motions of the planets, and withal so intricate, that little interest attaches to it.

The student of Arabian science may find much to interest him in the astronomical speculations of the Arabs, but this people do not seem to have furnished anything in the way of suggestive theory. In the fourth book of *De Revolutionibus*,[1] where we find the lunar theory of Copernicus, no writer later than Ptolemy is referred to. Moreover, as already intimated, the work of Copernicus in this particular direction forms little more than an episode in the history of the subject. The working hypothesis of the great founder of modern astronomy was borrowed from the ancients, and was that the celestial motions were all either circular or compounded of circular motions. The hypothesis of equal circular motions, though accepted by Ptolemy in name, was so strained by him in its applications that little was left of it in the *Almagest* (the Arabic translation of his *Syntaxis*). But, by taking the privilege of compounding circular motions indefinitely—in other words, of adding one epicycle to another—Copernicus was enabled to represent the planetary and lunar inequalities on a uniform system, though his heavens were perhaps worse "scribbled o'er" than those of Ptolemy. To one epicycle representing the equation of the centre he added another for the evection, and thus represented the longitude of the moon both at quadratures and oppositions. But the third inequality, "variation," which attains its maxima at the octants and vanishes at all four quarters, was unknown to him. To Tycho Brahe is commonly and justly ascribed the discovery of the variation. Joseph Bertrand of Paris has indeed claimed the discovery for Abú 'l-Wefá, an Arabian astronomer, and has made it appear probable that Abú 'l-Wefá really detected inequalities in the moon's motion which we now know to have been the variation. But he has not shown, on the part of the Arabian, any such exact description of the phenomena as is necessary to make clear his claim to the discovery. As regards Tycho, although he discovered the fact, he could add nothing in the way of suggestive theory. To the double epicycle of Copernicus he was obliged to add a motion of the centre of the whole lunar orbit round a circle whose circumference passed through the centre of the earth, two revolutions round this circle being made in each lunation. Kepler, by introducing a moving ellipse having the earth as its focus, was enabled to make a nearer approach to the truth than any of his predecessors. But the geometrical hypotheses by which he represented the inequalities due to the action of the sun form no greater epoch in the progress of science than do the geometrical constructions of his predecessors. We may therefore dispose of the ancient history of the lunar theory by saying that the only real progress from Hipparchus to Newton consisted in the more exact determination of the mean motions of the moon, its perigee and its line of nodes, and in the discovery of three new inequalities, the representation of which required geometrical constructions increasing in complexity with every step.

The modern lunar theory commenced with Newton, and consists in determining the motion of the moon deductively from the theory of gravitation. But the great founder of modern mechanics did not employ the method best adapted to lead to the desired result, and hence his efforts to construct a lunar theory are of more interest as illustrations of his wonderful power and correctness in mathematical reasoning than as germs of new methods of research. He succeeded perfectly in explaining the elliptic motion of two mutually attracting bodies round their common centre of gravity by geometrical constructions. But when the problem was one of determining the variations from the elliptic motion which would be produced by a third body, such constructions could lead only to approximate results. The path to modern methods was opened up by the Continental mathematicians, whose great work consisted in reducing the problem to one of pure algebra. The chasm between the laws of motion laid down by Newton and a problem of algebra seems so difficult to bridge over that it is worth while to show in what the real spirit of the modern method consists. We call to mind the statement of Newton's first two laws of motion: that a body uninfluenced by any force moves in a straight line and with uniform velocity for ever, and that the change of motion is proportional to the force impressed upon the body and in the direction of such force. These two laws admit of being expressed in algebraic language thus:—let us put m the mass of a material point; x its distance from any fixed plane whatever; t the time; X the sum of the components of all the forces acting upon the point in the direction perpendicular to the fixed plane, it being supposed that each force is resolved into three mutually perpendicular components, one of which is perpendicular to the fixed plane; then the differential equation

$$m\frac{d^2x}{dt^2}=X$$

expresses Newton's first two laws of motion with a completeness and precision which is entirely wanting in all statements in ordinary language. The latter can be nothing more than lame attempts to express the equation in language which may be understood by the non-mathematical reader, but which bear the same relation to the algebraic equation that a statement of the operations of the Bank of England in the symbolic language of a tribe of savages would bear to the bank statement in pounds, shillings, and pence. By taking two other planes, perpendicular to each other and to the first plane, we have three equations like the one last written. The law of gravitation and Newton's third law of motion enable us to substitute for X and the other forces the masses and coordinates of the various attracting bodies. Thus the data of the problem are expressed by a triplet of three equations for each attracting body. The integration of these equations is a problem of pure algebra, which, when solved, leads to expressions that give the position of each body in terms of the time, which is what is wanted. The special form which it is necessary to give the equations has not been radically changed during the century and a half since this method of research was opened out. The end aimed at is the algebraic expression of all the quantities involved in the form of an infinite series of terms, each consisting of a constant coefficient multiplied by the sine or cosine of an angle increasing uniformly with the time. It is indeed a remarkable fact that, notwithstanding the great advances which modern mathematics has made in the discovery of functions more general than the old-fashioned sines and cosines of elementary trigonometry, especially of elliptic functions, yet the form of development adopted by the mathematicians of the last century has remained without essential change.

It will be instructive to notice the general and simple property of the trigonometric functions to which is due their great advantage in the problems of celestial mechanics. It may be expressed thus:—*If we have any number of quantities, each of which is expressed in the form of a trigonometric series in which the angles increase uniformly with the time, then all the powers and products of these quantities, and all their differentials and integrals with respect to the time, may be expressed in series of the same form.* This theorem needs only an illustration by an example. Let our quantities be X and Y, and let us suppose them expressed in the form

$$X=a\cos A+b\cos B+c\cos C+, \&c.$$
$$Y=a'\sin A'+b'\sin B'+c'\sin C'+, \&c.,$$

in which we may suppose that the quantities a, b, c, &c., converge towards zero. In forming their product, the first term will be $aa'\cos A\sin A'$. But we have $\cos A\sin A'=\frac{1}{2}\sin(A'+A)+\frac{1}{2}\sin(A'-A)$. Hence the product XY will be of the form

$$XY=\tfrac{1}{2}aa'\sin(A'+A)+\tfrac{1}{2}aa'\sin(A'-A)+\tfrac{1}{2}ab'\sin(A+B'+),\&c.,$$

which is another series of the same general form. Moreover, if we suppose the angles A, B, &c., to increase uniformly with the time—that is, to admit of expression in the form

$$A=\alpha+mt,\ A'=\alpha'+m't,\ \&c—$$

we shall have, by integrating,

$$2\int XY\,dt=-\frac{aa'}{m+m'}\cos(A'+A)-\frac{aa'}{m'-m}\cos(A'-A),\ \&c.,$$

which, again, is a trigonometric series of the same general form, which admits of being manipulated at pleasure in the same way as the original expressions X and Y. This property does not belong to the elliptic functions, and in consequence, notwithstanding the great length of the trigonometric series, no attempt to supersede them has been successful.

The efforts to express the moon's motion by integrating the differential equations of the dynamical theory may be divided into three classes. (1) Laplace and his immediate successors found the problem so complex that they sought to simplify it by reversing its form; instead of trying from the beginning to express the moon's coordinates in terms of the time, they effected the integration by expressing the time in terms of the moon's true longitude. Then, by a reversal of the series, the longitude was expressed in terms of the time. Although it would be hazardous to say that this method is unworthy of further consideration, we must admit that its essential inelegance is such as to repel rather than attract study, and that it holds out no promise of further development. (2) By the second general method the moon's coordinates are obtained in terms of the time by the direct integration of the differential equations of motion, retaining the algebraic symbols which express the values of the various elements. Most of the elements are small numerical fractions: e, the eccentricity of the moon's orbit, about 0·055; e', the eccentricity of the earth's orbit, about 0·017; γ, the sine of half the inclination of the moon's orbit, about 0·046; m, the ratio of the mean motions of the moon and earth, about 0·075; and the expressions for the longitude, latitude, and parallax appear as an infinite trigonometric series, in which the coefficients of the sines and cosines are themselves infinite series proceeding according to the powers of the above small numbers. This method was applied with success by Pontécoulant and Sir John W. Lubbock, and afterwards by Delaunay. It should be remarked that the solution by the first method appears in the same form as by this one after the true longitude is expressed in terms of the mean longitude. (3) By the method just mentioned the series converge so slowly, and the final expressions for the moon's longitude are so long and complicated, that the series has never been carried far enough to insure the accuracy of all the terms. This is especially the case with the development in powers of m, the convergence of which has often been questioned. Hence, when numerical precision alone is aimed at, it has been found best to avoid this difficulty by using the numerical values of the elements instead of their algebraic symbols. This method has the advantage of leading to the more rapid and certain determination of the numerical values of the several coefficients of sines and cosines. It has the disadvantage of giving the solution of the problem only for a particular case, and of being inapplicable in researches in which the general equations of dynamics have to be applied. It has been employed by Damoiseau, Hansen, and Airy.

The methods of the second general class are those most worthy of study. And among these we must assign the first rank to the method of Delaunay, developed in his *Théorie du Mouvement de la Lune*, because it contains a germ which may yet develop into the great desideratum of a general method in celestial mechanics. To explain it, we must call to mind the general method of "variation of elements," due to Lagrange. This method is applicable to cases in which a problem of dynamics can be completely solved when any small forces which come into play are left out, but which does not admit of direct solution when these forces are included. Omitting the small forces, commonly called "disturbing forces," let us suppose the problem of the motion of a body under the influence of the "principal forces" completely solved. This will mean that we have found algebraic expressions for the coordinates which determine the position of the body in terms of the time, and (in the case of a material point) of six constant quantities, to which we may assign values at pleasure. Then Lagrange showed how, by supposing these constant quantities to become variable, the same expressions could be used for the case in which the effect of the disturbing forces was included. In other words, the effect of the disturbing forces could be determined by assuming them to change the constants of the first approximate solution into very slowly varying elements.

In the researches on the lunar theory before Delaunay the principal force was taken to be the attraction of the earth upon the moon, and the disturbing force was that due to the sun's attraction. When the action of the earth alone was included the moon would move in an ellipse, in accordance with Kepler's laws. The effect of the sun's action could be allowed for by supposing this ellipse to be movable and variable. But when it was required to express this variation the problem became excessively complicated, owing to the great number of terms required to express the sun's disturbing force. Now, instead of passing from the elliptic to the disturbed motion by one single difficult step, Delaunay effected the passage by a great number of easy steps. Out of several hundred periodic terms, the sum of which expressed the disturbing force of the sun, he first took one only, and determined the variations of the Keplerian ellipse on the supposition that this term was the only one. In the solution the variable elements of the ellipse would be expressed in terms of six new constants. He then showed how these new constants could be taken as variables instead of the elements of the original ellipse. Taking a second term of the disturbing force, he expressed the new constants in terms of a third set of constants, and so repeated the process until all the terms of the disturbing force were disposed of.

Among applications of the third or numerical method, the most successful yet completed is that of Hansen. His first work appeared in 1838, under the title *Fundamenta nova investigationis orbitæ veræ quam luna perlustrat*, and contained an exposition of his ingenious and peculiar methods of computation. During the twenty years following he devoted a large part of his energies to the numerical computation of the lunar inequalities, the re-determination of the elements of motion, and the preparation of new tables for computing the moon's position. In the latter branch of the work, he received material aid from the British Government which published his tables on their completion in 1857. The computations of Hansen were published some seven years later by the Saxon Royal Society of Sciences.

It is found on comparing the results of Hansen and Delaunay that there are some outstanding discrepancies, which, though too small to be of great practical importance, are of sufficient magnitude to demand the attention of those interested in the mathematical theory of the subject. It is therefore desirable that the numerical inequalities should be again determined by an entirely different method. This is the object of Sir G. B. Airy's *Numerical Lunar Theory*, which is not yet completely published, but is sufficiently far advanced to give hopes of an early completion. The essence of Sir George's method consists in

[1] The full title, *De Revolutionibus Orbium Cœlestium Libri VI.* (small folio, Nuremberg, 1543).

starting with a provisional approximate solution (that of Delaunay being accepted for the purpose), and substituting the expressions for the moon's coordinates in the fundamental differential equations of the moon's motion as disturbed by the sun. If the theory were perfect, the two sides of each equation would come out equal. As they do not come out exactly equal, Sir George puts the problem in the form: What corrections must be applied to the expressions for the coordinates that the two sides may be made equal? He then shows how these corrections may be found by solving a system of equations.

The several methods which we have described have for their immediate object the determination of the motion of the moon round the earth under the influence of the combined attractions of the earth and sun. In other words, the question is that of solving the celebrated "problem of three-bodies" in the special case when one of the bodies, the sun, has a much greater mass than the other two, and is at a much greater distance from them than they are from each other. All methods lead to a solution of the same general form which we shall now describe. Let us put g the moon's mean anomaly; g' the mean anomaly of the sun (or earth); ω the angular distance of the lunar perigee from the moon's node on the ecliptic; ω' the angular distance of the sun's perigee from the moon's node on the ecliptic. When no account is taken of the action of the sun the angles g and g' increase uniformly with the time, representing in fact the uniform motion of the moon round the earth and of the earth round the sun, while ω and ω' remain constant. When account is taken of the action of the sun all four of the angles change with a uniform progressive motion. In consequence, the mean orbit of the moon round the earth becomes a moving ellipse whose major axis makes a revolution round the earth in about nine years, and the line of whose nodes makes a revolution in about eighteen and a half years. All the other elements of this ellipse—namely, its major axis, its eccentricity, and its inclination to the ecliptic—remain absolutely constant however long the motion may continue, unless some other disturbing force than that of the sun comes into play. But in the actual motion of the moon there are periodic deviations from this ellipse, which may be represented by an infinite trigonometric series, each term of which is of the form

$$c \text{ (sin or cos) } (ig+i'g'+j\omega+j'\omega'),$$

in which the quantities c are absolutely constant coefficients, and i, i', j, and j' are integers which may take all combinations of values—positive, negative, or zero. The circular function is, a sine in the expression for longitude or latitude, a cosine in the expression for the parallax. Also, j and j' must be both even or both odd in the expressions for longitude and parallax, but the one even and the other odd in the case of the latitude. For example, if we suppose j, j', and i all zero, we shall have terms of the form

$$c_1 \sin g'+c_2 \sin 2g'+c_3 \sin 3g'+, \text{ \&c.}$$

To write other terms, suppose $i=1$, then we have terms of the form

$$e_1 \sin (g-g')+e_2 \sin (g+g')+e_3 \sin (g+2g')+, \text{ \&c.}$$

Taking the case when $j=2$ and $j'=-2$, we shall have terms of the form

$$m_1 \sin (g-g'+2\omega-2\omega')+m_2 \sin (g-2g'+2\omega-2\omega')+, \text{ \&c.}$$

As the indices i, i', j, and j' become larger, the coefficients c, e, m, &c., become smaller; but the number of terms included in the theories of Hansen and Delaunay amount to several hundreds. In the analytical theories, like that of Delaunay, each of the coefficients c, e, m, &c., is a complicated infinite series, but in the numerical theories it is a constant number. And the principal problem of the modern theory of three bodies is to find the appropriate coefficient for each of these hundreds of terms.

Action of the Planets on the Moon.—For nearly two centuries it has been known from observations that the mean motion of the moon round the earth is not absolutely constant, as it ought to be were there no disturbing body but the sun. The general fact that the motion has been accelerated since the time of Ptolemy was first pointed out by Halley, and the amount of the acceleration was found by Dunthorne. After vain efforts by the greatest mathematicians of the last century to find a physical cause for the acceleration, Laplace was successful in tracing it to the secular diminution of the eccentricity of the earth's orbit, produced by the action of the planets. He computed its amount to be 10″ per century—that is, if the place of the moon were calculated forward on its mean motion at the beginning of any century, it would at the end of the century be 10″ in advance of its computed place. This theoretical result of Laplace agreed so closely with the acceleration found by Lalande from the records of ancient and mediæval eclipses that it was not questioned for nearly a century. In 1852 Mr John C. Adams showed that Laplace had failed to take account of a series of terms, the effect of which was to reduce the acceleration to 6″ or less. The result was inconsistent with the accounts of ancient eclipses of the sun, and a cause for the discrepancy had to be sought for. A probable cause was pointed out, first by Ferrel, and afterwards by Delaunay. The former, in papers published in *Gould's Astronomical Journal*, and in the *Proceedings* of the American Academy of Arts and Sciences, showed that the action of the moon on the tidal waves of the ocean would have the effect of increasing the time of the earth's axial rotation or the length of the day, which is necessarily taken as the unit of time. Since, as the days became longer, the moon would move farther in one day, though its absolute motion should remain unchanged, and hence an apparent acceleration would be the result. That this cause really acts there can be no doubt. But the data for determining its exact amount are discrepant. If we take only such data as are purely astronomical—namely, the eclipses recorded by Ptolemy between 720 B.C. and 150 A.D., and those observed by the Arabians between 800 and 1000 A.D.—the apparent excess of the observed acceleration to be accounted for by the tidal retardation amounts to only 2″ per century, and may be even less. But this small acceleration is entirely incompatible with conclusions drawn from certain supposed accounts of total eclipses of the sun, notably the eclipse associated with the name of Thales. This is the famous eclipse supposed to be alluded to by Herodotus when he describes a battle as stopped by a sudden advent of darkness, which had been predicted by Thales. If the true value of the coefficient resulting from the combined effect of tidal retardation of the earth and secular acceleration of the moon is less than 10″, then not only could the path of totality not have passed over the field of battle but the greatest eclipse could not have occurred till after sunset. In fact, to represent this and other supposed eclipses of the sun, the acceleration must be increased to about 12″, which is near the value found by Hansen from theory, and adopted in his tables of the moon. But his theoretical computation is undoubtedly incorrect, because in computing in what manner the eccentricity of the earth's orbit enters into the moon's motion he took account only of the first approximation, as Laplace had done. The following is a summary of the present state of the question:—

The theoretical value of the acceleration, assuming the day to be constant, is, according to Delaunay	6″·176
Hansen's value, in his *Tables de la Lune*, is	12·18
Hansen's revised but still theoretically erroneous result is	12·56
The value which best represents the supposed eclipses (1) of Thales, (2) at Larissa, (3) at Stikkelstad, is about	11·7
The result from purely astronomical observations is......	8·3
The result from Arabian and modern observations alone is about..	7·0

Inequalities of Long Period.—Combined with the question of the secular acceleration is another which is still entirely unsettled—namely, that of inequalities of long period in the mean motion of the moon round the earth. Laplace first showed that modern observations of the moon indicated that its mean motion was really less during the second half of the 18th century than during the first half, and hence inferred the existence of an inequality having a period of more than a century. All efforts to find a satisfactory explanation were, however, so unavailing that Poisson, in 1835, disputed the reality of the inequality. But Airy, from his discussion of the Greenwich observations between 1750 and 1830, conclusively proved its existence. About the same time Hansen announced that he had found from theory two terms of long period arising from the action of Venus which fully corresponded to the inequalities indicated by the observations. These terms, as employed in his *Tables de la Lune*, are

$$15''\cdot34 \sin (-g-16g'+18g''+33°\ 36') \\ +21''\cdot47 \sin (8g''-13g'+4°\ 44'),$$

in which g, g', and g'' represent the mean anomalies of the moon, the earth, and Venus respectively. During the first few years after the publication of Hansen's tables they represented observations so well that their entire correctness was generally taken for granted. But doubt soon began to be thrown upon the inequalities of long period just mentioned. Indeed, Hansen himself admitted that the second and larger term was partly empirical, being taken so as to satisfy observations between 1750 and 1850. Delaunay re-computed both terms, and found for the first term a result substantially identical with that of Hansen. But he found for the second or empirical one a coefficient of only 0″·27, which would be quite insensible. With this smaller coefficient the observations from 1750 could not be satisfied, so that, so far as observations could go in deciding a purely mathematical question, the evidence was in favour of Hansen's result. But on comparing Hansen's tables with observations between 1650 and 1750 it was found that the supposed agreement with observation was entirely illusory. Moreover, since 1865 the moon has been steadily falling behind the tabular place. These inequalities of long period have not yet been satisfactorily explained. The most plausible supposition is that they are due to the action of one or more of the larger planets. But the problem of the action of the planets on the moon

is the most difficult and intricate of celestial mechanics, and no satisfactory general method of attacking it has yet been found. The sources of difficulty are two in number. First, the disturbing action of the planets is modified by that of the sun in such a way that the ordinary equations of disturbed elliptic motion are no longer rigorous, and hence new and more complicated ones must be constructed. And, secondly, the combination of the four bodies—moon, earth, sun, and planet—leads to terms so numerous and intricate that it has hardly been found possible to isolate them. The question has, indeed, been raised whether the rotation of the earth on its axis, and hence the unit of time, may not be subject to slow and irregular changes of a nature to produce apparent corresponding changes in the motion of the moon. But it has recently been found, from a discussion of the observed transits of Mercury since 1677, that, although such inequalities may exist, they cannot have the magnitude necessary to account for the observed changes of long period in the moon's motion.

The following is a summary of the present state of the various branches of the lunar theory. (1) The numerical solution of the problem of the sun's action on the moon may be regarded as quite satisfactory, at least when Hansen's results shall have been verified by an independent method. (2) The analytic theory needs to be perfected by finding some remedy for the slow convergence of the series by which it is expressed, but its general form may be regarded as quite satisfactory. (3) Except in one or two special cases, the action of the planets on the moon, when treated with the necessary rigour, is so intricate that no approach to a satisfactory solution has yet been attained. When this desideratum is reached, the mathematical theory will be complete. (4) The general discussion of ancient and modern observations with a view to finding what real or apparent inequalities of long period in the mean motion may exist is still to be finished. With it the astronomical theory will be complete. (S. N.)

MOORCROFT, William (*c.* 1770-1825), traveller in Asia, was born in Lancashire, about 1770. He was educated as a surgeon in Liverpool, but on completing his course he resolved to devote himself to veterinary surgery, and, after studying the subject in France, began its practice in London. In 1795 he published a pamphlet of directions for the medical treatment of horses, with special reference to India, and in 1800 a *Cursory Account of the Methods of Shoeing Horses.* Having been offered by the East India Company the inspectorship of their Bengal stud, Moorcroft left England for India in 1808. Under his care the stud rapidly improved; in order to perfect the breed, he resolved to undertake a journey into Central Asia to obtain a stock of Turcoman horses. In company with Captain William Hearsay, and encumbered with a stock of merchandise for the purpose of establishing trade relations between India and Central Asia, Moorcroft left Josimath, well within the mountains, on 26th May 1812. Proceeding along the valley of the Dauli, they reached the summit of the frontier pass of Niti on 1st July. Descending by the towns of Daba and Ghortope, Moorcroft struck the main upper branch of the Indus near its source, and on 5th August arrived at the sacred lake of Manasarowara. Returning by Bhután, he was detained some time by the Gúrkhas, and reached Calcutta in November. This journey only served to whet Moorcroft's appetite for more extensive travel, for which he prepared the way by sending out a young Hindustani, who succeeded in making very extensive explorations. In company with this young man and George Trebeck, Moorcroft set out on his second journey in October 1819. His enterprise was looked upon rather coldly by the directors, who merely allowed him his pay for a time, all the expenses being borne by Moorcroft himself. By way of Almorá and Srínagar, Lahore was reached on 6th May 1820. On 14th August the source of the Biyah (Hyphasis) was discovered, and subsequently that of the Chenáb. Leh, the capital of Ladák, was reached on 24th September, and here several months were spent in exploring the surrounding country. A commercial treaty was concluded with the Government of Ladák, by which the whole of Central Asia was virtually opened to British trade. Kashmir was reached on 3d November 1822, and by the Pír Panjál mountains Jalálábád on 4th June 1824, Cabul on 20th June, and by Khulm, Kunduz, and Balkh Moorcroft arrived at Bokhara on 25th February 1825. Everywhere he bought horses for the company, and endeavoured to establish trade relations. At Andkho in Cabul Moorcroft was seized with fever, of which he died on 27th August 1825, Trebeck surviving him only a few days. It was not till several years afterwards that his papers were obtained by the Asiatic Society, and published under the editorship of Horace Hayman Wilson in 1841 under the title of *Travels in the Himalayan Provinces of Hindustan and the Punjáb, in Ladakh and Kashmir, in Peshawur, Kabul, Kunduz, and Bokhara, from* 1819 *to* 1825. Though published so long after the traveller's death, the narrative was a valuable contribution to a knowledge of Central Asia, and still remains a classic. In vol. xii. of *Asiatic Researches* will be found an account by Moorcroft of his first journey, and in the *Transactions of the Royal Asiatic Society*, vol. i., a paper on the Purik sheep.

MOORE, Edward (1712-1757), minor poet, dramatist, and miscellaneous writer, was the son of a dissenting minister of Abingdon, where he was born in 1712. He was the author of the thrilling domestic tragedy of *The Gamester*, originally produced in 1753 with Garrick in the leading character, and still in the repertory of acting plays. It is perhaps the strongest lesson against gambling ever preached from stage or pulpit. The literary merit of the play is not great, but it is powerfully constructed and full of impressive incident, and the career of Beverley the gambler (a character modelled on Fielding's Captain Booth) affords great scope for the actor. Moore also wrote two comedies. As a poet he produced clever imitations of Gay and Gray, and with the assistance of Lyttelton, Chesterfield, and Horace Walpole conducted *The World* (1753-57) during the great decade of the revival of periodical essay-writing. *The World* followed Johnson's *Rambler*, and was followed by *The Idler*; it had as rivals *The Adventurer* and *The Connoisseur*. Moore died at London in 1757.

MOORE, Dr John (1730-1802), born at Stirling in 1730, was one of the most prominent writers of travels and novels in the latter part of the 18th century. His novel *Zeluco* (published in 1789) produced a powerful impression at the time, and indirectly, through the poetry of Byron, has left an abiding mark on literature. The novel would in these days be called a psychological novel; it is a close analysis of the motives of a headstrong, passionate, thoroughly selfish and unprincipled profligate. It is full of incident, and the analysis is never prolonged into tedious reflexions, nor suffered to intercept the progress of the story, while the main plot is diversified with many interesting episodes. The character took a great hold of Byron's imagination, and probably influenced his life in some of its many moods, as well as his poetry. It is not too much to say that the common opinion that Byron intended *Childe Harold* as a reflexion of himself cannot be cleared of its large mixture of falsehood without a study of Moore's *Zeluco*. Byron said that he intended the Childe to be "a poetical Zeluco," and the most striking features of the portrait were undoubtedly taken from that character. At the same time it is obvious to everybody acquainted with Moore's novel and Byron's life that the moody and impressionable poet often adopted the character of Zeluco, fancied himself and felt himself to be a Zeluco, although he was at heart a very different man. Moore's other works have a less marked individuality, but his sketches of society and manners in France, Germany, Switzerland, Italy, and England furnish valuable materials for the social historian. Like his countrymen Burnett and Boswell, he was a sagacious, penetrating, and in the main unprejudiced observer, with something of a natural historian's interest in the human species; and he had exceptional opportunities of observation.