremity of which the nostrils are placed,

and it rested quietly in this position concealed entirely from the eye, and would indeed have remained so for hours had it been necessary.

“The grebe is a very strange creature. Can you guess what plan it has invented to save itself the trouble of hatching its eggs? It builds its nest at the



COCKTAIL BEETLE (*Ocyrops olens*).

surface of the water with green leaves and vegetables, being apparently aware that this material in the process of fermentation will develop sufficient heat to enable the bird to dispense, at any rate to some extent, with the process of incubation.

“Better still! As this fermentation could not be produced without a disengagement of deleterious gases,

that might be sufficient to kill the young grebe in the egg, it is necessary, while utilising the heat, to neutralise the effect of the gases. The grebe is not nonplussed by such a trifle, and the nest is accordingly constructed and ballasted in such a manner that the eggs are partly in the water, and by this the gases are dissolved or absorbed as fast as they are formed.*

It must be admitted that a graduate of one of our technical colleges could not have solved the problem (which, as has been seen, is not without its difficulties) proposed by nature to the grebe in a happier manner.

The time for departure had now come, so with some regret they entered the keeper's lodge, then put to the horse, and at last departed, only, however, after Franceschini had filled the vacant places of the vehicle with a whole assortment of birds carefully stowed away.

Just as they were reaching their own cottage—

"I have a proposal to make to you," said Uncle Bob, "an excursion of two days."

The idea was at once approved of.

"Then, if you please, you must get everything in readiness to-night. To-morrow morning we embark

* Paul Noël. "Feuille des jeunes Naturalists," No. 116. (But it is probable that in the construction of this theory imagination has taken too large a part.—*Translator.*)

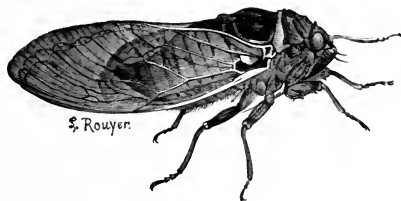
for our first voyage on board of Father Lucas's new vessel."

"And where shall we go to?"

"To Etretat."

"Unanimously accepted," said René. "After insects we go back to fishes; after the forest, the ocean!"

Then his restless and impulsive mind bringing him back all at once to the events of the day: "By-the-by, and what about my own particular collecting to-day, that concluded with a wedding in a bottle? Let us



CICADA.

see what has become of my establishment of a pair of *Staphylinus*."

Saying this he took out the tube. A sad spectacle presented itself to his eyes.

Of the male, more than three parts were devoured; there remained but little more than the hard wing-cases. The unfortunate creature must, however, have fought bravely for his life; and the female in the struggle had two legs torn off, and was resting, nearly motionless, at the bottom of the tube.

“Come, then, this is good,” said the Parisian; “another conjugal drama.” And then, in a tone of bitter reproach: “For shame, wretch. What an example to set to youth! An infamous creature, that has crunched up her husband!”

XX.

On board the cutter *Albatross*—At sea—Medusæ—René is again a “martyr of science”—Physalia—An old tale by Father Lucas—A sailor’s fancy that cost its author dear—Phosphorescence of the sea—How the Medusæ grow—Alternation of generations—Arrival at Etretat.

“ARE you all there? One, two, three! Courage, boys, courage!” And Father Lucas, with the help of five powerful sailors, pushed into the sea the bark that, drawn up on the sand, had awaited the rise of the tide. A blue pennant hung at the top of the mast, and a large tricolour flag, quite new, fluttered from the boom.

Their provisions, luggage, and some lifebelts (it is well to foresee everything when about to trust oneself to the ocean) had been sent down beforehand.

After them the three voyagers arrived. The young men boldly entered in the water half-way up their legs in order to get on board the vessel. As for Uncle Bob, he was obliged to resign himself to being carried by a sturdy sailor, by the aid of whose shoulders he gained the deck of the cutter.

“Is all ready?” said Father Lucas; “then we will start.”

All the sails were run up; the *Albatross* gently yielded to the wind. The old sailor, with bent back but attentive eye, took in one hand the rope of the sheets, in the other the tiller. Then one after the other, sailors, beach, the houses of Villers, began to disappear, while afar off Cape Antifer vaguely displayed its huge white outlines.

When they were fully out at sea, "You are not sick," said Uncle Bob to his nephew.

"Sick! How could anyone be so in such weather? besides, I have not time to feel ill. There is too much to see, and I am enjoying it all too much."

And indeed they had a magnificent panorama before their eyes. The *Albatross* was now traversing the great roadstead of Havre. A whole flotilla of vessels, with their furnaces half extinguished, or sails half clewed up, were at anchor quietly waiting until the tide was sufficiently full to permit them to enter the port, something after the fashion of wearied travellers, who with faces turned towards the desired goal enjoy a moment of repose before completing the last stage of their journey.

Here and there were to be seen pilot boats, whose full-spread sail appeared on the sky almost like a bird on the wing; large heavy fishing-boats, hauling their nets, and whose stem, painted red, was reflected on the trembling surface of the deep. On the right, lighted up by the rosy rays of the sun, appeared the

town with its crowd of roofs and its forest of masts ; to the left was the horizon, heaven and ocean united, and forming between the coast of Calvados and Cape Antifer a quarter of an immense circle.

Léon had placed himself in the fore part of the vessel, and without speaking he remained there as if fascinated, seated and leaning on his elbow, fully occupied with gazing.

René with much curiosity noticed the Medusæ, through whole shoals of which the vessel occasionally passed. Carried about at the mercy of the currents, they were displayed in the water like globes of opal surrounded by a circle of amethyst.

“What strange creatures !” he suddenly said to the doctor. “In vain I have looked quite through them, but I see no stomach, nor anything else. Have they, then, no internal organs ?”

“It is rather because their organs are also transparent,” said Uncle Bob. “If you were to place a Medusa, for a few hours only, in a coloured liquid, such as a solution of carmine, you would afterwards be able to study all the details of its structure with facility.”

René considered it a point of duty to put himself in a position to make the experiment, so, taking up a net that was at hand, he captured a Medusa and flung it on the deck.

Now that it was out of the water it appeared to be

nothing but a gelatinous and shapeless mass. Nevertheless the budding naturalist without hesitating took hold of it.

"Oh! and three times oh!" he cried, quickly withdrawing his hand from contact with the jelly-fish.

"What is the matter?" asked Léon, whom this cry had roused from his reverie.

"The matter is that I have taken hold of a handful of nettles. The ink of the Sepia, the prick of the 'crazy-fish,' the sting of the jelly-fish—I think I have had my share of these things. When we have got to ten we must chalk it up. Villainous creature! horrible and disgusting beast!" he added while vigorously rubbing his hand.

"That is nothing," said Father Lucas, "who had not thought it necessary to quit the tiller. Why, I have seen in the tropics many other kinds, including the Physaliæ, great Medusæ something like bladders—galleys, as the sailors call them."

"Perhaps you mean the *Physophora hydrostatica*?" said the doctor.

"Yes, indeed; that was, I think, the name the officers gave them. The bladder is surmounted by a sort of crest, which serves as a sail to the jelly-fish. Below are large twisted arms like corkscrews; you can see that from as far off as this.

"The first time I made the acquaintance of these

beasts was on board of the *Diana*, a corvette bound to the Gaboon. The major had about a dozen of them placed in a large tub and covered up with a tarpaulin, intending to study them.

“It was very hot; not a heat like this, but like what one feels only in the tropics, and that very likely you will never feel. The douches that the sailors gave to one another, the frequent washings of the deck, sometimes repeated as often as six times a day, nothing was any good! We were stewing, my children—were stewing as if Old Nick had cast us all into his stewpan.”

The old sailor here paused for a minute, and passed his hand over his brow, as if to drive away a painful reminiscence, and then continued his narrative.

“We had thought of taking a dip overboard, and being towed by a rope; but there were a lot of those miserable sharks. They caught every morsel thrown overboard before it reached the water; but this was not sufficient to prevent them from grinning and showing us their teeth in a most villainous fashion. It may be a fine thing to be a sailor, but one does not care to have such fellows for neighbours. So all through the day I looked with the corner of my eye at the major’s tub, and thought how much I should like to take a bath in it. The clear water tempted me too strongly.

“Well, when the night comes, I get up, I proceed

very gently, and there I am in my tub. No! by Jove, only to think of it again makes me sting all over—a regular fine bath, a dish of stinging nettles. I got out, I never yet know how, covered with pimples from head to feet. I had three days of it without being able to stir. The jelly-fish next day were found smashed to jelly. Fortunately it was supposed



JELLY-FISH (*Rhizostoma cœrulea*).

that the heat had caused them to die of apoplexy. If the major had known of the adventure he would never have forgiven me.

“This major was a learned man, but he had some very queer notions. He used to say (you will know if it is right) that it is the jelly-fish that make the sea phosphorescent.”

“The major was right. The phosphorescence of the sea is really due to myriads of minute *Medusæ*. They are altogether singular animals, and many of them undergo very strange metamorphoses.”

“Tell us about it, Uncle Bob,” said René, throwing overboard with his foot the jelly-fish, which again commenced swimming as if nothing had happened.

“Thus. The *Medusa* commences by producing an egg. From this egg issues, not a *Medusa*, but a sort of infusorian, furnished with vibratile ciliæ, which for some time leads a free life by rotating, but finishes by attaching itself to some object under the water. There it grows, branches out, and becomes a polype.

“Then new changes take place and contractions are formed, so that the creature becomes like a series of superposed discs. It breaks up, the discs become detached, and each forms a jelly-fish, which grows and later on produces eggs, and so the round is continued—*Medusæ* and polypes, one after the other. The series of transformations goes on in these lower beings in such a way that the children are always dissimilar from their parents, but resemble a generation of beings that preceded these.”

They were approaching Etretat. The bark was coasting beneath huge cliffs of chalk, mighty deposits left by the seas of far distant geological epochs, and that now rear themselves like colossal walls opposed to the immensity of ocean.

By degrees as they advanced the cliffs became more broken up. Soon the Needle appeared, and then the Cradle. These rocks stand there like the last vestiges of some cyclopean architecture. After these the beach again, with bathing machines, capstans planted in the shingle, and the tarred boats which, when they are no longer sound enough to encounter the perils of the ocean, they make use of for small shops. They had arrived.

While Uncle Bob, like a thoughtful provider, went to prepare a domicile for the little party, and Lucas was occupied with the boat, the young men went and took a glance at the great rocks that the ebbing tide was beginning to disclose.

XXI.

Villers and Etretat—The cliffs of Normandy—The power of a drop of water—How shingle beaches are formed—A “water-cat”—Way of getting rid of an Octopus—Every nook occupied—The population of a rock—A new fauna—The various zones of the tidal region.

THE distance separating the sands of Villers from the beach of Etretat is scarcely more than ten or a dozen leagues. It would, however, be difficult to imagine a greater contrast than exists between these two watering-places.

Villers, stretching out along an immense carpet of fine sand, extends eastwards almost indefinitely, and appears, with its villas arranged one after the other, like forlorn sentinels by the roadside, to offer its hand to Deauville, which begins a league farther on. To the west, the suburban houses are placed one higher than the other on the gentle declivity of a cliff of brown clay, the upper part of which is broken and interrupted.

Etretat on the contrary, compressed between the grasp of its two great cliffs, has its limits on each side

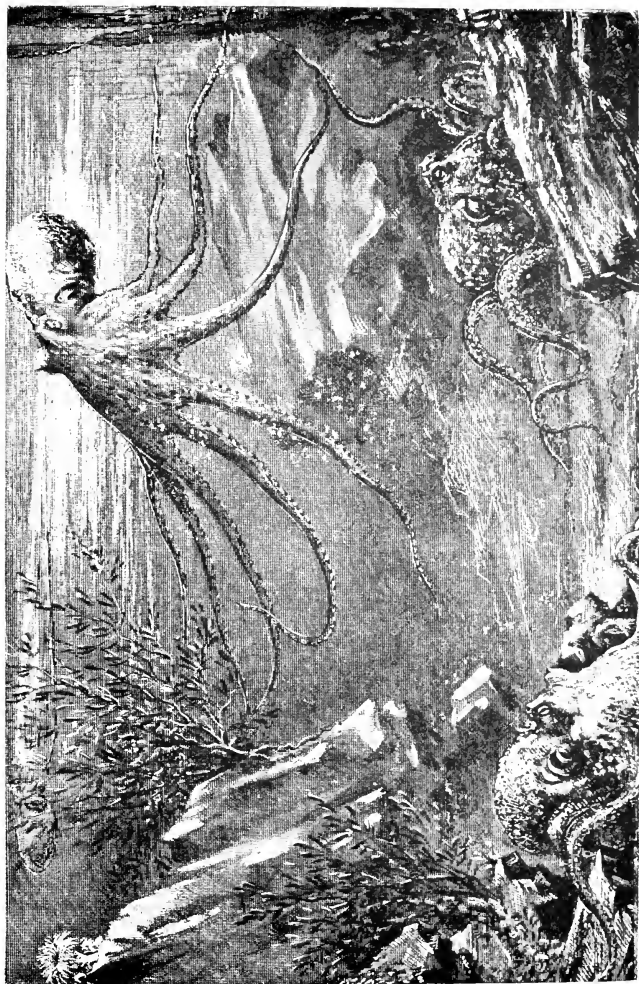
marked out for ever. Huge strata of chalk three or four hundred feet in height, almost as massive and imposing as granite, defy the efforts of man. Air and water are their only masters. The air, weathering them, disintegrates the rock, and scatters afar the dust it has rubbed from the great mass; the water, filtering into the almost imperceptible fissures of the rock, dissolves it, and the nearly invisible moisture works more effectually than either powder or dynamite.

As the result, enormous blocks are detached and fall like monstrous projectiles on the crushed shingle. There the sea takes possession of them and completes the work. The chalk is dissolved away, and the insoluble silex, pounded, broken, crumbled, and worn in every way, forms the shingle that the sea rolls with a monotonous thunder as far as the mouth of the Seine.

Two shores so different as Villers and Etretat could not be inhabited by the same creatures. At Villers delicate animals are able to repose on the sand, as if on a soft cushion. To Etretat belong the solid and hardy species that have nothing to fear from the shock of the waves, and who find a sheltering-place in the hard rocks.

“A water-cat!” *

* “Chatrouille,” a local slang name for which the Translator has been obliged to invent an equivalent.



OCTOPUS OR POLYPE (*Octopus vulgaris*).

“Turn his bonnet!”

These two almost simultaneous exclamations were uttered by two children, two young natives, who were engaged in seeking for crabs, by turning over the large stones covered with seaweed.

“Water-cat? turn his bonnet?” repeated René.

“What the deuce can they be talking about?”

He went nearer, and one of the children—he who had first cried out—raising himself up, waved



LIMPET (*Patella vulgata*, Lamarck).

an enormous Octopus in the air in a triumphant manner.

“Wasn’t long over it, eh?” said he to René, showing him his capture. “Directly you find yourself caught by a water-cat, you must catch hold of his head and turn him inside out like a bag. Will you buy this one, sir?” added the young Norman, without stopping.

“No indeed, I am very much obliged to you,” said René, looking with disgust at the hideous beast, whose arms, furnished with innumerable suckers, hung down in a flabby style. “What should you expect me to do with it?”

“Booh! Have it cooked and eat it,” replied the

child, apparently very much astonished that anyone should be in doubt about so simple a matter.

Then seeing he was not able to make a good thing out of it, he placed the monster in his basket and went off.

“It is a fortunate circumstance,” said Léon, “that the gigantic cuttle-fish, if they really exist, are so well-mannered as never to let themselves be seen. A mere dozen of poulpes like that described by Victor



SEA-SNAIL (*Purpura lapillus*, Lamarck).

Hugo in the ‘Travailleurs de la Mer,’ would render a seaside place quite uninhabitable !”

While speaking, the young naturalist by his own example gave the signal for exploration. Close at hand there began a heap of large rocks, still wet with the salt water, veritable dwelling-houses for marine animals, and covered by a thick mantle of green seaweed and shells of various sorts.

In such a spot no room is wasted. On the surface are mussels attached firmly by their byssus; limpets with conical shells, who manage to cling to the rock,

by creating a vacuum beneath them; acorn shells, that appear on the rock as little white projections, very hard and sharp, all these being species that have nothing to fear from the shocks of the waves. In the crevices, and in the minute hollows where protected from the surf, periwinkles and dog periwinkles (*Purpuræ*), deposit their eggs; while still more in the interior, some in the very heart of the rock, the numerous group of the corrodors of the stone, the piddock, the *Saxicavæ*, the *Venerupis*, carry on without any relaxation their incessant though unseen task of destruction.

If the ear be applied to the rock, a noise arising from their unceasing action may be heard, a strange sound, almost defying description, caused by the energy of vital action within the interior of the lifeless rock.

Farther off, at the limit of low water, commences a zone in which the action of the sun's rays is less powerful, and here the agreeable and lively green tints are replaced by more sombre shades of bistre-brown and olive.

Between the great brown stalks and the interlaced leaves of *Laminaria*, there is also a considerable population, of a quite different character. This is a lurking-place for certain molluscs without shells, the species of *Doris* and *Tritonia*, designated by the fishers under the common name of sea-slugs. As well as

Aplysia, whose respiratory organs are placed on the middle of the back, and which secretes a violet ink.

This zone is prolonged seawards for a considerable distance ; beyond it is the abyss. This is inaccessible and unknown, no human eye having yet examined its depths.

XXII.

The return from Etretat—Inventory—A serious culprit—The worst foe of the Dutchman—A selfish rascal—The sponges of the Channel—Homerie combat between a negro and a sponge—Clams—A Chinaman in a shell—Signs of bad weather—A recollection of some martyrs of duty—Old mariner and true sailors.

AFTER an excursion of two days, conscientiously devoted to the examination of Etretat and the neighbourhood—the Manhole, the Cauldron, the Needles, as well as the great springs at Bruneval—they commenced their homeward journey on board of the *Albatross*. With one of those sudden changes so frequent on the coasts of the Channel, the wind now blew from N.E. to S.W., bringing with it great banks of clouds. The surface of the water, slightly agitated by a swell, receiving no longer the rays of the sun, had become of a more glaucous colour. Sky overcast, breeze slight, as the sailors say.

However, old Lucas when he was consulted, had not any hesitation in giving the signal for departure. “A leading wind to come with, and a leading wind to return with! Why, the weather is made expressly

for us! With only half her sails the *Albatross* will skim along like an American cutter."

Accordingly they started.

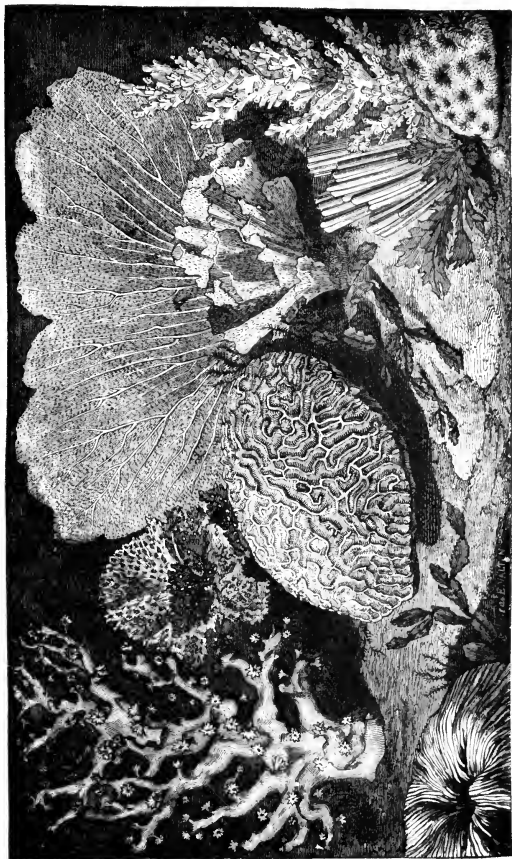
When Etretat had disappeared from sight, and they were beginning to follow the long line of cliffs, they went over the inventory of the preceding day.

The doctor, who had only passed a few minutes on the beach, opened his botanical box, and took out of it a large piece of wood.

"It is not for lighting the fire with," said he; "it is simply a sample of the ravages that the ship-worms are able to effect. Have you ever seen such a cutting-up?"

And in point of fact this piece of wood, pierced by holes in various directions, was reduced almost to the condition of a sponge. On its sides, and on the exposed parts, the galleries hollowed out of the wood could be seen lined with a calcareous layer.

"And here is the culprit!" added Uncle Bob, exhibiting a sort of worm, half dried up, and terminated by a pigmy shell. "It is the *Teredo navalis*, an implacable enemy of maritime constructions. When piles are driven in sea-water to form breakwaters or piers, or when wooden vessels are left stationary for some time in port, it comes boldly and establishes itself in them, eating away atom by atom of the construction by means of its shell, as if with an auger. Pile work, made from the heart wood of



SUBMARINE FORMS OF LIFE FROM THE TROPICAL SEAS.

oak, has been known to give way suddenly after a few weeks, being mined by these invisible workmen. In Holland, especially in that part of the country that is preserved from the invasion of the sea by means of dikes, the damage caused annually by these molluscs is very considerable.

“These other smaller holes, that you see at the end of the wood, are made by an enemy of the ship-worm, which fact, however, does not prevent it from being equally our enemy. It is a crustacean, and the selfish rascal would wish to have the monopoly of destroying our artificial marine constructions. It is the *Limnoria terebrans*. Our captain knows it well, only he gives it another name, calling it, I believe, the gribble.”

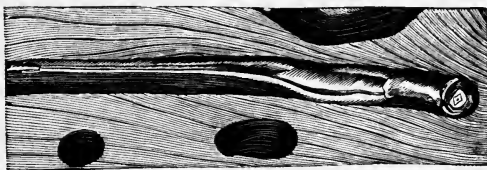
“Very good bait for fishing-lines,” sententiously remarked the fisherman, pulling at his pipe.

“That is all my find, except a *Spongia oculata*, one of the few kinds of sponges found in the Channel, all of which, moreover, are quite small. In warm seas, sponges, on the other hand, sometimes attain enormous dimensions. Witness the colossal sponge preserved in the museum at Havre, which was obtained about thirty years ago under circumstances that are worthy of being narrated.

“As they were disembarking on to a lighter in some port of Mexico—I have forgotten which one—some cases of machinery imported in a vessel from

Havre, as the result of some piece of awkward management one of these cases fell into the sea. A squad of negroes was immediately set to work to recover it. And it happened that one of these negroes fell, as if into a trap, into the sponge in question, which was just deep enough and large enough to contain the whole body of a man.

"The poor devil, maddened with fright, thought himself lost. By a desperate shock he succeeded in detaching the sponge from its attachment, and both



PIECE OF WOOD PERFORATED BY SHIP-WORMS.

of them rose to the surface together, the man in the sponge. This negro-eating sponge is, I believe, the largest specimen that has ever been secured."

"Now that we are talking of big things," said René, "can you tell me what are the largest of all the shells?"

"A species of *Tridacna*—giant clams, or holy-water basins as they are called. These sometimes attain a diameter of three feet. They are obtained chiefly in the Indian Ocean."

"I know them well enough," said old Lucas. "I have eaten them when I was in India."

"Well?"

"Well, it is detestable. But there is one thing about them that you probably do not know; it is that in China they make use of these shells, which we use here as holy-water basins, as troughs for horses. Indeed, I knew an old quartermaster who declared he had seen them so large that they were used as baths by the mandarins. You can't believe some quartermasters!"

They were entering the bay of the Seine. In the north the sky was becoming blacker and blacker, while, by a curious optical effect, to the south the houses of Trouville and all the details of the coast of Calvados were defined with remarkable clearness. Some flocks of sea-gulls appeared as white patches against the black sky, and made with all possible rapidity for the coast.

"We must make for Trouville as quickly as possible," said the captain of the *Albatross*; "there will be a pretty good hatful of wind to night."

He gave a stroke of the tiller, and noticing on the larboard side of the vessel the buoys of Amfard, which were bobbing about on the waves, he lifted his woollen bonnet by way of saluting them.

This gesture did not escape the three voyagers, and in response to the unspoken request of their eyes he

said : " A very sad recollection. About two years ago, in the spring—it was the 26th of March, I shall never forget the date—I had been already detained at Havre for three days by stormy weather. In the morning I went down to look at the sea, thinking how long it was likely to last, and to see if the wind was not moderating a bit. Bah ! it was stronger than ever.

" Then I saw plainly, down here near this buoy, an English cutter, the *Vivid*, on the point of being lost.

" With a telescope you could see the men, who had climbed into the rigging and were making signals—well, that sort of thing, you know—but then to venture out in such weather !

" They could not be deserted like that, and I said to myself, ' Ah ! if I were ten years younger ! ' Just then I see the lifeboat going out, with its crew of eleven ; it was No. 4. ' Hurrah ! boys,' I cry to them, ' Hurrah ! ' But they were never seen alive again.

" Another squad got under way in spite of the danger, but it was all over with the first crew. No. 4 had been manned by eleven men, and the next day they recovered eleven bodies.

" And when they gave them a magnificent funeral, with the soldiers and music, and all the weeping (they had deserved it, poor fellows !), I was there in

the church leaning against a pillar, and I said to myself below my breath : ‘They were sailors, true ones ! ’ ”

He was silent for a moment, and then as if speaking to himself again, he muttered—

“ True ones ! ”

The three excursionists looked at him without speaking, and while the cutter skimmed rapidly along, sloping under her sails, two big tears rolled, in silence down the wrinkled cheeks of the old sailor.

XXIII.

EPILOGUE.

“THERE is no company too good to part,” says an old proverb, and the time came when the portmanteaus had again to be packed, closed, and strapped up for the return.

“Already !” sighed René, who had been occupied all the morning with the unpleasant task.

“Already !” repeated mechanically Léon and the doctor.

It must be, however. The end of the vacation was at hand, and Uncle Bob himself would only be able to stay a week longer at Villers. The yearly leave that his position in the medical schools at Paris permits him to take was on the point of expiring, and professional duty required his speedy return.

They sat down to table, without much appetite, it must be admitted, and at the very moment when the meal was finished the door was opened and the servant announced—

“The omnibus for the railway, sir !”

Have you ever noticed the effect produced by such words, when it has become necessary to tear oneself away from an agreeable sojourn ? The idea of departure has not been allowed to take possession of the mind. If one has thought of it, a glance of the eyes at the surroundings has assured us that the moment of separation is not yet here. But the clock strikes, and brings one to the stern reality.

“The omnibus for the railway, sir !”

The luggage was again stowed away on the omnibus, and René, who a few weeks before affected such a complete nonchalance, and gaily mocked the scientific tastes of his cousin, René the giddy and incredulous Parisian of the previous year, returned a last time to the workroom at the moment of leaving the cottage as if to say good bye to it.

And when, having said adieu to Uncle Bob, he was on the point of mounting the steps of the carriage that was to take him back to Paris—

“Thank you much !” he said to Léon, pressing his hand with warmth. “You have taught me to observe, you have shown me how one may in any place occupy and train the intellect. Again I thank you.”

The train started, and the young man leant out so that he might get one more glimpse, through the trees, of the peaceful cottage where, instead of exciting pleasures, he had found during his short vacation

the tranquil and strengthening solace that is brought by study.

Then in turn the cottage and trees disappeared, and René ensconced himself in a corner and lulled by the monotonous rumbling of the train fell asleep.

At the time these lines are written nearly a year has elapsed, and Uncle Bob is again making his preparations for a return to Villers. He will find some changes there.

Father Lucas has gone to reside at Trouville. He can there find better shelter for his boat, the *Albatross*, and give it more attention. For the greater part of the year he lives the life of a retired man, but during the season of fine weather excursions to sea are a source of considerable profit to him.

The fishermen of Trouville hold him in great respect, and when a difference of opinion arises between two sailors, it is to the old patriarch that appeal is made. His decisions are treated as final.

So Father Lucas has become an authority.

Franceschini, in recognition of the services he rendered as non-commissioned officer in 1870, received, when he had ceased to expect it (possibly Uncle Bob may have known of it), a military decoration. Sometimes, when seated in the midst of his treasured collection, he gazes fixedly at the brilliant token displayed on the wall, and believes that the sight is a sovereign remedy for rheumatism and attacks of gout, from which he sometimes suffers.

Jacob, who when young was of so happy a disposition, has, now that he is older, become an impudent chatterbox and an incorrigible thief.

Yes, dear readers, I regret to inform you that it is impossible to deny that Jacob has a natural talent for theft. Everything that glitters excites his cupidity, and only yesterday, by chance his storehouse was discovered under the stairs. Here is the inventory of its contents—

Two thimbles.

A small key.

A penholder.

Two or three dozen pins.

About the same number of needles.

Some nails and screws.

Two half-franc pieces.

The cover of a sardine-box.

One may well ask what Jacob intended to do with such an accumulation.

And your two principal characters, René and Léon?

Léon, a medical student, has passed his first examination with honours; and his thoughtful turn of mind, and the remarkable grasp of his intelligence, cause it to be prophesied that he will be a worthy successor to his father.

René is about in a few days to pass his last examination as Bachelor of Arts; after which he proposes to enter the college of Saint Cyr. With his careless

courage and his frank good-humour there is but little doubt of his becoming one of our best officers.

There is, however, a dark side to every picture, and formerly the prospect of long days to be passed in garrison in the provinces dismayed him. But now, even should he have to pass whole months in the midst of the marshes, he is no longer afraid of *ennui*. For this terrible complaint he knows a perfect antidote: study—the pursuit of knowledge.

Can time be long when one has to learn?

Can anyone who is an observer weary?

THE END.





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