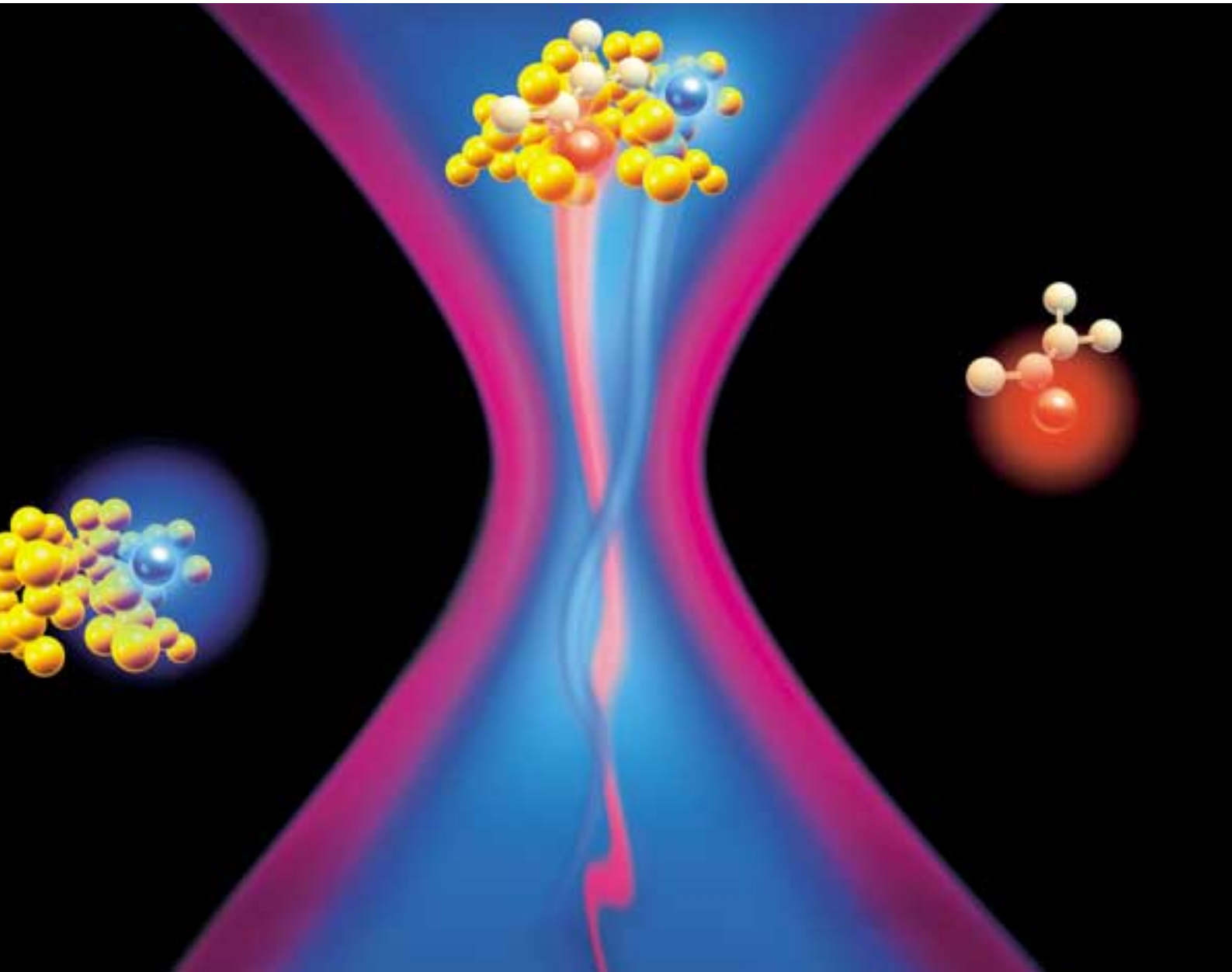


# **ConfoCor 2**

## **ConfoCor 2 / LSM 510 combi**



**Efficient Analysis  
of Molecular Interactions**





**Measuring with the ConfoCor 2:  
Dancing Molecules  
in the Spotlight**



**In Biochemistry:  
Sensitive Even to the Tiniest  
Dimensions**



**In Cell Biology:  
Function and Structure**



**Optics and Software:  
You Take Care of Your Specimen,  
We Take Care of the Technology**



**The Basis: Axiovert 200 M  
If You Need the Best,  
there is Simply no Alternative**



**Its Partner: LSM 510  
Compact. Flexible. Innovative.**



**Application Laboratory and More:  
Partnership for the Future**

## Milestones

**1903** M.v. Smoluchowski explains the interrelation between autocorrelation and Brownian movement.



**1972** The first fluorescence correlation spectrometers are developed in the laboratories of Cornell University, Ithaca, NY, USA and at the Max-Planck-Institute, Göttingen, Germany.



**1988** The first confocal instrument using a microscope set up for FCS measurements is developed at the Karolinska Institute, Stockholm, Sweden.

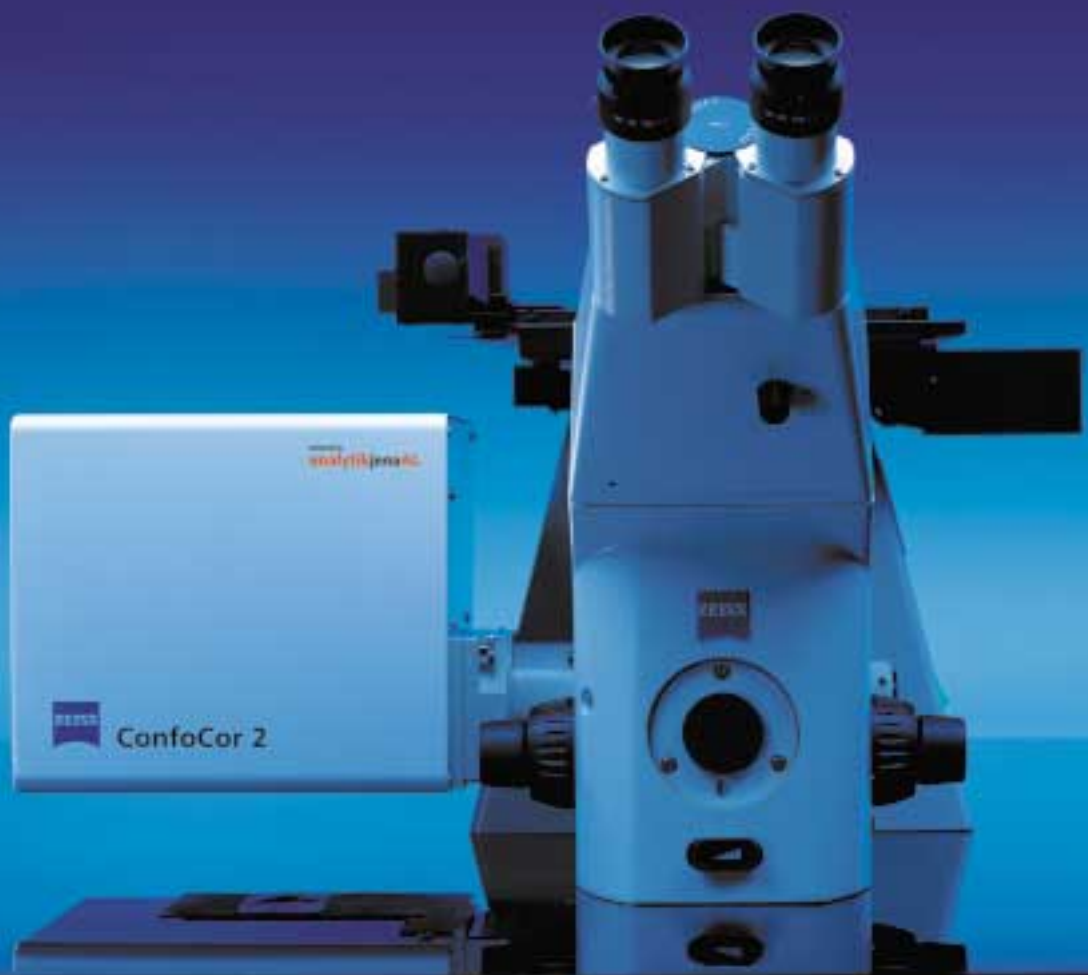


**1996** The ConfoCor from Carl Zeiss is the first automated fluorescence correlation spectrometer.

**1997** The confocal laser scanning microscope developed by Carl Zeiss is a very compact and user-friendly system.

**1999** Carl Zeiss sets the standard for fully automated dual channel cross correlation spectrometry: the ConfoCor 2.

**2000** With the combination of the ConfoCor 2 with the LSM 510 to form the ConfoCor 2/LSM 510 combi, the age of biophysics dawns in cell biology. An ingenious technique is made available to a wide variety of users.





# Measuring with the ConfoCor 2

## Dancing Molecules in the Spotlight

Versatile measurements in solution: concentrations, interactions, fluctuations, diffusions – that’s the ConfoCor 2.

Functional analysis, 3D localized in living cells – that’s the ConfoCor 2/LSM 510 combi, a unit combining the ConfoCor 2 fluorescence correlation spectrometer and the LSM 510 confocal laser scanning microscope.

The ConfoCor 2 measures the fluctuations of fluorescence-labelled molecules.

Fluorescence correlation spectroscopy (FCS\*) evaluates this data.

Other evaluation techniques are also possible, e.g. bleach analyses, FRET\*, PCH\* by exporting the raw data. The biophysical model provides you with the relevant data of the examined system.

### Photons from the confocal volume

The confocal volume is the measuring sensor of the ConfoCor 2. The focal volume has a diameter of approx. 300 nm and a height of approx. 1500 nm, depending on the wavelength. The molecules to be examined are marked with a fluorescent dye. Molecules in the confocal volume are excited. Only photons from the confocal volume are detected.

The light emitted by the dyes is gathered by the objective and focused on a very small stop, known as the pinhole. The pinhole is positioned in front of the detector. Since the focal point in the specimen and the pinhole lie in conjugate planes, they are considered to be confocal. Only light from the focal point can pass the pinhole and be registered by the detector. This is how the confocal measuring volume is created in a solution or a living cell. The confocal volume measures less than 1 femtoliter\* and has the same approximate dimensions as an *E.coli* bacterium. You can position this measuring volume in any spot accessible by light. There is no need for cannulas, electrodes, surfaces or any mechanical components.



Elliot Elson, St. Louis, USA

*“There is a renaissance of interest in FCS due to improvements in measurement techniques and a growing recognition of the wide range of problems to which it can be applied productively.”*



*“The ability to sense and interact with the smallest chemically meaningful particle of matter has an emotional appeal like that of the attainment of any ultimate as, for instance, a solo flight across the Atlantic Ocean, or flying a balloon around the world.”*

Rudolf Rigler,  
Stockholm, Sweden

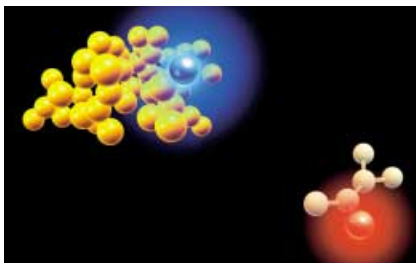
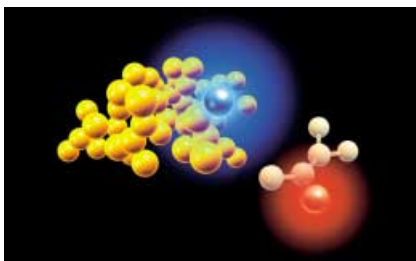
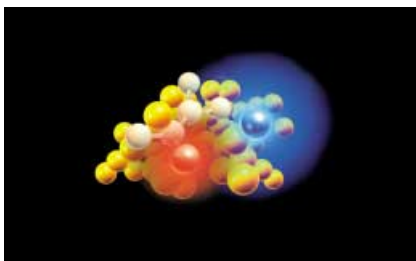


### **Fluctuations are evaluated**

The number of photons counted by the detector corresponds to the fluorescence intensity in the confocal volume.

The intensity is dependent on the number of molecules in the confocal volume. It consists of a constant and a fluctuating portion. The fluctuations are caused by molecules diffusing into the measuring volume or leaving it, driven by the Brownian molecular movement in most cases.

The constant intensity portion can be used, for example, for the evaluation of bleaching experiments. FCS evaluates the fluctuations by determining the time factor of the intensity correlation and analyzing the time behavior of the fluctuations.



*Fluorescence correlation spectroscopy distinguishes between bound and unbound molecules on the basis of their diffusion speed.*

\*See glossary on page 24

# Measuring with the ConfoCor 2

## A biophysical model helps

The model describes the origin of fluctuations in theory. The standard model provides the correlation functions of freely diffusing molecules of different sizes. The confocal volume is considered to be Gaussian in all three spatial directions. Furthermore, it is assumed that some of the electrons of the excited dyes are collected in the triplet state.

This model is fitted to the measured correlation curve. This is how you obtain the number of molecules, their diffusion times and the relative proportions of the particles of different sizes.

## Low concentration yields high correlation

Are you interested in the concentration of the few DNA\* fragments after the first cycles of PCR\*? Then take a look at the intersection point of the correlation curve with the y-axis. The amplitude of the correlation is inversely proportional to the number of particles in the confocal volume. This is why the ConfoCor 2 is so incredibly sensitive. This means you can measure the minute concentrations encountered under physiological conditions.

## Large particles diffuse more slowly

How does the lipid composition in the cell membrane change the motility of receptors? Focus the confocal volume on your cell membrane and analyze the correlation curve.

Slow particles remain in the measuring volume for a longer period of time. In the correlation curve, this is expressed by a slower decline of the curve.

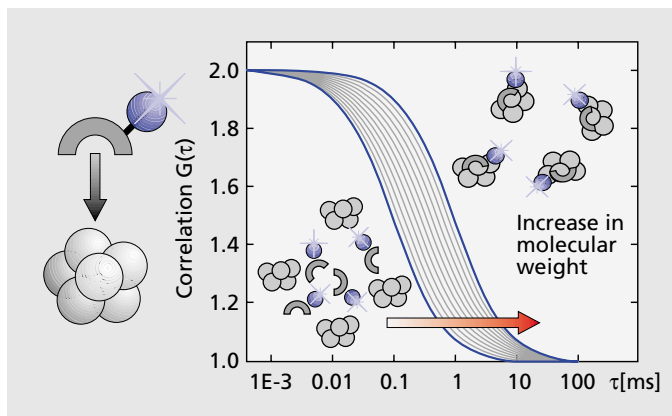
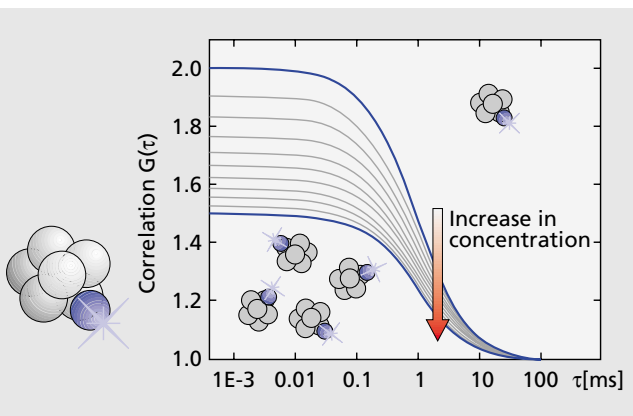
In solution, large particles are slower. This enables you to distinguish between molecules of different sizes.

In a homogeneous assay. Without separation procedures.

$$1 + \frac{\langle \Delta I(t) \Delta I(t+\tau) \rangle}{\langle I \rangle^2} = 1 + \frac{1}{N} \cdot \frac{1}{\left(1 + \frac{\tau}{\tau_D}\right) \sqrt{1 + \frac{\tau}{\tau_D} S^2}}$$

The measured intensity fluctuations are evaluated through correlation functions. The intersection point of the function with the y-axis is higher, the lower the concentration.

Fluorescence correlation spectroscopy evaluates diffusions. The slower the diffusion, i.e. the larger the measured molecules, the more the curves are shifted to the right.





### Efficient analysis of molecular interactions

Would you like to know how oligonucleotides bind to HIV-1 integrase?

Free oligonucleotides are small and fast, while bound ones are large and slow. Therefore, we are able to distinguish between them using FCS, and determine their relative concentrations. This is all you need for kinetic examinations.

*In cross correlation, molecules of spectrally different fluorescence are detected simultaneously and their signals are compared to each other. This permits the determination of the concentration of bound molecules. Autocorrelation allows the proportion of unbound particles to be determined and thus the binding constant  $K$  to be calculated.*

\*See glossary on page 24

### Cross correlation: Two detectors for more flexibility

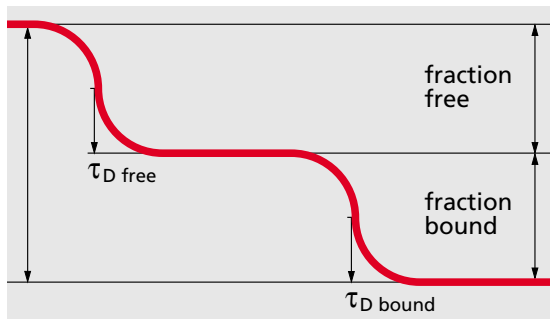
If you examine the kinetic behavior of restriction enzymes, the weight difference between restricted and unrestricted DNA\* may no longer be sufficient to make a distinction. The solution: cross correlation. Both ends of the DNA\* are marked with different dyes. Two detectors are used for this purpose. Cross correlation between these two signals indicates the reduction of the unrestricted DNA\*.

### Versatile: Complex data analysis

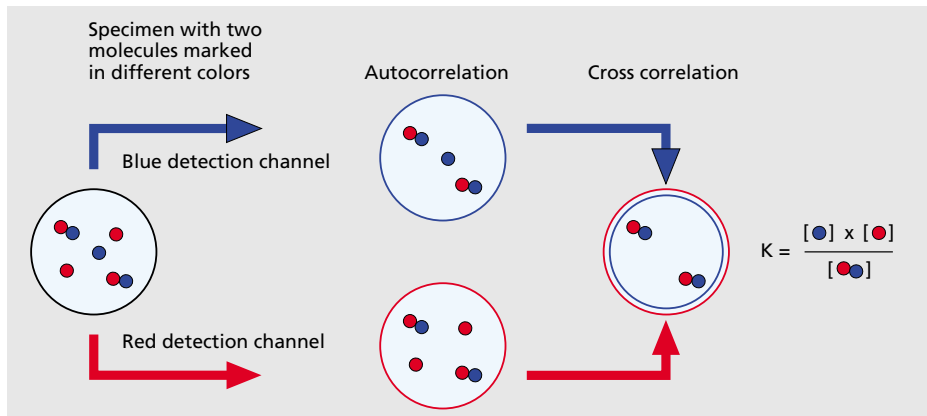
ConfoCor 2 in a nutshell:

- fluorescence
- measured in a tiny confocal volume
- within only a few seconds
- in tiny concentrations

The ConfoCor 2/LSM 510 combi even lets you perform these measurements in living cells.



*Curves of molecules of different sizes are added. All the parameters required to describe a biochemical reaction can be extracted from a curve.*



# In Biochemistry

## Sensitive to Even the Tiniest Dimensions

Your specimen is interesting. It is valuable. And very sensitive. You protect your specimen. We help you in your research. Determine concentrations, examine kinetic behavior, detect rare events, and conformational changes using the ConfoCor 2.

Nothing but light touches your specimen. The measurement lasts only a few seconds. The equilibrium is not disturbed. And one nanoliter\* is enough.

### Determining the concentration of minute specimen quantities

You can determine the concentration of your specimen in the same way as with a conventional spectrometer. The ConfoCor 2, however, is much more sensitive and requires considerably less material.

The principle of ConfoCor 2 is based on the measurement of single molecules. Therefore, it is extremely sensitive. You can detect molecules with concentrations of only a few femtomolars\*.

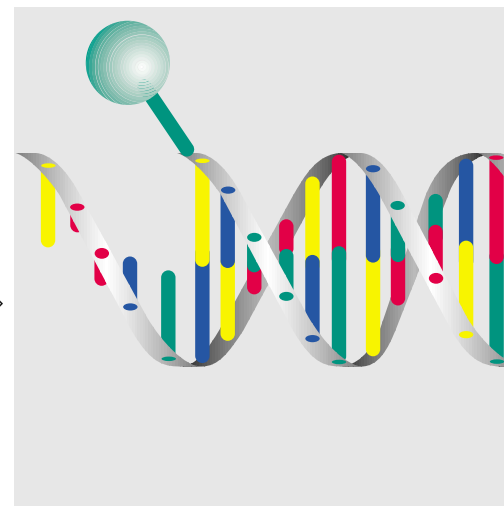
The measuring volume of the ConfoCor 2 is less than a femtoliter\*. Therefore, one nanoliter\* of specimen material is sufficient.

FCS distinguishes between molecules according to their size and brightness. Therefore, up to three different fractions can be detected.



*“We determined the yield of 500 bp DNA in asymmetric polymerase chain reaction (PCR) using FCS.”*

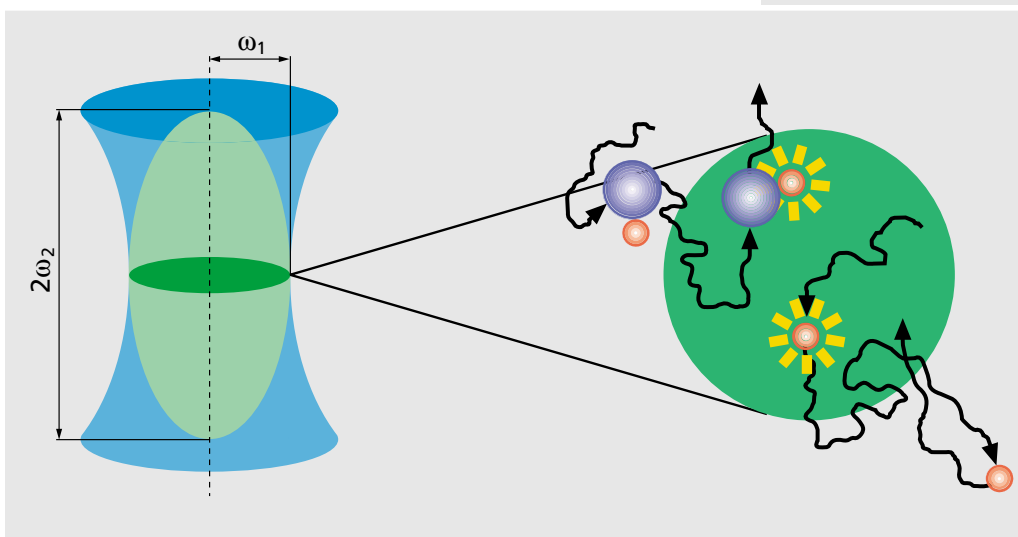
Masataka Kinjo,  
Sapporo, Japan



Hybridization of a fluorescence-marked M13 primer on M13 DNA.

\*See glossary on page 24

Molecules marked with dyes are excited for fluorescence by an accurately focused laser beam. The emitted light is gathered and detected. Fluctuations in the measured intensity reflect the changing number of excited molecules. The relative fluctuations increase when the concentration of the marked molecules decreases.





### Binding constants in equilibrium

Molecular interactions are the strength of the ConfoCor 2. Determine equilibrium constants and kinetic parameters. Without separation, without tubes, without surfaces – directly in solution. The ConfoCor 2 evaluates Brownian molecular movement.

This natural fluctuation permits measurements in a state of equilibrium.

You measure directly in solution. Unlike Surface Plasmon Resonance (SPR\*), only one tiny dye binds to your molecule. It can continue to move freely, rotate, fold and interact. No sensor chip results in unspecific adsorption.

*Binding of transcription factor Sp1 to its specific recognition sequence, the GC box.*

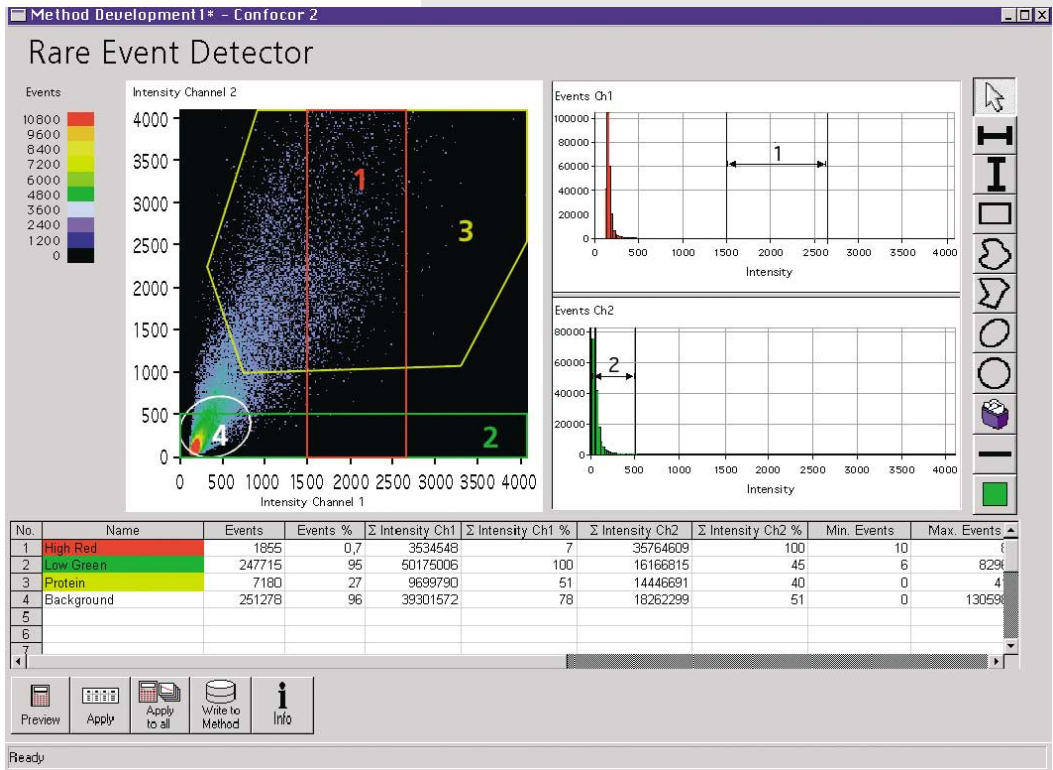
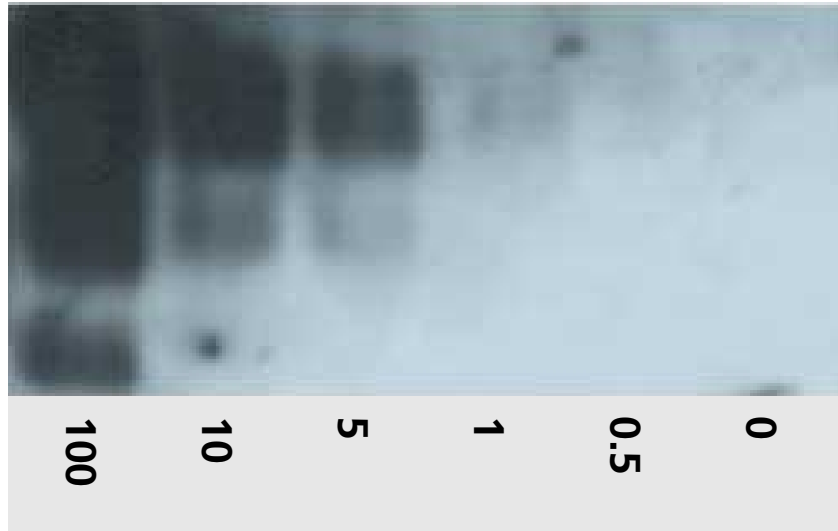


# In Biochemistry

## Detection with maximum sensitivity

You want to count single molecules? The coincidence analysis of the ConfoCor 2 is more than 20 times as sensitive as the Western Blot. The ConfoCor 2 features two detectors. You mark your specimen with two dyes. You therefore get double the reliability. And to ensure you don't have to wait for your protein for ages, the ConfoCor 2 scans the specimen for you.

*Detection of prion aggregates in spinal liquor by means of a prion-specific antibody in the Western Blot.*



Analysis menu for the "Rare Event Detection Module".

*"With FCS we developed a method which is ideally tailored to the identification of minute quantities of prions. The ConfoCor from Carl Zeiss has enabled us to continue developing this method."*



Manfred Eigen,  
Göttingen,  
Germany  
(Portrait by P. Goldmann)



### Flexible through data export

The ConfoCor 2 gathers photons for you. And you can do whatever you want with them.

You want to examine the blinking of single molecules?

You want to distinguish molecules by their brightness?

The ConfoCor 2 memorizes the raw data, and you can evaluate it.

Do conformational changes of your protein change the emission of the dye?

Does your mathematical model describe this behavior better than anything else imagined so far? The ConfoCor 2 memorizes the correlated data, and you can test your model.

Do you think that a home-made system would provide you with more flexibility? The data export of the ConfoCor 2 will convince you to the contrary.

Leave the optics to us so that you can fully concentrate on the science.

*Cross correlation measurements of prion aggregates*  
 Left: cross correlation curves after different incubation times  
 Incubation times: a) 1 min., b) 6 min., c) 20 min.,  
 e) 130 min, f) reference measurement in 0.2% SDS\*.  
 Right: Initial cross correlation amplitudes during the  
 aggregation process. The amplitude is directly proportional  
 to the number of aggregates.

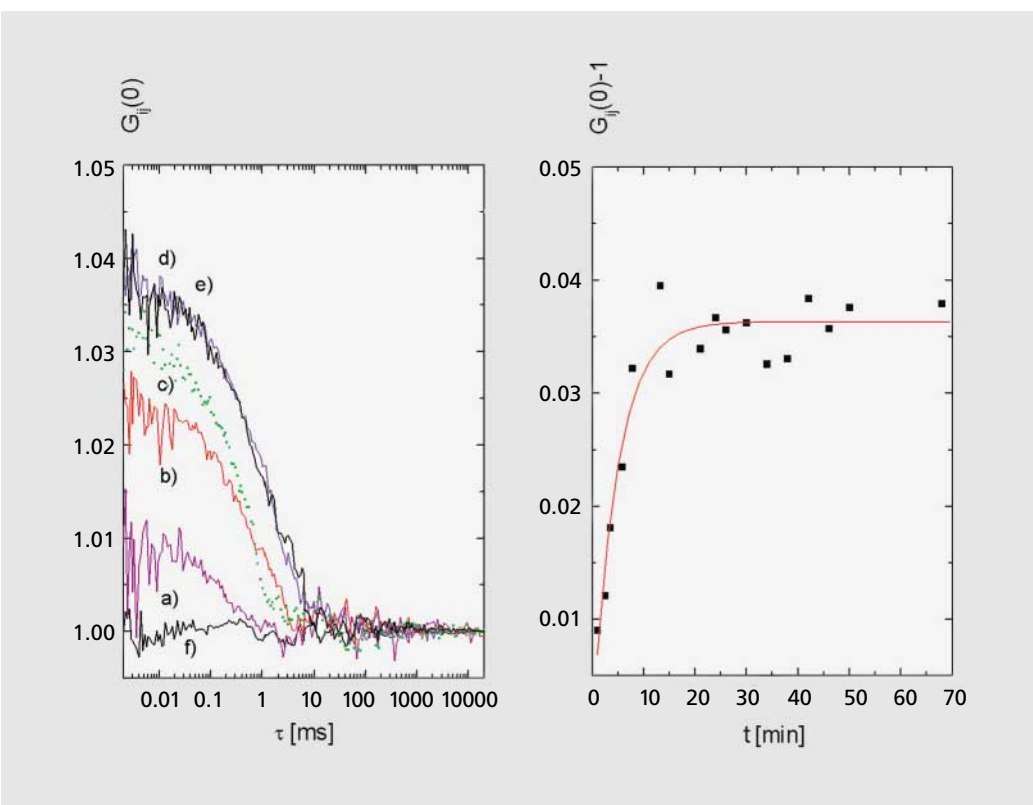
### ConfoCor 2: Ideal for biochemistry

The ConfoCor 2 is optimized for measurements in solutions. Micro-titer plates with glass bottom, cuvettes and drops of liquid on cover slips are ideal as specimen carriers.

The ConfoCor 2 lets you efficiently analyze molecular interactions:

- one nanoliter\* is enough
- in a homogeneous assay

\*See glossary on page 24



# In Cell Biology

## Function and Structure

The structures, pathways and shapes in cells are truly fascinating. You want to know more? How it all works? According to what plan? What reacts with what? And why?

To help you find the answers we combined the ConfoCor 2 with the LSM 510 confocal laser scanning microscope to create the ConfoCor 2/LSM 510 combi.

The LSM 510 displays cellular structures at maximum resolution. You select a spot, and only a few seconds later the ConfoCor 2 shows you what is diffusing in this spot, in what concentration, and what is reacting with what.

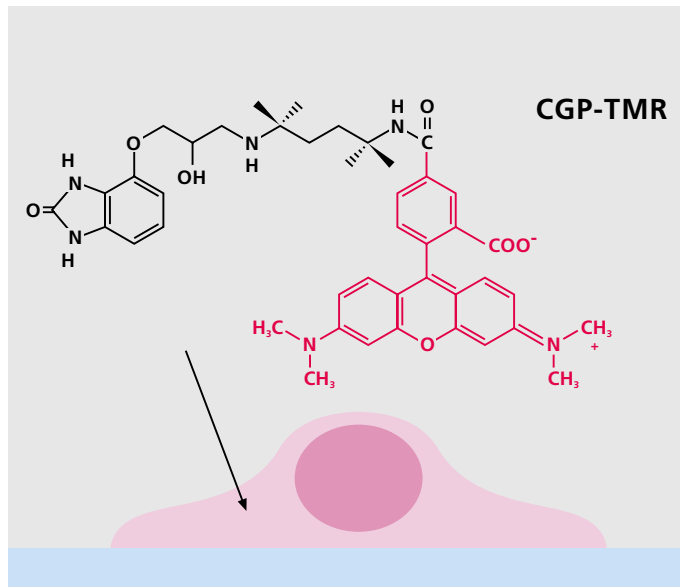
### Not only diffusion

As in photobleaching experiments, (FRAP\*), the ConfoCor 2/LSM 510 combi enables you to directly measure the diffusion in cells – and on the cell membrane. This means you don't have to bleach your cell. And you will learn more too: are there any components with different speeds? In what concentration?

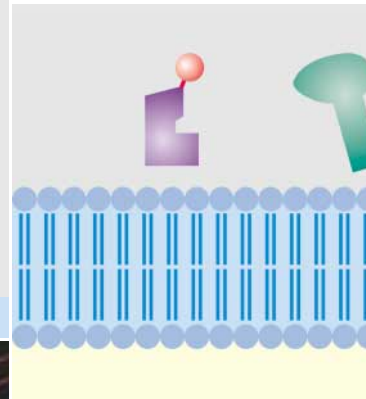
Do the components interact – and if so, with what?

The optics and the detectors of the ConfoCor 2 are designed for optimum sensitivity. Only a few molecules are sufficient for a measurement.

The ConfoCor 2 is fast. Its strength: fast processes that you cannot resolve with FRAP. The ConfoCor 2 is stable. Over long periods of time. You can measure for days without the need for calibration.

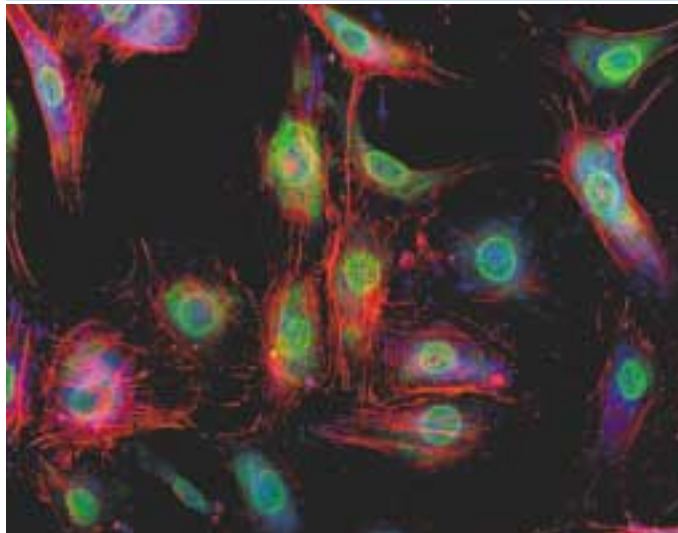


*CGP-TMR, a specific  $\beta$ -adreno receptor antagonist marked with a tetramethyl rhodamine dye, is internalized by Leiomyosarcoma cells of hamsters.*



*“We are using FCS to determine the viscosity of endosomes of bovine aortic endothelial cells by measuring the mobility of rhodamine-labeled micro-particles.”*

Masataka Kinjo and  
Yashido Naoto,  
Sapporo, Japan



△ *Competition experiments with marked and unmarked ligands prove a specific interaction with receptors.*

*Endothelial cells,  
J. Zbären,  
Inselspital Bern, Switzerland*



### What interacts with what on the living cell

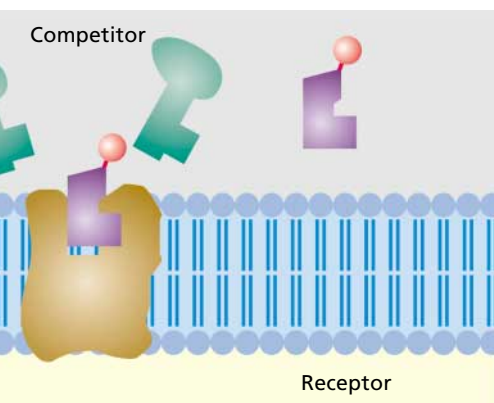
Is the binding between ligand and receptor on the living cell the subject of your research? Are your experiments based on Fluorescence Resonance Energy Transfer (FRET\*)? This can be done more precisely with the ConfoCor 2/LSM 510 combi.

And more reliably, too. With the ConfoCor 2, no interaction will escape you because the dyes are too far away from each other. And no interaction is prevented

because the dyes are lying too close to each other. Even interactions via bridge proteins are child's play for the ConfoCor 2.

You only know the ligand? Then all you have to do is label it.

The analysis method of choice is autocorrelation. Or would you like to know whether this ligand reacts with a very specific receptor? Then label the receptor too, e.g. with GFP\*. The cross correlation analysis of the ConfoCor 2 indicates whether the ligand really has bound to the receptor you have determined – and only to this one.



*“From our examinations of primary human kidney cells using the ConfoCor 2/LSM 510 combi, we expect to obtain completely new insights into the effects of c-peptides.”*



Rudolf Rigler,  
Stockholm,  
Sweden

\*See glossary on page 24

# In Cell Biology

## It's the inner qualities that count

Take a look inside! Using light. And nothing but light touches your cell!

Use the LSM 510 to see it all in three dimensions.

Select the region of interest in the cell. Use the ConfoCor 2 to measure the local concentrations.

Have you been using time series to follow the trafficking of your proteins?

Use the ConfoCor 2. It is faster. It is more sensitive. It is suitable for physiologically low concentrations.

## What interacts with what in the living cell

Would you like to know whether two different molecules are contained in the same cell compartment? Then use dual-color auto-correlation.

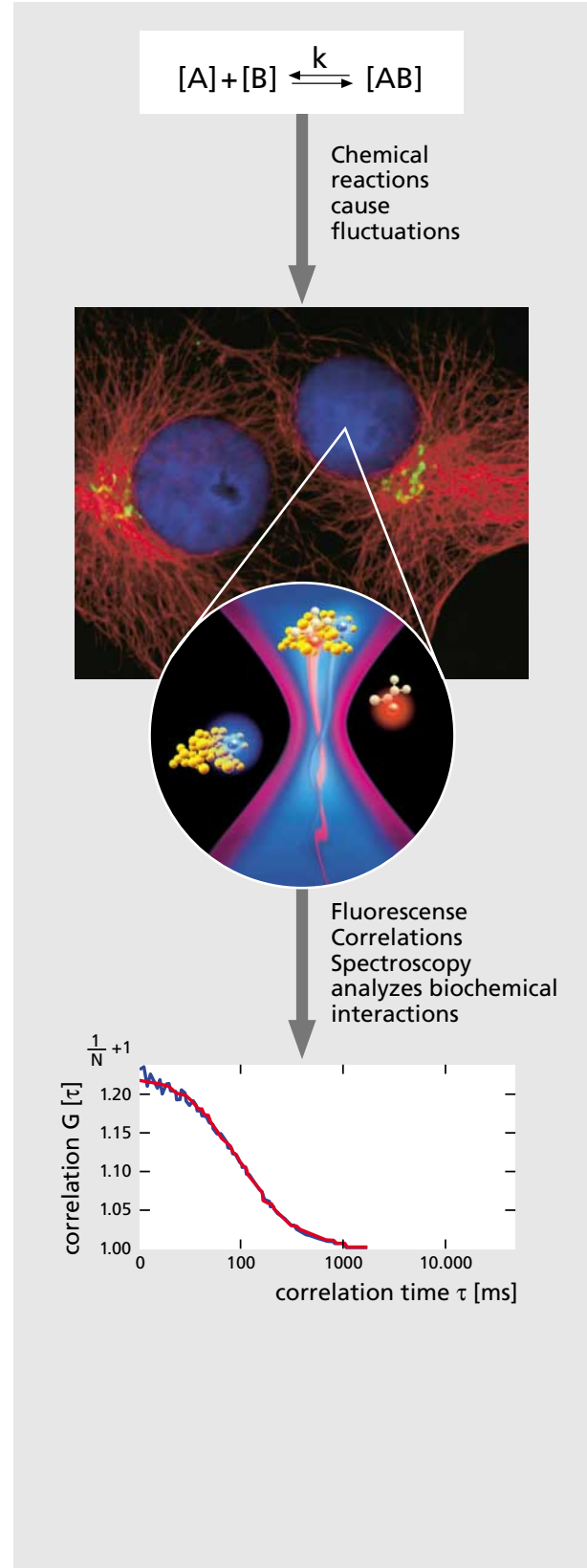
Would you like to know whether these two molecules bind to each other? As soon as you measure dual-color autocorrelation, you automatically obtain cross correlation. And therefore the answer to your question.

*“Dual-color auto- and cross-correlation analysis enables us to elucidate the endocytic pathway of drugs, exemplified by two different AB5 toxins internalized by monkey kidney cells.”*

Petra Schwille,  
Göttingen,  
Germany



*Biochemical procedures determine the structure and function of cells. The combination of the confocal LSM 510 laser scanning microscope and the ConfoCor 2 fluorescence correlation spectrometer from Carl Zeiss permits both to be visualized and biochemically examined simultaneously.*





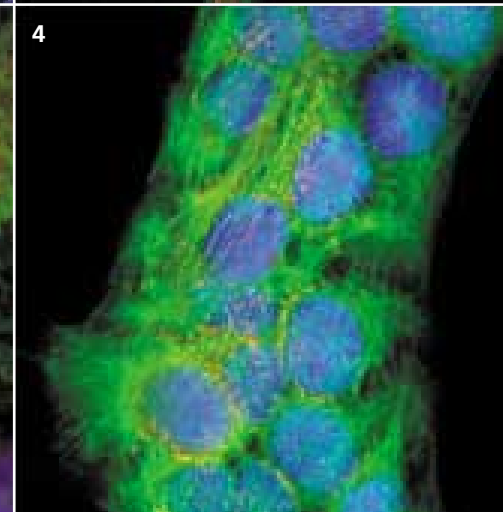
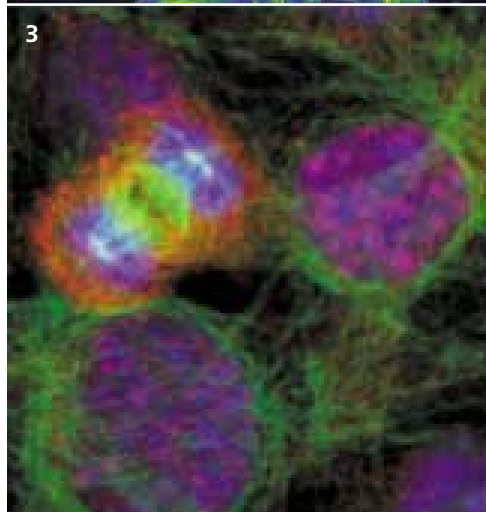
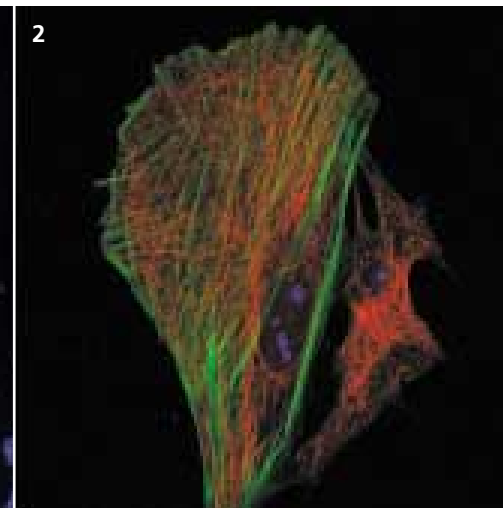
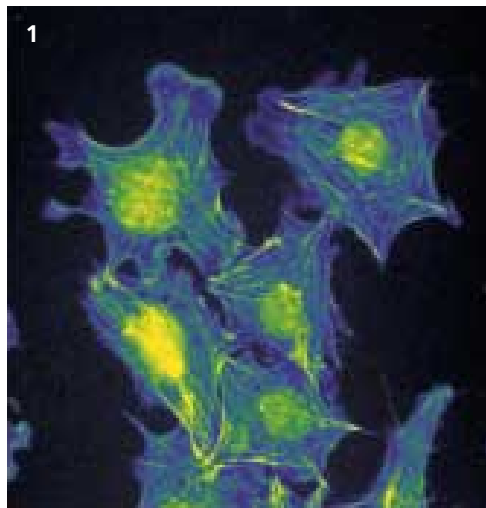
**ConfoCor 2/LSM 510  
combi:  
ideal for cell biologists**

With the combination of LSM 510 and ConfoCor 2, the age of biophysics is now dawning in cell biology.

A single measurement is sufficient to determine

- localization
- diffusion
- concentration and
- molecular interactions.

- 1) Mouse fibroblasts, cytoskeletal structures
- 2) Fibroblasts, microtubuli, intermediate filaments, nucleoli
- 3) Mitotic cells, multifuorescence
- 4) Cell nuclei, cytokeratines and desmoplacine



# Optics and Software

## You Take Care of Your Specimen, We Take Care of the Technology

Only the laws of physics limit the optics. Aided and supplemented by state-of-the-art software algorithms. And yet it is easy to operate, reliable, fully automated: features of the ConfoCor 2 and the ConfoCor 2/LSM 510 combi.

### Maximum sensitivity: The optics

Every photon is important. Precisely why we designed the optics to produce optimum transmission and selected highly sensitive APDs\* as detectors.

The variety of laser lines and the wide spectrum of filters provide you with an ample choice of dyes. Cross correlation requires two per-

fectly overlapping confocal volumes. Our solution: special patented optics.

Cross correlation requires individual multicolor excitation. Our solution: the flexibility of the AOTF\*. Every laser line can be attenuated individually.

### Do it automatically

Do you have a lot of specimens to measure? And every experiment has to be reproducible? Would you prefer not to have to sit beside the instrument during the whole time of routine measurements, and concentrate on the science instead? This is exactly what we have developed the ConfoCor 2 software for.

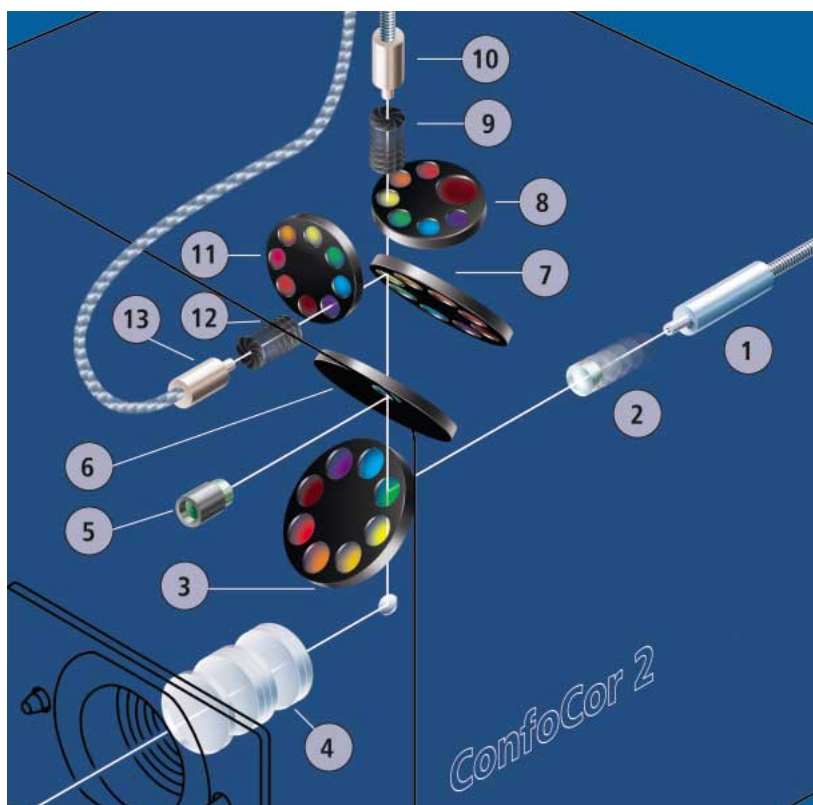
You define a method which becomes your standard. Select the format of your microtiter plate. Press the start button! Everything else is done automatically. Reproducibly. Thanks to the complete motorization of the ConfoCor 2.

### Be flexible

Would you like to optimize your settings? And match the evaluation to your requirements? No problem, thanks to the clear structure of the software. The LSM\* development showed just how user-friendly software can be. From the field of analytical measuring technology, we know your demands on precise evaluation.

Are the evaluation techniques available not sufficient for you? Then simply export the data.

\*See glossary on page 24



Up to five laser lines are coupled into the detection head via a glass fiber (1). Up to two independent detection channels with fiber-coupled Avalanche Photo Diodes (APD) (10), (13) permit the simultaneous measurement of two autocorrelation curves and one cross correlation curve. Each detection channel features a motorized pinhole (9), (12).

- 1 Optical fiber of the laser module
- 2 Motorized collimator
- 3 Main dichroic beam splitter wheel (8 positions)
- 4 Projection lens
- 5 CCD detector
- 6 Camera mirror
- 7 Auxiliary beam splitter wheel (8 positions)
- 8 Channel 1 of the emission filter wheel (6+1 positions)
- 9 Pinhole channel 1 (motorized in x, y and z)
- 10 Detector channel 1: fiber-coupled APD
- 11 Channel 2 of the emission filter wheel (8 positions)
- 12 Pinhole channel 2 (motorized in x, y and z)
- 13 Detector channel 2: fiber-coupled APD



**Would you like to put off your decision till later?**

You are not yet sure whether you will need a ConfoCor 2 for biochemical applications, an LSM 510 for the recording of 3-dimensional images, or rather a ConfoCor 2/LSM 510 combi for applications in cell biology? No problem: every ConfoCor 2, every LSM 510 can be upgraded into a ConfoCor 2/LSM 510 combi any time.

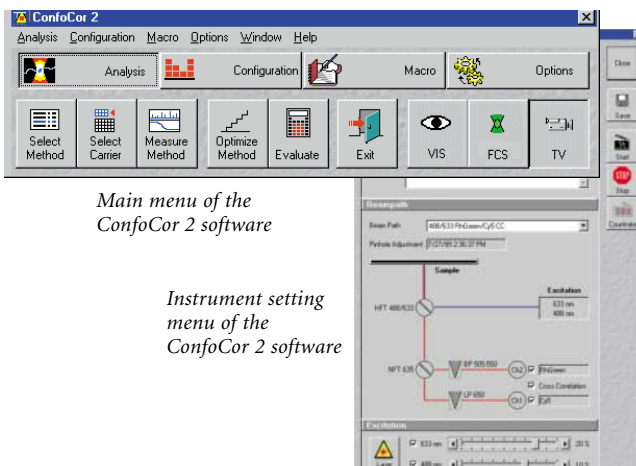
**Innovative technique, advanced technology**

Rely on our technology. Concentrate on your science.

The ConfoCor 2 provides you with

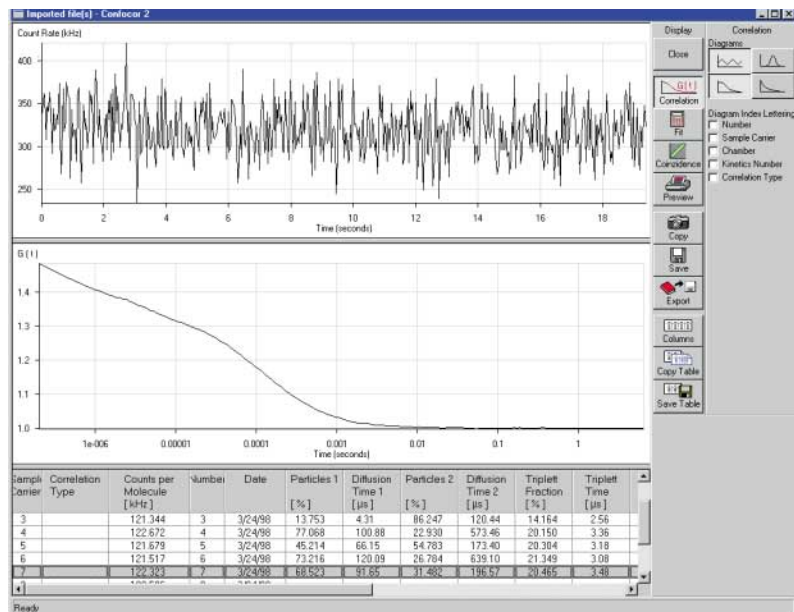
- optics featuring maximum transmission
- clear software structure: flexible and automated
- highest mechanical stability of all components.

*Evaluation window of the ConfoCor 2 software*



*Main menu of the ConfoCor 2 software*

*Instrument setting menu of the ConfoCor 2 software*



# The Basis: Axiovert 200 M

## If You Need the Best, there is Simply no Alternative

You demand only the very best from your research? Rightly so. That's why the ConfoCor 2 and the ConfoCor 2/LSM 510 combi are based on the Axiovert 200 M, the new standard in inverted microscopy.

### See everything at a glance

Quickly. Without damaging the specimen. And yet with perfect quality.

The solution: the Axiovert 200 M, the new state-of-the-art inverted microscope from Carl Zeiss.

The Axiovert 200 M is unique in every detail. With its excellent Zeiss optics. Do you know the wide spectrum of ICS objectives\* and the innovative condensers? Experience optimized fluorescence. Make use of the extreme variety of documentation and adaptation possibilities. Rely on extreme stability. Enjoy the unique ergonomic features and the freedom to automate processes reliably. Save some of your valuable time.

### All contrasting techniques: No restrictions

The Axiovert 200 M supports ConfoCor 2 and LSM 510 without any restriction. Find your cell with the help of brilliant fluorescence, optimized by the patented light trap.

Do you work with lowest dye concentrations? Then why not use phase contrast or Varel\*. Or rather DIC\*? With or without Sénaromont?

Everything is possible. And a lot more besides.

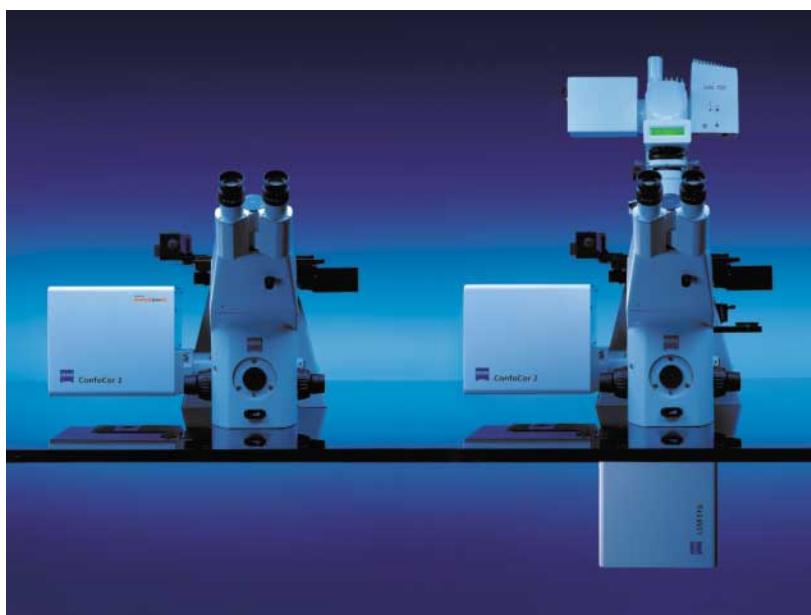
For measurements with the ConfoCor 2, simply use the C-Apochromat 40x objective specially designed for FCS measurements.



*Zeiss optics to perfection: a wide variety of ICS objectives is available to you for every technique.*

*The combination with the LSM 510 is the right choice for measurements in the cell.*

*The ConfoCor 2 as stand-alone unit on the Axiovert 200 stand. This configuration is ideal for measurements in solution and therefore for use in biochemical experiments.*



\*See glossary on page 24



**The Axiovert 200 M is the partner of your dreams**

ConfoCor 2, LSM 510 and Axiovert 200 M together form a unit the like of which can only be provided by a system from a single manufacturer.

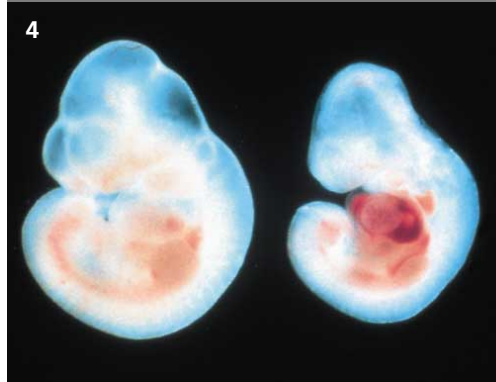
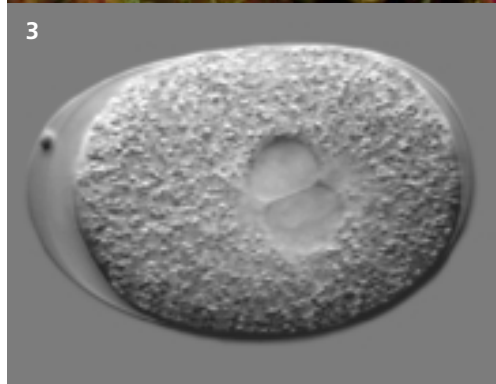
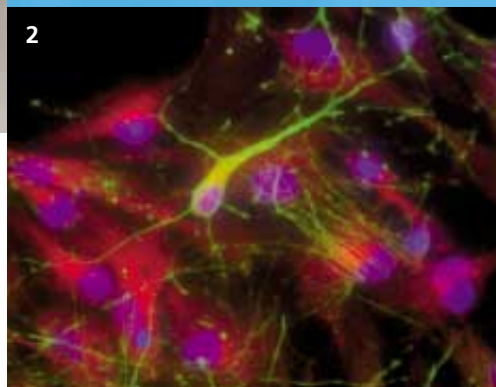
- Optimized optics
- Extreme stability
- Maximum automation

**You don't want to work with a microscope?**

Because you work in biochemistry. Because you work with solutions. No problem. To position the measuring volume in the specimen, use the CCD detector in the ConfoCor 2 detection module.

Do without unnecessary microscope components – and still benefit from the unique stability and optics of the Axiovert 200 M.

- 1) *Electrofusion of an embryo in the 2-cell stage, Phase contrast, K. Vintersten, S. Gray, EMBL Heidelberg/Germany*
- 2) *Embryonic rat cells, triple fluorescence, R. Learish, Promega Corporation, Madison, WI*
- 3) *C. elegans, embryo, DIC, Prof. Schnabel, Techn. University Braunschweig/Germany*
- 4) *Normal embryo (left) and mutant (right), darkfield, R. Adams, EMBL Heidelberg/Germany*



# Its Partner: LSM 510

## Compact. Flexible. Innovative.

The earth is flat. Not true? Well, your cells aren't either. Exactly why the ConfoCor 2/LSM 510 combi is a confocal laser scanning microscope. To let you see your cells just as they are: in three dimensions. Brilliant. Moving.

The measurement follows the image. Just a click of your mouse – and the ConfoCor 2/LSM 510 combi switches to the ConfoCor 2 measuring modes fully automatically. To provide you with even more information about the biochemical functions of your living cell.

Carl Zeiss. The same also applies to the ConfoCor 2/LSM 510 combi. Because both use the same software. And the same lasers. And the same electronics. We have combined two techniques and two instruments into one perfect system: the ConfoCor 2/LSM 510 combi.

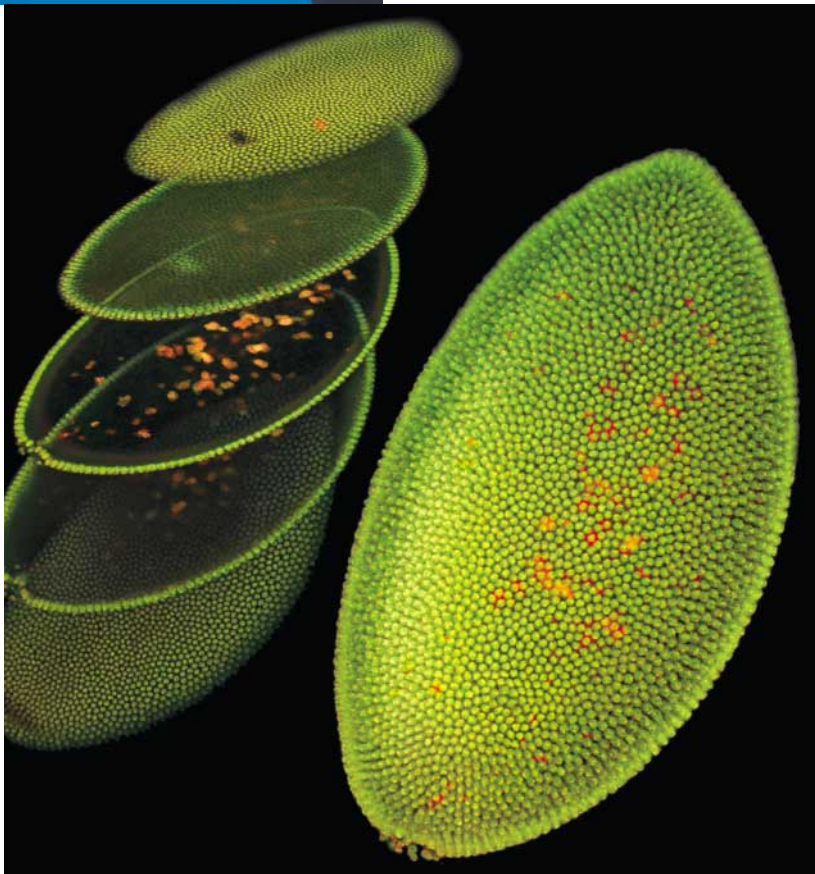
### ConfoCor 2 + LSM 510 - more than a perfect pair

So versatile and yet so simple: the software of the LSM 510 confocal laser scanning microscope from

### Perfection in multifluorescence and reflection

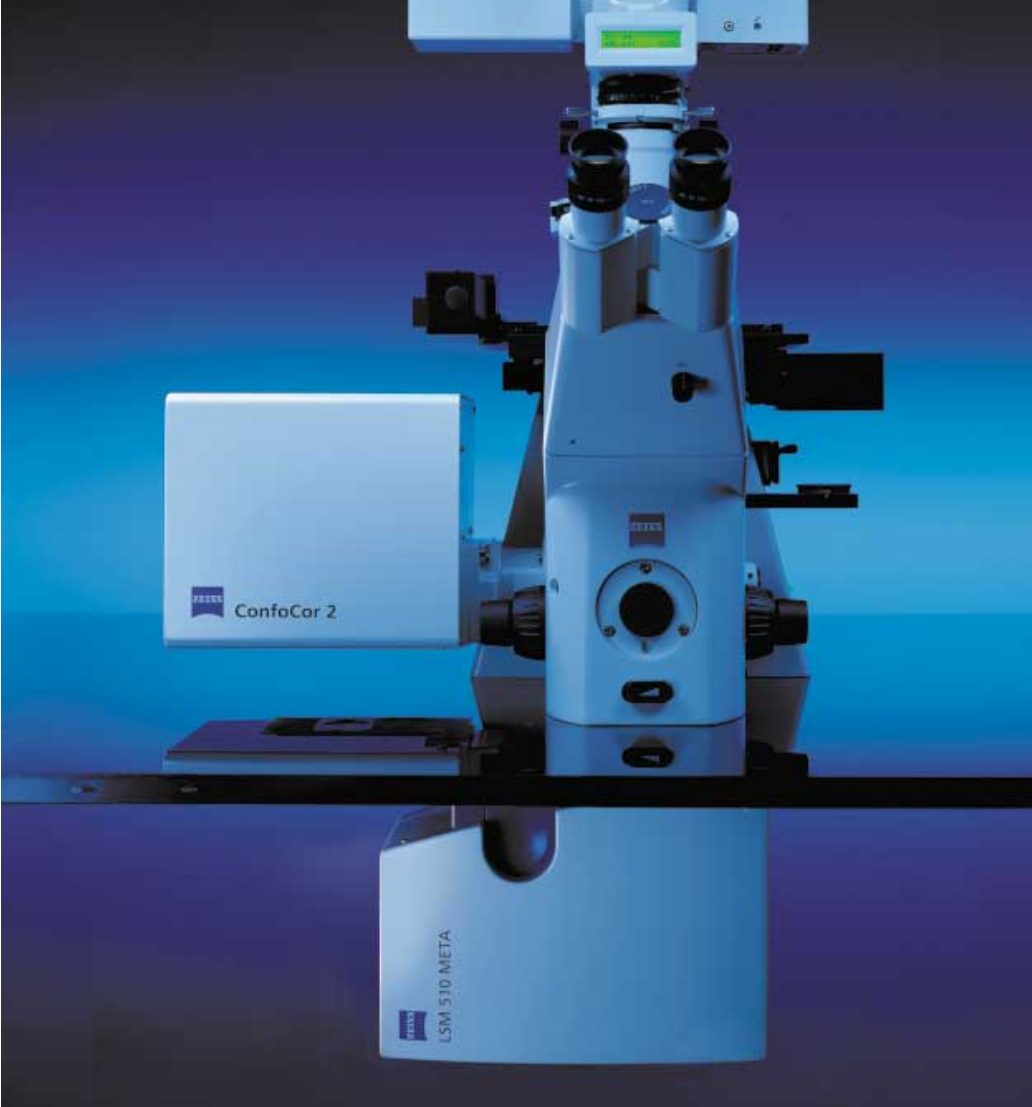
Up to four simultaneous confocal detection channels are available for fluorescence and reflection. Each with its own pinhole. Set the diameter and the x-y position you need. For optimum resolution. Channel 1 can even be adjusted in the z-direction. For true-to-original 3D displays, in all wavelengths. You would like to see more? Then zoom into the image using the crop function. In any required area. Rotate your image. Illuminate precisely the region required. Regions of any shape. This is all made possible by the symmetrical galvanometric mirrors in the scan head, the DSP\* in the electronics unit, the AOTF\* in the laser module.

◁ The LSM 510 module:  
The standard in  
confocal microscopy



*Drosophila embryo,  
single optical sections  
and projection of the  
entire stack of 47 single  
images*

\*See glossary on page 24



## LSM 510 META separates emission

Four channels are not sufficient for you? Even though the compact design ensures maximum sensitivity? Not colorful enough for you? Then combine the ConfoCor 2 with the LSM 510 META.

Then record Lambda stacks. This way, you will receive the entire spectral information about any spot in your image.

Do you use CFP\*, GFP\* and YFP\* simultaneously? Do the spectra of your dyes overlap?

Then use META. Separate the spectra through linear unmixing. With all the benefits of the LSM 510. And with full integration of the ConfoCor 2.

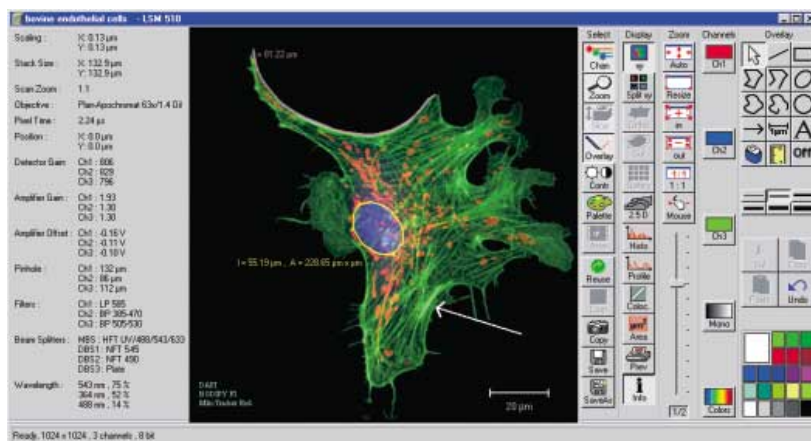
*A strong combination:  
ConfoCor 2 + LSM 510 META*

## Multitracking separates the excitation

Have your cells been dyed with DAPI and FITC? Can you see the DAPI signal in the FITC channel? Multitracking helps to avoid this

cross talk. You can switch between different excitation wavelengths at AOTF\* speed. Line by line. No excitation. No cross talk.

*Evaluation window  
of the LSM software*



## Gateways into new worlds

The various combinations of ConfoCor 2, LSM 510 and META form a single entity. Optics, electronics and software are perfectly matched to each other. To enable you to get more and more information from your specimen

- in brilliant images
- with sharply separate fluorescence
- combined with biochemical data.

# Application Laboratory and More Partnership for the Future

Superb instruments. But, in the end, it's people who make the decisions.

As the user, you exhaust all the possibilities provided.

We, the Carl Zeiss staff, help you. Right from day one. We advise you on the choice of the right components. We demonstrate the potential of our instruments. We will try everything possible to support you in all the questions that might arise.

## **We never leave you alone**

Does the ConfoCor 2 solve your problem?

Our highly qualified specialists will assist you. You can perform experiments together with the scientists from our application laboratories.

Is your laser really compatible with the ConfoCor 2/LSM 510 combi for which you have opted?

Technically trained staff at our headquarters will check every single order. No instrument leaves Jena without the OK from our system integration experts.

Your ConfoCor 2 and ConfoCor 2/LSM 510 combi are installed by specialists. They will be at your assistance if anything goes wrong. Or if you require maintenance.

Do you have any suggestions on how we can improve our systems, make them even more versatile? You know what is still missing? Just call us, or drop us a line.

## **Know-how first-hand**

ConfoCor 2 and LSM 510 are complex systems that let you get every single piece of information out of your specimen.

We offer courses. For beginners or for experts. For FCS, LSM\* and light microscopy.

In professional surroundings, in small groups, held by competent trainers and lecturers: experience and learn what light can tell you about your specimen.





### **Only the application counts**

We not only build instruments, we also provide solutions. Biologists, biochemists and physicists work in our application laboratories. They help in the design and development of our instruments. And provide you with expert advice. Before and after purchase.

### **An international community**

FCS users and pioneers all over the world would like to get to know you. Scientists like you. We bring you together, e.g. during the "International Carl Zeiss Workshop on Fluorescence Correlation Spectroscopy and Related Methods", the most important FCS conference. Regularly. On different continents. For details, please see

[www.zeiss.de/fcsevents](http://www.zeiss.de/fcsevents)

### **Carl Zeiss: The team by your side**

Rely on the team from Carl Zeiss. We

- give advice,
- measure with you,
- guarantee optimum quality, and
- are constantly developing new products, and making existing ones even better and even more innovative.

# Glossary

<b>AOTF</b>	Acousto Optical Tunable Filter: acoustically generated diffraction grating. The intensity of the laser excitation light can be tuned very quickly via AOTF.
<b>APD</b>	Avalanche Photo Diode: highly sensitive detector allowing single photons to be registered.
<b>CFP</b>	Cyan Fluorescence Protein: a protein that can be excited by light and fluoresces in the blue spectral range. Developed from GFP through modification.
<b>DIC</b>	Differential Interference Contrast: optical contrasting technique permitting the optical cutting of the specimen and the examination of height differences.
<b>DNA</b>	Deoxyribonucleic acid: the molecule that contains the genetic information of an organism.
<b>DSP</b>	Digital Signal Processor: controls all the processes of a laser scanning microscope.
<b>FCS</b>	Fluorescence Correlation Spectroscopy: statistical evaluation method where molecules are distinguished by their different diffusion speeds.
<b>Femtoliter</b>	$10^{-15}$ liter, i.e. one quadrillionth of a liter.
<b>Femtomolar</b>	$10^{-15}$ molar. The molarity is the unit for the concentration of a substance in solution.
<b>FRET</b>	Fluorescence Resonance Energy Transfer: transfer of the energy of a donor to an acceptor close to it which can then emit photons although it has not directly been excited by light. This technique is used to detect molecular interactions.
<b>GFP</b>	Green Fluorescence Protein: a protein that can be excited by light and fluoresces in the green spectral range. It is widely used in cell biology.
<b>ICS</b>	Infinity Color-Corrected System. The ICS optics of objectives allows excellent image flatness and the correction of chromatic aberration.
<b>LSM</b>	Laser Scanning Microscope. Light microscope where the specimen is scanned by laser light spot by spot. Permits razor-sharp images with optimum resolution and minimum noise.
<b>Nanoliter</b>	$10^{-9}$ Liter: one billionth of a liter.
<b>PCH</b>	Photon Counting Histogram: statistical evaluation method that distinguishes molecules by their different brightness.
<b>PCR</b>	Polymerase Chain Reaction: method permitting the amplification of any required nucleic acid sequence.
<b>SDS</b>	Sodium Dodecyl Sulfate: ionic detergent used for the denaturation of proteins.
<b>SPR</b>	Surface Plasmon Resonance: method permitting the examination of the interaction of a molecule immobilized on a certain material together with another molecule in solution. The measuring principle is based on the change in the angle of a light beam reflected on a surface in case of a binding event.
<b>Varel</b>	Variable relief contrast: optical contrasting technique where object structures of different optical densities appear in 3D.
<b>YFP</b>	Yellow Fluorescence Protein: a protein that can be excited by light and fluoresces in the yellow spectral range. Developed from GFP through modification.

# Welcome Online

Would you like to know even more?  
Then why not visit our website?

[\*\*www.zeiss.de/fcs\*\*](http://www.zeiss.de/fcs)

This site contains a detailed description of the FCS technique, parameters of the ConfoCor 2 and many applications.

Everything you would like to know about the LSM 510 is available at this address.

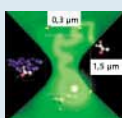
[\*\*www.zeiss.de/lsm\*\*](http://www.zeiss.de/lsm)

The scientific community, the FCS users and pioneers meet at

[\*\*www.fcs-list.net\*\*](http://www.fcs-list.net)

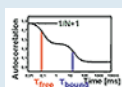
You will find a discussion forum, literature and links galore.

## ConfoCor 2 Making Fluorescence Correlation Spectroscopy (FCS) available to the Life Scientist



### What is FCS

Efficient Analysis of Molecular Interactions



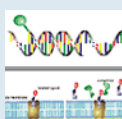
### How does FCS work

A Nanoliter is Enough



### How does ConfoCor 2 work

Non-invasive Study of Binding Phenomena



### What can you do with ConfoCor 2

Measurements in Solution and in Living Cells  
Realtime Measurement



### What do you need

ConfoCor 2 or ConfoCor 2/LSM 510 combi



*“Using light  
is our world”*

Corporate Vision  
of Carl Zeiss



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Subject to change.

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