A LASER MICROIRRADIATION ATTACHMENT FOR A BIOLOGICAL MICROSCOPE

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An attachment for a biological microscope converting it into an instrument for laser microirradiation has been built. The attachment is based on the current OI-17 production model of a luminescent opaque illuminator in which the light-dividing phase plate is replaced by a similar plate with different characteristics and by the attachment of an additional telescopic ocular. The attachment is easily fitted to any biological microscope, and in addition to laser microirradiation, it enables observations to be made and photomicrography to be carried out with any miniature suitable camera.

In recent years laser microirradiation has been widely used as a means of influencing single cells and cellular structures [1-6]. For this purpose comparatively complicated equipment for special microscopes are usually used [6, 8]. In some investigations, one of the oculars of a triple-ocular microscope has been used for laser microirradiation, with the other two oculars used for observation and photography [7].

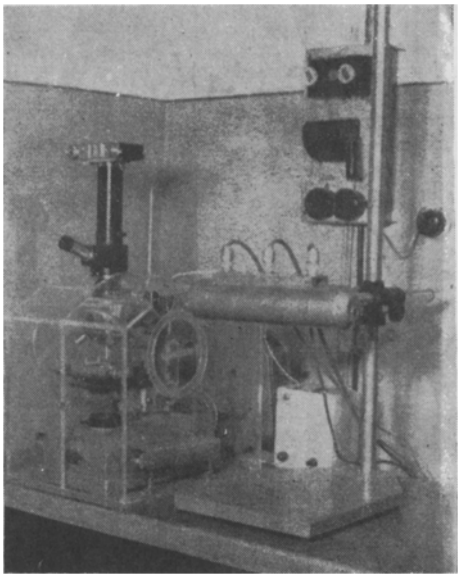

Fig. 1. General view of the attachment mounted on a thermostatically controlled ML-2 microscope.

The attachment, which can be used to convert any biological microscope into an instrument for laser microirradiation, was built on the basis of the OI-17 production model of the luminescent opaque illuminator, made in the USSR, by means of a comparatively simple modification. This modification consists of replacement of the light-dividing phase plate designed to reflect the light exciting luminescence onto the object by a similar plate selectively reflecting the spectral region of the laser radiation and transmitting the remainder of the spectrum, and also fitting a telescopic ocular to the side tube of the opaque illuminator.

For work with a ruby laser the phase plate fitted in the opaque illuminator, reflecting the blue-violet part of the spectrum, was replaced by a plate reflecting the red region of the spectrum and transmitting blue-green. (We take this opportunity for thanking G. G. Ovsyannikova for providing the phase plate with these spectral characteristics.)

The use of an attachment with this type of phase enables the object to be observed and photographed by means of the phase-contrast microscope in the blue-green rays of the spectrum before, during, and after irradiation. Any camera can be used for photomicrophy. The tube with the telescopic

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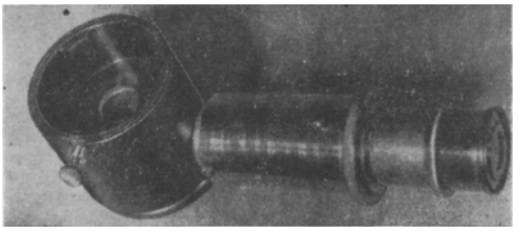

Fig. 2. General view of the attachment. The telescopic tube with the ocular can be seen.

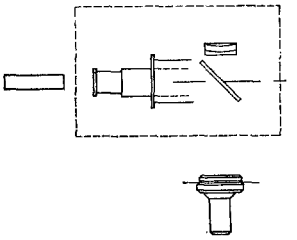

Fig. 3. Optical scheme of the attachment.

ocular is fixed by screws to the side tube of the opaque illuminator after removal of the achromatic lens from it (Fig. 2). The attachment is mounted on the body of the microscope.

The miniature camera is fitted above it. If prolonged observations must subsequently be made on the irradiated living cells [3], the microscope to which this attachment is fitted can be thermostatically controlled (Fig. 1).

Microirradiation by means of this attachment is carried out as follows: the laser beam falls through the side ocular on the phase plate tilted at an angle of 45°, is almost completely reflected from it, and is focussed by the objective of the microscope on the object (Fig. 3).

For complete absorption of the laser radiation, protective filters must be fitted to the oculars through which observations are made and photographs taken. (Notwithstanding this, it is obvious that observations must be prohibited during irradiation.)

Optical coupling of the plane of focus of the laser beam on the object with a sharp image of the object during observation and photography can be achieved by adjustment of the side telescopic ocular. To introduce dioptric corrections, oculars with a grid should be used. To select the area to be irradiated on the object with accuracy, an ocular micrometer with a scale or with a moveable crossline can be used [1, 2].

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