# Replicate or Perish!

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## 1    Abstract

In the year of 1657 I discovered very small living creatures in rain water.

If you are a true scientist, you are not to believe my verbal description of these findings. Instead you must pursue the replication of my observations.

The key feature of Scientific work is not "Novelty" but "Reproducibility".

## 2    Introduction

This article illustrates how to create a "Reproducible Research" report.

## 3    Input Data

The input data was taken from a Tralitus Saltator (sand hopper) specimen, found minding its own business in the beach of Saint Jacut de la Mer in France on June 23 2014 at 8:10am.

This work was done by Reproducible Research Warriors in training at the Summer School on Biomedical Imaging.

Image of the specimen where acquired using mobile phone cameras and a drop of water as a single-lens microscope, as shown in Figure 1.

## 4    Image Analysis

Image analysis was performed with the SimpleITK package.

The eye structure of the Trilitus Saltator was segmented using a region growing method based on color similarity.

## 5    Results

### 5.1    Image Segmentation

The resulting image of the segmented eye is presented in Figure 2.
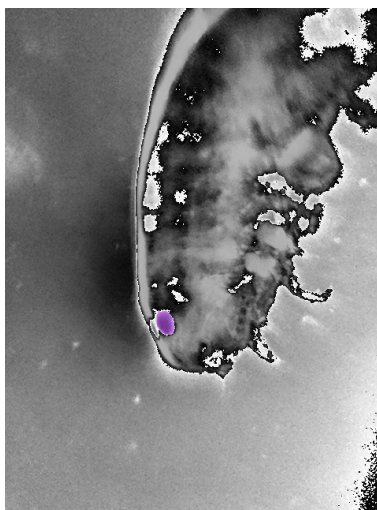
Figure 1: Input image of the Talitrus Saltrator Specimen



Figure 2: Segmentation of the Eye, overlaid on the input image

The image was segmented using the helper module "eyesize", that internally used a region growing segmentation method followed by a distance map. The module is invoked the following way:

```
estimator.set_image(input_image)
estimator.set_seed_point([204,400])
eyes_segmented,radius_estimate = estimator.estimate()
```

This module computes both the segmented image, and the estimation of the eye structure radius.

## 5.2  Radius Estimation

The smallest radius of the eye structure was estimated using the maximum value of the distance map, and the value found was 85.0.

## 5.3  Segmentation Overlay

The resulting segmented image is a binary image, that we can then overlap on top of the grayscale version of the input image. This is done with the following commands:

```
magnitude_image = sitk.VectorMagnitude(input_image)
image_overlay = sitk.LabelOverlay(magnitude_image, eyes_segmented)
sitk.WriteImage(image_overlay,'SegmentedEyeOverlay.png')
```

# 6  History

https://royalsociety.org/about-us/history/

The origins of the Royal Society lie in an "Invisible College" of natural philosophers who began meeting in the mid-1640s to discuss the new philosophy of promoting knowledge of the natural world through observation and experiment, which we now call science.

The Society was to meet weekly to witness experiments and discuss what we would now call scientific topics. The first Curator of Experiments was Robert Hooke. It was Moray who first told the King, Charles II, of this venture and secured his approval and encouragement. At first apparently nameless, the name The Royal Society first appears in print in 1661, and in the second Royal Charter of 1663 the Society is referred to as 'The Royal Society of London for Improving Natural Knowledge'.

# 7  Nullius in Verba

The Royal Society's motto "Nullius in verba" roughly translates as "take nobody's word for it". It is an expression of the determination of Fellows to withstand the domination of authority and to verify all statements by an appeal to facts determined by experiment.