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WYATT TECHNOLOGY CORPORATION

DynaPro™

The most widely used dynamic light scattering technology for the fast and accurate characterization of your biomolecules in solution



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Wyatt's DynaPro™

Complement your on-line Wyatt with the DynaPro dynamic light scattering systems

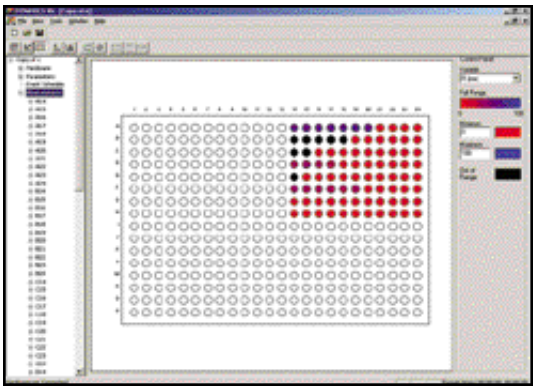
The great success of the DynaPro™ DLS systems is represented, in part, by the enormous number of peer-reviewed publications that cite them. There are more biopolymer-related publications using the DynaPro than all other DLS systems combined!

Introduction

In the early 1990s, the Protein Solutions'™ DynaPro began appearing in biophysical characterization labs throughout the world—for the first time offering scientists the ability to measure small volumes of dilute protein samples. These novel dynamic light scattering (DLS) instruments quickly earned acceptance on a *global* basis, becoming indispensable tools for scientists examining protein structure. By studying the dynamic light scattering size distributions of their protein solutions *prior* to lengthy crystallization trials, scientists could grow crystals in *less* time with *less* protein, breaking the bottleneck of protein structure determination.

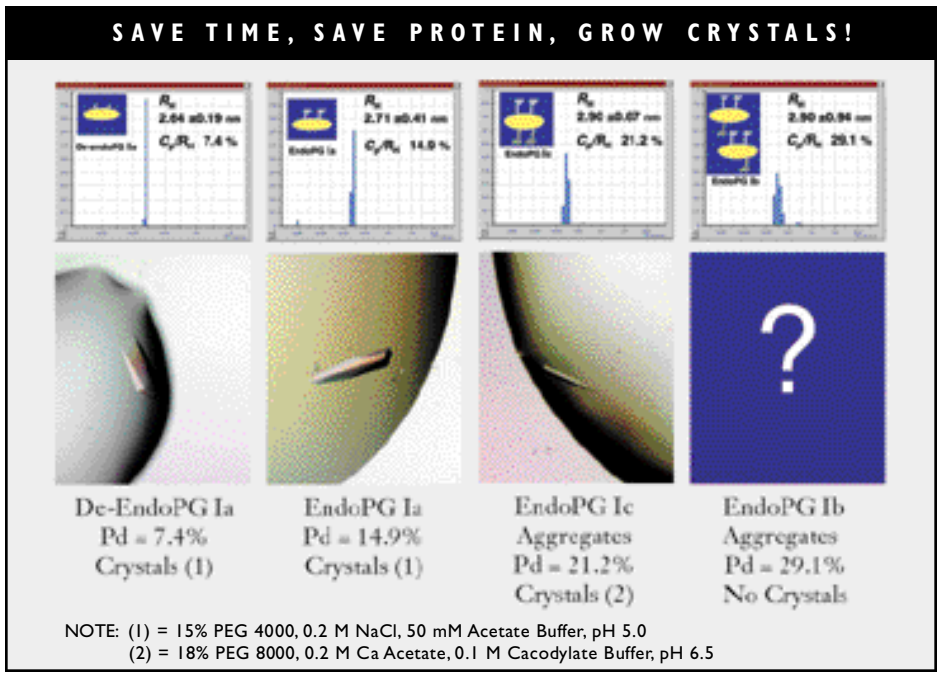
Soon, biophysical characterization became the critical path in the development cycle for *every* laboratory that required a complete understanding of how proteins and other biomolecules functioned in solution.

Stability, aggregation, complex formation, and conformation are all vital issues facing a wide variety of biomolecular Research & Development initiatives. The DynaPro Titan, whether alone or used in conjunction with other classical biophysical techniques, clarifies these issues in a fast, accurate, and user-friendly manner. In fact, the DynaPro instruments are used in more than 80% of the world's biophysical characterization labs, making them the best-selling light scattering instruments for protein crystallographers available.



SpectralView™ software allows you to rapidly score and screen your data according to parameters you define, providing you with intuitive interpretations of your data.

The DynaPro instruments measure the molecular diffusion, size, and polydispersity properties of macromolecules in solution *within seconds*. The instruments incorporate proprietary multi-mode optical fiber technology, as well as state-of-the-art software algorithms, data processing, and applications know-how to deliver the most sensitive and accurate performance anywhere.



DynaPro DLS size distributions and measured Polydispersity (Pd) from the pre-crystal screening of four forms of Endopolygalacturonase (EndoPG 1). The samples with lower polydispersity were more readily crystallized compared to samples with higher polydispersity.*

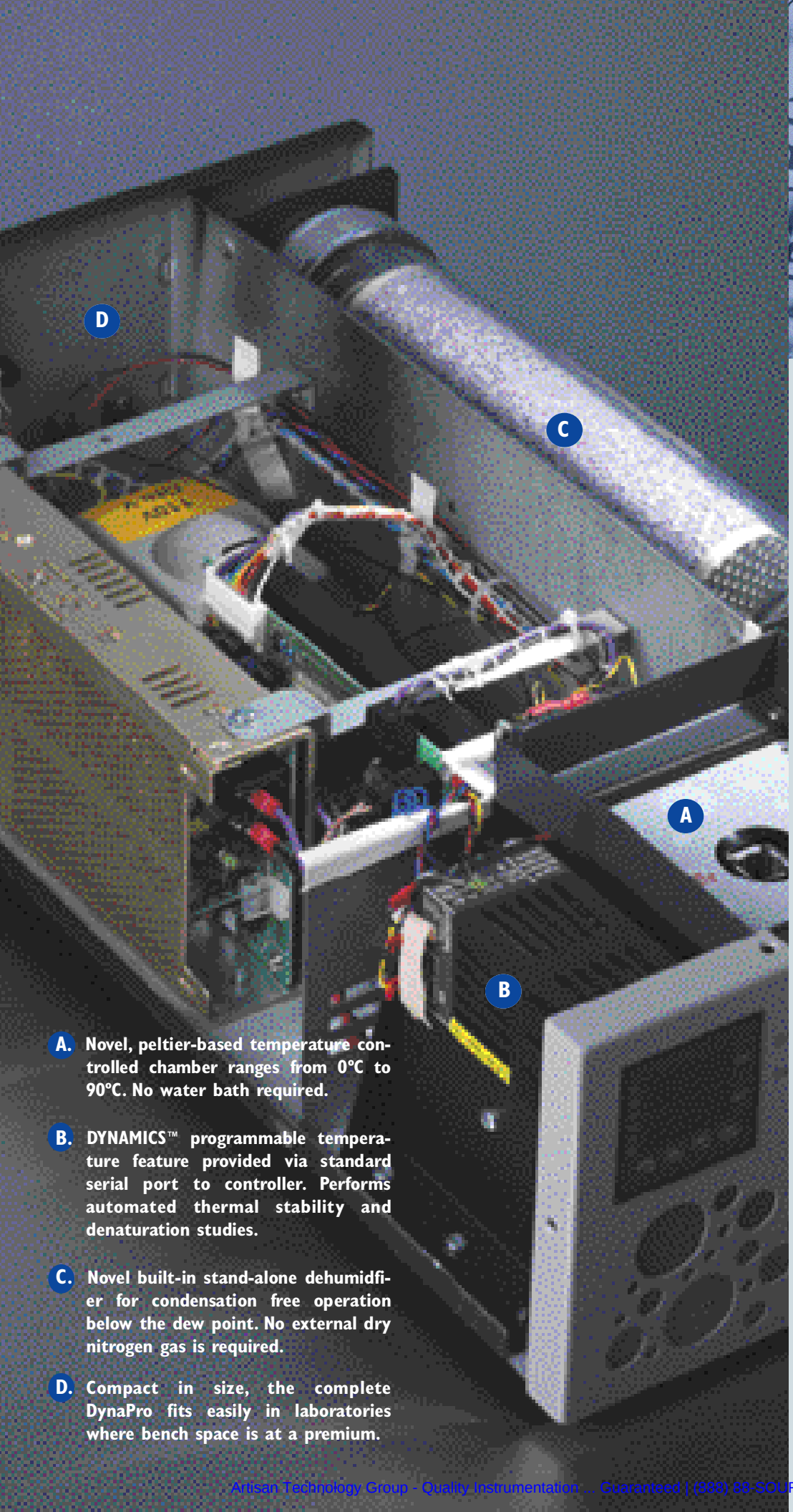
* Contains original DynaPro data, © Hiroaki KATO, Professor, Structural Biology, The Graduate School of Pharmaceutical Sciences, Kyoto University, 46-49, Yoshida-Shimoadachi, Sakyo, Kyoto 606-8501, JAPAN. Used with permission.

Joining the Wyatt Family of Instruments

Now, under the aegis of Wyatt Technology, the DynaPro family of instruments is backed by the service and support that have made WTC's DAWN® and Optilab® products world-renowned. And, for the *first* time, DynaPro customers are granted access to Wyatt's exclusive "Light Scattering University" (LSU).

Moreover, new customers also get access to Wyatt's Support Center on the Web at **www.wyatt.com**.

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A. Novel, peltier-based temperature controlled chamber ranges from 0°C to 90°C. No water bath required.

B. DYNAMICS™ programmable temperature feature provided via standard serial port to controller. Performs automated thermal stability and denaturation studies.

C. Novel built-in stand-alone dehumidfier for condensation free operation below the dew point. No external dry nitrogen gas is required.

D. Compact in size, the complete DynaPro fits easily in laboratories where bench space is at a premium.



How It Works...

The light scattered by the sample is collected by a custom optical fiber. The fiber collects wavelets of light, which scatter destructively or constructively, depending on the positions of the illuminated molecules. As the molecules undergo Brownian motion, their relative positions change with time. Small molecules—which diffuse quickly—generate signals that fluctuate **rapidly**. Conversely, large molecules generate signals that fluctuate **slowly**. The time dependence of these fluctuations is characterized by the intensity autocorrelation function that is defined as

$$G(\tau) = \int_{-\infty}^{\infty} I(t)\, I(t-\tau)\, dt,$$

where $I(t)$ is the detected intensity as a function of time, and τ is a delay time. The autocorrelation function of a monodisperse sample is related to its diffusion constant by

$$G(\tau) = \langle I(t) \rangle^2 \left(1 + \alpha e^{-2 D_T q^2 \tau}\right)$$

where $\langle I(t) \rangle^2$ is the average scattered intensity squared, α is an instrument constant, D_T is the translational diffusion constant, $q = (4\pi n/\lambda_0)\sin(\theta/2)$, n is the index of refraction of the solvent, λ_0 is the wavelength of light in vacuum, and θ is the angle of detection with respect to the incident beam direction.

By analyzing the correlation function, one can measure directly the diffusion constant of the molecule. Furthermore, if the molecule is assumed to be a uniform sphere, the Stokes-Einstein relation enables the molecule's hydrodynamic radius to be determined:

$$r_h = \frac{k_B T}{6\pi\eta D_T},$$

where k_B is Boltzman's constant, T is the absolute temperature (in degrees Kelvin), and η is the solvent viscosity.

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High Throughput Screening

Improve Productivity: High Throughput DLS Plate Reader

Today, productivity in R&D has become a significant issue facing the research community, particularly in the pharmaceutical industry. In response to the growing need for obtaining more information *faster*, the DynaPro has once again been augmented with an innovative new capability—the DynaPro Plate Reader.

High throughput dynamic light scattering analysis is finally a reality. The DynaPro Plate Reader accepts 96 or 384 well plates for hands-free, automated DLS analysis. There is no more cleaning of precious cuvettes. Now, you can simply use disposable plates and analyze more samples in a day than you might have been able to measure in a month. The DynaPro Plate Reader enables you to automate the detection of compound aggregation as part of a high throughput screening assay.

Designed expressly for *high capacity, automated sample analyses*, the DynaPro Plate Reader breaks the barrier of one-at-a-time, manual sample analysis. Now, you can collect more data in less time *and with less effort*. The Plate Reader can even be connected to your existing DynaPro host instrument, to enhance your productivity with automated, hands-free measurements. Compatibility of your instrument with the Plate Reader Accessory may be confirmed with a simple call or email inquiry to WTC.

Speed your way down the path of biomolecular characterization *and* reduce the amount of work involved. It sounds improbable, but it won't after you've tried the DynaPro Titan Plate Reader. Finally, batch DLS measurements have been automated, so sample analysis becomes trivial. Press a button, and the Plate Reader automatically analyzes up to 384 samples—as many times as you wish. And because it requires no attendance, it can be connected to an automated liquid handling system to streamline the processing of literally thousands of samples.

Applications

The DynaPro has been superbly engineered to provide flexibility in both hardware *and* software to meet a battery of specific application requirements.

You may choose our unique 12 µl quartz sample cell for limited samples, or you may employ industry-standard wellplates (50 µl sample volume per well) in the Plate Reader for high-throughput applications. The modular cell holder allows for simple conversion from the high sensitivity, low volume batch method to the high throughput, automated plate reader technology. Alternatively, the DynaPro can be connected to Wyatt's DAWN and miniDAWN static Multi-Angle Light Scattering (MALS) instruments for batch or on-line chromatography detection of both static *and* dynamic light scattering signatures.

The DynaPro Titan—and its Plate Reader variation—serve a broad range of applications spanning the "three D's": Discovery, Development, and Delivery. With these instruments you can:

- Characterize purified proteins for homogeneity, size, and thermal stability;
- Measure kinetics associated with macromolecular assemblies;
- Screen biotherapeutics for self-association over a broad range of solution conditions;
- Measure the stability and size of lipids, conjugates, and other drug delivery particles;
- Detect and analyze compound aggregates that may cause false positives;
- Complement your Wyatt MALS with the DynaPro DLS system to provide simultaneous off-line and on-line static and dynamic light scattering.

PLATE READER BENEFITS

Description	Batch (Cuvette) Operation	Plate Reader (Microplate)
Time to prepare 384 samples (make dilutions, measure salt concentrations,etc.)	2-16 hours	<2 hours
Loading samples	>12 hours (including time to insert, remove, and clean each cuvette)	<1 hour
Collecting data, personnel required	>6 hours, and a person required to change samples	No personnel required
Totals	20-34 hours	<3 hours

The DynaPro Plate Reader dramatically improves your productivity by over a factor of 10 compared to conventional batch DLS systems. Accelerate your research timetable, explore more conditions, or simply make better use of time with the Plate Reader.

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The only dynamic light scattering technology that can measure directly from industry standard microplates.



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DYNAMICS™ Software

Software Flexibility

DYNAMICS™ software provides an easy-to-use *and* powerful interface between you and the DynaPro.

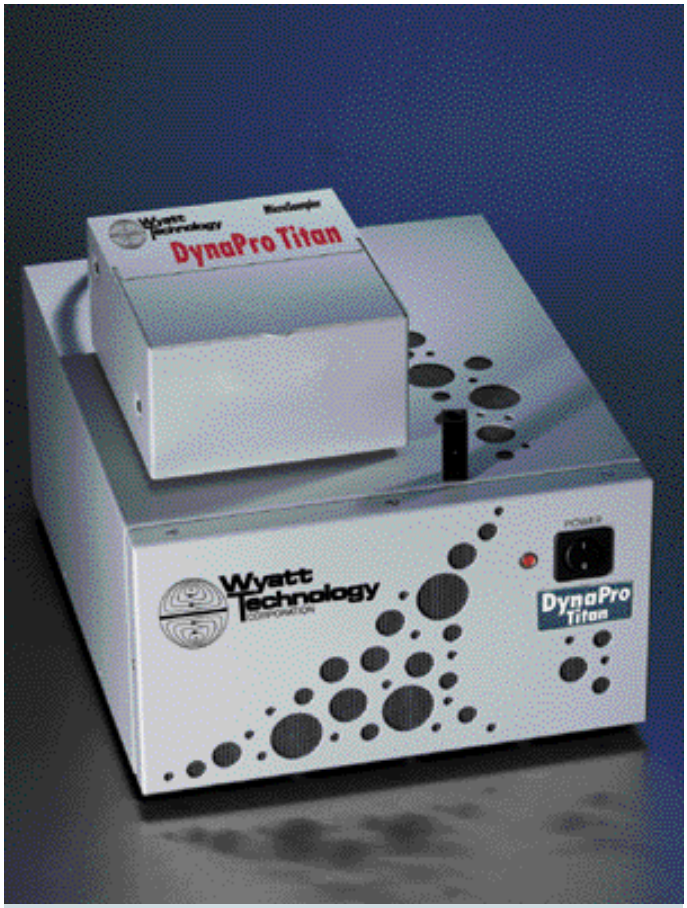
Real time size distributions are displayed in a Histogram format, as well as in custom tables highlighting the parameters of critical importance to your application.

You can view and control the analysis of the underlying correlation functions in unique graphical displays that convey at a glance how your molecules are behaving in solution. In addition, you can quickly and easily identify trends in size, polydispersity, and other critical parameters *versus* experimental solution conditions with a real time display of the measurement results in a custom, dual y-axis graph.

A logical software layout takes you step-by-step from experimental design to optimization. Powerful, proprietary algorithms process your measurements in seconds, and your results can be viewed in real time. All data can be brought into Microsoft-compatible programs, giving you the flexibility to present the data in a way that best suits your presentation. Click **GO**, and within minutes your data will have been analyzed to produce meaningful results.

The ***Spectral-View***™ module within the DynaPro's ***DYNAMICS*** software allows for intuitive experiment design and rapid display of plate reader experiments. Define the parameters you are screening, select a color scheme, and then easily assess the quality of your samples according to the parameters *you* defined. Samples can be scored on any one of more than ten parametric scales.

You can easily program and control the Plate Reader to measure partial or complete rows, columns, or wells for the highest flexibility and efficient use of the plates...not to mention your time!



The DynaPro Titan MicroSampler is the most compact and easy to use system for biomolecular characterization.



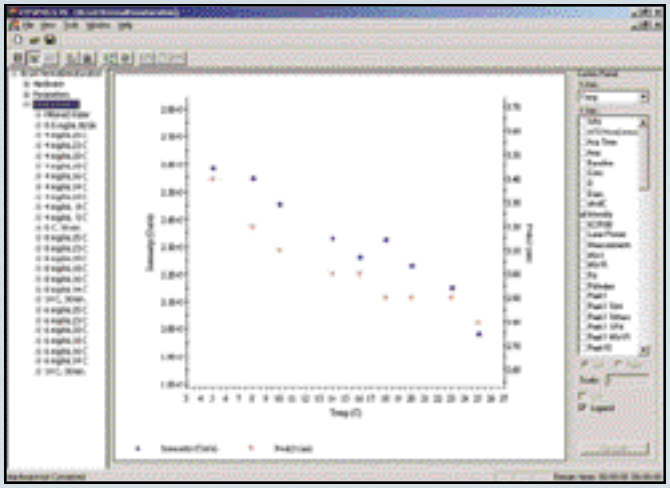
The microcuvette allows dynamic light scattering measurements to be made on samples as small as 12 microliters.

Support

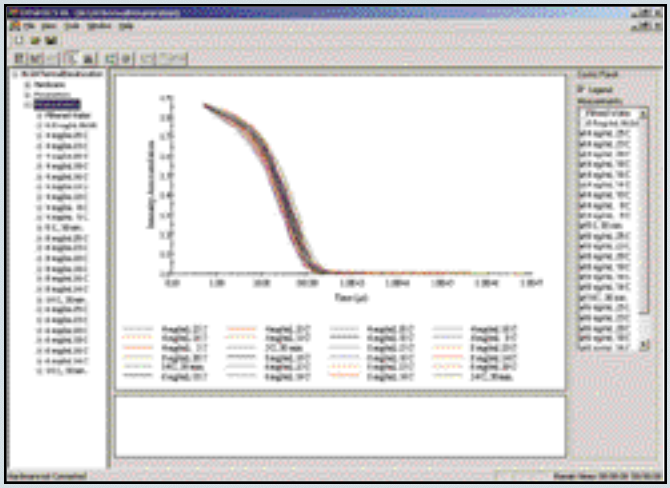
A long-standing committment of WTC focuses on our most important asset: you, the customer.

We take the time to develop an understanding of your research goals and then apply our expertise in matching the right applications to our DynaPro or DAWN products. Our exclusive on-line Application Library, found at **www.wyatt.com**, represents just a portion of the application and technical support included with every DynaPro purchase. A dedicated, customer-only section of our website lets you download the latest software drivers, applications, tutorials, and application notes any time of the day or night—wherever you are in the world.

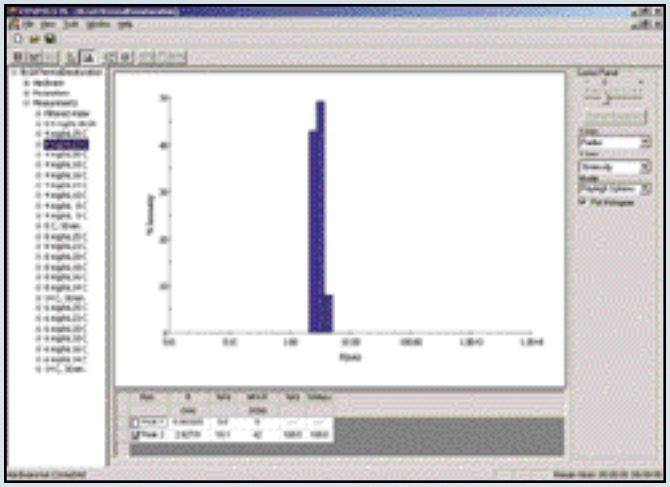
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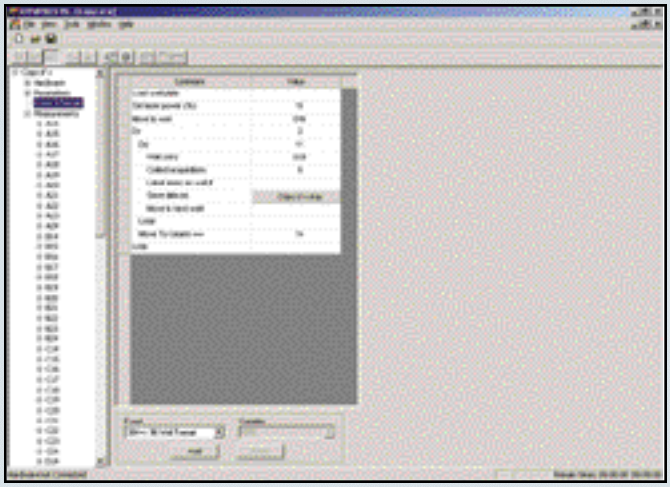
Quickly and easily identify trends in size, polydispersity, and other critical parameters versus experimental solution conditions with a real time display of the measurement results in a custom, dual y-axis graph.



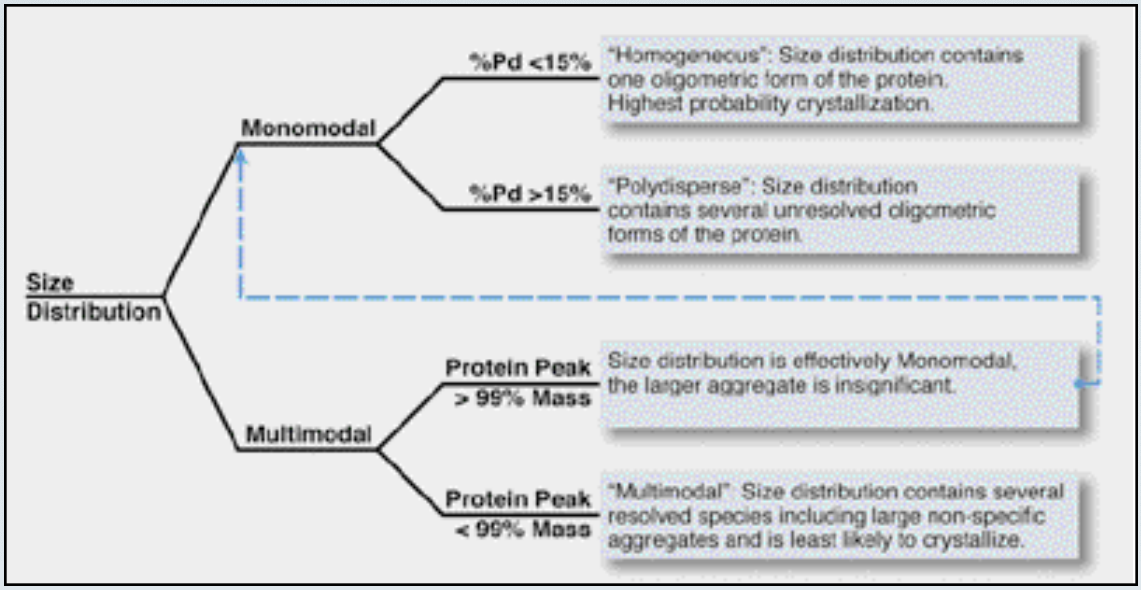
DYNAMICS™ software is designed to manage and analyze the large amounts of data obtained from the Plate Reader, including the unique ability to overlay correlation functions and size distributions from any or all of the data collected.



Real time size distributions are displayed in Histogram format and in custom tables highlighting the parameters of critical importance to your applications.



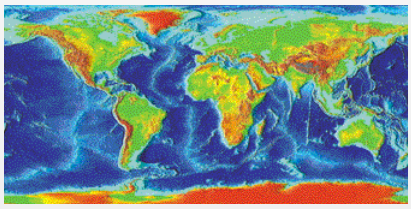
You can easily program and control the Plate Reader to measure partial or complete rows, columns, or wells for the highest flexibility and efficient use of the plates...and your time!



The DynaPro provides proven, invaluable insights making your protein crystallization efforts more productive. The size, size distribution, and polydispersity data from the DynaPro screen proteins for successful crystallization trials as part of a "rational approach" to protein crystallization.[1]

[1](D'Arcy, Allan "Crystallizing proteins—A rational approach", Acta Cryst.1994,D50,467-471).

Specifications



	DynaPro Titan TC	Plate Reader (PR)
Size Range (Radius - nm)	0.5 to 1000	1 to 1000
Minimum Concentration *	0.1 mg/ml	2 mg/ml
Scattering Angle (°)	90	150
Laser Wavelength (nm)	830	830
Laser Power (mW)	0–50 mW (programmable)	Same
Min. Sample Volumes (µl)	12 or 45	50
Cuvette Materials	Quartz	Plastic plate
Number of Samples	One	96 or 384
Temperature Range (°C)	0–90	Ambient
Condensation Control **	Built-in dehumidifier	Not applicable
Correlator	248 channels @ 0.48 µs.	Same
Data Acquisition Time (s)	1 to 3600	Same
Read Time (96 well plate)	N/A	96 minutes typical
Host Dimensions (W x H x D)	(265 x 155 x 350 mm)	Same
Host Weight	5 kg	Same
Sample Compartment Dimension	(265 x 165 x 505mm)	(420 x 195 x 510mm)
Sample Compartment Weight	14 kg	21 kg
PC ports	1 USB 1 Serial	Same
Optical Fiber	Multi-Mode	Multi-Mode

* 14 kDa Lysozyme, PBS, 100 seconds data aquisition

** The DynaPro contains a novel built-in, stand-alone, dehumidifier for condensation-free operation below the dew point. No external dry nitrogen gas is required.

With installations in *more* than 50 countries, Wyatt Technology is the **world's leading manufacturer of instruments** for absolute macromolecular characterization. It is the only company in the world focused exclusively on such systems, their design, and their application.

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