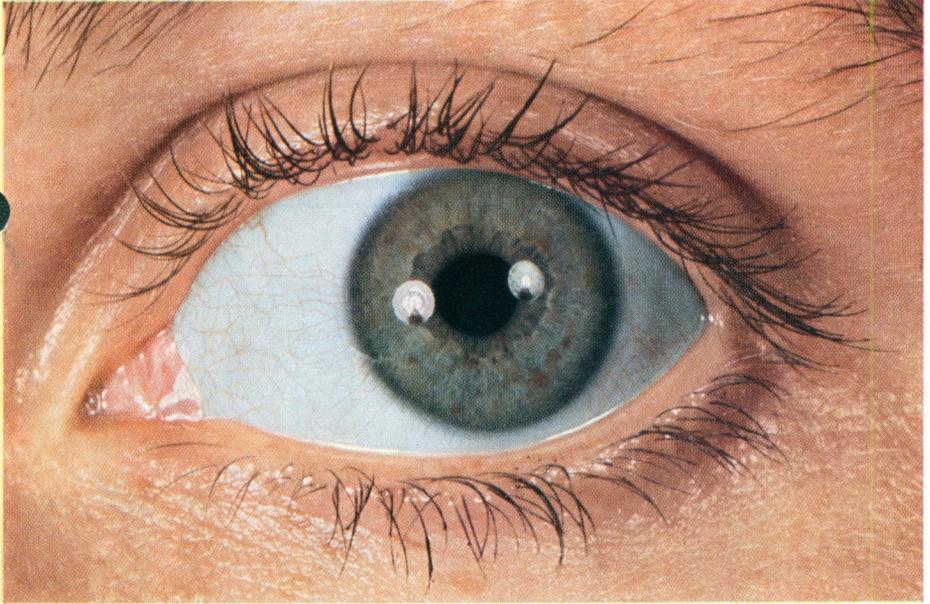




VICTOR HASSELBLAD AB  
SWEDEN

## MEDICAL PHOTOGRAPHY



Photography is today playing an extensive and important role in the medical field. Its applications include: photography of surgery recording the progress and care of diseases, documenting therapeutic results, identification purposes and photographing microscopic specimens. The most extensive use of photography is found in medical research and medical education. The expanding scope of modern medicine and concomitant demand for more highly trained doctors, nurses and attendants has been the inducement of new instructional methods in this field. Consequently, photography, motion pictures and

television have been found to be the ideal means of teaching medical science. Private doctors and dentists depend upon photography as an aid in registering their patients or as an unmistakable method of recording a patient's case history. Medical photography is a complete field in itself, in many ways different from regular photography. As a result of this, the biological photographer faces his own and other special problems. This pamphlet will explain how many problems in medical photography can be solved with the simplest conceivable equipment — a single camera.

## THE MAJOR REQUIREMENTS OF SUCH A CAMERA FOR MEDICAL PHOTOGRAPHY FOLLOW:

### Ease of handling

Frequently, trained photographers are not available, and regular hospital personnel must quickly learn how to handle the equipment.

### Instant readiness for any situation

Black and white color pictures frequently must be taken in sequence and then the camera may be needed for photographing an x-ray picture on cut film. The camera just can't be "tied up" to a particular type of film or one film size.

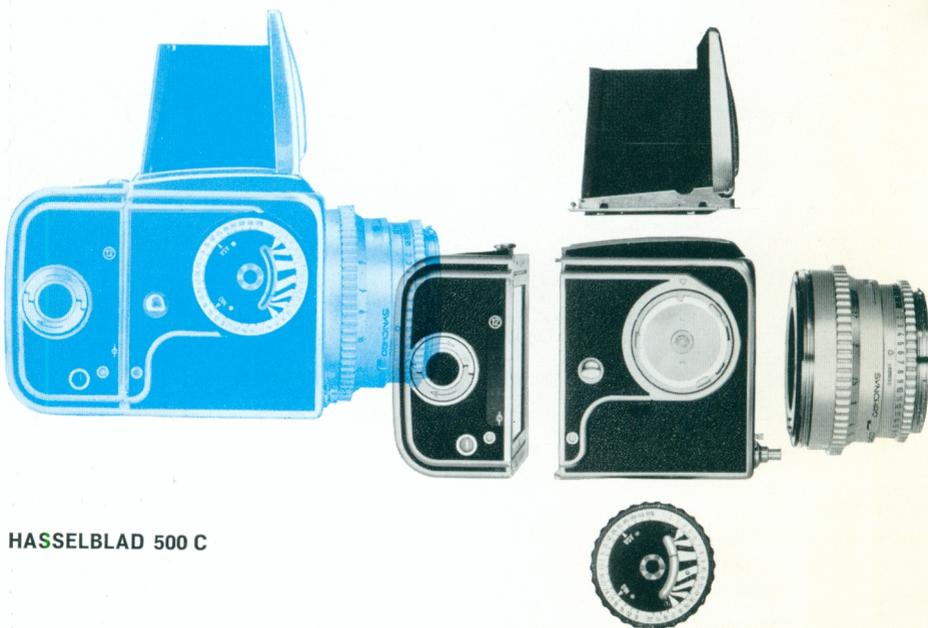
### Virtually limitless versatility

The camera must offer the possibility of adding all needed accessories to accommodate the most advanced requirements — from extreme wide-angle interiors to micro-photography.

### Reliability

Medical cameras must be of such quality that infallible dependability is assured. Medical personnel demand photographic equipment that meets the same exacting standards as their medical equipment.

These exacting requirements are the reasons why the Hasselblad camera system is being used more often in modern hospitals and research centers.



## HASSELBLAD 500 C

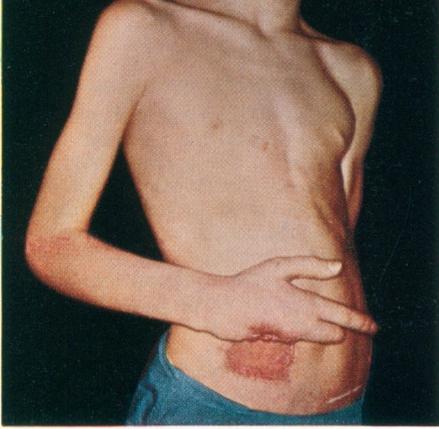
The Hasselblad 500 C camera body — a  $2\frac{1}{4}'' \times 2\frac{1}{4}''$  single-lens reflex camera — is equipped with the following **standard interchangeable components**:

The **standard viewing hood** is interchangeable with an eye-level prism finder, a prism sports viewfinder or magnifying focusing hood.

**Magazine 12** for  $12\ 2\frac{1}{4}'' \times 2\frac{1}{4}''$  negatives is interchangeable with magazine 16 for  $16\ 1\frac{5}{8}'' \times 2\frac{1}{4}''$  negatives, or magazine 16 S for  $16\ 2'' \times 2''$  negatives, (all of which accept 120 roll film) or the Hasselblad adapter for cut film. This versatility makes it possible to produce with one camera a large negative (especially recommended in black and white) or superslides which can be projected with any 35 mm projector. The **standard knob** which cocks the shutter and winds the film is interchangeable with rapid-winding crank or a winding knob with exposure meter.

The **standard Zeiss Planar f/2.8/80 mm lens** is interchangeable with a wide angle Distagon f/4/60 mm lens, with a Sonnar f/4/150 mm telephoto lens, a Sonnar f/5.6/250 mm telephoto lens or a Tele-Tessar f/8/500 mm extreme long focal length lens or the film magazine can be attached to the Hasselblad Superwide with its Biogon f/4.5/38 mm lens.

The scales and operating controls of the Planar are arranged in exactly the same manner as for all other Hasselblad lenses. Result: you develop fast, simple work routines. The shutter is fully synchronized for all types of flash of all shutter speeds and each lens has both manual and automatic diaphragm control, exposure values and movable depth-of-field indicator. Each lens focuses down to close distances. The Synchro Compur shutter range includes B and 1—1/500 sec.



A photograph showing a skin graft performed at a clinic for plastic surgery is one example of case-history photography.

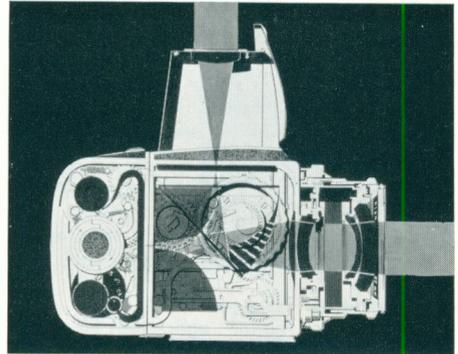
Since the subject-to-camera distance in medical photography is usually relatively short, the single-lens reflex camera is particularly advantageous. The photographer observes his subject through the same "eye" used by the film. Result: **parallax errors are completely eliminated.**

In the single-lens reflex camera the color picture appears on the ground glass — while the camera is waiting to be released. Before exposure, the picture is there to see, projected on a single plane with true edge limits. Focusing can be accomplished accurately. Use supplementary lenses, extension tubes, bellows extensions, or change to another focal length lens if necessary. The picture on the ground glass remains an exact reproduction of the final picture.

### CLINICAL COLOR PHOTOGRAPHY

Clinical photography includes a major portion of the pictures prepared by hospitals and private practitioners. Pictures have now become a valuable part of case histories. Sicknesses that are characterized by alterations of form, color, structure or location can be very advantageously documented with color photographs. To simplify record-keeping systems, many modern hospitals make use of negative color film for case-history photography. A single  $3\frac{1}{2}'' \times 3\frac{1}{2}''$  color print attached directly to the case card provides the doctor with instant information on the patient's condition. Such prints can be prepared on  $3\frac{1}{2}''$  wide rolls (Ektacolor). These color negatives can also be printed in black and white.

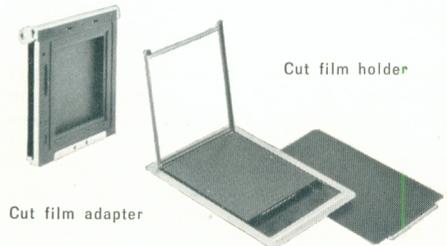
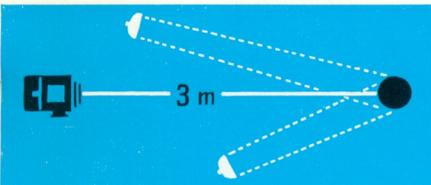
For this type of photographic assignment the Hasselblad 500 C performs as a studio camera. Large-size negatives are easy to work with and a uniform size simplifies record keeping. The interchangeable magazines eliminate entirely the need for interrupting a series of studio shots. Even in the middle of such a series the camera is ready for other assignments. The schematic drawing showing studio photography arrangements illustrates clearly that the Planar lens will cover the full human figure in color at slightly less than 10 feet.



The principle of the single-lens reflex



Film cutter



Cut film holder

Cut film adapter

## INFRA-RED PHOTOGRAPHY

The principal application of infra-red photography in the medical field is to more clearly show veins near the surface. Venous blood appears quite dark in an infra-red photograph, while arterial blood doesn't show at all. As a result, doctors are able to use infra-red photography in diagnostic technique to study pathological conditions, changes in veins close to the surface and certain circulatory defects. Developments during treatment of varicose veins can be followed up. Infra-red photographs often reveal details quite indiscernible in ordinary light.

Infra-red film is available in rolls and as cut film. The Hasselblad cut film adapter can be used to advantage here — no need to use up a full roll when only one or two pictures are needed.



Post-operative infra-red photograph of a thyroidectomy (goiter operation). In this case the operation has involved cutting of a blood-vessel, which shows swelling.



The focusing hood eliminates extraneous light while focusing. An ordinary electronic flash tube equipped with a reflector entirely covered with an infra-red filter (Wratten 38 A) is used. Exposure times are kept as short as possible to reduce the effects of surrounding light to a minimum.

## SURGICAL PHOTOGRAPHY

Taking pictures of surgical operations can be arranged in several ways, depending upon available space in the operation room and the type of operation. Specially-built stands or lifts can be used to position cameras above the scene of the operation and for remote camera control.

The advantages of this arrangement do not always outweigh the disadvantages, however. Preparations must be made before the operation starts and bulky stands sometimes cramp medical personnel in the performance of their duties. Under no circumstances can photographic equipment be allowed to hinder the surgical procedure.

For this reason more flexible hand-held photography is often used. However, for reasons of sterilization, cameras cannot be handled by operating room personnel. Three rules to follow when photographing operations are: camera-to-subject distances must comply with operating room sterilization regulations (preferably about 3 feet or more). Depth of field should be sufficient to cover the depth of the operation.

The camera should be held at eye level to assure a satisfactory shooting angle.

To obtain sufficient depth of field, it is often necessary to use the smallest possible diaphragm opening when photographing as close to the subject as is required in surgical photography. An electronic flash unit with power adjustment like those now appearing on the market will provide enough light to make this possible. They also supply reliably consistent color temperatures for color photography. The Hasselblad flash gun bracket will provide maximum convenience for this sort of flash photography. It is equipped with a cable release which permits the camera to be held and exposures to be made with the left hand, leaving the right hand free for focusing and transporting film.



## Technical data for close-up photography

Degree of magnification	Area covered in inches			Depth of field in inches (1:1)*	Increase of exposure	DISTAGON f/4 60 mm**		PLANAR f/2.8 80 mm		SONNAR f/4 150 mm		SONNAR f/5.6 250 mm	
	Mag. 12	Mag. 16	Mag. 16 S			Distance to film-plane in inches	Close-up equipment	Distance to film-plane in inches	Close-up equipment	Distance to film-plane in inches	Close-up equipment	Distance to film-plane in inches	Close-up equipment
0,1	21 <sup>5</sup> / <sub>8</sub>	21 <sup>5</sup> / <sub>8</sub> × 16 <sup>1</sup> / <sub>8</sub>	16 <sup>1</sup> / <sub>8</sub>	31 <sup>5</sup> / <sub>16</sub>		29		37 <sup>13</sup> / <sub>16</sub>		72 <sup>9</sup> / <sub>16</sub>		120	M21
0,2	10 <sup>3</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>4</sub> × 8 <sup>1</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>16</sub>	19 <sup>1</sup> / <sub>16</sub>				21 <sup>1</sup> / <sub>16</sub>	P1	43 <sup>8</sup> / <sub>16</sub>	M21	72	M21
0,3	7 <sup>3</sup> / <sub>16</sub>	7 <sup>3</sup> / <sub>16</sub> × 5 <sup>3</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	11 <sup>6</sup> / <sub>16</sub>	1/2			17 <sup>1</sup> / <sub>2</sub>	M21	33 <sup>7</sup> / <sub>16</sub>	M21+M21	56 <sup>11</sup> / <sub>16</sub>	M55
0,4	5 <sup>3</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub> × 4	4	7 <sup>1</sup> / <sub>16</sub>	1	12 <sup>1</sup> / <sub>4</sub>	M21	14 <sup>3</sup> / <sub>4</sub>	M21+P1	29 <sup>3</sup> / <sub>8</sub>	M55	49 <sup>1</sup> / <sub>2</sub>	M55+M21
0,5	4 <sup>5</sup> / <sub>16</sub>	4 <sup>5</sup> / <sub>16</sub> × 3 <sup>3</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>16</sub>	1	11 <sup>3</sup> / <sub>8</sub>	M21	13 <sup>1</sup> / <sub>16</sub>	M21+P0,5	27	M55	45 <sup>5</sup> / <sub>8</sub>	M55+M55
0,6	3 <sup>5</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>8</sub> × 2 <sup>5</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	13 <sup>6</sup> / <sub>16</sub>	1 1/2			13 <sup>3</sup> / <sub>16</sub>	M21+M21	25 <sup>9</sup> / <sub>16</sub>	M55+M21	43 <sup>3</sup> / <sub>16</sub>	B
0,7	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub> × 2 <sup>5</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	5 <sup>3</sup> / <sub>2</sub>	1 1/2			12 <sup>3</sup> / <sub>4</sub>	M55	24 <sup>13</sup> / <sub>16</sub>	B	42	B
0,8	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>16</sub> × 2	2	1 <sup>8/<sub>8</sub></sup>	1 1/2	10 <sup>5</sup> / <sub>16</sub>	M21+M21	12 <sup>1</sup> / <sub>8</sub>	M55+P1	24 <sup>3</sup> / <sub>8</sub>	M55+M55	41 <sup>3</sup> / <sub>16</sub>	B
0,9	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub> × 1 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	7 <sup>6</sup> / <sub>16</sub>	2			11 <sup>5</sup> / <sub>8</sub>	M55+P0,5	24	B	40 <sup>7</sup> / <sub>8</sub>	B
1,0	2 <sup>3</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>16</sub> × 1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>2</sub>	2	10 <sup>5</sup> / <sub>16</sub>	M55	12 <sup>3</sup> / <sub>8</sub>	M55+M21	24	B	40 <sup>11</sup> / <sub>16</sub>	B+M55
1,1	2	2 × 1 <sup>7</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>16</sub>	5 <sup>6</sup> / <sub>4</sub>	2			12 <sup>1</sup> / <sub>16</sub>	M55+M21+P1	24	B	40 <sup>7</sup> / <sub>8</sub>	B+M55
1,2	1 <sup>13</sup> / <sub>16</sub>	1 <sup>13</sup> / <sub>16</sub> × 1 <sup>5</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	2 1/2			11 <sup>3</sup> / <sub>4</sub>	M55+M21+P0,5	24 <sup>1</sup> / <sub>8</sub>	B		
1,3	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub> × 1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>16</sub>	2 1/2	10 <sup>7</sup> / <sub>16</sub>	M55+M21	12 <sup>9</sup> / <sub>16</sub>	B	24 <sup>3</sup> / <sub>8</sub>	B		
1,4	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub> × 1 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>16</sub>	2 1/2	10 <sup>9</sup> / <sub>16</sub>	M55+M21	12 <sup>11</sup> / <sub>16</sub>	M55+M55	24 <sup>5</sup> / <sub>8</sub>	B		
1,5	1 <sup>7</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>16</sub> × 1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	3 <sup>6</sup> / <sub>16</sub>	2 1/2	10 <sup>5</sup> / <sub>8</sub>	B	12 <sup>1</sup> / <sub>2</sub>	M55+M55+P1	25	B+M55		
1,6	1 <sup>5</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>16</sub> × 1	1	3 <sup>6</sup> / <sub>16</sub>	3	10 <sup>11</sup> / <sub>16</sub>	B	12 <sup>1</sup> / <sub>4</sub>	M55+M55+P0,5	25 <sup>5</sup> / <sub>16</sub>	B+M55		
1,7	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub> × 1 <sup>5</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>16</sub>	3 <sup>6</sup> / <sub>16</sub>	3	10 <sup>7</sup> / <sub>8</sub>	B	13 <sup>1</sup> / <sub>4</sub>	B	25 <sup>9</sup> / <sub>8</sub>	B+M55		
1,8	1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub> × 7 <sup>8</sup> / <sub>8</sub>	7 <sup>8</sup> / <sub>8</sub>	3 <sup>6</sup> / <sub>16</sub>	3	11	B	13 <sup>1</sup> / <sub>2</sub>	B	26 <sup>1</sup> / <sub>16</sub>	B+M55		
1,9	1 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub> × 1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>2</sub>	3	11 <sup>3</sup> / <sub>8</sub>	M55+M55		B				
2,0	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub> × 1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>2</sub>	3	11 <sup>7</sup> / <sub>16</sub>	M55+M55		B				
2,5	7 <sup>8</sup> / <sub>8</sub>	7 <sup>8</sup> / <sub>8</sub> × 5 <sup>8</sup> / <sub>8</sub>	5 <sup>8</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>2</sub>	3 1/2	11 <sup>7</sup> / <sub>8</sub>	B		B				
3,0	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub> × 1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>6</sup> / <sub>4</sub>	4	13 <sup>5</sup> / <sub>16</sub>	B		B+M55				
3,5	9 <sup>1</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>16</sub> × 7 <sup>1</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>16</sub>	1 <sup>6</sup> / <sub>4</sub>	4 1/2	14 <sup>5</sup> / <sub>16</sub>	B						

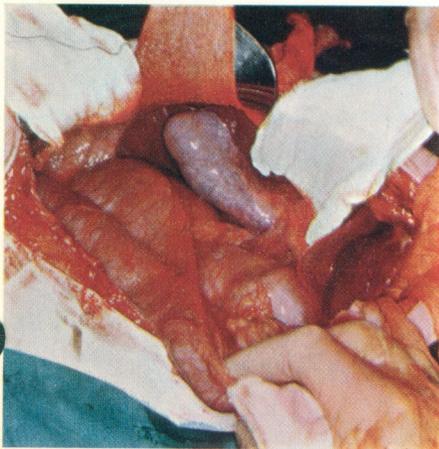
M21 = Extension tube 21 P0.5 = Proxar 0.5 B = Bellows extension  
 M55 = Extension tube 55 P1 = Proxar 1.0

\* At aperture 22 the depth of field will be doubled and at aperture 5.6 on the other hand, the depth of field will be halved.

\*\* For Distagon 1/5.6 the distance should be reduced by about 7/16 in.

It is possible to arrange two flash tubes at each end of a bar which can be attached to the camera tripod socket. The diffused light eliminates undesirable sharp shadows.

Thanks to the Hasselblad 500C interchangeable viewfinder system, three alternatives are offered for eye-level photography. Three slip-on accessories – an eye level prism finder, a prism sports viewfinder and a sports finder – are available. The latter can be used together with either of the other two.



The eye-level prism finder should be chosen for the type of photography done in operating rooms. It provides a brilliant **erect** image of the subject, 2 1/2 times larger than that appearing on the ground glass.



Flash gun bracket

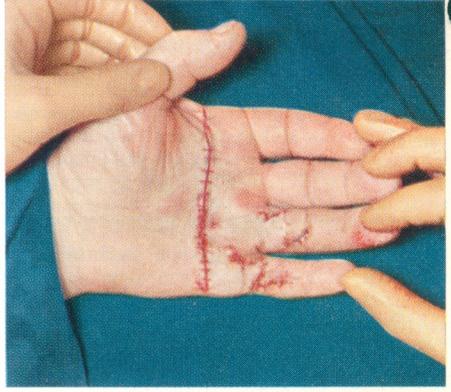
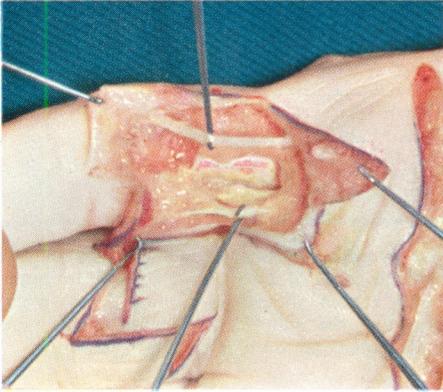
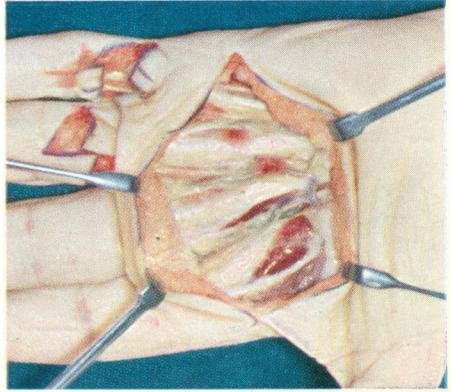
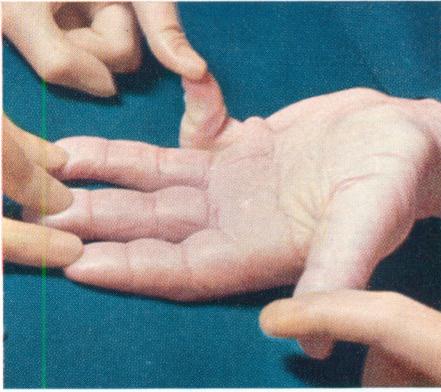
Eye-level prism finder



Prism sports viewfinder

Sports finder





Without interfering with sterilization regulations it is possible to take surgical photographs of smaller subject areas on  $2\frac{1}{4}'' \times 2\frac{1}{4}''$  film. Illustrated are a series of hand operation pictures taken with the Hasselblad 500 C, magazine 12, 150 mm Sonnar lens, using extension tube 21, with the exception of picture No. 3 for which extension tube 55 was used. Light source: electronic flash, about 150 W sec.

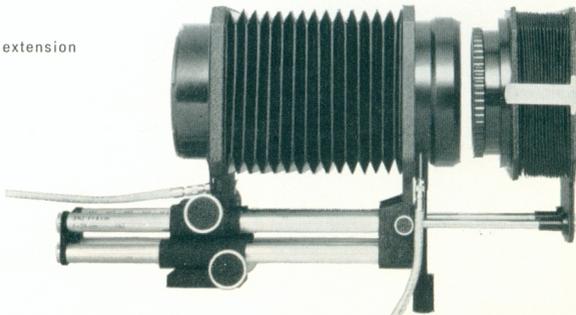


Extension tube 21



Extension tube 55

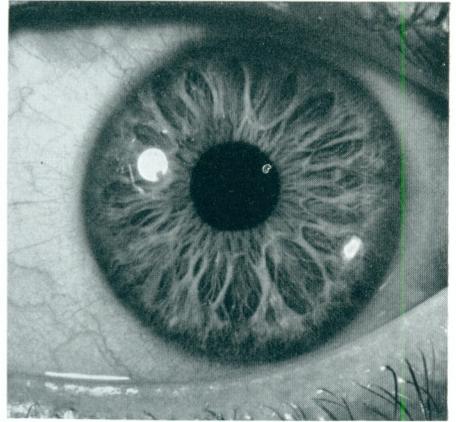
Bellows extension



## MACROPHOTOGRAPHY

Medical applications of macrophotography ordinarily include subjects as small as skin sections, pathological test specimens, bacterial cultures, etc. Three types of accessories are available for the Hasselblad 500C to make macrophotography possible: proxar supplementary lenses, extension tubes, and bellows extensions.

The Hasselblad extension tubes 21 and 55 are provided with bayonet fittings to fit all Hasselblad 500C lenses. The camera, equipped with extension tube, is handled in the ordinary way. Focusing is done on the ground glass as usual, and the shutter and automatic diaphragm controls function normally. If two extension tubes 55 are used together, lens extension can reach 110 mm. The Zeiss Sonnar 150 mm used with extension tube 55 on the 2" by 2" format (Hasselblad magazine 16S) provides an angle of view covering the area of the human mouth. This combination is thus recommended for dental photography.



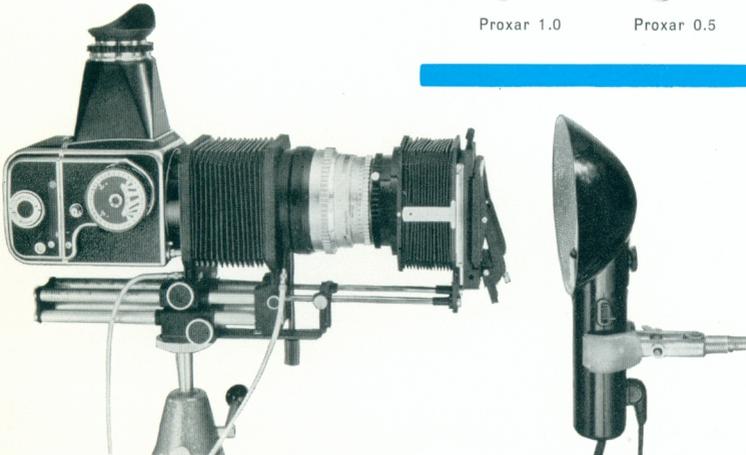
Picture showing an iris, taken with a Planar 80 mm and a bellows extension. An engraved scale on the extension bars indicates both the length of extension and increase in exposure. The double cable release features two-points release. The second shutter release can be used to trigger the between-the-lens shutter, thus eliminating the risk of vibrations.



Proxar 1.0

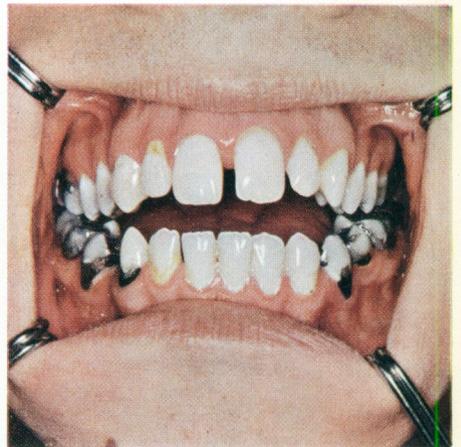
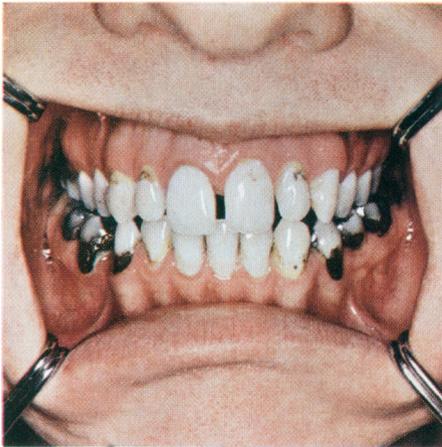
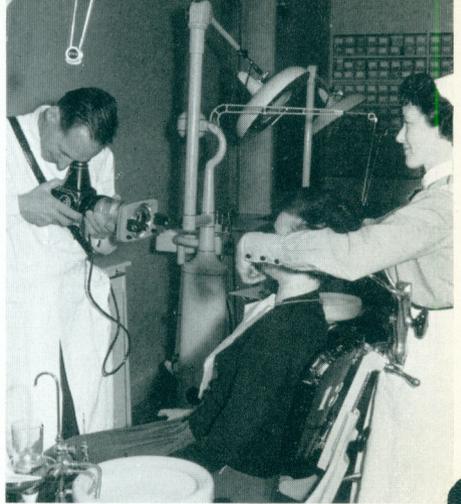


Proxar 0.5



Electronic ringlight flash is used to concentrate light on the small subject areas encountered in dental photography. These two pictures of the mouth were taken at a one-year interval. Used as instructional material at the Dental College in Stockholm, they show mordex apertus and the results after an osteotomy.

The Hasselblad bellows extension is designed for close ups with higher magnification than those so far discussed. Extension limits are 73 mm to 201 mm (3" to 8"). The lens shutter is cocked separately, but released simultaneously with the camera shutter by means of a double release.

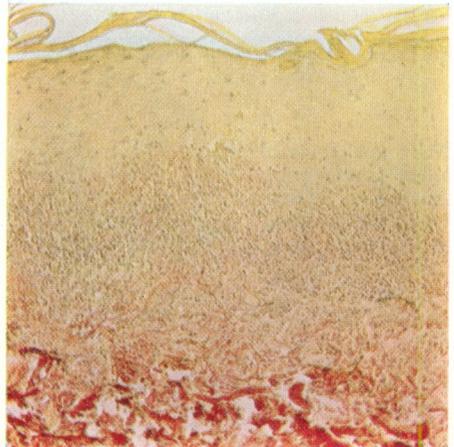
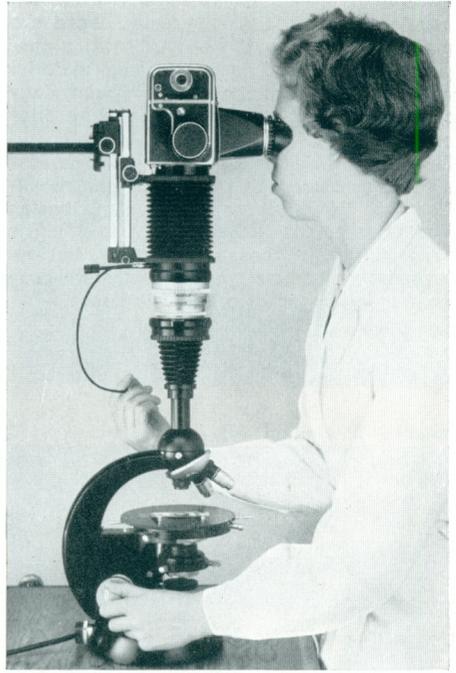


When duplicates of color slides are needed either in the original or a different size to illustrate a lecture for example, the Hasselblad transparency copy holder for the bellows extension offers a simplified duplication procedure. It is attached firmly to the bellows adapter; daylight or artificial light can be used as light source. Experience, however, has led to the recommendation of the use of flash. The lens can be fitted with one of the special Hasselblad filters for correcting color temperature.

## MICROPHOTOGRAPHY

In microphotography camera and microscope are combined to record microscopic specimens photographically. The medical photographer is expected to photograph microscopic test specimens from pathological, bacteriological, hemtological and other hospital departments in both color and black-and-white. Microphotographs often document valuable information for researchers and post mortem examinations. It is necessary of course, for the photographer to have at his disposal a high-quality microscope – for color photography the microscope objective should preferably be planoapochromatic.

A microscope adapter can be attached to the Hasselblad 500C which provides an effective, convenient connection between the camera and the microscope eyepiece. The microscope adapter can be connected either directly to the camera – in such case exposure is made with rear shutter in the camera body or with an external shutter timer – or to a between-the-lens shutter especially designed for microphotography. The micro-shutter adapter is a fully-synchronized Synchro Compur with M and X, B, 1–1/500 sec. settings. To avoid vibrations a cable release is recommended. If a cable release is not used the rear shutter can be opened before exposure with the quick-release button beneath the winding knob and the exposure will be made by the micro-shutter alone via the release button on the camera. If the bellows extension is introduced between microscope shutter and camera an uninterrupted transition from the magnification provided by the microscope lens is obtained. This combination is shown in the illustration. The bellows extension, like the microscope adapter, provides a completely vibrationless microscope attachment. If the focusing hood is used the microscopic image appears directly on the ground glass. The Hasselblad double cable release for the bellows extension then opens the focal plane shutter immediately before the between-the-lens shutter makes a vibration-free exposure.



The color photograph shows a skin section, lichenoid dermatitis, magnified approximately 150 times.

