# The VARIOLUM—a new LEITZ illumination module for microscopy

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## Introduction

Filters are essential to the solution of many problems in microscopy. When brightness is to be reduced in colour photomicrography or television microscopy without any change in the colour character, i. e. the colour temperature, neutral-density screens are necessary.

If the colour temperature of the light does not agree with that for which the film is balanced, it must be adjusted with the aid of conversion filters to prevent wrong colour rendering on the film.

When increased contrast is required in black-and-white photography, it can be achieved with a green filter. When the colour contrast is also to be increased, different colour filters must be used.

With comparative investigations, for instance in forensic science, differences in the two image-forming optical paths can be balanced with the aid of filters. In all these cases it has up to now been necessary to work with various individual filters, which was sometimes very time-consuming and cumbersome. In addition, only defined absorption values could be set, for instance with the neutral-density screen; intermediate values could not be obtained.

**The VARIOLUM illuminating attachment (Fig. 2) replaces all the above-described individual filters and makes work considerably more convenient and faster.**

**The principle of the VARIOLUM (see Fig. 1).**
The core of the VARIOLUM is a curved fibre-optical guide. (1). The curvature eliminates irregularities in the spatial light distribution of the light source through multiple total reflection in the fibre optics. At the exit face of the fibre optics (8) illumination is therefore always uniform independently of the spatial intensity distribution at the entry face (7). This permits the insertion of diaphragms or filters (6) into the optical path at will in front of the fibre optics entry face, which depending on the proportion of the blocked or affected of bundle light, produce a varying degree of light attenuation or change in the colour temperature or colour mixture.

## The function of the VARIOLUM

*Continuous intensity control*

Through the insertion of a diaphragm in the optical path in front of the entry face of the fibre optics the light intensity can be continuously attenuated without any change in the colour temperature. The VARIOLUM thus replaces all neutral-density screens with the advantage of continuous light control, in contrast with the graduated control by the neutral-density screens. The set values can be reproduced through a scale. Continuous intensity control has in the past been possible only via the voltage control on the transformer, but with the disadvantage that it also changed the colour temperature.

In addition, the possibility is offered for the first time of continuous control of the light intensity of gas discharge lamps.

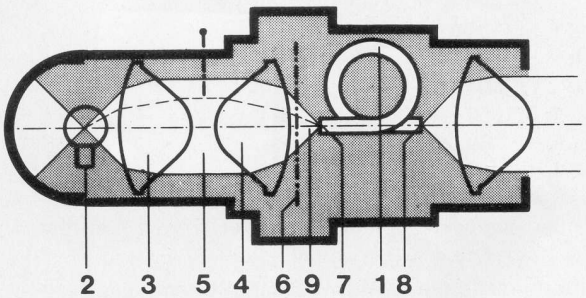


*Fig. 1: VARIOLUM, diagrammatic representation of function*

1 fibre optics
2 light source
3 lamp condenser
4 condenser of the illumination attachment
5 optical path
6 diaphragm or filter slide
7 entry face of the fibre optics
8 exit face of the fibre optics

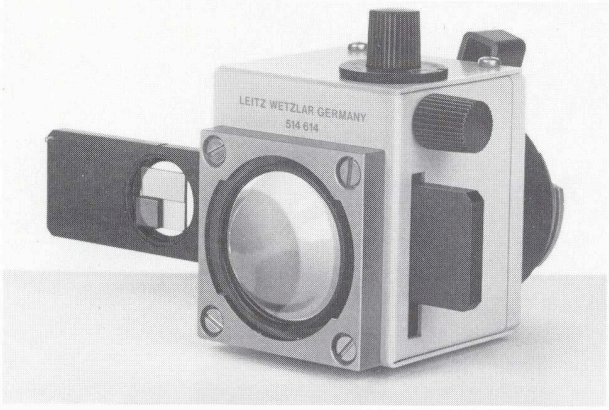


*Fig. 2: The VARIOLUM illumination attachment*

*Continuous colour temperature control*

Through the insertion of a conversion filter into the optical path of the fibre optics the colour temperature values 3100°K, 3200°L and 3400°K can be set independently of the voltage setting on the transformer. The colour temperature of a daylight film (5500°K) can be set at a high transformer setting.

*Colour contrasting*

Insertion of various colour filters (red, blue, green) replaces the individual filters. Mixed colours can also be produced because it is possible with the VARIOLUM to set the boundary region between two filters.

These properties thus enable the VARIOLUM to replace neutral-density screens, conversion filters, and colour filters. In visual microscopy this offers the possibility of observing any specimen in specific colour temperature conditions. As a result a correct colour impression is created of the various colourations.

**Practical uses of the VARIOLUM**

*Photomicrography*

Total reflection in the fibre optics fully compensates for irregularities in the illumination. Minor inhomogeneity fluctuations are rarely noticed during observation, because the eye is not sensitive enough, but they would be noticable in the photograph. Through the use of the VARIOLUM this problem can be eliminated. For intensity control the colour temperature required for colour photographs can be set and the brightness continuously regulated with the VARIOLUM. As a result, any desired exposure time can be set. This is a great advantage when it is necessary to choose the most favourable exposure time for neutral colour rendering on a given film.

Through the use of the red, green, blue colour filters or their mixed colours the colour contrast between object and surrounding field can be increased in black-and-white photography throughout the entire visible region of the spectrum. At the same time their complementary colour is attenuated.

*Forensic techniques*

With comparative investigations both in the micro- and in the macro-region visually identical illuminating conditions with the VARIOLUM can be created. This is achieved through the colour mixture of the light and through intensity attenuation. When two microscopes were coupled with a comparison bridge, the investigator often faced certain difficulties in the past in an accurate assessment of the specimen owing to the colour deviations in the object background. They can now be visually eliminated with the aid of two illuminating attachments.

*Television microscopy*

Most television cameras have variable light sensitivity (automatic plate potential), which produces correct image brightness. With cameras of narrow control range, however, the intensity of the light source must be additionally adjusted. Compared with the neutral-density screen the VARIOLUM produces a quicker, continuous brightness adjustment, which can be used whenever automatic light control is not desired.

For the correct rendering of the colour of the object structures a defined colour temperature of the light source is required also with the colour cameras. With the VARIOLUM a defined colour temperature can now be set. In black-and-white television microscopy as in photomicrography the colour filters of the VARIOLUM are used for increasing the contrast.

*Quantitative microscopy*

When image analytical methods are used a homogeneous reproducible illumination of the object plane is often of elementary importance. The shading caused by the light sources can thus be reduced, particularly in bright-field, enough practically to eliminate a complicated calculatory correction of this effect when the LEITZ TAS image analysis system or the LEITZ MPV 3 mirror scanner is used. The possibility of continuous variation of colours offers the additional advantage, particularly with stained biological specimens, of optimising the specimen contrast, to simplify electronic detection. Depending on the individual case, the speed of the analysis can be increased and the operation of the system in use considerably simplified.

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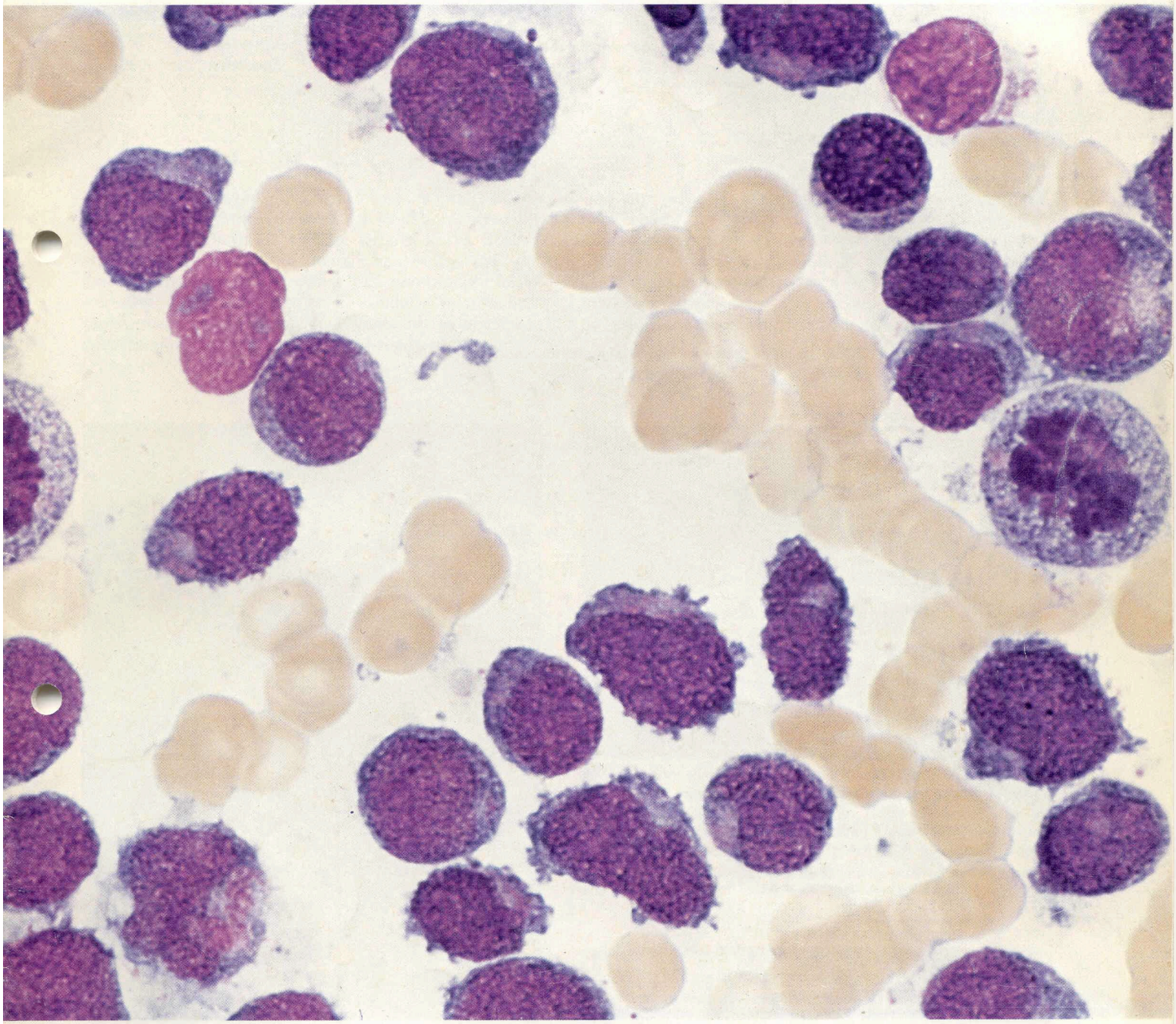
# Scientific and Technical Information

## Informations for ACHEMA 85



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