doi:10.1038/nature17956

1 Supplementary Methods

1.1 Equipment and settings

The microscopy methods are outlined in the Method section. Below, we list the specific settings for each microscopy image. For images obtained with the TiE and the TE2000-U, bitmaps are extracted from the microscopy files using bfconvert 5.1.7 (Open Microscopy Environment). Furthermore, image levels are linearly rescaled using ImageMagick.

Fig. 1a–b were obtained with the Tecnai 10 at 16-bit and image levels were linearly rescaled, so that 99.9% of all values are between the lower and upper level thresholds. Fig. 1a was obtained at 9.7 nm/px. Fig. 1b was obtained at 0.95 nm/px.

Fig. 1c–d were obtained with the TiE in reflected light mode at 40 nm/px and with 16-bit and image levels were linearly rescaled from the value of the darkest to the brightest pixel.

Fig. 2a was obtained with the FEI XL30 FEG at 6.5 nm/px with 8-bit, and levels are linearly rescaled from the value of the darkest pixel to the brightest pixel.

Fig. 2b was obtained with the TiE in reflected light mode at 43 nm/px with 16-bit, and levels are linearly rescaled from the value of the darkest pixel to the brightest pixel

Fig. 2c was obtained with the TE2000-U in confocal fluorescence mode at 35.72 nm/px with 12-bit, and levels are linearly rescaled from zero to the value of the brightest pixel. Fluorescein sodium salt is added to the water phase, and the image is false coloured in green.

Fig. 2d–f were obtained with the TECNAI 10 with 16-bit and image levels were linearly rescaled so that 99.9% of all values are between the lower and upper level thresholds. Fig 2d was obtained at 3.5 nm/px, and its inset was obtained at 0.95 nm/px. Fig2e was obtained at 3.5 nm/px, and its inset was obtained at 0.95 nm/px. Fig2f was obtained at 6.8 nm/px, and its inset was obtained at 0.95 nm/px.

Fig. 2g–j were obtained with the TiE in bright field mode at 43 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel,

Fig. 3b–e were obtained with the TiE in bright field mode at 40 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel.

Fig. 3g–j were obtained with the TiE in reflected light mode at 43 nm/px with 16-bit, and levels are linearly rescaled from the value of the darkest pixel to the brightest pixel.

Fig. 3k–n were obtained with the TiU in reflect light mode at 29 nm/px with 8-bit, and levels are linearly rescaled from the value of the darkest pixel to the brightest pixel

Fig. 3r–s,u–v were obtained with the LV100POL at 86 nm/px with 8-bit. For s and v, levels are linearly rescaled from the value of the darkest pixel to the brightest pixel, and these thresholds are also used for r and u.

Extended Data Fig. 2b–e were obtained with the TECNAI 10 with 16-bit and image levels were linearly rescaled so that 99.9% of all values are between the lower and upper level thresholds. Extended Data Fig. 2b was obtained at 4.9 nm/px, c at 0.95 nm/px, d at 4.9 nm/px and e at 0.95 nm/px.

Extended Data Fig. 2f–g were obtained with the TiE in fluorescence mode at 43 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel.

Extended Data Fig. 3c–e,h–j were obtained with the FEI XL30 FEG with 8-bit, and levels are linearly rescaled from the value of the darkest pixel to the brightest pixel. Extended Data Fig. 3c was obtained at 3.5 nm/px, d at 1.9 nm/px, e at 3.5 nm/px, h at 11 nm/px, i at 6.9 nm/px and j at 11 nm/px.

Extended Data Fig. 4a was obtained with the TiE in bright field mode at 43 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel.

Extended Data Fig. 4e–h were obtained with the TiE in bright field mode at 40 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel.

Extended Data Fig. 4i–v were obtained with the LV100POL at 86 nm/px with 8-bit. For m–o and t–v, levels are linearly rescaled from the value of the darkest pixel to the brightest pixel, and these thresholds are also used for i–k and q–s. For l and p, levels are linearly rescaled from zero to the value of the brightest pixel.

Extended Data Fig. 5a–d were obtained with the TECNAI 10 at 0.95 nm/px with 16-bit and image levels were linearly rescaled so that 99.9% of all values are between the lower and upper level thresholds.

Extended Data Fig. 5e–h were obtained with the TiE in bright field mode at 43 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel

The images in Extended Data Fig. 6 were obtained with the TiE in bright field mode at 40 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel

The images in Extended Data Fig. 7 were obtained with the LV100POL at 86 nm/px with 8-bit. Image levels were linearly rescaled using the thresholds from Fig. 3s and Extended Data Fig. 4m–o.

Extended Data Fig. 10a–d were obtained with the TiE in fluorescence mode at 43 nm/px with 16-bit, and levels are linearly rescaled from zero to the value of the brightest pixel.