The Ediacarans

The Ediacaran Period (635-541 million years ago), named after the Ediacara Hills in Australia where the first fossil collections were found, is the time after the sponges evolved and before the time when the

"two" "sides"

bilaterans (animals with bilateral

"same" "measure"

symmetry, one side mirrors the other) first evolved. The first Ediacaran organism identified was *Charnia* in Precambrian rocks in England. At the time, and up to the discovery of the Ediacara fossils, no large multicellular organisms except for sponges were believed to have existed until the Cambrian period. *Charnia*, seen above, shows a **fractal-like** body design. **Fractals** are objects made of self-similar parts at different scales. (We will be discussing a famous fractal, the Menger sponge, in an upcoming lesson.) Since fractals are self-similar, they require few instructions to make, a "do this and repeat" process. This meant that the Ediacaran organisms required a very small genome to create their bodies. The fossils show no discernible structures, so they are believed to have absorbed nutrients across their body surfaces. Their bodies were also very thin, meaning a lot of surface area for a small volume. It would allow them to obtain enough energy from simple absorption to grow to a few metres long, like some species of *Charnia* found at Mistaken Point, Nfld. did.

A cast of the quilted *Charnia*, the first accepted complex Precambrian organism. *Charnia* was once interpreted as a relative of the sea pens.

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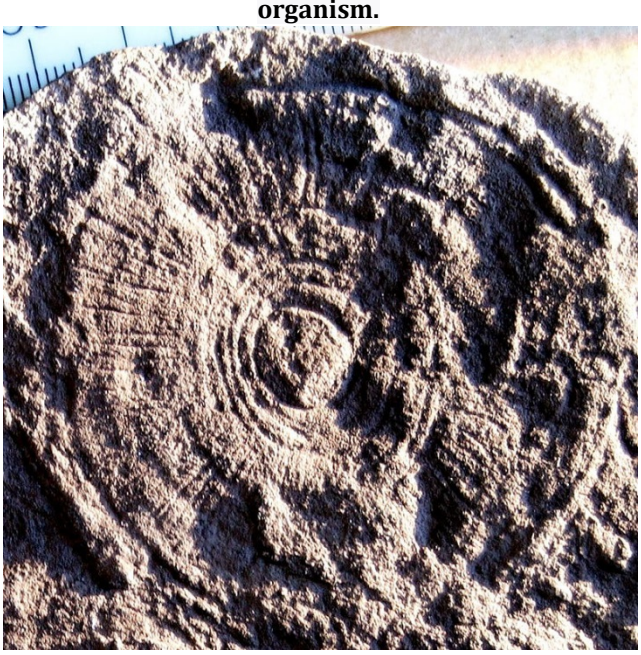
***Tateana inflata* is the attachment disk of an unknown organism.**



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***Dickinsonia costata*, an iconic Ediacaran organism, displays the characteristic quilted appearance of Ediacaran enigmata**

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Ediacaran fossils have been found all over the world. Some have been found in sandstone where fossils rarely are formed. Sand is porous and water flowing through carries oxygen which helps decompose dead bodies. Sand is often found in moving water which would destroy dead organisms, and the moving sand would abrade them. So it is hypothesized some ediacarans grew in **microbial mats**, large colonies of cyanobacteria that secrete sticky mucus entrapping sand, forming stromatolites. When the ediacarans died, the stromatolites stabilized the sand allowing preservation.

***Spriggina* was originally interpreted as an annelid or arthropod. However, lack of known limbs, and glide reflected isomers instead of true segments, rejects any such classification despite some superficial resemblance.**

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At first, these organisms were thought to be plants or plant-like. However, the discovery of the fossil ediacarans at Mistaken Point, Nfld. ended that speculation. These fossils which anyone who walks the rocky shoreline can see are known to have been upheaved over time from the ocean depth where they originated. There is not enough light in the deep ocean to permit photosynthesis, so these organisms relied on others for food, making them animals.

Late Ediacaran *Archaeonassa*-type trace fossils are commonly preserved on the top surfaces of sandstone strata.

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As the Ediacara progressed, the animals became more complex. They evolved methods of movement. Some appear to be possible ancestors of the **molluscs** (snails, clams, etc.), **annelids** (true worms) and **crustaceans** (crabs, etc). However, it is now accepted that the ediacarans left no ancestors. The Ediacara Period ended with the beginning of a great diversification of life, the **Cambrian Explosion**. The Ediacara arose after the snowball or slushball Earth events of the Cryogenian Period that covered the planet to, maybe, the equator. (These are not to be confused with the **Huronian Glaciation** that occurred after the Great Oxygenation Event resulting in a widely accepted Snowball Earth.) The resulting runoff brought nutrients to the oceans. This allowed for greater evolution, including burrowing organisms as evidenced by trace fossils (above) that released even more nutrients, seeding the explosion that was to follow.