

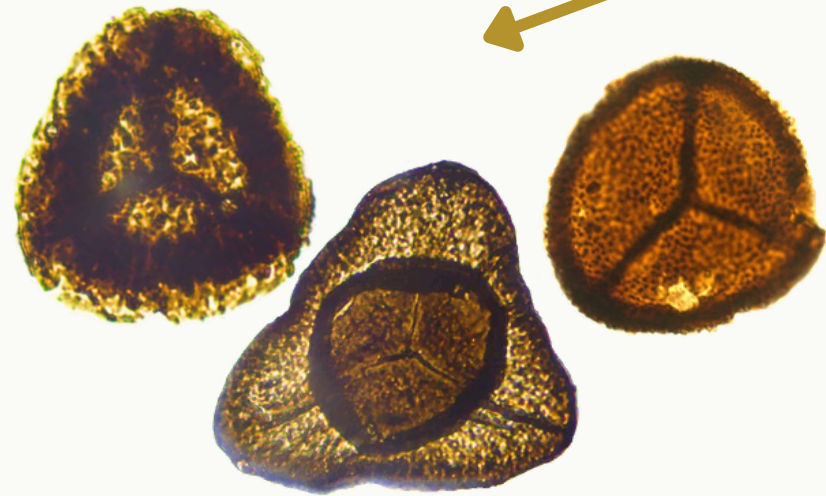
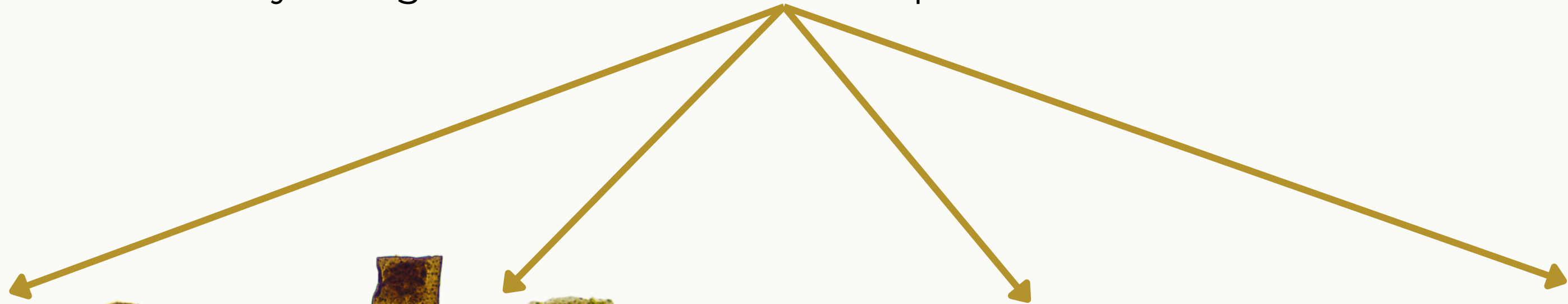


# Automated Recognition of Devonian Miospores Using AI

Lokteva Vitalina,  
Vahram Serobyan,  
Martin Tetard,  
Pierre Breuer,  
and Taniel Danelian

# Palynology

study of organic-walled microfossils preserved in sediments



spores and pollen



miospores



chitinozoans



acritarchs and prasinophytes



scolecodonts



microscopic · organic-walled · palynomorphs

- Determining the age and conducting correlations between sections
- Establishing correlations between regions
- Providing stratigraphic control for exploration

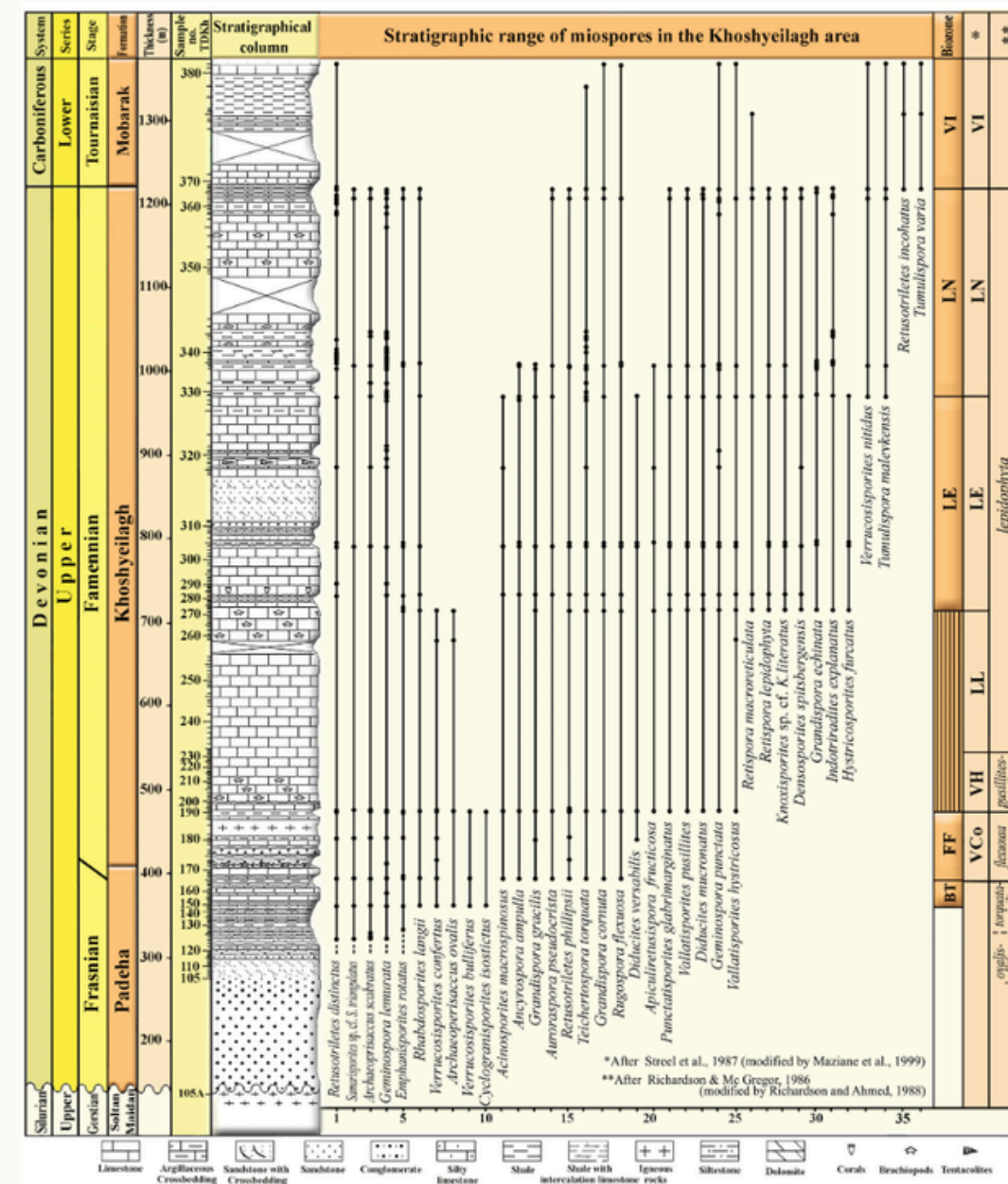


Figure 1. Biostratigraphy in the Khoshyeilagh area, Iran (Taherian et al., 2022).

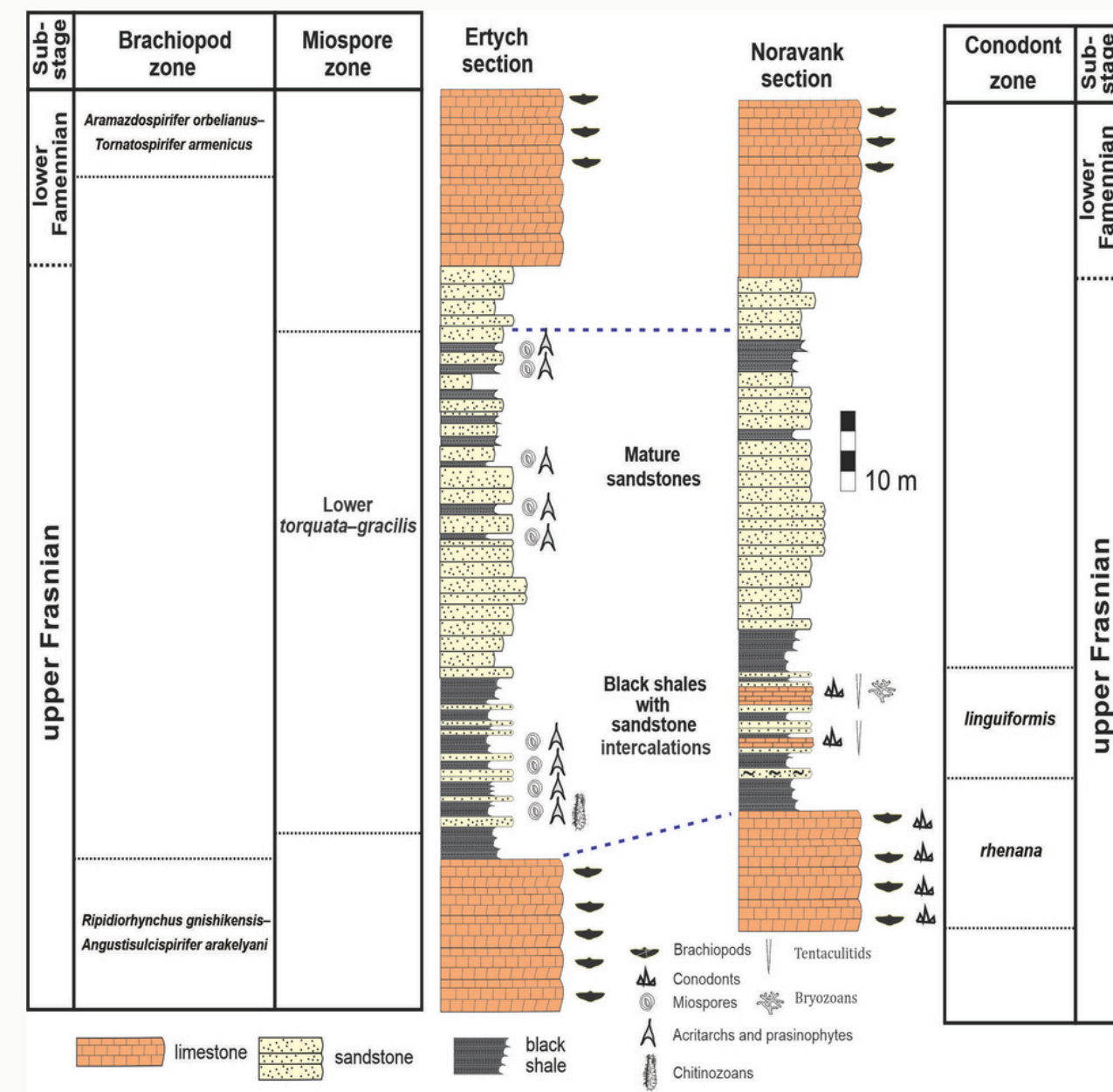


Figure 2. Lithostratigraphic columns of the Ertych and Noravank sections in Central Armenia.

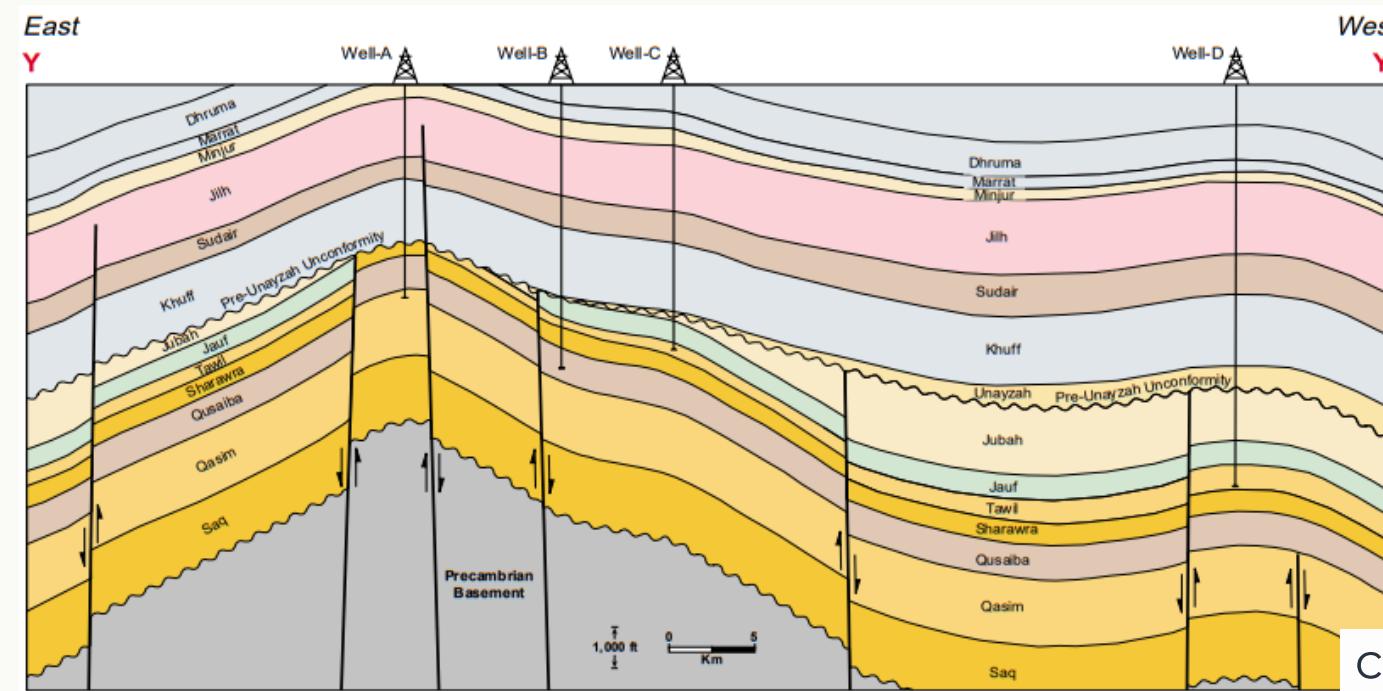
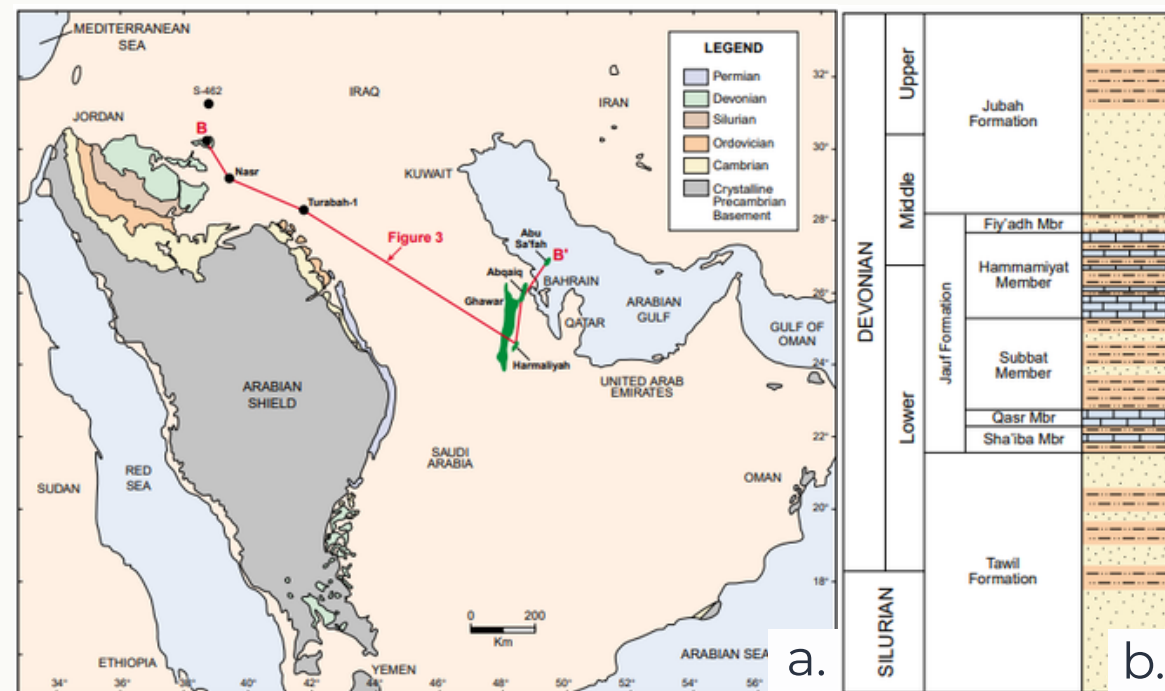







Figure 3. a. Palaeozoic outcrop map; b. Generalized Devonian stratigraphic section of northwestern Saudi Arabia; c. Schematic structural cross-section of the Ghawar Area (from Al-Hajiri et al., 1999).

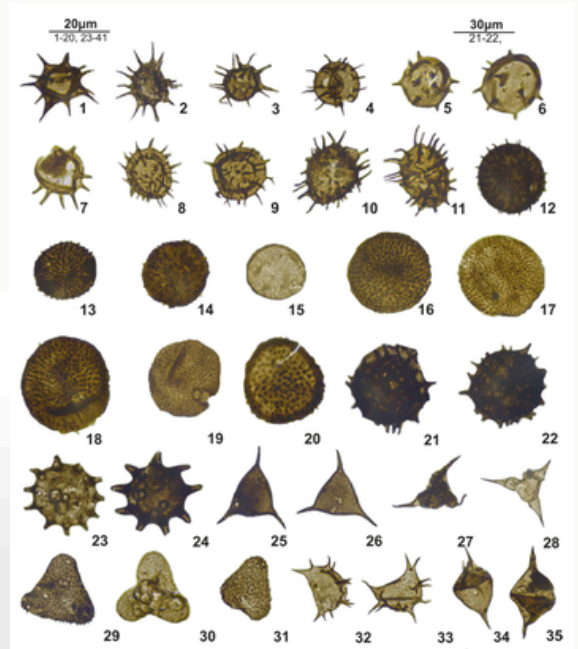
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## Acritarchs and prasinophytes from the Upper Devonian of Armenia: biostratigraphical and palaeobiogeographical implications

Meri Yeghiazaryan , David Marius Kroeck  , Taniel Danelian , Arayik Grigoryan , Sylvie Regnier & Vahram Serobyanyan  
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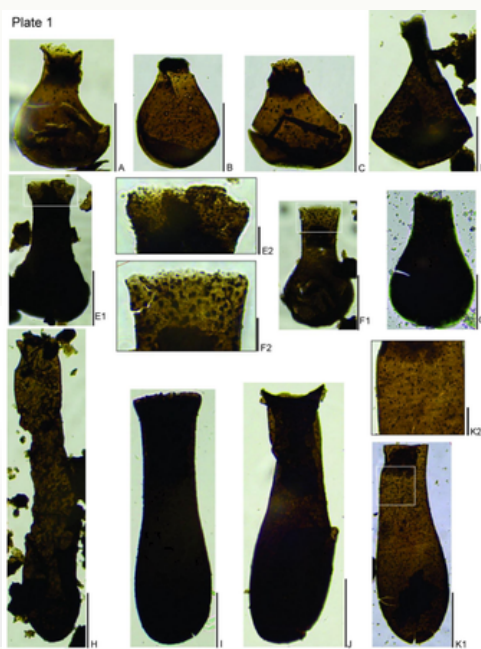
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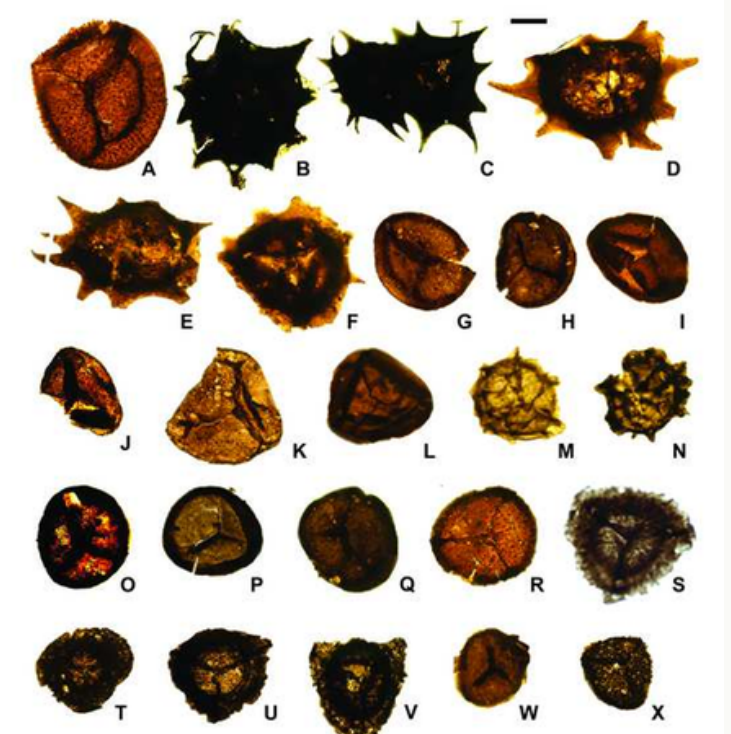
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 Palaeoworld  
Volume 34, Issue 3, June 2025, 100879

## First palynological evidence from the Upper Devonian of Armenia (northern Gondwanan margin): Biostratigraphic implications

Sirush Khachatryan <sup>a b c</sup> , Borja Cascales-Miñana <sup>d</sup> , Taniel Danelian <sup>b</sup>  , Pierre Breuer <sup>e</sup> , Philippe Steemans <sup>e</sup> , Araik Grigoryan <sup>a</sup> , Ivan Gabrielyan <sup>c</sup> , Vachik Hairapetian <sup>f</sup> , Sylvie Regnier <sup>b</sup> , David Marius Kroeck <sup>g</sup> , Vahram Serobyanyan <sup>a</sup> 



# Traditional palynological analysis

- Palynological work is multi-step: scanning slides, photographing, recording coordinates, and documenting each specimen.

## Manual case studies

- Palynological analysis under the microscope required 4 to 6 months of intensive, near-continuous work.
- We prepared and examined slides 46 and screened thousands of fields of view.

## AI

- NLP
- knowledge representation
- automated reasoning
- CV
- robotics

## ML

- Supervised learning
  - Classification
  - Regression
- Unsupervised learning
- Reinforcement learning

## DL

- CNN
- RNN
- Transformer
- other architectures

## Artificial Intelligence (AI) and Deep Learning (DL)

- Convolutional neural networks (CNNs) may assist in the classification of palynomorph images.
- Object detection models can help recognize spores on images.
- AI techniques have the potential to reduce time and effort in taxonomic analysis.

Figure 5. A simplified structure of AI; NLP - Natural Language Processing, CV - Computer Vision, ML - Machine Learning.

# Thank you for your attention!

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about the study.

## **Acknowledgements.**

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