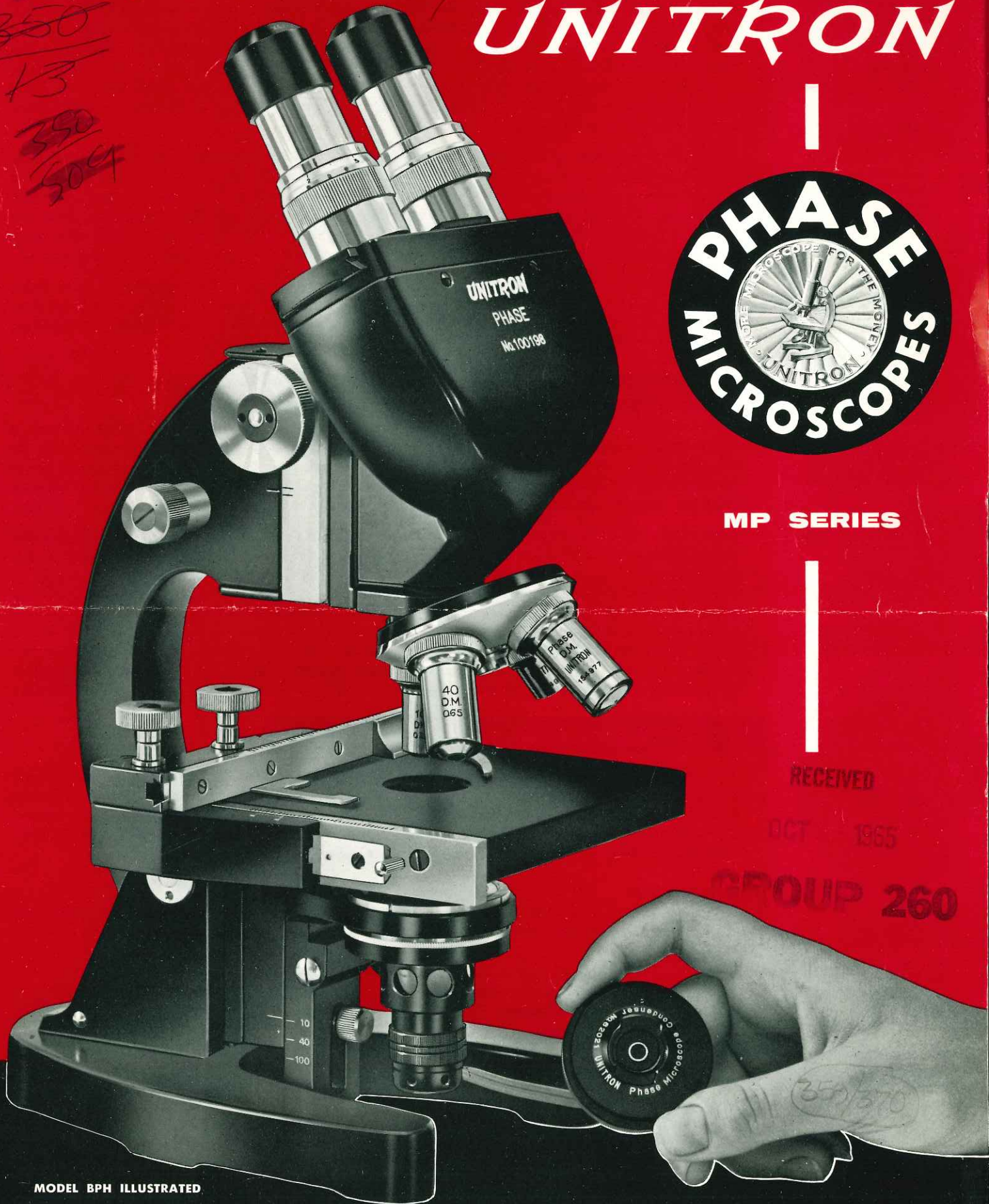
UNITRON

PHASE MICROSCOPES

MP SERIES



MODEL BPH ILLUSTRATED

RECEIVED
OCT 1965
GROUP 260

UNITRON INSTRUMENT CO. MICROSCOPE SALES DIVISION 66 NEEDHAM STREET, NEWTON HIGHLANDS 61, MASS.

THE ADVANTAGES OF PHASE MICROSCOPY

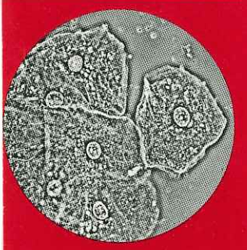
Epithelial cells make an ideal specimen to demonstrate in a dramatic way the advantages of the *phase* microscope as compared with ordinary "brightfield" types. It is easy to prepare a test slide for examination: merely scrape the inside of your cheek with the broad end of a toothpick, add a drop of water, and cap with a coverglass. When the specimen is observed through a conventional microscope, the faint outline of cells may, with luck, be just barely visible in the manner shown in the photomicrograph to the left. Compare this "ghostlike" image with the companion illustration which shows the same image as seen through a UNITRON Phase Microscope. Here, you will agree, all of the cellular details are revealed with startling clarity.



Epithelial cells from the inner lining of the cheek, unstained. *Above:* brightfield view — even with the iris diaphragm closed down, the image is almost invisible. *Below:* as seen through a UNITRON Phase Microscope.

Before the introduction of the phase microscope, highly transparent material such as epithelial cells, and thin microtome sections, were routinely treated with chemical stains as a means of introducing enough *contrast* to make structures visible. But aside from the skill and laborious preparation which the staining technique requires, it has the added disadvantage that it *kills living* specimens. Thus, the opportunity is lost to observe the natural behavior of organisms. Furthermore, the chemicals often react with the specimen to introduce distortions which make even the static, stained picture an unrealistic one.

Now, with the aid of phase contrast, live material and unstained specimens, regardless of their transparency, can be studied in sharp detail without the need for special treatment. Phase microscopy may be thought of as a form of *optical staining:* that is, contrast and visibility is introduced by the *optical system* alone – the specimen itself is not tampered with.





Amoeba Proteus. Unstained animal as seen with a UNITRON Phase Microscope. The brightfield image is too faint to be reproduced.

UNIQUE FEATURES OF UNITRON SERIES MP MODELS

Any phase microscope, of whatever type, uses two essential elements to produce optical staining: a "phase plate" within each objective lens and some form of annular-shaped diaphragm system in the substage of the microscope. With practically all phase microscopes, changing the objective power involves changing a diaphragm as well. Usually, the new diaphragm has to be aligned to the objective using centering screws and a special "centering telescope" eyepiece.

On the other hand, the unique, patented design of the UNITRON MP Models incorporates the essential optical elements in such a way that a single diaphragm serves for all objectives. Time-consuming diaphragm adjustments are completely eliminated. You can use a UNITRON MP Phase Model in exactly the same manner as an ordinary microscope, without the need to learn any new, special technique. Since the exclusive UNITRON system also reduces complexity and manufacturing cost, the MP Series can be sold at prices which are actually below those of many conventional brightfield microscopes which use the same type of stand. Not only are all these advantages obtained without any sacrifice whatsoever in image resolution or mechanical performance, but the UNITRON design offers special features of its very own such as "Continuous-Transition" Microscopy in the Laboratory Models.

APPLICATIONS OF THE PHASE MICROSCOPE

The ease of operation and time-saving features of UNITRON Phase Microscopes make them ideally suited for many ordinary, as well as research, applications in educational, hospital and industrial laboratories. For example, many haemotology labs now routinely use the phase microscope to determine blood counts – formerly, they used the ordinary brightfield microscope in combination with the time-consuming staining process. Other customary applications include:

- **HISTOLOGY**
  examination of unstained, living tissue cultures, cancer cells, spirochetes, serial sections.
- **CYTOLOGY**
  study of isolated cells and their parts: epithelial cells, mascerated muscle cells, and parts of nerve cells and fibers.
- **EMBRYOLOGY and GENETICS**
  observing mitosis, meiosis, spermatozoa and chromosomes.
- **DRUG LABORATORIES**
  composition and dispersion in tablets, adhesive coatings and crystals.
- **SECONDARY SCHOOL LABS**
  to illustrate the phenomenon of living cells in biology, circulatory systems in zoology, plant spores in botany.
- **INDUSTRIAL MICROSCOPY**
  to identify fibers, crystals and droplets; to determine particle size of paints, waxes, films.
- **GEOLOGY**
  combined with polarized light for identification of double refracting materials, inclusions, and refractive indices.
- **FOOD INSPECTION**
  to detect contaminants such as mold spores, fat globules, and adulterant materials.



Head of a Louse. *Above:* brightfield does little more than outline the major structures. *Below:* using UNITRON Phase, hidden internal structures and delicate details become visible.

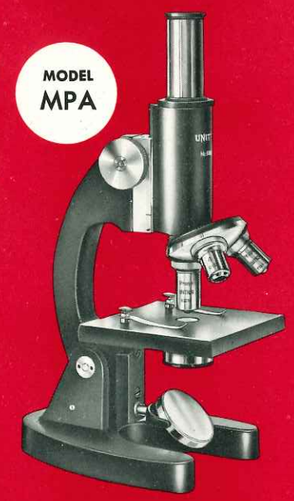


CONTRASTS: All UNITRON Phase Models are available with a choice of two contrasts. In *bright contrast,* specimen details stand out brighter than the background, while in *dark contrast,* the image structure is seen darker than the surrounding material. For general work, using a variety of specimens, both contrasts are equally useful and a choice need not be made when ordering. Research workers who by experience have found one contrast to be more advantageous in some special application may wish to specify their preference. An extra matched set of objectives with the second contrast may be ordered separately when required.

UNITRON

STUDENT PHASE MICROSCOPES

MODEL MPA

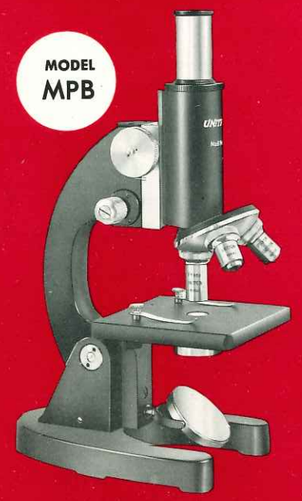




Above: Unscrew the substage annulus for brightfield microscopy. *Below:* Substage lamp of "LV" Auto-Illumination models operates from the variable transformer illustrated on an inside page.



MODEL MPB



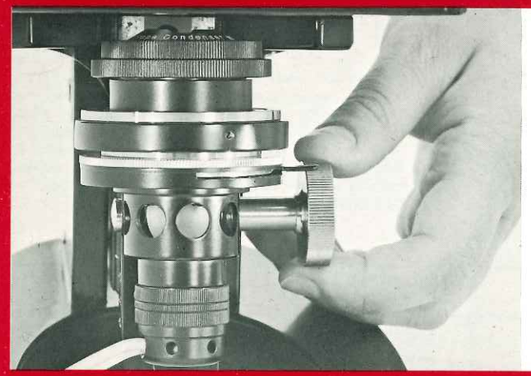
Laboratory work becomes more meaningful, and studies more interesting, when students have an opportunity to see the *living* cell in *action.* Viewing a lifeless, stained specimen, or a washed-out brightfield image is hardly a satisfactory substitute for seeing the rowing oars of the ciliates, the antics of the rotifers, and the slithering motion of the living amoeba. Formerly, the high cost of the phase microscope restricted its use to advanced research. Now, in the words of Professor Julian D. Corrington, "the most important development in light microscopy since oil-immersion objectives is within the reach of amateurs, high schools, colleges, and the average laboratory."

Use of the UNITRON Student Models is by no means limited to the classroom. With the high-dry objectives, minute organisms such as bacteria can be clearly seen without any special preparation of the specimen. The UNITRON Advanced Student Model MPB is in daily use in many medical labs for material which could not be examined as well, if at all, even with costly research microscopes of the brightfield type.

- **EASY TO OPERATE**
From the student's standpoint, the Phase Microscope is "different" only in the sense that, with it, he can observe specimen structures that are invisible under an ordinary microscope. There is no new operating technique to be learned or to be taught.
- **WIDE RANGE OF COATED OPTICS**
The UNITRON Student Models are furnished with three achromatic, parfocal, coated obectives: a brightfield 4X scanning lens and two *phase* objectives (P10X, P20X for MPA Series and P10X, P40X for MPB Series). Using the standard and accessory optics, a magnification of 20X-800X is available.
- **FOR BOTH PHASE AND BRIGHTFIELD**
Merely by unscrewing the substage annulus, a UNITRON Student Phase Model is changed from a phase, to a brightfield, microscope. These instruments are therefore of double value in teaching: use them with your present stained slides (that will continue to be important in many laboratory exercises) and, in addition, let the phase feature serve as the basis for introducing exciting new studies of living material into the teaching program. If control of aperture for brightfield applications is desired, you can obtain an accessory iris diaphragm to screw into the substage condenser. This versatility explains why forward looking schools are gradually replacing their conventional brightfield instruments with UNITRON Phase Models.
- **LOW-POWERED DARKFIELD**
When the phase annulus is used with the 4X non-phase objective, it serves as a darkfield "stop." Teachers have found this feature especially valuable as a means of introducing students to darkfield microscopy without the need to purchase any extra equipment. Low-power reveals in a dramatic way the abundance of life present in a drop of water.
- **SUBSTAGE CONDENSER FOR MAXIMUM RESOLUTION**
A fixed condenser of N.A. 0.65 forms part of the optical equipment of UNITRON Student Models. This professional feature, often lacking in teaching instruments, insures maximum resolution at all magnifications.
- **OPTICS AND MECHANICS OF PROFESSIONAL QUALITY**
As with UNITRON Student Microscopes of other types, the phase models are furnished with the same high-resolution objectives supplied on more expensive medical microscopes – not merely a "student-type," so often used in other brands. The stand, focusing slideways, nosepiece, and other mechanical parts are likewise constructed to the same standards of precision as professional instruments, and furnished with our regular printed guarantee, your assurance of UNITRON quality. Dependable performance can be expected, year after year.
- **TWO STANDS TO CHOOSE FROM**
Two series of models are offered: the Student MPA and the Advanced-Student MPB. The optical quality and phase features of both are identical. The economy MPA Series uses a medium stand with coarse focusing adjustment only, and a P20X as the objective of highest power. In the MPB Series, the large stand is the same size as conventional lab models and is equipped with a fine adjustment to focus the high-dry P40X objective.
- **CHOICE OF STANDARD OR AUTO-ILLUMINATION MODELS**
STANDARD Models are furnished with a plano-concave mirror. Any external light source of sufficient intensity may be used provided that the beam is broad enough to illuminate the substage annulus, completely and evenly. AUTO-ILLUMINATION Models use the UNITRON Low Voltage Substage Illuminator, LLV, in place of the mirror. Since the illuminator maintains perfect alignment, irrespective of the inclination of the stand, highest resolution and perfect results are insured at all times without need for time-consuming adjustments. The external transformer has a 5-position rotary switch to provide correct intensity at all powers, with or without filters, for either visual observation or photography.
- **CHOICE OF HUYGENS, WIDEFIELD, OR ZOOM EYEPIECES**
Student Models are available with a single 10X Huygens eyepiece. More striking views are obtained with the UNITRON 10X Widefield Eyepiece which gives a field diameter about one third greater than the Huygens ocular. For the greatest flexibility in magnification, choose the UNITRON ZOOM Eyepiece which provides *continuous* power from 10X through 20X by the turn of a collar. (Refer to the catalog sheet on the Zoom Eyepiece.)
- **AVAILABLE FOR FREE TEN-DAY TRIAL**
Investigate the advantages of phase microscopy in your own teaching program. Request a free ten-day trial at no cost or obligation to you, or your school. We should be glad to send one or more models with eyepieces of different types for your critical evaluation.

TURN TO THE BACK PAGE FOR SPECIFICATIONS AND PRICE LIST

UNITRON LABORATORY PHASE AUTO



"CONTINOUS-TRANSITION" MICROSCOPY

PHASE CONTRAST → BRIGHTFIELD → DARKFIELD

The UNITRON Laboratory Models MPH and BPH offer *more* than just the advantages of phase contrast images. Merely by turning the knob which focuses the condenser, you obtain a *continuous transition* from phase, to brightfield, and (except with the 100X objective) to darkfield microscopy. Intermediate positions of the condenser also prove useful in revealing hidden details in specimen structure. Even polarized light is available by using accessory filters. With a UNITRON Laboratory Phase Microscope at your disposal you have in a *single* versatile instrument, the means of observing a specimen using the most important techniques of microscopy, all in rapid succession.

OTHER OUTSTANDING FEATURES INCLUDE —

• EASY TO USE

The operating technique is essentially the same as for the familiar brightfield microscope. There are no substage annuli to change or align. Both the phase optical system, and the integral illuminator, are built into the stand and remain in perfect and permanent optical alignment. To obtain a phase image with any objective, merely set the condenser at the correct, pre-calibrated height as indicated by a scale engraved on the condenser bracket — it's as easy as that!

• FULL RANGE OF COATED OPTICS

The UNITRON Laboratory Models come complete with four achromatic, parfocal, coated objectives: three phase objectives — P10X (N.A. 0.25), P40X (N.A. 0.65), P100X (N.A. 1.25) oil immersion — and a brightfield 4X (N.A. 0.15) scanning lens. Using the standard and accessory eyepieces, a magnification range of 20X-2000X is available.

• BUILT-IN ILLUMINATOR ELIMINATES GUESSWORK

Correct illumination is essential for optimum performance with any type of microscope. It is especially important for phase if highest image resolution is to be achieved. The illuminator supplied with the Laboratory Auto-Illumination Models is especially engineered for UNITRON'S "Continuous-Transition" Phase Condenser to provide maximum resolution and even, full-field illumination at all powers, for all types of microscopy. Perfect alignment is maintained even when the stand is inclined. A 5-position transformer provides a wide range of light intensities for both visual observation and photomicrography, with or without filters. There is even ample intensity to allow brightfield microprojection, for making drawings, and to provide for work with polarized light. An eyepiece projection prism and polarizing filters are offered as optional accessories.

• CONVERTS TO STANDARD BRIGHTFIELD FOR MEDICAL SCHOOL REQUIREMENTS

While many medical and dental schools are now beginning to recommend phase microscopes for student use, a brightfield type is normally specified because of the usual high cost of phase equipment. Using "Continuous-Transition" Microscopy, there are many positions of the condenser which provide brightfield images. However, a medical school might require, for purposes of uniform teaching, that all students use the same kind of equipment. To provide for situations of this type, a UNITRON Laboratory Phase Microscope may be converted *instantly* to a conventional laboratory brightfield medical model merely by unscrewing the condenser annulus.

• SPECIAL LONG WORKING DISTANCE CONDENSER

The unique design of the UNITRON condenser provides long working distances for examining preparations enclosed in culture dishes. For example, using the P10X objective, a phase image can be produced with the specimen raised as much as 16mm. above the normal stage height.

• FULLY-EQUIPPED MONOCULAR STAND

The course focusing mechanism uses a diagonal-cut rack and pinion. Counter-rotation of the knobs is all that is needed to adjust the tension to suit individual preference. The dual fine focus knobs provide sensitive control even at the very highest powers. To prevent damage, this mechanism disengages if the objective should contact the slide. A graduated drawtube aids in calibration during measurements with micrometer reticles and also permits adjustment of the tube length to compensate for cover glasses and preparations of non-standard thickness. Positioning of the slide is made with speed and ease using the micrometric mechanical stage controls. In brief, the stand offers every convenience for advanced microscopy.

• SPECIAL FEATURES OF THE BINOCULAR MODEL

The binocular body is inclined 30° for maximum comfort while observing. An interpupillary-distance adjustment and a diopter collar provide for differences in individual vision. All prisms are anti-reflection coated to enhance contrast. An accessory monocular body, with graduated drawtube, is supplied as standard equipment for use in photomicrography, projection, and for accurate measurements. The built-in mechanical stage is of the graduated type, reading to 0.1mm. using verniers. Binocular models have a fine focus with a drum calibrated in 2 micron intervals for measuring specimen depth.

• WIDEFIELD AND ZOOM MODELS

The Monocular Model is available with either a Widefield 10X Eyepiece or the new UNITRON ZOOM Eyepiece. The Binocular Model is furnished with a set of paired Widefield 10X oculars. The widefield design gives a field diameter about one third greater than the usual Huygens type and has a built-in, focusable cell to accommodate micrometer reticles. The UNITRON ZOOM Eyepiece provides *continuous* magnifications from 10X through 20X by an effortless turn of the zoom collar. This eyepiece is described in detail in a separate catalog sheet.

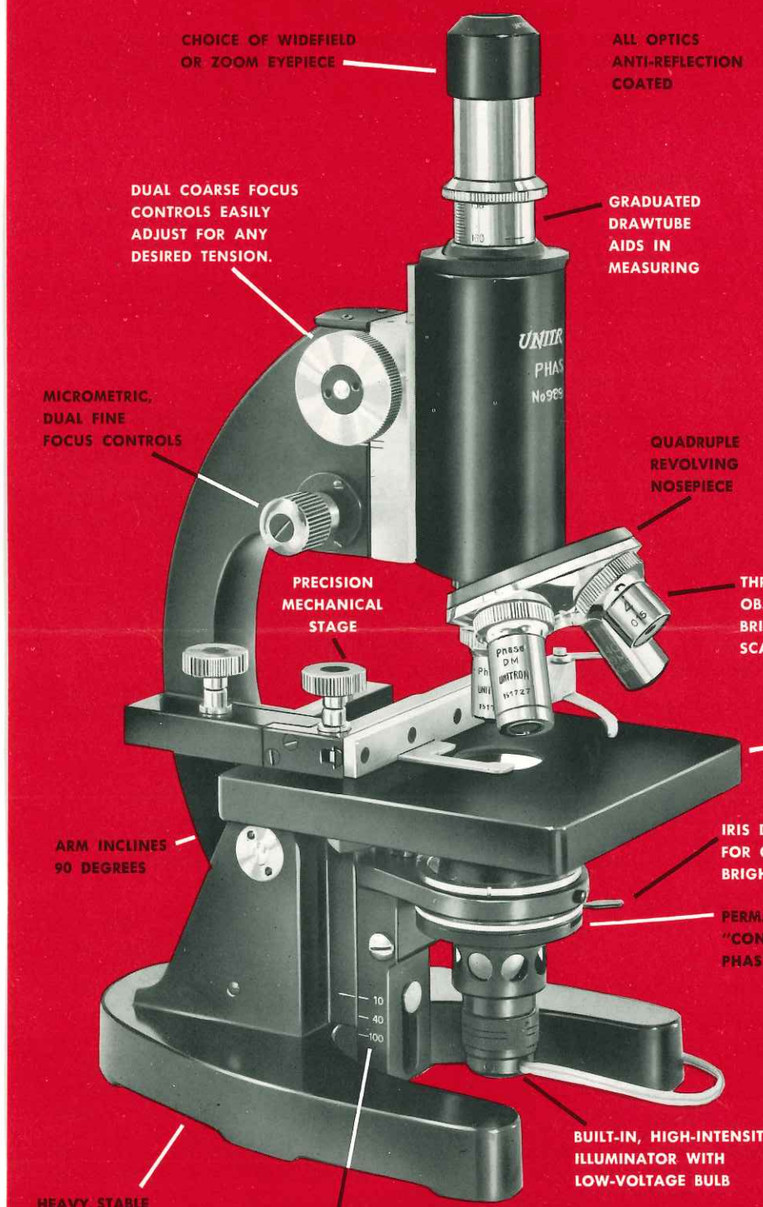
• FOR COLLEGES, MEDICAL USE, INDUSTRY AND RESEARCH

The UNITRON Laboratory Phase Models are recommended not only for phase microscopy, but for any application which calls for a general purpose, oil immersion microscope. The versatility of "Continuous-Transition" Microscopy — including phase, brightfield, and darkfield — is available for little more than the cost of an ordinary brightfield auto-illumination model.

• AVAILABLE FOR FREE TEN-DAY TRIAL

A short demonstration gives you only thirty minutes to examine a microscope . . . hardly the best conditions for a critical appraisal. Using UNITRON'S free ten-day trial, you can prove to yourself the value of "Continuous-Transition" Microscopy in your own work *before* you decide to purchase.

LUMINATION MODELS offer many unique features





When the phase annulus is unscrewed, the UNITRON Laboratory Phase Models convert to microscopes of the familiar medical type and the iris diaphragm may be used in the usual manner. The top element in the condenser unit consists of a removable holder for filters.

ZOOM EYEPIECE (10X thru 20X)

ALSO INCLUDED —

- Green Filter
- Stage Clips
- Spare Bulbs
- Plastic Dustcover
- Wooden Cabinet



TURN TO THE BACK PAGE FOR SPECIFICATIONS AND PRICES

SPECIFICATIONS and PRICE LIST for UNITRON "MP" PHASE MODELS



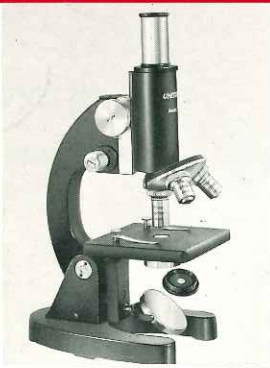
STUDENT SERIES MPA

SPECIFICATIONS — Three coated, achromatic objectives: 4X (non-phase, N.A. 0.15), phase P10X (N.A. 0.25) and P20X (N.A. 0.45); medium stand inclinable through 90°; triple revolving nosepiece; focusing by diagonal-cut rack and pinion; built-in safety focusing stop; stage 100x100mm with stage clips; fixed, single-lens condenser (N.A. 0.65) with phase annulus removable for brightfield observation; plano-concave mirror; wooden cabinet and dustcover. Choice of bright or dark contrast.

EYEPIECE INCLUDED	STANDARD MODELS	AUTO-ILLUMINATION MODELS
Huygens 10X Widefield 10X Zoom (10X-20X)	MPA-HG ....**$99** MPA-WF....$104.50 MPA-ZM....$119.00	MPA-LV-HG ... **$125** MPA-LV-WF.....$130.50 MPA-LV-ZM.....$145.00

ADDITIONAL ACCESSORIES FOR ALL STUDENT MODELS

- Mechanical stage, Model STA.....$14.75
- Iris Diaphragm: with filter holder and daylight filter..... 10.00
- 5X Huygens Eyepiece..... 4.50
- Bulbs, Auto-illumination Models: Type VLL.....per dozen 6.00



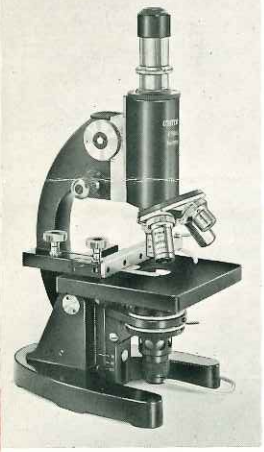
ADVANCED–STUDENT SERIES MPB

SPECIFICATIONS — Three coated, achromatic objectives: 4X (non-phase, N.A. 0.15), phase P10X (N.A. 0.25) and P40X (N.A. 0.65); large stand inclinable through 90°; triple revolving nosepiece; coarse focusing by diagonal-cut rack and pinion; fine focusing by micrometer screw; built-in safety focusing stop; stage 115x115mm. with stage clips; fixed, single-lens condenser (N.A. 0.65) with phase annulus removable for brightfield observation; plano-concave mirror; wooden cabinet and dustcover. Choice of bright or dark contrast.

EYEPIECE INCLUDED	STANDARD MODELS	AUTO-ILLUMINATION MODELS
Huygens 10X Widefield 10X Zoom (10X-20X)	MPB-HG ..**$167** MPB-WF....$172.50 MPB-ZM....$187.00	MPB-LV-HG ....**$193** MPB-LV-WF.....$198.50 MPB-LV-ZM.....$213.00

NOTE: Where illumination requirements are less critical, the UNITRON 110 Volt Substage Illuminator, Model LHC, offers adequate intensity for general use. It is available for the STANDARD Models in place of the plano-concave mirror at an additional cost of $7.00.

(Additional eyepieces available for all models)



MONOCULAR LAB MODEL MPH

SPECIFICATIONS — Four coated achromatic objectives: 4X (non-phase, N.A. 0.15), phase P10X (N.A. 0.25), P40X (N.A. 0.65), and P100X (N.A. 1.25) oil immersion; monocular body with graduated, adjustable drawtube; large stand inclinable through 90°; quadruple revolving nosepiece; coarse focusing by diagonal-cut rack and pinion; fine focusing by micrometer screw; detachable mechanical stage; phase condenser (N.A. 1.2) for "Continuous-Transition" Microscopy, focusable by rack and pinion, with removable phase annulus, and iris diaphragm for brightfield applications; filter holder and green filter; built-in illuminating system with 5-intensity transformer (115 volts AC); 6 spare bulbs; stage clips; wooden cabinet and dustcover. Choice of bright or dark contrast.

MODEL MPH: with Widefield W10X Eyepiece.....$315

MODEL MPH-ZM: with ZOOM (10X thru 20X) Eyepiece.....$328.00

- Polarizing Accessories: Polarizer and analyzer, type PMP.. 8.75
- Replacement Bulbs: Type EL-2B.....Per dozen 6.00
- For graduations on mechanical stage, extra cost..... 6.00



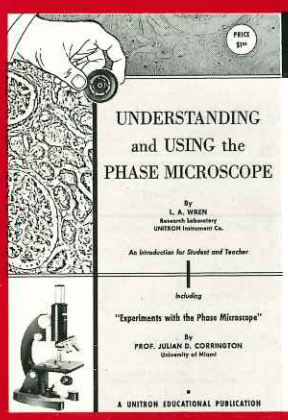
BINOCULAR LAB MODEL BPH

SPECIFICATIONS — Four coated achromatic objectives: 4X (non-phase N.A. 0.15), phase P10X (N.A. 0.25), P40X (N.A. 0.65), and P100X (N.A. 1.25) oil immersion; binocular body with interpupillary and diopter adjustments; supplementary monocular body for photomicrography, with graduated adjustable drawtube; large stand inclinable through 90°, quadruple revolving nosepiece; coarse focusing by diagonal-cut rack and pinion; micrometric fine focusing graduated in units of 2 microns; built-in graduated mechanical stage reading to 0.1mm. by vernier; phase condenser (N.A. 1.2 for "Continuous-Transition" Microscopy, focusable by rack and pinion, with removable phase annulus, and iris diaphragm for brightfield applications; filter holder and green filter; built-in illuminating system with 5-intensity transformer (115 volts AC); 6 spare bulbs; stage clips; wooden cabinet and dustcover. Choice of bright or dark contrast.

MODEL BPH: As above, with paired Widefield Eyepieces.....$527

- Set of paired Periplan Bi-P15X Eyepieces for BPH $14.00
- Set of paired Compensating Bi-K20X Eyepieces for BPH..... 32.00
- Polarizing Accessories: Use with monocular tube, type PMP..... 8.75
- Replacement Bulbs: Type EL-2B .....Per dozen 6.00

Prices quoted are f.o.b. Newton Highlands and are subject to quantity discounts.



INTRODUCTORY BOOK ON PHASE MICROSCOPY AVAILABLE

Since the subject of phase microscopy is relatively new, information is often missing from the usual textbooks. To introduce this important development to the teacher, laboratory worker, and amateur scientist, UNITRON has published a profusely illustrated, 64-page booklet on **Understanding and Using the Phase Microscope.** No extensive knowledge of optics or microscopy is presupposed — the necessary fundamentals are explained and illustrated by experiments that you, the reader, can perform. In addition to providing an easily understood explanation of how the phase microscope works, the book also covers related topics including brightfield, darkfield, and polarized light microscopy, the interference theory of microscope image formation, etc. To guide you in using the phase microscope to best advantage, there is a special section on "Experiments with the Phase Microscope" written by Professor Julian D. Corrington, author of many well-known books and articles.

A copy of **Understanding and Using the Phase Microscope** is included with each UNITRON MP Phase Model without charge. The booklet is also available separately at the modest price of only $1.00 and the cost will be credited to you if you later decide to purchase an instrument.

UNITRON Inverted Phase Models for advanced research are described in separate catalogs available on request.

Printed in U.S.A.

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