Supplementary Table 2: Fields of the MicrobeJ data structure containing particle properties or complementary information based on user-selected options. Each field can be accessed using an intuitive object-oriented semantic.

Properties	Description
NAME [name]	
. id	The unique Id of the particle
. name	The name of the particle
SHAPE [morphology]	
. angularity [mean]	
. mean	The mean value of the angularity (defined as the local angle) values measured along the medial axis of the particle
. max	The max value of the angularity values used to generate the mean angularity
. min	The min value of the angularity values used to generate the mean angularity
. median	The median value of the angularity values used to generate the mean angularity
. mid	The angularity value measured at the center of the medial axis
. stdev	The standard deviation of the angularity values used to generate the mean angularity
. variation	The ratio of the standard deviation and the mean value of the angularity
. area	The area of the particle in square pixels or in calibrated square units
. aspectRatio	The aspect ratio of the particle's fitted ellipse (see ImageJ Documention for more details)
. circularity	$4\pi \times$ area / perimeter^2 with a value of 1.0 indicating a perfect circle (see ImageJ Documention for more details)
. curvature	The curvature (defined as the reciprocal of the radius of curvature) measured between the end points and the center of the medial axis
. feret [max]	
. max	The longest distance between any two points along the particle boundary, also known as maximum caliper
. min	The minimum caliper diameter
. length	The length of the medial axis of the particle in pixels or in calibrated units
. morphology	The morphology index the particle is associated to
. perimeter	The length in pixels or in calibrated square units of the outside boundary of the particle
. roundness	$4 \times$ area / ($\pi \times$ major axis^2) or the inverse of aspect ratio (see ImageJ Documention for more details)
. sinuosity	The ratio of the curvilinear length (along the medial axis) and the distance (straight line) between the end points of the medial axis
. solidity	area / convex area (see ImageJ Documention for more details)
. width [mean]	
. mean	The mean value of the width in pixels or in calibrated units along the medial axis of the particle
. max	The max value of the width values used to generate the mean width
. min	The min value of the width values used to generate the mean width
. median	The median value of the width values used to generate the mean width
. mid	The width value measured at the center of the medial axis
. stdev	The standard deviation of the width values used to generate the mean width
. variation	The ratio of the standard deviation and the mean value of the width
LOCATION [(x;y)]	
. x	The x coordinate of the particle center, expressed in pixels or in calibrated units.
. y	The y coordinate of the particle center, expressed in pixels or in calibrated units.
EXPERIMENT	
. name	The name of the experiment
. description	The description of the experiment
. fullName	The name and the description of the experiment
. date	The date when the experiment was analyzed
. id	The unique Id of the experiment
. field	The field of the image used to analyze the experiment
. series	The series of images used to analyze the experiment
IMAGE [label]	
. name	The name the image
. label	The label of the frame on which the particle was detected
. meta	The metadata of the frame on which the particle was detected
. background	
. chX [mean]	The statistics of the gray values within the particle boundary measured on channel X in the stack or hyperstack
. count	The number of pixels within the particle boundary
. dmode	Most frequently occurring gray value within the particle boundary. Corresponds to the highest peak in the histogram (see ImageJ Documention for more details)
. kurtosis	The fourth order moment about the mean
. max	Maximum gray value within the particle boundary
. mean	Average gray value within the particle boundary. This is the sum of the gray values of all the pixels in the selection divided by the number of pixels (see ImageJ Documention for more details)
. median	Median gray value within the particle boundary
. min	Minimum gray value within the particle boundary
. skewness	The third order moment about the mean (see ImageJ Documention for more details)
. stdev	Standard deviation of the gray values used to generate the mean gray value
POSITION [position]	
. position	The position (slice or frame) of the particle in the hyperstack
. slice	The slice position of the particle in the hyperstack
. frame	The frame position of the particle in the hyperstack
. channel	The channel position of the particle in the hyperstack
INTENSITY	The average gray value measured on the channel used to detect the particle
. chX [mean]	The statistics of the gray values within the particle boundary measured on the channel X in the stack or hyperstack
. count	The number of pixels within the particle boundary
. dmode	Most frequently occurring gray value within the particle boundary. Corresponds to the highest peak in the histogram (see ImageJ Documention for more details)
. kurtosis	The fourth order moment about the mean
. max	Maximum gray value within the particle boundary
. mean	Average gray value within the particle boundary. This is the sum of the gray values of all the pixels in the selection divided by the number of pixels (see ImageJ Documention for more details)
. mean_c	The corrected average gray value (mean_c=|(µparticle-µbackground)|)
. median	median gray value within the particle boundary
. min	Minimum gray value within the particle boundary
. skewness	The third order moment about the mean (see ImageJ Documention for more details)
. signal	Is true [1] when the unsigned sigma distance (z=|(µparticle-µbackground)/σbackground|) is higher than the user-defined value of z

. snr	The signal-to-noise ratio between the average gray value within the particle boundary and the average gray value of the background
. sum	The sum of the gray values within the particle boundary
. stdev	Standard deviation of the gray values used to generate the mean gray value
MAXIMA [count]	The properties of the associations with all the maxima
. betwixt	The number of maxima localized neither at one of the poles nor at the midcell region of the particle (see the Association section for more details)
. bipolar	Is true [1] when the particle is associated with at least two maxima localized at two different poles
. connected	Is true [1] when the particle is associated with at least one maximum associated with at least one other particle
. count	The total number of associated maxima.
. midcell	The number of maxima localized at the midcell region (see the Association section for more details)
. polar	The number of maxima localized at one of the poles (see the Association section for more details)
. pole [X]	The number of maxima localized at the specified pole (see the Orientation section to see how to define poles indexes)
. type	The type of the association : none / unipolar / bipolar
. undefined	The number of maxima with an undefined localization
. unipolar	Is true [1] when the particle is associated with at least two maxima localized at the same pole
. distance [mean]	
. mean	The mean value of the distance in pixels or in calibrated units between the associated maxima
. max	The maximum value of the distance values
. min	The minimum value of the distance values
. median	The median value of the distance values
. stdev	The standard deviation value of the distance values
. variation	The ratio of the standard deviation and the mean value
. X [count]	The properties of the associations with the maxima detected using the settings defined at the index X
FEATURE [count]	The properties of the associations with all the features
. betwixt	The number of features localized neither at one of the poles nor at the midcell region of the particle (see the Association section for more details)
. bipolar	Is true [1] when the particle is associated with at least two features localized at two different poles
. connected	Is true [1] when the particle is associated with at least one feature associated with at least one other particle
. count	The total number of associated features
. midcell	The number of feature localized at the midcell region (see the Association section for more details)
. polar	The number of feature localized at one of the poles (see the Association section for more details)
. pole [X]	The number of feature localized at the specified pole (see the Orientation section to see how to define poles indexes)
. type	The type of the association : none / unipolar / bipolar
. undefined	The number of feature with an undefined localization
. unipolar	Is true [1] when the particle is associated with at least two features localized at the same pole
. distance [mean]	
. mean	The mean value of the distance in pixels or in calibrated units between the associated features
. max	The maximum value of the distance values
. min	The minimum value of the distance values
. median	The median value of the distance values
. stdev	The standard deviation value of the distance values
. variation	The ratio of the standard deviation and the mean value
. X [count]	The properties of the associations with the features detected using the settings defined at the index X
PARENT [name]	The properties of the association with the parent particle (i.e. Bacteria) (see the Association section for more details)
. id	The unique Id of the parent particle
. name	The name of the parent particle
. location	
. cartesian [x;y]	
. x	The relative X-coordinate of the particle using the cartesian coordinate system
. y	The relative Y-coordinate of the particle using the cartesian coordinate system
. orthogonal [x;y;z]	
. x	The relative X-coordinate of the particle using the orthogonal coordinate system
. y	The relative Y-coordinate of the particle using the orthogonal coordinate system
. z	The relative Z-coordinate of the particle using the orthogonal coordinate system
. normalized [x;y;z]	
. x	The relative X-coordinate of the particle using the normalized orthogonal coordinate system
. y	The relative Y-coordinate of the particle using the normalized orthogonal coordinate system
. z	The relative Z-coordinate of the particle using the normalized orthogonal coordinate system
. cylindrical [θ;r;p]	
. theta	The angular position θ of the particle using a polar coordinate system $[-\pi/2,\pi/2]$
. p	The longitudinal position p of the particle using a polar coordinate system $[-1,1]$
. r	The radial coordinate r of the particle using the cylindrical coordinate system $[-1,1]$
. b	The revolution angle β of the particle using a polar coordinate system $[0,2\pi]$
. l	The arc length L of the particle using a polar coordinate system.
. phi	The elevation angle φ of the particle using a polar coordinate system $[-\pi/2,\pi/2]$
. distance	
. center	The distance in pixels or in calibrated units between the orthogonal projection of the particle center and the center of the parent particle
. pole1	The distance in pixels or in calibrated units between the orthogonal projection of the particle center and the tip of the pole 1
. pole2	The distance in pixels or in calibrated units between the orthogonal projection of the particle center and the tip of the pole 2
. side	The distance in pixels or in calibrated units between the particle center and the closest side of the parent particle
. axis	The distance in pixels or in calibrated units between the particle center and its orthogonal projection on the medial axis of the parent particle
. linker	The distance in pixels or in calibrated units between the particle center and the point of reference on the parent particle
. localization [title]	
. title	The localization of the particle inside the parent particle ('polar','midcell','betwixt','undefined')
. index	The index of the localization of the particle inside the parent particle (polar:0,midcell:1,betwixt:2,undefined:3)
. side	Is true [1] when the particle is located close to the sides of the parent particle (location.norm.y>=0.5)
. axis	Is true [1] when the particle is located close to the medial axis of the parent particle (location.norm.y<0.5)
. inside	Is true [1] when the particle is located inside the parent particle
. outside	Is true [1] when the particle is located outside the parent particle
. branch	The index of the branch that the particle is associated with
. pole	The index of the pole that the particle is associated with
. midcell	Is true [1] when the particle localization is 'midcell'

	. polar	Is true [1] when the particle localization is 'polar'
	. betwixt	Is true [1] when the particle localization is 'betwixt'
	. tip	Is true [1] when the particle is located at the tip of one of the poles of the parent particle
CONTACT [count]		
	. active	The number of accepted cells in contact with the particle
	. morphologyX	The number of cells matching the morphology X in contact with the particle
	. total	The total number of cells (accepted and refused) in contact with the particle
TYPE		
	. color	The color of the associated type
	. index	The index of the associated type
	. title	The title of the associated type
DISTANCE [mean]		
	. mean	The average distance between the particle and the surrounding particles
	. stdev	The standard deviation of the distances between the particle and the surrounding particles
	. count	The number of surrounding particles
CLUMP		The finite number of portion of a specified area inside the particle.
GAUSSIAN [fit]		
	. a	The amplitude of the peak
	. b	The offset of the peak
	. d	The standard deviation of the peak
	. x	The x-position of the center of the peak
	. y	The y-position of the center of the peak
	. fit	Is true [1] when the amplitude is greater than the specified threshold