the theory of atoms by which these facts are explained is by no means of importance to the present inquiry. It is by means of a series of numbers computed according to the method of Richter, that this scale is constructed so as to answer at one view the very numerous questions that occur to an analytic chemist in the examination of any saline compound. It is similar in principle to the common sliding rule, and like that instrument has the usual Gunter's line of numbers on the slider; but upon a line adjacent to the slider are marked certain points corresponding to those numbers which represent the various chemical elements, acids, alkalies, and other compounds intended to be included in the present view. By motion of the slider any one point of the line of numbers, as 100, may be made to correspond with the point indicating any compound, as sulphate of potash. By the position of the point for sulphuric acid, this salt is seen to contain 46 of acid, and the other ingredient potash at the same time corresponds with 54 on the slider. By the position of the point for sulphate of barytes, it appears that 135 of this precipitate would be obtained from 100 of the salt, and in the same manner that it would yield 176 of sulphate of lead, with a great variety of similar answers respecting the equivalent quantities of other compounds in which the same quantities of acid or neutralizing base is contained.

Since the line of numbers is so divided that a given space of every part of it corresponds to numbers that bear a given ratio to each other, and since the intervals on the adjacent column of equivalents are all laid down according to certain given portions of the same scale, they directly indicate by juxtaposition numbers that are in the same proportion on any part of the scale that may be presented to them, as will be very evident to those who are acquainted with the common properties of other sliding rules.

For the sake of those who may not be accustomed to the use of the sliding rule, and for the purpose of recommending that valuable instrument to more general use, the author enters rather more than might otherwise be requisite into the elementary principles of logometric division.

Methods of clearing Equations of quadratic, cubic, quadrato-cubic, and higher Surds. *By* William Allman, *M.D. Communicated by the Right Hon. Sir* Joseph Banks, *K.B. P.R.S.* Read July 8, 1813. [*Phil. Trans.* 1814, *p.* 23.]

In a paper communicated to the Royal Irish Academy by Dr. Mooney, the method of exterminating any number of quadratic surds is pointed out by successively squaring them when brought alone to one side of the equation; and the present is an extension of the same method: first, to all surds whose indices are any integral power of 2, as the fourth, eighth, sixteenth, thirty-second power, &c.; and next to cubic surds, and to any number of surds whose common indices are in any manner compounded of the factors 2 and 3; next

to any combinations of surds whose indices do not exceed the number 6, and to as many as *three* surds, neither of whose indices exceed 12, as well as to various others which cannot be concisely specified.

Analysis of a new Species of Copper Ore. *By* Thomas Thomson, *M.D. F.R.S. L. and E.* Read November 18, 1813. [*Phil. Trans.* 1814, *p.* 45.]

The mineral here analysed was brought from the peninsula of Hindostan by Dr. Heyné, where it occurs in considerable quantity along with malachite. Those specimens that are freest from malachite are of a dark blackish brown colour, soft, being easily scratched with a knife, which leaves a streak of a reddish brown. Its specific gravity is 2·62. Its fracture is in general small-conchoidal, but with a tendency in some parts to a foliated fracture; but it has not yet been seen with any appearance of external crystalline form.

It effervesces with acids, which form a blue or green solution according to the acid used, and leaves a red powder undissolved.

One hundred grains treated with dilute sulphuric acid lost 16·7 grains by escape of carbonic acid gas.

One hundred grains having been treated with muriatic acid formed a green solution, from which a clean plate of zinc precipitated 48·5 grains.

The red powder left by cold muriatic acid was digested for several hours in nitro-muriatic acid, which left 2·1 grains of white quartz undissolved, and afforded by ammonia a precipitate of 19·5 grains oxide of iron.

In order to determine the state of the oxide of copper in this ore, Dr. Thomson put 100 grains in fine powder into the bottom of a tall narrow vessel, which he then filled with water, and by means of a funnel poured a quantity of muriatic acid on the ore at the bottom. Since the ore was even in this mode immediately attacked, and formed a solution which from the commencement appeared green, he considers this evidence decisive, that the copper is in the state of black oxide, in which 100 of the metal are combined with 25 oxygen; so that 48·5 of copper precipitated by zinc indicated 60·75 of black oxide in the ore, and the analysis thus conducted gives an amount of ingredients corresponding within one per cent. with the quantity originally taken for experiment.

Since the integrant parts of carbonic acid and of oxide of copper, as the author has elsewhere shown, are to each other in the ratio of 2·75 to 10, and as this is just the ratio of 16·7 to 60·75, the quantities contained in the ore, there can be no doubt that the carbonic acid and copper are combined in the ore, constituting a carbonate of copper without water, and in that respect differing from both malachite and the blue carbonate, the former of which would appear from Klaproth's analysis to contain two particles of water, and the latter one. So that the present ore may be distinguished by the name of anhydrous carbonate of copper.