



# Object Classification



**4Deep** *inwater imaging*

*Holographic microscopes. Deeper insights.*

[4-Deep.com](http://4-Deep.com)

# Object Classification



In many fields, speciation classification is time consuming and costly for the user. In many research areas, traditional population sampling is unnecessary, as real-time in situ monitoring is one of the greatest strengths of 4Deep's Submersible microscope. In laboratory settings, no time is needed to incubate or dye the sample.

## Benefits

*Replace the need for tedious analysis of samples*

*Offers more functionality outside of classification, including particle size distribution analysis*

*Saved holograms allows the user to re-analyze data as much as required*

*Chaetoceros in Octopus recorded by a 4Deep microscope*



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## Submersible Microscope

The Submersible microscope can simply be deployed in a test tank or in the field.



## Desktop Microscope

The Desktop microscope is ideal in laboratory settings and has a minimal space requirement.

## Stingray Software

Stingray is capable of both real-time morphological object classification and analysis of already recorded holograms.

Phase information in Octopus provides further classification details, allowing for classification of morphologically similar cells.



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## Oil & Gas

4Deep's system can be used to distinguish types of oil & study the effect of dispersants on these different types of oil. Swordfish has the capability of detecting and counting round objects only, resulting in more efficient analysis.

## Oceanography

In Oceanographic applications, 4Deep's system can be used for general exploration, with Stingray performing morphological classification of objects. More detailed speciation can be achieved with phase information in Octopus. In conjunction with particle size distribution information generated by Swordfish, the microscope can be used to observe, identify and quantify marine species and to determine important particle concentrations such as planktonic larvae and/or eggs from invasive species.

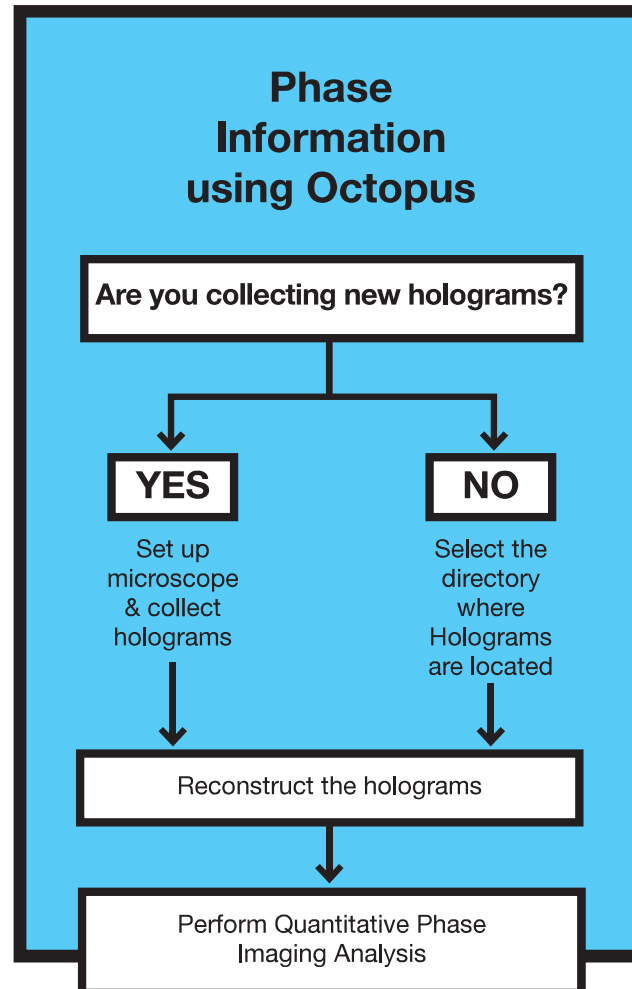
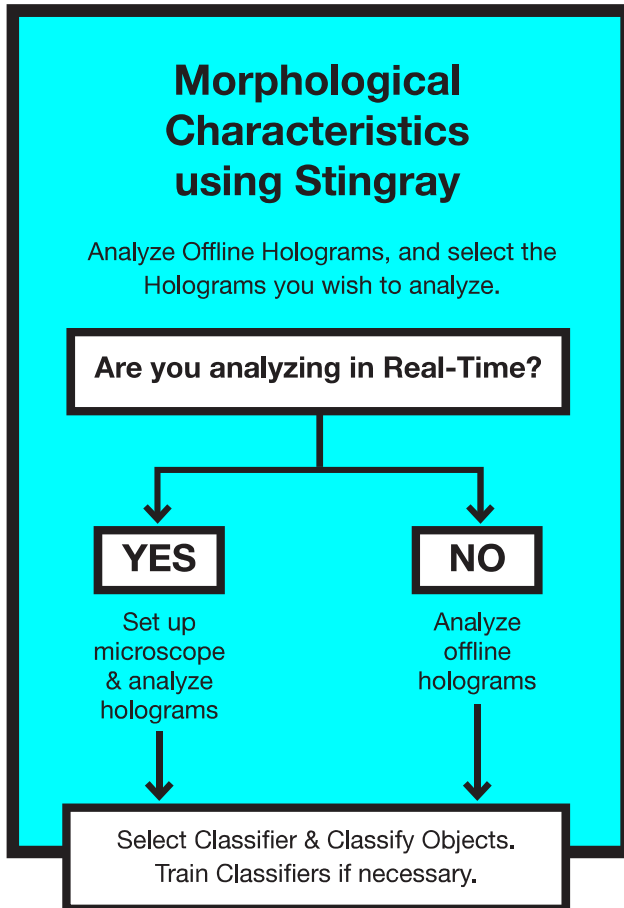
## Water Quality & Algae

Object classification is essential for water quality testing, as classification of both organic and inorganic material is critical. Identifying harmful organisms in potable water systems is key to ensure health standards are met. When detecting Harmful Algae Blooms (HABs), speciation information is essential in identifying which cells contribute to the bloom, and which cells are harmless.

## Food & Beverage

The ability to differentiate between cells is critical in the Food & Beverage industry, as certain cells are expected to be present in a given sample (ex: yeast cells in wine-making), while other cells (ex: E. coli) are dangerous to consumers. Once Stingray has classified cells based on morphological characteristics, the results can be analyzed in Octopus to determine differences in phase information, which allows for further classification of morphologically similar cells.

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## Software

Stingray detects and classifies objects automatically with already trained objects in the database. In many fields, classification criteria is based on Morphological Characteristics, such as the size and shape of the organism. Stingray also allows the user to train classifying databases, based on the user's dataset. In cases where the size and shape alone cannot be used for identification (ex: yeast cells), Phase Information provided by Octopus can be used, as the phase shift will be different for different species.