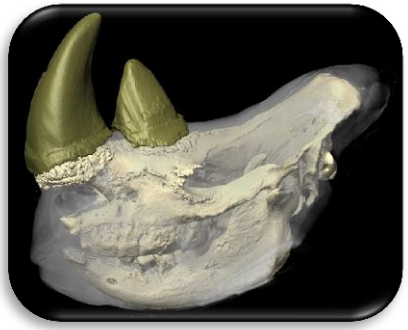
Digital assembly of a complete CT dataset of Kehtla

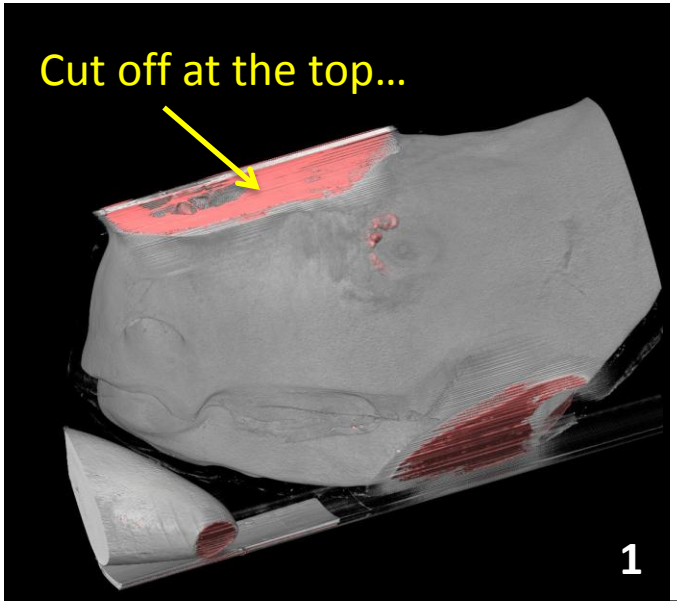
Kehtla, a male white rhino donated by the Phoenix Zoo, was simply too big to scan all at once. We had to assemble four different datasets. This next sequence shows how Ryan Ridgely did the assembly.

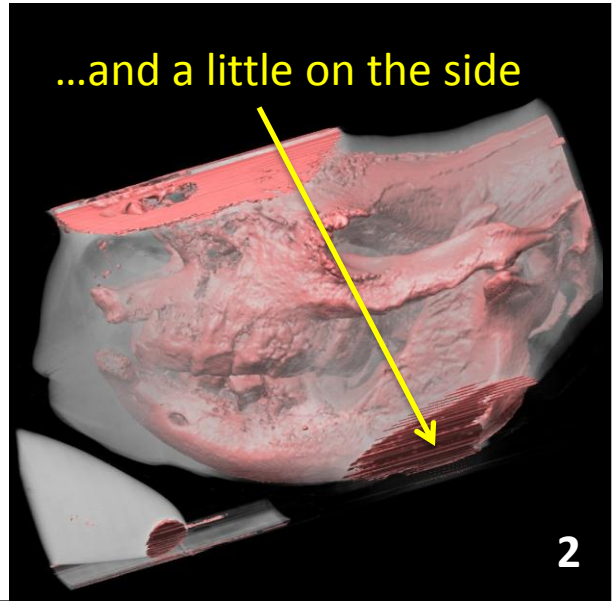


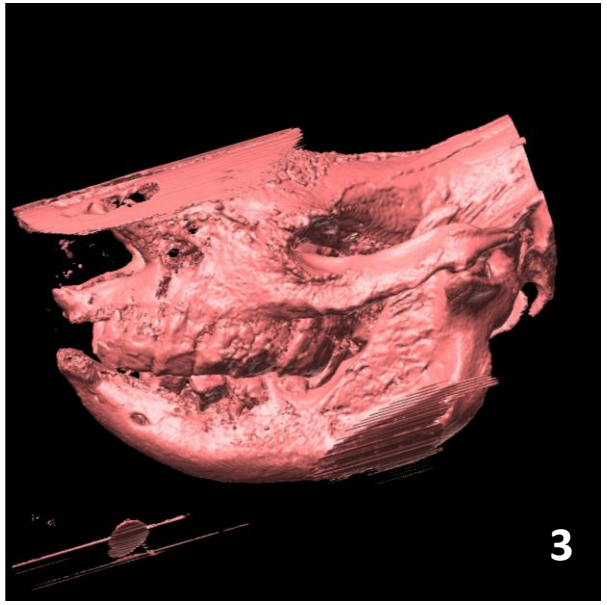
witmerlab

Imaging the lower part of the head

CT scanners have a circular field of view (FOV), resulting in images of large objects like a rhino head being “cut off” around the periphery. We deal with this problem by positioning the head such that a region of interest is closer to the center of the scanner’s opening. Here we image the bottom of the head, cutting off the top and a little around the sides. We also cut off the back…because the ears wouldn’t fit!

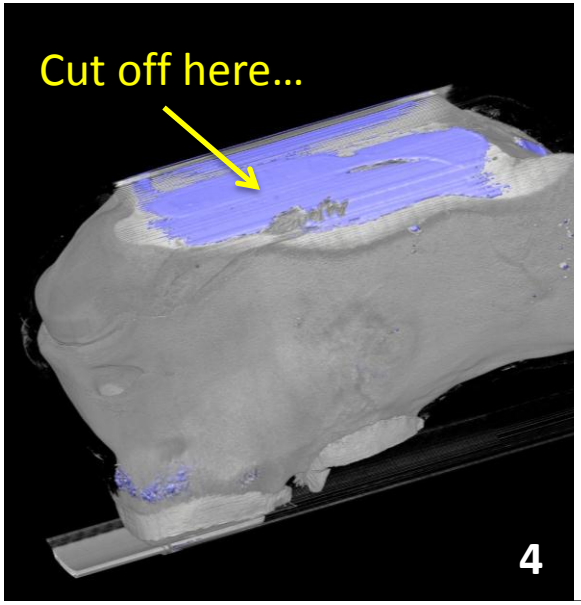


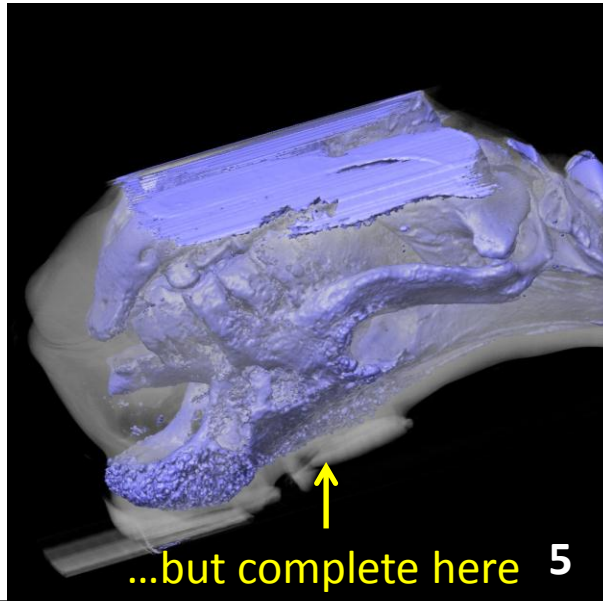


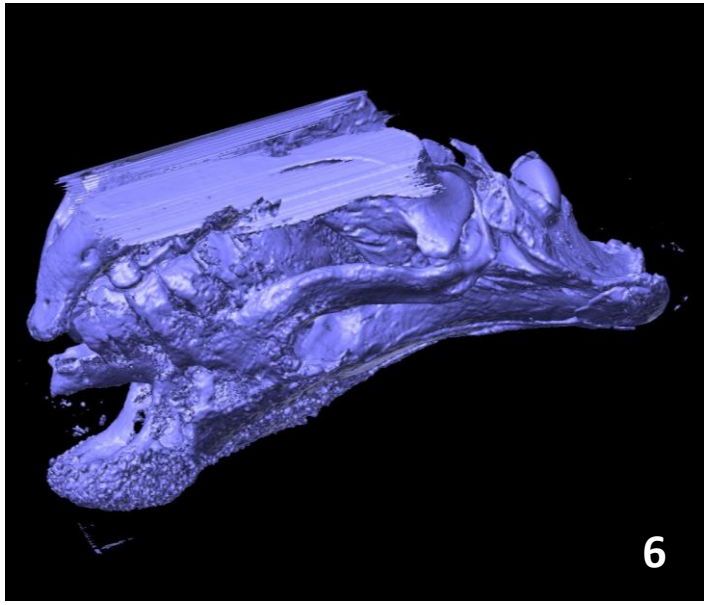


Imaging the upper part of the head

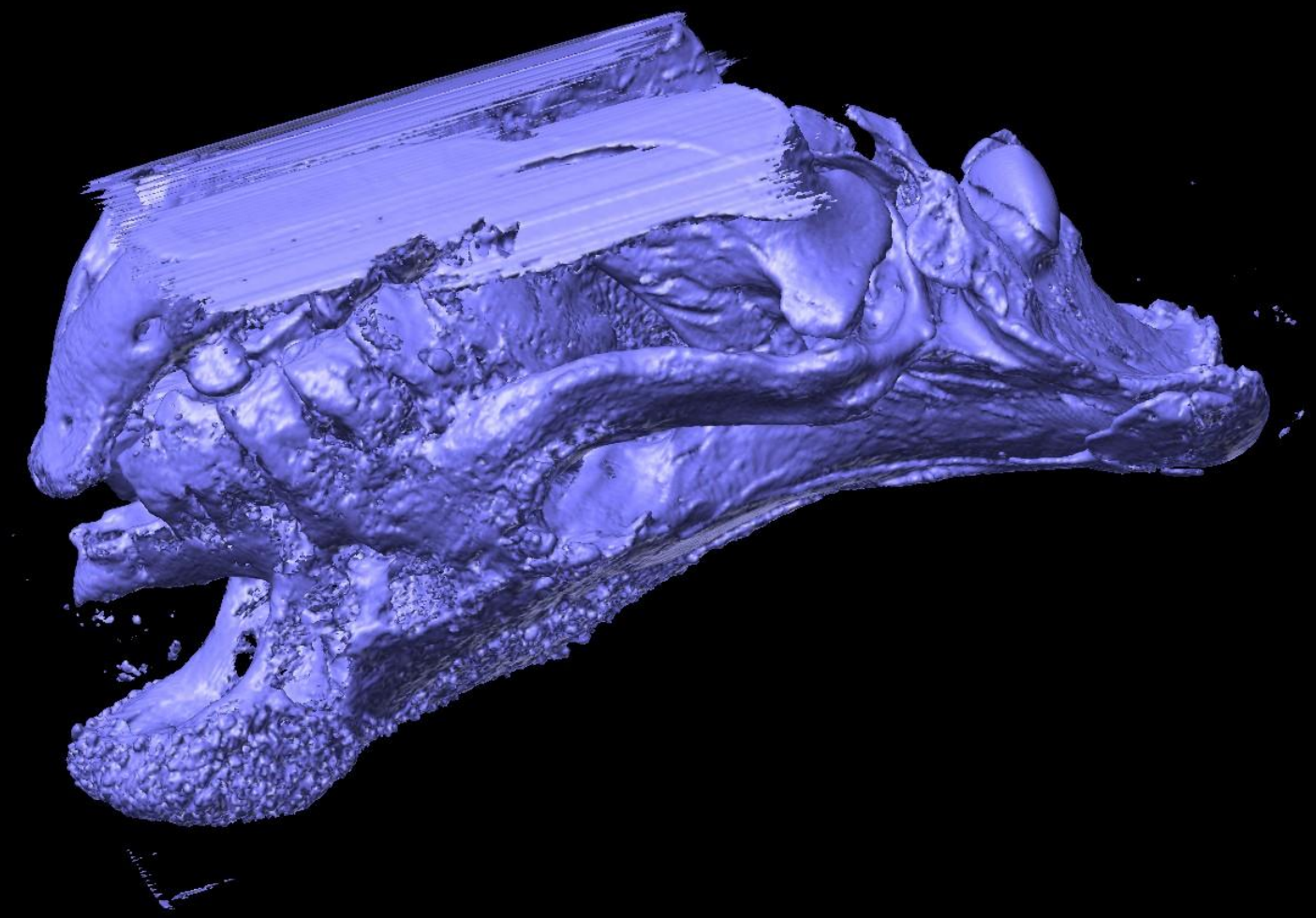
Flipping the head upside down brings the upper part of the head closer to the center of the scanner's field of view, although cutting off the lower part of the head. In retrospect, it was fortuitous that our previous studies of rhino horns required us to remove Kehtla's horns. Otherwise, we'd never have been able to image the whole head.





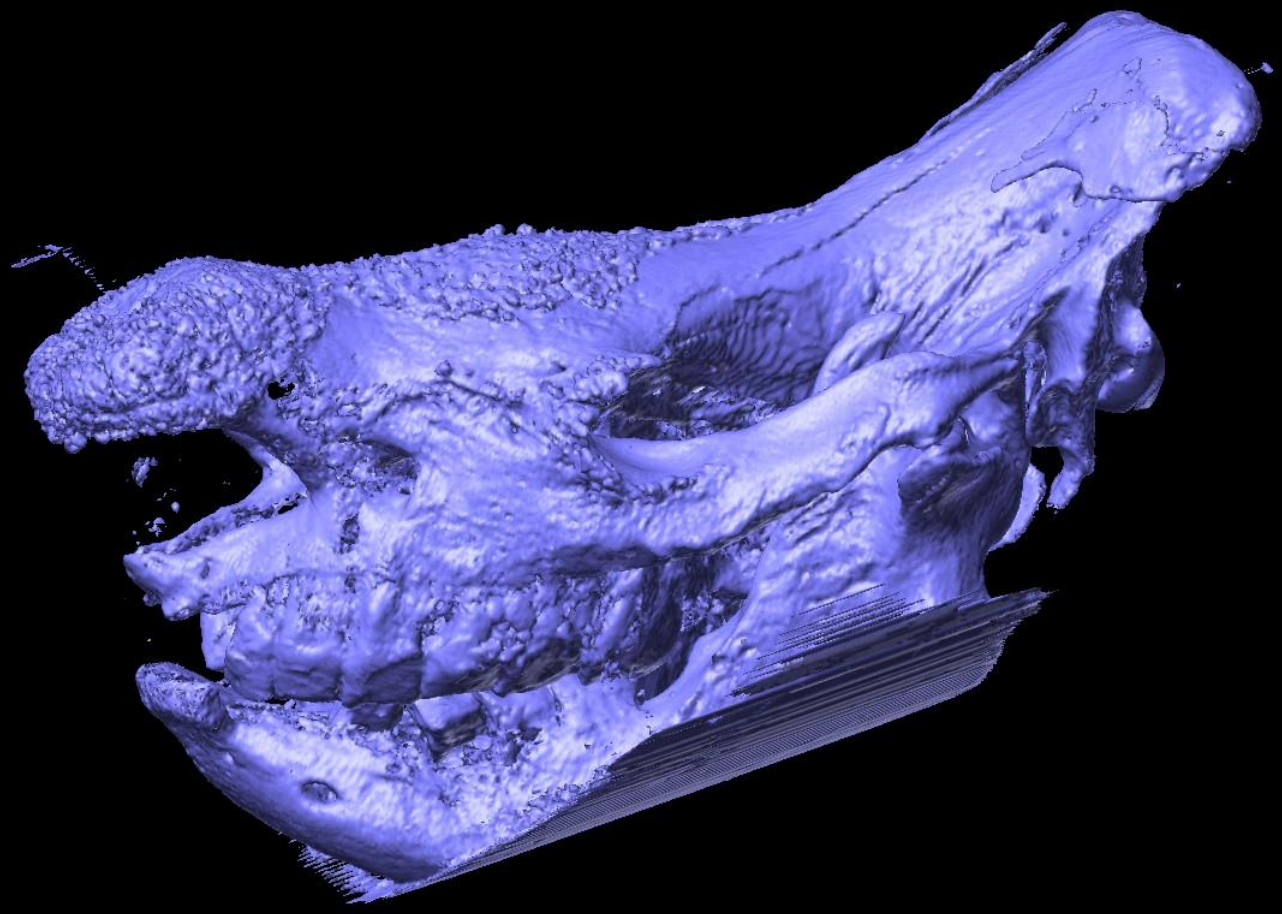


The rest of this series is intended to be run almost like a movie, so advance forward and back, frame by frame, to see the steps.

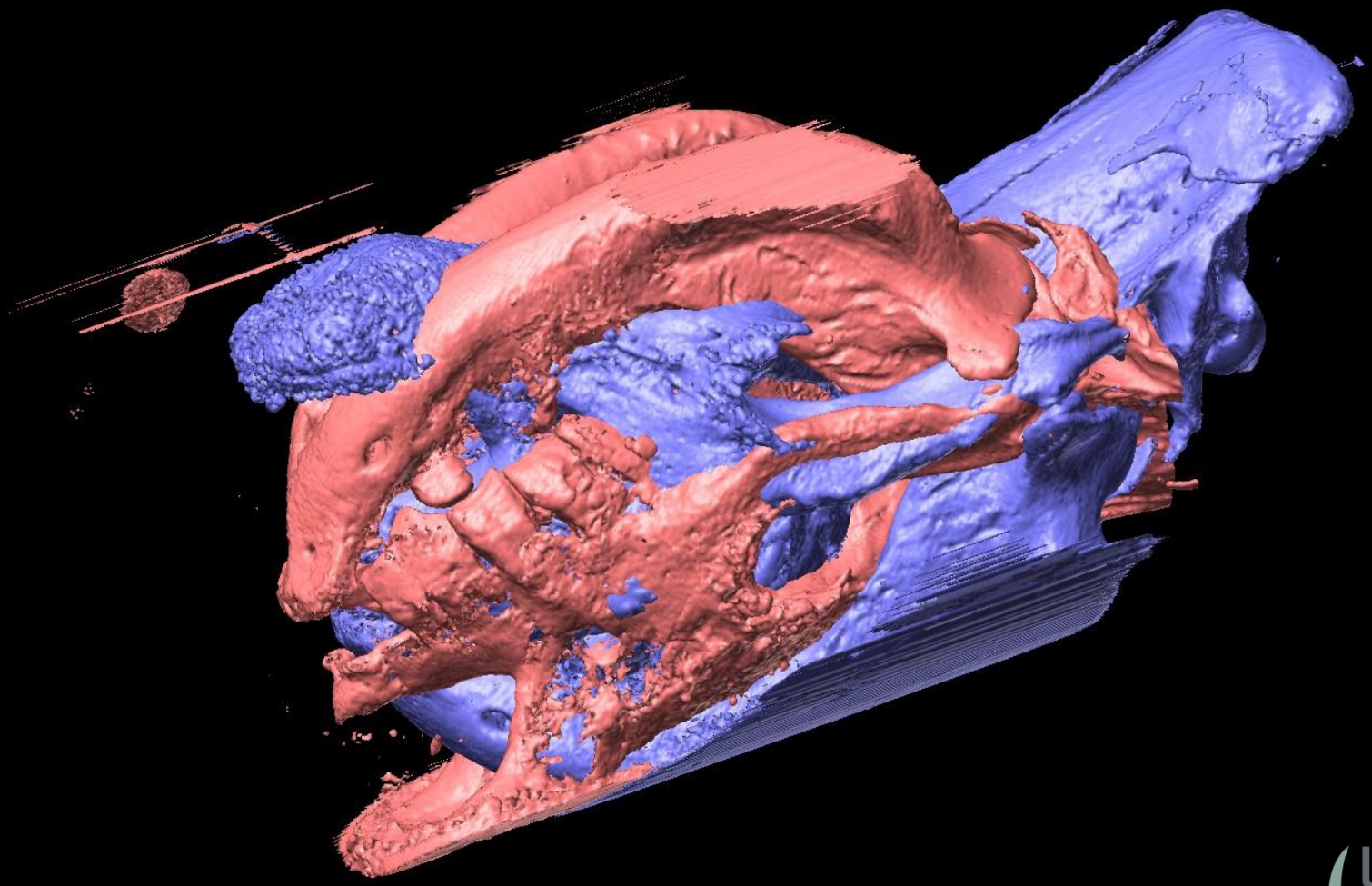


witmerlab

First the digital skull model is flipped, so that we wind up with the head right-side up.

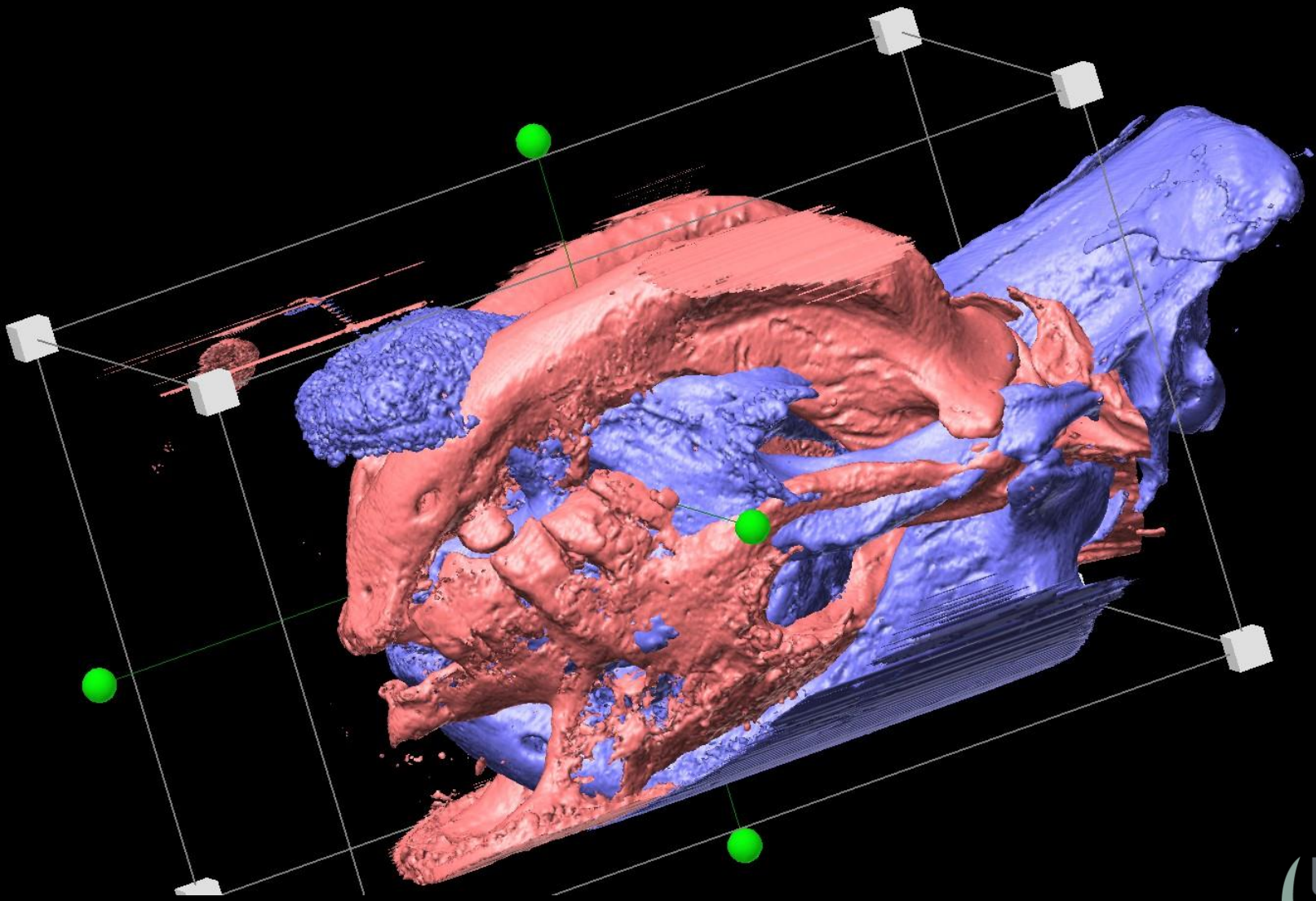


Now we add in the other dataset…which was originally scanned right-side up but we flipped it here to remind you that the two datasets were offset 180 degrees.
Still with me?



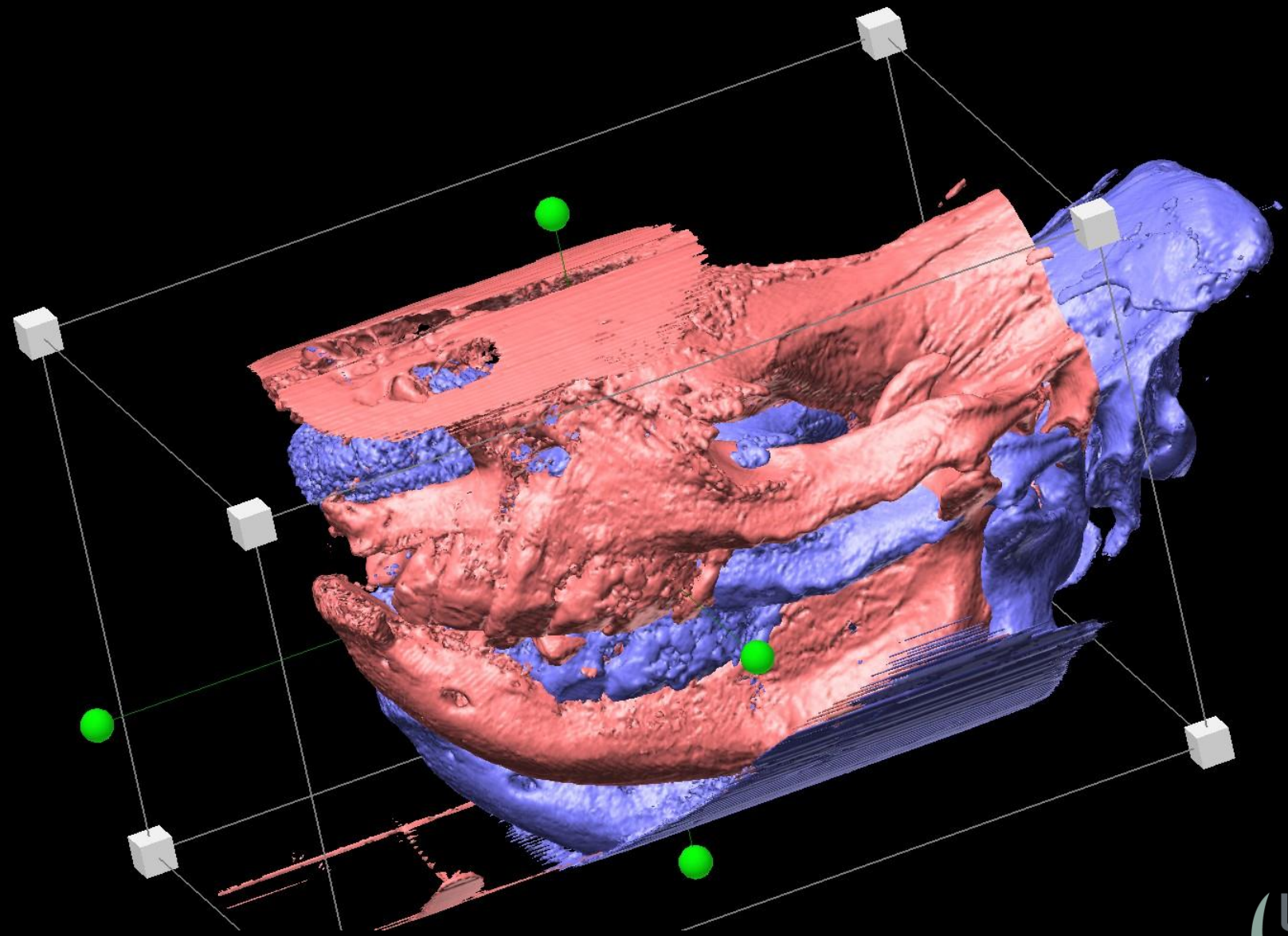
witmerlab

The software we're using is called Avizo. Here we invoke the Transformation Editor, which allows us to align these different datasets. (note: "we" = Ryan Ridgely)



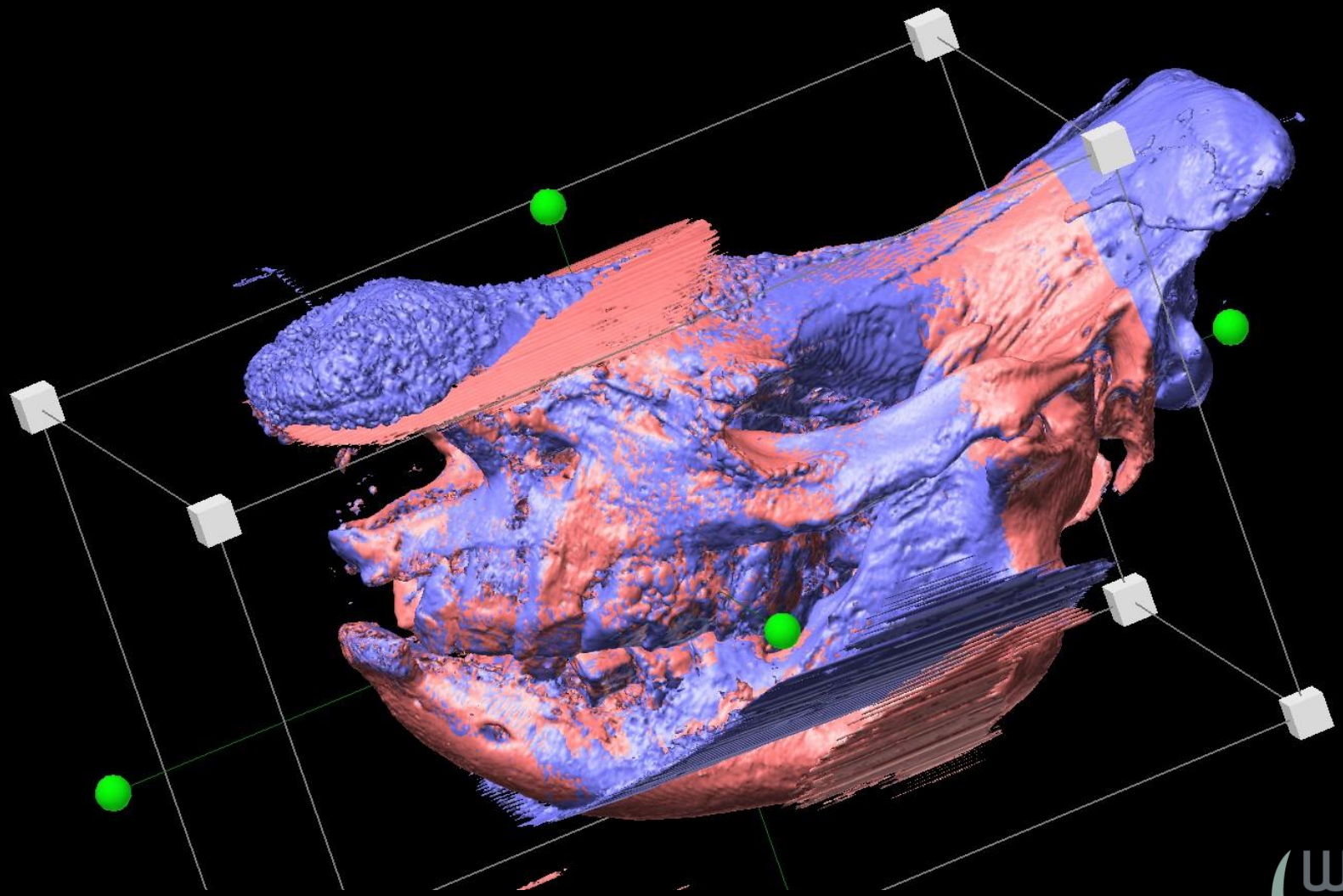
witmerlab

The “red head,” which has a better lower part, is then flipped to start the process.



witmerlab

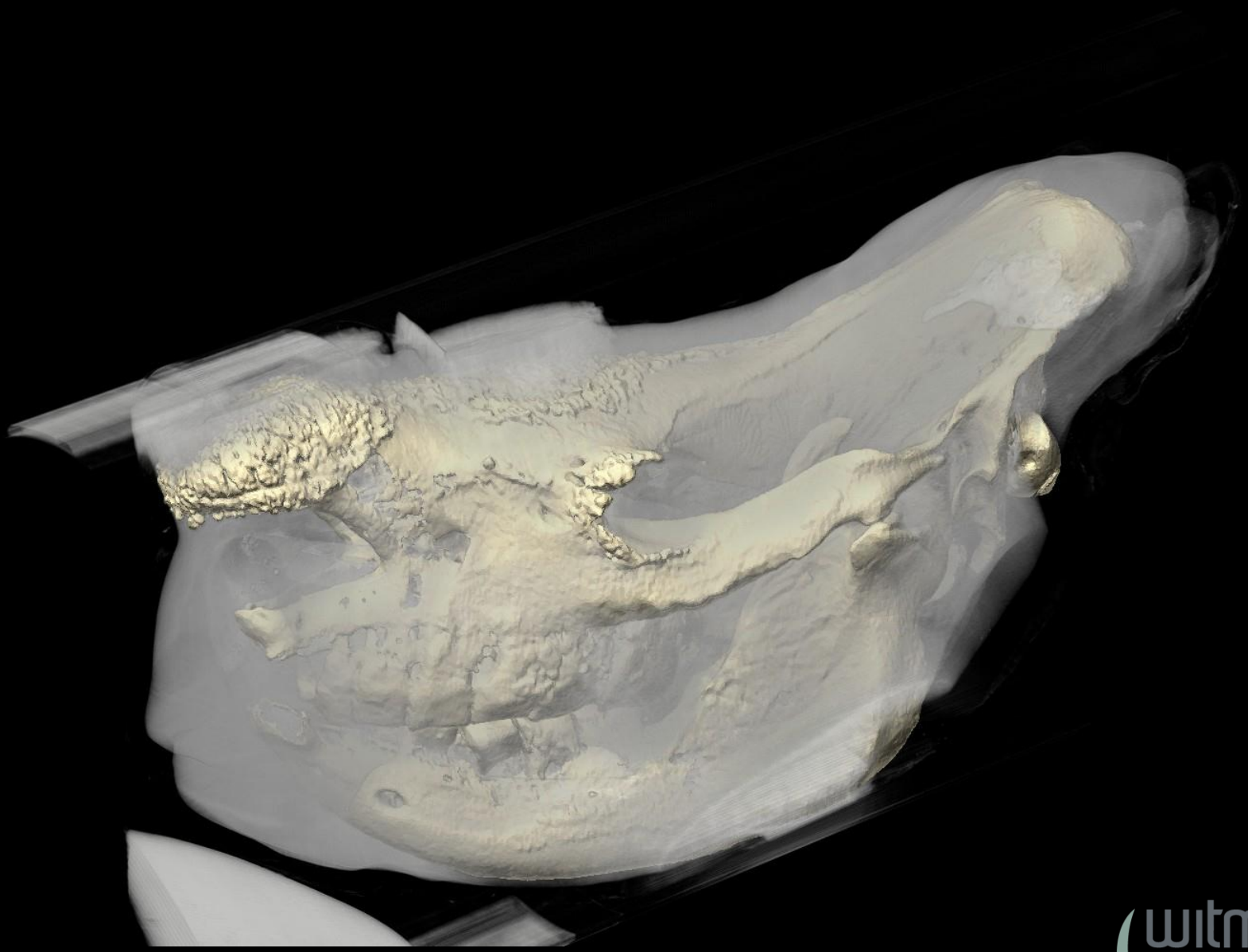
The software then aligns (or, in the jargon of 3D modeling, “registers”) the two datasets, which combines the best of both datasets…as well as the worst, meaning the cut-off artifacts needs to be removed.



Ta da! But we're not done yet. We're not just interested in the skull only…we want the whole head put together, meaning all the soft-tissues—including the horns.

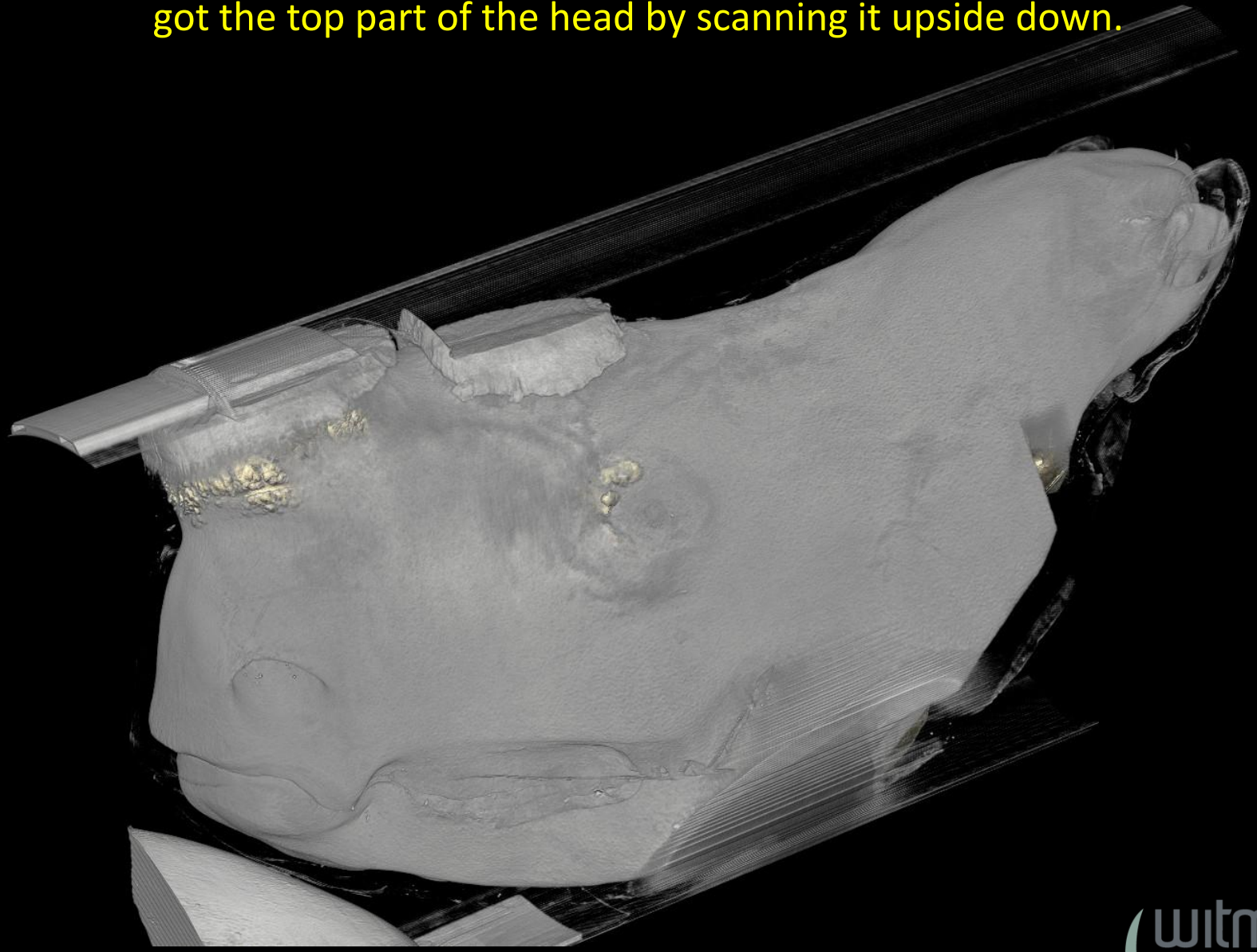
witmerlab

To reattach the horns that we removed in around 2005, we need the whole head.



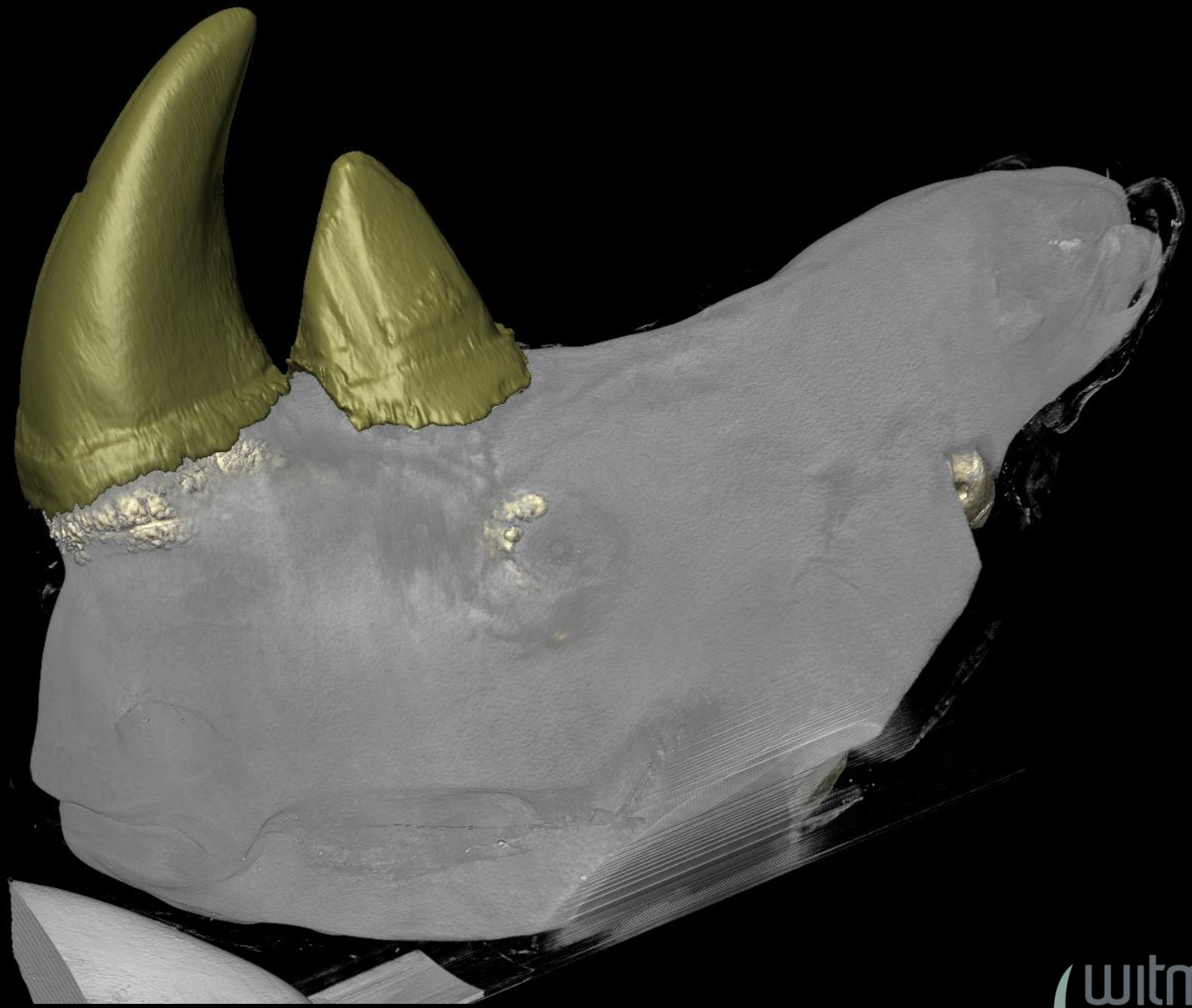
witmerlab

Here's the reassembled head, showing the bases of the horns. The plate-like object that seems to sit on the nasal-horn base is part of the scanner's table…remember, we got the top part of the head by scanning it upside down.



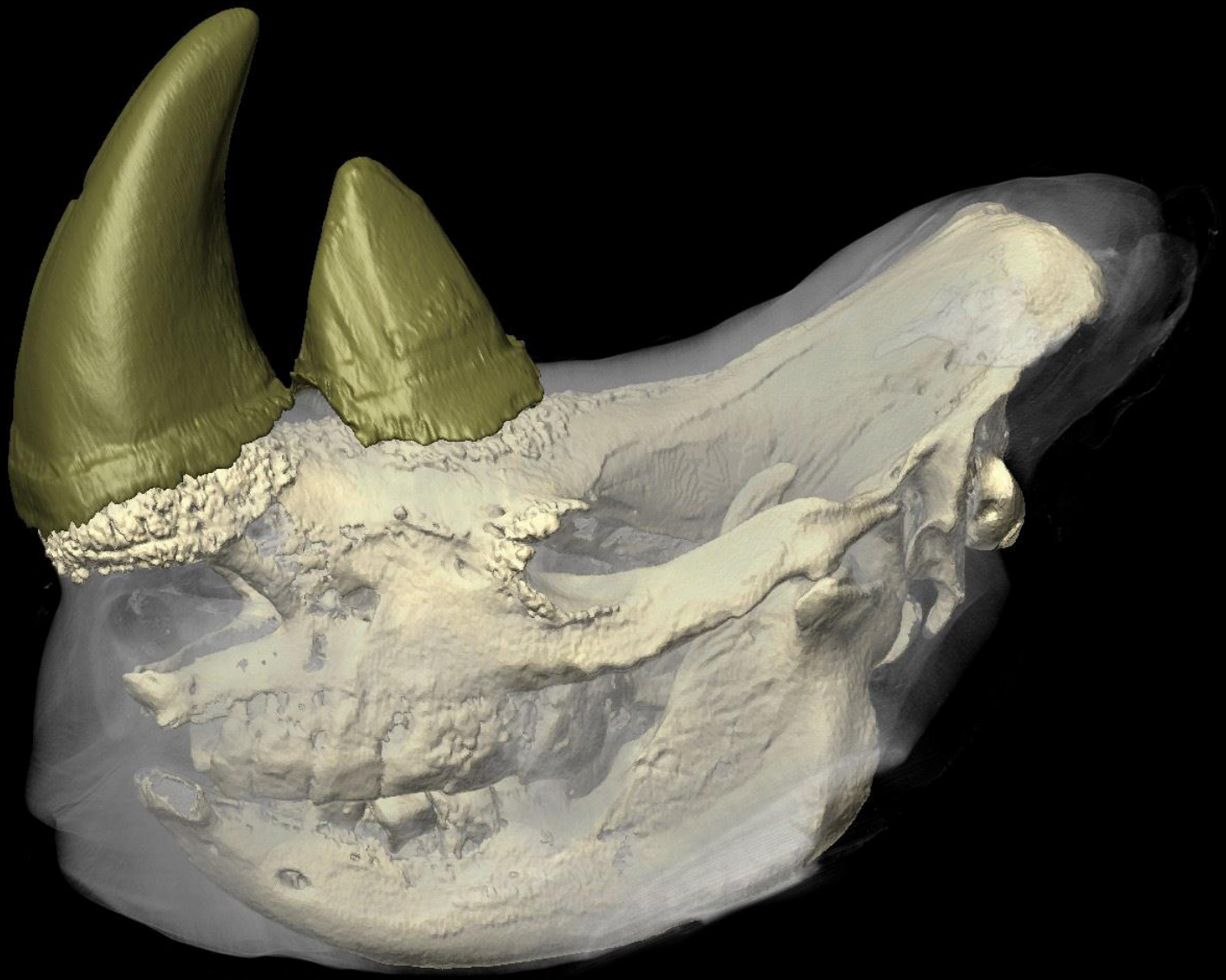
witmerlab

The horns are now attached. Ryan even sealed up the kerf (the saw-cut gap).



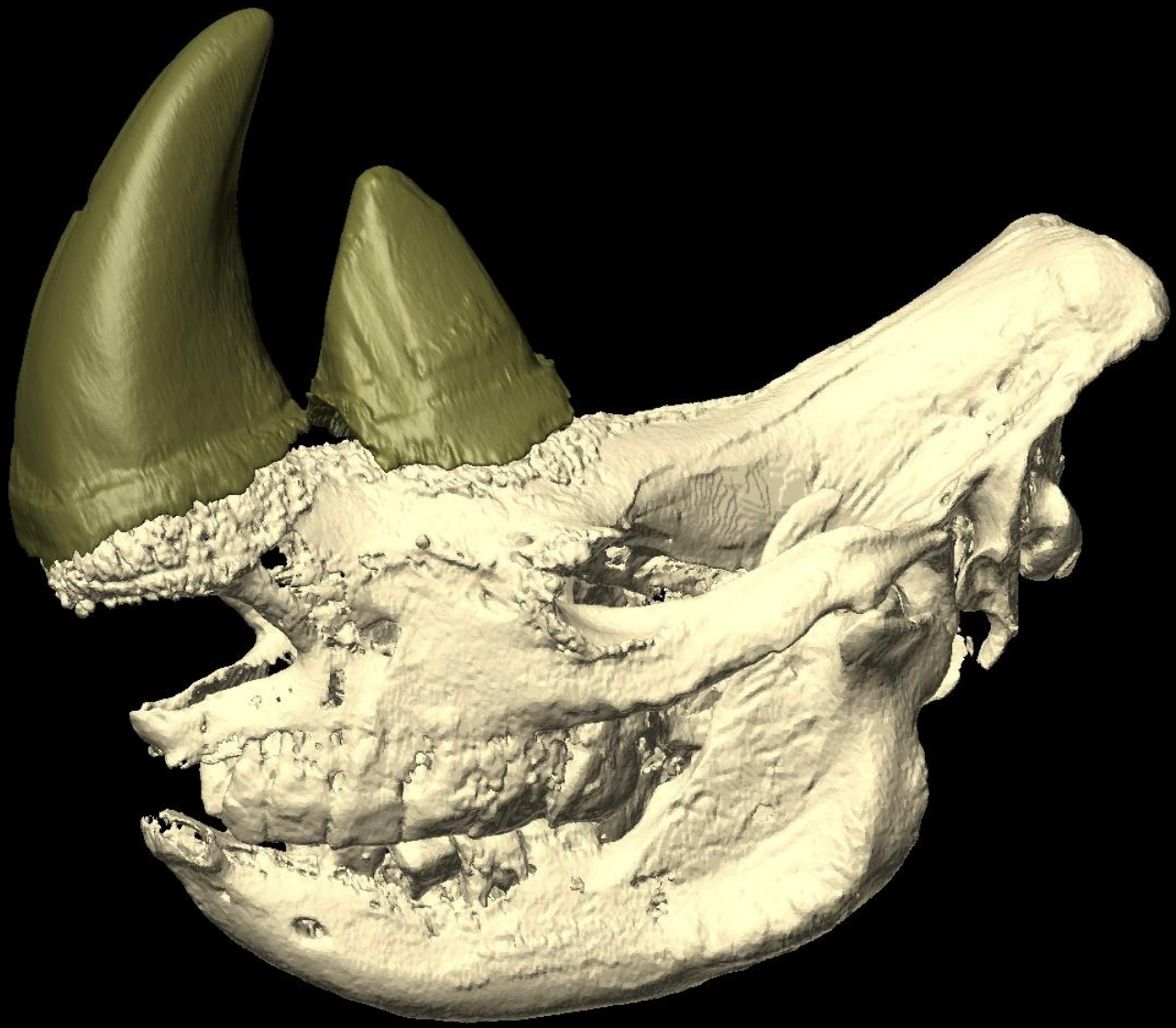
witmerlab

Ta da…fo realz! Now that the head is assembled, we can really get to work with 3D analysis and visualization.



witmerlab

Okay…one more bonus image.



witmerlab

To see what we've done with this assembled rhino dataset, please visit the Visible Interactive Rhino website:.
http://www.oucom.ohiou.edu/dbms-witmer/3D_rhino.htm

Brought to you by
WitmerLab at Ohio University: http://www.ohio.edu/witmerlab
Ohio University: http://www.ohio.edu
OU Heritage College Osteopathic Medicine: http://www.oucom.ohiou.edu/
O'Bleness Memorial Hospital: http://www.obleness.org/
National Science Foundation: http://www.nsf.gov/

witmerlab