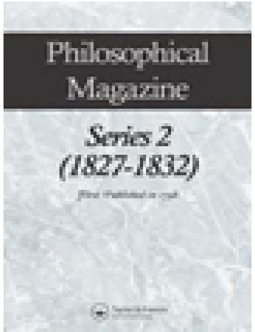

Philosophical Magazine Series 2

ISSN: 1941-5850 (Print) 1941-5869 (Online) Journal homepage: http://www.tandfonline.com/loi/tphm13

Elements of Algebra: being a short and practical introduction to that useful science; on a new plan including a simplification of the rule for the solution of equations of all dimensions.

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To cite this article: Robert Wallace A.M. (1828) Elements of Algebra: being a short and practical introduction to that useful science; on a new plan including a simplification of the rule for the solution of equations of all dimensions., Philosophical Magazine Series 2, 4:23, 370-372, DOI: 10.1080/14786442808674846

To link to this article: http://dx.doi.org/10.1080/14786442808674846

Published online: 10 Jul 2009.

1 : 74, and the change in the value of $\psi'-\psi$ will, therefore, principally determine the value of e^2. Now the logarithmic tables will show, that a change of 1″ in m' and λ will produce a change in the logarithmic tangent ψ' (to seven decimals) of 6 and 51 . 6 and an equal variation of m and λ' will change the logarithmic tang ψ 5·2 and 51·2, and a change of 60·2 in the logarithms of tang ψ and tang ψ' will change these angles 1″. The difference of ψ and ψ' is 2″·00.. and therefore a change of 1″ in the value of $\psi'-\psi$ will reduce the ellipticity to one half or increase it by one half of its value; that is to say, will change it from $\frac{1}{149}$ to $\frac{1}{298}$ or to $\frac{1}{99}$. This circumstance is no doubt one of the principal causes of the failure of the method in its application to small geodetical lines; and however correct in theory, such an application of it must clearly always lead to erroneous results.

If we change the conditions of the problem, and assume the ellipticity of our spheroid or the length of any one of the axes, the length of the geodetical line together with λ and m of one place will give those of the other place their difference of longitude, and the linear dimensions of the spheroid very nearly correct, as has been satisfactorily proved by Mr. Ivory.

There can be little doubt at present that the difference of longitude between Beachy Head and Dunnose, does not much differ from 1° 27′ 5″; and this proves, as Professor Airy has correctly observed, that there is an error of about 13″ in the sum of the azimuths. A new determination of the azimuths at these places would certainly be desirable, and might lead to a decision of the question, whether local attraction has had any effect in producing these erroneous measurements.

Oct. 13, 1828. J. L. Tiarks.

LXIV. *Notices respecting New Books.*

Elements of Algebra: being a short and practical Introduction to that useful Science; on a new Plan; including a Simplification of the Rule for the Solution of Equations of all Dimensions. By Robert Wallace, A.M. late Andersonian Professor of Mathematics, Glasgow. London, 1828; 8vo: pp. 60.

We extract from this work the table of contents, and the simplified rule for solving equations of all dimensions; the latter involves some interesting particulars respecting part of the modern ist ry of Algebra.

Contents: Definitions—Characters or symbols of operation—Less common symbols of operation—Terms—Equations—General Rule to obtain an equation—Axioms—Addition—Equations to be resolved by by Addition—Subtraction—Resolution of equations, Cases I. and II. —Multiplication—Equations solvable by multiplication—Division—Equations solvable by division—Resolution of equations, Case III.—Algebraic functions—Resolution of equations, Case IV.—Involution—Table of powers—Sir I. Newton's Rule for finding any power of a binomial—Evolution—Table of roots—Resolution of equations, Case V.—Proportion—Resolution of equations, Cases VI. VII. and VIII.—Resolution of adfected quadratic equations—Resolution of equations of all dimensions.

Resolution of Equations of all Dimensions.

" 180. *Rule.*—1. Arrange the terms of the given equation, whether quadratic, cubic, biquadratic, or any higher dimension, in the order of their powers, beginning with the highest, and place the numerical or absolute term on the right of the sign of equality, and all the other terms on the left.—2. Reduce the equation, if necessary, so that the coefficient of the first term shall be unity; and supply the want of any term in the regular series, putting zero for its coefficient.—3. Divide the absolute term into periods of as many figures each as there are units in the index of the first term, if necessary; and mark out a place for the quotient on the right.—4. Find by trial the first figure of the required root of the equation, and place it in the quotient.—5. Add this first figure to the coefficient of the second term and to each successive sum, as often as there are units in the index of the first term.—6. Multiply each of these sums, except the last, by the first figure, and add the products to the coefficient of the third term and to each successive sum.—7. Proceed in this manner to the coefficient of the last term, under which by this process will be found two sums; the first of which is the proper divisor for the first figure of the root, and the second the trial divisor for the next.—8. Multiply the first divisor by the first figure of the root, and subtract the product from the first period of the absolute term, bringing down the next period to the remainder for a dividend.—9. By means of the trial divisor, find the second figure of the root, making some allowance for its increment.—10. Add this second figure to the last sum under the second term, and to each successive sum, in the same manner as was done with the first figure; proceed to find the successive products and sums as in finding the proper divisor for that figure, till the proper divisor for the second figure of the root be found.—11. Multiply this divisor by the second figure in the root, and subtract the product from the dividend, bringing down the third period, if any, to the remainder for a new dividend.—12. Proceed in the same manner till the process terminate without a remainder, or till as many figures of the root be found as are required.

" 181. The method given in the preceding rule for the solution of equations of all dimensions, supersedes the necessity of giving in this short elementary treatise, the old methods of solving cubic and biquadratic equations by the rules of Cardan, Tartaglia, Euler, and others, as well as the various rules for approximating to the roots of equations, which are to be found in all the larger works on algebra."

" 183. The solution of equations of all degrees by the method from which

which this rule was derived, is generally ascribed to a Mr. Holdred of London, who published a tract on the subject in 1820. A similar method, by Mr. Horner of Bath, appeared in the Philosophical Transactions for 1819. It is not given, however, to one individual to accomplish the work of ages. For while we do not dispute the originality of either of these authors, we claim the priority of the invention for a Scotsman of the name of Halbert, (schoolmaster at Auchinleck,) in as far as regards the solution of equations of the *third* degree. While Mr. Bonnycastle in his elementary treatise asserted so late as 1818, that the solution of the *irreducible case* of cubic equations, except by means of a table of sines, or by infinite series, had hitherto baffled the united efforts of the most celebrated mathematicians of Europe; the rule for solving cubic equations of all kinds, whether *reducible* or *irreducible*, had been given by Mr. Halbert as far back as 1789, in his treatise on Arithmetic, published at Paisley in that year. The inventor, after giving his rule and a variety of examples, says, 'so that I reckon this method a valuable discovery, when compared with the jargon we meet with in other authors about *Transmutations*, *Limitations*, and *Approximations*, and what brings us never the nearer our purpose.'

"184. The step from the solution of the *irreducible* case of cubics to that of equations of all degrees, was evidently very easy, from the nature of the rule there given. Besides, it is a singular circumstance, that Mr. Holdred is said to have been in possession of his method for a length of time previous to publication, which tallies almost exactly with the date of Mr. Halbert's treatise.—Such are the facts respecting this invention, and we now leave the mathematical world to draw its own conclusions, and award the honour to whosoever it is due. In his next pnblication, the author may be induced to unfold this subject a little more than it is possible for him to do in the present, without encroaching on his prescribed limits."

Description of Six New Species of the Genus Unio, embracing the Anatomy of the Oviduct of one of them, together with some Anatomical Observations on the Genus. By Isaac Lea.—*Read before the American Philosophical Society, Nov. 2, 1827.—Extracted from the Transactions of the Am. Phil. Soc. 4to, p. 15. Four coloured engravings.*

The following are the specific characters, habitats, &c. of the *Uniones*, described and well-figured in this memoir.

1. Unio Calceolus.—*Testâ inæquilaterali, transversâ, aliquantulùm cylindraceâ, tenuiter rugatâ; dente cardinali prominente.*

Hab. Ohio. T. G. Lea. My cabinet. Cabinet of Prof. Vanuxem.

2. Unio lanceolatus.—*Testâ transversim elongatâ, compressâ, posticè subangulatâ; valvulis tenuibus; umbonibus vix prominentibus; dente cardinali acuto, obliquo.*

Hab. Tar River at Tarborough. My cabinet. Professor Vanuxem's cabinet. Cabinet of the Academy of Natural Sciences. Mr. Nicklin's cabinet. Peale's Museum.

3. Unio donaciformis.—*Testâ inæquilaterali, transversâ, curvatâ, rugatâ;*