Supplementary Movies 1-10. The movies show all figure panels going slice-by-slice through the Z-stack of the tomogram. Accompanying models are provided when a three-dimensional view is helpful for interpreting the structure. https://figshare.com/s/782461843c3150d27cfa

Supplementary Table 1. Species range and frequency of structures observed. Prevalence of described structures in our database is reported. Note that this is not an exhaustive list, and statistics for very common features (such as single or paired filaments) are not reported. Some tomograms contained multiple copies of a structure, and we did not complete an exhaustive search for common structures, so the indicated counts represent lower limits. Column IDs: "#" = number of tomograms the structures were seen in. "%" = percent of tomograms viewed of that species that contained the structure.

Feature	Species	Taxon	#	%
Surface appendages	*Prosthecobacter debontii*	*Verrucomicrobia*	6	4.6
Surface hooks	*Azospirillum brasilense* WT	*α-proteobacteria*	20	95.2
	A. brasilense ΔcheOp1	*α-proteobacteria*	24	92.3
	A. brasilense ΔcheOp4	*α-proteobacteria*	9	52.9
	A. brasilense ΔcheOp1 ΔcheOp4	*α-proteobacteria*	0	0
Polar fimbriae	Strain JT5 (*Dysgonomonas*)	*Bacteroidetes*	41	100
Nanospheres	*Vibrio cholerae*	*γ-proteobacteria*	2	0.1
Filament bundles	*Agrobacterium tumefaciens*	*α-proteobacteria*	1	< 0.1
	Borrelia burgdorferi	*Spirochaetes*	1	2.2
	Campylobacter jejuni	*ε-proteobacteria*	2	3.3
	Caulobacter crescentus	*α-proteobacteria*	1	< 0.1
	Escherichia coli	*γ-proteobacteria*	1	0.1
	Halothiobacillus neapolitanus c2	*γ-proteobacteria*	5	2.6
	Helicobacter pylori	*ε-proteobacteria*	2	2.1
	Hylemonella gracilis	*β-proteobacteria*	1	0.9
	Hyphomonas neptunium	*α-proteobacteria*	32	2.7
	Mycobacterium smegmatis	*Actinobacteria*	5	5.8
	Myxococcus xanthus	*δ-proteobacteria*	1	0.1
	Prosthecobacter debontii	*Verrucomicrobia*	2	1.5
	Prosthecobacter fluviatilis	*Verrucomicrobia*	5	3.6
	Prosthecobacter vanneervenii	*Verrucomicrobia*	4	2.3
	Thiomonas intermedia	*β-proteobacteria*	3	6.7
	Vibrio cholerae	*γ-proteobacteria*	10	0.8
	Shewanella putrefaciens	*γ-proteobacteria*	1	6.3
Tubes	*Bdellovibrio bacteriovorus*	*δ-proteobacteria*	1	0.3
	Halothiobacillus neapolitanus c2	*γ-proteobacteria*	1	0.5
	Hyphomonas neptunium	*α-proteobacteria*	7	0.6
	Prosthecobacter vanneervenii	*Verrucomicrobia*	1	0.6
	Thiomicrospira crunogena	*γ-proteobacteria*	2	9.1
	Thiomonas intermedia	*β-proteobacteria*	1	2.2
Ring array	*Helicobacter pylori*	*ε-proteobacteria*	1	1
Vesicles - horseshoe	*Caulobacter crescentus*	*α-proteobacteria*	8	0.4
	Hyphomonas neptunium	*α-proteobacteria*	1	0.1
	Magnetospirillum magneticum	*α-proteobacteria*	1	0.2
	Myxococcus xanthus	*δ-proteobacteria*	2	0.1
	Prosthecobacter fluviatilis	*Verrucomicrobia*	2	1.4

	Prosthecobacter vanneervenii	*Verrucomicrobia*	1	0.6
	Ralstonia eutropha	*β-proteobacteria*	1	1.6
	Thiomonas intermedia	*β-proteobacteria*	2	4.4
Vesicles - flattened	*Agrobacterium tumefaciens*	*α-proteobacteria*	1	< 0.1
	Caulobacter crescentus	*α-proteobacteria*	78	3.6
	Escherichia coli	*γ-proteobacteria*	1	0.1
	Helicobacter pylori	*ε-proteobacteria*	16	2.9
	Hyphomonas neptunium	*α-proteobacteria*	1	0.1
	Myxococcus xanthus	*δ-proteobacteria*	9	0.5
	Prosthecobacter debontii	*Verrucomicrobia*	1	0.8
	Prosthecobacter dejongeii	*Verrucomicrobia*	7	5.3
	Prosthecobacter fluviatilis	*Verrucomicrobia*	4	2.9
	Prosthecobacter vanneervenii	*Verrucomicrobia*	1	0.6
	Streptococcus pneumoniae	*Firmicutes*	4	11.4
	Thiomonas intermedia	*β-proteobacteria*	1	2.2
	Treponema primitia	*Spirochaetes*	1	1.1
	Vibrio cholerae	*γ-proteobacteria*	3	0.2
Vesicles - nested	*Agrobacterium tumefaciens*	*α-proteobacteria*	2	0.1
	Bacillus subtilis	*Firmicutes*	1	1.9
	Bdellovibrio bacteriovorus	*δ-proteobacteria*	1	0.3
	Borrelia burgdorferi	*Spirochaetes*	1	2.2
	Brucella abortus	*α-proteobacteria*	2	3.7
	Caulobacter crescentus	*α-proteobacteria*	53	2.4
	Escherichia coli	*γ-proteobacteria*	4	0.3
	Halothiobacillus neapolitanus c2	*γ-proteobacteria*	5	2.6
	Helicobacter hepaticus	*ε-proteobacteria*	2	6.1
	Helicobacter pylori	*ε-proteobacteria*	10	1.8
	Hyphomonas neptunium	*α-proteobacteria*	3	0.3
	Strain JT5 *(Dysgonomonas)*	*Bacteroidetes*	2	4.7
	Myxococcus xanthus	*δ-proteobacteria*	23	1.3
	Prosthecobacter debontii	*Verrucomicrobia*	3	2.3
	Prosthecobacter dejongeii	*Verrucomicrobia*	3	2.3
	Prosthecobacter fluviatilis	*Verrucomicrobia*	1	0.7
	Prosthecobacter vanneervenii	*Verrucomicrobia*	2	1.1
	Ralstonia eutropha	*β-proteobacteria*	2	3.2
	Serpens flexibilis	*γ-proteobacteria*	1	10
	Sphingopyxis alaskensis	*α-proteobacteria*	1	4.5

	Streptococcus pneumoniae	*Firmicutes*	1	2.9
	Tetrasphaera remis	*Actinobacteria*	1	25
	Thiomonas intermedia	*β-proteobacteria*	1	2.2
Vesicles - periplasmic	*Agrobacterium tumefaciens*	*α-proteobacteria*	2	0.1
	Bdellovibrio bacteriovorus	*δ-proteobacteria*	2	0.6
	Brucella abortus	*α-proteobacteria*	3	5.6
	Campylobacter jejuni	*ε-proteobacteria*	1	1.7
	Caulobacter crescentus	*α-proteobacteria*	16	0.7
	Escherichia coli	*γ-proteobacteria*	6	0.5
	Halothiobacillus neapolitanus c2	*γ-proteobacteria*	22	11.5
	Helicobacter hepaticus	*ε-proteobacteria*	2	6.1
	Helicobacter pylori	*ε-proteobacteria*	3	0.5
	Hyphomonas neptunium	*α-proteobacteria*	3	0.3
	Myxococcus xanthus	*δ-proteobacteria*	1	0.1
	Prosthecobacter dejongeii	*Verrucomicrobia*	1	0.8
	Prosthecobacter fluviatilis	*Verrucomicrobia*	2	1.4
	Prosthecobacter vanneervenii	*Verrucomicrobia*	3	1.7
	Ruminococcus flavefaciens	*Firmicutes*	2	18.2
	Thiomicrospira crunogena	*γ-proteobacteria*	1	4.5
	Thiomonas intermedia	*β-proteobacteria*	1	2.2
	Vibrio cholerae	*γ-proteobacteria*	2	0.2