

# APS/Users Monthly Operations Meeting

Brian Stephenson  
September 25, 2013

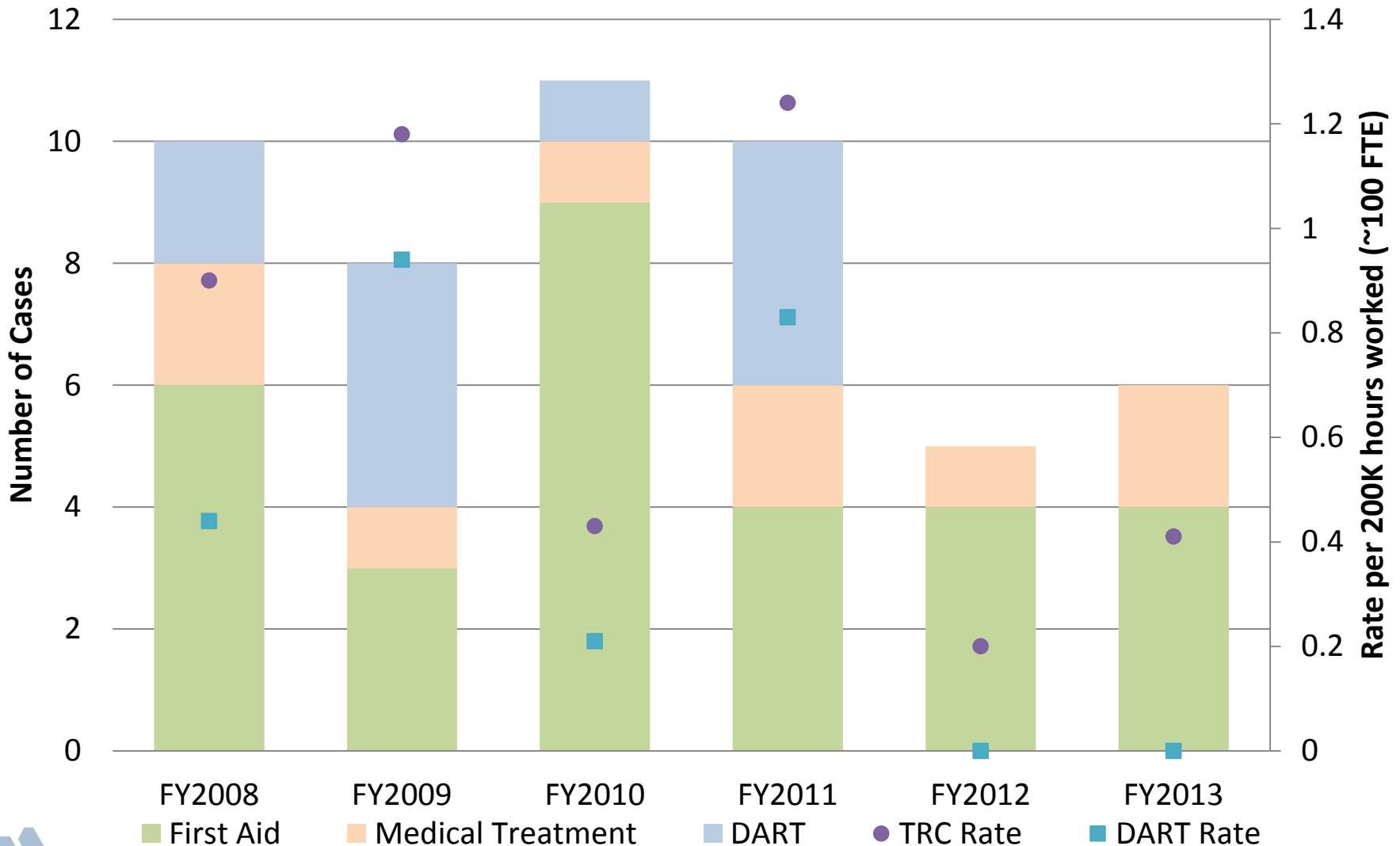
# Agenda

- APS Update – Brian Stephenson
- APS Upgrade Update – George Srajer
- Two APS Upgrade Beamlines and Their Expected Performance at the MBA APS - Ruben Reininger



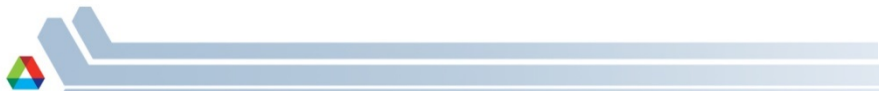
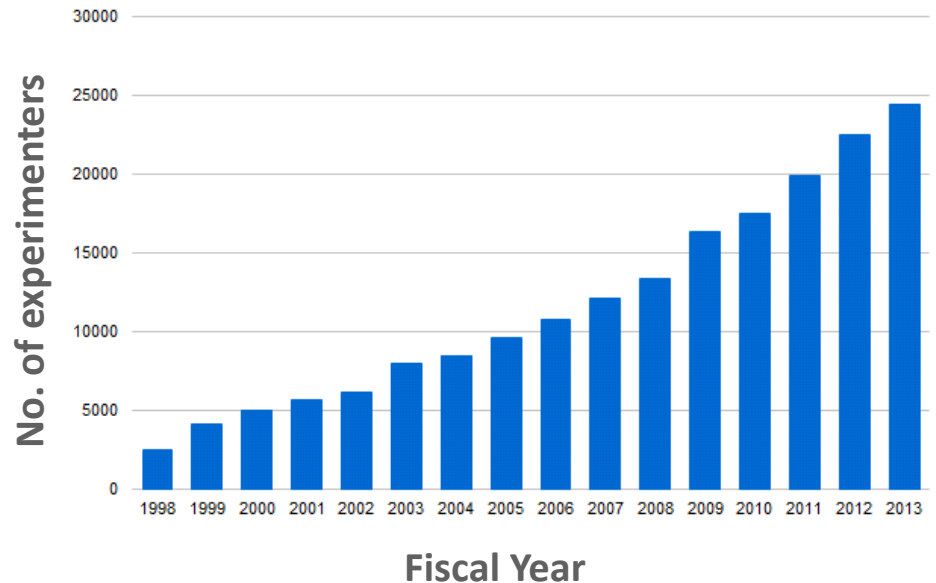
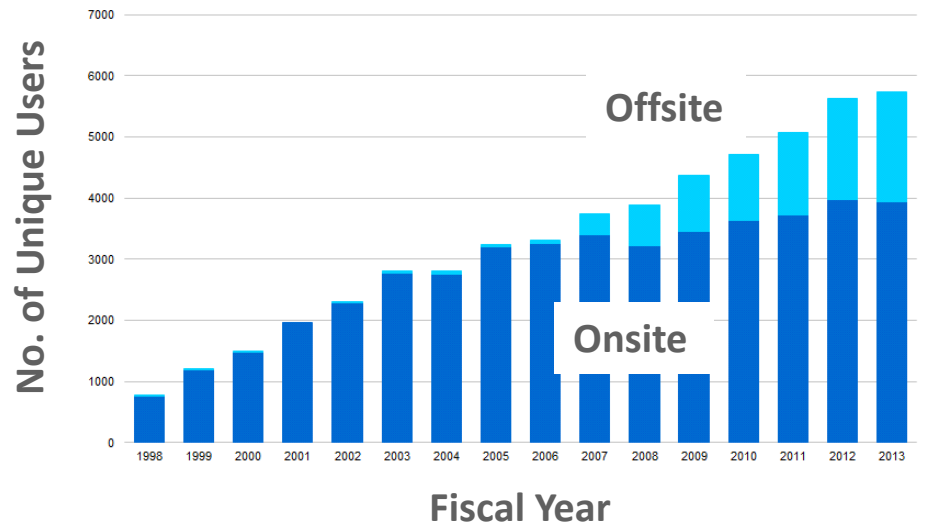
# Excellent and Improving APS Safety Record

## APS Injury Types and TRC/DART Rate FY2008-13

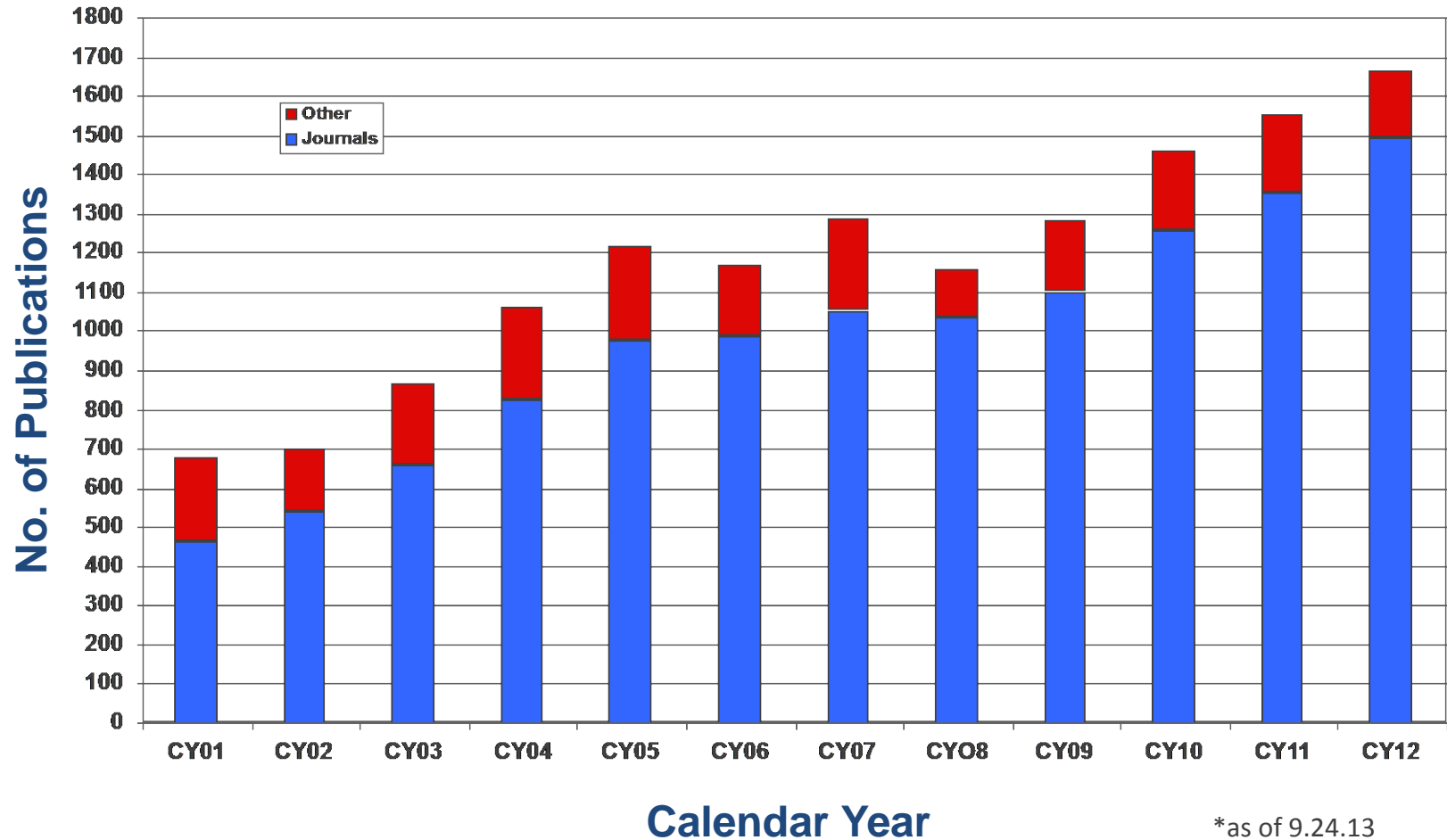


# Advanced Photon Source in 2013: The Nation's Largest User Facility

- 66 simultaneously operating beamlines, 5000 hours per year
- 24,365 participations by 5700 unique onsite and offsite users in FY13
- 5175 experiments in FY13
- 1663 total publications in CY2012; ~20% of journal articles high impact
- 1600 protein structure deposits a year, plus drug discovery programs
- Industrial users from 150 companies in pharma, energy, electronics, materials ...



# APS publications, CY01-12\*



# Good Machine Performance in FY13

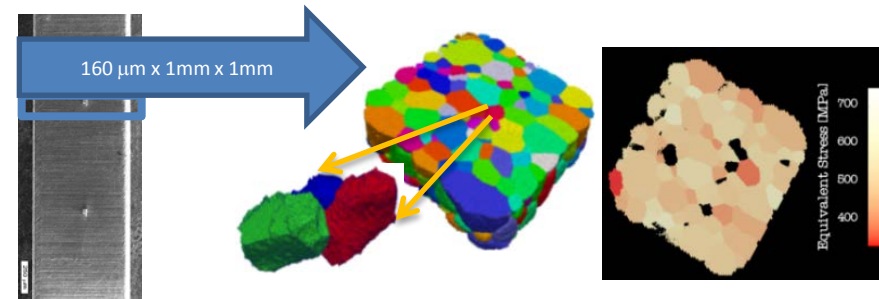
- Vacuum problems at start of run 2013-2 led to 5 faults in first 5 days
- FY13 was not as good as FY12, but was in top five overall

Year	Faults (Number)	Faults (Rank)	MTBF (hours)	MTBF (Rank)	Availability (%)	Availability (Rank)
FY2010	49	2	101	3	98.5	3
FY2011	56	7	88	7	98.2	5
FY2012	25	1	199	1	99.4	1
FY2013	49	2	100	4	97.9	6



# HEDM: A New Paradigm for Engineering Design

- Researchers from AFRL, APS, LLNL, DESY, CMU, PulseRay working at XSD 1-ID (as well as CHESS and PETRA) developed a novel capability to concurrently map material substructure and the evolving stress in 3D during mechanical testing
- Data form an essential basis for the development of microstructure-based design tools, enabling adoption of location-specific processing where properties are optimized spatially within components to improve capabilities, safety, and savings
- Integrated three high-energy synchrotron x-ray techniques to:
  - quantify the average elastic strain and stress tensor for each grain using far-field high-energy diffraction microscopy (HEDM);
  - map the grain shape and local crystallographic orientation within and between grains using near-field HEDM; and,
  - track the formation and spread of voids and cracks using micro-contrast tomography during mechanical testing

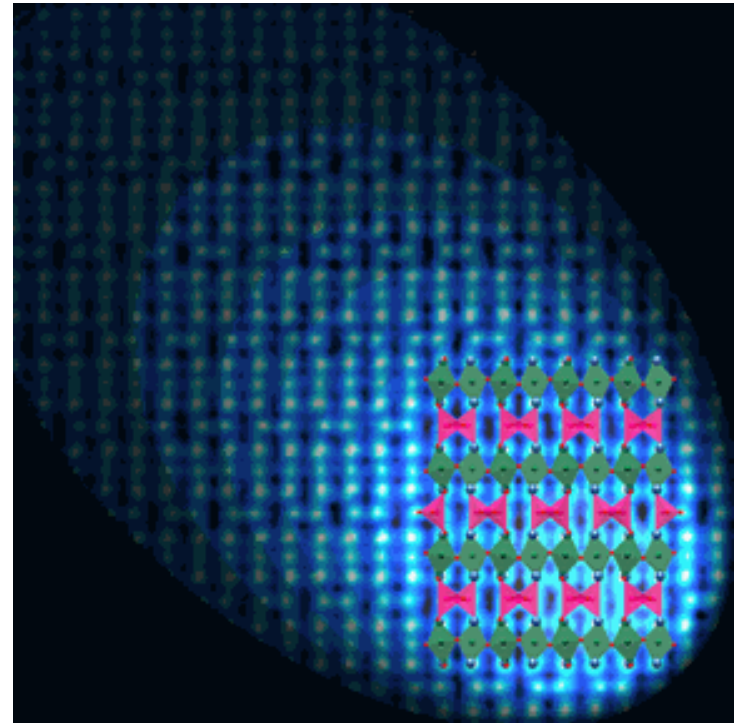


A titanium test specimen shown with a sub-volume selected to demonstrate how the internal grain structure can be mapped nondestructively. The equivalent stress is also shown for each grain in a 2D cross-section. This information pushes far below surface measurements on bulk samples to allow for each grain to be used as a test bed for model development.

J.C. Schuren, P.A. Shade, T.J. Turner (AFRL/RXCM) J. Almer, P. Kenesei, A. Mashayekhi, E. Benda, K. Goetze (ANL/APS) U. Lienert (DESY) J. Bernier, S.F. Li (LLNL) R. Suter, J. Lind (Carnegie Mellon Univ.) Basil Blank (PulseRay)

# A “Sponge” Path to Better Catalysts & Energy Materials

- XAS and XMCD at XSD beamline 4-ID-C aided development of new oxygen “sponge” that can easily absorb or shed oxygen atoms at low temperatures
- Materials with these novel characteristics would be useful in devices such as rechargeable batteries, sensors, gas converters, and fuel cells
- Material consists of strontium cobaltite  $\text{SrCoO}_x$ , known to occur in a preferred crystalline form called brownmillerite ( $\text{SrCoO}_{2.5}$ )
- Through epitaxial stabilization process team discovered way to synthesize material in a more desirable perovskite phase ( $\text{SrCoO}_{3-\delta}$ )
- Researchers have filed an invention disclosure on their findings



Schematic of new ORNL material that can easily absorb or shed oxygen atoms

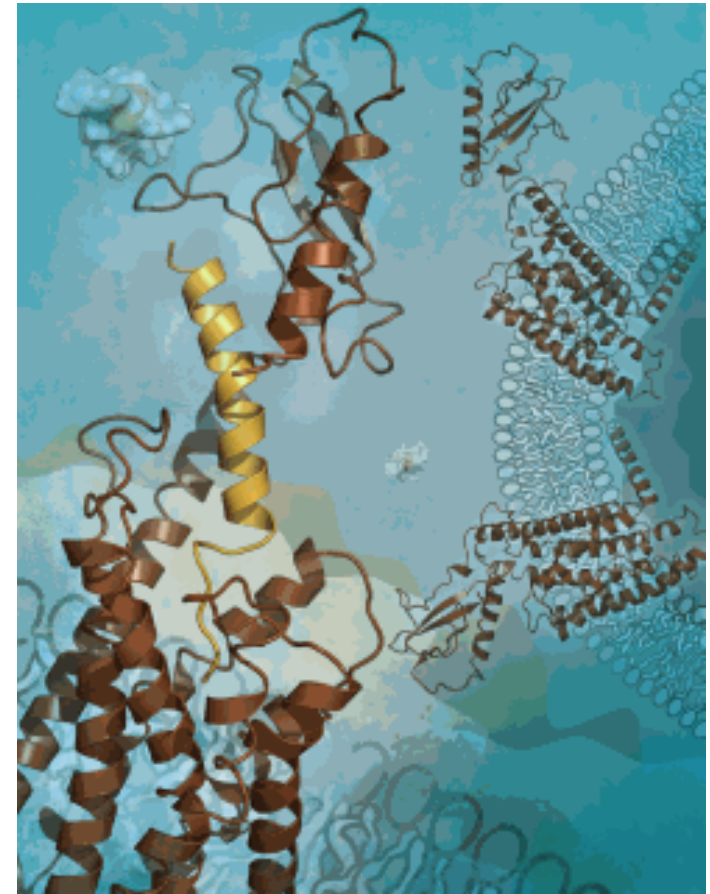
H. Jeen, W.S. Choi, M.D. Biegalski, C.M. Folkman, I-C. Tung, D.D. Fong, J.W. Freeland, D. Shin, H. Ohta, M.F. Chisholm, H.N. Lee, “Reversible redox reactions in an epitaxially stabilized  $\text{SrCoO}_x$  oxygen sponge,” [Nat. Mater., published online \(2013\)](#). DOI: 10.1038/NMAT3736

H. Jeen, W.S. Choi, M.D. Biegalski, D. Shin, M.F. Chisholm, H.N. Lee (ORNL) C.M. Folkman, D.D. Fong, J.W. Freeland (ANL) I-C. Tung (ANL, NWU) H. Ohta (Hokkaido U.)



# A Key Target for Diabetes Drugs

- 3-D atomic structure of the human glucagon receptor was identified by an international team of researchers at the GM/CA-XSD 23-ID-D beamline
- The receptor, found mainly on liver and kidney cells, helps regulate glucose levels in the bloodstream and is the target of potential therapeutic agents for type 2 diabetes
- This and related GLP1 and GIP receptors are high on list of desired class B GPCR structures due to potential as diabetes drug target and similarity to other receptors involved in endocrine and metabolic disorders



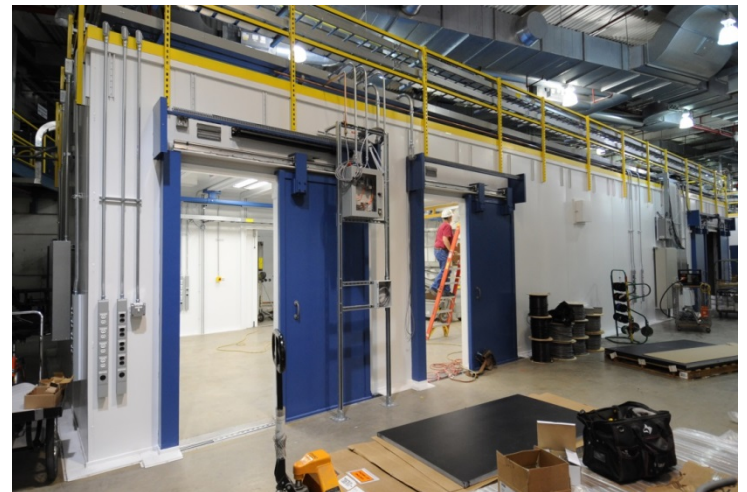
The structure of the human glucagon receptor. (Image courtesy of Katya Kadyshevskaya, The Scripps Research Institute)

F.Y. Siu, GW. Han, D.Wacker, J.S. Joseph, W. Liu, V. Cherezov, V. Katritch, R.C. Stevens (Scripps) M. He, D.Yang, Z. Zhang, C. Zhou, M.-W. Wang (Shanghai Inst. Materia Medica) C. de Graaf, (U. Amsterdam) Q. Xu (SLAC) J. Lau (Novo Nordisk)

F.Y. Siu, M. He, C. de Graaf, GW. Han, D.Yang, Z. Zhang, C. Zhou, Q. Xu, D.Wacker, J.S. Joseph, W. Liu, J. Lau, V. Cherezov, V. Katritch, M.-W. Wang, R.C. Stevens<sup>1\*</sup>, "Structure of the human glucagon class B G-protein-coupled receptor," *Nature*, [published online 17 July 2013](https://doi.org/10.1038/nature12393). DOI:10.1038/nature12393

# Dynamic Compression Sector 35 Hutches

- Completion FY14



9.24.2013



# LOM 438F (DCS) Construction

- Completion October



9.24.2013



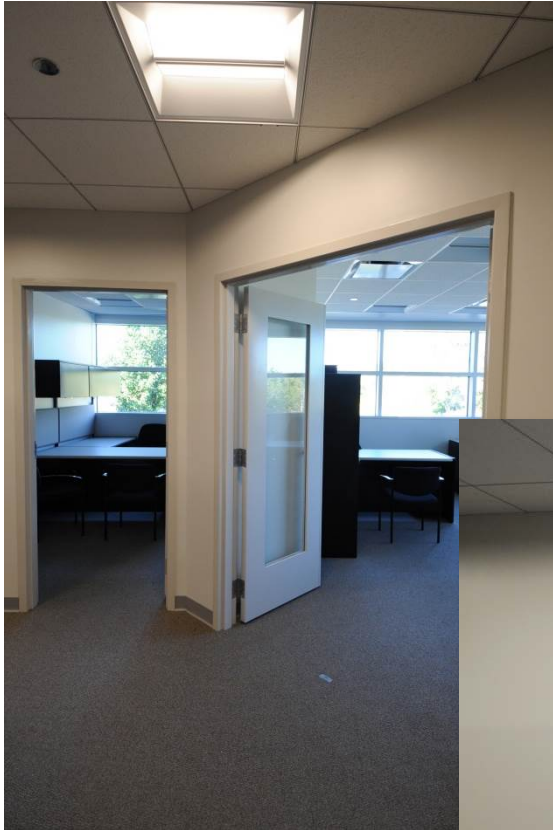
# LOM 438F (DCS) Construction

- Completion October



# LOM 437 Office Build-out

- Completion Oct 1



9.24.2013



# New Parking Lot in 437 / CNM Area

- Ready for use October 1



# New Parking Lot

- Completion Oct 1



From the CNM 2<sup>nd</sup> floor terrace

# New Parking Lot

- 360° panorama





# Advanced Protein Crystallization Facility Construction

- Completion FY14



9.24.2013

