Analytical Ultracentrifugation
Macromolecule Characterization in Solution

Optima AUC

BECKMAN COULTER

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.
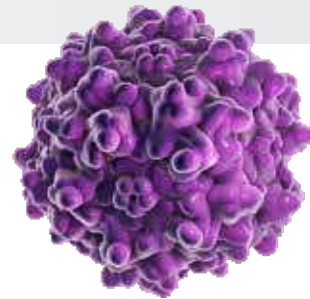
Even at 60k RPM, there was room for **one more revolution.**
The Optima AUC

JOURNEY OF DRUG STAGES
BASIC RESEARCH

Viral Payload

AUC is a critical tool to researchers studying adeno-associated viruses and other vectors for drug delivery to determine genetic payload

Protein Characterization

AUC is the gold standard for molecular weight and sample purity determination. Performed in a native state, AUC can characterize protein conformational changes, homogeneity, and shape.
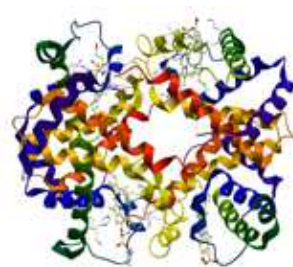
Drug Conjugates

AUC is routinely used for characterizing the conjugation efficiency of Antibody Drug Conjugates (ADCs) and encapsulation or fusion of nanoparticle-drug complexes

"The results of AUC are explicit, reliable, and reproducible. AUC is my method of choice to characterize macromolecules and precisely study protein-protein interactions."

Jia Ma, PhD Director Bioanalytical Core, Purdue University

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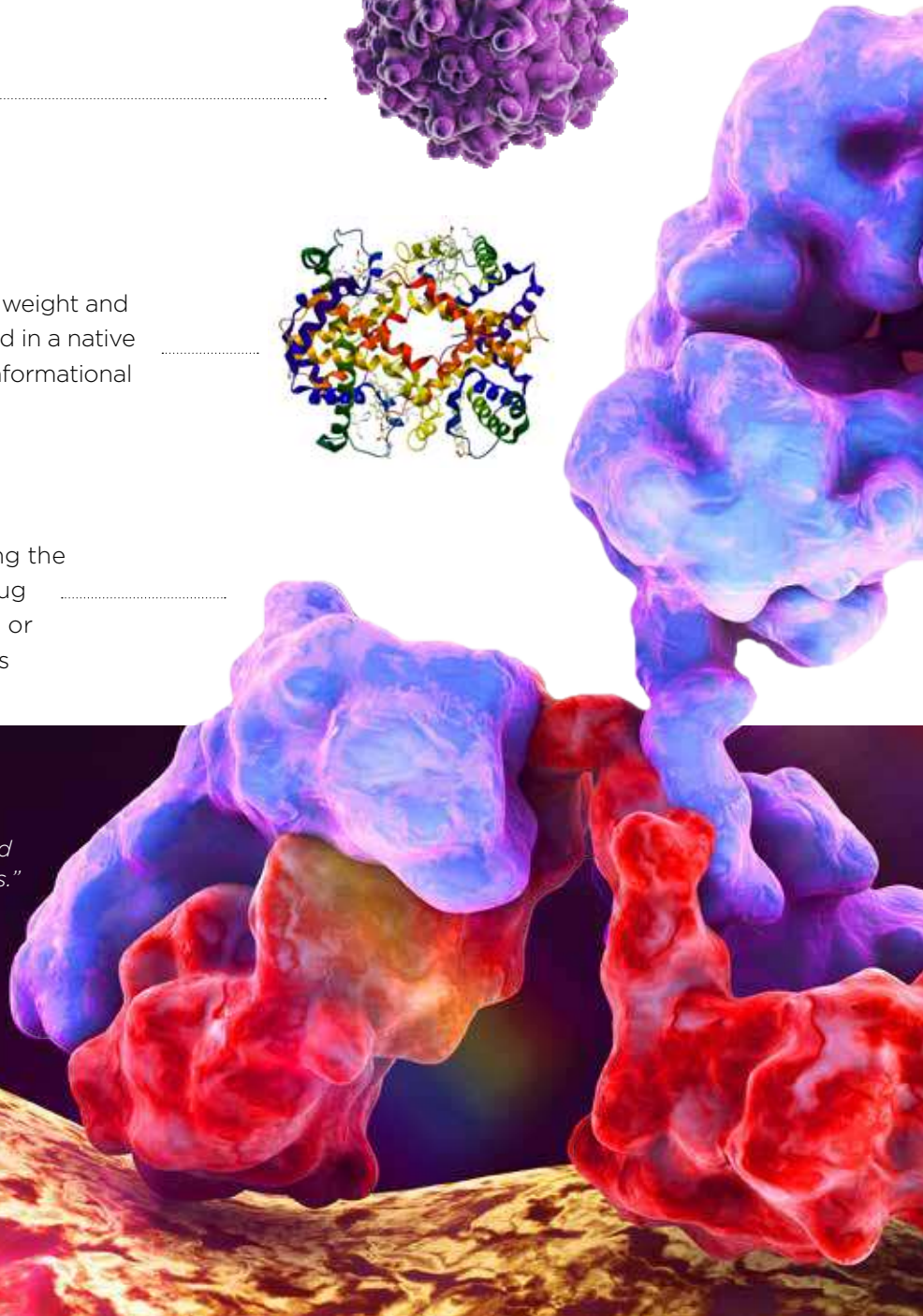
"Due to the large size and conformational heterogeneity of our samples, sedimentation velocity experiments in the analytical ultracentrifuge have allowed us to make many seminal findings about chromatin condensation mechanisms that would not have been possible with any other technique.

Jeffrey C. Hansen, PhD, Colorado State University

Formulation

AUC is a solution-state method, allowing researchers a buffer of choice and is commonly used for titration and formulation studies
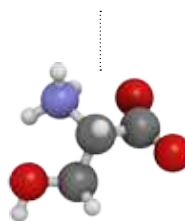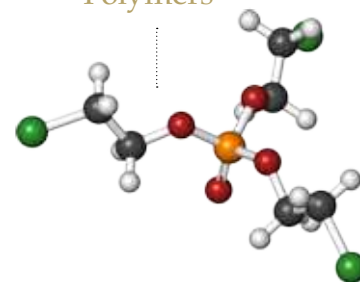
USP Insulin Assembly

Aggregation

Peptides and polymers represent additional types of molecules that scientists will study with AUC, generally looking at structure and stability. AUC is a great tool for studying non-covalent aggregation under native conditions.

Peptides

Polymers

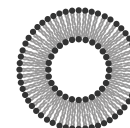### Nanoparticles

Researchers commonly study the size and shape of nanoparticles with and without drug-conjugates

Gold NPs

Micelles

Liposomes

Pre-IND and Investigational New Drug

- Toxicology lot evaluation

- Formulation development

- API and drug formulation characterization, stability, and lot-release

- Accelerated stability API and drug product

- Stress testing for methods validation

QUALITY CONTROL

APPLICATIONS

- Active Pharmaceutical Ingredient (API)

- Drug Product formulation

- API and Drug Product release assays

- API and Drug Product Stability

- Reference standard evaluation

"Analytical ultracentrifugation is one of the most powerful and versatile techniques for analyzing proteins and other macromolecules in solution; it is an incredibly important part of my lab's workflow. We find that it is the best way to quickly characterize a new protein system, since one experiment can tell us whether our protein sample is monomeric or forming higher-order species, including aggregates. It is an ideal complementary technique for structural biologists, since we can validate structural data in solution and quantitatively characterize protein-ligand binding or protein assembly processes."

Andrew Herr, PhD; Cincinnati Children's Hospital Medical Center

Brilliance at Every Turn

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

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