Your Vision – Our Mission

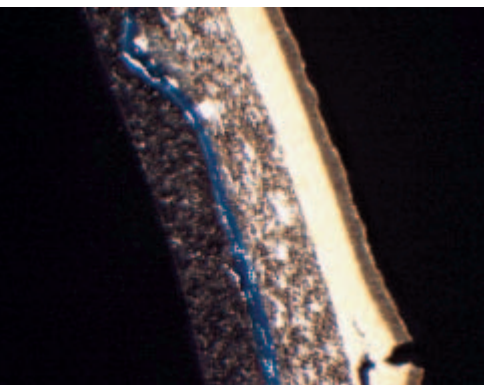
High-tech stereomicroscopes Leica MZ16 and MZ16 A

Global Innovations: see 0.6-micron structures, save 80% more time, motorized zoom, automatic measurement

Leica
MICROSYSTEMS

From Vision to Reality

C. elegans: mutated male tail section, visual magnification of 230×



Forensic analysis of a car-paint cross-section, visual magnification of 230×

Visions are the gears of progress. They bring human creativity and innovation to blossom and prepare the world for the future. Mankind's courage for vision, intelligence, idealism and will have taken us to the moon, brought global communication to the world and given us the ability to transplant human body parts to save lives. Glancing into the laboratories of scientists and engineers gives us a glimpse of future visions of hope. With the decoding of the human genome, for example, medical professionals see great opportunity for being able to better understand and one day find solutions to illnesses like cancer, Alzheimer's and Parkinson's disease. In the largest research laboratory of the world, the ISS, scientists are growing perfect crystals using microgravitation, which may lead to new medicines, materials and electronic products. Even the revolutionary vision of one day returning the ability to walk to disabled patients by implanting nanosize microchips is beginning to take shape thanks to the interdisciplinary collaboration of technology and science.

The road there

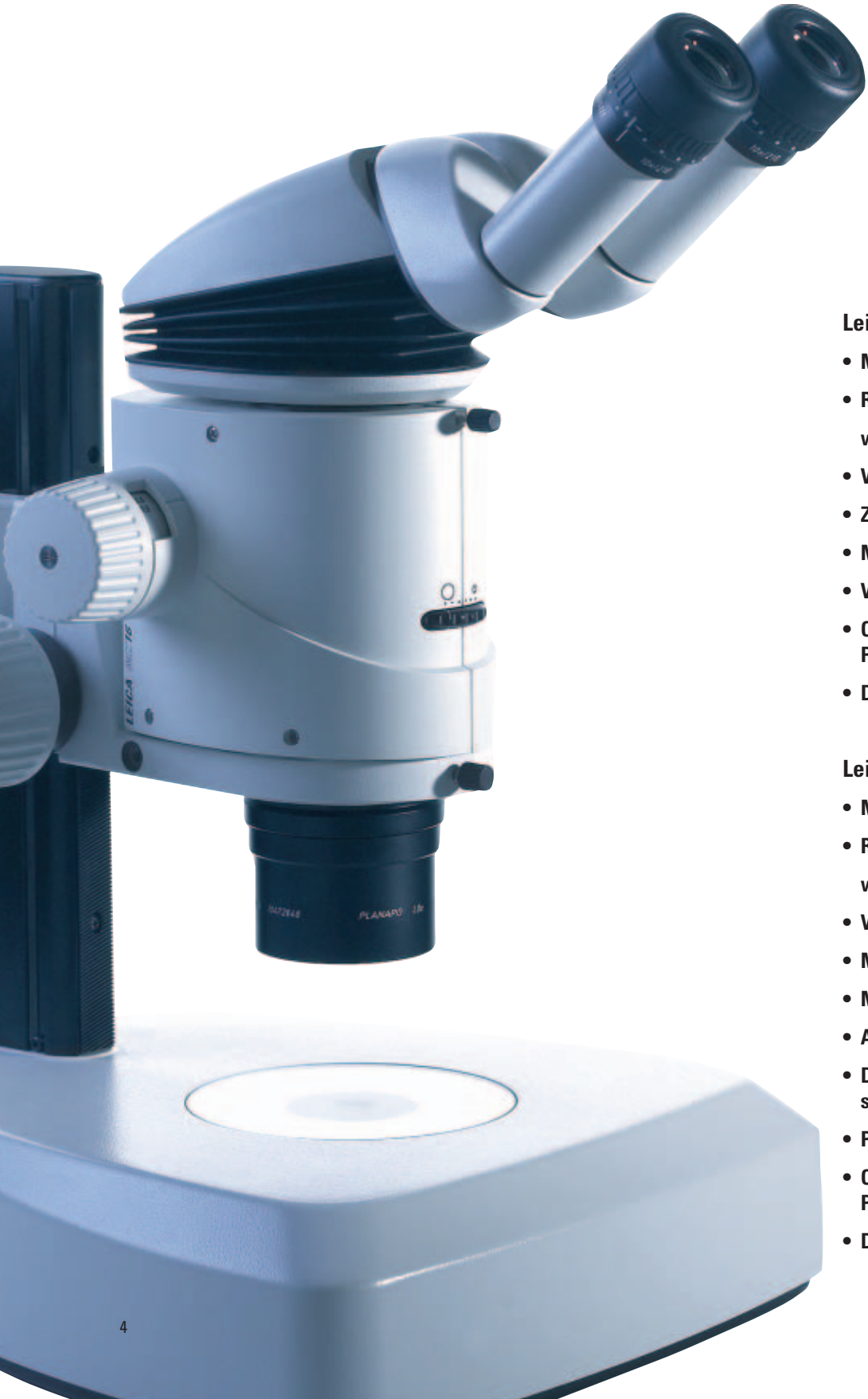
Turning visions into realities requires a tool. Not to mention hands that understand how to use it successfully. What ever your visions are—whether you want to turn human dreams into reality or make life for us more comfortable, safer and more enjoyable in small steps—we at Leica Microsystems feel a certain commitment, and a chance, to participate. We are convinced that you can take great steps toward your goals with the world's first stereomicroscope with motorized zooming and the highest resolution in stereomicroscopy. And the greatest thing about working with the new stereomicroscopes? You can observe, prepare and manipulate living, intact specimens in a wide field of vision, three-dimensionally and with a great depth of field, and then, using the same device, immediately analyze details and reactions at a resolution of 840 line pairs/mm and at 230x magnification. For the first time ever, 0.6-micron structures can now be observed with a stereomicroscope. Laboratory trials using the Leica MZ16 and MZ16 A stereomicroscopes have shown that the processes of presorting, classifying, characterizing, and analyzing can take one-fifth the time they used to. Let yourself be convinced of how much time you will gain for important things, thanks to motorized functions. Leica MZ16 A —bringing your vision of the future to the present.

"Visions are nothing more than strategies for action. Not only do we need courage for such visions, we also need the strength and the will to bring them into being."
Professor Dr. Roman Herzog, 6th President of the Federal Republic of Germany


N
ISSION

The Vision:

Viewing Down to 0.6 Micron



RESOLUTION

RE

Leica MZ16 highlights:

- Magnification with 2 × PlanApo objective 230×
- Resolution of 840 Lp/mm
  with 2× PlanApo objective
- Visible structural widths 600 nm
- Zoom 16:1
- Motorized focus (optional)
- Variable ErgoTube™
- Objective nosepiece for 1× and 2× PlanApo objectives, parafocal
- Double iris diaphragm

Leica MZ16 A highlights:

- Magnification with 2× PlanApo objective 230×
- Resolution of 840 Lp/mm
  with 2× PlanApo objective
- Visible structural widths 600 nm
- Motorized zoom 16:1
- Motorized focus (optional)
- Auto-functions: automatic measurement
- Display: magnification, measuring sections, selection menu
- PC transfer
- Objective nosepiece for 1× and 2× PlanApo objectives, parafocal
- Double iris diaphragm

TIME

T

SOLUTION

IME

Learning from a fly

Since Thomas H. Morgan, the father of gene research (1933 Nobel Prize in Medicine), brought the drosophila into his laboratory in 1908, this fruit fly has become one of the most genetically studied, completely sequenced organisms ever. In many cases, its genes coincide with the genes of humans. This is why the drosophila offers an ideal model for studying gene functions and diseases in humans.

The illustration here shows the rope-ladder nervous system of the embryo of the drosophila melanogaster fruit fly. In the early stages of embryonic development, the neural stem cells and neuroblasts delaminate and produce daughter cells. With the Leica MZ16 and MZ16 A, you can see every individual 1.2 to 1.4-micron-sized neuron. Researchers want to clarify how the neuroblasts and their daughter cells receive (specification) and specify (differentiation) their individual identities. Using various marker techniques, an antibody in this illustration, individual cells of the embryonic central nervous system and their cell progenitors are characterized by their specific gene expression samples.

Viewing expressed genes

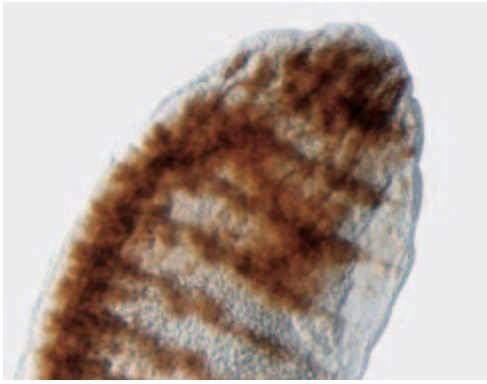
More than half of the known human genes that, in mutated form, cause disease are conserved in the drosophila genome. Understanding the biological development processes and their evolution is of practical importance for basic biomedical research. With in-situ hybridization (ISH), researchers can observe nucleic acid sequences in the biological specimen directly, as well as when and where a gene is activated/expressed. The illustration here shows the stomach through ISH. The new Leica MZ16 and MZ16 A stereomicroscopes offer excellent observation of the gene expression at high resolution, great field of depth and excellent contrast.

Microscopic helpers in the search for oil

In micropaleontology, minute skeletons of prehistoric organisms play an important role as guiding fossils for recognizing oil deposits in the Earth. Trial drillings provide samples that are analyzed mineralogically and geochemically. Their fossil contents are paleontologically examined to determine the ages and chronology of the rock layers.

Observe the microfossils that were documented using a Leica MZ16 and a Leica DC500 digital camera. These minute 1.5-micron microstructures, which are used to determine an age and assign it to a period of time in the history of the Earth, are clearly visible. They teach us the exciting history of the oceans, the continents and the climate 60 – 70 million years ago and provide clues to potential oil deposits.

Rope-ladder nervous system of a drosophila embryo, expressed by antibodies.



Each individual 1.2 to 1.4-micron-sized neuron is visible at 230x magnification

Drosophila, expression sample from genes represented through in-situ hybridization

Microfossils: These microstructures, which are about 1.5 microns in size, are clearly observable

Leica Design by Christophe Apothéloz

ERG

ERGONOMICS

The Vision:

Cutting Time by 80%

TIME

TIME

230× magnification

Never before was it possible to observe three-dimensional objects with a stereomicroscope at 230x magnification at resolutions as high as those offered by the new Leica MZ16 and MZ16 A stereomicroscopes. With the objective nosepiece, objects can be sampled in very little time within a magnification range of 7.1× to 230× at a resolution of up to 840 Lp/mm. This can save you very much time, for example, when selecting gene-manipulated C. elegans, because you no longer have to switch to a light-microscope with interference contrast to accurately identify the mutated tail sections (see image on page 2).

Motorized functions—bringing new meaning to ergonomics

The vision of through-and-through ergonomic stereomicroscopes is a reality at Leica Microsystems. The new Leica MZ16 A is the first stereomicroscope with motorized zooming, which, like the optional motorized focussing system, can be controlled easily, very quickly and precisely—with fine, gentle finger movements, using the feet, or controlled by a computer. This lets you drive from the lowest to the highest zoom factor, including 11 preset and 5 customizable positions, at maximum tempo. For you, this means saving time and energy, and becoming more productive than ever before possible.

ONOMICS

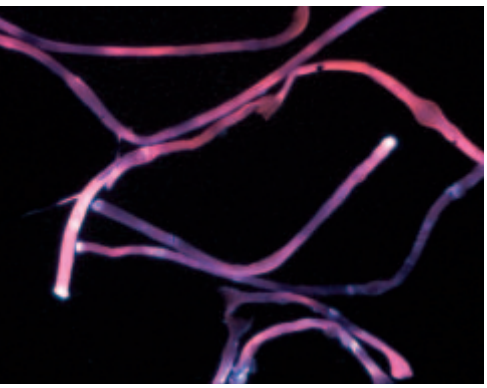
Digital display

The Leica MZ16 A is the first stereomicroscope that immediately displays the actual magnification with every zoom adjustment while taking into account the eyepiece, objective, coaxial reflected light and measurements. For example, you can adjust as needed the motorized zoom with ultrahigh precision at high magnifications. Calibration is automatically taken care of by the system.

Automatic measurement

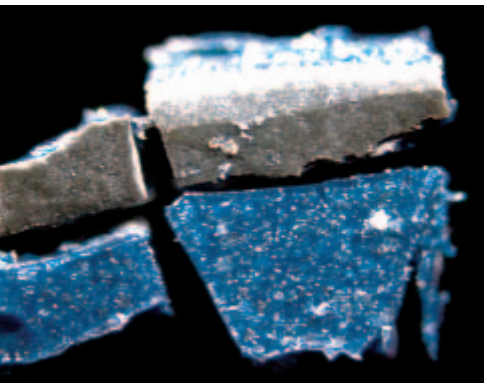
You adjust the magnification so that the desired line segment in the object corresponds to the reference distance in the eyepiece—Leica MZ16 A immediately displays the measurement in mm, inches or thousandths of an inch. It is that easy.

A Clue for Every Crime



Polyester fibers in blue fluorescence excited by the Leica fluorescence module

Animal hair with suspicious blood stuck to it



Paint particles, left: incriminated, right: original material

The search for clues with adhesive strips

A taxi is on the sidewalk. Just behind it lies a dead man on his side. The driver's window is shattered and shards of glass, coins and a deformed bullet are scattered on the pavement. Police fence off the area around the site. Cameras flash. Specialists in white overalls pack small and even tiny particles into plastic bags, collect splattered blood samples and make molds of footprints. The position of each item of evidence is recorded with meticulous accuracy, numbered, sketched and photographed. Trace evidence is gathered from every millimeter of the victim and the area using a special particle lifting tape, because, of all the microtraces gathered, fibers from clothing or hair can eventually determine the murderer. Of all the material evidence collected, fibers and hair have very high value.

Police inspector with a microscope

Examining the particle lifting tape and sorting the microtraces gathered at the scene of the crime takes place in a forensic laboratory using a stereomicroscope (reflected light, polarization, fluorescence). This is because an overview and a large field of vision, a three-dimensional image and a great field depth range are necessary during the first stages of the examination. Furthermore this often time-consuming, tedious task requires exceptional accuracy, as the results of the examinations, comparisons and analyses carry great weight in discovering the truth—guilty or not guilty. An advantage to this phase is that it has been improved and shortened significantly with the new Leica MZ16 and MZ16 A stereomicroscopes. The vegetable, animal and chemical fibers that come into question can be more accurately and more quickly identified—before high technologies, like microspectral photometry, Fourier-transformed infrared spectroscopy (FTIR), chromatography and scanning electronmicroscopy (SEM), come into the process.

In the end, there is a testimonial report that contains and photographically documents all examinations from the very beginning, and which now can provide either an incriminatory or non-incriminatory examination result.

B

FORENS

FORENSIC

Of Mice and Men

BIOMED

Biomedical research examines complex development stages and their influences on model organisms like worms, flies and mice. While these forms of life may at first appear to have nothing in common with humans, geneticists continue to find increasing numbers of segments of their genetic information that have lasted unchanged through millions of years of constantly diverging evolution. Programmed in the genetic substance of model organisms are illness-causing genes that are inherited through reproduction. Researchers promise new treatments in the long term for Alzheimer's patients and patients who suffer from chronic pain.

Caenorhabditis Elegans, the laboratory pet

A particular success in the story of genetics is this discrete, just one-millimeter long ground-dweller. Its 19,099 genes were the first of any animal genome to be completely sequenced. The fact that the structure of about every other gene belonging to this worm shows stark similarities to human genes gives great importance to the study of this living laboratory animal. The male C. elegans illustrated is bound to help researchers understand the Kallmann syndrome. The main characteristics of the Kallmann syndrome are genetically conditioned hypogonadotropic hypogonadism (delayed puberty due to decreased hormonal functions of the gonads) and anosmia (the loss of the sense of smell). Via targeted insertion of defective genes in the worm experiment, researchers now hope to get to the bottom of the molecular mechanism responsible for this defect. With the new Leica MZ16 and MZ16 A stereomicroscopes, the mutant genes can be classified five times faster than before.

The mouse: A close relative

Medical research places much hope in the mouse Mus musculus, as it possesses highly concentrated hereditary dispositions closely related to those of humans. Its genome is not much smaller than the human genome. The classic example for a highly concentrated gene is "Pax 6", which plays a central role in the control of eye development. It is identical in humans, mice and drosophila. The more gene sequences become known, the clearer it becomes which hereditary dispositions are responsible for congenital developmental disorders.

Categorizing mutants in overview, 230x magnification, see page 2

Complete view of Mus musculus

Details of the lens eye visible at a larger field of depth

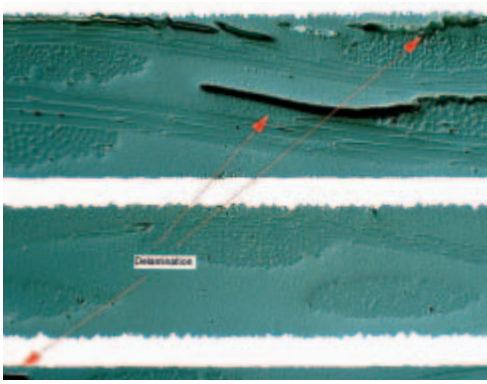
IN

INFORMATION

The Vision:

12 Million Pieces of Information

These days, there are no more scientists who sit alone, pondering in their quiet laboratories. Our scientific community now communicates through a global data network faster, and at greater distances, than ever before. We now can both utilize and make connections between knowledge sources from the entire world at the same time. In the future, ambitious researches from extremely varied fields around the world will work in cooperation and come to new, creative solutions—for the benefit of us all.



EDM board, delamination in first and third layers, 230× visual magnification

Interface to the virtual knowledge exchange

Leica Microsystems is a specialist in two regards— for both optical data gathering and digital data storage. The proof? All of the application images in this brochure were taken using digital camera systems of the Leica DC line of products—without complicated preparation, without loss of time... plug&play with top results. Our assortment of cameras ranges from the standard digital camera for universal use to the high-end camera for scientific microscopy, medicine, biotechnology, metrology, material analysis and quality assurance.

To mention just a few: With true 12 megapixels, the Leica DC500 is the professional digital camera, the superlative for analysis, measurements and advanced processing of high-quality image data. With a resolution of 7.2 megapixels in high-resolution mode, the Leica DC300 is the ideal, all-round camera for professional microscopy. Leica DC300 F (color camera) and DC350 F (black & white) are the specialists for digital fluorescence microscopy.

Gene expression in a chicken embryo

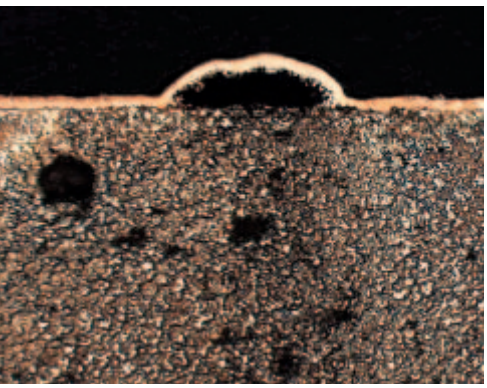
Data for viewing and analysis

Use your digital images for archiving, processing and analysis. Integrate your image data into graphics, image management and image analysis programs like Leica IM1000, QWin, QFish (Leica CW4000) or Materials Workstation. Use the entire spectrum of Leica applications, such as measurement, image compare, time-lapse, image assembly, presentation, Multifocus and many more.

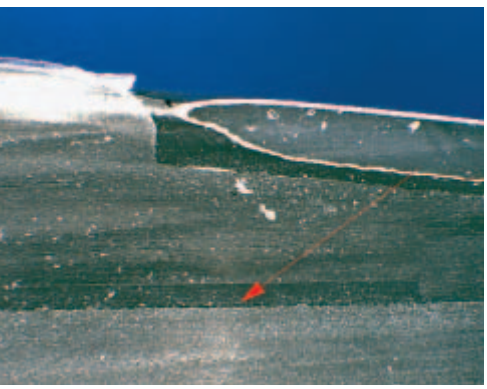
FORMATION

Leica DC300 digital camera system on a
Leica MZ16 A with motorized zooming and motorized focus

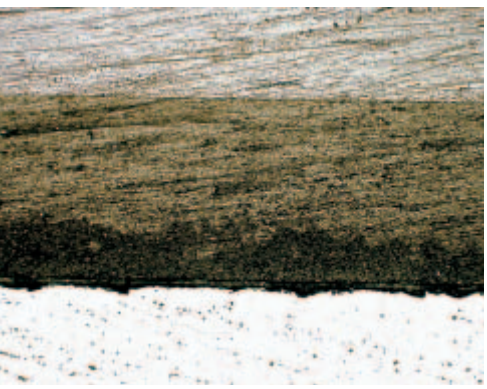
3-liter Automobiles, Lighter Rockets, Faster Airplanes



Cast magnesium, copper coating detachment from base material, visual magnification 230×



Circuit board material: separation in the adhesive layer between glass and plastic



The same material at 230x magnification

Around the world, materials scientists are working with lighter materials and new designs to create lighter and more efficient automobiles. As early as the legendary VW Beetle, 20 kilograms of the lightest of all metal construction materials, magnesium, hit the street. At that time, however, the magnesium alloys failed because of production difficulties and soon were to be forgotten. Today, though, we finally have the knowledge of new methods for processing magnesium alloys.

At this moment, the "new" old material of magnesium is experiencing a renaissance. Because 100 kilograms less in vehicle weight equals about 0.6 liters less fuel for every 100 kilometers, experts prophesy that the light-metal alloy may become the material of the 21st Century. Many are counting on a decrease in the weight of vehicle designs of up to 50 percent, if parts such as the steering column, the steering wheel, the gear casing and the multi-shell intake manifolds are manufactured using this rediscovered, light-construction material. Very recently, development engineers have even been experimenting with a magnesium engine.

The material of the 21st century

The use of magnesium is not limited to the automobile industry. Airplane, train and rocket engineers also see the potential to lower weight and save fuel. Because they are very resistant to catching fire, magnesium alloys can run the gamut of airplane components, all the more so because these metals do not give off any poisonous gases in fire situations. Magnesium is conquering other fields of application like chain saws, bicycles, household devices and cell phone cases and appears to be getting ready to rob plastic of its number 1 rank.

In materials testing, materials examination, damage analysis and research, nondestructive testing processes are needed. With the Leica MZ16 and MZ16 A stereomicroscopes, quality analysis of surfaces, fracture surfaces, polished metal samples and thin sections into the microscopic realm can be accomplished fast, saving significant time.

BIO

NEW MAT

More Resistant, More Efficient, Environmentally Sound

TECH

BIOTECH

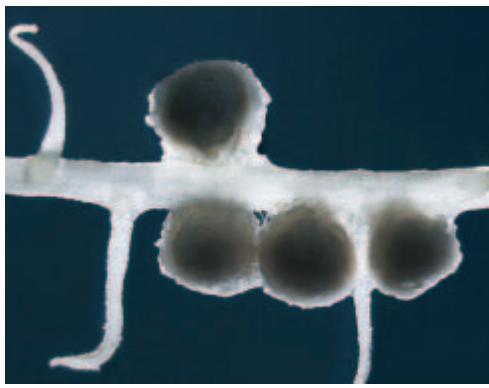
Worldwide, there are more than 800 million undernourished people. Supplying food to a continually growing world population is one of the greatest challenges of the future. "Green" biotechnology is pursuing the goal of breeding grains and vegetables with greater resistance against destructive viruses, insects, fungi, cold and drought. The objects of research are chiefly plant materials, like biological cellular systems. The knowledge gained in recent years can be applied as the fundamental source for new, future-oriented visions. Examples include: food plants that naturally produce herbicides, that endure salt water, droughts and cold, as well as staple foods that fulfill the human vitamin and mineral requirements and protect against disease. An increase, for example, in vitamin A content would protect against blindness in malnourished children.

Growth without fertilizer

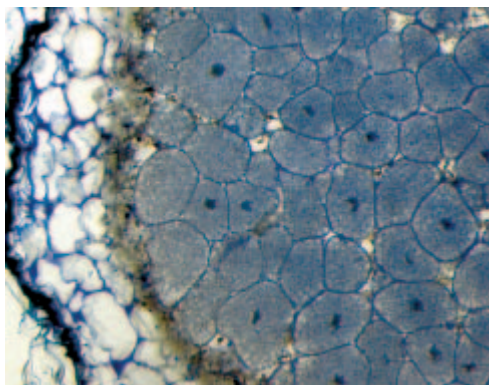
Every hobby gardener knows that many plants cannot thrive well without fertilizer. Fertilizers contain a large portion of nitrogen, a nutrient that plants depend on. Plants, however, are not capable of exploiting the vast amount of nitrogen found in the air. Certain ground bacteria, on the other hand, can. Rhizobia is one such bacteria, with which many plants, such as clover, peas and beans (legumes), share a symbiotic relationship. If we inoculate seedlings with rhizobia, the seedlings grow better because these bacteria are always there to supply them with sufficient nitrogen. During this symbiosis, these plants develop nitrogen-fixating root nodules. Rhizobia establish themselves within the nodules, take the gaseous nitrogen out of the air and convert it into ammonium. This is referred to as biological or symbiotic nitrogen fixation.

Using the Mexican bean as an example, researchers are studying the nitrogen cycle. How are the metabolic mechanisms in the two symbiotic partners interwoven? How are the processing and transport of the fixated nitrogen regulated, thus achieving such a well coordinated cooperative effect? Can these processes be optimized and can the efficiency of nitrogen fixation be increased? Can we design rhizobia phyla that are able to fixate nitrogen more efficiently, thus resulting in improved plant growth without the need for chemical aids? With the new Leica MZ16 and MZ16 A stereomicroscopes, the geometry and shape of the rhizobium in its entirety can be assessed, after which the thin sections can be accurately analyzed at top magnification and resolution.

ERIALS



Root nodules



Plant transport system cross-section

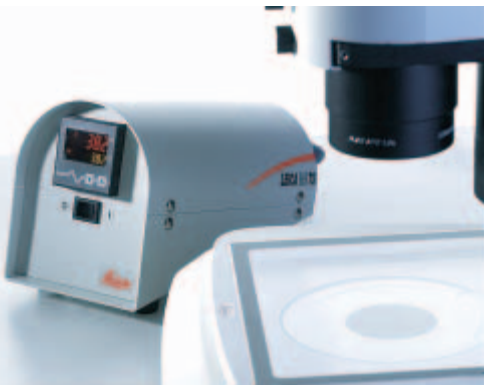
Worldwide innovation: the digital display

The Vision:

Limitless Diversity

Objective nosepiece

Motorized focus



Heating table with control unit

A top-rate stereomicroscope has to be easily adaptable for every application in the field of natural science and technology. You can profit from the vast accessories program for all imaginable analysis, training and documentation tasks—today, or any time later. The following mentions just a few examples. Other modules are listed in the M1-116-1 brochure.

Total information
The objective nosepiece lets you switch from the 1× to the 2× PlanApo objective and back fast, without having to waste time exchanging parts. In no time at all, you can achieve an overview of the entirety of an object in a 29.6 mm field of vision, in relief and with a large depth of field, and then you can accurately inspect details at a maximized 230x magnification and high resolution without having to adjust the focus.

Effortless focussing
Frequently repeated, subtle motory tasks such as focussing place high demands on the musculo-skeletal system. The motorized focussing system lets every apparatus be adjusted up and down effortlessly and provides accurate focussing at high magnification—using hand, foot or computer controls.

Living cells need warmth
Temperature-sensitive samples such as valuable living cells die when the temperature drops. This is a danger dealt with by the Leica Thermocontrol System, MATS. Leica MATS provides life-saving, absolutely uniform temperature across the entire table surface and monitors and controls the temperature reliably.

ODULARITY

Features

DATA

DATA

Optical data	Leica MZ16	Leica MZ16 A
Zoom	16:1 manual	16:1 motorized
Data with standard optics (objective 1× / eyepieces 10×)		
– Zoom range	7.1× – 115×	7.1× – 115×
– Resolution	max. 420 Lp/mm	max. 420 Lp/mm
– Working distance	55 mm (PlanApo), 60 mm (Plan)	55 mm (PlanApo), 60 mm (Plan)
– Field of view	∅ 29.6 mm – 1.8 mm	∅ 29.6 mm – 1.8 mm
Maximum values (based on optics combination)		
– Magnification	920× (max. useful magnification: 280×)	920× (max. useful magnification: 280×)
– Resolution	840 lp/mm	840 lp/mm
– Visible structural width	0.6 micron	0.6 micron
– Numerical aperture	0.14	0.14
– Field of view	∅ 57.5 mm	∅ 57.5 mm
Working distances	135 mm (Plan 0.5×) 112 mm (Plan 0.8×) 97 mm (PlanApo 0.63×) 19 mm (PlanApo 1.6×) 15 mm (PlanApo 2×)	135 mm (Plan 0.5×) 112 mm (Plan 0.8×) 97 mm (PlanApo 0.63×) 19 mm (PlanApo 1.6×) 15 mm (PlanApo 2×)
Optics carrier		
Optic system	CMO (Common Main Objective) lead-free	CMO (Common Main Objective) lead-free
Specific surface resistance (housing)	2 × 10 Ohm/square, discharge time <2 seconds from 1000V to 100V	2 × 10 Ohm/square, discharge time <2 seconds from 1000V to 100V
Motorized zoom		controlled by hand, foot or PC
Digital display		displays the objective, eyepiece magnification, total magnification and measurement values
Automated functions		– computes the total magnification absolute or user-defined – computes the measurements, can be calibrated
Switchable zoom rasters	11 for repetitive tasks	11 for repetitive tasks
Double iris diaphragm for increasing the depth of field	integrated	integrated
Optics carrier rotation in microscope carrier	360°	360°
Accessories		
Standard objective	PlanApo 1×	PlanApo 1×
Additional objectives	PlanApo 2×, PlanApo 1.6×, PlanApo 0.63× Plan 1×, Plan 0.8×, Plan 0.5×	PlanApo 2×, PlanApo 1.6×, PlanApo 0.63× Plan 1×, Plan 0.8×, Plan 0.5×
Objective nosepiece for PlanApo 1× and 2×	quick magnification change 7.1× – 230× parafocal	quick magnification change 7.1× – 230× parafocal
Binocular observation tubes, ergonomic	– apochromatic ErgoTube™ 10° – 50° with synchronous eye distance adjustment – diverse ErgoModule™ (optional)	– apochromatic ErgoTube™ 10° – 50° with synchronous eye distance adjustment – diverse ErgoModule™ (optional)
Eye distance	55 mm – 75 mm	55 mm – 75 mm
Wide-angle eyepieces for spectacle wearers	10×, 16×, 25×, 40× with eyecups	10×, 16×, 25×, 40× with eyecups
Manual rough/fine focus	focusing drive 185 mm, adjustable ease of movement	focusing drive 185 mm, adjustable ease of movement
Motorized focus	controlled by hand, foot or PC	controlled by hand, foot or PC
Microscope carrier AX for stereo or vertical observation	for convergence-free mapping (in progress)	for convergence-free mapping (in progress)
PC connection		via RS232 serial interface

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MICROSYSTEMS