

aperture through which the light comes can be enlarged, or reduced to a mere point, at will. Messrs. Beck have adapted to the microscope a very elegant *iris diaphragm*, imitating the action of the pupil of the human eye, and preserving a nearly round aperture, whether dilated or contracted. These instruments have a double use. They enable the quantity of light to be nicely graduated, and thus save the eye from fatigue, and they permit us to observe with great delicacy the varying degrees of transparency different objects, or different parts of the same object, possess.

With diatom markings, and many other objects, a plan just introduced by the Rev. J. B. Reade, F.R.S., President of the Royal Microscopical Society, will be found very valuable as an aid to distinct and pleasant vision. He places below the object an equilateral prism, with one side parallel to the object. The light is thrown on to another side, by means of a bull's-eye, in parallel rays, and being reflected by the third side of the prism, enters the object with moderate obliquity. It is not easy to explain why this illumination is so remarkably effective as it is found to be, but no one who has seen it in use can avoid being at once delighted and surprised.

There are many objects which can only be properly shown by sending a very strong light through them, and if the whole field is illuminated in the same proportion, the effect is wearisome and painful. In such cases I strongly recommend the eye-piece made at my suggestion by Mr. Ross, and known as my *Diaphragm Eye-piece*. In this eye-piece four shutters can be adjusted by small milled heads, conveniently situated, so as to leave the entire field open, or to shut off any portion of it that can be bounded by square, oblong, or rhombic figures. By this means the object is, as it were, framed in black, with just as much of light margin as may be desirable. The adjustments are easily made to suit long, thin, round, or square objects, as the case may require.

All the contrivances mentioned are adapted to binocular, as well as to monocular vision.

Various modes of obtaining dark ground illumination, by the spot-lens, parabola, etc., are much to be commended for certain objects, not only for the beauty of the display, but for the comfort of the eye; and a small spot-lens may be advantageously used with the binocular as a light-distributor, with powers that can take in its whole pencil of rays.

It is much more common for persons to injure their sight by the misuse of transmitted light with transparent objects, than for them to experience inconvenience from any excess of reflected illumination; and this results, not so much from any greater facility in the exhibition of objects by the last-named method, as from its being one less frequently employed in conjunction with lamps. The reflected illumination obtainable in open daylight, out of the direct sun, is never too strong, and is well adapted to objects of considerable size. To see smaller opaque objects clearly and comfortably several contrivances are advantageous. Lieberkuhn's have lately been neglected by many observers to an unreasonable extent. For low powers, a silver-side reflector, mounted on a brass stand with universal motions, is extremely handy. Messrs. Beck made an admirable parabolic reflector to fit to a  $1\frac{1}{2}$  or  $\frac{3}{4}$  objective, and furnished with a moveable arm which brings a flat mirror into such a position that the illumination is instantly changed from slanting to nearly vertical, which enables some surface markings—on metals, etc.—to be made out with great distinctness. Mr. Crouch has constructed a parabolic silver reflector (like Beck's), with a universal joint to suit different powers, but without the flat mirror, which for special purposes is invaluable. A Lieberkuhn works beautifully with Ross's  $\frac{1}{4}$ -inch, Beck's small-angled  $\frac{1}{6}$ ths, and similar glasses of Powell and Lealand.

No microscopist should be satisfied without acquiring skill in all the methods of illumination I have mentioned, and where objects admit being seen in a variety of ways, all should be tried, as each will bring out some special feature. While an object is indistinct, the observer should avoid paying much attention to it. He should simply watch the changes he can effect in attempts to show it properly, and reserve steady examination until all the adjustments are in order. Few persons are aware how much the eye is under control of the mental faculty of attention, and what advantages they may gain by acquiring the habits recommended in the preceding remarks.—*The Student*.

## A R T.

### The Uses of Music.

The social uses of music are often forgotten when its value as an art is being estimated. In one of his novels, Douglas Jerrold records

a dispute between the performers in a band employed at an election, the question being whether the drum or the trombone did most toward returning a member to the House of Commons. The idea may at first seem far-fetched, but it expresses a truth in a coarse way. The influence of music everywhere, of the piano in the house, even of the thin sentimental songs of the day, might be found to produce practical results of a deep and abiding kind. In a theatre they can do nothing without music. A hero declares his love to a sympathetic though suppressed murmur of the violins in the orchestra. The heart-strings and the fiddle-strings are worried simultaneously. In melodrama, the villain stabs to a tune; in opera, the whole business of life is represented in major and minor keys, affection is set in B-flat, and eating and drinking goes on in F-sharp. In the stalls and the boxes, the gusts and the zephyrs of sounds alternately stir another cast of emotion; and it is the strange mission of this wonderful art to be all things to all men and all women, full of suggestiveness to most, but dumb or mere ear-tickling to many.

Perhaps the most beautiful combination which the fashionable world can affect in the season is a flower-show. The music chimes in well with the ladies and the rare plants. It is music, too, of a filigree and fragile pattern—a dainty waltz of Gungl's, a delicate *polonaise* or a swift rustling galop. If the trombone in the band mentioned by Jerrold had to answer through his instrument for making a member of parliament, the clever cornet of Mr. Godfrey's band deserves a testimonial from the associated Belgravian mothers. No one can guess at the romance set afloat by a clarinet, considered from this point of view, and there may be even a virtue in the clashing cymbals, the jingling triangle, or the rattling kettle-drum. When working with their allies at a flower-show, even these unpromising instruments might produce as important a consequence as the efforts of the passionate Italians who sing their souls out to each other on the stage at Covent Garden. Music lends itself to war in stirring songs and marches; Dibdin's ballads were employed to recruit the navy, and from the dismal trenches of the Crimea might be heard the snatches of song with which the soldiers cheered their spirits. Nor does it cease to aid us at the most solemn periods of devotion and worship, not alone under the roof of a temple, but abroad at the concerts, where the magnificent choruses chant the profound interpretations of Handel. That which Bishop Beveridge found the best recreation, both to mind and body, whenever either stood in need of it was music, which exercised at once both body and soul. It called in his spirit, composed his thoughts, delighted his ear, recreated his mind, and so not only fitted him for after business, but filled his heart at the present with pure and useful thoughts. People say it is nonsense to talk of music being representative, and the question has been asked, Did you ever hear a sonata descriptive of a man going abroad and changing his religion? Of course, music can not of itself define a material notion, but it is from this nature it derives its power of exalting the mind into a sphere of indefinite longing and luxurious melancholy. It may be insisted on at least that music, orchestral music, has a distinctive character, and that there is such a thing as a vulgar tune, and a vulgar, we had almost written vicious, arrangement of it. There is a French composer, more or less popular here, whose conceptions seem to leap from his brain fully equipped for burlesque. The airs are indicative of roystering animalism, and of nothing else; so are some of the ditties of comic singers, which, if torn from the words, would still exhibit a kind of tipsy manner irresistibly suggestive of a gentleman with a nonsensical swagger and ridiculous clothes.

"Heaven reward the man," wrote Hood, "who first hit upon the very original notion of sawing the inside of a cat with the tail of a horse." The world knows not half the power and the occult and remoter influences of the art. In a letter of Mendelssohn's, we find a paragraph stating that, when he became acquainted with Goethe, the Poet often asked him to play for him in the twilight, his eyes gleaming like those of a lion out of the gloom. So the tune poet and the world-poet wove their fancies into shape side by side, and one, we may be sure, was an inspiration to the other. The poet owes to music system, form, and his finest phrases; we can not speak of the painter's picture without referring its beauties by comparison to music; sculpture, we are told, is but frozen music, and indeed the word harmony, we should bear in mind, originally signified proportion of shape, and not a combination of strains. It is our servant in grave or gay moods, just as we will have it. It is also, as Johnson says, the only sensual pleasure which is completely innocent. We should not, however, degrade it from being an art into a mere fashion. There are numbers of people who attend concerts simply to see others, and to be seen, who are utterly forgetful of the performances. Like other arts, too, music, to be duly appreciated, must, in some degree, at least, be understood. A good deal of trouble is taken by parents to have their children taught a technical acquaintance with an instrument, and it frequently happens that pupils are put to such hard practising at an