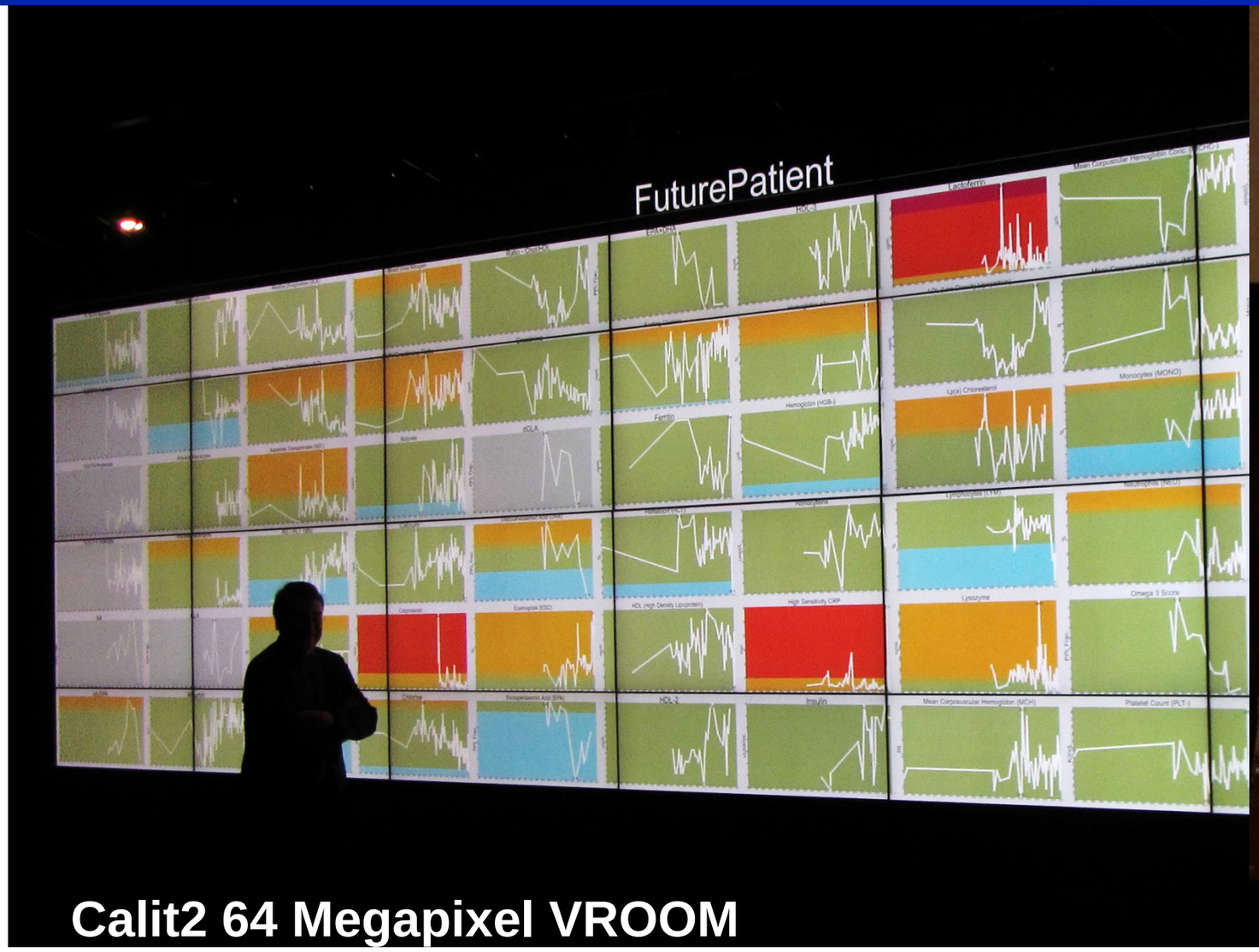
“Convergence: Patient, Surgeon and Roboticist”

- Panel Presentation
- by Larry Smarr & Sonia Ramamoorthy, UCSD and Catherine Mohr, Intuitive Surgical
- Empowered Patients, Collaborations, Disparities
- Exponential Medicine 2017
- San Diego, CA
- November 6, 2017

I Have Been Tracking My Internal Biomarkers For A Decade To Understand My Body's Dynamics

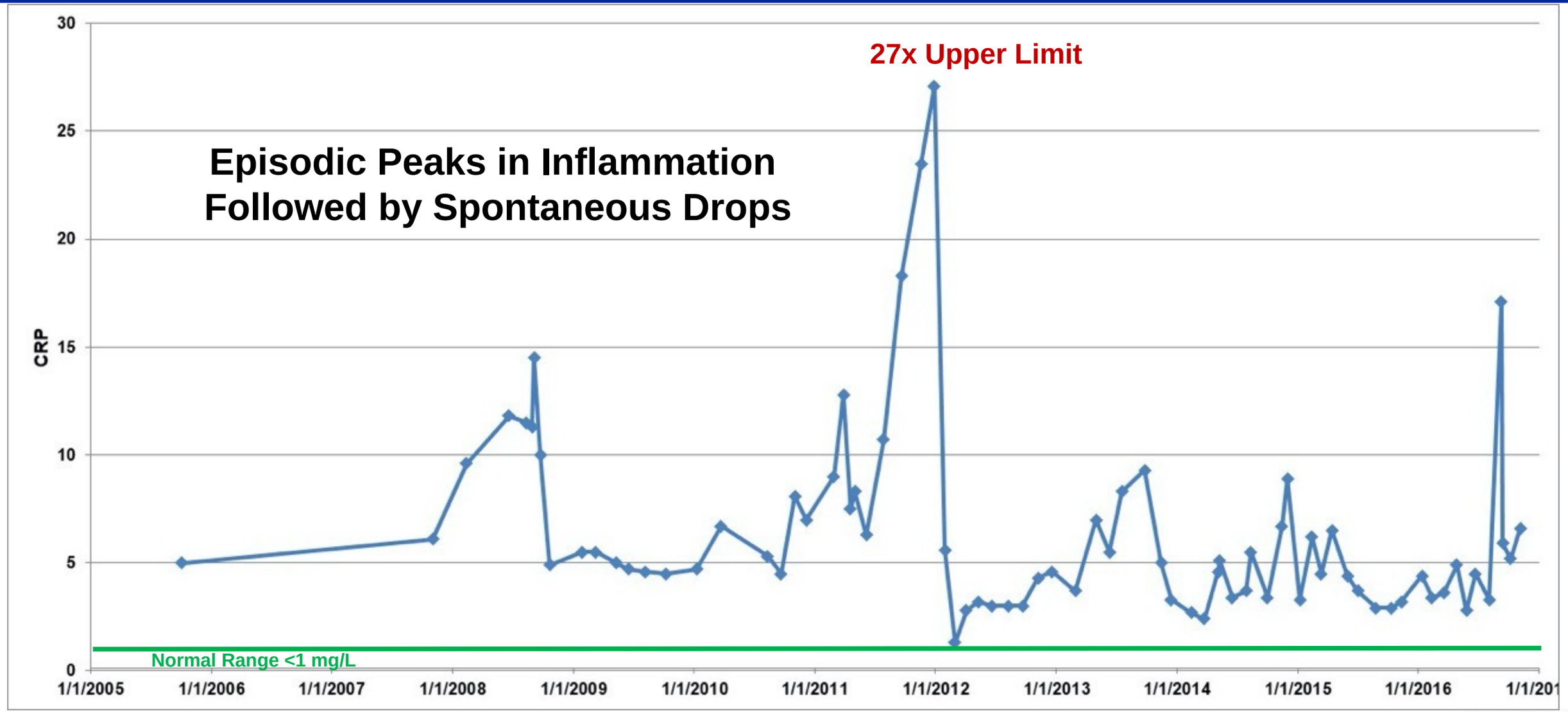


Calit2 64 Megapixel VROOM



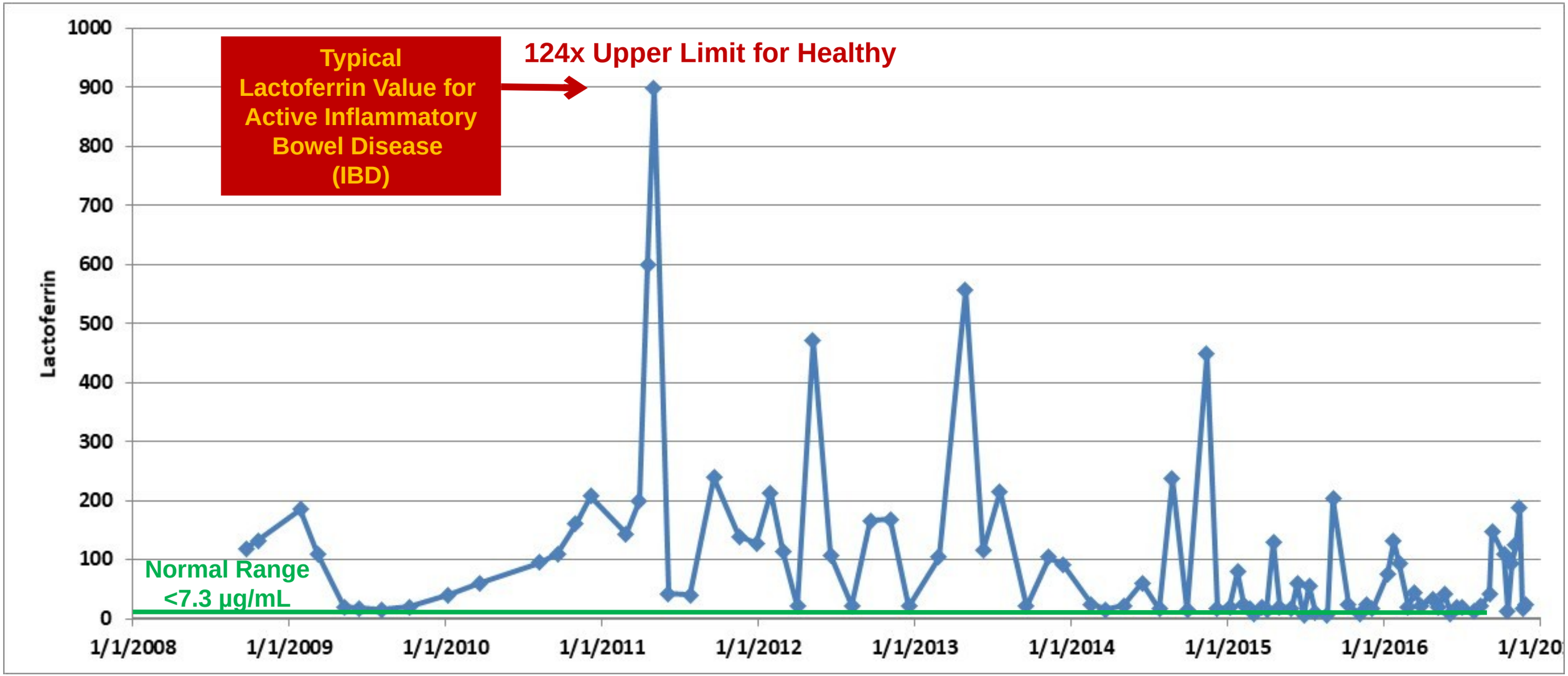
My Quarterly

Only One of My Blood Measurements Was Far Out of Range--Indicating Chronic Inflammation



Complex Reactive Protein (CRP) is a Blood Biomarker for Detecting Presence of Inflammation

Adding Stool Tests Revealed
Oscillatory Behavior in an Immune Variable Which is Antibacterial



Lactoferrin is a Protein Shed from Neutrophils -
An Antibacterial that Sequesters Iron

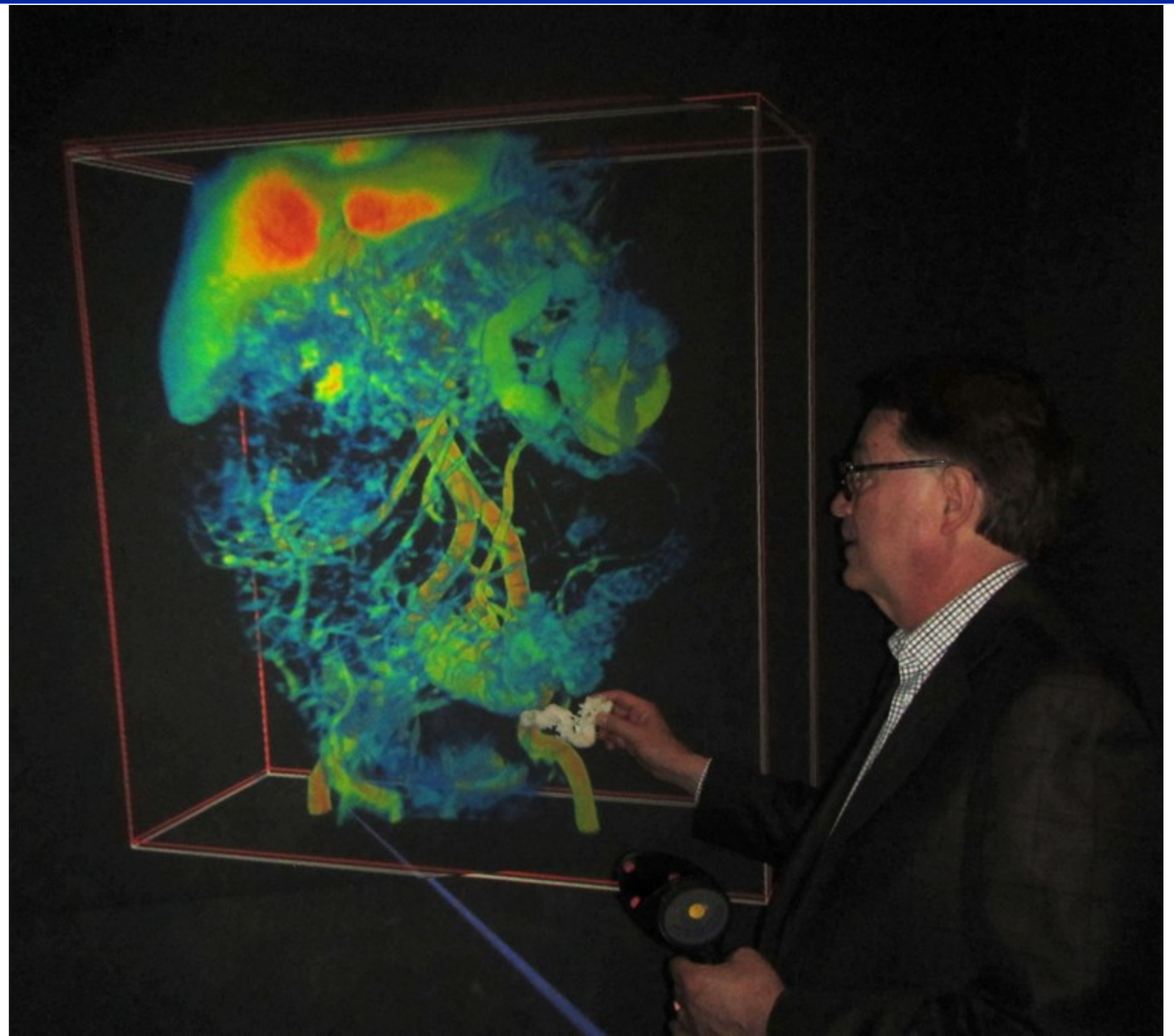
2012 MRI Video Reveals Diseased Sigmoid Colon



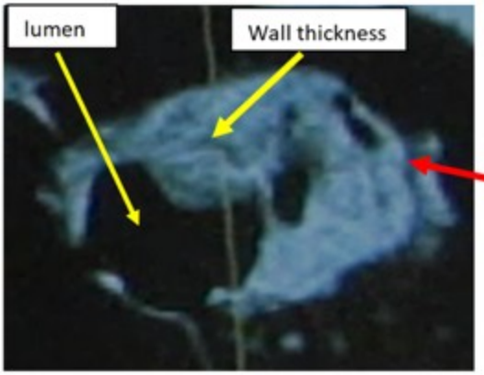
Source: Cynthia Santillan, MD Radiologist, UCSD

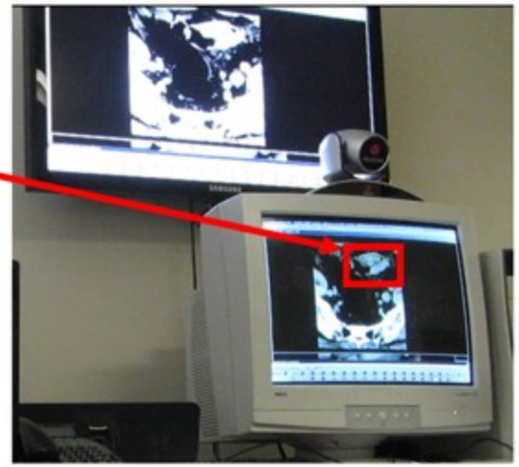
3D Volumetric Visualization From MRI In Calit2 Virtual Reality StarCAVE

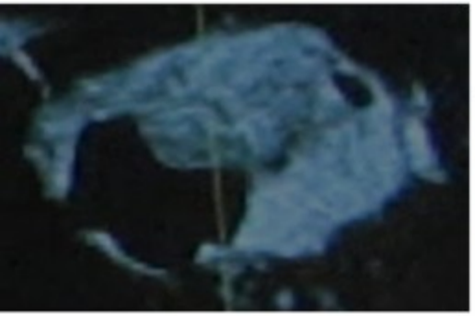
3D Volumetric Visualization Created by Calit2's Jurgen Schulze from January 2012 MRI

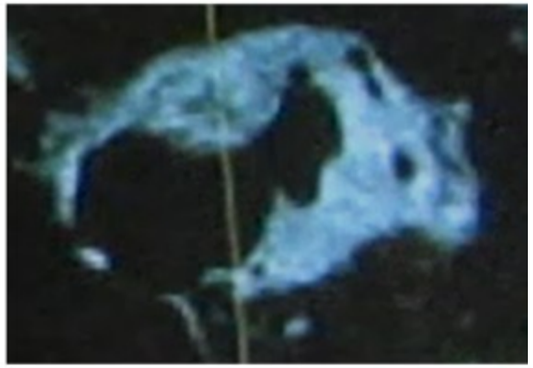


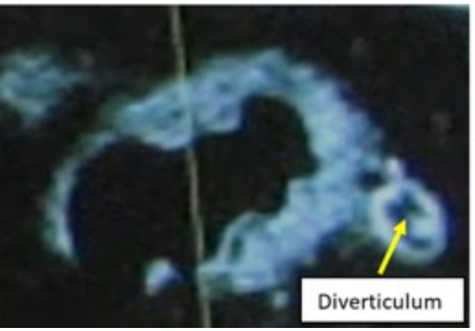
Full Body CAT Scan at mm Resolution, Including Virtual Colonoscopy June 2016 Convinced Me Time Had Come for Surgery

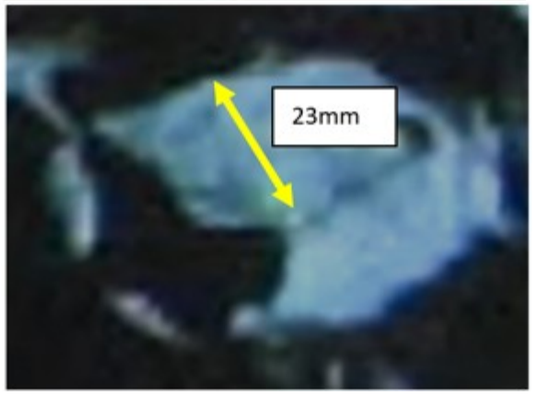




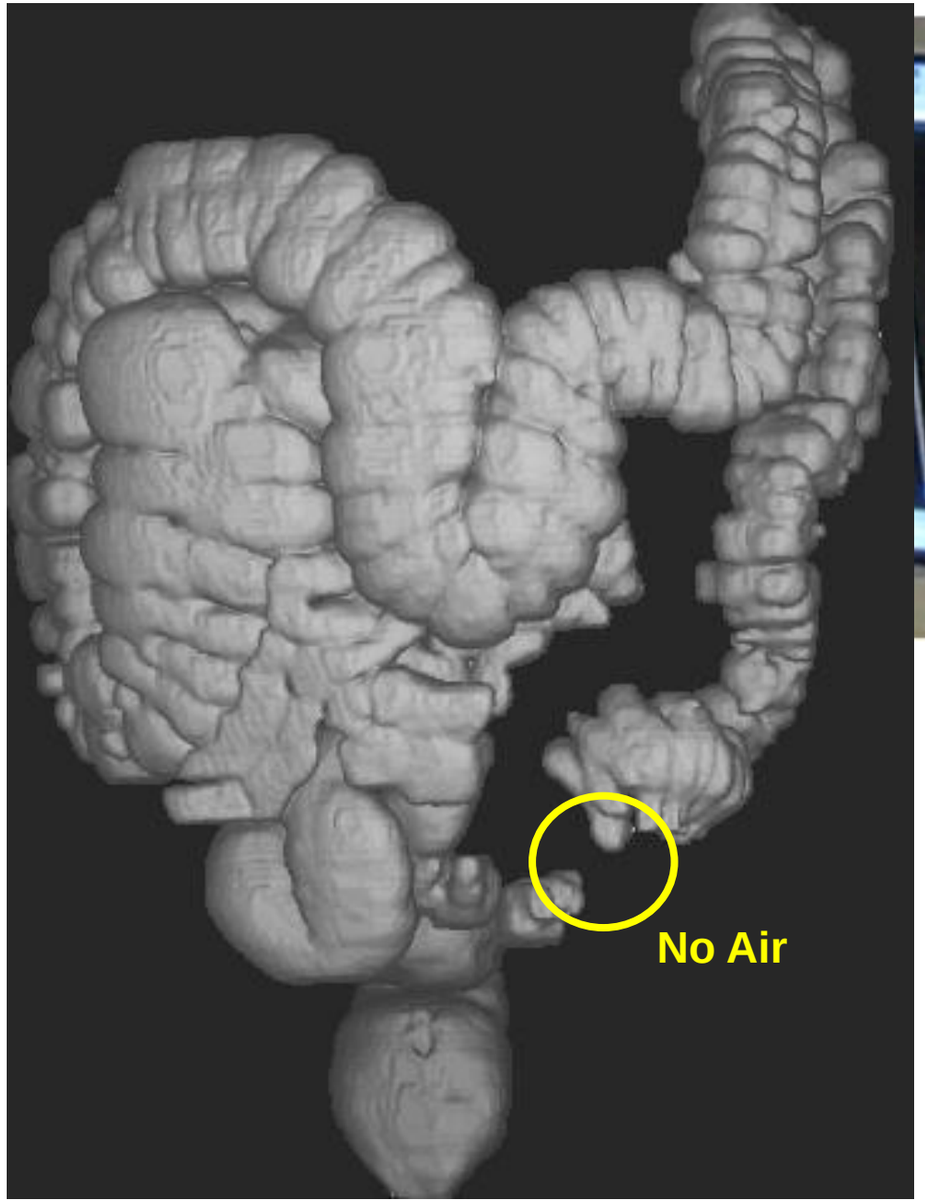








Source: June 2016
Dr. Harvey Eisenberg,
Body Scan Intl., Irvine, CA





Dr. Ramamoorthy
10/6/17:
"This is perfect-
this is your indication
for surgery."

Smarr Met with Intuitive Surgical's Dr. Catherine Mohr at Exponential Medicine October 10, 2016



… Larry Smarr, one of the most quantified human beings on earth. The world knows more about this super super tech geek's stool samples than we probably should…

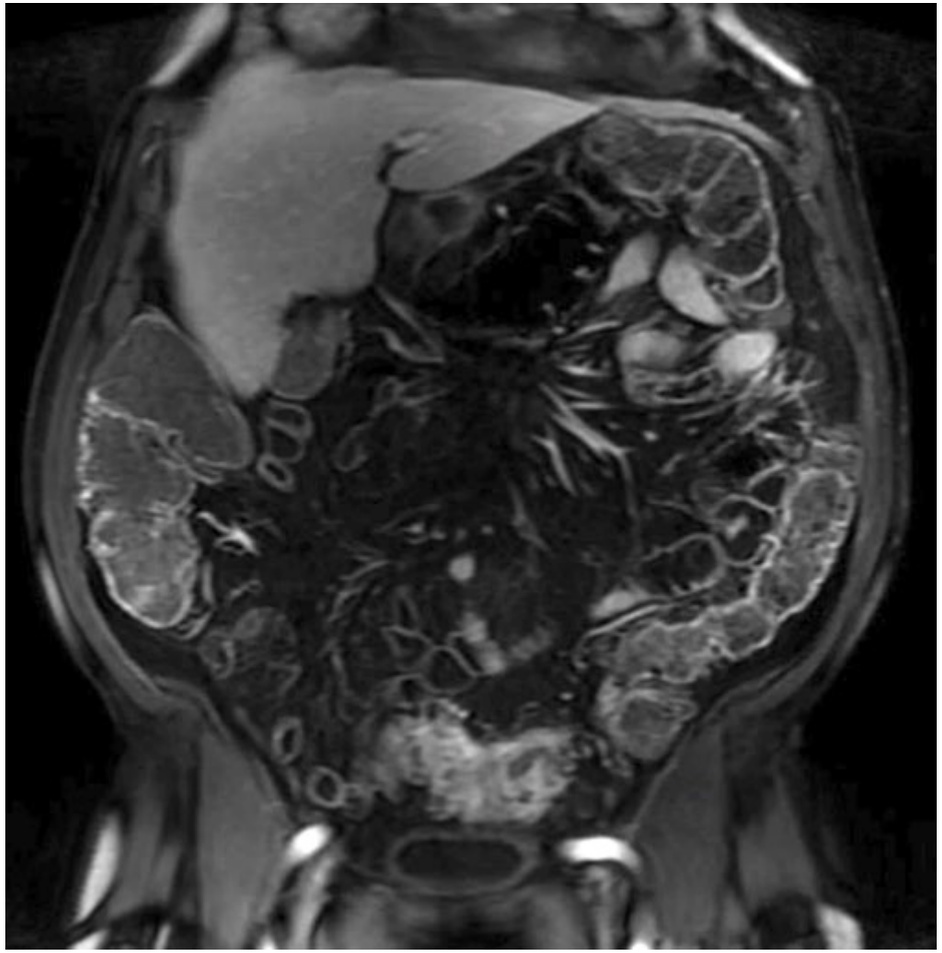
… yes, he sounds a bit kooky, but he is smart [and] articulate ("astrophysicist turned computer scientist" professor at UCSD)…

…we have the opportunity to work with him and his medical team to do some pre-op 3D fusion for his dV surgery…

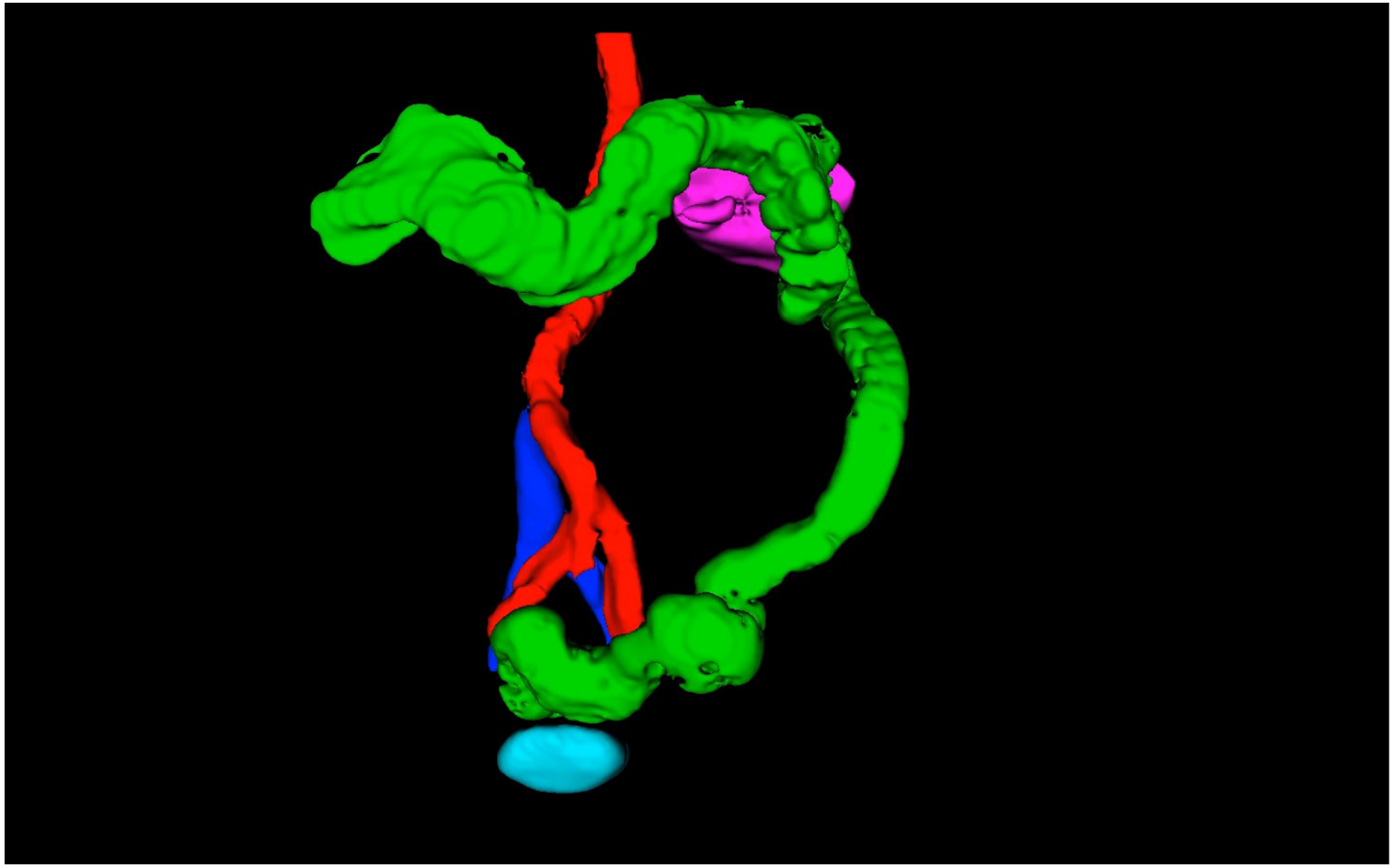
So... interesting, or 10 foot pole territory?

From Quantified Self to Quantified Surgery: Converting MRI Slices to 3D Organ Segmentation for Surgical Pre-Planning

Images of Dr. Smarr's Abdomen
To Support Sigmoid Colon Resection Surgery



MRI Slice from Dr. Cynthia Santillan

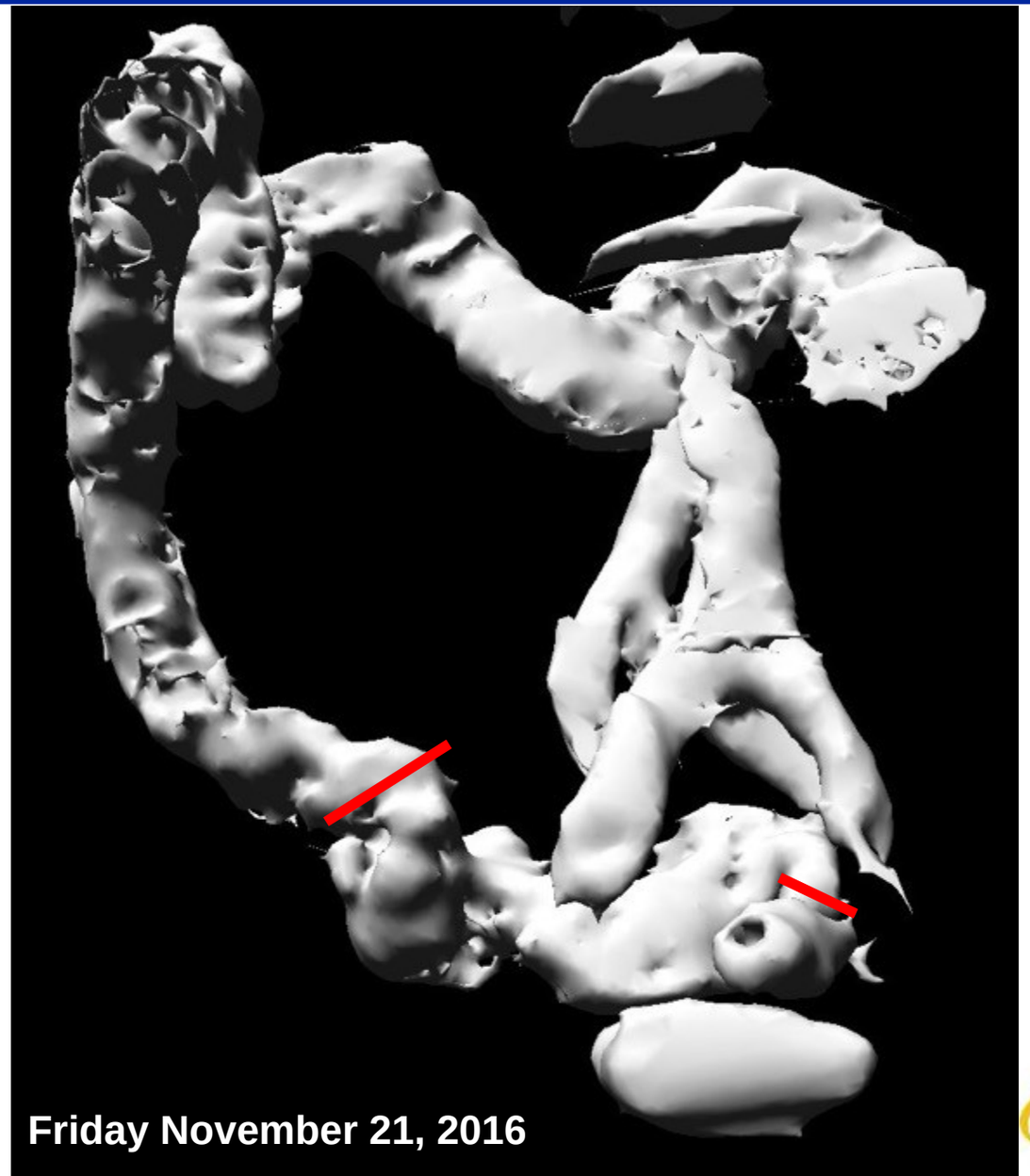


3D Organ Segmentation Made by Dr. Jurgen Schulze from Dr. Santillan's 150-Slice MRI

Pre-Surgical Planning in QI Virtual Reality:
Using Virtual Reality As Input for Positioning The Two Resection Cuts

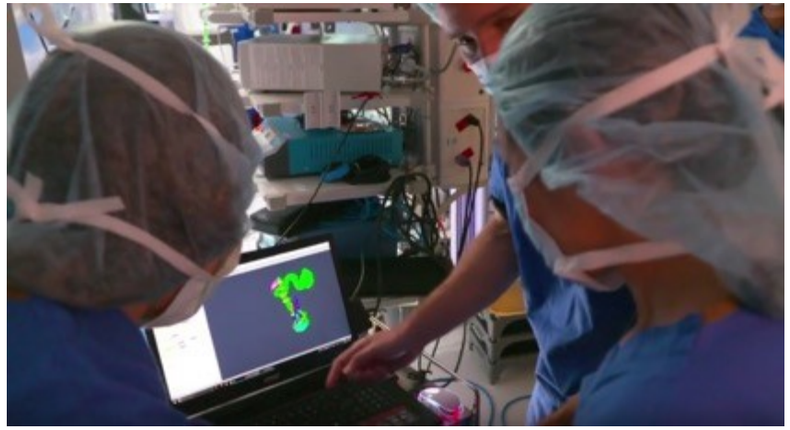


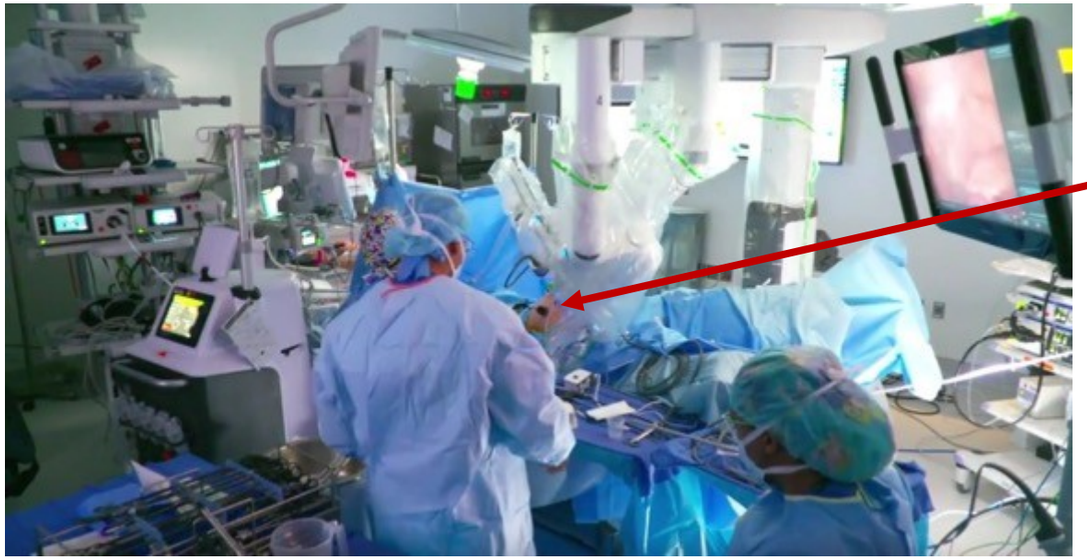
Colon visualization by Jurgen Schulze, Calit2;
Photo credit Tom DeFanti, Calit2



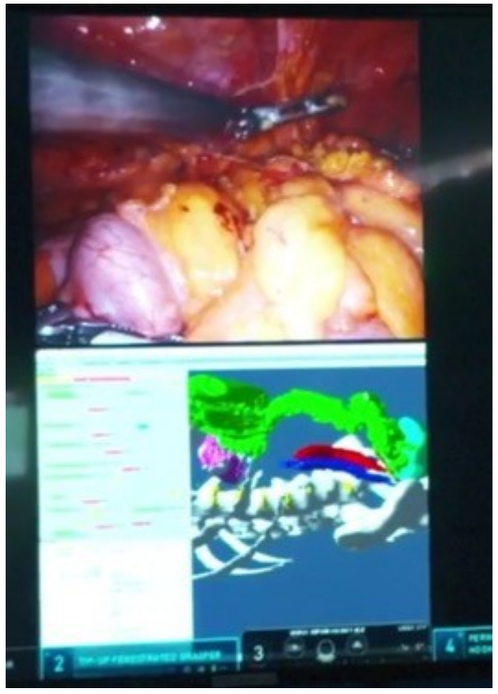
Using QI Organ Segmentation in Jacobs OR on Tuesday November 29, 2016

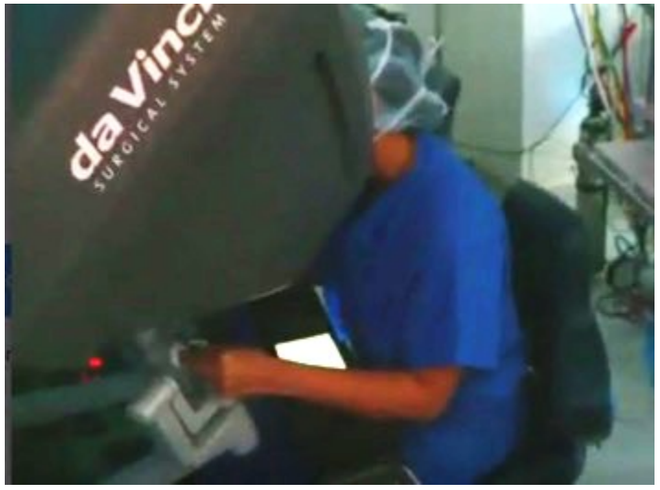
Dr. Schulze Rotating 3D Organs To Match Up With da Vinci Arms and Internal Camera





Patient Smarr With da Vinci Robot Arms Inside Him





Dr. Ramamoorthy Operating Da Vinci Xi Robot During Surgery



OR Team Using Large Screens To Watch Dr. Schulze's da Vinci Images

Dr. Ramamoorthy's Use of 3D Interactive Anatomy To Guide Surgical Team on Site For Bowel Division



Dr. William Sandborn Using Colonoscope in OR To Examine Stapled Anastomosis



Dr. William Sandborn Performing Colonoscopy While da Vinci Observes from Inside Abdomen



Dr. Santi Horgan, Director of Minimal Invasive Surgery, Pointing to Stapled Anastomosis

Lactoferrin Measure of Colonic Inflammation: Normalized After Surgery (Note Logarithmic Scale)

