## Fossils of Ontario מעתם ישעה ישים אישה אישה

OLD ROCK - ANCIENT LIFE . T'L 476 - . T'L ALDY. A

## FOSSILS: PRESERVED REMAINS OR OTHER EVIDENCE OF ANIMALS AND PLANTS FOUND IN ANCIENT SEDIMENTS AND SEDIMENTARY ROCK $\cdot \nabla^{\circ} b^{-}$ $\Lambda \cdot \Delta \sigma b$ a: b $I \in \cdot \Delta \cap P$ $I \in \cdot A$ $I \in A$ $I \in \cdot A$ $I \in A$ $I \in \cdot A$ $I \in A$ $I \in \cdot A$ $I \in A$ mya: million years ago רלים ∧>ם ⊳כם׳ LEGENDP^Po·4CYaAb

·◁⁴° 360 Гσ-৮° ∧>╸ ▷Ca`

420 mya

.⊲4° 420

Geological Time Scale: A system of time measurement that subdivides the Earth's history  $\mathsf{b}$   $\mathsf{P}$   $\mathsf{V}\mathsf{P}$   $\mathsf{A}\Delta\mathsf{G} \mathsf{v}\mathsf{b}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$   $\mathsf{A}\mathsf{C}\mathsf{P}'$ 

## **DEVONIAN** Age of Fish and Forests

#### • 85% of the Earth was covered with oceans and the climate was warm.

U, P, ad, e, C, P ∇C, Ju A9 FP TLLPL,

- Life got big, and modern fishes appeared in the oceans.
- First forests and amphibians appeared on land.
- 85% Δσσλ Φορ ΦΟΓ΄ ΡΓΕΓ΄ Ρ ΔΟ-Ε΄ ΦΟ ΡΡΊ-ΦΟ Ε ΔΟΤ΄

Stromatolites

**Tabulate Corals** 

C'45/ 69T1

**Trilobites** 

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^/2LJcΔ/^

ΔC·⊲\ PLPL/\*

Crinoids

\~2 D △ /

b^/2.</^

Rugose Corals .49' Pe.

Gastropods

#### **FOSSIL FACTS**

Mesozoic

Devonian

Silurian

Cambrian

JUP97

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Ordovician P571479

Precambrian ' 9c' 42

- Ontario Precambrian bedrock is covered by Cambrian, Ordovician, Silurian, Devonian and Mesozoic aged rocks.
- These rocks originally began as **mud** at the bottom of shallow tropical seas between 500 and 360 million years ago.
- These seas periodically covered most of Ontario and had **sediments** transported to them by rivers.
- Most of these sediments originated from the erosion of mountains and previous glaciers.
- Limestone comes from marine plants and animals: eroded shells, skeletal material and/or excrement.

In Northern Ontario fossils are mainly found in sedimentary rocks that underlie the Hudson and James Bay Lowlands. Fossils from these areas have been transported by glaciers to other areas of the Canadian Shield.

 $\rho \cdot \nabla \Omega$   $\rho \cdot \nabla \cdot \rho$   $\rho \cdot \nabla \cdot \Delta \rho$ LUBPOINT VL 444, P VCL, ۵٬۲۰ ∧ ∆۹ ۲P Jeu V ΔU9<sub>x</sub> ·∇'b⁻ Λ·Δσba ⊳U  $4U \nabla_{\nu} V U 9 \cdot 4 / L 1$ **₽**₽٩Υ• Ρ\*

- Life was abundant in these tropical seas.
- died, their bodies would settle to the bottom of the sea.
- The sediment transported by the rivers would then cover and preserve the animal/ plant parts.
- Over time, the sediments and the animal/plant parts have undergone burial and **lithification** to become **rocks** and fossils that now lie under our feet!

## Γ<sub></sub> Λ>σ ⊳(σ<sub>γ</sub> • When the animals and plants . 44° 445 Γ<sub>σ</sub>ρ° Λ>σ ⊳Cσ<sub>γ</sub> Fossils are found across Southern Ontario. in bedrock outcrops such as the Niagara Escarpment. ᠂·∇°b⁻ ∧·△σь৫ Γ°₽ьU·⊲ .√4° 485 L°4, 5.4₽, P304₽, CVA-<sup>₽</sup> Β ΤυδΥυν 46°9 476 6°46

¹d™ ∆U9x

#### **SILURIAN** World Underwater

#### • A higher sea level than today.

- Shallow seas covered Ontario and the climate
- First land plants started growing near sea coasts.
- First land habitats appear: near-river and wetland.
- Early fish and wingless insects appear.
- L ¬¬ρ¬, ЬСРС Р ∇2σ·Р, ·∇σ ¬¬¬

**Ancient Sea Life Legend** 

Bivalves 

Brachiopods

**¹50⊳**•<∕^^

Bryozoans

داح∆ ک

Cephalopods

^′>۰</^

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- ▶¬Р- ¬¬Ь, Р СЪВЬ, Ь ¬О ¬¬Ч-¬¬;
   ↑Љ- Чу, ¬¬С ГъЯ¬\*

#### **ORDOVICIAN** Tropical Seas. Deep Freeze

#### 



- Ontario was located near the equator and was periodically covered by shallow, tropical seas.
- A 500,000 year long ice age contributed to an extinction of 85% of marine life and marked the end of the Ordovician.
- ·△¬P- Þ›∩¬Þ Þ∪Ь ∧∽- P ∇ḍ ЫЗП/ ∇С·Р¬
   › Þ›П¬Þ Þ₀С  $ዻ^{\circ}$ ሁ°  $\triangleleft$ CT'  $\nabla$  < ሁኔን',  $\nabla$   $\rightleftharpoons$ V^U' የቦኔT' $_{x}$
- P Pr Cbb° 500.000 Λ>' Δσδ' ·∇r P ∢n αLUr' 85%  $\Delta \sigma d' = \Delta \sigma d' = \Delta$

#### **CAMBRIAN** Explosion of Life

#### 

# Early Algae

PRECAMBRIAN Life is Small ι<sup>μ</sup> θει<sup>μ</sup>Φ, 6 ΦΥ<mark>γ</mark>Ρ, ΥΓUΥ·Φ,



To become preserved as fossils, animals and plants should be buried quickly in mud or sand, escape erosion and be deposited in suitable environments (e.g. deep marine, lagoons). Hard bones and shells are more likely to be preserved than soft tissues.

## $C_{0}\Omega \cdot \Delta U \cdot V \cdot \nabla_{0}P_{-} \cdot \nabla_{0}P_{-} \cdot \nabla \cdot \nabla \Phi P \sigma^{*}$

`¬^C ለd ¬ьь`, ∇ь የቦ ገ^Cь∪` ¬^C ⊾Δ₽Ь∪` ٩ Δኌ የዾ•∇° σ•ьΔь∪` С∧'d- ∇ Δኌ ΓιьΓ` σ∧ ¬°C ∧d ∧CV`∗ ∨ Ľ'₺∙⊲` ⊳°Ь³ ¬°C ∧d ∨\` ⊳\ና የቃ∙∨° የቦ ቃ∙Ьዮ Δ°∧⁻ ٩∙Ьˀ Ь ቃ°Ь'∗

#### Why are fossils so important?

They help scientists reconstruct Earth's past environments including: land and water, fresh and saltwater, arctic, temperate and tropical climates. Different fossils evolved at different times in the Earth's history. The relative age of sedimentary rocks can be identified through the fossil record.

#### $9.6^{\circ}$ $a^{\circ}\Lambda^{-}$ $\cdot\nabla\Gamma$ $P^{\circ}U_{\sigma}C\cdot bP$ $\cdot\nabla^{\circ}b^{-}$ $\Lambda\cdot\Delta\sigma ba_{\star}$

 $\sigma \Lambda$ , b <4bbΓ'  $\sigma$ ^C b  $\Im$ ·ΔCbΓ', L· $\Im$ Γ P· $\nabla$ Π $\omega$ ', b ΔCb', a abe · $\nabla$ 'b-  $\Lambda$ ·Δ $\sigma$ ba  $\omega$ ·ba b Δ $\Im$ VFUSTP, ⊲₀b\* ⋅Δ∞P- V·∇ΦP, U<LI·∇Φ, PC ÞL b₀deLPN₀ CΦ₀VUSL, ⊲SΦP,\*

#### •∇υρ- Λ•Δσβα С•∨•Δα

- $9^{c_1} \wedge 3^{c_2}$ ,  $\nabla^{c_2} \nabla \Delta^{c_2}$ ,  $\nabla^{c_1} \nabla \Delta^{c_2}$ ,  $\nabla^{c_2} \nabla \Delta^{c_2}$ ,  $\nabla^{c_1} \nabla \Delta^{c_2}$ **Vd Lb 7^Dd△\ 47æ\.**
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- LJ, ▶▶ ₽ Ь ΛС>ПЬ ЧУ, Δ V·Δ>ПЬ ·⊲ry ¬°C dCby bpg2.p, p ⊳rlb.o.x
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- ይሁየĽ,\*
- Δ<sup>ˆ</sup>Λ ∇ σΛΓ<sup>ˆ</sup>\ Φ·Δ<sup>ˆ</sup>ν σ<sup>ˆ</sup>C Lb ∇ σΛLbP b σC·ΔPP, ·Δ5·Δ·Δ° P ΔΠ
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- ·Δ<sup>ˆ</sup>bC aq. b β d<sup>ˆ</sup>U>Uβ σ<sup>ˆ</sup>C Lb ዻ・Δϧን $^{\circ}$   $\neg^{\circ}$ ር  $\wedge$ ላ  $^{\circ}$   $^{\circ}$  Lb  $\forall r \rightarrow \rho$   $\rightarrow \rho$   $\rightarrow \rho$   $\rightarrow \rho$   $\rightarrow \rho$   $\rightarrow \rho$ **β ΔC·βΡ ΔCΓ΄ β Δ**\$ Cd^95°\*

4600 mya .√√4° 360 Let, ∨>° √√°

.√4° 540 ГσЪ° ∧>⊾ ▷Сω`

540 mya

Paleontology: The study of fossils and the rocks they occur in • Lithification: Changes sediments (mud and sand) into hard rock • Sedimentary rocks: Rocks produced by lithification of sediments

# Fossils of Ontario

## ONTARIO BENEATH YOUR FEET > ULD APP ACT 6 AS CO195

TRACE FOSSILS P <.ΔU, V·∇ΦP,</p>



Preserved evidence of animal or plant activities.

Time: 550 mya to present.

**Examples:** Burrows, footprints, tracks, plant root networks (roots not preserved).

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Cσ<sup>^</sup>Λ b ΔC·b<sup>'</sup>: · 44<sup>''</sup> 550 Γσ·b<sup>'</sup> Λ>α ▷Cα<sup>'</sup> ∡⁻م ∀م∼

CN'd⁻: •4C, Fr' ♥ Lra•ΔN\, 7°6a•4, 

**BIVALVES** - Pelecypods (Mollusc)  $\nabla$   $\sigma \sim 6.9 \Gamma^{\setminus} - \sqrt{25} \Delta^{0} < 10^{\circ}$ 



Time: 540 mya to present.

Description: Each has two shells (often symmetrical to each other), hinged together and held closed by strong muscles.

Life/Habitat: Filter feeder.

Modern Relatives: Modern clams, mussels, etc.

Cσ<sup>^</sup>Λ b ΔCΓ<sup>^</sup>: · √4° 540 Γσ+<sup>3</sup> Λ>α ▷Cα<sup>^</sup> ~ە كە√

 $\rho$  የሚያ ነው። የአን የተመሰው የሚያ የተመሰው የሚያ የተመሰው የሚያ የመደር የመደር የመደር የሚያ የመደር የሚያ የመደር የመደር የመደር የሚያ የመደር የሚያ የመደር የመ  $\nabla \cdot 4 \cdot 4 C^{P} + C^{N}$ ,  $\nabla \cdot 4 \cdot 6 C + C^{N} \cdot \nabla \cdot P^{N} \cdot \nabla \cdot P^{N} \cdot A \cdot A \cdot C^{N}$ **TU^CC**♭∧♭ ▼ **4<CP**<sub>x</sub>

**BRACHIOPODS** '**ና**ቦ⊳•<′^



Time: 540 mya to present.

**Description:** Two shells that are symmetrical along the center of each shell.

Life/Habitat: Filter feeder.

Modern Relatives: Brachiopods.

Cσ<sup>^</sup>Λ b ΔC′: ·<4′ 540 Γσ+<sup>3</sup> Λ>α ▷Cα<sup>^</sup> -مک مح∧

⊳∨ΓUS-∇Φ₀/P ∇ũ CũdL: ΥΥ<C·Γ, P LLL/ ▷·◁↲┗ⴰⴰ・◁° ◁፴⁻: ¹ʕՐ▷·</^
</p>

**BRYOZOANS** 194 P43



Time: Possibly 488 mya to present.

**Description:** Many different forms, including branching twig-like structures and lacy networks. Openings to individual chambers are smaller than those of corals.

Life/Habitat: Filter feeder. Modern Relatives: Bryozoans.

CΦ^Λ 6 ΔC′: L'd⁻ 488 Γσ+, √>σ ⊳Cσ,

 $\rho$   $\nabla 2 \sigma q L_{\chi}$ :  $\sigma \sigma \rho \cdot \nabla \sigma q L_{\phi}$   $\Delta_{\phi} \rho_{\phi}$   $\cdot \Delta U \cdot \rho \sigma_{\chi}$   $\Delta$  $\Delta \Omega = 0$  -0. TP -0.  $\nabla \Omega = 0$  -0.  $\nabla \Omega = 0$ ΔC·bσσ₽ ▷^bσ·√ο°

 $PV\GammaUSVPOON$ 

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**CEPHALOPODS** (Mollusc) ^′>د⊳۲



Time: 520 mya to present.

**Description:** Cone - or coil - shaped shell divided into chambers.

**Life/Habitat:** Predator or scavenger. Top predators in the Ordovician.

Modern Relatives: Nautilus, octopuses, squids and cuttlefish.

ρ ∇ኒσ٩٠ς: CV.٩- L<ÞP، ΔυC V9 UU<Φσ٩٠ςο **△** △ LJO·♥ ·♥∀√× ⊳∨Γ∪Կ·∇Գ°/₽ ∇ኒ Cኒፊι: ¸С[Φ⊳° ┛ݛС V٩ LJS669° L·d- 6 P GC 'C[ab/ J·b- 6

 $V_0 < \Phi_{\ell} D_0 D_1 \nabla_1 P_0 = V_0 \nabla_1 P_0$ 

₽ ⊳∟ LJጋ₽∩ഘ./ Г

**CRINOIDS** \u2>△/



**Time:** 485 mya to present.

**Description:** Animals resembling flowers with a grouping of feathery arms at the top of a stem.

Life/Habitat: Filter feeder.

Modern Relatives: Sea lilies, starfish and sea urchins.

Cσ^Λ b ΔC′: ·◁4° 485 Γσታ<sup>3</sup> Λ>α\ Λσ<sup>°</sup>

′Γ126U′ ∇ ⊳Λ•**⊲•**Δ′ 6 Δ∫ የ∫Λ<mark>۲</mark>′∗ ▷·◁₫┖₽₠·◁° ◁Φ፫: ФФ₽。 ቴኒ₽ኒ, ፭·∇ዖኒዮ/ 

**GASTROPODS** (Mollusc)  $P_{\cup} S \cdot S \cdot A \cdot (\Delta_{\cup})$ 



Time: 510 mya to present.

Description: Coiled shell houses the animal.

Life/Habitat: Filter feeder, algae eater or detritivore. Modern Relatives: Snails and slugs.

ርσ^Λ ι ΔC′: ∙<44° 510 Γστ⟩ Λ>Φ ▷Сω` ^₽° **4**₽⁻

4.77.2.x

444 0.0

**RUGOSE CORALS** ·494 P214



**Time:** 462 mya to 251 mya.

**Description:** Hard cone shaped skeleton: the interior is divided by vertical walls.

Life/Habitat: Filter feeder. Modern Relatives: Corals.

UVAL < \. \JU\. \delta \.

▶·◁₫┖₽₠∙◁。 ◁◑፫: ₽¿ፈ.

STROMATOLITES  $^{\prime\prime}$ PLD $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$   $^{\prime}$ 



Time: 3500 mya to present.

**Description:** Colonies of

bacteria. They trap grains of sediment, forming layers and building mounds.

Modern Relatives: Stromatolites.

ርራ^ለ 6 Δር′: ∙ላ4° 3500 Γσታ³ Λ>교 ⊳ርፊ` ۸۰ م\_۰

 $\rho$   $\nabla \ell \sigma \cdot \rho_{\ell}$ :  $\Gamma T \cdot \nabla$   $C \ell \delta \cdot d_{\ell}$   $\Gamma_{\ell} T \cdot e_{\ell}$   $\Delta q + \epsilon \nabla_{\ell}$   $\rho$ ∆ VJ99PCL/

**TABULATE CORALS** C'45/ 65TA



**Time:** 488 mya to 251 mya.

**Description:** A skeleton of vertical tubes further divided horizontally.

Life/Habitat: Filter feeder. Modern Relatives: Corals.

**∧>**• **⊳**C•⁄ ×

b  $\Delta Sadr'$ :  $\cdot \Delta b \cdot \Delta'$   $D^{\circ}ba$   $\nabla$   $\cdot bb^{\circ}dgp$  DdCba $\triangle$  VLL  $\cdot \triangleleft \cdot \triangledown < b^{\times}$ 

⊳∨Γ∪≺·∇°ο,/₽ ∇℃ C℃dL: ΥΥ<C·Γ, ₽ LLL,

۵۰-: ۱۹۲۰ م۰۱۵ م۰۱۵ م۰۱۵ ۱۹۳۰

**TRILOBITES** ^\**ک**>د\_



**Time:** 520 mya to 251 mya.

**Description:** Often have three distinct sections lengthwise and crosswise. Fossils found are often pieces of the external skeleton.

**Life/Habitat:** Burrower, detritivore, possibly predator and scavenger.

Modern Relatives: Horseshoe crabs, scorpions, spiders, etc.

 $\Delta''\Lambda\Gamma'$   $\nabla J$  Lb  $\Lambda\Gamma^{-}_{\star}$   $\cdot\nabla''b^{-}$   $\Gamma J \cdot \Delta$   $\triangleright ^{\circ}b = \nabla$ < A·∇ Γ^PbUP\*

►ALAT'Aσ°/6 AS CS9C: ·AA9°, ·VAσ6e LLour JCLT > CLT > -JC TPPLdox 

L.PL9\ ⊳Cσ<850 ₽UC 9C62

LEGEND P^Pa·ACYaAb

J°⊳d△\ Mesozoic ال⊳،م⊲، Devonian ۲₁⊳۳⊲۵ Silurian Ordovician P<sub>2</sub>D<sub>1</sub>∇<sub>1</sub>Q<sub>3</sub> Cambrian 9دا∿⊲۵

¹∿ 9°¹∿**⊲**° Precambrian

mya: million years ago רלים 🔨 🗘 🗘 ראים אווויס איז איז איז



English and Cree