Methods:

A Leica DME microscope was used for observations of *Elodea canadensis*, human cheek cell, *Paramecium aurelia*, *Gonium* sp., yeast and bacteria.

A culture of the aquatic plant *Elodea canadensis* submerged in water was available in the lab. A single leaf was removed from a stalk and placed in a drop of distilled water on a slide. The preparation was covered with a coverslip and observed in the microscope. The preparation remained illuminated in the microscope for approximately five minutes. After this period observations of cyclosis were recorded.

Human cheek epithelial cells were harvested from the mouth of the investigator using the blunt end of a wooden toothpick by scraping the inside of the cheek. The harvested cells were then stirred into a drop of isosmotic methylene blue stain on a slide. The preparation was allowed to equilibrate for five minutes. A coverslip was applied and the preparation observed in the microscope.

The culture of *Paramecium aurelia* was mixed. A drop of culture was then placed on a glass slide with an equal volume of Protoslo. A coverslip was applied and the preparation observed in the microscope. The same procedure was followed to observe *Gonium* sp. from the mixed pond culture.

A mixed culture of yeast (*Saccharomyces cerevisiae*) and bacteria (*Micrococcus roseus)* was available in the lab. A drop of basic methylene blue was placed on a slide along with a drop of the mixed culture. A coverslip was applied and the preparation observed in the microscope.

Results:

The leaf of *Elodea canadensis* obtained was light green and approximately 15 mm in length. The cells were observed to be rectangular, bounded by a cell wall, and with a number of dark green chloroplasts in the cytoplasm of each cell dispersed in an irregular manner (Figure 1). A typical cell was 89 μm in length, which is above the average cell size of 85.8 μm determined using data from several groups (Table 1). The average chloroplast size was 4.3 μm compared to our value of 3.2 μm. After being illuminated in the microscope for approximately five minutes cyclosis was observed in cells of *E. canadensis*, involving the flow of the cytoplasm in a circular manner around the outside of the cell nearest the cell wall carrying the chloroplasts in the stream.

Human cheek epithelial cells appeared blue and square to round in shape and were bounded by a plasma membrane (Figure 2). A representative cell was 20.6 μm (group data mean 25.2 μm) having a nucleus 1.5 μm (group data mean 1.9 μm) in diameter (Table 1). The cytoplasm was granular while the nucleus, located in the centre of the

cell, was a darker blue than the rest of the cell. Several of the cells appeared to be folded over.

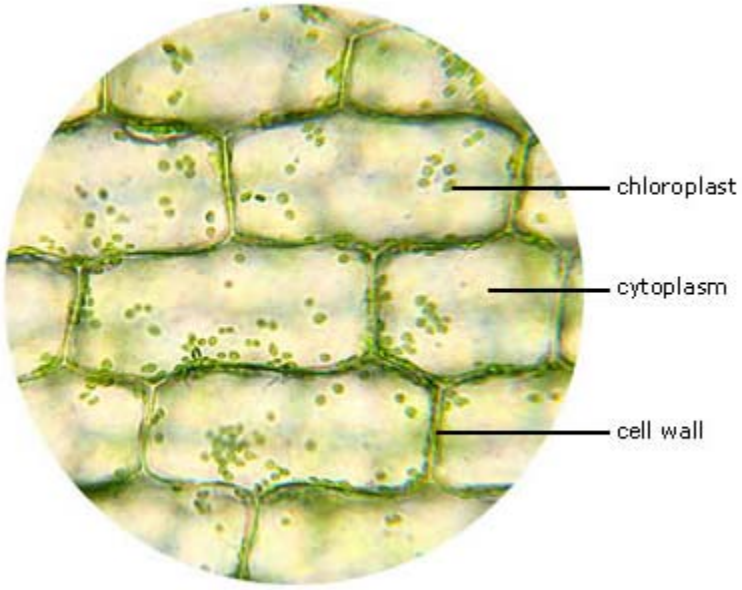
Table 1: Cell and organelle sizes for some eukaryotic and prokaryotic organisms.

	Elodea canadensis		***Paramecium aurelia***	***Gonium* sp.**	**Human cheek cell**		***M. roseus***	***S. cerevisiae***
Group	length (μm)	chloroplast (μm)	length (μm)		width (μm)	nucleus (μm)	diameter (μm)	
ours	**89**	**3.2**	**85**	**15**	**20.6**	**1.5**	**1.3**	**4.6**
G1	**94**	**2.5**	**92.0**	**13.5**	**22.5**	**1.5**	**1.7**	**4.7**
L2	**68**	**6**	**78**	**11**	**23.6**	**2.4**	**1.4**	**5.2**
M3	**79**	**4.5**	**110.0**	**18.2**	**27.6**	**1.9**	**1.1**	**5.3**
N4	**99**	**5.2**	**126**	**12.8**	**31.5**	**2.3**	**1.1**	**5.4**
Mean	85.8	4.3	98.2	14.1	25.2	1.9	1.3	5.0

The specimen of *Paramecium aurelia* observed was a green-grey colour, with a slightly tapering shape and a length of 85 μm (Figure 3, Table 1). Group data resulted in a mean length of 98.2 μm (Table 1). The cytoplasm contained a number of dark objects, and was granular in appearance. A large, circular nucleus was located near the pellicle at the largest width of the cell. The exterior of the cell appeared slightly fuzzy due to the numerous cilia embedded in the pellicle. The observed specimen moved with a smooth, gliding motion even when Protoslo was added to the preparation.

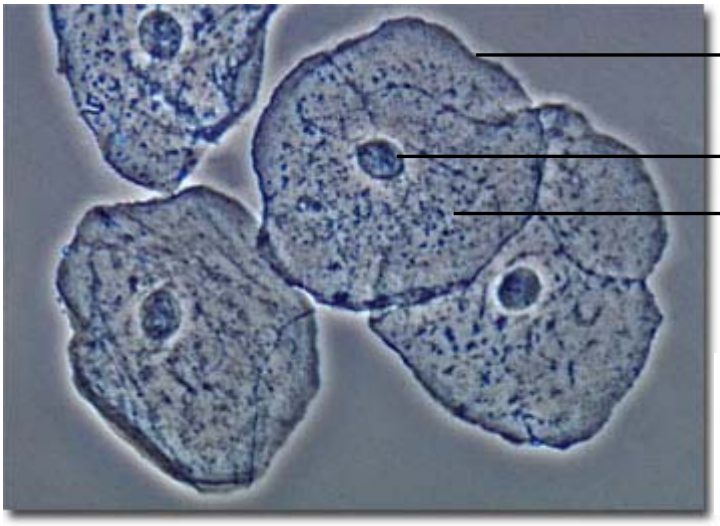
The flagellated protist *Gonium* sp. was bright green in colour and was nearly spherical in shape (Figure 4). The majority of the specimens observed were grouped together in colonies consisting of at least four cells. Individual cells were motile with a rotating type of movement. The nucleus was located near the midpoint of the organism. The diameter was determined to be 15 μm (group data mean 14.1 μm) (Table 1).

The mixed culture examined contained two types of organisms, *Saccharomyces cerevisiae* (yeast) and *Micrococcus roseus* (bacteria). These organisms are represented in Figures 5 and 6, respectively. The yeast cells (Figure 5) were slightly oblong in shape and measured 4.6 μm (group data mean 5.0 μm) while the bacteria cells (Figure 6) were spherical and 1.3 μm in diameter, the same size as the group data mean (Table 1). Both types of cell appeared blue and were non-motile, although some Brownian motion was observed for both types of cell. A distinguishing feature between the two types of cells was the large nucleus evident in the yeast cell which also had a large vacuole located near the middle of the cell. A bud (daughter cell) was attached to one end of the parent yeast cell (Figure 5). The only structures observed for the bacteria cells were the cell wall and cytoplasm.



$$\text{Mag.} = \frac{60\ mm\ x\ 10^3}{89\ \mu m} = 674X$$

Figure 1: *Elodea canadensis* leaf cells (unstained).



$$\text{Mag.} = \frac{45\ mm\ x\ 10^3}{20.6\ \mu m} = 2185X$$

Figure 2: Human cheek epithelial cells stained with methylene blue.

Figure 3: *Paramecium aurelia*, unstained whole mount.

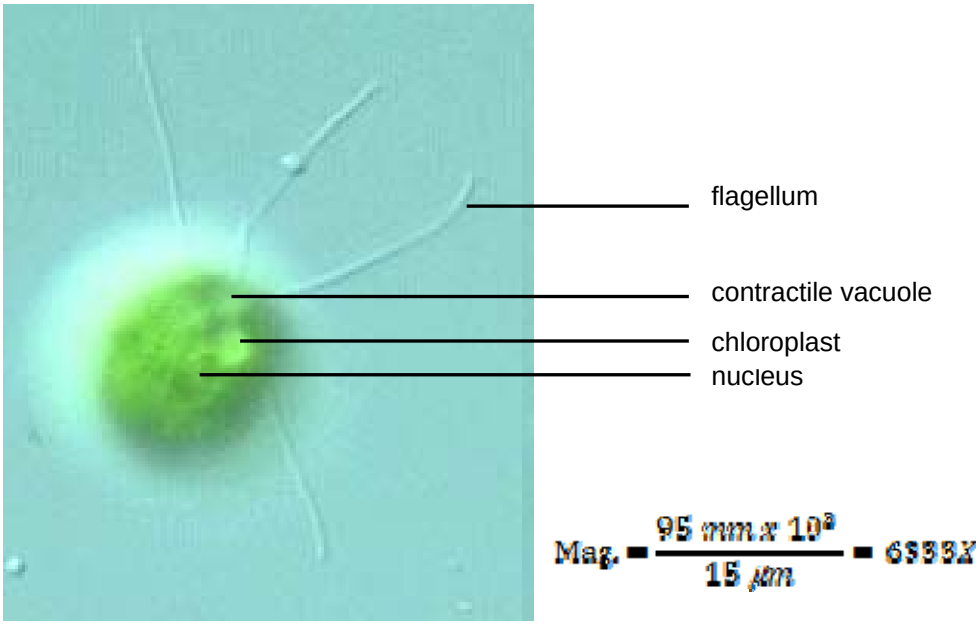


Figure 4: *Gonium* sp. unstained whole mount.

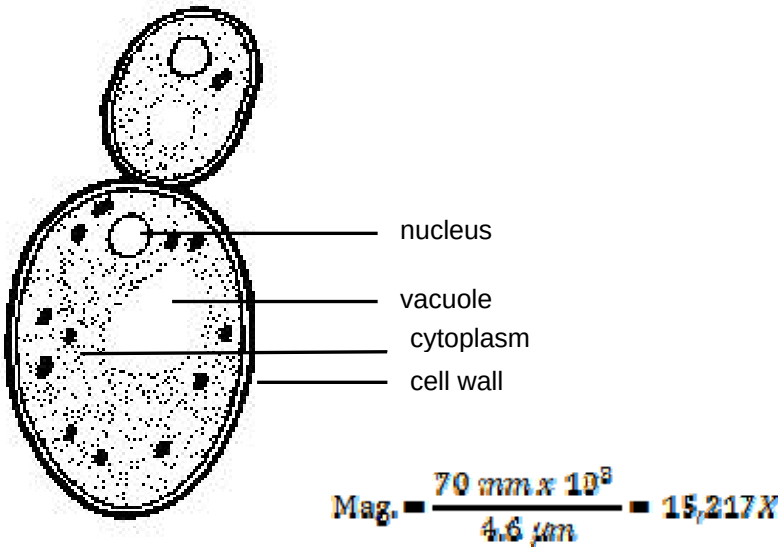


Figure 5: *Saccharomyces cerevisiae* stained with basic methylene blue; note the bud (top) resulting from the reproductive process

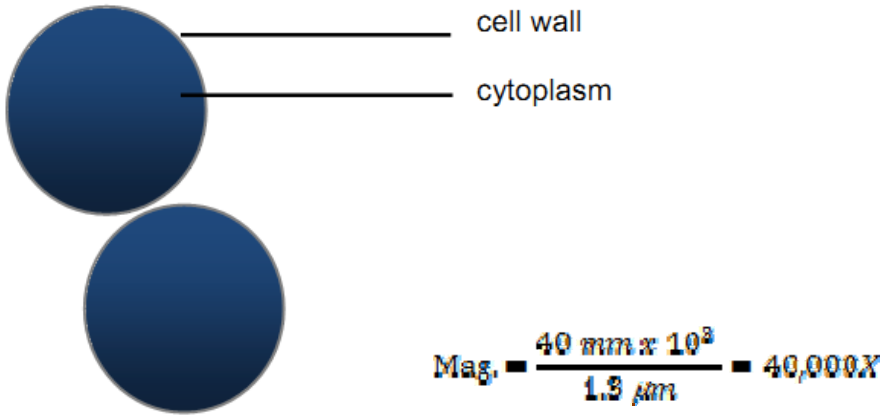


Figure 6: *Micrococcus roseus* stained with basic methylene blue.