

Solution of the Quartic.

PERHAPS the following semi-graphic solution of a quartic equation may be of some interest to your readers.

Suppose the parabola $x^2 - y = 0$ is drawn, once for all, on a sheet of squared paper. Take an equal parabola, and place it with its vertex at the point (a, b) and axis parallel to OX so that its equation, in this position, is

$$(y - a)^2 = x - b.$$

Then the abscissæ of the intersections of the parabolas are the real roots of

$$x^4 - 2ax^2 - x + (a^2 + b) = 0 \dots (1)$$

Now the general quartic is at once reducible to the form

$$x^4 + px^2 + qx + r = 0,$$

and if we put

$$x = -z \sqrt[2]{q},$$

this becomes

$$z^4 + \frac{p}{q} z^2 - z + \frac{r}{q} = 0.$$

This is identical with (1) if

$$a = -\frac{p}{2q^{\frac{3}{2}}}, \quad b = \frac{4r - p^2}{4q^{\frac{3}{2}}};$$

so we can calculate a, b , then place the movable parabola in position, read off the real values of z , and finally take

$$x = -z \sqrt[2]{q}.$$

G. B. MATHEWS.

10 Menai View, Upper Bangor, N. Wales.

Rural Education.

I AM very glad to learn from my friend, Prof. Meldola, that the school of which I previously wrote is so well known. The frequent reference to Bigods as an experiment, and as the first attempt to give a systematic training in science in a purely rural district, led me to imagine that people were not generally aware of Sexey's Trade School. It seemed therefore that some mention of its success might act as an encouragement to others, but obviously the fact that this work has been successfully carried on for some years in Somersetshire in no way detracts from the value of what is now being done in Essex. I may observe too that, while the latter has had to depend mainly upon the generosity of Lady Warwick and the enthusiasm of Prof. Meldola, the former enjoyed certain advantages in the way of endowment.

At Bruton the outlay in capital has amounted to 5140*l.* (cost of site 640*l.*, buildings and equipment 4500*l.*). This sum is made up of grants from the County Council amounting altogether to 1100*l.*, and of 4040*l.* derived from endowment, income account and donations. The County Council Building grants were thus distributed: in 1891 250*l.* for building and equipment, in 1892 450*l.* for a similar purpose, in 1894 250*l.* for new class-rooms and metal work, in 1897 150*l.* for a new physical laboratory, &c.; in all 1100*l.* Nothing under this head has been contributed by the Science and Art Department. Since 1893 a capitation grant of 2*l.* for day scholars and 3*l.* for boarders has been paid by the County Council to all approved schools in Somersetshire. At Sexey's Trade School this amounts to about 225*l.* a year. These grants go towards the salaries of science and technical teachers, and the school is open to inspection by the County Director of Technical Education. The total annual income of the school is about 1200*l.* Since 1894, pupils from the school have obtained 21 out of 36 County Intermediate Scholarships, and 5 out of 11 Senior Scholarships.

The school was opened with fifty pupils in temporary premises in April 1891. At Easter 1892 the new buildings were opened with sixty pupils. The cost of the buildings so far was nearly 3000*l.*, towards which, as stated above, the County Council contributed 700*l.* and the Governors subscribed 120*l.* Some of the classes were registered in connection with the Science and Art Department in the autumn of 1892, and the first examinations were held in May 1893. The school buildings were enlarged in 1897, when two new class-rooms, a metal workshop and gymnasium were erected. In 1895 the new regulations of the Science and Art Department for organised science schools were issued. The school appears to have been

working for three years on similar lines to those laid down by the Department, and I am told that the conversion of the school into an "organised science school" was accomplished with practically no change of curriculum or method. The first grant of 260*l.* under the new regulations was received in 1896. Since then the grant has been very high, almost maximum grants for chemistry and physics having been awarded. The grant this year was 385*l.* and the number of pupils presented was fifty-seven. The grants from the Department have been as follows:—1893, 57*l.*; 1894, 104*l.*; 1895, 96*l.*; 1896, 260*l.*; 1897, 384*l.*; 1898, 355*l.*; 1899, 385*l.* To comply with the requirements of the Department, a new physical laboratory and other buildings were provided in 1897, and this year a new museum and additions to the master's residence are being undertaken at a cost of nearly 400*l.*

I regret that I can furnish no information as to the constitution of the Technical Instruction Committee of the Somersetshire County Council, but doubtless these particulars can be ascertained from its annual report. JOHN C. MEDD.

Stratton, near Cirencester, October 29.

I SHOULD like to add to the above interesting statement by Mr. Medd that a rural school of science, which is even more akin to Bigods' than Sexey's Trade School, has been at work for some years at Bakewell in Derbyshire. I referred to this in my address at Bigods in 1898. The resemblance in constitution and function is due to the co-education of boys and girls, and it would add to the value of the present discussion if some information could be given as to the working of the Bakewell school. R. MELDOLA.

IN addition to Sexey's Trade School, Bruton, the visitors of Sexey's Hospital recently (and in this case also at the instance of Mr. Hobhouse) have established a dual school of the same general type as the Bruton school in the village of Blackford, five or six miles from the nearest railway station, and in the midst of a purely agricultural district. New buildings have been erected at a cost of about 4000*l.*, towards which the County Education Committee has contributed 1000*l.*, in addition to 250*l.* in aid of the equipment of the laboratory and workshop. The Blackford school has been carried on for about one year in unsuitable temporary premises, but nevertheless attracted more than fifty pupils. The new buildings were opened at the end of September by Sir Henry Roscoe. The school has now between seventy and eighty pupils, a considerable proportion being boarders. The school will receive from the County Education Committee an annual grant of at least 120*l.*

C. H. BOTHAMLEY.

County Education Office, Weston-super-Mare, November 2.

Birds Capturing Butterflies.

WITH reference to Mr. O. H. Latter's note in NATURE (September 28, p. 520) on the capture of butterflies by the sedge warbler, it may be of interest to note that Sweet, whose work on keeping warblers in captivity is incorporated with Bechstein's "Cage-birds" in Bohn's edition of that work, recommends a living butterfly as a bait for this very species, and for several other warblers, when it is desired to trap adult birds.

I may mention that not long ago I saw here in Calcutta a common Mynah (*Acridotheres tristis*) with a white butterfly in its bill, which it had no doubt obtained in repose, as the day was dull, and the Mynah is not very expert at catching insects on the wing. I remember also once seeing at Dehra Dun a Dhyal or Magpie-robin (*Copsychus saularis*) take a disabled *Catopsilia* I threw out for it, though I have seen the same bird disregard a specimen flying at no great distance. Evidently the birds wait their opportunity, and, though too wise to waste their energies in the pursuit of these evasive insects on the wing, are always ready to snap them up when they can take them at a disadvantage. In this way it can hardly be expected that attacks by birds on butterflies will be often noticed, unless a naturalist will undertake to watch individual insectivorous birds for whole days at a time.

Similarly, one does not in India see kites and crows pursuing sparrows, though a dead one flung out will be greedily snapped up