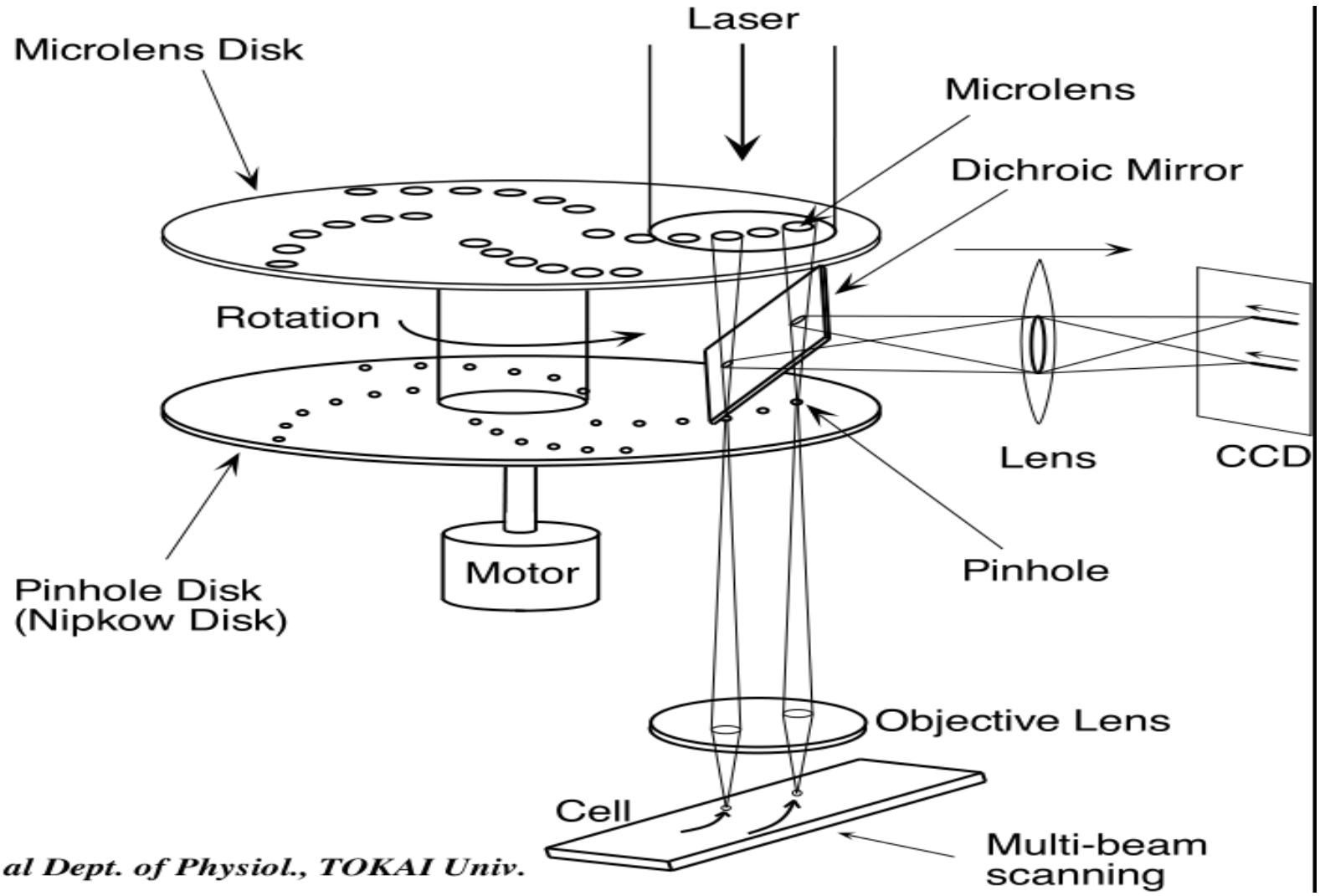
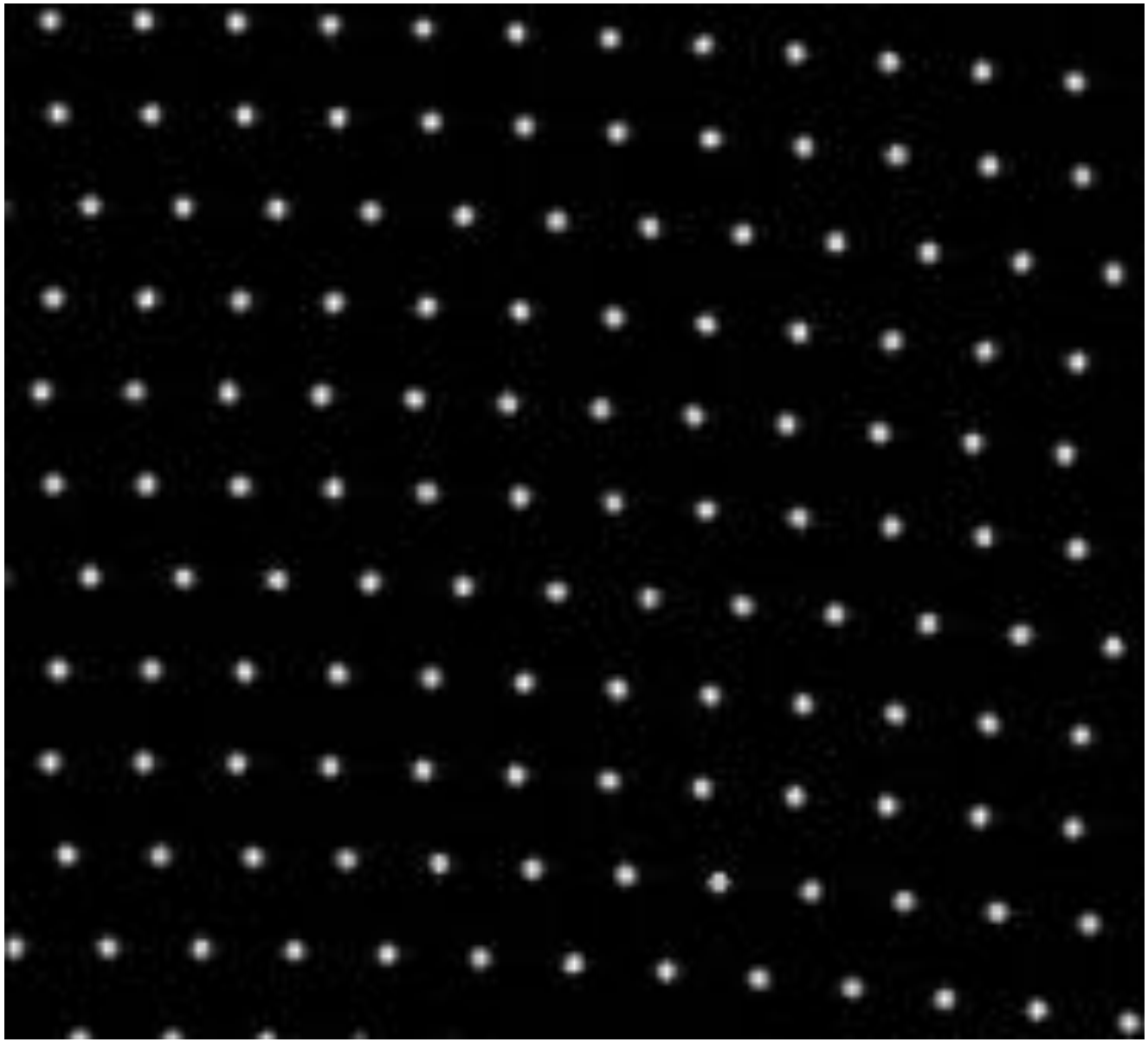
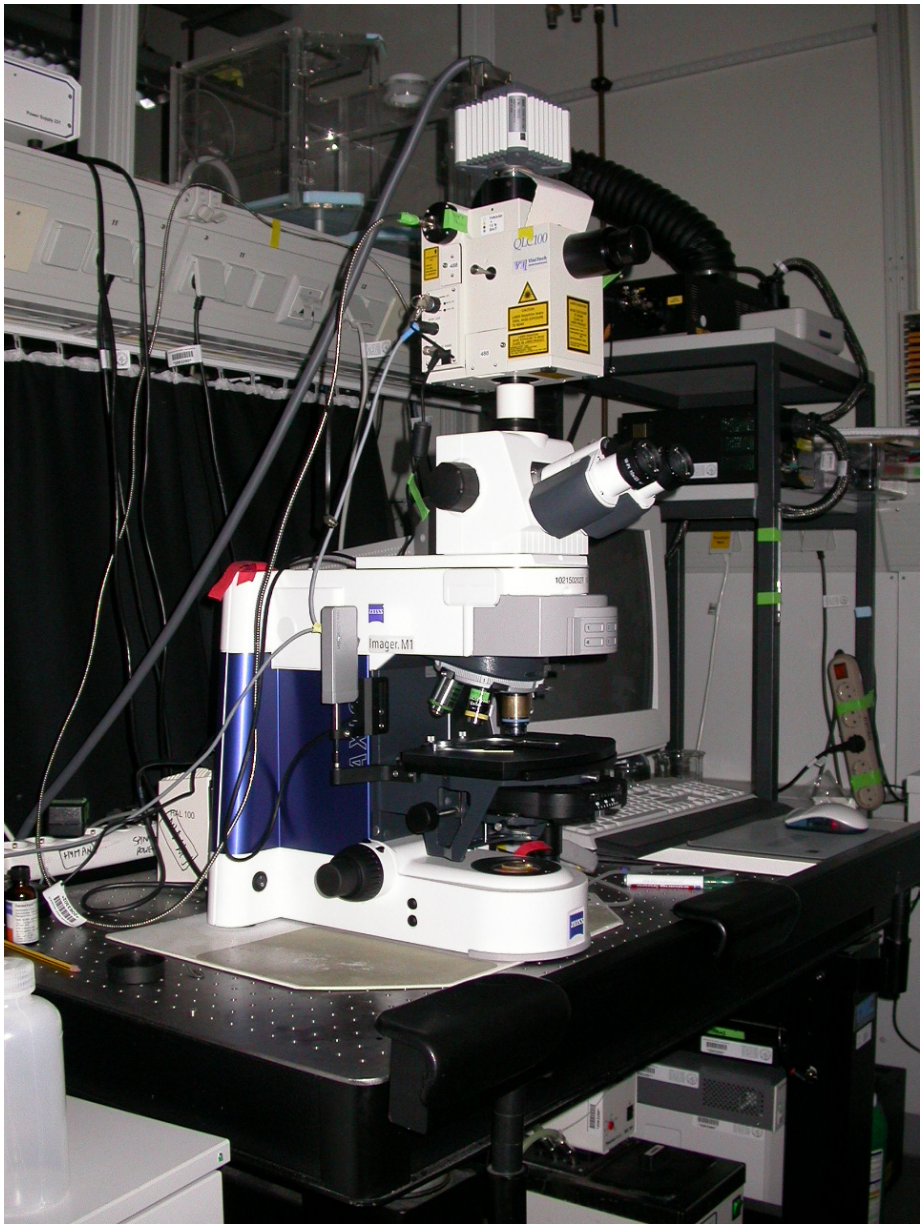
Spinning disk confocal microscopy

spinning disk
confocal scanner head



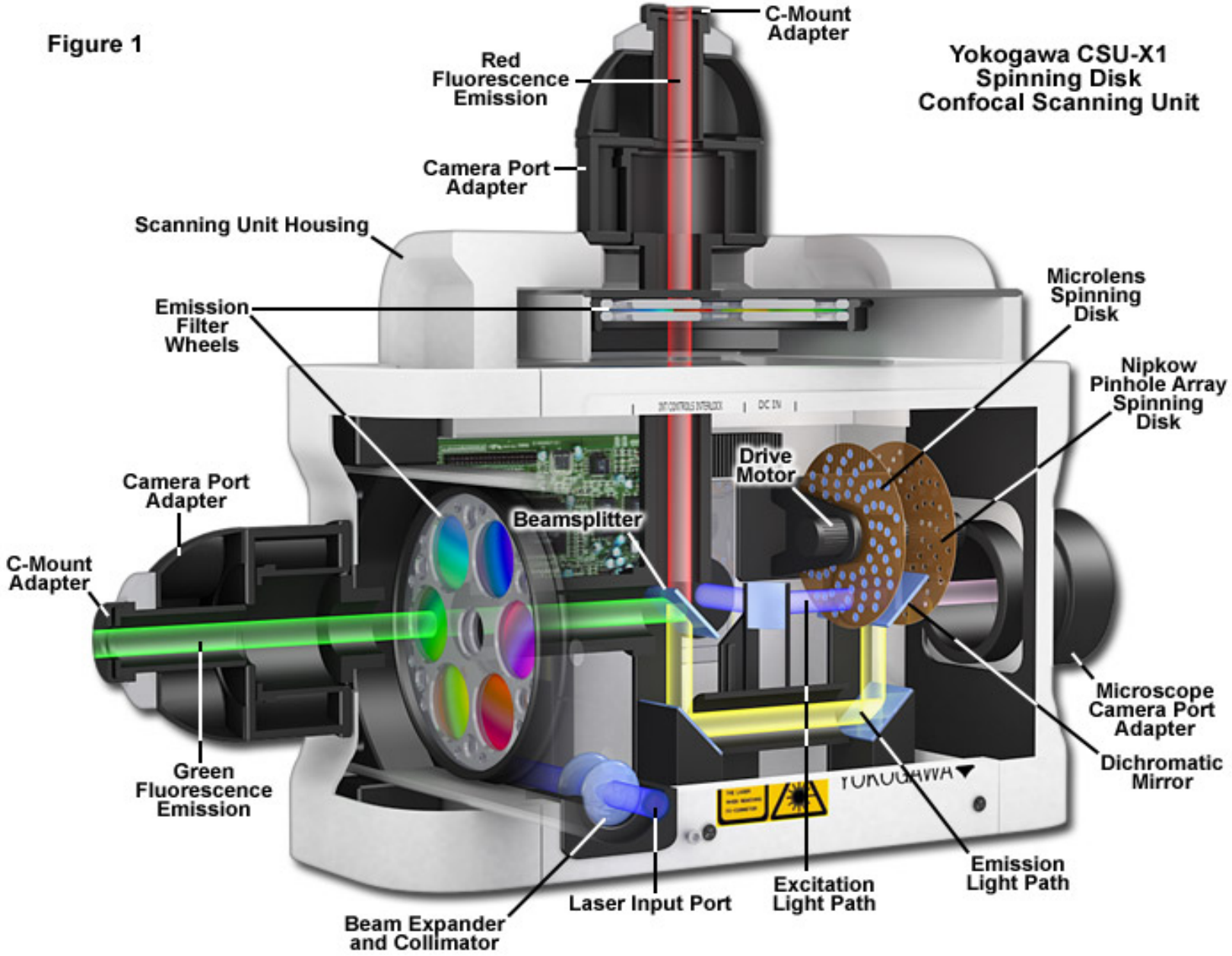


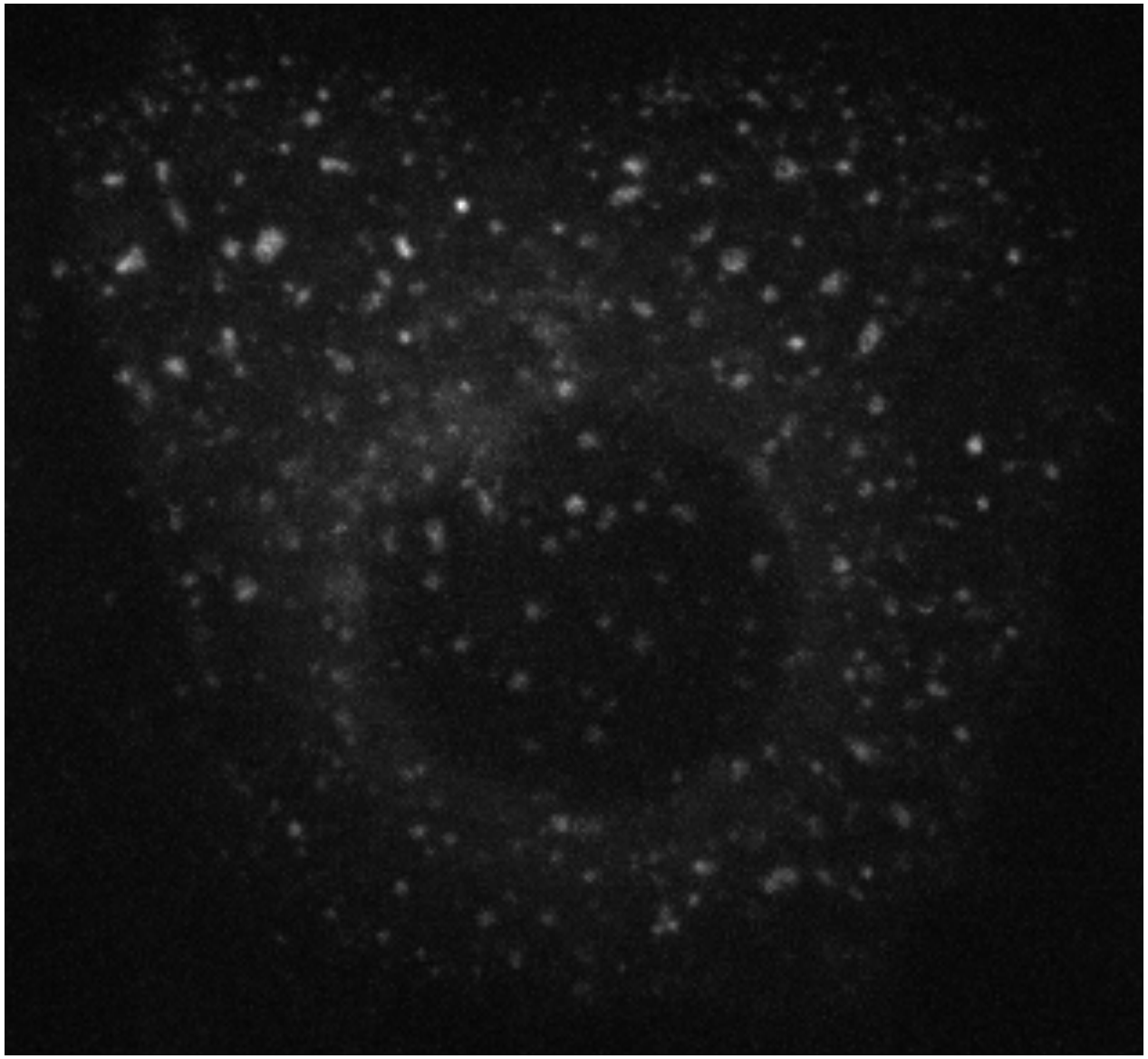
Britta Schroth-Diez



Zeiss Axioimager, Yokogawa CSU-10 spinning disk scan head, CCD camera

Figure 1


C-Mount Adapter
Red Fluorescence Emission
Yokogawa CSU-X1 Spinning Disk Confocal Scanning Unit
Camera Port Adapter
Scanning Unit Housing
Microlens Spinning Disk
Emission Filter Wheels
Nipkow Pinhole Array Spinning Disk
Drive Motor
Camera Port Adapter
Beamsplitter
C-Mount Adapter
Microscope Camera Port Adapter
Dichromatic Mirror
Green Fluorescence Emission
Emission Light Path
Excitation Light Path
Laser Input Port
Beam Expander and Collimator



mammalian cell, Rab5-GFP

1 frame – 0.3 sec, playback 15 frames/sec

Claudio Collinet, Zerial lab

Paul Nipkow, 1860 – 1940, Germany

KAISERLICHES PATENTAMT.

PATENTSCHRIFT

— № 30105 —

KLASSE 21: ELEKTRISCHE APPARATE.

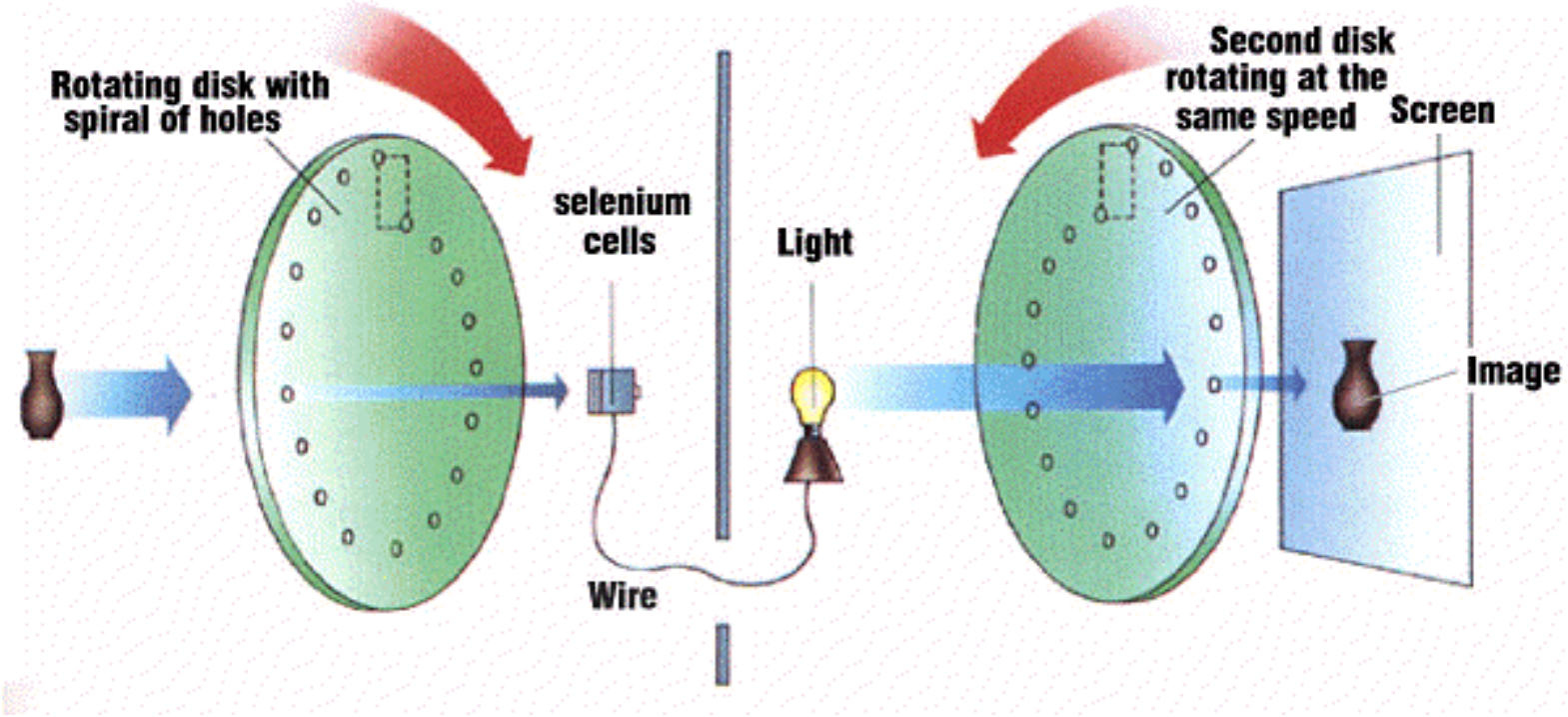
PAUL NIPKOW IN BERLIN.

Elektrisches Teleskop.

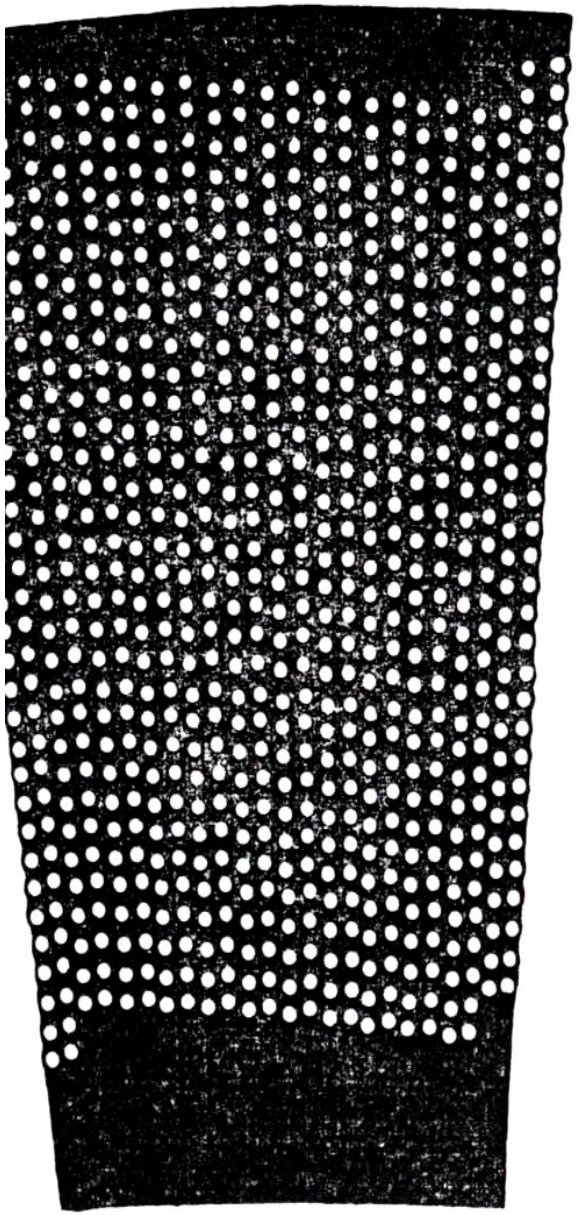
Patentirt im Deutschen Reiche vom 6. Januar 1884 ab.

Der hier zu beschreibende Apparat hat den Zweck, ein am Orte *A* befindliches Object an einem beliebigen anderen Orte *B* sichtbar zu

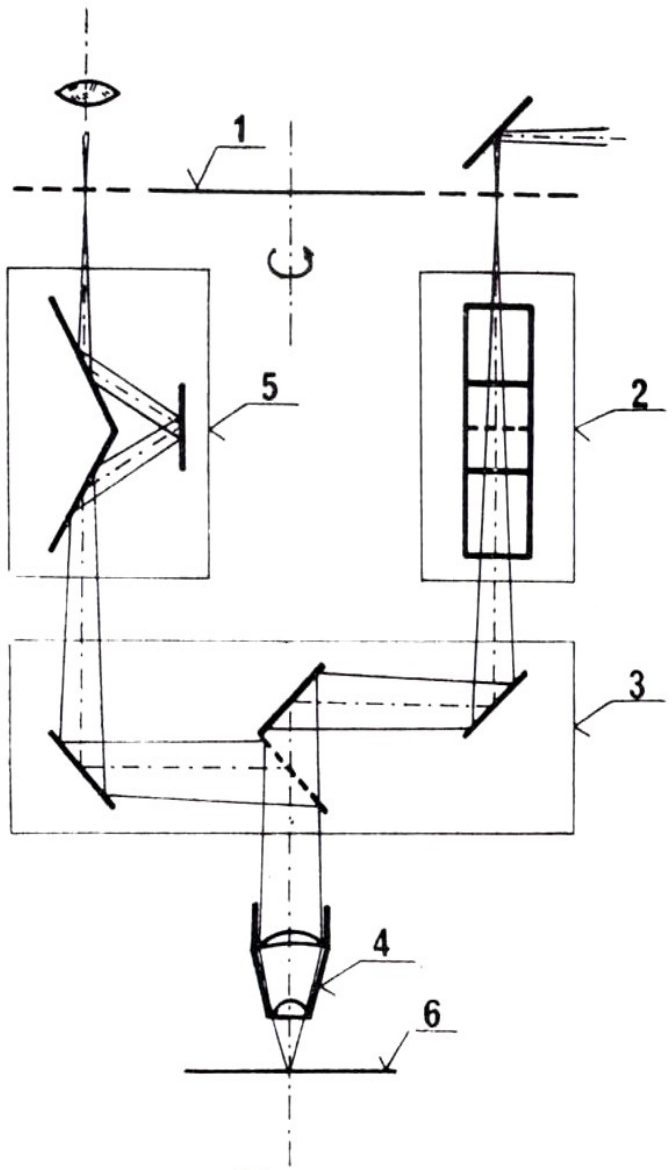
durchlaufenden polarisirten Lichtstrahles unter dem Einfluss eines die Spirale durchstreichenden elektrischen Stromes zu drehen, z. B. ein Cu-



http://inventors.about.com



Obr. 2



Obr. 1

128936

United States Patent Office

3,517,980

Patented June 30, 1970

3,517,980

METHOD AND ARRANGEMENT FOR IMPROVING THE RESOLVING POWER AND CONTRAST

Mojmir Petran and Milan Hadravsky, Plzen, Czechoslovakia, assignors to Ceskoslovenska akademie ved, Prague, Czechoslovakia

Filed Dec. 4, 1967, Ser. No. 687,638

Claims priority, application Czechoslovakia, Dec. 5, 1966, 7,720/66, 7,721/66

Int. Cl. G02b *21/06, 17/00, 27/02*

U.S. Cl. 350—17 5 Claims

ABSTRACT OF THE DISCLOSURE

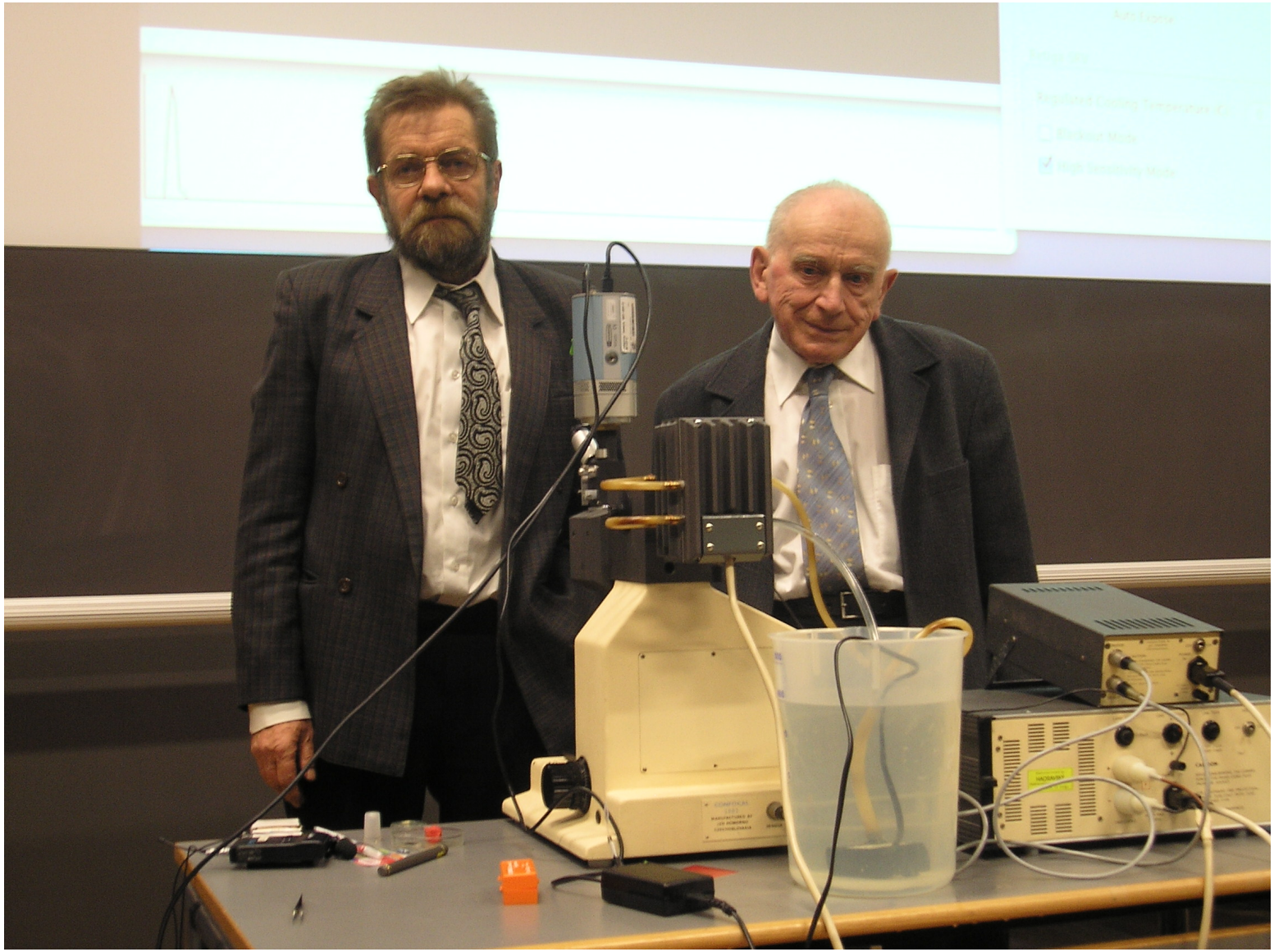
The observed object is illuminated by light spots scanning subsequently the whole area of the observed object, and only a part of the light coming from the observed object due to illumination by said light spots of an area which corresponds to the area of the original light spots is allowed to enter the image plane of the microscope objective. The resolving power is thus substantially improved and observation of objects covered by translucent material such as living cells and nerves below the skin is enabled.

observed object point. The light passing through each filter impinges on its own photocell and the subtraction is accomplished electrically. The resulting signal is again transformed to light and the image is reconstructed by scanning rotating mirrors.

It can be assumed that the realization of the method based on this principle is rather difficult if not impossible as the demands for exact localization of images on filters, transposed to accuracy of angles and the synchronization of rotating mirrors and the accuracy of their axle bearings reach small fractions of seconds and several manometers. Requirements for stability and linearity of amplifiers are similarly rather high. For a suitable scanning density and/or suitable size of the field of view, the result is either an enormous rotation speed of the mirrors or a rather long time interval necessary for a complete image to be formed.

Stray light is another cause of the redaction of resolving power and of the contrast of images. Sources of stray light can be reflection on optical surfaces of the microscope components and diffraction in different layers of a thicker object observed. This stray light particularly deteriorates images in incident light microscopes.

The stray light caused by the reflection on optic sur-



Mojmir Petran, Milan Hadravsky, Pilsen, Czech Republic

en.wikipedia.org/wiki/Iron_Curtain

Jindřichova Hora
U tří křížů
Čapartice
Černá Řeka
Falcká myslivna
Chodov
Trhanov
Havlovice
Nevolice
Bořice
Smolov
Spáňov
Stráž
Rudolfova Pila
Mlýneček
Pec
Okrouhlík
Babylon
Mrákov
Tlumačov
Kout na Šumavě
Nová-Pasečnice
Stará-Šalka
Šafranice
Pelechy
Starý-Klíčov
Nový-Klíčov
Loučka
Čerchov
Šnory
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Krásnice
Starec
Sedlová jedlina
Česká studánka
Česká Kubice
Domažlický průsmyk
Nová Kubice
Spáleneček
Nový-Spálenec
Starý Spálenec
Mlýneček
Brůdek
Všerubský průsmyk
Studánky
Bystřice
U tří znaků
Dolní-Folmava
Horní
Maxov
Hájek
Všeruby
Hyršov
Pomezí
B

Spinning disk confocal microscopy

- “field” illumination method – multipoint scanner
- detector : CCD, EM-CCD, sCMOS
- temporal resolution typically in a range of dozens to hunders of ms/image for “standard” FOV: 512x512 pixels
- lower Z resolution compared to LSCM
- circa 800 nm as Z resolution at best
- more out of focus signal

What is it good for ?

- high speed live cell imaging
- fast imaging of fixed samples