XXII.—*On an Improvement in the Stage of the Microscope.*

By M. S. LEGG, Esq.

(Read Jan. 26, 1848).

It may be in the recollection of many members of the Society, that last year our attention was directed to a useful mode of manipulation, in a paper by John Anthony, Esq., "On certain appearances observable in *Navicula*, from the Humber, by means of Oblique Transmitted Light,"* by which certain markings existing in various objects may be more readily observed: this communication has doubtless had the effect of recalling the attention of microscopists to a most eligible means of detecting lined structures. The importance of employing oblique illumination, and the consequent necessity of readily turning the object so as to place it at right angles to its former position, and present it in an opposite direction to the light, is sufficiently obvious, as, I trust, to justify the introduction of an improvement in the stage of the microscope by which these desiderata may be accomplished.

In the present arrangement of stages to microscopes as far as I have as yet observed, the revolving-plate, when present, is placed *above* the vertical and horizontal movements, the consequence is that unless the stage-actions be brought to certain fixed points (in which case the object must be adjusted to the field of the microscope by the hand) the object is sure to be lost to the field of view directly the revolving-plate is turned upon its axis, and if the adjustment be at all out of place, the object will be found to describe an orbit round the centre of the revolving-plate, which will increase in proportion to the eccentricity of the adjustment.

The above difficulties occurred to me, on a recent occasion in examining with a friend a specimen of *Navicula*, sent from America by Professor Bailey, under a high power, and although the object, when turned one quarter of a circle, was readjusted under a lower power, it was with difficulty found again.

* In Annual Report, 1847, p. 17.

Under these circumstances, it appeared to me that these difficulties might be overcome by a different arrangement of the parts of the stage, without at the same time detracting in any great degree from the conveniences and appliances existing in the stages at present employed; this I propose to effect by changing the position of the revolving-plate, and placing it *below instead of above the actions of the stage*; by adopting this principle it is evident *that if the centre of the revolving-plate be a fixed point coinciding exactly with the axis of the microscope*, the object under examination must remain in the field of view during an entire revolution, however eccentric the adjustments may be: in confirmation of this principle I was induced to construct the rough model which you see on the table, and my views have since been admirably carried out by Messrs. Smith and Beck, in adapting a new stage to my instrument.

The principal feature then, in this improvement, consists in fitting the revolving apparatus immediately upon the foundation-plate of the stage by means of a strong dovetailed or conical ring, working firmly but freely in the foundation-plate; when in use it may be turned by hand, or if great nicety be required, an endless screw may be fitted, acting upon the ring, and connected with a milled head placed at the side of the stage; upon this ring is fixed a plate upon which the stage-actions are adapted; the adjustments are effected by two milled heads on each side of the stage: the lateral motion consists of a screw working in a collar connected with the sliding-plate, and the vertical action is effected by means of a pinion fixed in the sliding-plate and acting upon a rack on the under side of the top or object-plate; the whole is so constructed that it will traverse the entire circle, and pass under the arm of the microscope without impediment. It may be objected as unnecessary that the stage and its appurtenances should revolve entirely round the circle, and perhaps a partial revolution would be sufficient for many objects, in which case a larger and more commodious stage may be constructed, but my principal object in proposing an entire revolution is to prove the efficacy of the principle, as well as to adapt it in many cases where it may be found advantageous, as, for example, in the examination of opaque objects illuminated by a side light, when it is desirable to cast a shadow in an opposite direction, which may be done by turning the stage and object round instead of changing the light: it will also be useful in examining certain objects in polarized light, when it is wished to place either the neutral or positive axis of a crystal to coincide with the plane of vibration.

These arrangements afford the usual large aperture for throwing a light from the mirror upon a Lieberkuhn, and do not in any way interfere with the ordinary diaphragm or the adaptation of the *achromatic condenser*.

In applying this principle to the stages of microscopes much will depend on the taste of the microscopist, and the ingenuity of the workman, but the chief points to be attended to are, the making the centre of the revolving-plate to coincide with the axis of the instrument, and placing the adjustments above the revolving-plate.

It will be found by experiment that an object placed in the centre of the field under one object-glass will not be exactly so when another is employed ; this arises from the well-known difficulty of accurately centring the object-glasses, and consequently the almost impossibility of making the optical and mechanical centres exactly the same. I may state, however, that the old stage of my microscope has been altered in accordance with the principle above laid down, and I find that under a power of 500 diameters an object is retained in the field, though not in the centre, during the three-fourths of a revolution to which the stage is limited (an approximation to mechanical truth sufficiently close) that the slightest touch of the adjustments will bring the object again to the centre.