



Analytical Ultracentrifugation

Macromolecule Characterization in Solution



BRILLIANCE
at every turn.

 **BECKMAN
COULTER**
Life Sciences

AUC TECH OVERVIEW

OPTIMA AUC

Analytical Ultracentrifugation

Beckman Coulter delivered the first AUC sample characterization tool to the scientific community powering discoveries. The tradition continues into the 21st century with the new Optima AUC system. This latest offering is the most robust technology for providing protein molecular weight in basic protein research and quantification of aggregation levels for academic and biopharma research.

Analytical ultracentrifugation is the most versatile, rigorous and accurate means for determining the molecular weight, hydrodynamic and thermodynamic properties of a protein or other macromolecule. Currently, there is no other technique capable of providing the same range of information with a comparable level of precision and accuracy.

AUC Applications

- Molecular Weight
- Stoichiometry
- Protein Aggregation
- Ligand Binding
- Conjugation efficiency
- Polydispersity

"For the first time, these advanced features enable revolutionary new multi-wavelength experiments, an entirely new class of experimental designs that can exploit the presence of multiple chromophores in complex mixtures through spectral decomposition."

Borries Demeler
(University Texas Health Science Center)





Advantages

- Sample recovery
- No dilution required
- Matrix free
- Minimal buffer constraints
- Detection at low concentrations
- Low sample volume (0.1 mL minimum)
- High throughput
- No standards required

The Optima AUC combines the power of a centrifuge to provide sedimentation of particles and the functionality of an optical module to detect the sedimentation over time. AUC technology provides insight into sample molecular weight, shape, conformation, and heterogeneity.

It was 90 years ago that the analytical ultracentrifuge became the world's best, most natural way of characterizing proteins. Now, our newly upgraded **Optima AUC** offers absorbance scans in seven seconds and interference scans in less than 5 seconds. The advanced optics simplify cleaning and produce more valid, reproducible data.

DON'T CALL IT A COMEBACK

2010s



Optima AUC is introduced opening up the possibilities for future discoveries

2000s



ProteomeLab XL-A and XL-I are introduced by Beckman Coulter

1990s

The Optima XL-A and XL-I centrifuges introduced by Beckman Coulter

The AN 60 Rotor introduced by Beckman Coulter

1970s

Development of flotation Sedimentation Techniques

1960s



Rayleigh interference optics developed in Schachman's Laboratory, giving the ability to characterize particles with low absorption in range outside of the visible UV spectrum.

1950s



Beckman Instruments acquires Spinco (1954)



Discovery of semi-conservative replication of DNA by Meselson and Stahl



Discovery of Johnston-Ogston effect and the resultant boundary anomaly

1940s



Plasma and blood volume extender methods for transfusions developed

Ability to determine size, shape, density, and electric charge



Establish basis of protein science and molecular biology

The first commercially available centrifuge, the Spinco Model E, is introduced (1947)

1920s



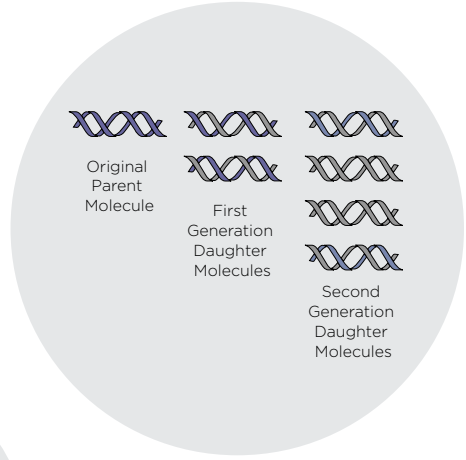
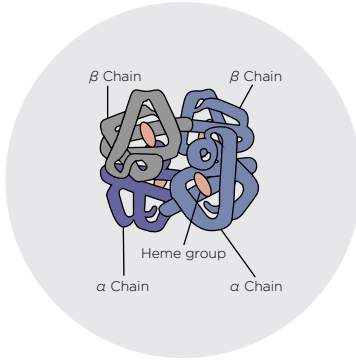
1925: The Analytical Ultracentrifuge is invented by Theodor Svedberg



Tertiary and Quaternary Structure established



Lamm Equation is created, describing the sedimentation and diffusion of a solute under ultracentrifugation.



$$\frac{dc}{dt} = \frac{1}{r} \frac{d}{dr} \left[rD \frac{dc}{dr} - s\omega^2 r^2 c \right]$$

"Due to the large size and conformational heterogeneity of our samples, sedimentation velocity experiments in the analytical ultracentrifuge have allowed us to make many seminal findings about chromatin condensation mechanisms that would not have been possible with any other technique.

Jeffrey C. Hansen, PhD,
Colorado State University

PRODUCT SPECIFICATION COMPARISON

	ProteomeLab XL-I	Optima AUC**
Optical Systems		
Fastest Data Acquisition Rate	ABS: 90 sec/cell INT: 5 sec/scan	ABS: <7 sec/sector* INT: <5 sec/scan
Max # of Wavelengths	3	20**
Wavelength Precision	+/- 3 nm	+/- 0.5 nm
Lowest Radial Resolution	30 µm	10 µm
Absorbance Flash Lamp Frequency	50 Hz	300 Hz
CCD Camera Specifications	2048 x 96 pixels	2048 x 1088 pixels
Interference Fringes	≥ 4 fringes/cell	≥ 10 fringes/cell
Usable Concentration Ranges	ABS: .005 - 1.5 mg/mL INT: .025 - 3-4 mg/mL	ABS: .005 - -1-2 mg/mL Luteinizing Hormone INT: .025 - -4-5 mg/mL BSA
Hardware		
Operating System	Windows	LINUX Remote GUI (any operating system)
Remote Experimental Setup, Monitoring, and Data Export	No	Yes
Display	7 inches	15 inches
Sample Temperature Control Accuracy	+/-0.5°C	+/- 0.5°C***
Sample Temperature Range	4-40°C	0-40°C****
Optical Architecture	Dependent systems	Open, Modular (up to 3 detection capabilities at once)

*At optimal rotor speeds, at 10 µm radial resolution

**Product under development - specifications pending system verification

***After reaching temperature equilibrium

***Environmental temperature must be less than 25°C to reach below 4°C

INSTRUMENTS & COMPONENTS

Ordering Information

Component	Part No.	Description
Optima AUC - Absorbance Only	B86438	Hardware only with Absorbance optics
Optima AUC - ABS/INT	B86437	Hardware only with Absorbance + Interference optics
Optima AUC - ABS Bundle + An-60	C00707	Optima AUC (A) + Starter Kit (1 CB, 1 torque stand, 1 Quartz Cell + 1 accessory kit) + An-60
Optima AUC - ABS/INT Bundle + An-60	C00708	Optima AUC (A/I) + Starter Kit (1 CB, 1 torque stand, 1 Quartz Cell + 1 accessory kit) + An-60
Optima AUC - ABS Bundle + An-50	C00709	Optima AUC (A) + Starter Kit (1 CB, 1 torque stand, 1 Quartz Cell + 1 accessory kit) + An-50
Optima AUC - ABS/INT Bundle + An-50	C00710	Optima AUC (A/I) + Starter Kit (1 CB, 1 torque stand, 1 Quartz Cell + 1 accessory kit) + An-50
An-60 rotor	361964	4-hole rotor rated to 60,000 rpm
An-50 rotor	363782	8 hole rotor rated to 50,000 rpm
2-sector charcoal Quartz	392772	SV cell with charcoal flow-through centerpiece and quartz windows
Torque stand Assembly	361318	Required to torque cells to prevent sample leaking
Counterbalance Kit	360219	1 counterbalance with mask + weights
Accessory Kit	392777	6 brass housing plugs
Cell housing kit	334606	2 window assemblies + cell housing

