

EGG STRUCTURE

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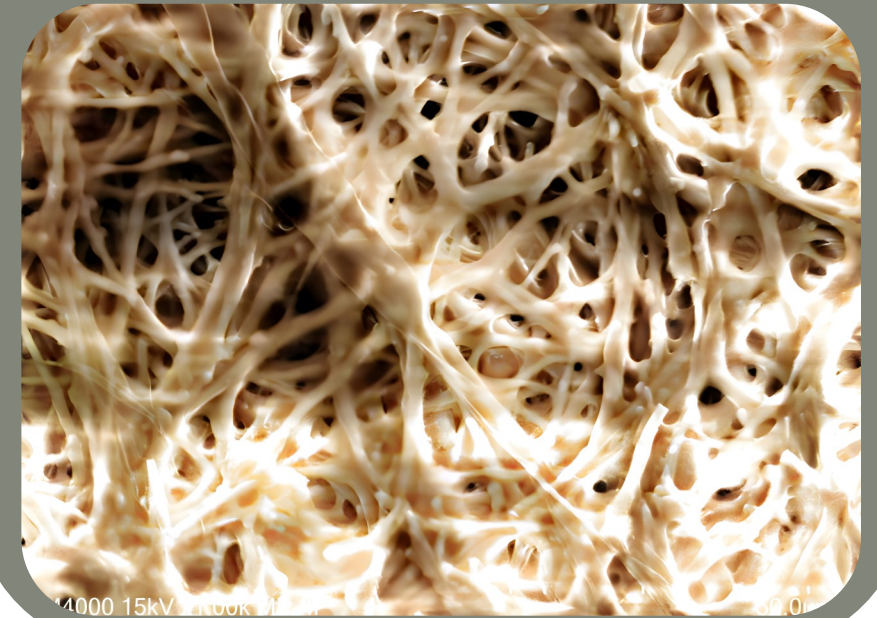
Introduction

Egg shells protect the developing chick against physical damage and microbial attack, yet they are sufficiently porous to allow the chick within to breathe. They are constructed to withstand a surprising amount of physical force but are sufficiently fragile to allow the chick to emerge.



Pheasant Egg 1000x Magnification

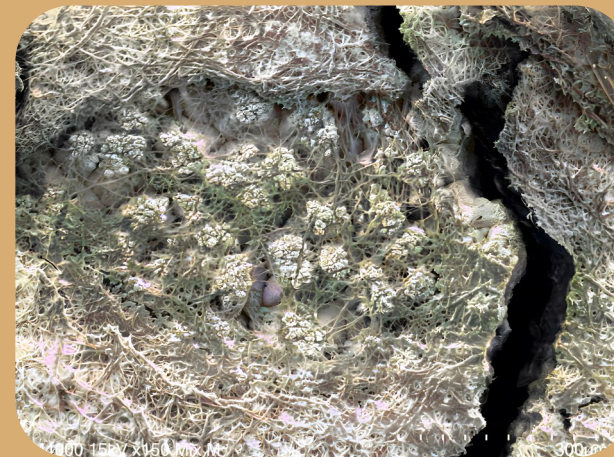
This image reveals what an egg is made up of: calcium carbonate crystals (97%). An egg has the important job of being strong enough to keep the baby bird secure, whilst also being easily breakable for it to escape when its ready. Calcium carbonate is perfect for the job, as it is thought that the protein matrix has an important role to play in eggshell strength. These proteins affect crystallization, which in turn affects the eggshell structure. Furthermore, the concentration of eggshell proteins decreases over time, which decreases eggshell strength making it easier to break out of when the time is nearly right. You can also see air pockets in between the spaghetti-like structure, which allows the young chick to drive its egg-tooth into it to create a hole. This gives the chick enough oxygen to give it the strength, after several hours or even days, to break through the shell.



We think this is one of our best images. It was taken at 800x zoom and is of the inside of the egg shell on a broken edge.

The egg has two layers of shell membrane. A thicker layer on the outside (where the label is pointing) and the thinner internal (the plant root like inside)

A pore is a minute opening in a surface, especially the skin or integument of an organism, through which gases, liquids, or microscopic particles may pass.



This shows many of the adaptations of an eggshell. You can see the strings of calcium carbonate that allow young chicks to pierce through, whilst still being strong enough to stay uncracked, even after a fall from tree height.

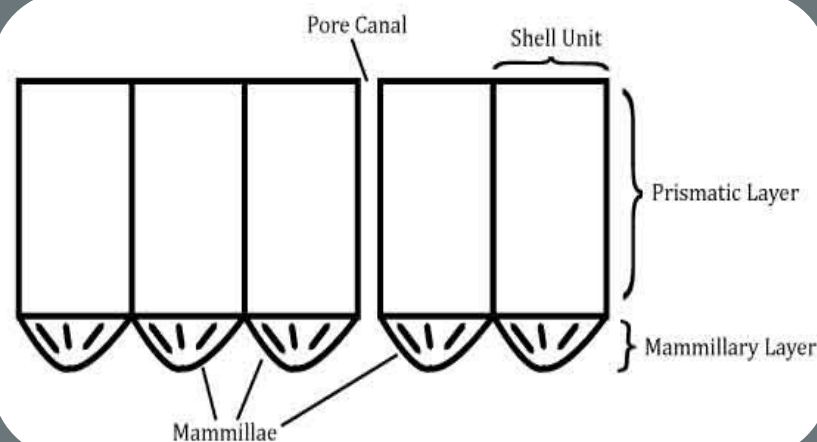
Our Method

- ⇒ Acquire your desired egg and give it a name
- ⇒ Open your egg, consume the contents and take the shell for yourself (try your best to keep it clean and un-damaged)
- ⇒ De-vacuum electron microscope and place shell on the specimen holder and make sure that it is thin enough
- ⇒ Shut the door and re-vacuum the microscope
- ⇒ Adjust settings to your liking, you can change the capture mode between MIXED, BSE and SE (they are the different angles the electrons are fired at the subject), and click the capture button when you find an image you want to save. Choose TIFF or BMP for best file quality
- ⇒ Once you have your pictures, using the deep AI "Image Colorization API" colourize your images (as electron microscopes don't produce coloured images)
- ⇒ Make poster with the outcome

Summary

In summary, this project has enabled us to produce some fantastically detailed and interesting pictures that we couldn't have done with a simple light microscope. Something so basic as the egg shell that nearly everyone has interacted with really does hold some secrets. There are very few Scanning Electron Microscope images of egg shells which was one of the many reasons we chose this item. If we had more time we would have taken more pictures

If the opportunity came up again we would instead look at imperfections in man made products such as metal nails.



Here is a diagram of the pores from the picture above