Lab produces world's first 'pathoconnectome'

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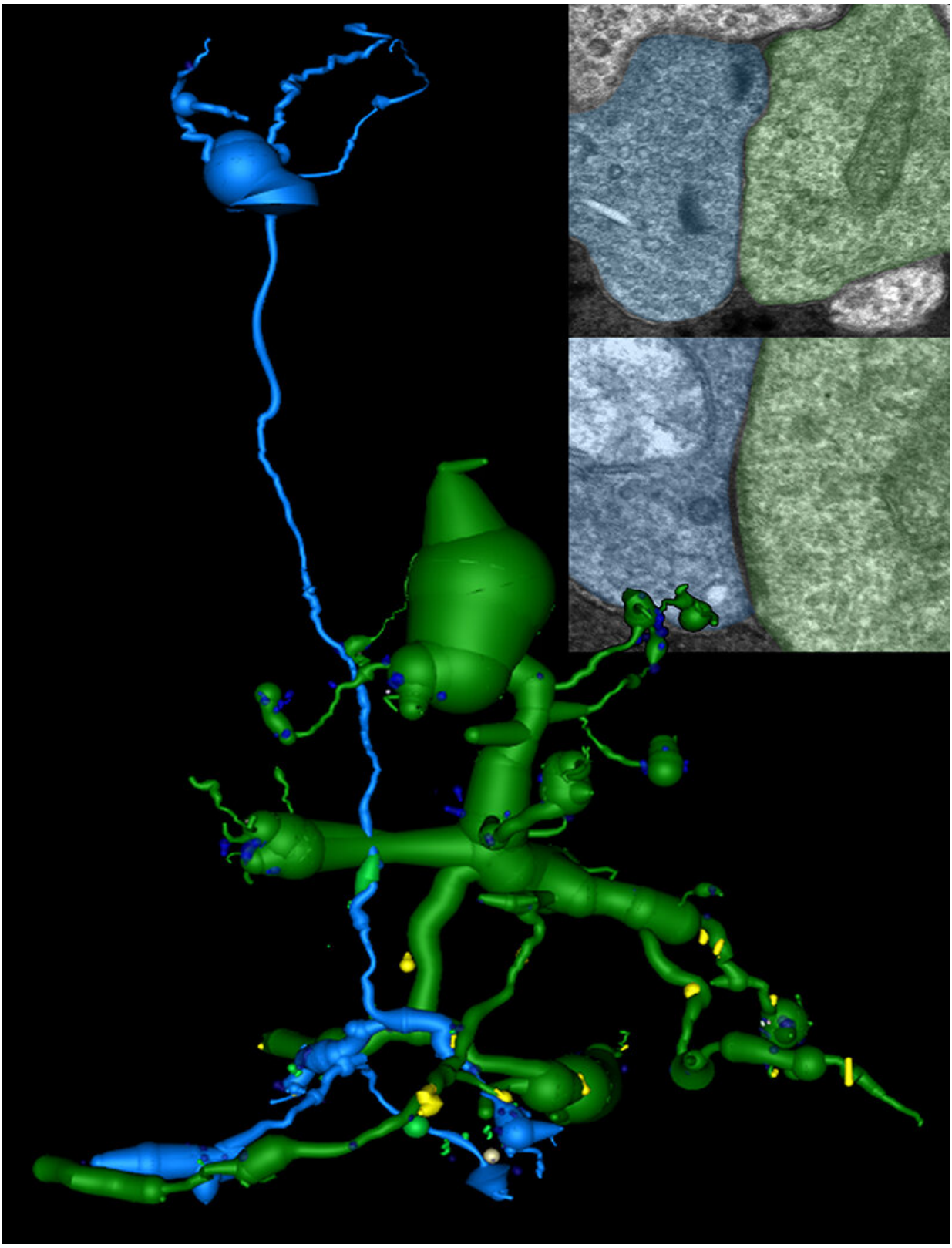


A 2-D pathoconnectome image showing two retinal neurons (rod bipolar cell in

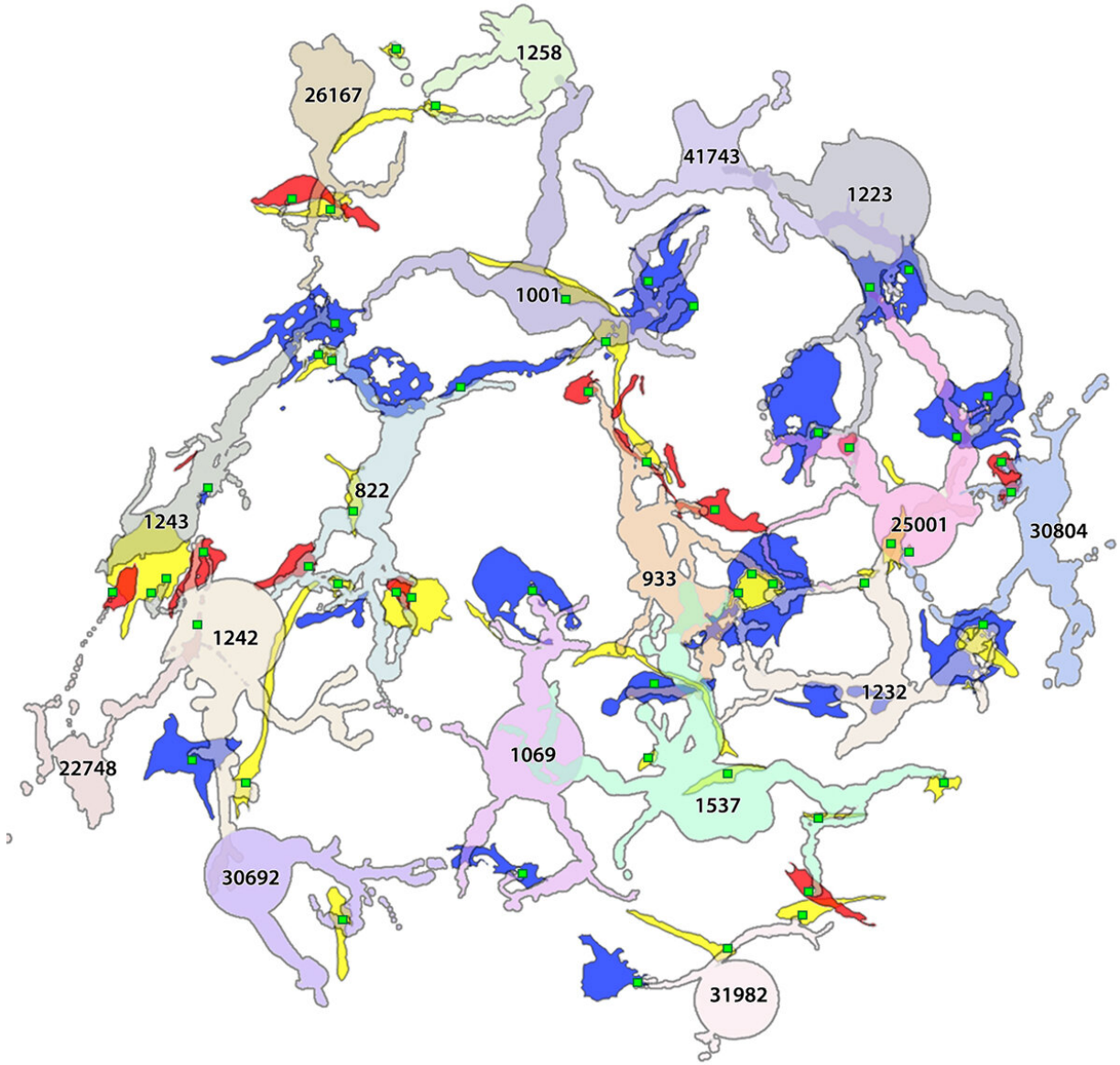
blue, Aii amacrine cell in green). A gap junction connection (lower inset image) is not normally present between them but formed as the degenerating retina rewired itself during disease. Credit: University of Utah Health Sciences

Scientists from the John A. Moran Eye Center at the University of Utah have achieved another first in the field of connectomics, which studies the synaptic connections between neurons.

Moran's Marclab for Connectomics was the first to complete a map of the circuitry of the retina, or connectome, in 2011. Now, the National Institutes of Health (NIH)-funded lab has produced the first pathoconnectome, showing how eye disease alters retinal circuitry.

The implications of the published research, A pathoconnectome of early neurodegeneration: Network changes in retinal degeneration, extend far beyond eye diseases. The eye holds lessons applicable to a host of neurodegenerative diseases including Alzheimer's, Parkinson's, epilepsy, and Lou Gehrig's disease.

"The components of neurodegeneration we see in the eye seem to mimic those we see in the brain," explained the paper's lead author, Moran's Rebecca L. Pfeiffer, Ph.D. "So this pathoconnectome is allowing us to learn fundamental rules of how neurodegenerative diseases alter neural networks in general. The ultimate goal is to identify how we might develop new therapies based on preventing or interfering with the network rewiring prompted by disease."



A 2-D pathoconnectome image shows rod bipolar cell dendrites and their synapse locations with rod (red), cone (blue), and indeterminate (yellow) photoreceptors. Credit: John A. Moran Eye Center

The Marclab developed the pathoconnectome from a model of early-stage retinitis pigmentosa (RP), an inherited retinal disease that can lead

to blindness. The immense data set compiled to construct the pathoconnectome has taken years to assemble and is open for use by other scientists. The Marclab is working on a second and third pathoconnectome that will show how the retina rewires itself in later stages of RP.

More information: Rebecca L. Pfeiffer et al, A pathoconnectome of early neurodegeneration: Network changes in retinal degeneration, *Experimental Eye Research* (2020). DOI: 10.1016/j.exer.2020.108196

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