

lever is maintained, when the weights are inversely as their distance from the fulcrum. As this equilibrium of unequal weights depends on the velocities they would have if set in motion, its law has been called the principle of virtual velocities. No theorem has been of more important utility to mankind. It is one of those great truths of science, which, combating and conquering enemies from opposite quarters, prejudice and empiricism, justify the name of philosophy against both classes. The waste of labour and expense in machinery would have been incalculably greater in modern times, could we imagine this law of nature not to have been discovered; and as their misapplication prevents their employment in a proper direction, we owe, in fact, to Galileo the immense effect which a right application of it has produced. It is possible that Galileo was ignorant of the demonstration given by Stevinus of the law of equilibrium in the inclined plane. His own is different; but he seems only to consider the case when the direction of the force is parallel to that of the plane.

39. Still less was known of the principles of dynamics than of those of statics, till Galileo came to investigate them. The acceleration of falling His Dynamics. bodies, whether perpendicularly or on inclined planes, was evident; but in what ratio this took place, no one had succeeded in determining, though many had offered conjectures. He showed that the velocity acquired was proportional to the time from the commencement of falling. This might now be demonstrated from the laws of motion; but Galileo, who did not perhaps distinctly know them, made use of experiment. He then proved by reasoning that the spaces traversed in falling were as the squares of the times or velocities; that their increments in equal times were as the uneven numbers, 1, 3, 5, 7, and so forth; and that the whole space was half what would have been traversed uniformly from the beginning with the final velocity. These are the great laws of accelerated and retarded motion, from which Galileo deduced most important theorems. He showed that the time in which bodies roll down the length of inclined planes is equal to that in which they would fall down the height, and in different planes is proportionate to the height; and that their acquired velocity is in the

same ratios. In some propositions he was deceived; but the science of dynamics owes more to Galileo than to any one philosopher. The motion of projectiles had never been understood; he showed it to be parabolic; and in this he not only necessarily made use of a principle of vast extent, that of compound motion, (which, though it is clearly mentioned in one passage by Aristotle,¹ and may probably be implied, or even asserted, in the reasonings of others, as has been observed in another place with respect to Jordano Bruno, does not seem to have been explicitly laid down by modern writers on mechanical science,) but must have seen the principle of curvilinear deflection by forces acting in infinitely small portions of time. The ratio between the times of vibration in pendulums of unequal length had early attracted Galileo's attention. But he did not reach the geometrical exactness of which this subject is capable." He developed a new principle as to the resistance of solids to the fracture of their parts, which, though Descartes as usual treated it with scorn, is now established in philosophy. "One forms, however," says Playfair, "a very imperfect idea of this philosopher from considering the discoveries and inventions, numerous and splendid as they are, of which he was the undisputed author. It is by following his reasonings, and by pursuing the train of his thoughts, in his own elegant, though somewhat diffuse exposition of them, that we become acquainted with the fertility of his genius, with the sagacity, penetration, and comprehensiveness of his mind. The service which he rendered to real knowledge is to be estimated not only from the truths which he discovered, but from the errors which he detected; not merely from the sound principles which he established, but from the pernicious idols which he overthrew. Of all the writers who have lived in an age which was yet only emerging from ignorance and barbarism, Galileo has most entirely the tone of true philosophy, and is most free from any contamination of the times, in taste, sentiment, and opinion."²

40. Descartes, who left nothing in philosophy untouched, turned his acute mind to the science of mecha-

¹ Drinkwater's *Life of Galileo*, p. 80.

² Fabroni.

* Preliminary Dissertation to *Encyclop. Britan.*

nics, sometimes with signal credit, sometimes very unsuccessfully. He reduced all statics to one principle, that it requires as much force to raise a body to a given height, as to raise a body of double weight to half the height. This is the theorem of virtual velocities in another form. In many respects he displays a jealousy of Galileo, and an unwillingness to acknowledge his discoveries, which puts himself often in the wrong. "I believe," he says, "that the velocity of very heavy bodies which do not move very quickly in descending increases nearly in a duplicate ratio; but I deny that this is exact, and I believe that the contrary is the case when the movement is very rapid."¹ This recourse to the air's resistance, a circumstance of which Galileo was well aware, in order to diminish the credit of a mathematical theorem, is unworthy of Descartes; but it occurs more than once in his letters. He maintained also, against the theory of Galileo, that bodies do not begin to move with an infinitely small velocity, but have a certain degree of motion at the first instance which is afterwards accelerated.² In this too, as he meant to extend his theory to falling bodies, the consent of philosophers has decided the question against him. It was a corollary from these notions that he denies the increments of spaces to be according to the progression of uneven numbers.³ Nor would he allow that the velocity of a body augments its force, though it is a concomitant.^b

41. Descartes, however, is the first who laid down the laws of motion; especially that all bodies persist in their present state of rest or uniform rectilinear motion till affected by some force. Many had thought, as the vulgar always do, that a

Laws of motion laid down by Descartes.

¹ Œuvres de Descartes, vol. viii. p. 24.
² Il faut savoir, quoique Gallée et quelques autres disent au contraire, que les corps qui commencent à descendre, ou à se mouvoir en quelque façon que ce soit, ne passent point par tous les degrés de tardiveté; mais que dès le premier moment ils ont certaine vitesse qui s'augmente après de beaucoup, et c'est de cette augmentation que vient la force de la percussion. viii. 181.

^a Cette proportion d'augmentation selon

les nombres impairs, 1, 3, 5, 7, &c., qui est dans Gallée, et que je crois vous avoir aussi écrite autrefois, ne peut être vraie, qu'en supposant deux ou trois choses qui sont très fausses, dont l'une est que le mouvement croisse par degrés depuis le plus lent, ainsi que le songe Gallée, et l'autre que la résistance de l'air n'empêche point. Vol. ix. p. 349.

^b Je pense que la vitesse n'est pas la cause de l'augmentation de la force, encore qu'elle l'accompagne toujours. Id.,

continuance of rest was natural to bodies, but did not perceive that the same principle of inertia or inactivity was applicable to them in rectilinear motion. Whether this is deducible from theory, or depends wholly on experience, by which we ought to mean experiment, is a question we need not discuss. The fact, however, is equally certain; and hence Descartes inferred that every curvilinear deflection is produced by some controlling force, from which the body strives to escape in the direction of a tangent to the curve. The most erroneous part of his mechanical philosophy is contained in some propositions as to the collision of bodies, so palpably incompatible with obvious experience that it seems truly wonderful he could ever have adopted them. But he was led into these paradoxes by one of the arbitrary hypotheses which always governed him. He fancied it a necessary consequence from the immutability of the divine nature that there should be at all times the same quantity of motion in the universe; and rather than abandon this singular assumption he did not hesitate to assert, that two hard bodies striking each other in opposite directions would be reflected with no loss of velocity; and, what is still more outrageously paradoxical, that a smaller body is incapable of communicating motion to a greater; for example, that the red billiard-ball cannot put the white into motion. This manifest absurdity he endeavoured to remove by the arbitrary supposition, that when we see, as we constantly do, the reverse of his theorem take place, it is owing to the air, which, according to him, renders bodies more susceptible of motion than they would naturally be.

42. Though Galileo, as well as others, must have been acquainted with the laws of the composition of moving forces, it does not appear that they had ever been so distinctly enumerated as by Descartes, in a passage of his *Dioptrics*.^c That the doctrine was in some measure new may be inferred from the objections of Fermat; and Clerselier, some years afterwards, speaks of persons "not much versed in mathe-

p. 356. See also vol. viii. p. 14. He was probably perplexed by the metaphysical notion of causation, which he knew not how to ascribe to mere velocity. The

fact that increased velocity is a condition or antecedent of augmented force could not be doubted.

^c Vol. v. p. 18.

matics, who cannot understand an argument taken from the nature of compound motion,"^d

43. Roberval demonstrated what seems to have been assumed by Galileo, and is immediately deducible from the composition of forces, that weights on an oblique or crooked lever balance each other, when they are inversely as the perpendiculars drawn from the centre of motion to their direction. Fermat, more versed in geometry than physics, disputed this theorem, which is now quite elementary. Descartes, in a letter to Mersenne, ungraciously testifies his agreement with it.^e Torricelli, the most illustrious disciple of Galileo, established that when weights balance each other in all positions, their common centre of gravity does not ascend or descend, and conversely.

Other discoveries in mechanics.

44. Galileo, in a treatise entitled *Delle Cose che stanno nell' Acqua*, lays down the principles of hydrostatics already established by Stevin, and among others what is called the hydrostatical paradox.

In hydrostatics and pneumatics.

Whether he was acquainted with Stevin's writings may be perhaps doubted; it does not appear that he mentions them. The more difficult science of hydraulics was entirely created by two disciples of Galileo, Castelli and Torricelli. It is one everywhere of high importance, and especially in Italy. The work of Castelli, *Della Misura dell' Acque Correnti*, and a continuation, were published at Rome, in 1628. His practical skill in hydraulics, displayed in carrying off the stagnant waters of the Arno, and in many other public works, seems to have exceeded his theoretical science. An error into which he fell, supposing the velocity of fluids to be as the height down which they had descended, led to false results. Torricelli proved that it was as the square root of the altitude. The latter of these two was still more distinguished by his discovery of the barometer. The

^d Vol. vi. p. 508.

^e Je suis de l'opinion, says Descartes, de ceux qui disent que *pondera sunt in æquilibrio quando sunt in ratione reciproca linearum perpendicularium*, &c. Vol. ix. p. 357. He would not name Roberval; one of those littlenesses which appear too frequently in his letters, and in all his writings. Descartes, in fact,

could not bear to think that another, even though not an enemy, had discovered anything. In the preceding page he says, C'est une chose ridicule que de vouloir employer la raison du levier dans la poulie, ce qui est, si j'ai bonne mémoire, une imagination de Guide Ubalde. Yet this imagination is demonstrated in all our elementary books on mechanics.

principle of the syphon or sucking pump, and the impossibility of raising water in it more than about thirty-three feet, were both well known; but even Galileo had recourse to the clumsy explanation that Nature limited her supposed horror of a vacuum to this altitude. It occurred to the sagacity of Torricelli, that the weight of the atmospheric column pressing upon the fluid which supplied the pump was the cause of this rise above its level; and that the degree of rise was consequently the measure of that weight. That the air had weight was known indeed to Galileo and Descartes; and the latter not only had some notion of determining it by means of a tube filled with mercury, but, in a passage which seems to have been much overlooked, distinctly suggests as one reason why water will not rise above eighteen brasses in a pump, "the weight of the water which counterbalances that of the air."† Torricelli happily thought of using mercury, a fluid thirteen times heavier, instead of water, and thus invented a portable instrument by which the variations of the mercurial column might be readily observed. These he found to fluctuate between certain well-known limits, and in circumstances which might justly be ascribed to the variations of atmospheric gravity. This discovery he made in 1643; and in 1648, Pascal, by his celebrated experiment on the Puy de Dôme, established the theory of atmospheric pressure beyond dispute. He found a considerable difference in the height of the mercury at the bottom and the top of that mountain; and a smaller yet perceptible variation was proved on taking the barometer to the top of one of the loftiest churches in Paris.

45. The science of optics was so far from falling behind other branches of physics in this period, that, including the two great practical discoveries which illustrate it, no former or later generation has witnessed such an advance. Kepler began, in the year 1604, by one of his first works, *Paralipomena ad Vitellionem*, a title somewhat more modest than he was apt to assume. In this supplement to the great Polish philosopher of the middle ages, he first ex-

Optics. Discoveries of Kepler.

† Vol. vii. p. 437.

[This seems an error of the press, or of the writer; for the French *brasse* being of

six feet, water does not rise much more than five brasses.—1847.]

plained the structure of the human eye, and its adaptation to the purposes of vision. Porta and Maurolycus had made important discoveries, but left the great problem untouched. Kepler had the sagacity to perceive the use of the retina as the canvas on which images were painted. In his treatise, says Montucla, we are not to expect the precision of our own age; but it is full of ideas novel and worthy of a man of genius. He traced the causes of imperfect vision in its two principal cases, where the rays of light converge to a point before or behind the retina. Several other optical phenomena are well explained by Kepler; but he was unable to master the great enigma of the science, the law of refraction. To this he turned his attention again in 1611, when he published a treatise on Dioptrics. He here first laid the foundation of that science. The angle of refraction, which Maurolycus had supposed equal to that of incidence, Descartes assumed to be one-third of it; which, though very erroneous as a general theorem, was sufficiently accurate for the sort of glasses he employed. It was his object to explain the principle of the telescope; and in this he well succeeded. That admirable invention was then quite recent. Whatever endeavours have been made to carry up the art of assisting vision by means of a tube to much more ancient times, it seems to be fully proved that no one had made use of combined lenses for that purpose. The slight benefit which a hollow tube affords by obstructing the lateral ray must have been early familiar, and will account for passages which have been construed to imply what the writers never dreamed of.* The real inventor of the telescope is not certainly known. Metius of Alkmaar long enjoyed that honour; but the best claim seems to be that of Zachary Jens, a dealer in spectacles at Middleburg. The date of the invention, or at least of its publicity, is referred beyond dispute to 1609. The news of so wonderful a novelty spread rapidly through Europe; and in the same year Galileo, as has been mentioned, having heard of the discovery, constructed, by his own sagacity, the instrument which he exhibited at

Invention
of the
telescope.

* Even Dutens, whose sole aim is to depreciate those whom modern science has most revered, cannot pretend to show that the ancients made use of glasses to assist vision. *Origine des Découvertes*, i. 218.

Venice. It is, however, unreasonable to regard himself as the inventor; and in this respect his Italian panegyrists have gone too far. The original sort of telescope, and the only one employed in Europe for above thirty years, was formed of a convex object-glass with a concave eye-glass. This, however, has the disadvantage of diminishing too much the space which can be taken in at one point of view; "so that," says Montucla, "one can hardly believe that it could render astronomy such service as it did in the hands of a Galileo or a Scheiner." Kepler saw the principle upon which another kind might be framed with both glasses convex. This is now called the astronomical telescope, and was first employed a little before the middle of the century. The former, called the Dutch telescope, is chiefly used for short spying glasses.

46. The microscope has also been ascribed to Galileo; Of the microscope. and so far with better cause, that we have no proof of his having known the previous invention. It appears, however, to have originated, like the telescope, in Holland, and perhaps at an earlier time. Cornelius Drebbel, who exhibited the microscope in London about 1620, has often passed for the inventor. It is suspected by Montucla that the first microscopes had concave eye-glasses; and that the present form with two convex glasses is not older than the invention of the astronomical telescope.

47. Antonio de Dominis, the celebrated archbishop of Antonio de Dominis. Spalato, in a book published in 1611, though written several years before, *De Radiis Lucis in Vitris Perspectivis et Iride*, explained more of the phenomena of the rainbow than was then understood. The varieties of colour had baffled all inquirers, though the bow itself was well known to be the reflection of solar light from drops of rain. Antonio de Dominis, to account for these varieties, had recourse to refraction, the known means of giving colour to the solar ray; and guiding himself by the experiment of placing between the eye and the sun a glass bottle of water, from the lower side of which light issued in the same order of colours as in the rainbow, he inferred that after two refractions and one intermediate reflection within the drop, the ray came to the eye tinged with different

colours, according to the angle at which it had entered. Kepler, doubtless ignorant of De Dominis's book, had suggested nearly the same. This, though not a complete theory of the rainbow, and though it left a great deal to occupy the attention, first of Descartes, and afterwards of Newton, was probably just, and carried the explanation as far as the principles then understood allowed it to go. The discovery itself may be considered as an anomaly in science, as it is one of a very refined and subtle nature, made by a man who has given no other indication of much scientific sagacity or acuteness. In many things his writings show great ignorance of principles of optics well known in his time, so that Boscovich, an excellent judge in such matters, has said of him, "*Homo opticarum rerum supra quod patiatur ætas imperitissimus.*"^b Montucla is hardly less severe on De Dominis, who in fact was a man of more ingenious than solid understanding.

48. Descartes announced to the world in his *Dioptrics*, 1637, that he had at length solved the mystery which had concealed the law of refraction. He showed that the sine of the angle of incidence at which the ray enters, has, in the same medium, a constant ratio to that of the angle at which it is refracted, or bent in passing through. But this ratio varies according to the medium; some having a much more refractive power than others. This was a law of beautiful simplicity as well as extensive usefulness; but such was the fatality, as we would desire to call it, which attended Descartes, that this discovery had been indisputably made twenty years before by a Dutch geometer of great reputation, Willebrod Snell. The treatise of Snell had never been published; but we have the evidence both of Vossius and Huygens, that Hortensius, a Dutch professor, had publicly taught the discovery of his countryman. Descartes had long lived in Holland; privately, it is true, and by his own account reading few books; so that in this, as in other instances, we may be charitable in our suspicions; yet it is unfortunate that he should perpetually stand in need of such indulgence.

*Dioptrics of
Descartes.
Law of re-
fraction;*

^b Playfair, *Dissertation on Physical Philosophy*, p. 119.

49. Fermat did not inquire whether Descartes was the original discoverer of the law of refraction, but disputed by Fermat. disputed its truth. Descartes, indeed, had not contented himself with experimentally ascertaining it, but, in his usual manner, endeavoured to show the path of the ray by direct reasoning. The hypothesis he brought forward seemed not very probable to Fermat, nor would it be permitted at present. His rival, however, fell into the same error; and starting from an equally dubious supposition of his own, endeavoured to establish the true law of refraction. He was surprised to find that, after a calculation founded upon his own principle, the real truth of a constant ratio between the sines of the angles came out according to the theorem of Descartes. Though he did not the more admit the validity of the latter's hypothetical reasoning, he finally retired from the controversy with an elegant compliment to his adversary.

50. In the Dioptrics of Descartes, several other curious Curves of Descartes. theorems are contained. He demonstrated that there are peculiar curves, of which lenses may be constructed, by the refraction from whose superficies all the incident rays will converge to a focal point, instead of being spread, as in ordinary lenses, over a certain extent of surface, commonly called its spherical aberration. The effect of employing such curves of glass would be an increase of illumination, and a more perfect distinctness of image. These curves were called the ovals of Descartes; but the elliptic or hyperbolic speculum would answer nearly the same purpose. The latter kind has been frequently attempted; but, on account of the difficulties in working them, if there were no other objection, none but spherical lenses are in use. In Descartes's theory, he explained the equality of the angles of incidence and reflection in the case of light, correctly as to the result, though with the assumption of a false principle of his own, that no motion is lost in the collision of hard bodies such as he conceived light to be. Its perfect elasticity makes his demonstration true.

51. Descartes carried the theory of the rainbow beyond the point where Antonio de Dominis had Theory of the rainbow. left it. He gave the true explanation of the

outer bow, by a second intermediate reflection of the solar ray within the drop: and he seems to have answered the question most naturally asked, though far from being of obvious solution, why all this refracted light should only strike the eye in two arches with certain angles and diameters, instead of pouring its prismatic lustre over all the rain-drops of the cloud. He found that no pencil of light continued, after undergoing the processes of refraction and reflection in the drop, to be composed of parallel rays, and consequently to possess that degree of density which fits it to excite sensation in our eyes, except the two which make those angles with the axis drawn from the sun to an opposite point at which the two bows are perceived.

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speech runs into great variety and complication, which we call language, while that of animals within the same species is much more uniform.

6. The question as to the use of speech to brutes is not difficult. But he seems to confine this utility to the expression of particular emotions, and does not meddle with the more curious inquiry, whether they have a capacity of communicating specific facts to one another; and if they have, whether this is done through the organs of the voice. The fourth question is, in how many modes animals express their feelings. These are by look, by gesture, by sound, by voice, by language. Fabricius tells us that he had seen a dog, meaning to expel another dog from the place he wished himself to occupy, begin by looking fierce, then use menacing gestures, then bark, and finally bark. Inferior animals, such as worms, are only the two former sorts of communication. Fishes, at least some kinds, have a power of emitting a sound, though not properly a voice; this may be by the fins or gills. To insects also he seems to deny voice, much more language, though they declare their feelings by sound. Even of oxen, stags, and some other quadrupeds, he would rather say that they have voice than language. But cats, dogs, and birds have a proper language. All, however, are excelled by man, who is properly called *μῦθος*, from his more clear and distinct articulations.

7. In the fifth place, however difficult it may appear to understand the language of brutes, we know that they do understand what is said to them; how much more therefore ought we, superior in reason, to understand them! He proceeds from hence to an analysis of the passions, which he reduces to four—joy, desire, grief, and fear. Having thus drawn our map of the passions, we must ascertain by observation what are the articulations of which any species of animals is capable, the articulations of the dog and the hen. His own experiments were made on these complex; as, when a dog wants to come into his master's chamber, he begins by a shrill small yelp, expressive of desire, which becomes deeper, so as to denote a mingled desire and annoyance, and ends in a lamentable howl of the latter feeling alone. Fabricius gives

English physician of the preceding century, was published in 1634; it seems to be compiled in a considerable degree from the unpublished papers of Gesner and foreign naturalists, whom the author has rather too servilely copied. Haller, however, is said to have placed Mouffet above all entomologists before the age of Swammerdam.^m

5. We may place under the head of zoology a short essay by Fabricius de Aquapendente on the language of brutes; a subject very curious in itself, and which has by no means sufficiently attracted notice even in this experimental age.

Fabricius
on the lan-
guage of
brutes.

It cannot be said that Fabricius enters thoroughly into the problem, much less exhausts it. He divides the subject into six questions:—1. Whether brutes have a language, and of what kind: 2. How far it differs from that of man, and whether the languages of different species differ from one another: 3. What is its use: 4. In what modes animals express their affections: 5. What means we have of understanding their language: 6. What is their organ of speech. The affirmative of the first question he proves by authority of several writers, confirmed by experience, especially of hunters, shepherds, and cowherds, who know by the difference of sounds what animals mean to express. It may be objected that brutes utter sounds, but do not speak. But this is merely as we define speech; and he attempts to show that brutes, by varying their utterance, do all that we do by *literal* sounds. This leads to the solution of the second question. Men agree with brutes in having speech, and in forming elementary sounds of determinate time; but ours is more complex; these elementary sounds, which he calls *articulos*, or joints of the voice, being quicker and more numerous. Man, again, forms his sounds more by means of the lips and tongue, which are softer in him than they are in brutes. Hence his

^m Biogr. Univ.; Chalmers. I am no judge of the merits of the book; but if the following sentence of the English translation does it no injustice, Mouffet must have taken little pains to do more than transcribe:—In Germany and England I do not hear that there are any *grasshoppers* at all; but if there be, they

are in both countries called Bow-krickets, or Baulm-krickets." P. 989. This translation is subjoined to Topsell's History of Four-footed Beasts, collected out of Gesner and others, in an edition of 1658. The first edition of Topsell's very ordinary composition was in 1608.

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several other rules deduced from observation of dogs, but ends by confessing that he has not fully attained his object, which was to furnish every one with a compendious method of understanding the language of animals: the inquirer must therefore proceed upon these rudiments, and make out more by observation and good canine society. He shows, finally, from the different structure of the organs of speech, that no brute can ever rival man; the chief instrument being the throat, which we use only for vowel sounds. Two important questions are hardly touched in this little treatise: first, as has been said, whether brutes can communicate specific facts to each other; and, secondly, to what extent they can associate ideas with the language of man. These ought to occupy our excellent naturalists.

8. Columna, belonging to the Colonna family, and one of the greatest botanists of the sixteenth century, maintained the honour of that science during the present period, which his long life embraced. In the academy of the Lincei, to which the revival of natural philosophy is greatly due, Columna took a conspicuous share. His *Ecphrasis*, a history of rare plants, was published in two parts at Rome, in 1606 and 1616. In this he laid down the true basis of the science, by establishing the distinction of genera, which Gesner, Cæsalpin, and Joachim Camerarius had already conceived, but which it was left for Columna to confirm and employ. He alone, of all the contemporary botanists, seems to have appreciated the luminous ideas which Cæsalpin had bequeathed to posterity.^a In his posthumous observations on the natural history of Mexico by Hernandez, he still further developed the philosophy of botanical arrangements. Columna is the first who used copper instead of wood to delineate plants; an improvement which soon became general. This was in the *Φυτολόγιον*, sive *Plantarum aliquot Historia*, 1594. There are errors in this work; but it is remarkable for the accuracy of the descriptions, and for the correctness and beauty of the figures.^b

9. Two brothers, John and Gaspar Bauhin, inferior in philosophy to Columna, made more copious additions to

^a Biogr. Univ.

^b Id. Sprengel.

the nomenclature and description of plants. The elder, who was born in 1541, and had acquired some celebrity as a botanist in the last century, lived to complete, but not to publish, an *Historia Plantarum Universalis*, which did not appear till 1650. It contains the descriptions of 5000 species, and the figures of 3577, but small and ill-executed. His brother, though much younger, had preceded him, not only by the *Phytopinax* in 1596, but by his chief work, the *Pinax Theatri Botanici*, in 1623. "Gaspar Bauhin," says a modern botanist, "is inferior to his brother in his descriptions and in sagacity; but his delineations are better, and his synonyms more complete. They are both below Clusius in description, and below several older botanists in their figures. In their arrangement they follow Lobel, and have neglected the lights which Cæsalpin and Columna had held out. Their chief praise is to have brought together a great deal of knowledge acquired by their predecessors, but the merit of both has been exaggerated."^p

John and
Gaspar
Bauhin.

10. Johnson, in 1636, published an edition of Gerard's *Herbal*. But the *Theatrum Botanicum* of Parkinson, in 1640, is a work, says Pulteney, of much more originality than Gerard's, and it contains abundantly more matter. We find in it near 3800 plants; but many descriptions recur more than once. The arrangement is in seventeen classes, partly according to the known or supposed qualities of the plant, and partly according to their external character.^q "This heterogeneous classification, which seems to be founded on that of Dodoens, shows the small advances that had been made towards any truly scientific distribution; on the contrary, Gerard, Johnson, and Parkinson had rather gone back, by not sufficiently pursuing the example of Lobel."

Parkinson.

^p Biogr. Univ. Pulteney speaks more highly of John Bauhin: "That which Gesner performed for zoology, John Bauhin effected in botany. It is, in reality, a repository of all that was valuable in the ancients, in his immediate predecessors, and in the discoveries of his own

time, relating to the history of vegetables, and is executed with that accuracy and critical judgment which can only be exhibited by superior talents."—*Hist. of Botany in England*, i. 120.

^q P. 146.

SECT. II.—ON ANATOMY AND MEDICINE.

Claims of early Writers to the Discovery of the Circulation of the Blood — Harvey
— Lactæal Vessels discovered by Asellius — Medicine.

11. THE first important discovery that was made public in this century was that of the valves of the veins; which is justly ascribed to Fabricius de Aquapendente, a professor at Padua; because, though some of these valves are described even by Berenger, and further observations were made on the subject by Sylvius, Vesalius, and other anatomists, yet Fallopius himself had in this instance thrown back the science by denying their existence, and no one before Fabricius had generalised the discovery. This he did in his public lectures as early as 1524; but his tract *De Venarum Ostioliis* appeared in 1603. This discovery, as well as that of Harvey, has been attributed to Father Paul Sarpi, whose immense reputation in the north of Italy accredited every tale favourable to his glory. But there seems to be no sort of ground for either supposition.

12. The discovery of a general circulation in the blood has done such honour to Harvey's name, and has been claimed for so many others, that it deserves more consideration than we can usually give to anatomical science. According to Galen, and the general theory of anatomists formed by his writings, the arterial blood flows from the heart to the extremities, and returns again by the same channels, the venous blood being propelled, in like manner, to and from the liver. The discovery attributed to Harvey was, that the arteries communicate with the veins, and that all the blood returns to the heart by the latter vessels. Besides this general or systemic circulation, there is one called the pulmonary, in which the blood is carried by certain arteries through the lungs, and returned again by corresponding veins preparatory to its being sent into the general sanguineous system; so that its course is through a double series of ramified vessels, each beginning and terminating at the heart, but not at the

Valves of
the veins
discovered.

Theory of
the blood's
circulation.

same side of the heart; the left side, which from a cavity called its ventricle throws out the arterial blood by the aorta, and by another called its auricle receives that which has passed through the lungs by the pulmonary vein, being separated by a solid septum from the right side, which, by means of similar cavities, receives the blood of all the veins, excepting those of the lungs, and throws it out into the pulmonary artery. It is thus evident that the word pulmonary circulation is not strictly proper, there being only one for the whole body.

13. The famous work of Servetus, *Christianismi Restitutio*, has excited the attention of the literary part of the world, not only by the unhappy fate it brought upon the author, and its extreme scarcity, but by a remarkable passage wherein he has been supposed to describe the circulation of the blood. That Servetus had a just idea of the pulmonary circulation and the aeration of the blood in the lungs, is manifest by this passage, and is denied by no one; but it has been the opinion of anatomists that he did not apprehend the return of the mass of the blood through the veins to the right auricle of the heart.^r

sometimes
ascribed to
Servetus;

^r In the first edition of this work I remarked, vol. i. p. 456, that Levasseur had come much nearer to the theory of a general circulation than Servetus. But the passage in Levasseur, which I knew only from the quotation in Portal, *Hist. de l'Anatomie*, i. 373, does not, on consulting the book itself, bear out the inference which Portal seems to deduce; and he has, not quite rightly, omitted all expressions which he thought erroneous. Thus Levasseur precedes the first sentence of Portal's quotation by the following: *Intus (in corde) sunt sinus seu ventriculi duo tantum, septo quodam medio discreti, per cujus foramina sanguis et spiritus communicatur. In utroque duo vasa habentur.* For this he quotes Galen; and the perforation of the septum of the heart is known to be one of Galen's errors. Upon the whole there seems no ground for believing that Levasseur was acquainted with the general circulation; and though his language may at first lead us to believe that he speaks of that through the lungs, even this is not distinctly made out. Sprengel, in his

History of Medicine, does not mention the name of Levasseur (or Vassæus, as he was called in Latin) among those who anticipated in any degree the discovery of circulation. The book quoted by Portal is Vassæus in *Anatomen Corporis Humani Tabulæ Quatuor*, several times printed between 1540 and 1560.

Andrès (*Origine e Progresso d'ogni Letteratura*, vol. xiv. p. 37) has put in a claim for a Spanish farrier, by name Reyna, who, in a book printed in 1552, but of which there seems to have been an earlier edition (*Libro de Maniscalcheria hecho y ordenado por Francisco de la Reyna*), asserts in few and plain words, as Andrès quotes them in Italian, that the blood goes in a circle through all the limbs. I do not know that the book has been seen by any one else; and it would be desirable to examine the context, since other writers have seemed to know the truth without really apprehending it.

That Servetus was only acquainted with the pulmonary circulation has been the general opinion. Portal, though in one place he speaks with less precision,

14. Columbus is acknowledged to have been acquainted with the pulmonary circulation. He ^{to Colum-} says of his own discovery that no one had observed or consigned it to writing before. Arantius, ^{bus;} according to Portal, has described the pulmonary circulation still better than Columbus, while Sprengel denies that he has described it at all. It is perfectly certain, and is admitted on all sides, that Columbus did not know the systemic circulation: in what manner he disposed of the blood does not very clearly appear; but as he conceived a passage to exist between the ventricles of the heart, it is probable, though his words do not lead to this inference, that he supposed the aerated blood to be transmitted back in this course.*

repeatedly limits the discovery to this; and Sprengel does not entertain the least suspicion that it went farther. André (xiv. 38), not certainly a medical authority, but conversant with such, and very partial to Spanish claimants, asserts the same. If a more general language may be found in some writers, it may be ascribed to their want of distinguishing the two circulations. A medical friend who, at my request, perused and considered the passage in Servetus, as it is quoted in Allwoerden's life, says in a letter, "All that this passage implies which has any reference to the greater circulation may be comprised in the following points:—1. That the heart transmits a vivifying principle along the arteries and the blood which they contain to the anastomosing veins; 2. That this living principle vivifies the liver and the venous system generally; 3. That the liver produces the blood itself, and transmits it through the vena cava to the heart, in order to obtain the vital principle, by performing the lesser circulation, which Servetus seems perfectly to comprehend.

"Now, according to this view of the passage, all the movement of the blood implied is that which takes place from the liver, through the vena cava to the heart, and that of the lesser circulation. It would appear to me that Servetus is on the brink of the discovery of the circulation; but that his notions respecting the transmission of his 'vitalis spiritus' diverted his attention from that great

movement of the blood itself which Harvey discovered. . . . It is clear that the quantity of blood sent to the heart for the elaboration of the *vitalis spiritus* is, according to Servetus, only that furnished by the liver to the vena cava inferior. But the blood thus introduced is represented by him as performing the circulation through the lungs very regularly."

It appears singular that, while Servetus distinctly knew that the septum of the heart, *paries ille medius*, as he calls it, is closed, which Berenger had discovered, and Vesalius confirmed (though the bulk of anatomists long afterwards adhered to Galen's notion of perforation), and consequently that some other means must exist for restoring the blood from the left division of the heart to the right, he should not have seen the necessity of a system of vessels to carry forward this communication.

* The leading passage in Columbus (*De Re Anatomica*, lib. vii. p. 177, edit. 1559), which I have not found quoted by Portal or Sprengel, is as follows:—*Inter hos ventriculos septum adest, per quod fere omnes existimant sanguini a dextro ventriculo ad sinistram aditum patefieri; id ut fieret facilis, in transitu ob vitalium spirituum generationem demum reddi; sed longa errant via; nam sanguis per arteriosam venam ad pulmonem fertur; ibique attenuatur; deinde cum aere una per arteriam venalem ad sinistram cordis ventriculum deferitur; quod nemo hactenus aut animadvertit*

15. Cæsalpin, whose versatile genius entered upon every field of research, has, in more than one of his treatises relating to very different topics, and especially in that upon plants, some remarkable passages on the same subject, which approach more nearly than any we have seen to a just notion of the general circulation, and have led several writers to insist on his claim as a prior discoverer to Harvey. Portal admits that this might be regarded as a fair pretension, if he were to judge from such passages; but there are others which contradict this supposition, and show Cæsalpin to have had a confused and imperfect idea of the office of the veins. Sprengel, though at first he seems to incline more towards the pretensions of Cæsalpin, comes ultimately almost to the same conclusion; and giving the reader the words of most importance, leaves him to form his own judgment. The Italians are more confident: Tiraboschi and Corniani, neither of whom are medical authorities, put in an unhesitating claim for Cæsalpin as the discoverer of the circulation of the blood, not without unfair reflections on Harvey.⁴

aut scriptum reliquit; licet maximè et ab omnibus animadvertendum. He afterwards makes a remark, in which Servetus had preceded him, that the size of the pulmonary artery (*vena arteriosa*) is greater than would be required for the nutrition of the lungs alone. Whether he knew of the passages in Servetus or no, notwithstanding his claim of originality, is not perhaps manifest; the coincidence as to the function of the lungs in aerating the blood is remarkable; but if Columbus had any direct knowledge of the Christianismi Restitutio, he did not choose to follow it in the remarkable discovery that there is no perforation in the septum between the ventricles.

⁴ Tiraboschi, x. 49; Corniani, vi. 8. He quotes, on the authority of another Italian writer, il giudizio di due illustri Inglesi, i fratelli Hunter, i quali, esaminato bene il processo di questa causa, si maravigliano della sentenza data in favore del loro concittadino. I must doubt, till more evidence is produced, whether this be true.

The passage in Cæsalpin's *Questiones Peripateticæ* is certainly the most re-

sembling a statement of the entire truth that can be found in any writer before Harvey. I transcribe it from Dutens's *Origine des Découvertes*, vol. ii. p. 23: *Idcirco pulmo per venam arteriis similem ex dextro cordis ventriculo fervidum hauriens sanguinem, eumque per anastomosin arteriæ venali reddens, quæ ex sinistrum cordis ventriculum tendit, transmissio interim aere frigido per asperæ arteriæ canales, qui juxta arteriam venalem protenduntur, non tamen osculis communicantes, ut putavit Galenus, solo tactu temperat. Huic sanguinis circulationi ex dextro cordis ventriculo per pulmones in sinistrum ejusdem ventriculum optimè respondent ea quæ ex dissectione apparent. Nam duo sunt vasa in dextrum ventriculum desinentia, duo etiam in sinistrum: duorum autem unum intromittit tantum, alterum educit, membranis eo ingenio constitutis. Vas igitur intromittens vena est magna quidem in dextro, quæ cava appellatur; parva autem in sinistro ex pulmone introducens, cujus unica est tunica, ut cæterarum venarum. Vas autem educens arteria est magna quidem in sinistro, quæ aorta appellatur;*

16. It is thus manifest that several anatomists of the sixteenth century were on the verge of completely detecting the law by which the motion of the blood is governed; and the language of one is so strong, that we must have recourse, in order to exclude his claim, to the irresistible fact that he did not confirm by proof his own theory, nor proclaim it in such a manner as to attract the attention of the world. Certainly when the doctrine of a general circulation was advanced by Harvey, he both announced it as a paradox, and was not deceived in expecting that it would be so accounted. Those again who strove to depreciate his originality sought intimations in the writings of the ancients, and even spread a rumour that he had stolen the papers of Father Paul; but it does not appear that they talked, like some moderns, of plagiarism from Levasseur or Cæsalpin.

17. William Harvey first taught the circulation of the blood in London in 1619; but his *Exercitatio de Motu Cordis* was not published till 1628. He was induced, as is said, to conceive the probability of this great truth by reflecting on the final cause of those valves, which his master, Fabricius de Aquapendente, had demonstrated in the veins; valves whose structure was such as to prevent the reflux of the blood towards the extremities. Fabricius himself seems to have been ignorant of this structure, and certainly of the circulation; for he presumes that they serve to prevent the blood from flowing like a river towards the feet and hands, and from collecting in one part. Harvey followed his own happy conjecture by a long inductive process of experiments on the effects of ligatures, and on the observed motion of the blood in living animals.

18. Portal has imputed to Harvey an unfair silence as to Servetus, Columbus, Levasseur, and Cæsalpin, who had all preceded him in the same track. Tiraboschi copies Portal, and Corniani

parva autem in dextro ad pulmones derivans, cujus similiter duæ sunt tunice, ut in cæteris arteriis.

In the treatise *De Plantis* we have a similar but shorter passage: Nam in animalibus videmus alimentum per venas duci ad cor tanquam ad officinam caloris

insiti, et adepta inibi ultima perfectione, per arterias in universum corpus distribui agente spiritu, qui ex eodem alimento in corde gignitur. I have taken this from the article on Cæsalpin in the *Biographie Universelle*.

speaks of the appropriation of Cæsalpin's discovery by Harvey. It may be replied, that no one can reasonably presume Harvey to have been acquainted with the passage in Servetus. But the imputation of suppressing the merits of Columbus is grossly unjust, and founded upon ignorance or forgetfulness of Harvey's celebrated Exercitation. In the proœmium to this treatise, he observes, that almost all anatomists have hitherto supposed with Galen, that the mechanism of the pulse is the same as that of respiration. But he not less than three times makes an exception for Columbus, to whom he most expressly refers the theory of a pulmonary circulation.^u Of Cæsalpin he certainly says nothing; but there seems to be no presumption that he was acquainted with that author's writings. Were it even true that he had been guided in his researches by the obscure passages we have quoted, could this set aside the merit of that patient induction by which he established his own theory? Cæsalpin asserts at best, what we may say he divined, but did not know to be true: Harvey asserts what he had demonstrated. The one is an empiric in a philosophical sense, the other a legitimate minister of truth. It has been justly said that he alone discovers who proves; nor is there a more odious office or a more sophistical course of reasoning than to impair the credit of great men, as Dutens wasted his erudition in doing, by hunting out equivocal and insulated passages from older writers, in order to depreciate the originality of the real teachers of mankind.^x It may indeed be thought

^u Pene omnes huc usque anatomici medici et philosophi supponunt cum Galeno eundem usum esse pulsus, quam respirationis. But though he certainly claims the doctrine of a general circulation as wholly his own, and counts it a paradox which will startle every one, he as expressly refers (p. 38 and 41 of the Exercitatio) that of a pulmonary transmission of the blood to Columbus, peritissimo doctissimoque anatomico; and observes, in his proœmium, as an objection to the received theory, quomodo probabile est (uti notavit Rualdus Columbus) tanto sanguine opus esse ad nutritionem pulmonum, cum hoc vas, vena videlicet arteriosa [id est, arteria pulmonalis] exsuperet magnitudine utrumque

ramum distributionis vena cava descendens cruralem. P. 16.

^x This is the general character of a really learned and interesting work by Dutens, *Origine des Découvertes attribuées aux Modernes*. Justice is due to those who have first struck out, even without following up, original ideas in any science; but not at the expense of those who, generally without knowledge of what had been said before, have deduced the same principles from reasoning or from observation, and carried them out to important consequences. Pascal quotes Montaigne for the shrewd remark, that we should try a man who says a wise thing, for we may often find that he does not understand it. Those who entertain

wonderful that Servetus, Columbus, or Cæsalpin should not have more distinctly apprehended the consequences of what they maintained, since it seems difficult to conceive the lesser circulation without the greater; but the defectiveness of their views is not to be alleged as a counterbalance to the more steady sagacity of Harvey. The solution of their falling so short is that they were right, not indeed quite by guess, but upon insufficient proof; and that the consciousness of this embarrassing their minds prevented them from deducing inferences which now appear irresistible. In every department of philosophy, the researches of the first inquirers have often been arrested by similar causes.⁷

19. Harvey is the author of a treatise on generation, wherein he maintains that all animals, including men, are derived from an egg. In this book we first find an argument maintained against spontaneous generation, which, in the case of the lower animals, had been generally received. Sprengel thinks this treatise prolix, and not equal to the author's reputation.⁸ It was first published in 1651.

20. Next in importance to the discovery of Harvey is that of Asellius as to the lacteal vessels. Eustachius had observed the thoracic duct in a horse. But Asellius, more by chance, as he owns, than by sagacity, perceived the lacteals in a fat

a morbid jealousy of modern philosophy are glad to avail themselves of such hunters into obscure antiquity as Dutens, and they are seconded by all the envious, the uncandid, and by many of the unreflecting among mankind. With respect to the immediate question, the passages which Dutens has quoted from Hippocrates and Plato have certainly an appearance of expressing a real circulation of the blood by the words *περιόδος* and *περιφερόμενον αἷματος*; but others, and especially one from Nemesius, on which some reliance has been placed, mean nothing more than the flux and reflux of the blood, which the contraction and dilatation of the heart was supposed to produce. See Dutens, vol. ii. p. 8-13. Mr. Coleridge has been deceived in the same manner by some lines of Jordano Bruno, which he takes to describe the circulation of the blood; whereas they merely ex-

press its movement to and fro, *meat et remeat*, which might be by the same system of vessels.

⁷ The biographer of Harvey in the *Biographie Universelle* strongly vindicates his claim. Tous les hommes instruits conviennent aujourd'hui que Harvey est le véritable auteur de cette belle découverte. . . . Cæsalpin presentoit la circulation artérielle, en supposant que le sang retourne des extrémités au cœur; mais ces assertions ne furent point prouvées; elles ne se trouverent étayées par aucune expérience, par aucun fait; et l'on peut dire de Cæsalpin qu'il divina presque la grande circulation dont les lois lui furent totalement inconnues; la découverte en était réservée à Guillaume Harvey.

⁸ Hist. de la Médecine, iv. 299. Portal, ii. 477.

dog whom he opened soon after it had eaten. This was in 1622, and his treatise *De Lacteis Venis* was published in 1627.^a Harvey did not assent to this discovery, and endeavoured to dispute the use of the vessels; nor is it to his honour that even to the end of his life he disregarded the subsequent confirmation that Pecquet and Bartholin had furnished.^b The former detected the common origin of the lacteal and lymphatic vessels in 1647, though his work on the subject was not published till 1651. But Olaus Rudbeck was the first who clearly distinguished these two kinds of vessels.

21. Scheiner proved that the retina is the organ of sight, and that the humours serve only to re-
fract the rays which paint the object on the
optic nerve. This was in a treatise entitled
Oculus, hoc est, Fundamentum Opticum, 1619.^c The
writings of several anatomists of this period, such as
Riolan, Vesling, Bartholin, contain partial accessions to
the science; but it seems to have been less enriched by
great discoveries, after those already named, than in the
preceding century.

Optical
discoveries
of Scheiner.

22. The mystical medicine of Paracelsus continued to have many advocates in Germany. A new
class of enthusiasts sprung from the same
school, and calling themselves Rosicrucians,
pretended to cure diseases by faith and imagination. A
true Rosicrucian, they held, had only to look on a patient
to cure him. The analogy of magnetism, revived in the
last and present age, was commonly employed.^d Of this
school the most eminent was Van Helmont, who com-
bined the Paracelsian superstitions with some original
ideas of his own. His general idea of medicine was that
its business was to regulate the archæus, an immaterial
principle of life and health; to which, like Paracelsus,

Medicine—
Van Hel-
mont.

^a Portal, ii. 461; Sprengel, iv. 201. Peiresc soon after this got the body of a man fresh hanged after a good supper, and had the pleasure of confirming the discovery of Asellius by his own eyes. Gassendi, *Vita Peirescii*, p. 177.

^b Sprengel, iv. 203.

^c Id. 270.

^d All in nature, says Croll of Hesse, one of the principal theosophists in medicine, is living; all that lives has its

vital force, or astrum, which cannot act without a body, but passes from one to another. All things in the macrocosm are found also in the microcosm. The inward or astral man is Gabalis, from which the science is named. This Gabalis or imagination is as a magnet to external objects, which it thus attracts. Medicines act by a magnetic force. Sprengel, iii. 362.

he attributed a mysterious being and efficacy. The seat of the archæus is in the stomach; and it is to be affected either by a scheme of diet or through the imagination. Sprengel praises Van Helmont for overthrowing many current errors, and for announcing principles since pursued.* The French physicians adhered to the Hippocratic school, in opposition to what Sprengel calls the Chemiatic, which more or less may be reckoned that of Paracelsus. The Italians were still renowned in medicine. Sanctorius, *De Medicina Statica*, 1614, seems the only work to which we need allude. It is loaded with eulogy by Portal, Tiraboschi, and other writers.†

SECTION III.

On Oriental Literature — Hebrew Learning — Arabic and other Eastern Languages.

23. DURING no period of equal length since the revival of letters has the knowledge of the Hebrew language been apparently so much diffused among the literary world as in that before us. The frequent sprinkling of its characters in works of the most miscellaneous erudition will strike the eye of every one who habitually consults them. Nor was this learning by any means so much confined to the clergy as it has been in later times, though their order naturally furnished the greater portion of those who laboured in that field. Some of the chief Hebraists of this age were laymen. The study of this language prevailed most in the Protestant countries of Europe; and it was cultivated with much zeal in England. The period between the last years of Elizabeth and the Restoration may, perhaps, be reckoned that in which a knowledge of Hebrew has been most usual among our divines.

24. Upon this subject I can only assert what I collect to be the verdict of judicious critics.‡ It seems that

* Vol. v. p. 22.

† Portal, ii. 391; Tiraboschi, xi. 270; *Biogr. Univ.*

‡ The fifth volume of Eichhorn's *Geschichte der Cultur* is devoted to the

progress of Oriental literature in Europe, not very full in characterising the various productions it mentions, but analytically arranged, and highly useful for reference. Jenisch, in his preface to Meninski's

the Hebrew language was not yet sufficiently studied in the method most likely to give an insight into its principles, by comparing it with all the cognate tongues, latterly called Semitic, spoken in the neighbouring parts of Asia, and manifestly springing from a common source. Postel, indeed, had made some attempts at this in the last century, but his learning was very slight; and Schindler published in 1612 a *Lexicon Pentaglottum*, in which the Arabic, as well as Syriac and Chaldaic, were placed in apposition with the Hebrew text. Louis de Dieu, whose 'Remarks on all the Books of the Old Testament' were published at Leyden in 1648, has frequently recourse to some of the kindred languages, in order to explain the Hebrew.^b But the first instructors in the latter had been Jewish rabbis; and the Hebraists of the sixteenth age had imbibed a prejudice, not unnatural though unfounded, that their teachers were best conversant with the language of their forefathers.¹ They had derived from the same source an extravagant notion of the beauty, antiquity, and capacity of the Hebrew; and, combining this with still more chimerical dreams of a mystical philosophy, lost sight of all real principles of criticism.

Language not studied in the best method.

25. The most eminent Hebrew scholars of this age were the two Buxtorfs of Basle, father and son, both devoted to the rabbinical school. The elder, who had become distinguished before the end of the preceding century, published a grammar in 1609, which long continued to be reckoned the best, and a lexicon of Hebrew, Chaldee, and Syriac, in 1623, which was not superseded for more than a hundred years. Many other works relating to these three dialects, as well as to that of the later Jews, do honour to the erudition of the elder Buxtorf; but he is considered as representing a class of Hebraists which in the more com-

The Buxtorfs.

Thesaurus (Vienna, 1780), has traced a sketch of the same subject. We may have trusted in some respects to Simon, *Histoire Critique du Vieux Testament*. The biographical dictionaries, English and French, have of course been resorted to.

^b Simon, *Hist. Critique du Vieux Testament*, p. 494.

¹ This was not the case with Luther,

who rejected the authority of the rabbis, and thought none but Christians could understand the Old Testament. Simon, p. 375. But Munster, Fagius, and several others, who are found in the *Critici Sacri*, gave way to the prejudice in favour of rabbinical opinions, and their commentaries are consequently too Judaical. P. 496.

prehensive orientalism of the eighteenth century has lost much of its credit. The son trod closely in his father's footsteps, whom he succeeded as professor of Hebrew at Basle. They held this chair between them more than seventy years. The younger Buxtorf was engaged in controversies which had not begun in his father's lifetime. Morin, one of those learned Protestants who had gone over to the church of Rome, systematically laboured to establish the authority of those versions which the church had approved, by weakening that of the text which passed for original.^k Hence he endeavoured to show — though this could not logically do much for his object — that the Samaritan Pentateuch, then lately brought to Europe, which is not in a different language, but merely the Hebrew written in Samaritan characters, is deserving of preference above what is called the Masoretic text, from which the Protestant versions are taken. The variations between these are sufficiently numerous to affect a favourite hypothesis, borrowed from the rabbis, but strenuously maintained by the generality of Protestants, that the Hebrew text of the Masoretic recension is perfectly incorrupt.^m Morin's opinion was opposed by Buxtorf and Hottinger, and by other writers even of the Romish church. It has, however, been countenanced by Simon and Kennicott. The integrity at least of the Hebrew copies was gradually given up; and it has since been shown that they differ greatly among themselves. The Samaritan Pentateuch was first published in 1645, several years after this controversy began, by Sionita, editor of the Parisian Polyglott. This edition, sometimes called by the name of Le Jay, contains most that is in the Polyglott of Antwerp, with the addition of the Syriac and Arabic versions of the Old Testament.

26. An epoch was made in Hebrew criticism by a work of Louis Cappel, professor of that language at Saumur, the *Arcanum Punctuationis Revelatum*, in 1624. He maintained in this an opinion promulgated by Elias Levita, and held by the first reformers and many other Protestants of the highest authority, though contrary to that vulgar orthodoxy which is always omnivorous, that the vowel-points

Vowel-
points re-
jected by
Cappel.

^k Simon, p. 522.

^m *Id.* p. 522; Eichhorn, v. 464.

of Hebrew were invented by certain Jews of Tiberias in the sixth century. They had been generally deemed coeval with the language, or at least brought in by Esdras through divine inspiration. It is not surprising that such an hypothesis clashed with the prejudices of mankind, and Cappel was obliged to publish his work in Holland. The Protestants looked upon it as too great a concession in favour of the Vulgate, which having been translated before the Masoretic punctuation, on Cappel's hypothesis, had been applied to the text, might now claim to stand on higher ground, and was not to be judged by these innovations. After twenty years the younger Buxtorf endeavoured to vindicate the antiquity of vowel-points; but it is now confessed that the victory remained with Cappel, who has been styled the father of Hebrew criticism. His principal work is the *Critica Sacra*, published at Paris in 1650, wherein he still further discredits the existing manuscripts of the Hebrew Scriptures, as well as the Masoretic punctuation.^a

27. The rabbinical literature, meaning as well the Talmud and other ancient books, as those of the later ages since the revival of intellectual pursuits among the Jews of Spain and the East, gave occupation to a considerable class of scholars. Several of these belong to England, such as Ainsworth, Godwin, Lightfoot, Selden, and Pococke. The antiquities of Judaism were illustrated by Cunæus in *Jus Regium Hebræorum*, 1623, and especially by Selden, both in the *Uxor Hebraica* and in the treatise *De Jure Naturali et Gentium juxta Hebræos*. But no one has left a more durable reputation in this literature than Bochart, a Protestant minister at Caen. His *Géographie Sacra*, published in 1646, is not the most famous of his works, but the only one which falls within this period. It displays great learning and sagacity; but it was impossible, as has been justly observed, that he could thoroughly elucidate

^a Simon, Eichhorn, &c. A detailed account of this controversy about vowel-points between Cappel and the Buxtorfs will be found in the 12th volume of the *Bibliothèque Universelle*; and a shorter précis in Eichhorn's *Einleitung in das alte Testament*, vol. i. p. 242.

[It is not universally agreed that Cappel was altogether in the right about Hebrew

vowels. Schultens was the first, according to Dathe, who proved that neither party could be reckoned wholly victorious. It seems, however, that the points now in use are acknowledged to be comparatively modern. Dathe, *præfatio ad Waltoni Prolegomena*, Lips. 1777, p. 27. —1847.]

this subject at a time when we knew comparatively little of modern Asia, and had few good books of travels. A similar observation might of course be applied to his Hierozoicon, on the animals mentioned in Scripture. Both these works, however, were much extolled in the seventeenth century.

28. In the Chaldee and Syriac languages, which Chaldee and Syriac. approach so closely to Hebrew that the best scholars in the latter are rarely unacquainted with them, besides the Buxtorfs, we find Ferrari, author of a Syriac lexicon, published at Rome in 1622; Louis de Dieu of Leyden, whose Syriac grammar appeared in 1626; and the Syriac translation of the Old Testament in the Parisian Polyglott, edited by Gabriel Sionita, in 1642. A Syriac college for the Maronites of Libanus had been founded at Rome by Gregory XIII.; but it did not as yet produce anything of importance.

29. But a language incomparably more rich in literary treasures, and long neglected by Europe, began Arabic. now to take a conspicuous place in the annals of learning. Scaliger deserves the glory of being the first real Arabic scholar; for Postel, Christman, and a very few more of the sixteenth century, are hardly worth notice. His friend Casaubon, who extols his acquirements, as usual, very highly, devoted himself some time to this study. But Scaliger made use of the language chiefly to enlarge his own vast sphere of erudition. He published nothing on the subject; but his collections became the base of Rapheling's Arabic lexicon; and it is said that they were far more extensive than what appears in that work. He who properly added this language to the domain of learning, was Erpenius, a

Erpenius. native of Gorcum, who, at an early age, had gained so unrivalled an acquaintance with the Oriental languages as to be appointed professor of them at Leyden, in 1613. He edited the same year the above-mentioned lexicon of Rapheling, and published a grammar, which might not only be accounted the first composed in Europe that deserved the name, but became the guide to most later scholars. Erpenius gave several other works to the world, chiefly connected with the Arabic version of the Scriptures.* Golius, his successor

* Biogr. Univ.

in the Oriental chair at Leyden, besides publishing a lexicon of the language, which is said to be still the most copious, elaborate, and complete that has appeared,^p and several editions of Arabic writings, poetical and historical, contributed still more extensively to bring the range of Arabian literature before the world. He enriched with a hundred and fifty manuscripts, collected in his travels, the library of Leyden, to which Scaliger had bequeathed forty.^q The manuscripts belonging to Erpenius found their way to Cambridge; while, partly by the munificence of Laud, partly by later accessions, the Bodleian Library at Oxford became extremely rich in this line. The much larger collection in the Escorial seems to have been chiefly formed under Philip III. England was now as conspicuous in Arabian as in Hebrew learning. Selden, Greaves, and Pococke, especially the last, who was probably equal to any Oriental scholar whom Europe had hitherto produced, by translations of the historical and philosophical writings of the Saracenic period, gave a larger compass to general erudition.^r

30. The remaining languages of the East are of less importance. The Turkish had attracted some degree of attention in the sixteenth century; but the first grammar was published by Me-giser, in 1612, a very slight performance; and a better at Paris, by Du Ryer, in 1630.^s The Persic grammar was given at Rome by Raimondi, in 1614; by Dieu, at Leyden, in 1639; by Greaves, at London, in 1641 and 1649.^t An Armenian dictionary, by Rivoli, 1621, seems the only accession to our knowledge of that ancient language during this period.^u Athanasius Kircher, a man of immense erudition, restored the Coptic, of which Europe had been wholly ignorant. Those farther eastward had not yet begun to enter into the studies of Europe. Nothing was known of the Indian; but some Chinese manuscripts had been brought to Rome and Madrid as early as 1580; and not long afterwards, two Jesuits, Roger and Ricci, both missionaries in China,

Golius.

Other
Eastern
languages.

^p Jenisch, præfatio in Meninski The-
saurus Linguarum Orientalium, p. 110.

^q Biogr. Univ.

^r Jenisch; Eichhorn; Biogr. Univer-

selle; Biogr. Britannica.

^s Eichhorn, v. 367.

^t Id. 320.

^u Id. 351.

were the first who acquired a sufficient knowledge of the language to translate from it.* But scarcely any further advance took place before the middle of the century.

SECT. IV.

On Geography and History.

31. PURCHAS, an English clergyman, imbued by nature, like Hakluyt, with a strong bias towards geographical studies, after having formed an extensive library in that department, and consulted, as he professes, above 1200 authors, published the first volume of his *Pilgrim*, a collection of voyages in all parts of the world, in 1613; four more followed in 1625. The accuracy of this useful compiler has been denied by those who have had better means of knowledge, and probably is inferior to that of Hakluyt; but his labour was far more comprehensive. The *Pilgrim* was at all events a great source of knowledge to the contemporaries of Purchas.[†]

32. Olearius was ambassador from the Duke of Holstein to Muscovy and Persia from 1633 to 1639. His travels, in German, were published in 1647, and have been several times reprinted and translated. He has well described the barbarism of Russia and the despotism of Persia; he is diffuse and episodical, but not wearisome; he observes well and relates faithfully; all who have known the countries he has visited are said to speak well of him.[‡] Pietro della Valle is a far more amusing writer. He has thrown his travels over Syria and Persia into the form of letters written from time to time, and which he professes to have recovered from his correspondents. This perhaps is not a very probable story, both on account of the length of the letters, and the want of that reference to the present time and to small passing events, which

* Eichhorn, v. 64.

† Biogr. Univ.; Pinkerton's Collection of Voyages and Travels. The latter does

not value Purchas highly for correctness.

‡ Biogr. Universelle

such as are authentic commonly exhibit. His observations, however, on all the countries he visited, especially Persia, are apparently consistent with the knowledge we have obtained from later travellers. Gibbon says that none have better observed Persia, but his vanity and prolixity are insufferable. Yet I think that Della Valle can hardly be reckoned tedious; and if he is a little egotistical, the usual and almost laudable characteristic of travellers, this gives a liveliness and racy air to his narrative. What his wife, the Lady Maani, an Assyrian Christian, whom he met with at Bagdad, and who accompanied him through his long wanderings, may really have been, we can only judge from his eulogies on her beauty, her fidelity, and her courage; but she throws an air of romance over his adventures, not displeasing to the reader. The travels of Pietro della Valle took place from 1614 to 1626; but the book was first published at Rome in 1650, and has been translated into different languages.

33. The *Lexicon Geographicum* of Ferrari, in 1627, was the chief general work on geography; it is alphabetical, and contains 9600 articles. The errors have been corrected in later editions, so that the first would probably be required in order to estimate the knowledge of its author's age.^a

34. The best measure, perhaps, of geographical science, are the maps published from time to time, as perfectly for the most part, we may presume, as their editors could render them. If we compare the map of the world in the "*Theatrum Orbis Terrarum sive Novus Atlas*" of Blaew in 1648 with that of the edition of Ortelius published at Antwerp in 1612, the improvements will not appear exceedingly great. America is still separated from Asia by the straits of Anian, about lat. 60; but the coast to the south is made to trend away more than before; on the N. E. coast we find Davis's Sea, and Estotiland has vanished to give way to Greenland. Canada continues to be most inaccurately laid down, though there is a general idea of lakes and rivers better than in Ortelius. Scandinavia is far better, and tolerably correct. In the South, Tierra del Fuego

^a Salfi, xl. 418; Biogr. Univesselle.

terminates in Cape Horn, instead of being united to Terra Australis; but in the East, Corea appears as an oblong island; the Sea of Aral is not set down, and the wall of China is placed north of the fiftieth parallel. India is very much too small, and the shape of the Caspian Sea is wholly inaccurate. But a comparison with the map of Hakluyt, mentioned in our second volume, will not exhibit so much superiority of Blaew's Atlas. The latter, however, shows more knowledge of the interior country, especially in North America, and a better outline in many parts of the Asiatic coast. The maps of particular regions in Europe are on a large scale, and numerous. Speed's maps, 1646, appear by no means inferior to those of Blaew; but several of the errors are the same. Considering the progress of commerce, especially that of the Dutch, during this half century, we may rather be surprised at the defective state of these maps.

35. Two histories of general reputation were published Davila and in the Italian language during these fifty years; Bentivoglio. one of the civil wars in France by Davila, in 1630, and another of those in Flanders by Cardinal Bentivoglio. Both of these had the advantage of interesting subjects; they had been sufficiently conversant with the actors to know much and to judge well, without that particular responsibility which tempts an historian to prevarication. They were both men of cool and sedate tempers, accustomed to think policy a game in which the strong play with the weak, obtuse, especially the former, in moral sentiment, but on this account not inclined to calumniate an opposite party, or to withhold admiration from intellectual power. Both these histories may be read over and over with pleasure; if Davila is too refined, if he is not altogether faithful, if his style wants the elegance of some older Italians, he more than redeems all this by the importance of his subject, the variety and picturesqueness of his narration, and the acuteness of his reflections. Bentivoglio is reckoned, as a writer, among the very first of his age.

36. The History of the War of Granada, that is, the rebellion of the Moriscos in 1565, by the famous Mendoza's Wars of Granada. Diego de Mendoza, was published posthumously in 1610. It is placed by the Spaniards them-

selves on a level with the most renowned of the ancients. The French have now their first general historian, Mezeray, a writer esteemed for his lively style and bold sense, but little read, of course, in an age like the last or our own, which have demanded an exactness in matter of fact, and an extent of historical erudition, which was formerly unknown. We now began, in England, to cultivate historical composition, and with so much success, that the present period was far more productive of such works as deserve remembrance than a whole century that next followed. But the most considerable of these have already been mentioned. Lord Herbert of Cherbury's History of Henry VIII. ought here to be added to the list, as a book of good authority, relatively at least to any that preceded, and written in a manly and judicious spirit.^b Camden's Life of Elizabeth is also a solid and valuable history. Bacon's Life of Henry VII. is something more; it is the first instance in our language of the application of philosophy to reasoning on public events in the manner of the ancients and the Italians. Praise upon Henry is too largely bestowed; but it was in the nature of Bacon to admire too much a crafty and selfish policy; and he thought also, no doubt, that so near an ancestor of his own sovereign should not be treated with severe impartiality.

SECT. V.

On the General State of Literature.

37. Of the Italian and other continental universities, we have little to say beyond what may be collected from the general tenor of this literary history, that they contributed little to those departments of knowledge to which we have paid most attention, and adhering pertinaciously to their ancient studies, were

^b [Lord Herbert's Life of Henry VIII. was composed with great assistance from Thomas Masters, of a Gloucestershire family, who collected materials; whether

he wrote any part is not clear. Wood's *Athenæ Oxonienses* (Bliss's edition), vol. iii. p. 79.—1853.]

left behind in the advance of the human mind. They were, indeed, not less crowded with scholars than before, being the necessary and prescribed road to lucrative professions. In theology, law, and medicine, sciences the two former of which, at least, did not claim to be progressive, they might sustain a respectable posture; in philosophy, and even in polite letters, they were less prominent.

38. The English universities are in one point of view very different from those of the rest of Europe. Their great endowments created a resident class, neither teachers nor students, who might devote an unbroken leisure to learning with the advantage of that command of books which no other course of life could have afforded. It is true that in no age has the number of these been great; but the diligence of a few is enough to cast a veil over the laziness of many. The century began with an extraordinary piece of fortune to the university of Oxford, which formed in the seventeenth century, whatever it may since have been, one great cause of her literary distinction. Sir Thomas Bodley, with a munificence which has rendered his name more immortal than the foundation of a family could have done, bestowed on the university a library collected by him at great cost, building a magnificent room for its reception, and bequeathed large funds for its increase. The building was completed in 1606; and Casaubon has, very shortly afterwards, given such an account of the university itself, as well as of the Bodleian library, as will perhaps be interesting to the reader, though it contains some of those mistakes into which a stranger is apt to fall.

39. "I wrote you word," he says in July, 1613, to one of his correspondents, "a month since, that I was going to Oxford in order to visit that university and its library, of which I had heard much. Every thing proved beyond my expectation. The colleges are numerous, most of them very rich. The revenues of these colleges maintain above two thousand students, generally of respectable parentage, and some even of the first nobility; for what we call the habits of pedagogues (*pædagogica vitæ ratio*) is not found in these English colleges. Learning is here cul-

Bodleian
library
founded.

Casaubon's
account of
Oxford.

tivated in a liberal style; the heads of houses live handsomely, even splendidly, like men of rank. Some of them can spend ten thousand livres [about 1000*l.* at that time, if I mistake not] by the year. I much approved the mode in which pecuniary concerns are kept distinct from the business of learning.^c Many still are found, who emulate the liberality of their predecessors. Hence new buildings rise every day; even some new colleges are raised from the foundation; some are enlarged, such as that of Merton, over which Saville presides, and several more. There is one begun by Cardinal Wolsey, which if it should be completed, will be worthy of the greatest admiration. But he left at his death many buildings which he had begun in an unfinished state, and which no one expects to see complete. None of the colleges, however, attracted me so much as the Bodleian library, a work rather for a king than a private man. It is certain that Bodley, living or dead, must have expended 200,000 livres on that building. The ground plot is the figure of the letter T. The part which represents the perpendicular stem was formerly built by some prince, and is very handsome; the rest was added by Bodley with no less magnificence. In the lower part is a divinity school, to which perhaps nothing in Europe is comparable. It is vaulted with peculiar skill. The upper story is the library itself, very well built, and fitted with an immense quantity of books. Do not imagine that such plenty of manuscripts can be found here, as in the royal library (of Paris); there are not a few manuscripts in England, but nothing to what the king possesses. But the number of printed books is wonderful, and increasing every year; for Bodley has bequeathed a considerable revenue for that purpose. As long as I remained at Oxford, I passed whole days in the library; for books cannot be taken out, but the library is open to all scholars for seven or eight hours every day. You might always see therefore many of these greedily enjoying the banquet prepared for them, which gave me no small pleasure."^d

40. The Earl of Pembroke, Selden, and above all,

^c *Res studiosorum et rationes separatæ sunt, quod valde probavi.* I have given the translation which seemed best; but I may be mistaken.

^d Casaub. *Epist.* 299.

Archbishop Laud, greatly improved the Bodleian library. It became, especially through the munificence of that prelate, extremely rich in Oriental manuscripts. The Duke of Buckingham presented a collection made by Erpenius to the public library at Cambridge, which, though far behind that of the sister university, was enriched by many donations, and became very considerable. Usher formed the library of Trinity College, Dublin; an university founded on the English model, with noble revenues, and a corporate body of fellows and scholars to enjoy them.

41. A catalogue of the Bodleian library was published by James in 1620. It contains about 20,000 articles. Of these, no great number are in English, and such as there are chiefly of a later date than the year 1600; Bodley, perhaps, had been rather negligent of poetry and plays. The editor observes that there were in the library three or four thousand volumes in modern languages. This catalogue is not classed, but alphabetical; which James mentions as something new, remarking at the same time the difficulty of classification, and that in the German catalogues we find grammars entered under the head of philosophy. One published by Draud, *Bibliotheca Classica, sive Catalogus Officinalis*, Frankfort, 1625, is hardly worth mention. It professes to be a general list of printed books; but as the number seems to be not more than 30,000, all in Latin, it must be very defective. About two-fifths of the whole are theological. A catalogue of the library of Sion College, founded in 1631, was printed in 1650; it contains eight or nine thousand volumes.*

42. The library of Leyden had been founded by the first prince of Orange. Scaliger bequeathed his own to it; and it obtained the Oriental manuscripts of Golius. A catalogue had been printed by Peter Bertius as early as 1597.^f Many public and private libraries either now began to be formed in France, or received great accessions; among the latter, those of the historian De Thou, and the president Seguier.^g No German library, after that of Vienna, had been so considerable as one formed in the course of

* In Museo Britannico.

^f Jugler, *Hist. Litteraria*, c. 3.

^g *Id. ibid.*

several ages by the Electors Palatine at Heidelberg. It contained many rare manuscripts. On the capture of the city by Tilly in 1622, he sent a number of these to Rome, and they long continued to sleep in the recesses of the Vatican. Napoleon, emulous of such a precedent, obtained thirty-eight of the Heidelberg manuscripts by the treaty of Tolentino, which were transmitted to Paris. On the restitution of these in 1815, it was justly thought that prescription was not to be pleaded by Rome for the rest of the plunder, especially when she was recovering what she had lost by the same right of spoliation; and the whole collection has been replaced in the library of Heidelberg.

43. The Italian academies have been often represented as partaking in the alleged decline of literary ^{Italian} spirit during the first part of the seventeenth ^{academies.} century. Nor is this reproach a new one. Boccacini, after the commencement of this period, tells us that these institutions once so famous had fallen into decay, their ardent zeal in literary exercises and discussions having abated by time, so that while they had once been frequented by private men, and esteemed by princes, they were now abandoned and despised by all. They petition Apollo, therefore, in a chapter of his *Ragguagli di Parnasso*, for a reform. But the god replies that all things have their old age and decay, and as nothing can prevent the neatest pair of slippers from wearing out, so nothing can rescue academies from a similar lot; hence he can only advise them to suppress the worst, and to supply their places by others.^b If only such a counsel were required, the institution of academies in general would not perish. And in fact we really find that while some societies of this class came to nothing, as is always the case with self-constituted bodies, the seventeenth century had births of its own to boast, not inferior to the older progeny of the last age. The Academy of Humorists at Rome was one of these. It arose casually at the marriage of a young nobleman of the Mancini family, and took the same line as many have done, reciting verses and discourses, or occasionally representing plays. The tragedy of Demetrius, by Rocco, one of this academy,

^b *Ragg.* xviii. c. 1.

is reckoned among the best of the age. The Apatisti of Florence took their name from Fioretti, who had assumed the appellation of Udeno Nisielo, Academico Apatista. The Rozzi of Siena, whom the government had suppressed in 1568, revived again in 1605, and rivalled another society of the same city, the Intronati. The former especially dedicated their time to pastoral in the rustic dialect (*commedia rusticale*), a species of dramatic writing that might amuse at the moment, and was designed for no other end, though several of these farces are extant.¹

44. The Academy Della Crusca, which had more solid objects for the advantage of letters in view, has
 The Lincæi. been mentioned in another place. But that of the Lincæi, founded by Frederic Cesi, stands upon a higher ground than any of the rest. This young man was born at Rome in 1585, son of the Duke of Acqua Sparta, a father and a family known only for their pride and ignorance. But nature had created in Cesi a philosophic mind; in conjunction with a few of similar dispositions, he gave his entire regard to science, and projected himself, at the age of eighteen, an academy, that is, a private association of friends for intellectual pursuits, which, with reference to their desire of piercing with acute discernment into the depths of truth, he denominated the Lynxes. Their device was that animal, with its eyes turned towards heaven, and tearing a Cerberus with its claws; thus intimating that they were prepared for war against error and falsehood. The church, always suspicious, and inclined to make common cause with all established tenets, gave them some trouble, though neither theology nor politics entered into their scheme. This embraced, as in their academies, poetry and elegant literature; but physical science was their peculiar object. Porta, Galileo, Colonna, and many other distinguished men, both of Italy and the Transalpine countries, were enrolled among the Lynxes; and Cesi is said to have framed rather a visionary plan of a general combination of philosophers, in the manner of the Pythagoreans, which should extend itself to every

¹ Salfi, vol. xlii.

part of Europe. The constitutions of this imaginary order were even published in 1624; they are such as could not have been realised, but from the organisation and secrecy that seem to have been their elements, might not improbably have drawn down a prosecution upon themselves, or even rendered the name of philosophy obnoxious. Cesi died in 1630, and his academy of Lynxes did not long survive the loss of their chief.^k

45. The tide of public opinion had hitherto set regularly in one direction; ancient times, ancient learning, ancient wisdom and virtue, were regarded with unqualified veneration; the very course of nature was hardly believed to be the same, and a common degeneracy was thought to have overspread the earth and its inhabitants. This had been at its height in the first century after the revival of letters, the prejudice in favour of the past, always current with the old, who affect to dictate the maxims of experience, conspiring with the genuine lustre of classical literature and ancient history, which dazzled the youthful scholar. But this aristocracy of learning was now assailed by a new power which had risen up in sufficient strength to dispute the pre-eminence. We, said Bacon, are the true ancients; what we call the antiquity of the world was but its infancy. This thought, equally just and brilliant, was caught up and echoed by many; it will be repeatedly found in later works. It became a question whether the moderns had not really left behind their progenitors; and though it has been hinted, that a dwarf on a giant's shoulders sees farther than the giant, this is, in one sense, to concede the point in dispute.^m

46. Tassoni was one of the first who combated the established prejudice by maintaining that modern times are not inferior to ancient; it well became his intrepid disposition.ⁿ But Lancilotti, an Italian ecclesiastic, and member of several academies, pursued this subject in an

^k Salfi, xi. 102; Tiraboschi, xi. 42, 243.

^m Ac quemadmodum pygmaeus humeris gigantis insidens longius quam gigas prospicere, neque tamen se gigante majorem habere aut sibi multum tribuere potest, ita nos veterum laboribus

vigiliisque in nostros usus conversis adjicere aliquid, non supercilia tollere, aut parvi facere, qui ante nos fuerunt, debemus. Cyprianus, Vita Campanella, p. 15.

ⁿ Salfi, xi. 331.

Prejudice
for anti-
quity di-
minished.

elaborate work, intended to prove—first, that the world was neither morally worse nor more afflicted by calamities than it had been; secondly, that the intellectual abilities of mankind had not degenerated. It bears the general title, *L'Hoggidi, To-Day*; and is throughout a ridicule of those whom he calls *Hoggidiani*, perpetual declaimers against the present state of things. He is a very copious and learned writer, and no friend to antiquity; each chapter being entitled *Disinganno*, and intended to remove some false prejudice. The first part of this work appeared in 1623, the second, after the author's death, not till 1658. Lancilotti wrote another book with somewhat a similar object, entitled *Farfalloni degl' Antichi Istorici*, and designed to turn the ancient historians into ridicule; with a good deal of pleasantry, but chiefly on account of stories which no one in his time would have believed. The same ground was taken soon afterwards by an English divine, George Hakewill, in his '*Apology, or Declaration of the Power and Providence of God in the Government of the World*,' published in 1627. This is designed to prove that there is not that perpetual and universal decay in nature which many suppose. It is an elaborate refutation of many absurd notions which seem to have prevailed; some believing that even physical nature, the sun and stars, the earth and waters, were the worse for wear. A greater number thought this true of man; his age, his size, his strength, his powers of mind, were all supposed to have been deteriorated. Hakewill patiently and learnedly refuted all this. The moral character of antiquity he shows to be much exaggerated, animadverting especially on the Romans. The most remarkable, and certainly the most disputable chapters, are those which relate to the literary merits of ancient and modern times. He seems to be one of the first who ventured to put in a claim for the latter. In this he anticipates Wotton, who had more to say. Hakewill goes much too far in calling Sidney's *Arcadia* "nothing inferior to the choicest piece among the ancients;" and even thinks "he should not much wrong Virgil by matching him with Du Bartas." The learning shown in this treatise is very extensive, but Hakewill has no taste, and cannot perceive any real

superiority in the ancients. Compared with Lancilotti, he is much inferior in liveliness, perhaps even in learning; but I have not observed that he has borrowed anything from the Italian, whose publication was but four years earlier.

47. Browne's Inquiry into Vulgar Errors displays a great deal of erudition, but scarcely raises a high notion of Browne himself as a philosopher, or of the state of physical knowledge in England. The errors he indicates are such as none but illiterate persons, we should think, were likely to hold; and I believe that few on the continent, so late as 1646, would have required to have them exploded with such an ostentation of proof. Who did not know that the phoenix is a fable? Browne was where the learned in Europe had been seventy years before, and seems to have been one of those who saturate their minds with bad books till they have little room for anything new that is better. A man of so much credulity and such an irregular imagination as Browne was almost sure to believe in witchcraft and all sorts of spiritual agencies. In no respect did he go in advance of his age, unless we make an exception for his declaration against persecution. He seems to have been fond of those trifling questions which the bad taste of the schoolmen and their contemporaries introduced; as whether a man has fewer ribs than a woman, whether Adam and Eve had navels, whether Methusaleh was the oldest man; the problems of children put to adults. With a strong curiosity and a real love of truth, Browne is a striking instance of a merely empirical mind; he is at sea with sails and a rudder, but without a compass or log-book; and has so little notion of any laws of nature, or of any inductive reasoning either as to efficient or final causes, that he never seems to judge anything to be true or false except by experiment.

48. In concluding our review of the sixteenth century, we selected Pinelli, as a single model of the literary character which, loving and encouraging knowledge, is yet too little distinguished by any writings to fall naturally within the general subject of these volumes. The period which we now bring

Browne's
Vulgar
Errors.

Life and
character of
Peiresc.

to a close will furnish us with a much more considerable instance. Nicolas Peiresc was born in 1580, of an ancient family in Provence, which had for some generations held judicial offices in the parliament of Aix. An extraordinary thirst for every kind of knowledge characterised Peiresc from his earliest youth, and being of a weak constitution, as well as ample fortune, though he retained, like his family, an honourable post in the parliament, his time was principally devoted to the multifarious pursuits of an enlightened scholar. Like Pinelli, he delighted in the rarities of art and antiquity; but his own superior genius, and the vocation of that age towards science, led him on to a far more extensive field of inquiry. We have the life of Peiresc written by his countryman and intimate friend Gassendi; and no one who has any sympathy with science or with a noble character will read it without pleasure. Few books, indeed, of that period are more full of casual information.

49. Peiresc travelled much in the early part of his life; he was at Rome in 1600, and came to England and Holland in 1606. The hard drinking, even of our learned men,^o disconcerted his southern stomach; but he was repaid by the society of Camden, Saville, and Cotton. The king received Peiresc courteously, and he was present at the opening of parliament. On returning to his native province, he began to form his extensive collections of marbles and medals, but especially of natural history in every line. He was, perhaps, the first who observed the structure of zoophytes, though he seems not to have suspected their animal nature. Petrifications occupied much of his time; and he framed a theory of them which Gassendi explains at length, but which, as might be expected, is not the truth.^p Botany was among his favourite studies, and Europe owes to him, according to Gassendi, the Indian jessamine, the gourd of Mecca, the real Egyptian papyrus, which is not that described by Prosper Alpinus. He first planted ginger, as well as many other Oriental plants, in an European garden, and also the cocoa-nut, from which, however, he could not obtain fruit.

^o Gassendi, *Vita Peirescii*, p. 51.

^p P. 147.

50. Peiresc was not less devoted to astronomy: he had no sooner heard of the discoveries of Galileo than he set himself to procure a telescope, and had in the course of the same year, 1610, the pleasure of observing the moons of Jupiter. It even occurred to him that these might serve to ascertain the longitude, though he did not follow up the idea. Galileo indeed, with a still more inventive mind, and with more of mathematics, seems to have stood in the way of Peiresc. He took, as far as appears, no great pains to publish his researches, contenting himself with the intercourse of literary men who passed near him, or with whom he could maintain correspondence. Several discoveries are ascribed to him by Gassendi; of their originality I cannot venture to decide. "From his retreat," says another biographer, "Peiresc gave more encouragement to letters than any prince, more even than the Cardinal de Richelieu, who some time afterwards founded the French Academy. Worthy to have been called by Bayle the *attorney-general* of literature, he kept always on the level of progressive science, published manuscripts at his own expense, followed the labours of the learned throughout Europe, and gave them an active impulse by his own aid." Scaliger, Salmasius, Holstenius, Kircher, Mersenne, Grotius, Valois, are but some of the great names of Europe whom he assisted by various kinds of liberality.⁹ He published nothing himself, but some of his letters have been collected.

51. The character of Peiresc was amiable and unreserved among his friends; but he was too much absorbed in the love of knowledge for insipid conversation. For the same reason, his biographer informs us, he disliked the society of women, gaining nothing valuable from the trifles and scandal upon which alone they could converse.⁷ Possibly the society of both sexes at Aix, in the age of Peiresc, was such as, with no excessive fastidiousness, he might avoid. In his eagerness for new truths, he became somewhat credulous; an error not perhaps easy to be avoided, while the accumulation of facts proceeded more rapidly than the ascertainment of natural

⁹ Biogr. Universelle.

⁷ Gassendi, p. 219.

laws. But for a genuine liberality of mind and extensive attainments in knowledge very few can be compared to Peirese; nor among those who have resembled him in this employment of wealth and leisure, do I know that any names have descended to posterity with equal lustre, except our two countrymen of the next generation, who approached so nearly to his character and course of life, Boyle and Evelyn.

END OF THE THIRD VOLUME.



