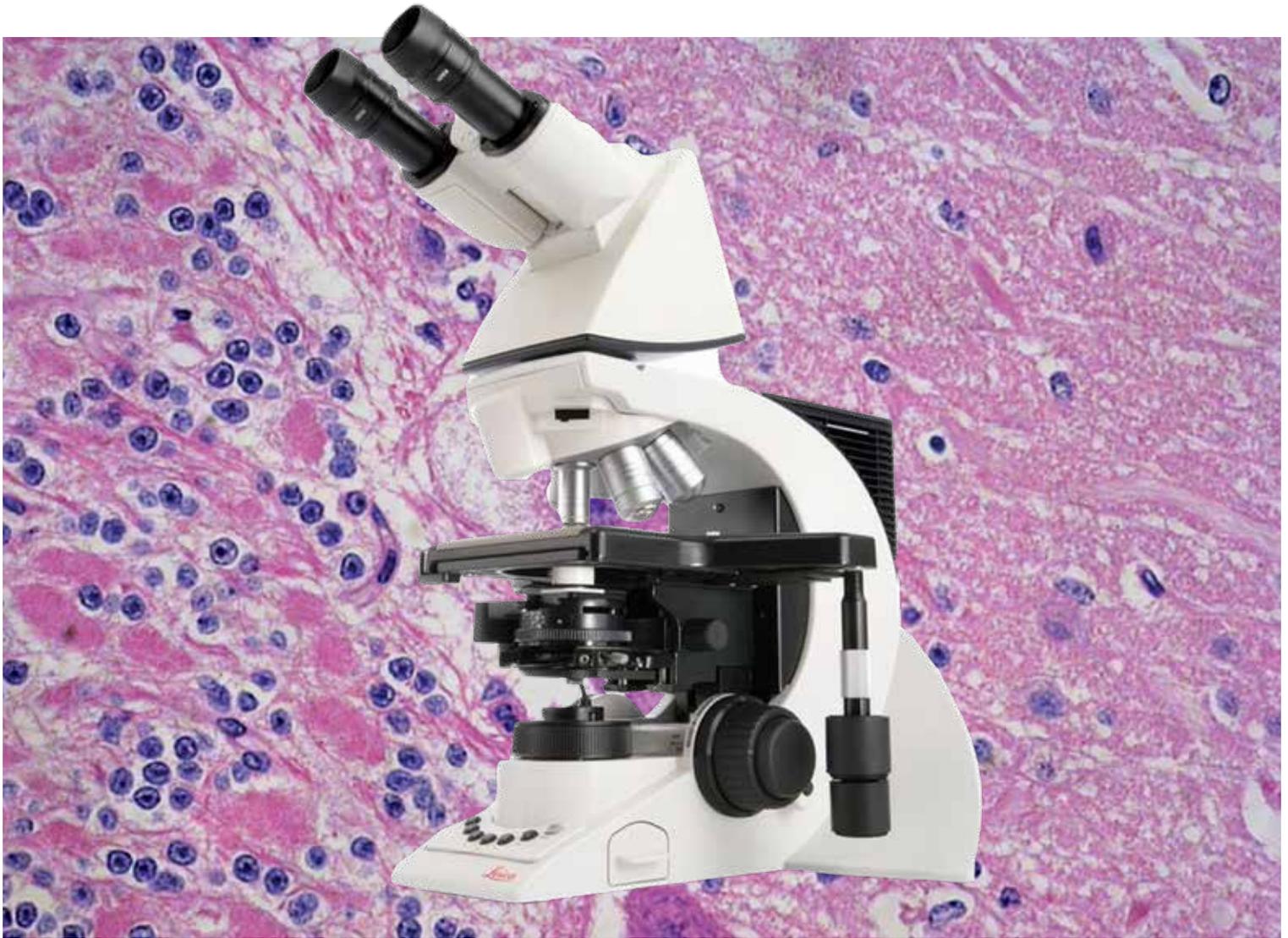


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## Ergonomics, Efficiency and Optical Performance in Clinical Microscopy

Microscopic analysis of patient samples in histopathology, hematology, cytology or microbiology is a key step in providing accurate and efficient diagnoses

## Confident Diagnoses Require Excellence in Imaging

**Accurate diagnoses** are a must in all clinical applications, as patients' lives depend on the results. The quality of the sample, viewed through the microscope, has the potential to impact the accuracy of the diagnosis, therefore optical performance is crucial.

A clinical microscope must deliver excellent image quality to support a confident and accurate diagnosis at all levels of magnification, from sample overview to higher magnifications.

As such, optical performance and broad compatibility with high-quality optics that match the users' needs, is considered as one of the highest priorities when choosing a clinical microscope.

A precise focus drive, to reveal the finest details of nuclei in histopathology samples or to focus on extremely small specimens

**“This microscope has a super-fine focus. We sharpen the picture with the fine focus...super-fine focus... is very useful for making photographs.”**

*Marianne Noordanus, Microbiology,  
Star-MDC Rotterdam, The Netherlands*

in microbiology is crucial. Switching between coarse and medium focus or coarse and super-fine focus (for details and microphotography), can lead to increased efficiency and faster review of specimens.



**Figure 1:** All optical parts of a microscope must provide excellent quality, including objectives, eyepieces, and optical components of the condenser

## Not just *a* microscope, but *my* microscope: The Importance of Ergonomics

Ergonomics can be defined as the science of refining product designs to optimize for safe, efficient and comfortable use.

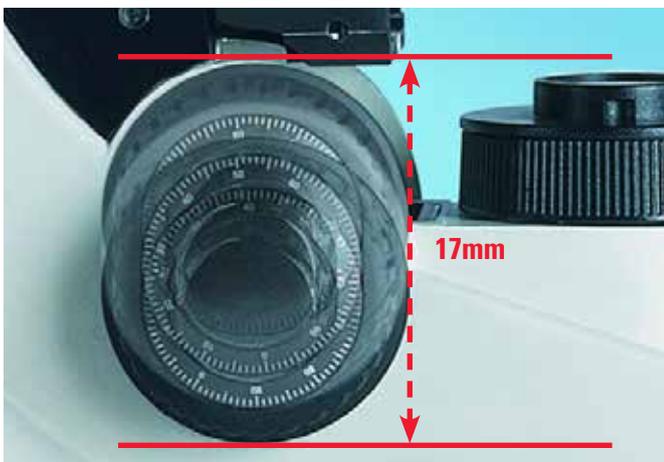
In the clinical diagnostic environment, users regularly employ their microscope for extended periods of time, often as much as 6 hours per day. Poor microscope design or set up, which does not match the frame of the user, can result in bad posture and muscle tension caused by the user having to twist or strain their body to align with the microscope. In this situation, the muscles of neck and shoulders, as well as forearms and wrists are under constant strain, which can lead to fatigue, stress, and even severe illness like RSI (Repetitive Strain Injury).

The user's working position is predominantly determined by the necessity to look into the microscope eyepieces. For regular, routine use, the microscope should be easily tailored to match the unique frame of the individual. In addition, it should facilitate regular, minor adjustments during the work day to enable the users to alter their working position. Microscope height adjustments can ease strain on back, neck and shoulders, while ensuring controls are in comfortable reach. This eliminates the need to stretch and allows forearms to rest comfortably on the desk.

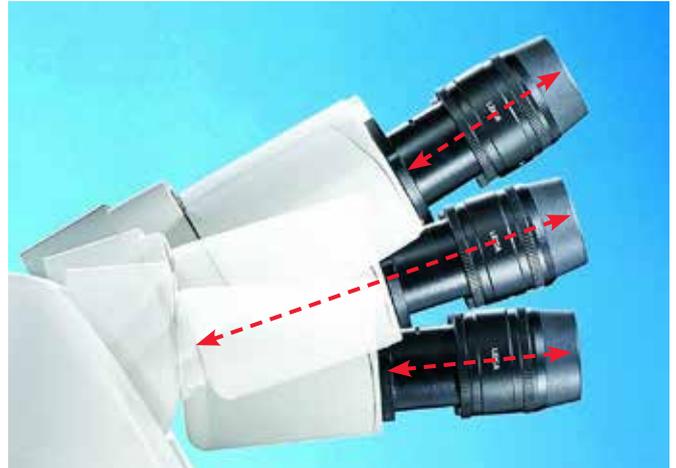
The DM3000 has the broadest selection of ergonomics accessories, allowing the microscope to be tailored to the individual operator.



**Figure 2:** The optional Ergolift accessory underneath the microscope alters the distance from bench to eyepieces, which is particularly useful for tall users. The adjustment wheels (red arrows), enable the height to be varied between 40 and 80 mm, and for the microscope to tilt up to 17mm +/- 1mm. Hands and forearms rest comfortably on the skin-friendly surfaces on both sides.



**Figure 3:** Height-adjustable focus knobs allow hands and forearms to rest comfortably on the bench, independent from individual hand sizes.



**Figure 4:** 0-35° Tiltable ergo observation tube with eyepiece extension is an optimized solution that enables the user to change the working position multiple times during the day. Users benefit from the adjustable distance between eyepieces and focus knobs.



**Figure 5:** Optimal ergonomic operation of a microscope thanks to symmetrical layout of coaxial drive and focus knobs. Shoulders are level, the spine is straight and arms are resting at a comfortable angle without stretching.



**Figure 6:** Left: A telescopic ergomodule between stand and observation tube allows for easy adjustment of the microscope height enabling to frequent changes to the user's working position or to facilitate multiple users employing the same microscope, without forfeiting ergonomics.

Right: A fixed 60 mm ergomodule helps taller users to work in comfort, especially when combined with a tiltable observation tube.



**“You can sit with a straight back and your elbows on the table,”**

explains Marianne Noordanus,  
Star-MDC Rotterdam, The Netherlands

In addition to the customizable set up and accessories, the **layout of the control elements** of a microscope should not be underestimated. Symmetrical operation of a microscope is key to promoting and maintaining good posture. When microscopes are not arranged symmetrically, the user will instinctively twist shoulders and spine to reach the controls. This results in an unnatural distortion of the body – and the consequence can be pain at the end of a long working day.

To allow the user to speed up operation, and to free one hand for other tasks such as operating a counting machine or to take notes, control elements such as the coaxial drive and focus knobs can be operated with just one hand.

Furthermore, for proper posture, the light intensity control must be easy to reach, and with some microscopes, optional footswitches can be used, which free the hands for other tasks.

In addition, there are personal preferences with regard to operating a microscope; for example, if the stage drive shall be for right- or left-hand use. A microscope that facilitates changing the drive from right to left and vice versa fast and easily, but most of all without the need for a new stage can be a decisive advantage for the user. This is particularly beneficial for shared microscopes or when changing staff members or tasks.



**Figure 7:** One hand operation of focus knob and stage drive with DM3000 microscope.

## Microscope automation to boost efficiency

Microscope automation is often not widely adopted for clinical applications due to the perception that it is not fast enough, and could slow down throughput in high workload disciplines. However, microscope automation can increase efficiency and speed significantly. For example, a motorized nosepiece that works at least as fast as changing the objectives by hand, supports the clinical workflow and relieves the hands from repetitive tasks and unnecessary movements.

Automation is the prerequisite for improved efficiency. The toggle mode of the DM3000 microscope allows users to switch between two preferred objectives at a touch of a single button, including the correct and automated movement of the condenser head, and adaptation of the light intensity. With fully manual microscopes, these three tasks use both hands – and are performed several hundred times per day.

Intelligent automation of the microscope can be a significant advantage in daily clinical work, increasing efficiency and eliminating repetitive tasks, which can put strain on hands, arms and shoulders.

Trudi de Jong-Gerrits describes her work with the toggle mode:

**“I press the grey button and choose the two objectives I want to use, for instance 10 and 100 times. So I can change objectives very quickly.”**



Figure 8: Control buttons for objectives and toggle mode with DM3000 microscope.



Figure 9: Freely programmable buttons behind each focus knob (DM3000 microscope).

Trudi de Jong-Gerrits states:

**“It is very easy to use these knobs. Because they are close by, you can do two things at the same time,”**

**“The microscope is very efficient when we are busy,”**

says Marianne Noordanus.

The DM3000 microscope features, in addition, two freely programmable buttons behind each focus knob, to adapt to the preferences of the individual user. These buttons enable the user to continue to work without averting the eyes from the eyepieces, and operate the microscope without looking at the controls. With users spending long hours every day making critical diagnoses, choosing the correct microscope is both an important and personal decision. Excellence in image quality, ensuring that all diagnostically significant features can be visualized, facilitates confident reporting, while intelligent automation of repetitive microscope functionality helps to increase efficiency. Furthermore, ergonomic set up of the microscope, tailored to the frame of the user, can promote good posture to eliminate pain and injury both today and in the future.