Success is a question of attitude

ErgoHandbook™

Leica

Contents

1. The purpose of this handbook

For an employee to feel "at home" while at work, ergonomic (human-engineered) workstations and work sequences are essential. They increase motivation and lead to improved performance. Ergonomics, properly applied, brings higher productivity and increased profits.

Any works doctor with experience in this field will tell you that workstations equipped with optical instruments can bring with them a host of medical problems, particularly as regards postural strain and eyestrain. The ergonomics of video display terminals have been widely discussed in the press, but it is less well known that workstations which include a microscope put considerably higher demands on the user.

The intention of this handbook is to make you more familiar with the importance of ergonomic microscopy workstations and with their advantages, to set out the basic principles of ergonomics, and to show you how to arrange your workstation to ensure minimum stress. Leica has given more thought than any other stereomicroscope manufacturer to this subject and has introduced the world's widest range of ergonomic accessories. This fact gives Leica a considerable advantage, particularly in view of the increasing strictness with which the product-liability laws are being applied (see inset).

An actual example

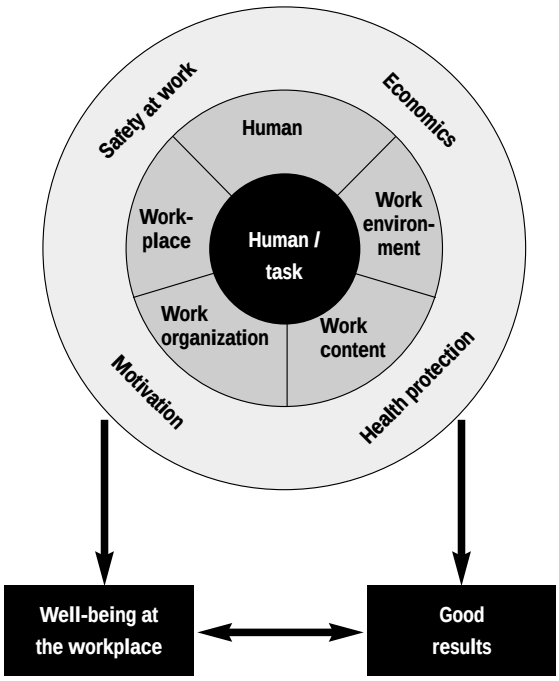
Ignoring or neglecting basic ergonomic rules can cost plenty. Government sources in the USA put a price label of a hundred thousand million dollars on the annual cost to the U.S. economy of unsatisfactory ergonomics. Escalating claims for damages are pushing the authorities to introduce legislation. In a widely-publicized legal case, three female employees successfully sued the manufacturer of their computer keyboards for damages running into millions of dollars. Working at the keyboard had caused damage to the fingers, the wrist and the arm. This verdict affects not only the computer industry, but also other industrial activities. Many manufacturers will now have to come to grips with ergonomic facts and to introduce appropriate measures, because the Brooklyn court declared industry to be liable for the damage caused by its products. This specific legal case, together with calculations showing that injury due to repetitive movement is costing the U.S. health organizations $20,000 million a year, have driven the authorities to force the introduction of ergonomic product design by means of appropriate legislation. In November 1996, California became the first state in the USA to introduce a law to this effect.

from USA TODAY, 9. January 1997

2. What do you mean by ergonomics?

The term 'Ergonomics' is derived from the Greek words ergos meaning "work" and nomos meaning "natural laws of" or "study of".
'ergon'= work and 'nomos'= according to statutes

Ergonomics investigates and analyzes the relationship between people and their work, with the aim of improving the performance of the entire work system and of reducing the negative impact on the individual. Industrial ergonomics involves the systematic technical equipping of workplaces and the effect on the person working there. It is the task of ergonomics to derive rules for fitting the task to the person.



This "ergonomic wheel diagram" includes all of the factors which affect the well-being of the employee and which therefore impact on the profitability of the business. The individual and the task are at the centre. The inner circle (activities) includes the dynamic ergonomic processes which directly affect the fields in the outer circle (reaction).

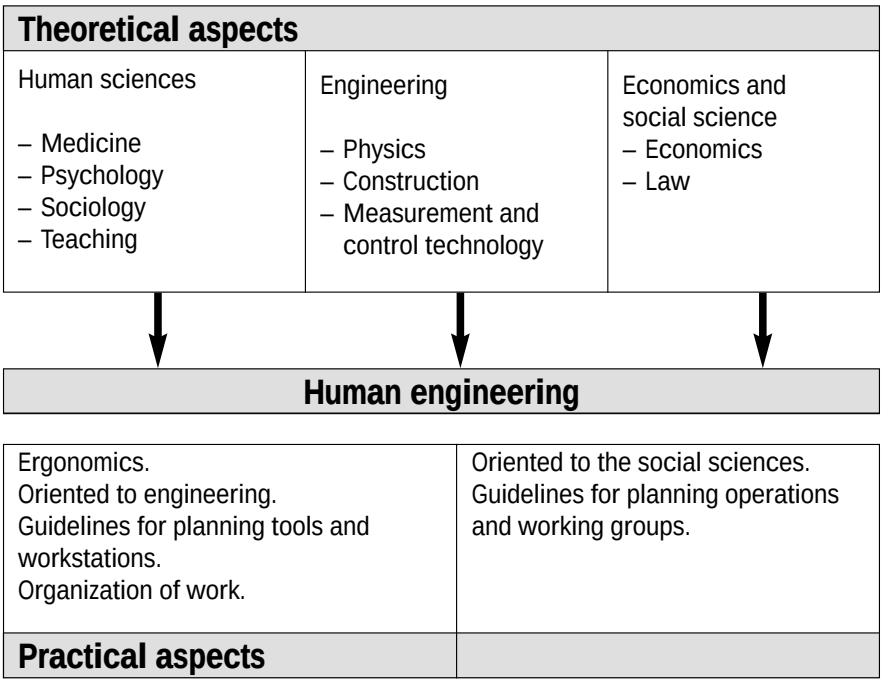
Diagram from: Ergonomics, a success factor for every organization.
Swiss Accident Insurance (SUVA)

Human engineering and ergonomics

Starting with the foundations laid by the work of Taylor in the field of scientific business management, the science of "human factors" or "human engineering" has arisen, and is well established in Europe and in the USA. This new science is in harmony with the mechanistic views of the 19th century, which claim that the laws of classical physics can be applied to all natural phenomena, including human life (refer in this connection to Releaux and to the psychophysics of Fechner).

Core definition of human engineering according to the German "Gesellschaft für Arbeitswissenschaft"
Human engineering is the systematic analysis, ordering and arrangement of the technical, organizational and social conditions relating to work processes. Its purpose is to ensure that employees engaged in productive and efficient work processes

- work under safe, achievable conditions,
- see that appropriate social standards regarding work content, work analysis, work environment, remuneration and cooperation are being met,
- have room for manoeuvre, have the opportunity to learn and, in cooperation with others, can preserve and further develop their personalities.



Human engineering and its constituents

In 1857, the Polish investigator Wojciech Jastrzebowski coined the word "ergonomics" to denote a branch of science covering certain aspects of man-machine interaction, but the term did not become generally accepted at that time.

In 1949, scientific co-workers of Murell re-introduced the word to denote a new branch of science researching the capabilities and properties of humans when using technical equipment. The stated purpose was to establish facts enabling proposals to be formulated for the design of tools, instruments and machines. The roots of this research originated during the Second World War, when both the Allies and the Germans carried out investigations which were considered to be so important that they should be applied to civilian activities.

The main task of ergonomics is to reduce the stress on the human operator while improving the performance of the entire work system. These goals are achieved by analyzing the task, the working environment and the interplay between human and machine. (Schmidtke, 1993).

Human engineering is multidisciplinary. It derives its basic principles from the human sciences, from engineering, from economics and from the social sciences. It includes the disciplines of medicine, psychology, teaching, technology and law insofar as they all relate to occupational aspects, and it also embraces industrial sociology. Each of these disciplines is concerned with human work as seen from the point of view of the particular aspect science. For the purposes of practical applicability, this basic knowledge is combined into what are known as praxeologies (practical aspects). Of these, organization theory is primarily social-centred; it provides the guidelines for organization and for working groups, whereas ergonomics is more engineering-centred and has the goal of providing guidelines for the technical planning of workplaces and tools (Luczak and Volpert, 1987).

Free translation of an extract from the brochure of the Institute for Ergonomics, Technical University, Munich, Germany
http://www.lfe.mw.tu-muenchen.de/wasist.html

References

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Hilf, H.: Einführung in die Arbeitswissen-schaft.

Luczak, H., Volpert, W., Raithel, A. & Schwier, W.: Arbeitswissenschaftliche Kerndefinition, Gegenstandskatalog, Forschungsgebiete.

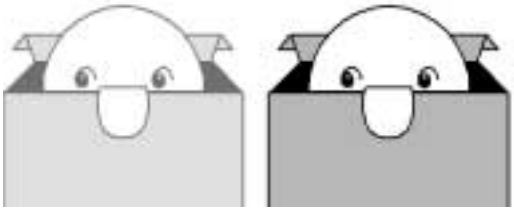
3. Ergonomics applied to improving microscopy workstations

Ergonomics is just a craze. Ergonomics in the workplace is only a luxury, something for lazy and difficult people.

Prejudices like these still crop up now and again. They are based on false information or on ignorance, because it has been long confirmed by many investigations in occupational medicine the world over that ergonomics, scientifically applied in the workplace, directly affects not only the individual well-being of employees, but also their performance and therefore the profits of the business.

Workstations equipped with optical aids such as the microscope make seeing easier, but when used continuously for many hours a day they place enormous demands on the eyes, the musculo-skeletal system and the powers of concentration (see fig. 2, section 4). These demands are considerably greater than those associated with VDUs, but the latter have received much greater publicity. The present section is directed primarily towards users of optical aids and to those responsible for procuring and installing microscopy workstations. It includes suggestions for reducing the health risk by means of:

- ergonomic instruments
- ergonomic workstations
- variety within the work process
- the introduction of work breaks
- appropriately-qualified personnel
- training for users
- problem-awareness in the user.

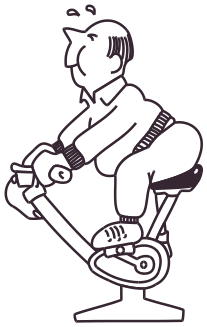


People are very different
There are tall and short people, some slimmer than others. This makes workplace requirements into a personal matter. For example, the existing height of a microscope equipped for a certain task with accessories and with a particular working distance may be quite unsuitable for the specific user. Aches and pains, and reduced performance, are inevitable. If the viewing height is too low, the observer will be forced to bend forward while working, with resulting muscular tension in the neck region. In the ideal microscope, therefore, the viewing height and the viewing angle should be adjustable to the build of the user. In addition, a variable viewing height is the best way to prevent an entirely-sedentary posture (see fig. 1, section 4). It permits the observer to adopt a personal sitting posture and to change it periodically in accordance with the natural urge to shift around from time to time. It is true that the height of the chair can be altered so that a relaxed, slightly-bent posture is substituted for the previous rigidly-upright one (see fig. 3, section 4), but this is not the best approach. It is much simpler and more comfortable to use a variable binocular tube in order to compensate for the height difference.

Dynamic sitting reduces to a minimum the stresses placed on the back muscles, putting a stop to the decrease in performance and staving off the onset of fatigue (see fig. 4, section 4).

All controls ready at hand

Two conditions must be met for frequently-used controls such as the zoom and focus to be used comfortably. Firstly, these controls must be as far down as possible on the microscope and secondly, it must be possible to operate them with the forearms supported and the shoulders relaxed. To avoid unnecessary stress to the shoulder girdle, the need to stretch out the arms too far should be avoided. Ergonomically, this means that the best posture is with the arms horizontal or sloping slightly downwards, and with the hands resting on their edges. The drive knobs should be neither too slack nor too tight; ideally, their ease of movement should be adjustable to individual requirements. For higher magnifications there should be a fine-focus mechanism.



About the chair and the table

Ergonomics at the workplace naturally relates not only to the instrument itself, but also to the chair and table which are used. The limited adjustment possibilities of the instrument itself can accommodate the finer ergonomic tuning, but first the chair and table must be chosen and arranged so as to meet the more basic ergonomic requirements. Their height and their tilt must ensure that the whole person, from head to foot, including back, head, arms, hands and legs, can sit and work in the best possible posture. Because microscopical observation generally extends over a considerable period of time, and requires great concentration, the posture is decisive. In general, the ideal in terms of relaxed and comfortable sitting is offered by a microscopy table with adjustable height and which offers a sufficiently-large surface on which to rest the hands, combined with a chair which is adaptable to the build of the user and which should have a tall backrest tiltable backwards by up to 30° (see fig. 6, 7, section 4). If the task requires the user to lean forwards, this forward tilt should not exceed 20°.

Special arm- and hand supports

To carry out the fine movements required to position, manipulate and prepare objects, support should be provided by arm- and handrests which have no sharp edges. The base of the microscope stand itself can be designed to provide this support. The elbow joint should not be supported. It is also important that ancillary tools such as soldering irons are designed adequately; they should not be too heavy, and neither should they force the hand to adopt an unfavourable position.

About the optical systems

The literature of occupational medicine contains the results of numerous investigations into eyestrain resulting from microscopical observation. A discussion of this aspect requires a specialized knowledge of the properties of optical instruments and of illumination technology, and is outside the scope of the present handbook. One important fact is however this: An elaborate lens system is more expensive, but in the long term it pays off because it protects the eyes and reduces fatigue. High-quality microscopes have optical and mechanical properties which simple instruments cannot offer. Examples are parfocality, which eliminates the constant need to refocus; and plano objectives, which produce an image which is sharp right to the edge and not (as with simpler objectives) either in the middle or in the peripheral area.

The eyepiece: right next to the user

In every microscope, the eyepieces have a very important function, because they represent the visual interface to the user. Wide-field eyepieces for spectacle wearers, and with dioptric correction and adjustable eyepieces, are particularly recommended. "Wide field" means that these eyepieces show a larger area of the object at any one time, which makes long-term observation more effective on account of easier navigation and because the eye does not need to adapt so much. Eyepieces for spectacle wearers have a high eyepoint, well away from the eyelens of the eyepiece, and so present the option of working with spectacles or without. The eyecups keep out stray light from the side, and prevent disturbing reflections on the eyelens.

A few words about the work environment
Performance and work satisfaction depend not only on the ergonomics of the workstation, but also on the position of that workstation within the room. Temperature, humidity, light, noise, vibration and pollutants all have an immediate effect on the well-being and productivity of operators. For example, matching the room brightness and the microscope-field brightness to one another makes a major contribution to reducing strain on the eyes. The illumination provided by these sources should be uniform, and moderately bright. Avoid reflections, flickering and dazzling; all of these can result in premature fatigue.

Pauses for thought
Variety is the spice of life. In this context, job rotation is a good way of avoiding muscular problems. It is a good idea to alternate frequently between various different microscopical tasks and, if possible, to intersperse these tasks with others which do not require the microscope. If these options are not available, the daily working hours at the microscope should be restricted and the operator encouraged to take frequent breaks of appropriate length. It is known that eyes and muscles can recover quickly under these conditions. If these deliberate breaks in work are accompanied by physical exercises, work takes on a new dimension.

Microscopy is not for everybody
Those who work at the microscope carry a high responsibility, whether they are in the research laboratory or in industrial quality assurance. A lot is expected of their expertise, their powers of concentration and their attention to detail. Microscope operators need to be selected partly on the basis of their eyesight and of the capabilities of their musculo-skeletal systems. Fine work with the stereomicroscope needs good eyes and steady hands. The tendency to trembling is an important example; it depends on individual makeup, on health and on age. Persons with back problems, arthritis, sinovial inflammation, carpal syndrome or peripheral circulation problems are likely to have considerable problems. Difficulties are also to be expected with overweight persons, because the distance between the eye and the eyepiece cannot be changed.

More training means less troubles
The more demanding the task, the more comprehensive the training required for it. Thorough instruction for working with the microscope should include ergonomic aspects, work planning and optical considerations. Continuous monitoring and advice from the field of occupational medicine are also very important. The key to minimizing bodily and optical difficulties in microscopical work is to know, and to practise - to know what can be done to arrange and organize a workstation as well as possible, to apply that knowledge, and to repeatedly practise routine microscope adjustments such as dioptric setting, focusing, and the resetting of the illumination, until they become second nature.

A healthy approach brings success
The life style and personal attitudes of the individual affect the subjective perception of stress. Too little sleep, the taking of medicines and the use of coffee, tobacco and alcohol, can all reduce the visual power. They can all lead to an increase in hand tremor, as can energetic sport immediately before working with the microscope. On the other hand, regular and reasonable exercise in the form of sport during leisure time is to be encouraged as a means of improving health generally and of preventing the deterioration of muscles and joints.

To summarize:
Ergonomics is not a slogan; it is a fundamental theme which relates to the well-being of the individual when at work. If basic ergonomic principles are followed during the creation of microscopical workstations, health problems are less likely to arise. As many as possible of the parameters involved need to be matched to one another so that the individual can work productively and without making mistakes, and so that eyes and muscles are not overtaxed. Each person has a different bodily build, and each activity has its own specific requirements.

Consequently every workstation must be considered separately and equipped individually. The assessment needs to be repeated at regular intervals. The optimization process covers not only the workstation itself, but also the content and organization of the work, and the optical aid itself. To implement these points successfully, the person responsible needs a sound specialized knowledge of the physiology of vision and of body motoricity.

Finally, it must be emphasized that the initial high capital outlay invested in ergonomic workplaces and tooling pays for itself very quickly and brings long-term benefits for all concerned - through better performance, a higher-quality end product, and a lower failure rate.

4. Ergonomics, illustrations and tables

Diagrams from: Physiologische Arbeitsgestaltung, Etienne Grandjean.

Dynamic and static exertion

- Dynamic exertion is characterized by rhythmic tensioning and relaxation. The blood circulation is enhanced, particularly in the muscles, and waste products are washed away. Dynamic exertion can be continued for very long periods at an appropriate rhythm before the first signs of fatigue appear.

- Static exertion (microscopy is an example) is characterized by tensioning of the muscles over long periods. The blood circulation is at a low level. Little or no sugar or oxygen is supplied to the muscles. Waste products are not washed away; instead they trigger the pain of muscle fatigue. For this reason, we cannot tolerate static exertion for very long without introducing some movement.

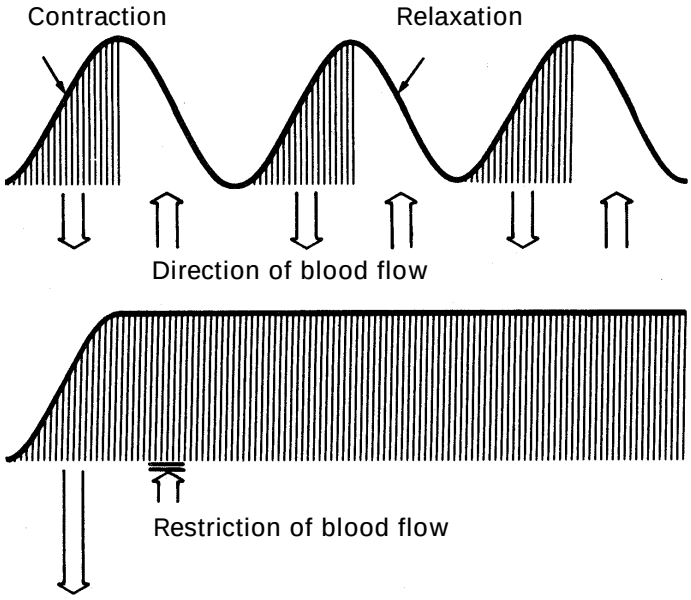


Fig .1
The effect of dynamic exertion on blood circulation in the muscles is analogous to that of a motor pump. By contrast, static exertion leads to restriction of the blood circulation.

Bodily complaints

Static exertion and inappropriate planning of the workplace lead to an increased incidence of back trouble and of pain in the neck, shoulders, knees and feet.

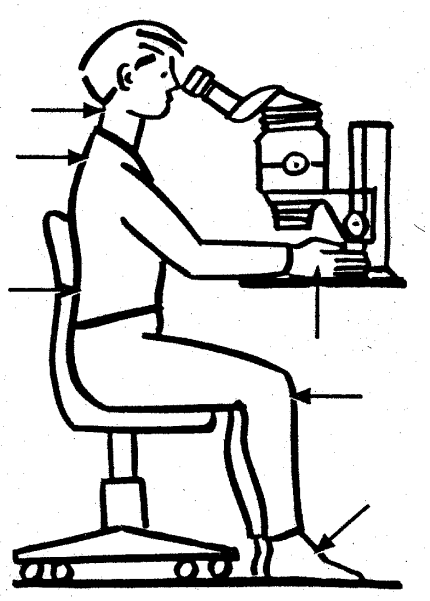


Fig. 2
Bodily complaints resulting from a sedentary posture

Sitting upright, sitting relaxed

– Sitting upright tensions the back muscles.
– With a relaxed sitting posture, with the body leaning slightly forwards, the weight of the trunk is in equilibrium and over the long term the back muscles are used less.

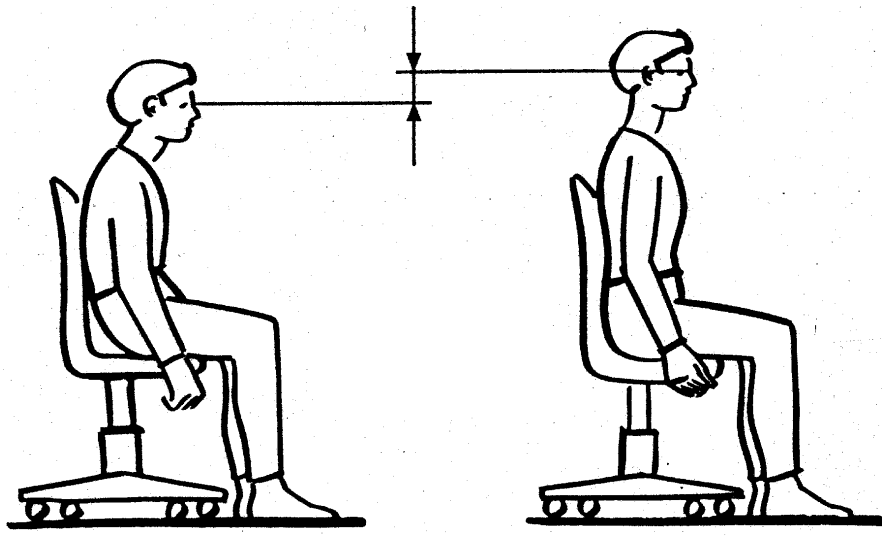


Fig. 3
Sitting upright, sitting relaxed

Pressure on intervertebral disks

– When the trunk is relaxed and inclined slightly backwards, the pressure on the intervertebral disks is minimized.
– The pressure on the intervertebral disks is less for backrests which are convex in the lumbar region than it is for straight ones.

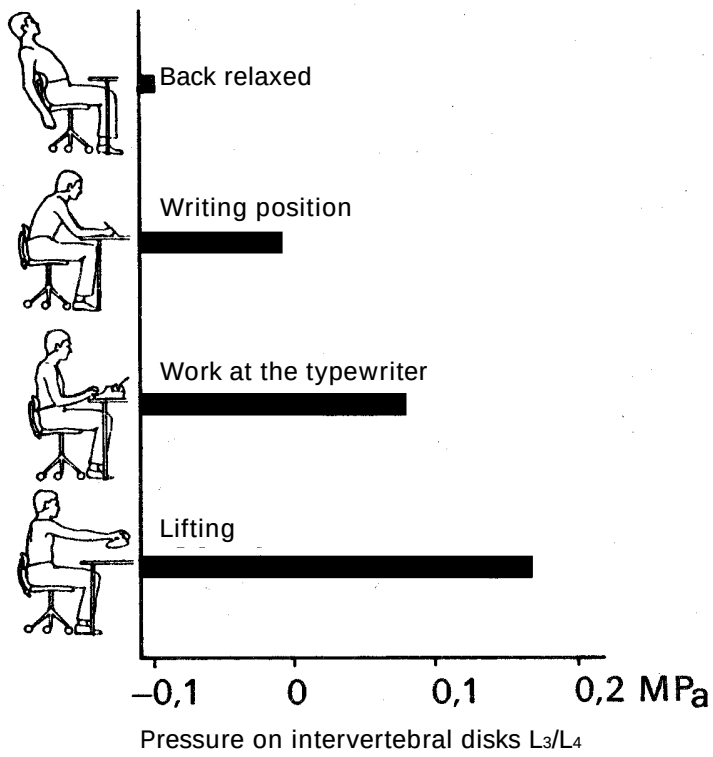


Fig. 4
The influence of various sitting postures on the pressure applied to intervertebral disks.
Lumbar vertebrae L3/L4. Mpa = 10.2kp/cm2

Body dimensions

To ensure a natural posture (position of trunk, arms and legs) it is essential to match the workplace to the build of the individual, and for this purpose it is necessary to know body dimensions. The extreme range of body dimensions displayed among members of different sexes and races, and among individuals within a category, presents great difficulties in this respect.

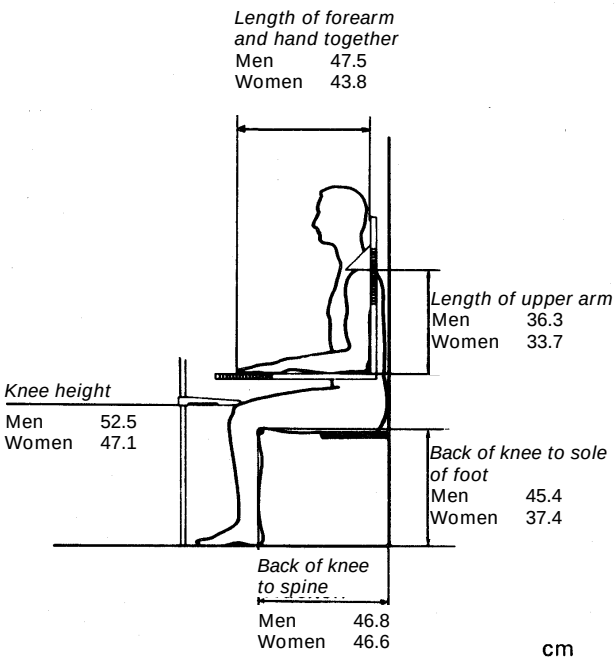


Fig. 5
Average values for the body dimensions of individuals within one Swiss industrial organization.

Chair and table

A tall backrest, slightly concave towards the top and markedly convex in the lumbar region, provokes less muscular tension, subjects the intervertebral disks to a minimum of pressure, and causes the minimum of back problems.

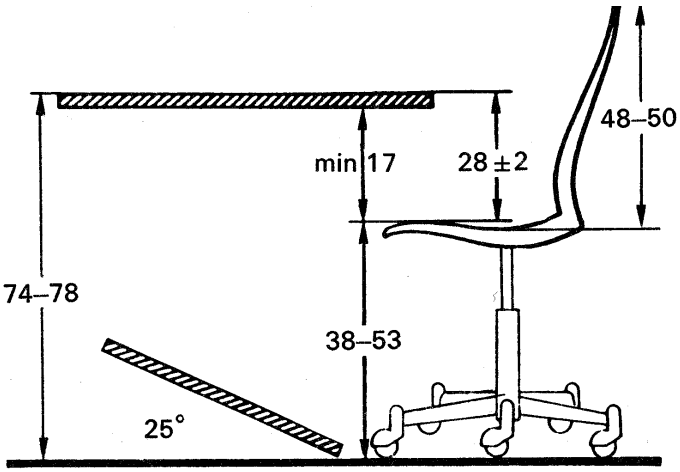


Fig. 6
Favourable dimensions for chairs, tables and footrests

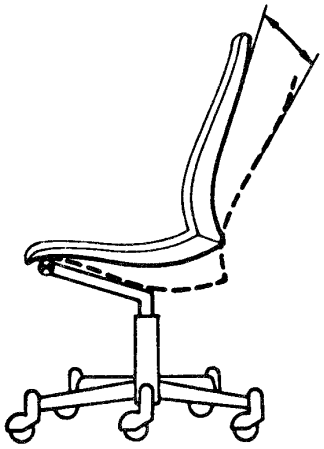


Fig. 7
If the backrest is tilted slightly backwards (by about 25° to 30°), the pressure on the intervertebral disks is minimized.

Angle of observation
The working area which is constantly inspected with the eyes must be positioned so that the observer has a comfortable head posture. An angle of observation which is inclined too steeply upwards or downwards will cause neck fatigue in due course.

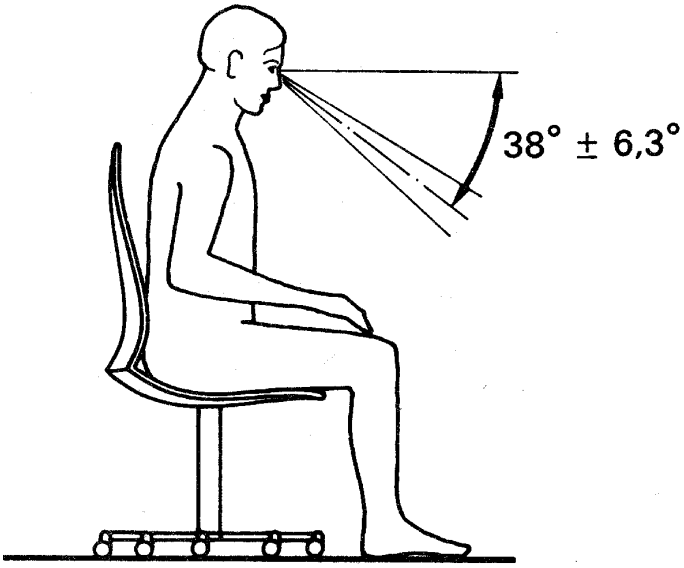


Fig. 8
Favourable angle of observation

Posture
An observation tube with variable viewing can be matched to the build of the user, who can then change position at intervals while working (dynamic sitting).

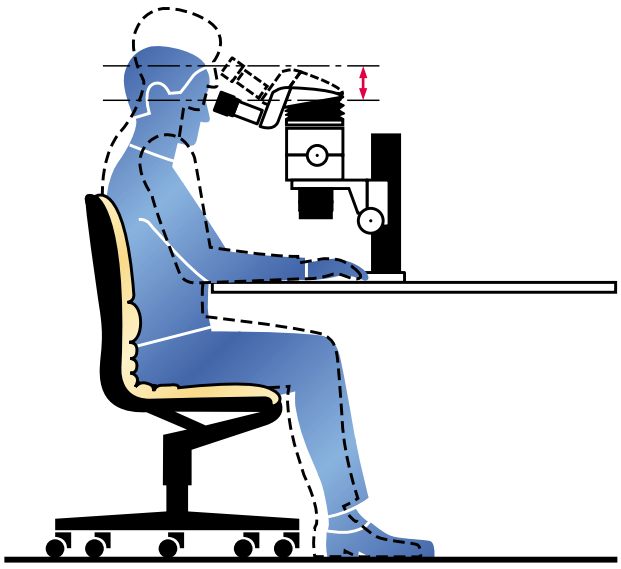


Fig. 9
Relaxed body and head, arms comfortably supported, adequate space for the legs, good use of the chair.

Monotonous work
Monotony is the reaction of a person to conditions which exhibit little change and offer little stimulation. Examples are easy activities which extend over a long period, or a situation which changes only very occasionally. The main symptoms of monotony are fatigue, sleepiness, apathy, and decreasing alertness.

Monotonous repetitive work as seen from the viewpoint of various sciences

As seen by	Possible consequences
Medicine	Atrophy of mental and physical organic systems
Occupational physiology	Monotony; risk of mistakes and accidents
Occupational psychology	Decrease in work satisfaction
Ethics	Obstacle to self-development
Human engineering	Increased absenteeism, increased difficulties in recruiting personnel

Precision work
Work beneath the microscope requires rapid and small muscle contractions, coordination and precision in muscle movements, concentration, and visual inspection.

Making procedures easier during precision work

Procedure	Measures taken
Perception	Work accompanied by visual inspection. Optimization of visual inspection procedure. Clear understanding of task. Adequate light and colour.
Alertness Sequence of movements	Screening-out of distractions. Protection against noise. Clear arrangement of workplace. Logical organization of work. Work rhythms.
	Only one operation at any one time. Ergonomic arrangement of working area. Optimization of work operations.

5. Assessment of the workplace

Minimizing the strain placed on the stereomicroscope user by the static posture has long been one of our most important goals. The user of a Leica stereomicroscope has access to the world's greatest variety of binocular tubes and ergonomics modules, and can therefore adopt the most comfortable sitting posture and change this at any time. Compulsion to use one pre-ordered posture is superseded by a dynamic and less stressful sitting position.

Quality is the starting-point for ergonomics

Leica TQM ISO 9001

- Leica possesses the ISO 9001 certificate, which confirms that quality management and quality systems are of a very high level.
- A high standard of quality and reliability ensures that the stringent demands imposed by product-liability regulations are met, helps to minimize risks, and leads to a reduction in costs.
- A high level of functionality, absolute reliability and long life, even under extreme conditions, lead to a reduction in future investment costs.
- Comprehensive user-friendly product documentation, didactically structured and in accordance with product-liability requirements, simplifies and shortens the training period, helps to answer queries arising during the use of the product, and provides confidence.
- The presence of a Leica customer service in more than 100 countries ensures competent advice and quick service.

The optical system, the basis for ergonomic working

- Design principle - one main objective and two parallel beam paths - for fatigue-free viewing.
- High-quality optical glass, multiple-coated for bright and crisp images.
- High resolution to enable the finest details to be seen better.
- Pronounced stereoscopic effect for better perception of depth.
- Less focusing required, thanks to profound depth of field.
- Perfectly-matched optical components for parfocality (constant image sharpness from the lowest magnification to the highest).
- Large fields of view for a better overall impression of the object.
- Plano objectives for crisp imaging over the entire field of view.
- Planapochromatic objectives for the contrast-rich, colour-true rendering of the finest details.

Leica Design
by Ernest Igl/Christophe Apothéloz

For ergonomic viewing

ErgoTubes™ and ErgoModules™ are usable with all current and past models of Leica Series M stereomicroscopes.

® The 'US Patent and Trademark Office' entered the trademarks ErgoWedge, ErgoHandbook, ErgoTube and ErgoModule in the Principal Register on 23. February 1999 under the following numbers:

ErgoWedge®	Reg. No. 2,228,097
ErgoHandbook®	Reg. No. 2,223,420
ErgoTube®	Reg. No. 2,270,645
ErgoModule®	Reg. No. 2,225,687

The entries remain in force for ten years.

The variable ones

ErgoTube™ 10°-50°
Stock no. 10 445 822

Observation tube with viewing angle continuously variable between 10° and 50°.
Low viewing angle, long overhang.
Improved viewing conditions for tall and short users and with various outfits.
Apochromatically corrected.
Manufactured from antistatic material.

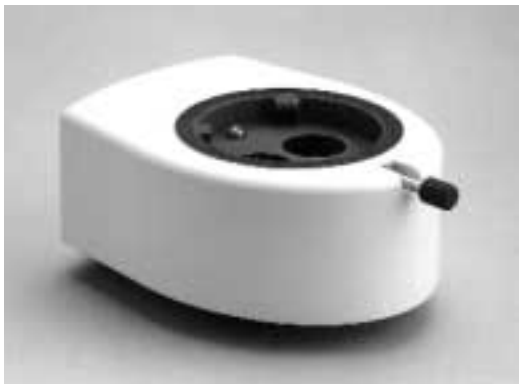
ErgoWedge™ 5°-25°
Stock no. 10 446 123

An intermediate piece which enables the viewing angle of the binocular tube used to be changed continuously within the range 5° - 25°. The eyepieces are displaced towards the observer by up to 65mm. Improved viewing conditions with various binocular tubes. Manufactured from antistatic material.

ErgoModule™ 30mm to 120mm
Stock no. 10 446 171

The ErgoModule™ 30mm to 120mm makes low-built stereomicroscopes taller, enabling users with different builds to use the same instrument and to adjust the viewing height accordingly.
Manufactured from antistatic material.

The higher ones



ErgoModule™ 50mm
Stock no. 10 446 170

A fixed intermediate piece which increases by 50mm the viewing height of the binocular tube used. Better viewing conditions for tall observers when using low outfits.

Straight binocular tube
Stock no. 10 429 783

Provides horizontal viewing if the stereomicroscope is fitted in a tilted position to the swinging-arm stand or to a bonder.

Higher and closer

ErgoTube™ 45°
Stock no. 10 446 253

Erect body position, because the viewing point is displaced 65mm upwards and 65mm towards the observer. Interpupillary distance up to 90mm, magnification factor 1.6x.

The low ones

Trinocular video-/phototube

Stock no. 10 445 924, 50% or 10 446 229, 100%

Combined tube for observation and photography, with low viewing height. Improved viewing conditions for photographing in combination with accessories.

Inclined binocular tube, low

Stock no. 10 429 781

Low viewing height for stereomicroscope outfits which are tall because they have a transmitted-light stand or are equipped with a video-/phototube, a drawing tube, a coaxial illuminator etc.

High and low

ErgoWedge™ ±15°

Stock no. 10 346 910

A fixed intermediate piece with which the angular tilt range of the various binocular tubes can be extended by 15° both upwards and downwards. Improved viewing conditions with various outfits.

Standard

Inclined binocular tube 45°

Stock no. 10 445 619

Binocular tube with 45° viewing angle, for standard outfits. Fits to ErgoModules and to accessories such as a video-/phototube, a drawing tube, or a coaxial illuminator.

For competitors' instruments

Tube adapter

Stock no. 10 446 251 Tube adapter for Nikon
10 446 250 Tube adapter for Olympus

Adaptation of the Leica ErgoTube™ 10° - 50° or of the ErgoWedge™ 5° - 25° to fit on Nikon and Olympus stereomicroscopes. Better viewing comfort for the customers of our competitors as well.

Wide-field eyepieces for spectacle wearers, distortion-free

Stock no. 10 445 111 (10x), 10 445 301 (16x)
10 445 302 (25x), 10 445 303 (40x)

Usable either with spectacles or without, adjustable eyecups, distortion-free imaging.
Dioptric settings adjustable within the range +5 to -5.

Rotatable optics carrier

Leica MS5, MZ6, MZ7$_5$, MZ9$_5$, MZ12$_5$, MZ APO

Optics carrier rotatable 360° in microscope carrier.
Direction of viewing is matched to work situation.
Comfortable observation without twisting the head.

For ergonomic operation

Motor-focus system

Stock no. 10 446 176 MF drive with column and with transformer for transmitted-light bases
10 446 259 MF drive with inclinable column and with transformer for swinging-arm / table clamp stand

Effortless operation with hand control or footswitch, or through computer.
Use of the footswitch leaves the hands free for manipulation.
Increased flexibility as regards the working position.
The same ease of movement in both directions of adjustment, even with heavy outfits.
Rapid travel to stored positions saves time.

Focusing drive

Stock no. 10 445 615 (300mm)
10 446 100 (500mm)

Ease of movement individually adjustable
Low, bilateral drive knobs
Comfortable use with hands supported

Focusing drive, coarse/fine

Stock no. 10 445 616 (300mm)

Fine focusing for high magnifications
Low, bilateral drive knobs
Comfortable use with hands supported

Focusing drive, coarse/fine, for 50mm diameter columns

Stock no. 10 445 629

Coarse / fine focusing
Bilateral drive knobs
Easy movement even with heavy outfits

Microscope carrier
Stock no. 10 445 617

Microscope carrier mountable in two basic positions (low and high) in accordance with object size and working distance. The focusing drive can always be placed in an ergonomically-favourable position.

Incident-light stands
Stock no. 10 445 631 (large)
13 445 630 (small)

Pleasant supporting surface for the hands
Large stage insert, diameter 120mm

Transmitted-light stands

Stock no. 10 445 387 (bright field)
13 445 363 (bright-/dark field)

Pleasant supporting surface for the hands
Large stage insert, diameter 120mm. Long overhang (120mm) between column and optical axis.
Comfortable manipulation of larger objects.

Comfortable stages

Stock no. 10 446 301 **Gliding stage**

Makes it easier to manipulate the object.
Careful displacement of the object.
Usable on incident- and transmitted-light stands, with black/white stage insert, glass stage plate or cup stage.

Stock no. 10 446 303 **Cup stage**

A holder for petri dishes.
Rubber surface for pinning plant and insect specimens.
The stage is tiltable, facilitating the observation of spatial objects from all sides.

Ergonomic outfits

LEICA MZ6 stereomicroscope with ErgoWedge™ 5° - 25°,
positions 25° and 5°

ErgoTube™
10° - 50°

ErgoWedge™
5° - 25°

Ergo-Module™ 30 bis 120mm

ErgoWedge™ ±15°

LEICA MS5 stereomicroscope with ErgoModule™ 50mm

LEICA MZ6 stereomicroscope with ErgoTube™ 45°

LEICA MZ12 stereomicroscope with trinocular video-/phototube