Tables and figures

TABLE 1. The Cone Distribution in the Rabbit Retina

Location	S cones (# per mm^2)	M cones (# per mm^2)	Duel-expressing cones (# per mm^2)	Total cones (# per mm^2)	Duel-expressing cone ratio (%)
Dorsal site	1027±230	5470±571	0±0	6497±512	0.00±0.00
Visual streak	885±278	9969±1243	48±60	10806±1429	0.42±0.55
Ventral site	2197±663	7391±1003	837±316	8751±1356	9.41±2.99
Blue streak	10958±1328	2293±418	1979±353	11272±1395	17.82±4.02

The location was arranged from the dorsal side retina to the ventral side retina. Five images (each covers 145 ×145 μm) in each region were taken to count the cone density (average ± standard deviation).

TABLE 2. Summary of the Wide-Field Bopolar Cells

Cell type	# of cells observed	Axon terminal			Dendrites		
		Field area (μm^2)	Diameter (μm)	Stratification (% IPL)	Field area (μm^2)	Diameter (μm)	connectivity
BB	2	4340 ± 1520	73 ± 13	5- 15	1580 ± 520	44 ± 8	S
BL	5	3270 ± 1440	63 ± 14	10- 40	1710 ± 390	46 ± 5	S & M
WA	6	4990 ± 780	79 ± 6	20-40	1850 ± 260	48 ± 3	S & M
WB	4	5130 ± 1000	80 ± 8	45-60	1910 ± 470	49 ± 6	S & M

The total number of the injected wide-field bipolar cells was 17. The axon terminal field and dendritic field areas were computed from a polygon connecting the tip of the process endings. The diameters of the fields were calculated from the field area and assumed the circular area. BB: Blue cone contact only bipolar cells. BL: BB-like bipolar cells. WA: Wide-field bipolar cells whose axonal terminal stratified in the sublamina a. WB: Wide-field bipolar cells whose axonal terminal stratified in the sublamina b.

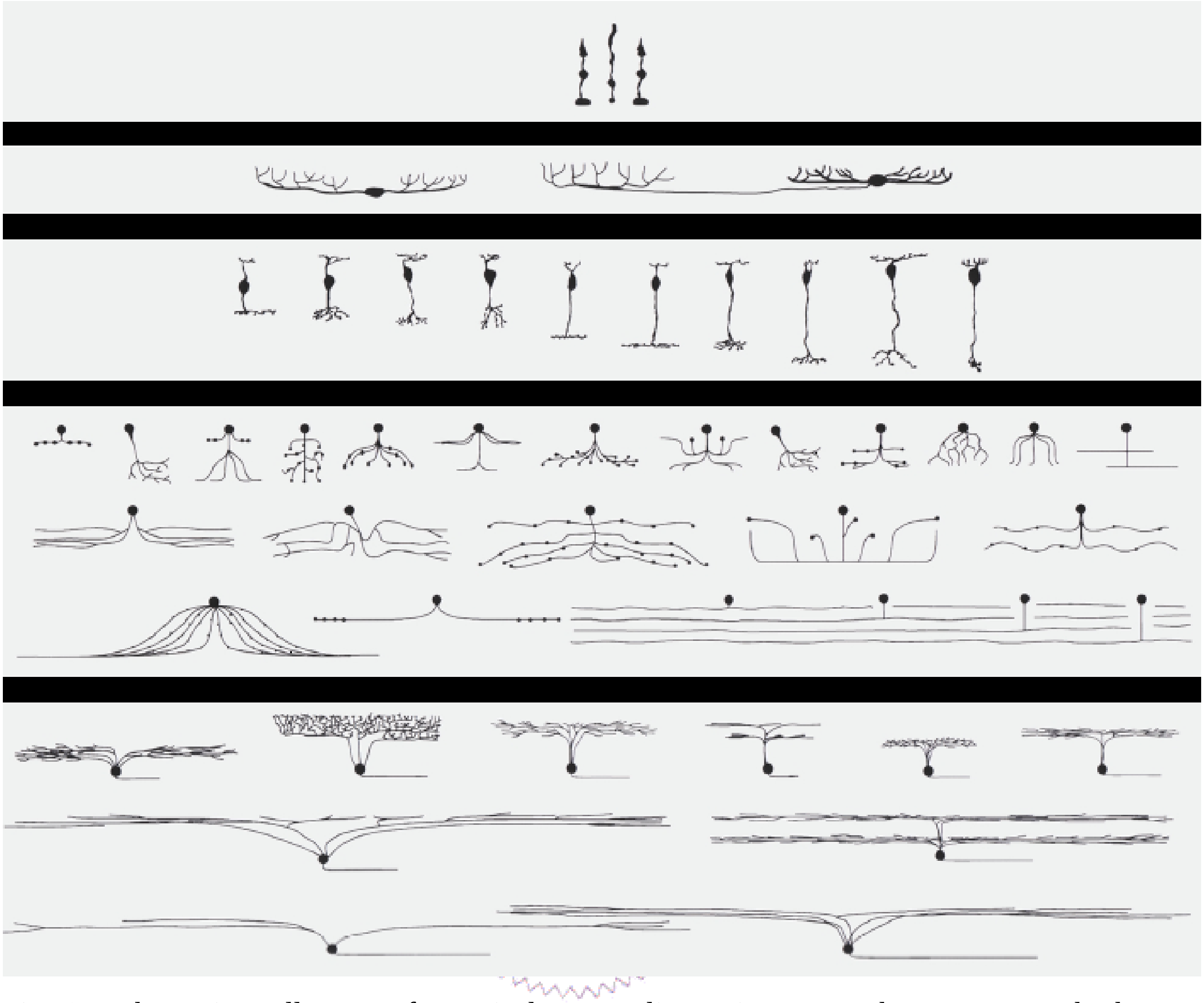


Fig. 1. The major cell types of a typical mammalian retina. From the top row to the bottom, photoreceptors, horizontal cells, bipolar cells, amacrine cells and ganglion cells. The illustration is based primarily on work in the rabbit. Most of the cells are also seen in a variety of mammalian species. The bipolar cells are from work in the rat; similar ones have been observed in the rabbit, cat and monkey. Picture comes from Masland (2001), Nature Neuroscience, Vol 4, Page 878.

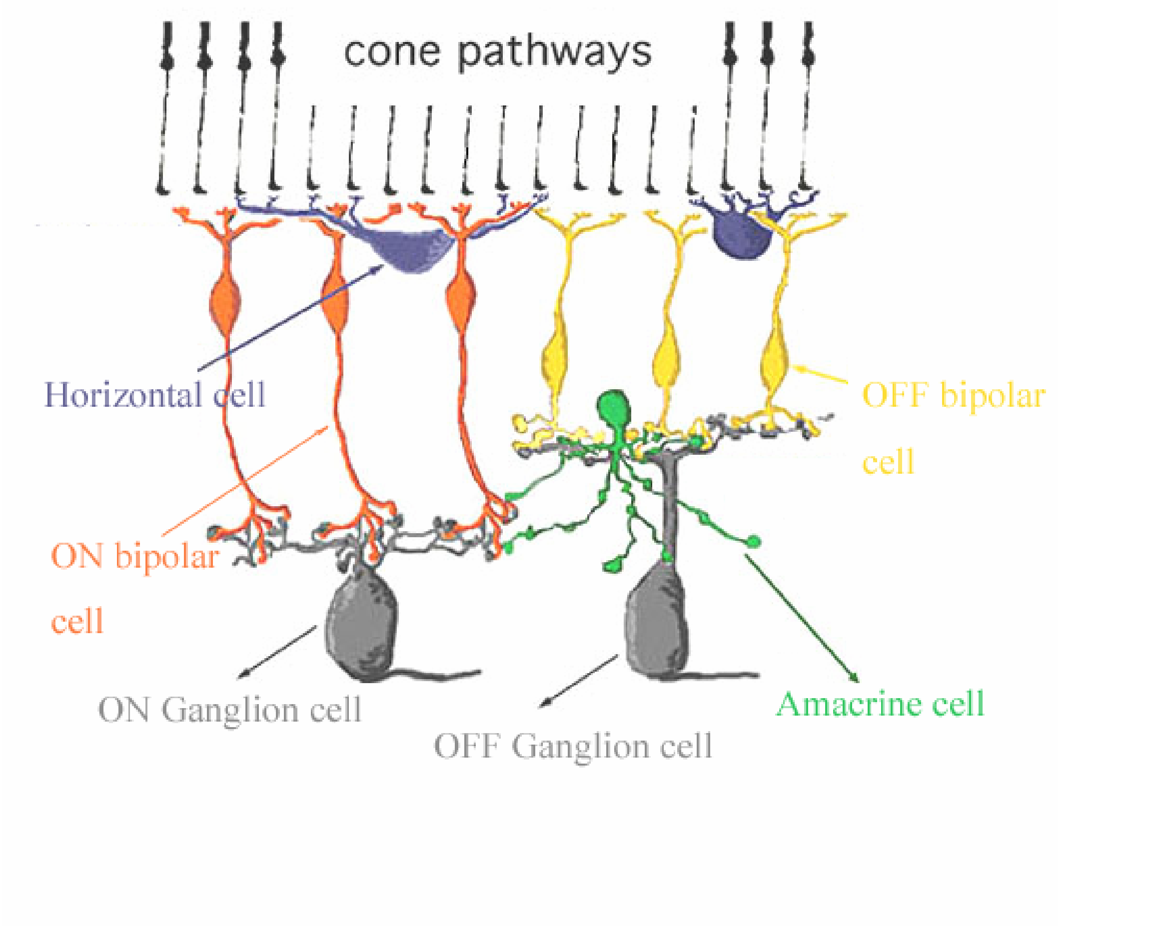


Fig. 2. The cone pathways in the retina. Cone bipolar cells receive visual signal from con photoreceptors then transmit to ganglion cells. The signal is modulated by horizontal cells in the first synapses and by amacrine cells in the second synapses. Picture comes from Webvison, http://webvision.med.utah.edu/.

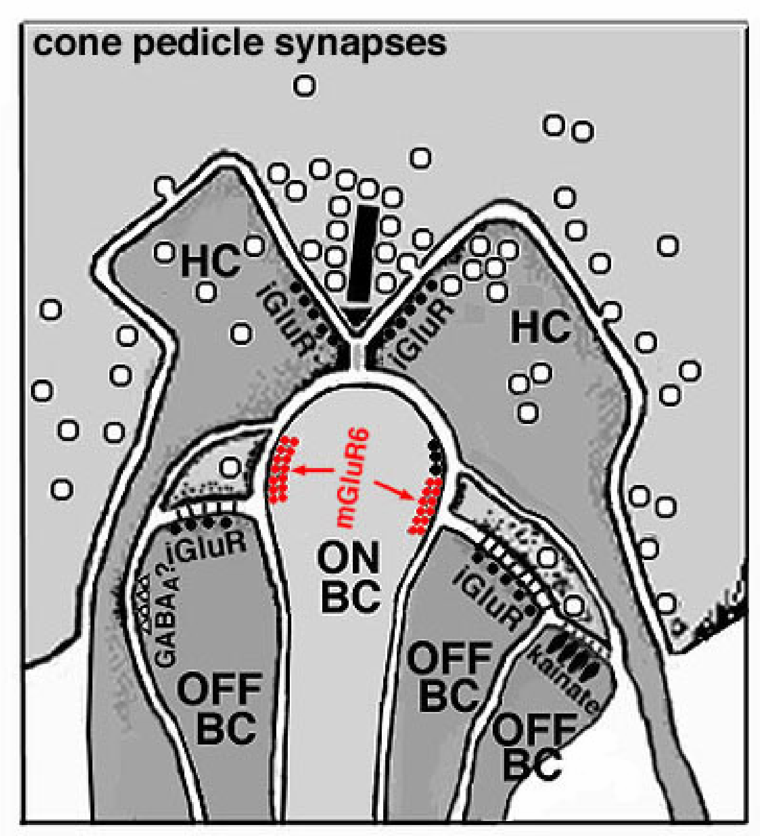


Fig. 3. The cone pedicle synapse structure. The dendrite of an ON-bipolar cell is central invaginating element of a cone terminal's triad synapse that is shared with two laterally horizontal cell processes. The dendrites of an OFF-bipolar cell establish flat contacts or basal junctions at the base of the cone pedicle. Picture comes from Webvison, http://webvision.med.utah.edu/.

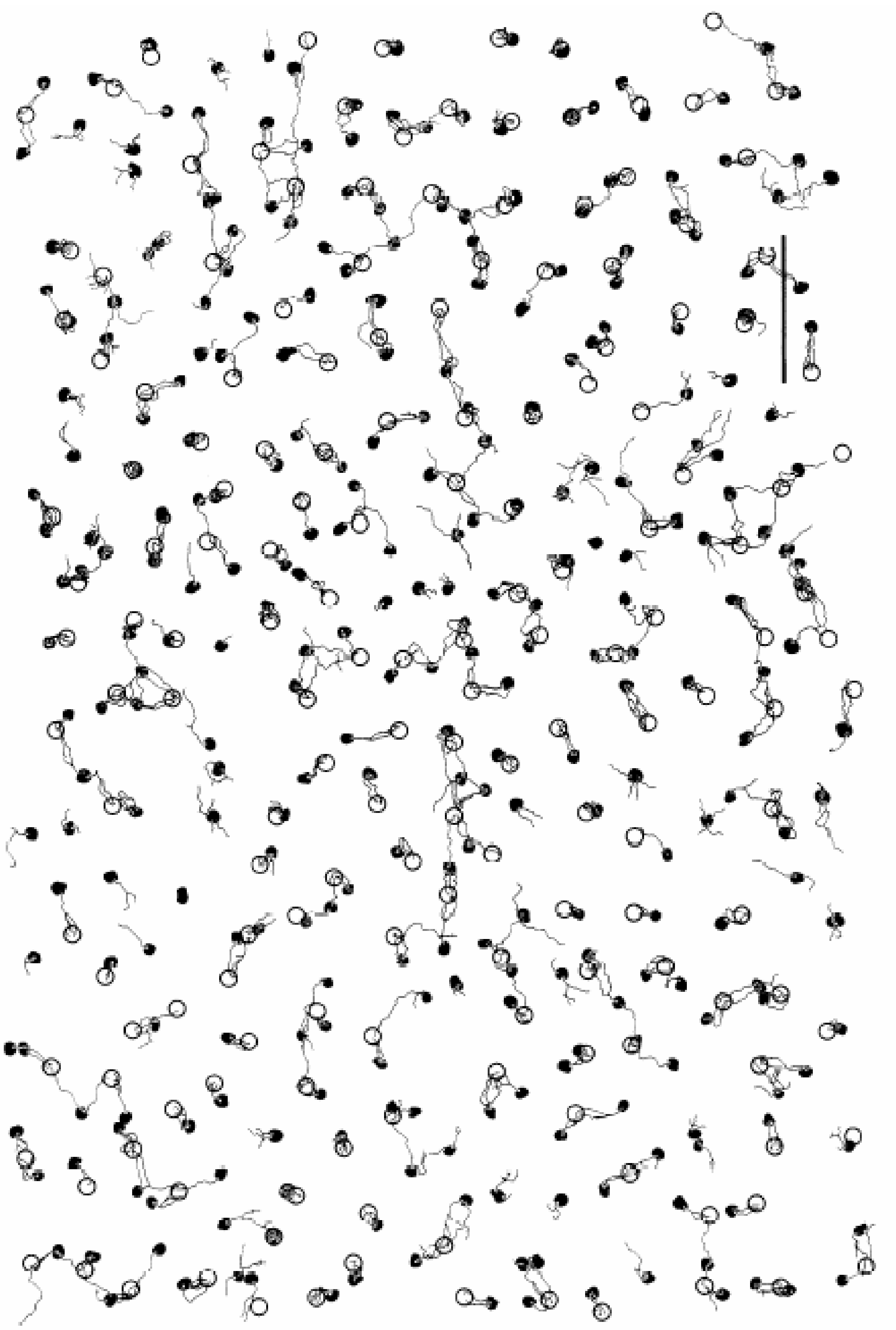


Fig. 4. Camera lucida drawing of the major dendritic arborizations of the blue cone bipolar cells (black) and the mosaic of Procion black-labeled blue cones (open circles) in ventral peripheral retina. Nearly all the bipolar cell dendrites terminated beneath the blue cones, and all blue cones were contacted by bipolar cell dendrites. Scale bar, 100 µm. Picture comes from Kouyama and Marshak (1992), Journal Neuroscience, Vol 12, Page 1242.

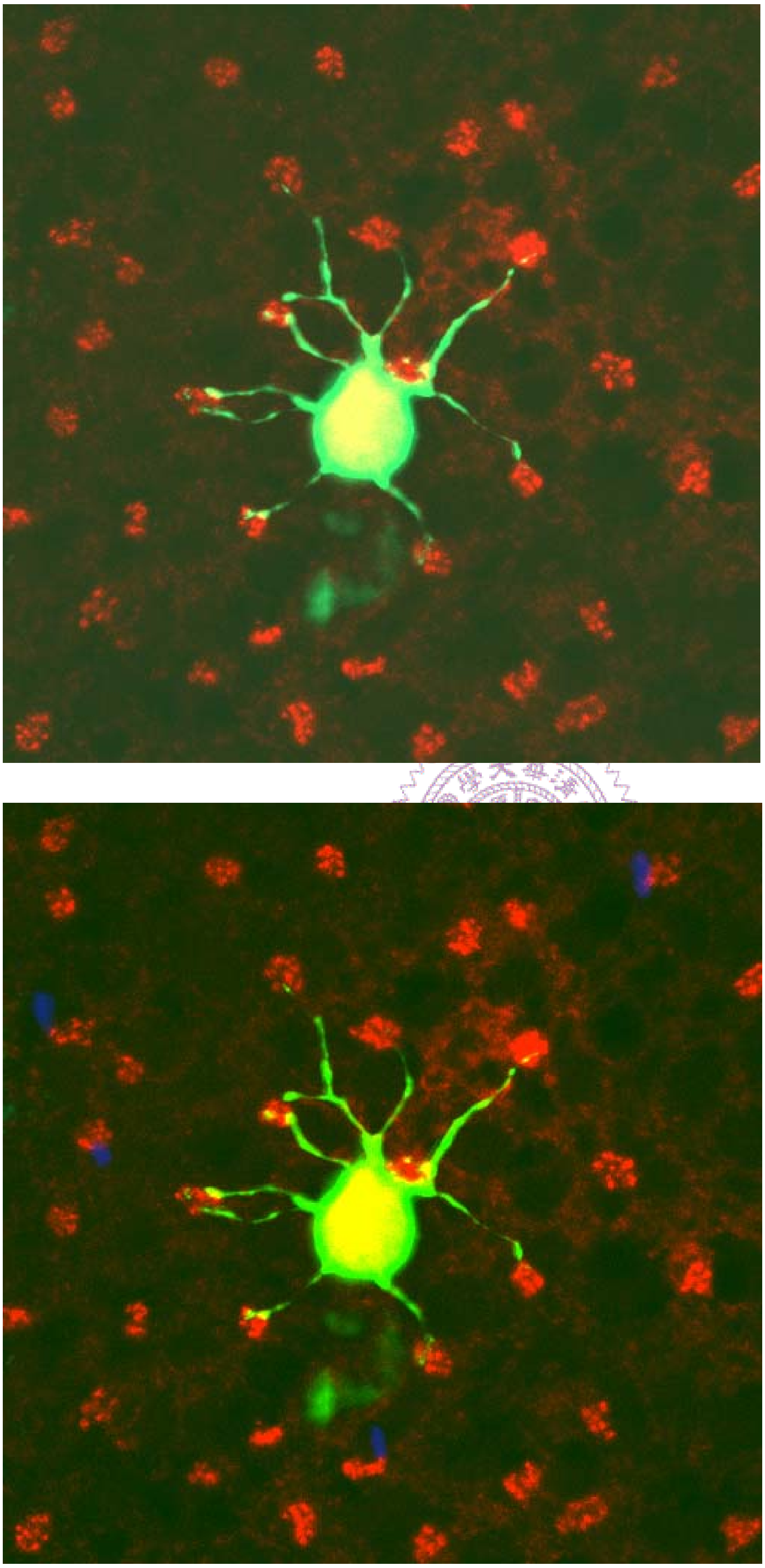


Fig. 5. The model of Image superimposition. Top: the dendritic processing made directly connection with cone pedicles. Image was projected from 4 images with 1μm interval. Green showed the bipolar cell processes labeled by microinjection; red showed the cone pedicles labeled by PNA. Bottom: top image was superimposed with S cone image. Blue showed the outer segment of S cone photoreceptors labeled by anti-S cone antibody. The outer segments had a little shift from the cone pedicles, but it is easy to distinguish the S cone pedicles from the non-S (M cone in rabbit) cone pedicles. In this image pair, the labeled bipolar cell contact 9 cone pedicles but no S cone pedicle.

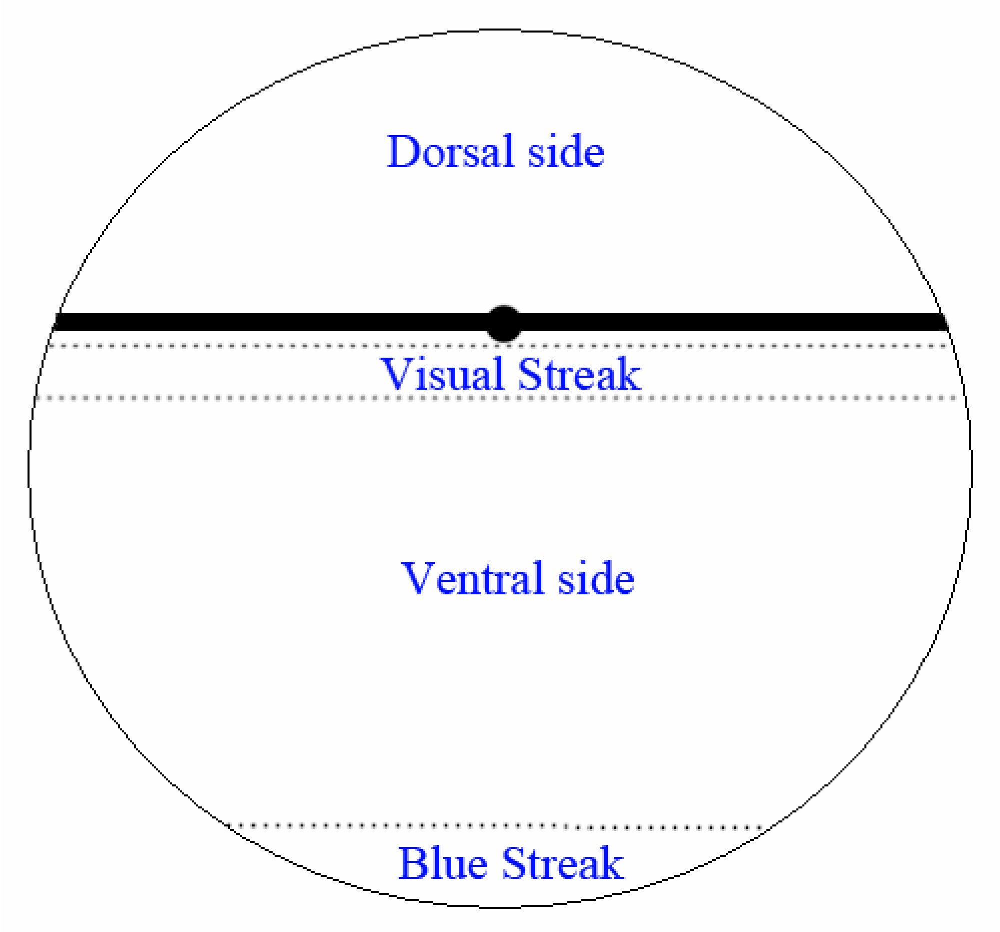


Fig. 6. Four regions of rabbit retina used in this study Instead of the fovea in primate retina, the rabbit retina has a visual streak where cell population density is the highest. In addition, the blue streak in the ventral most 5% to 6% is showed highest S cone population density. Therefore, the rabbit retina is normally divided into four regions.

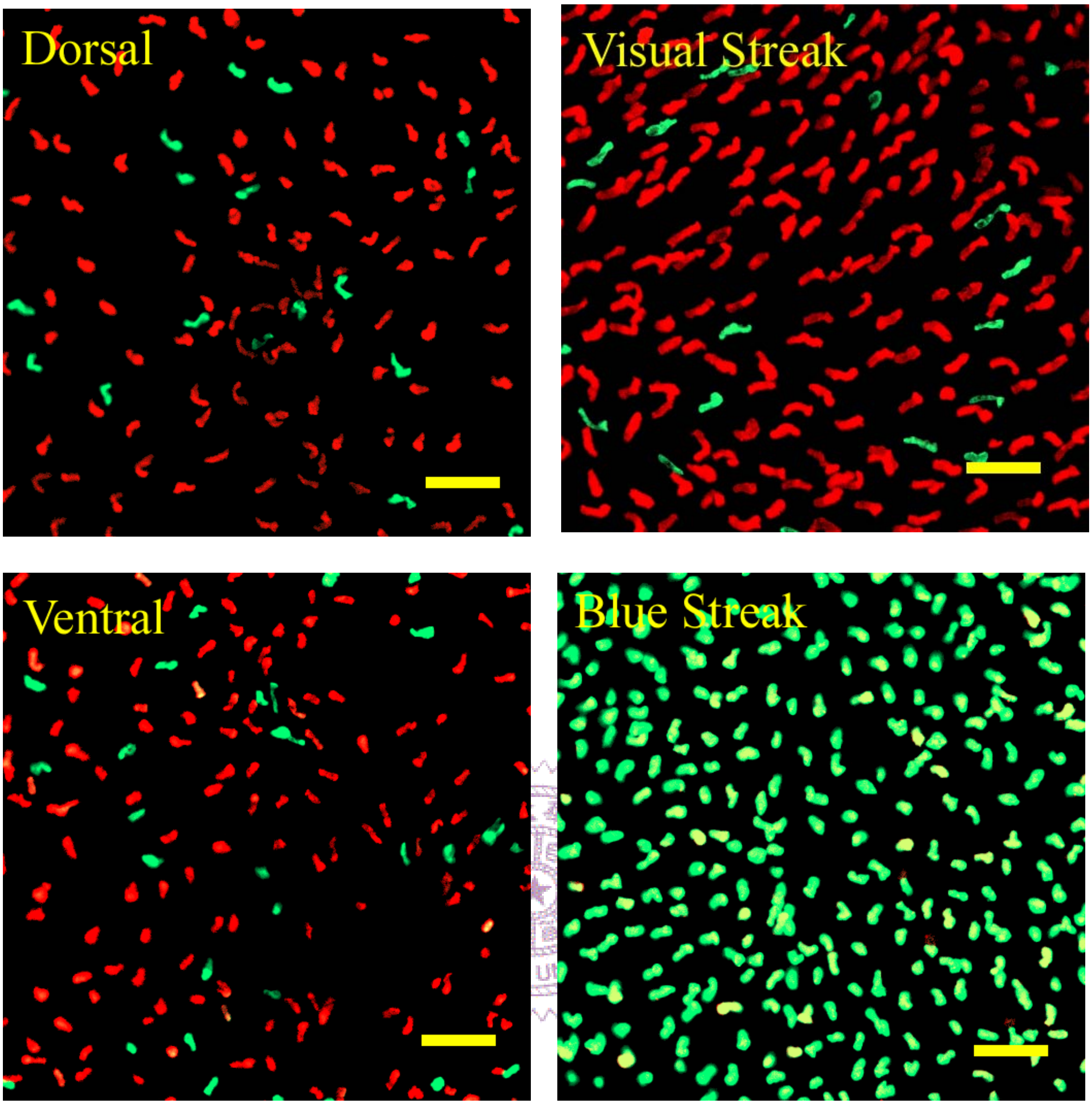
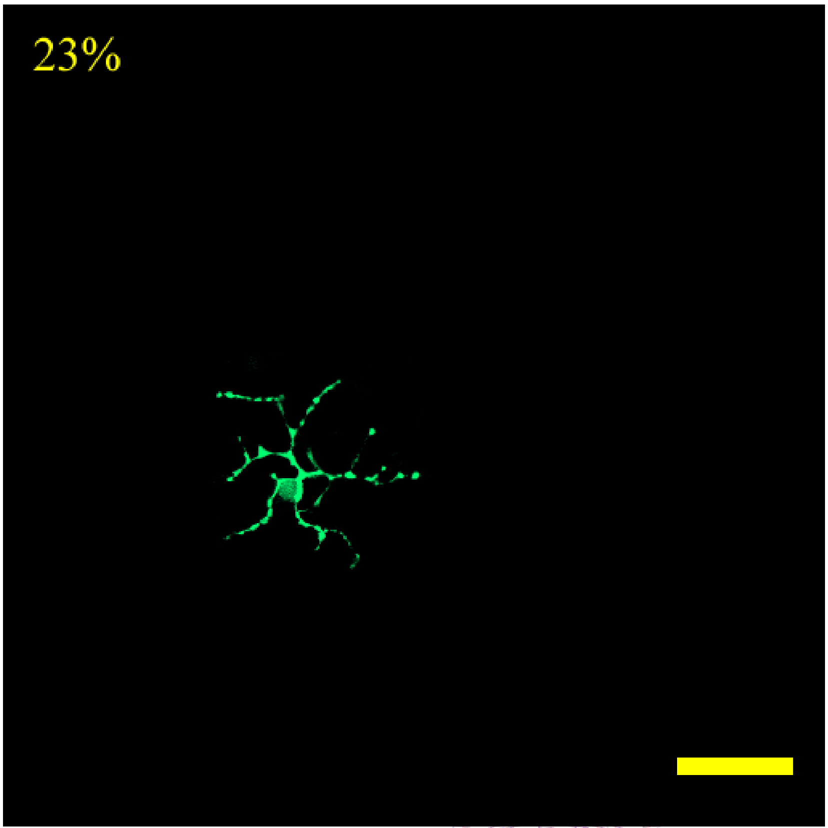


Fig. 7. Cone distribution in four region of rabbit retina. Green: S cone labeled by the anti-S opsin antibody. Red: M cone labeled by the anti-M opsin antibody. Yellow: S opsin and M opsin co-expressed. Scale bar = 20 μm.



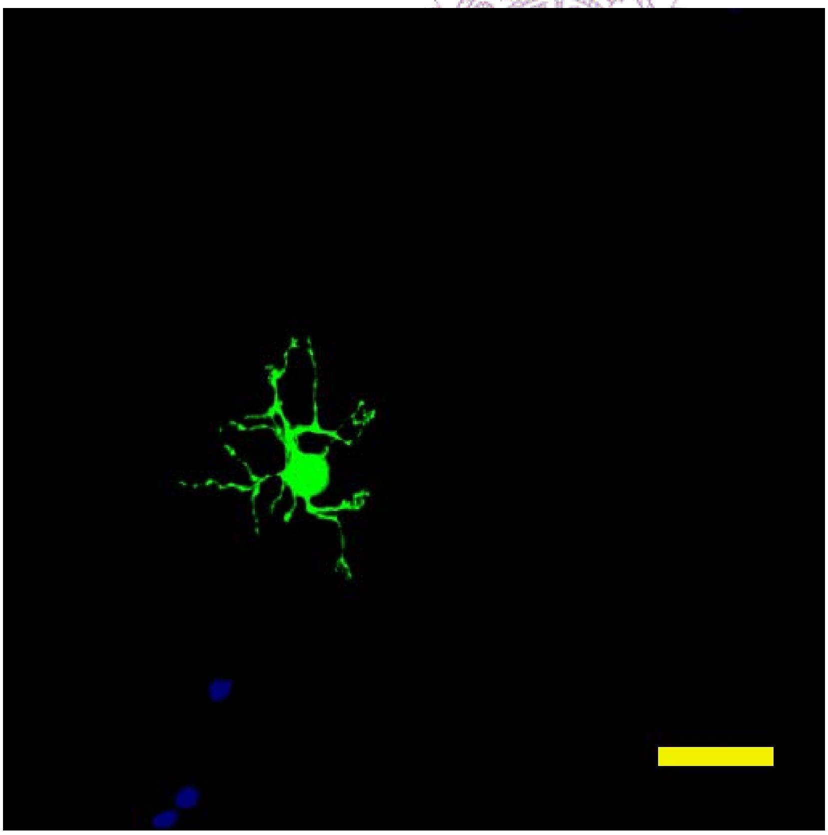
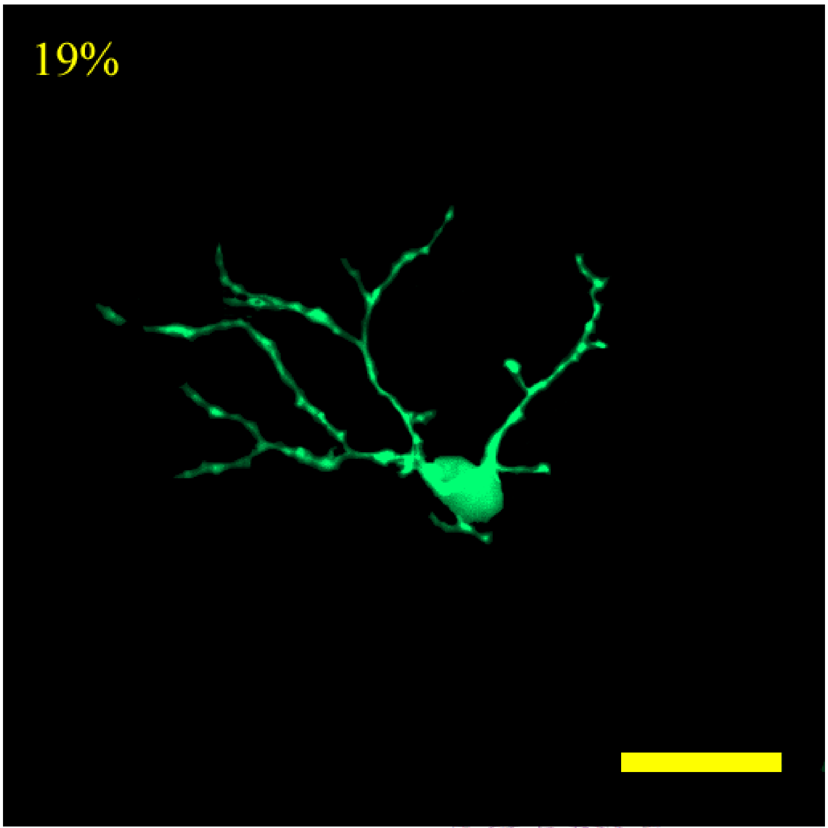


Fig. 8A. The morphology of CBa1. Top: axon of the CBa1 cell. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa1 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.



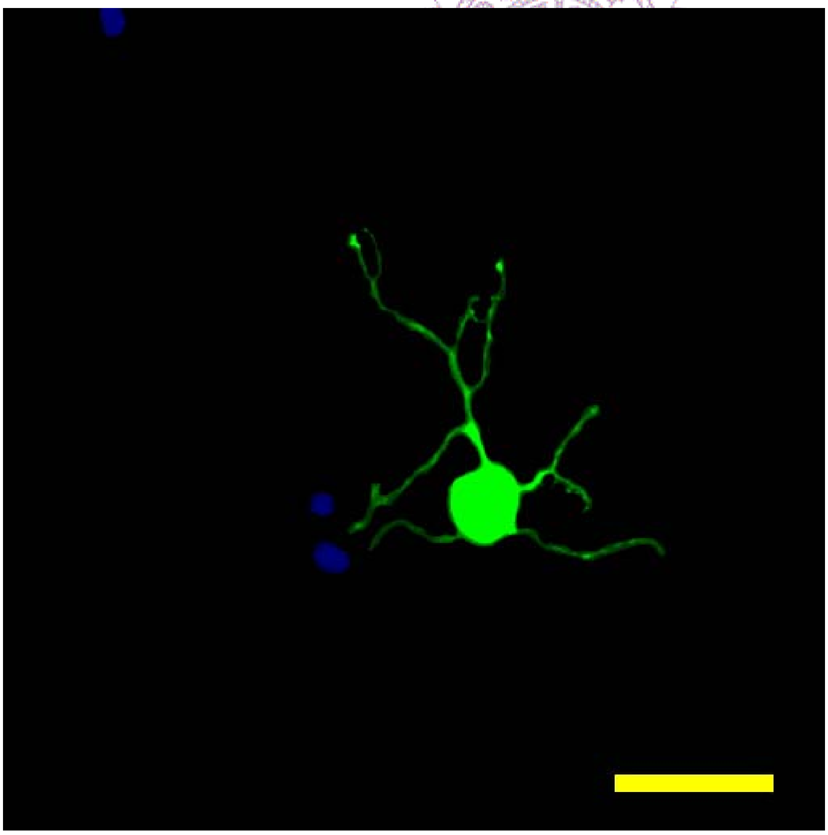


Fig. 8B. The morphology of CBa1w. Top: axon of the CBa1w cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa1w cell, projection from 2 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

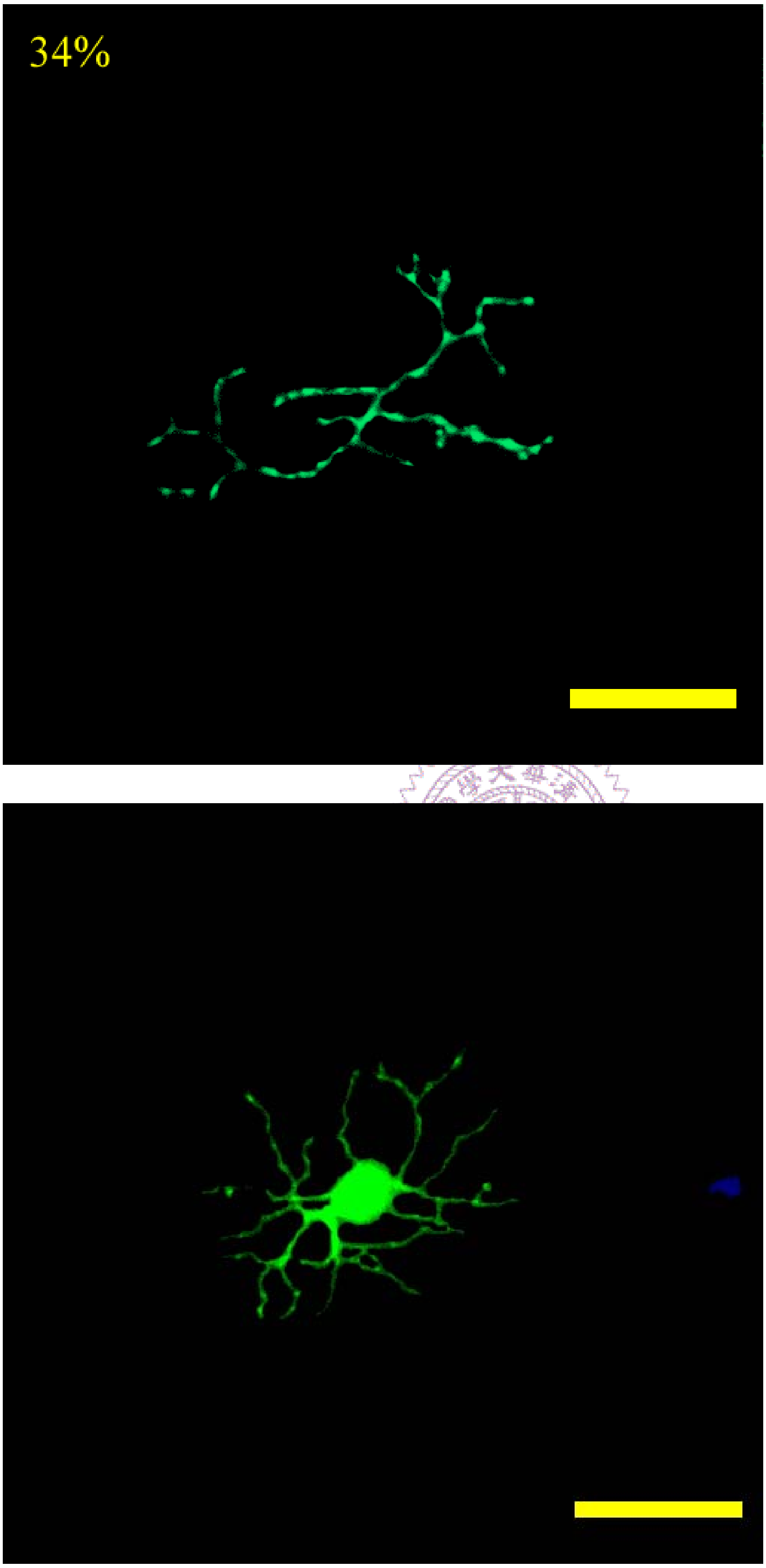


Fig. 8C. The morphology of CBa1-2. Top: axon of the CBa1-2 cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa1-2 cell, projection from 4 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

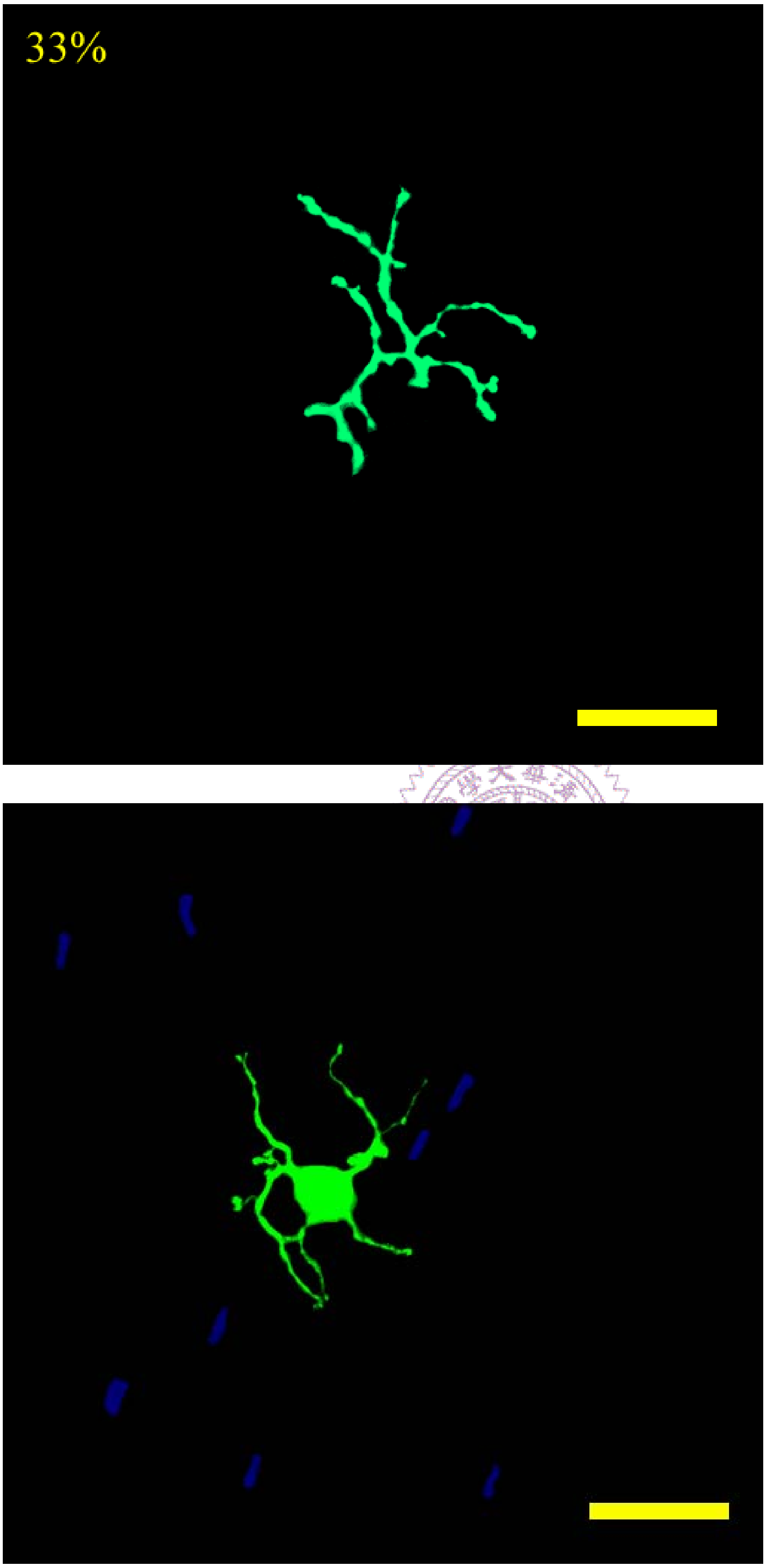


Fig. 8D. The morphology of CBa1-2n. Top: axon of the CBa1-2n cell. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa1-2n cell, projection from 2 images with 1µm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20µm.

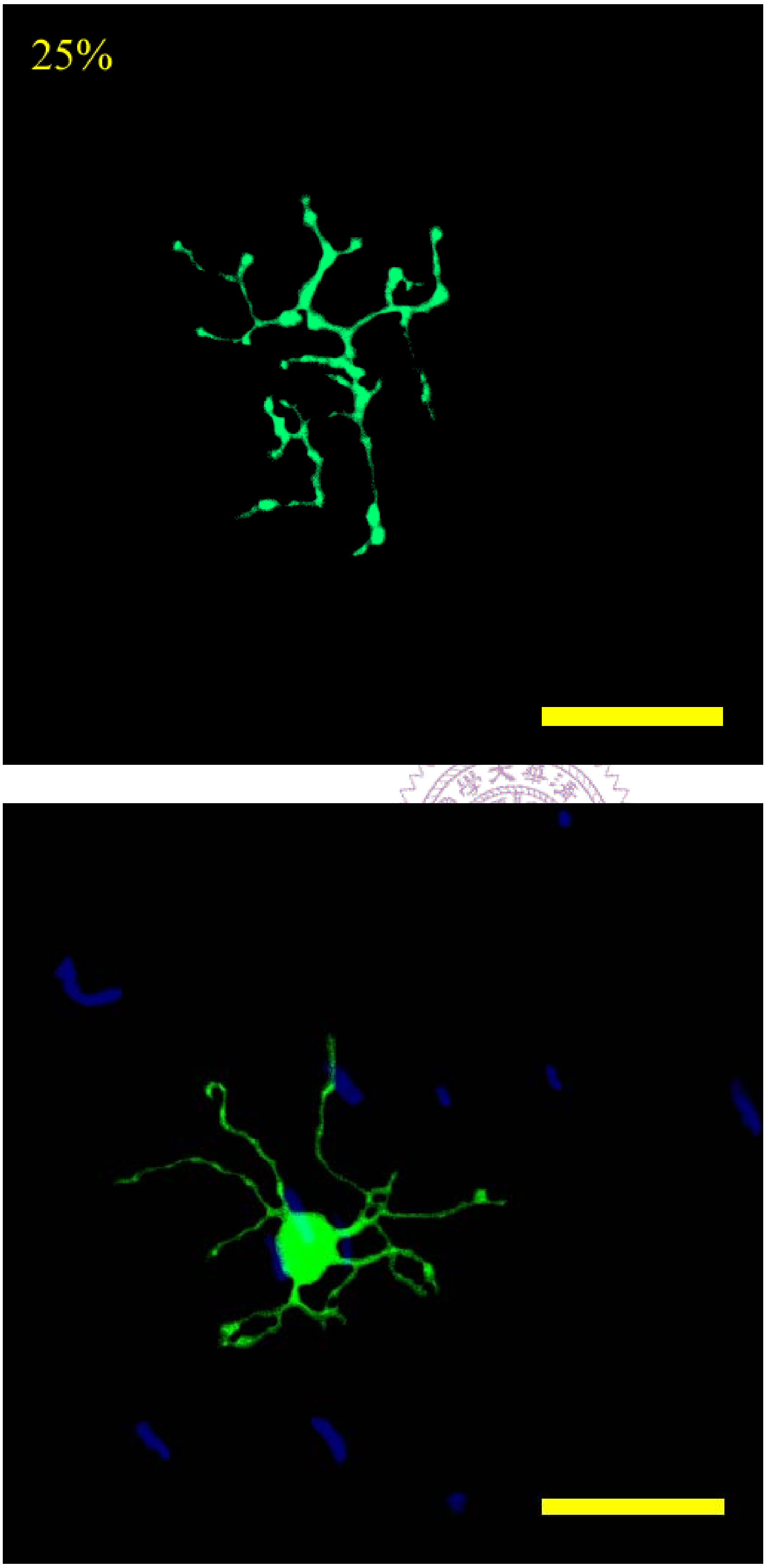


Fig. 8E. The morphology of CBa2. Top: axon of the CBa2 cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa2 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

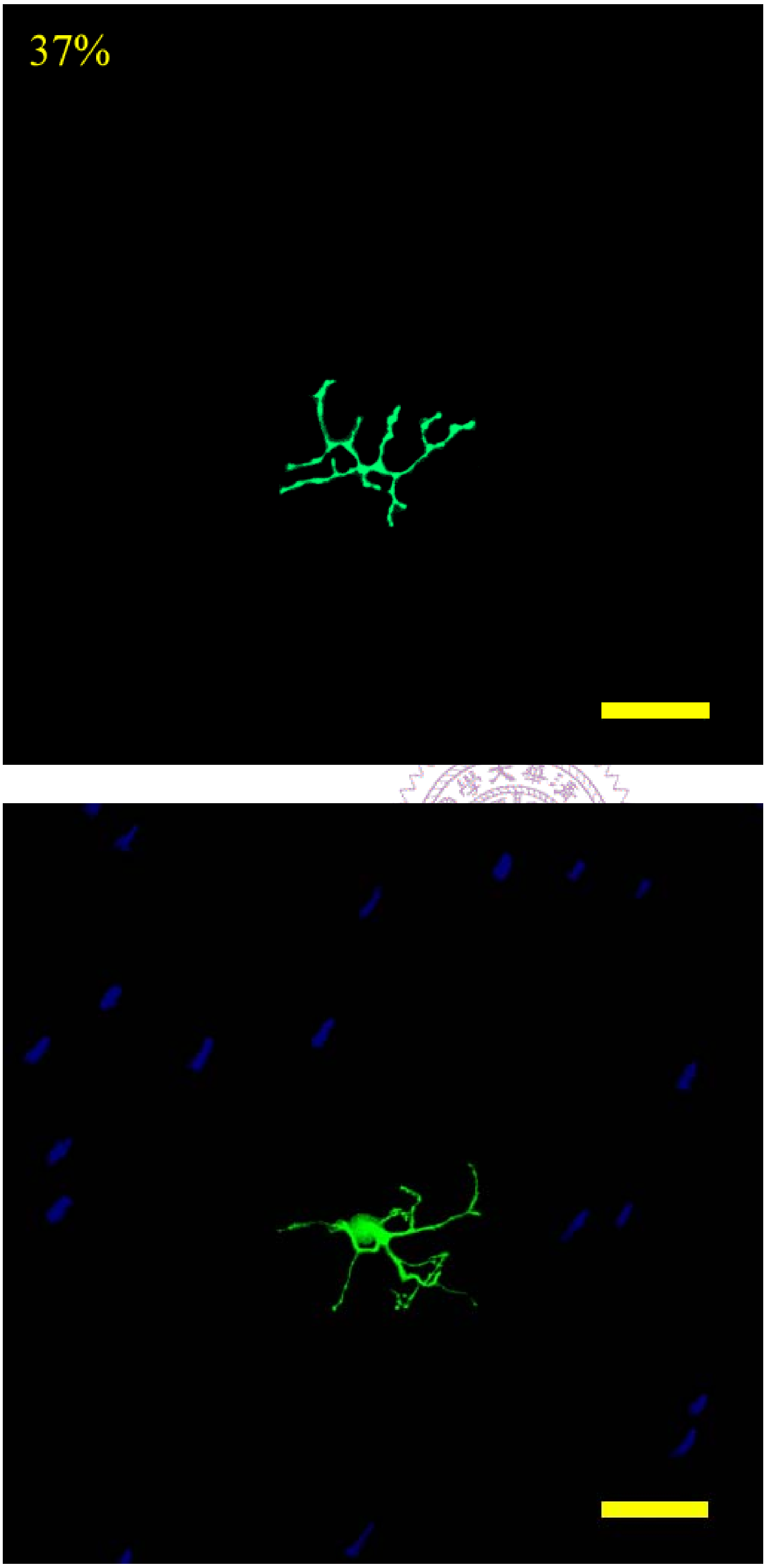


Fig. 8F. The morphology of CBa2n. Top: axon of the CBa2n cell. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBa2n cell superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

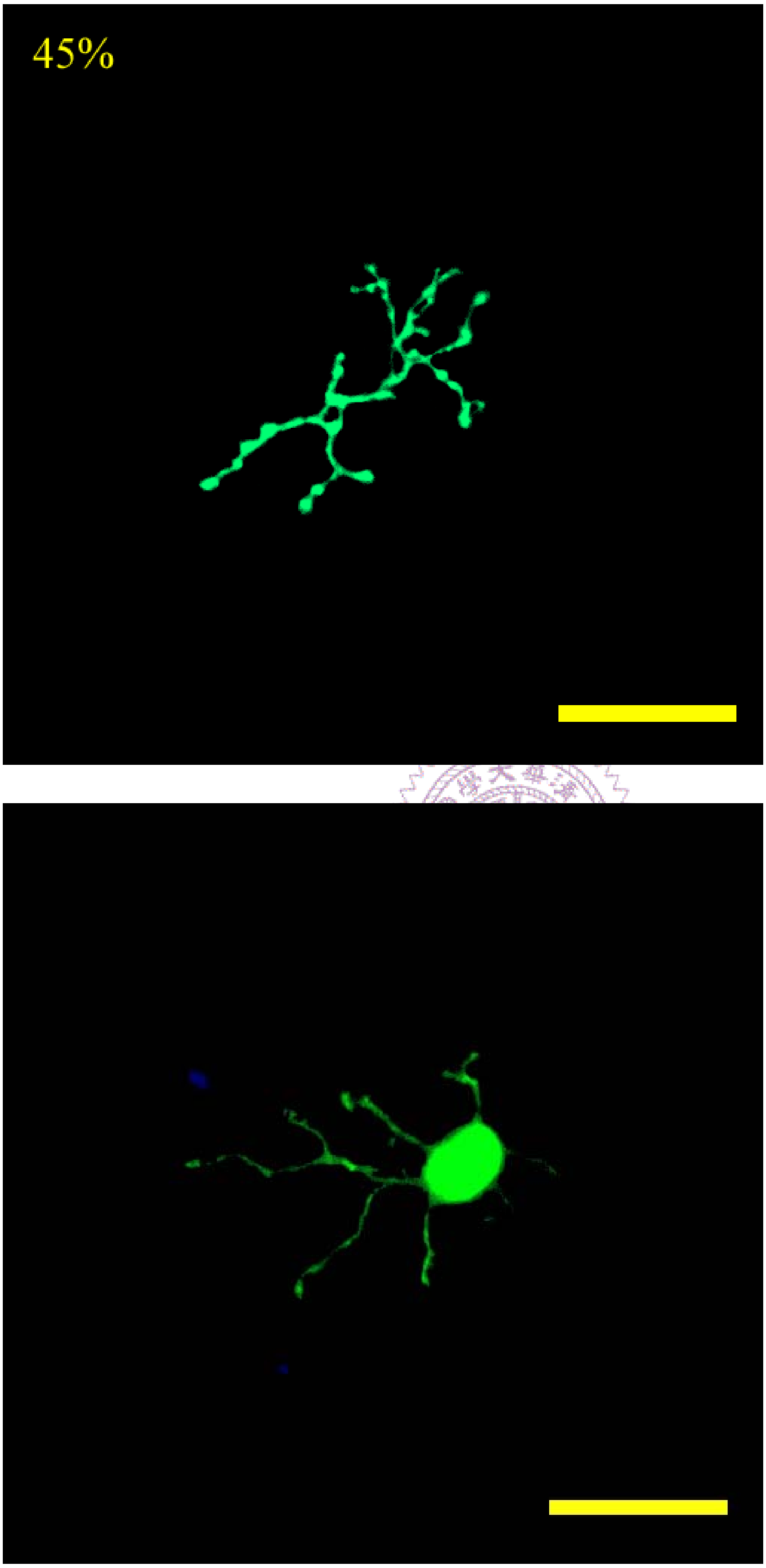


Fig. 8G. The morphology of CBb3n. Top: axon of the CBb3n cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBb3n cell, projection from 2 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

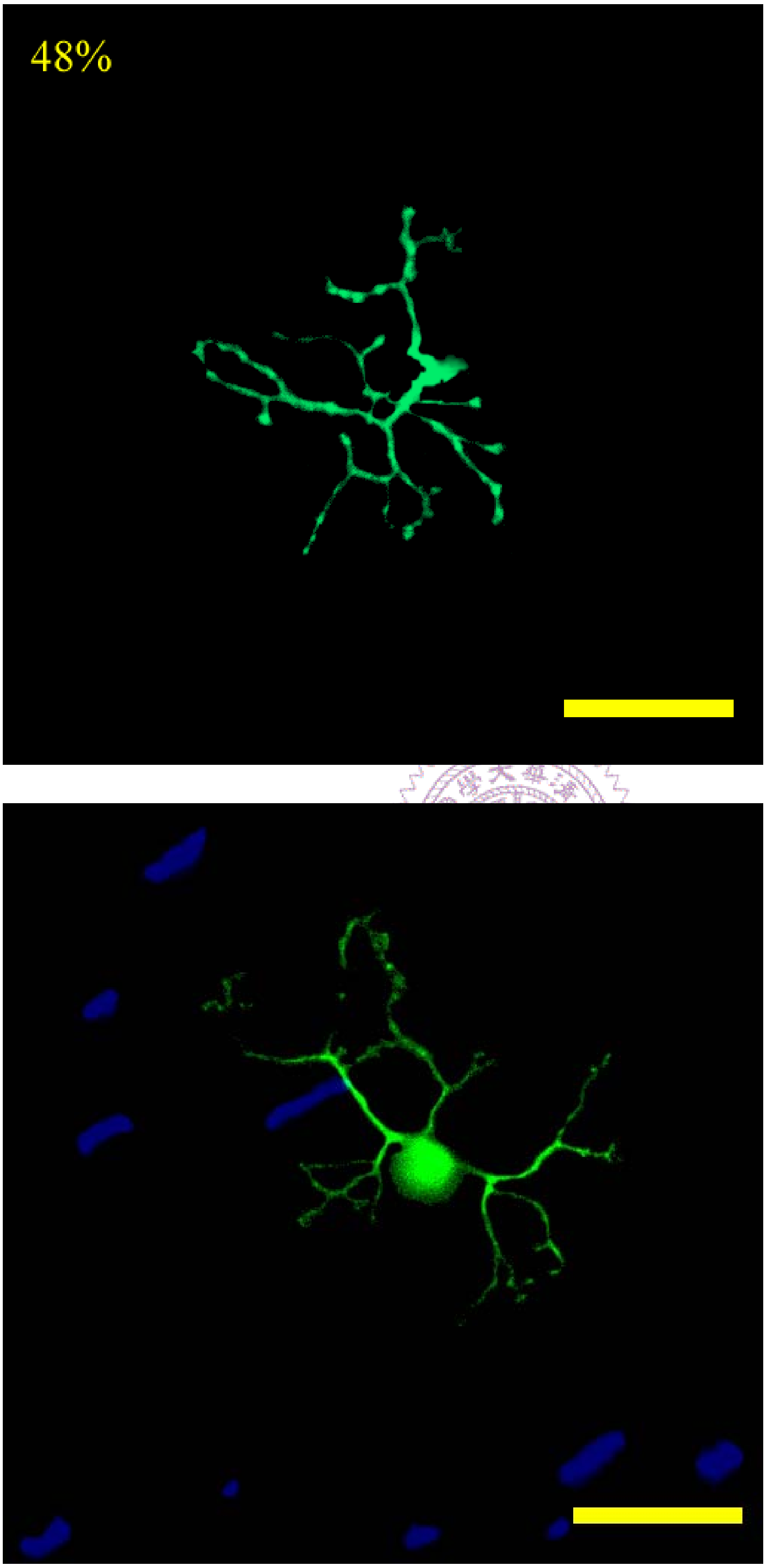


Fig. 8H. The morphology of CBb3. Top: axon of the CBb3 cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBb3 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

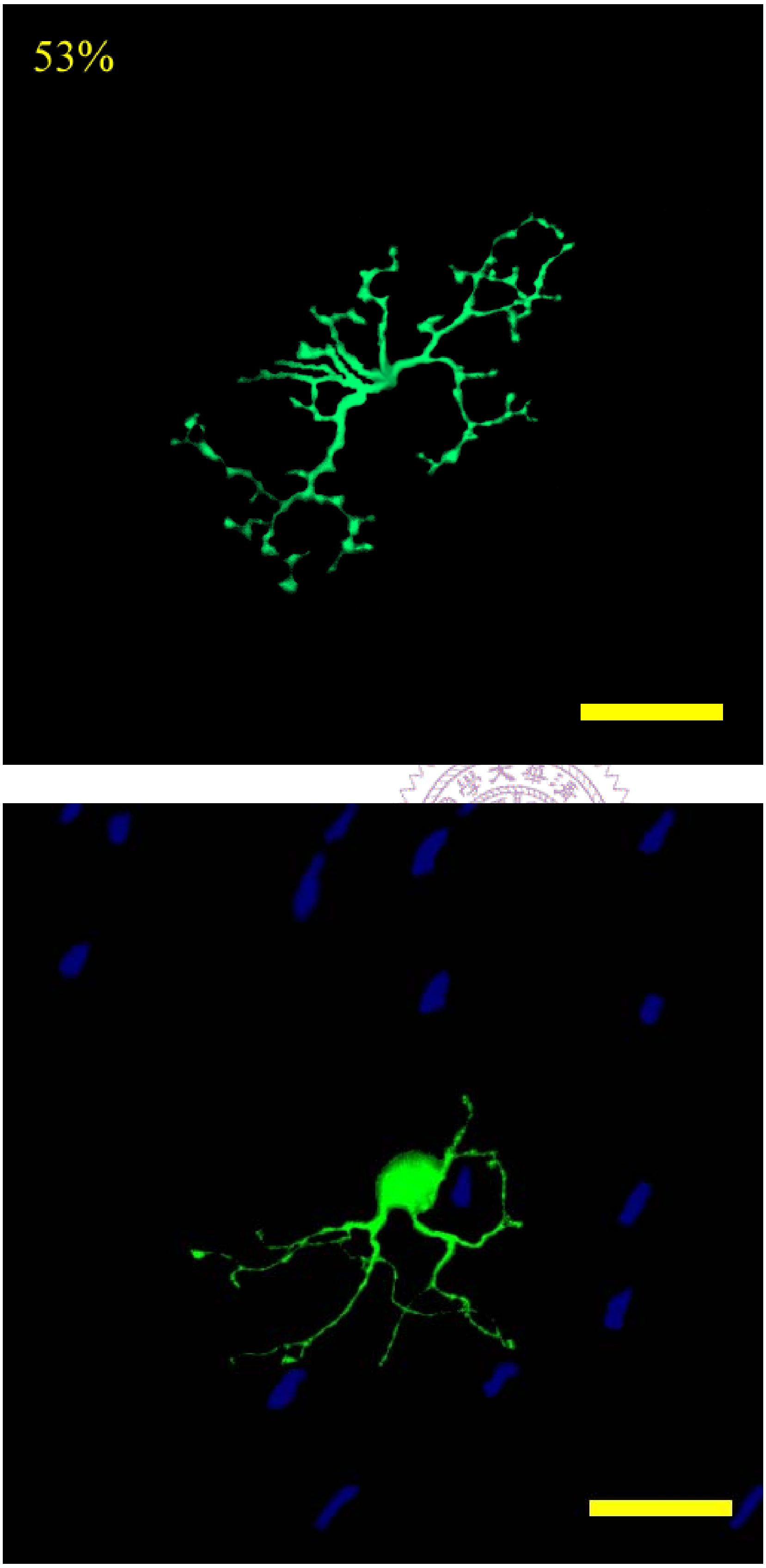


Fig. 8I. The morphology of CBb3-4. Top: axon of the CBb3-4 cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBb3-4 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

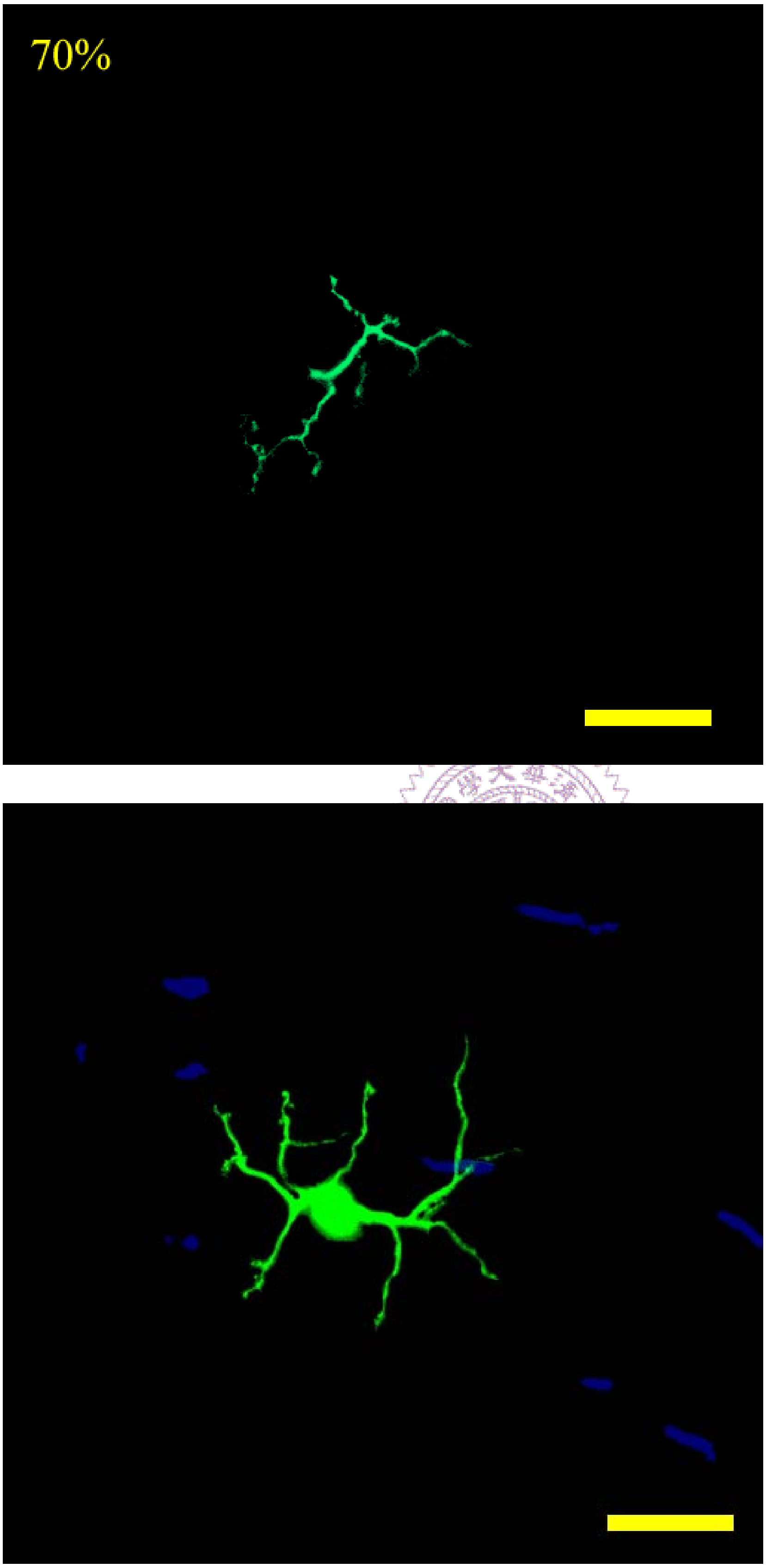


Fig. 8J. The morphology of CBb4. Top: axon of the CBb4 cell. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBb4 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

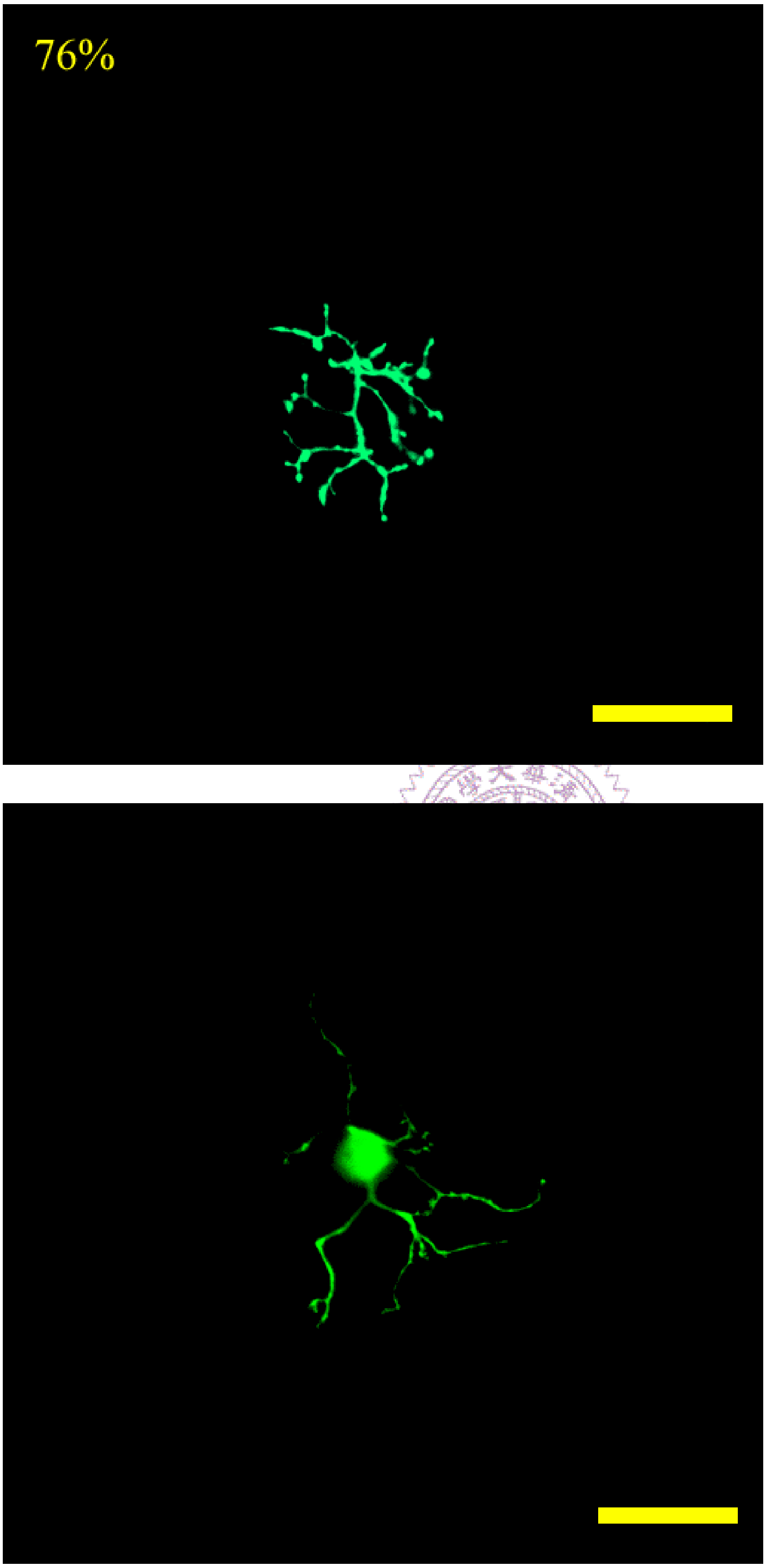


Fig. 8K. The morphology of CBb5. Top: axon of the CBb5 cell, projection from 2 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the CBb5 cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

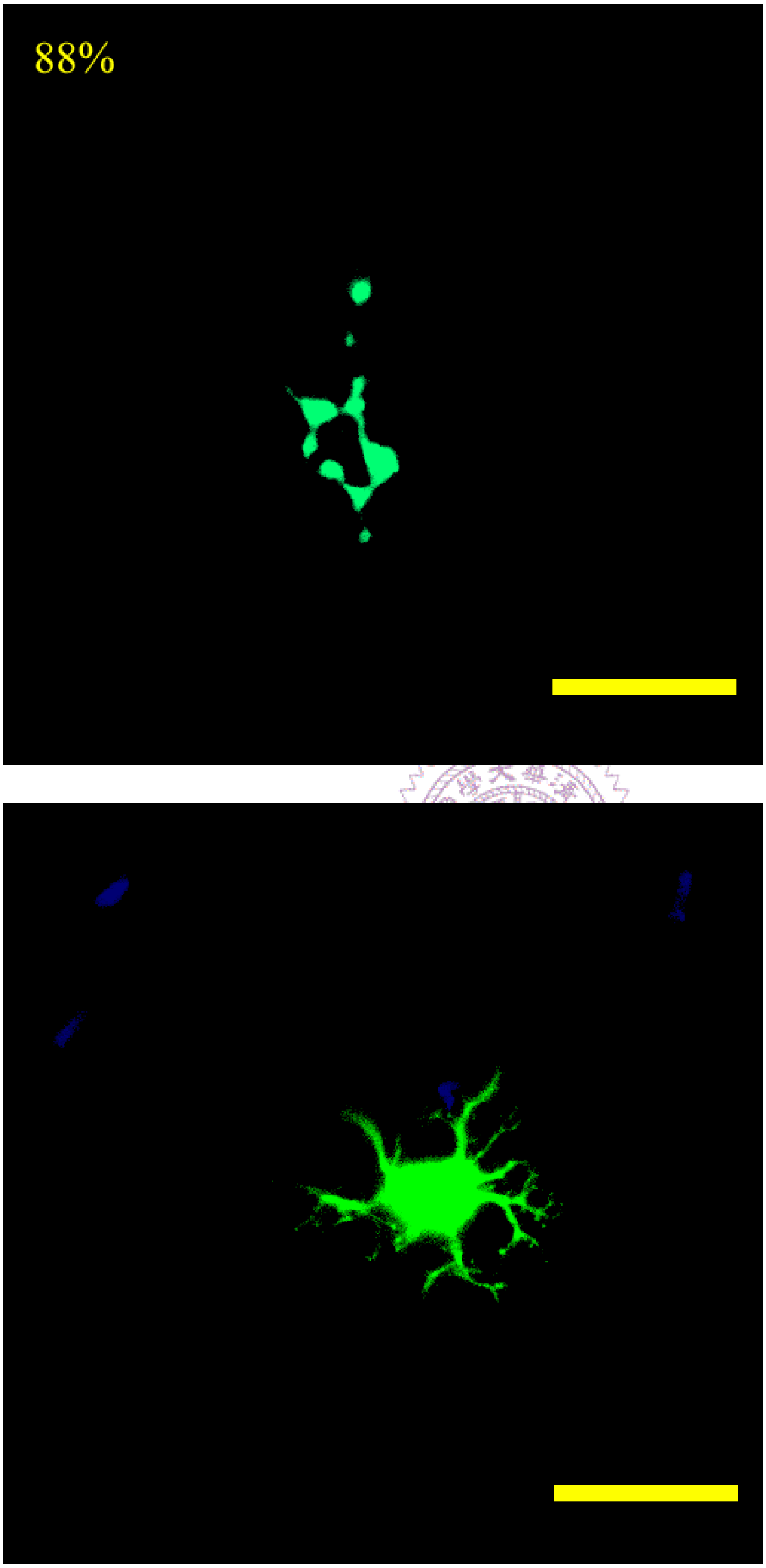


Fig. 8L. The morphology of RB. Top: axon of the RB cell, projection from 6 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the RB cell, projection from 4 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

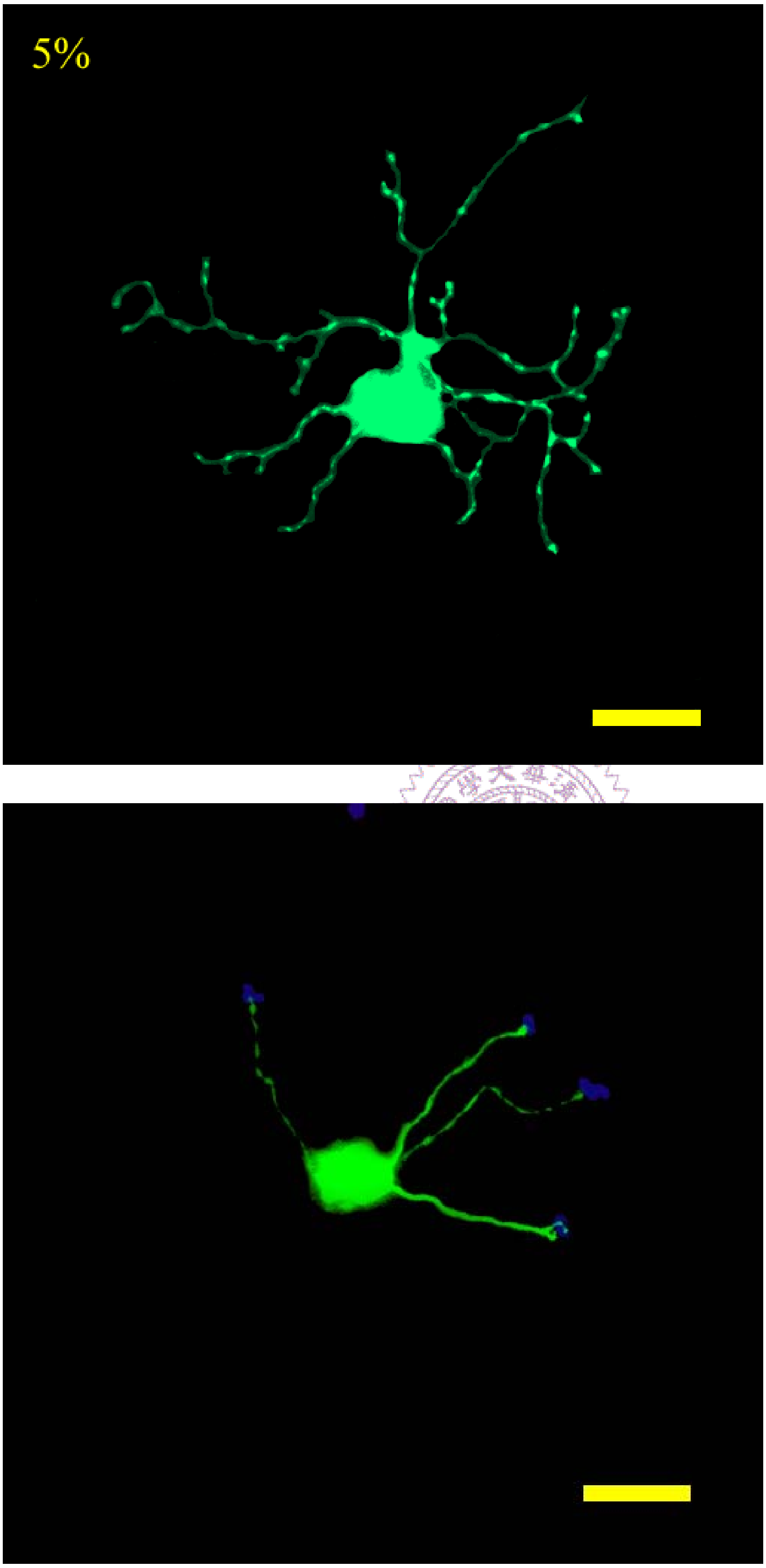


Fig. 9A. The morphology of BB. Top: axon of the BB cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the BB cell, projection from 5 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

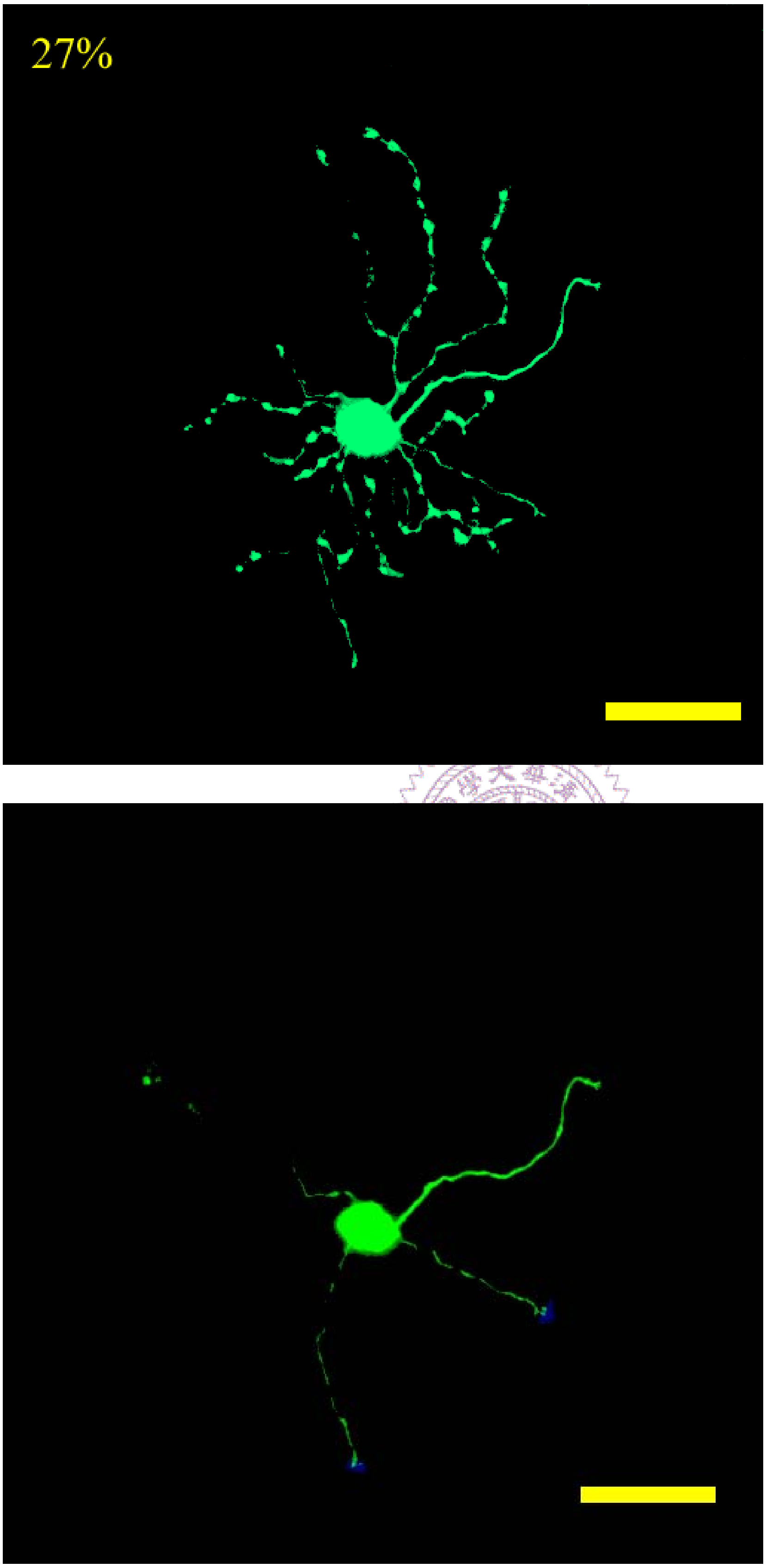


Fig. 9B. The morphology of BB-like bipolar cell. Top: axon of the BB-like bipolar cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the BB-like bipolar cell, projection from 3 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm

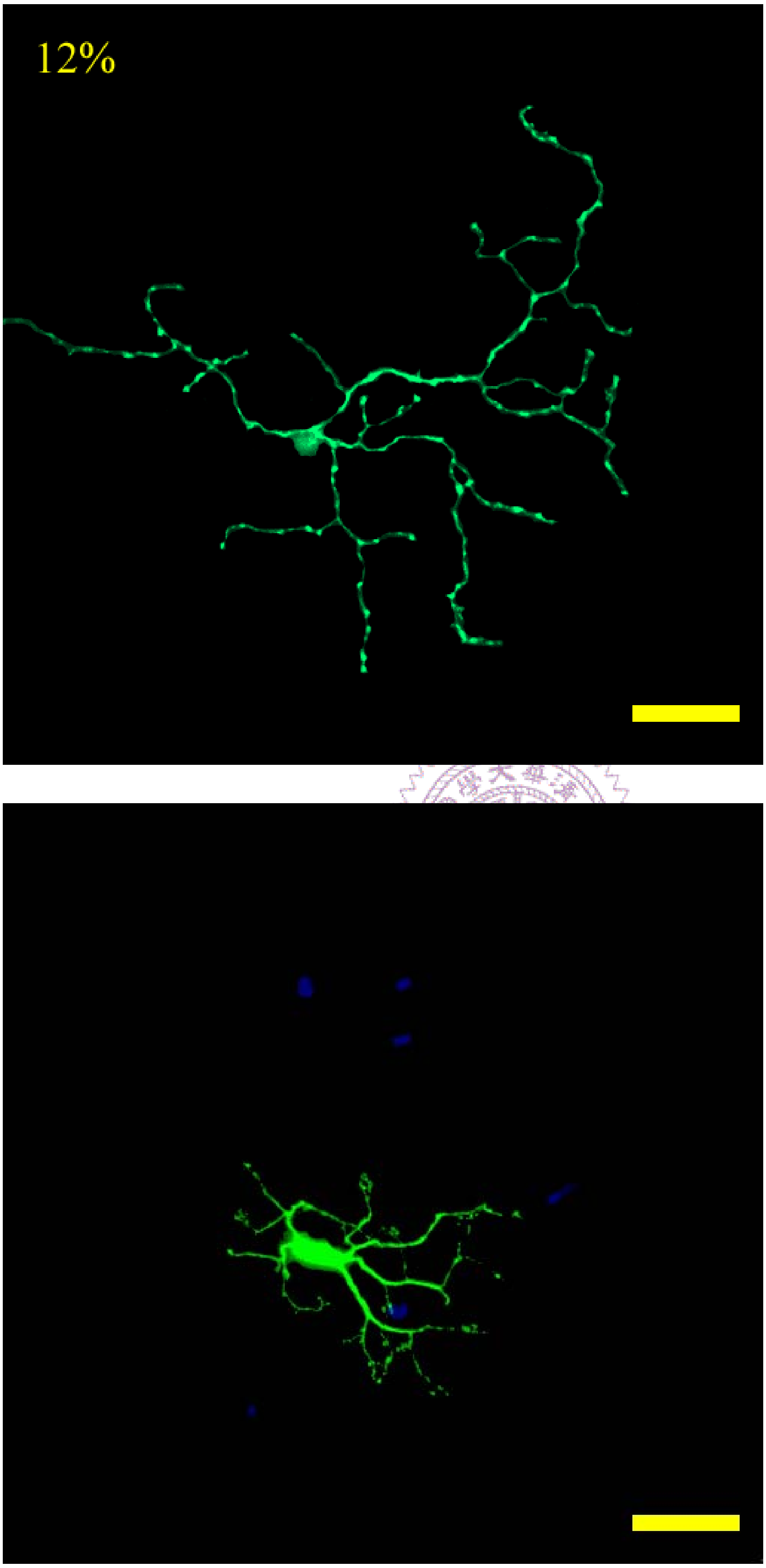


Fig. 9C. The morphology of WA. Top: axon of the WA cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the WA cell, projection from 2 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm

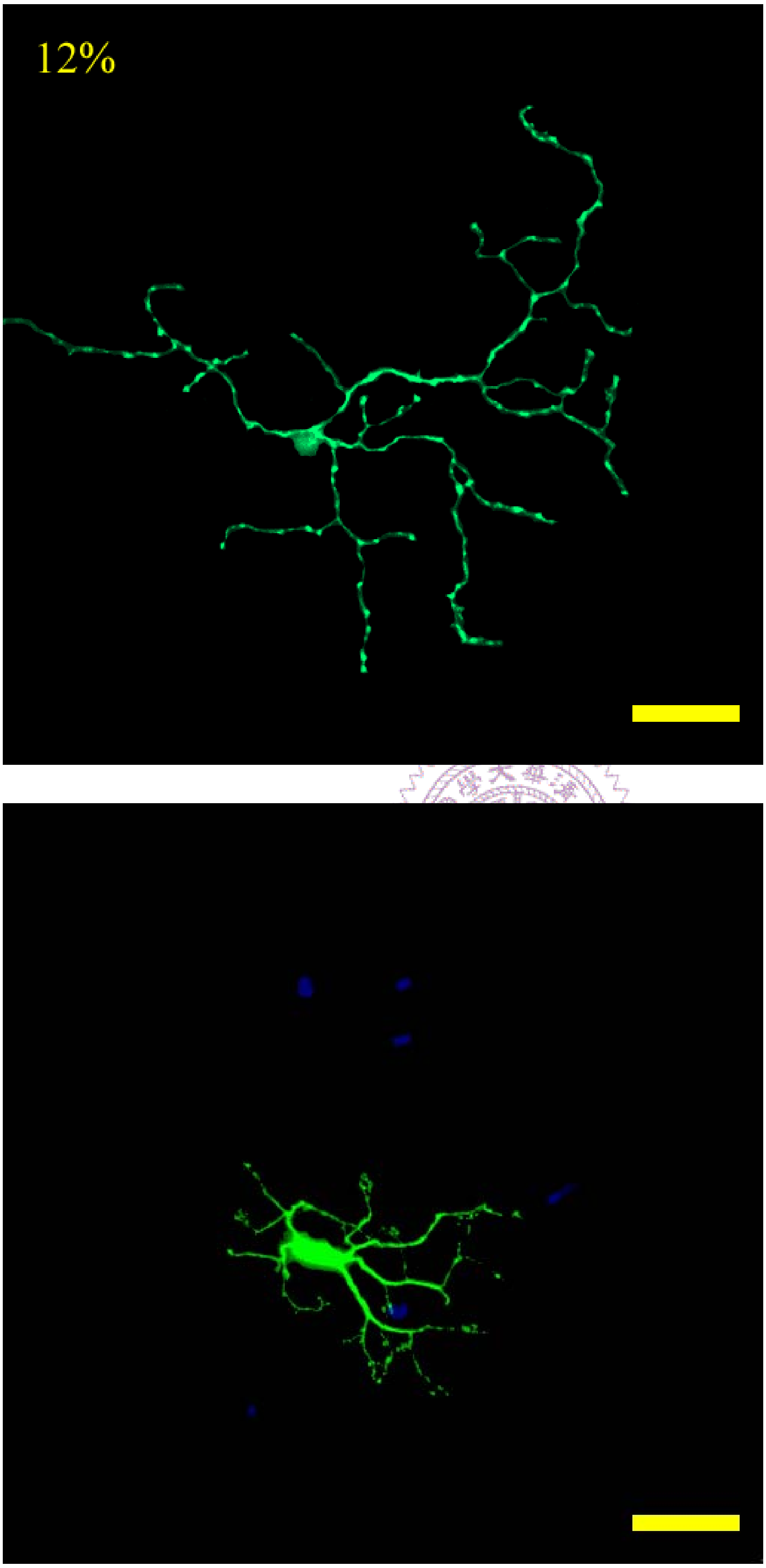


Fig. 9D. The morphology of WB. Top: axon of the WB cell, projection from 3 images with 1μm interval. The number in the upper left of top panel indicates the depth of the axon terminal pictured. Bottom: dendrite of the WB cell, projection from 5 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 20μm.

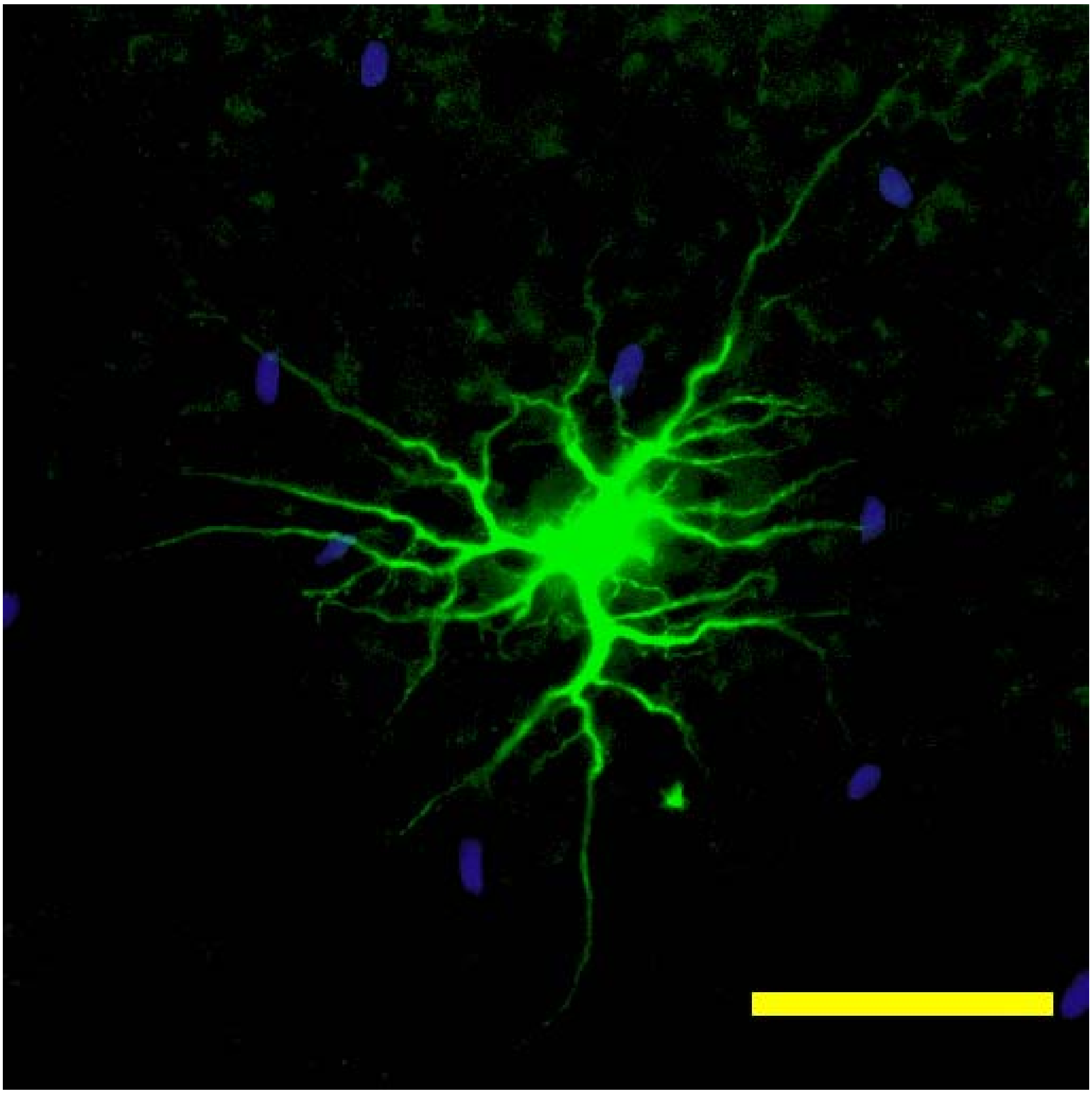


Fig. 10. The cone connection of C-type like horizontal cell. The processes of the C-type like horizontal cell, projection from 13 images with 1μm interval and superimpose with S cone distribution image. Blue: S cones. Scale bar = 50μm.

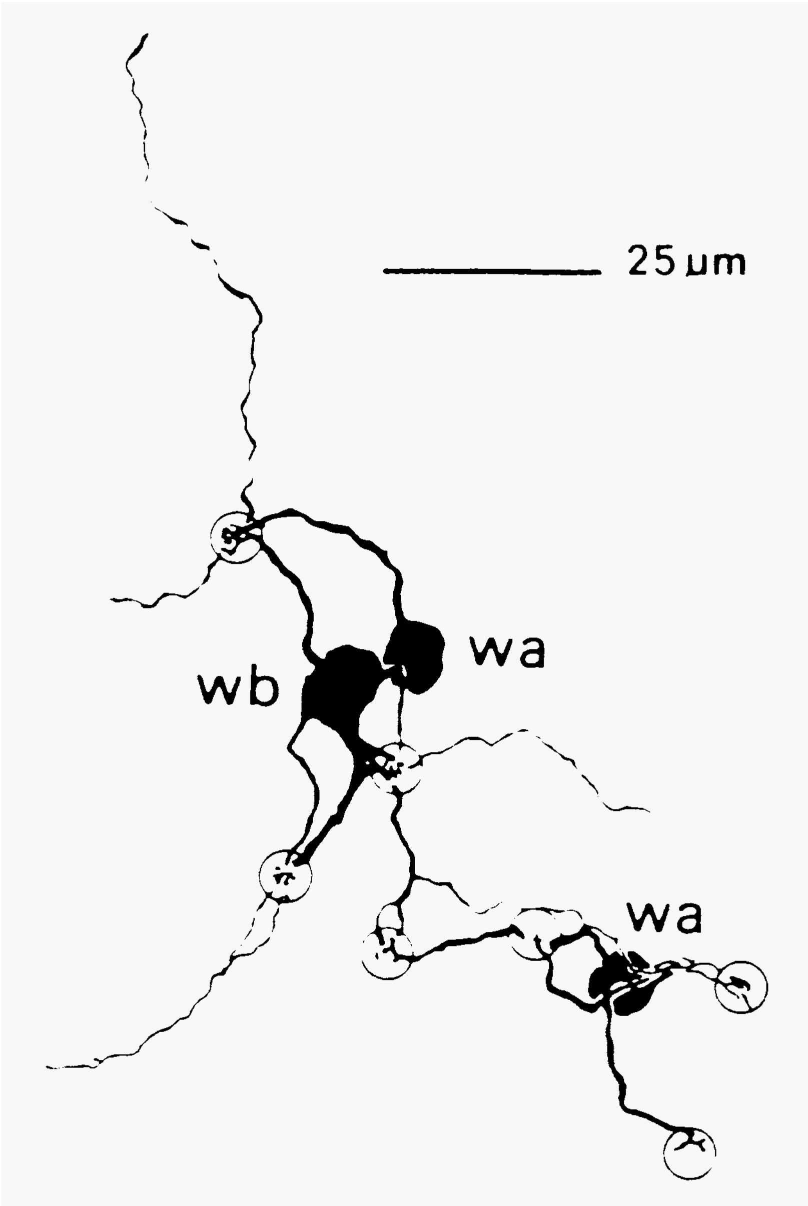


Fig. 11. The wa and wb morphology drawed in orignal paper. Each w bipolarcell gives rise to 1-4 relatively thick and extensive primary dendrites which rarely branch prior to giving off a small terminal cluster. The dendrites of wa bipolar cells terminate at these clusters, but the dendrites of wb bipolar cells extend for considerable distance beyond the terminal clusters. Open circle: the small clusters. Scale bar = 25µm. Picture comes from Famiglietti (1981), Vision research, Vol 21, Page1561.