

Examples of reelaborated ammonites

Sixto Rafael Fernández López

Departamento y UEI de Paleontología, Facultad de Ciencias Geológicas (UCM) e Instituto de Geología Económica (CSIC-UCM. C/ José Antonio Novais, 2. Universidad Complutense. 28040-Madrid.

sixto@geo.ucm.es

Abstract: Identify reelaborated fossils require knowing the meaning of the term taphonomic reelaboration and the diagnostic criteria that can be used to test such preservation state. In the present work: 1) we make explicit the meaning of the taphonomic terms: accumulation, remotion or reworking, sedimentation and reelaboration, understood as diverse categories of the same taphonomic classification system; 2) showing a model of the process of taphonomic reelaboration; and 3) displaying diverse examples of accumulated (2), resedimented (2) and reelaborated (16) ammonites.

Key words: Palaeontology. Taphonomy. Fossilization. Fossil record.

EXAMPLES OF REELABORATED AMMONITES

Processes and mechanical states of preservation (Complementary file REELABORATION.swf)

Firstly, the meaning of the taphonomic terms: accumulation, removal (remobilization) or reworking, resedimentation and reelaboration, as categories of the same classification system are showed.

Model of taphonomic reelaboration

Using a flow chart, a model of taphonomic reelaboration is presented and several examples of accumulated, resedimented and reelaborated elements are displayed.

Examples of mechanical states of preservation

Links to the figured examples of mechanical states of preservation are available, grouped in three categories: accumulated, resedimented and reelaborated. Two examples of accumulated ammonites and two examples of resedimented ammonites have been described and figured.

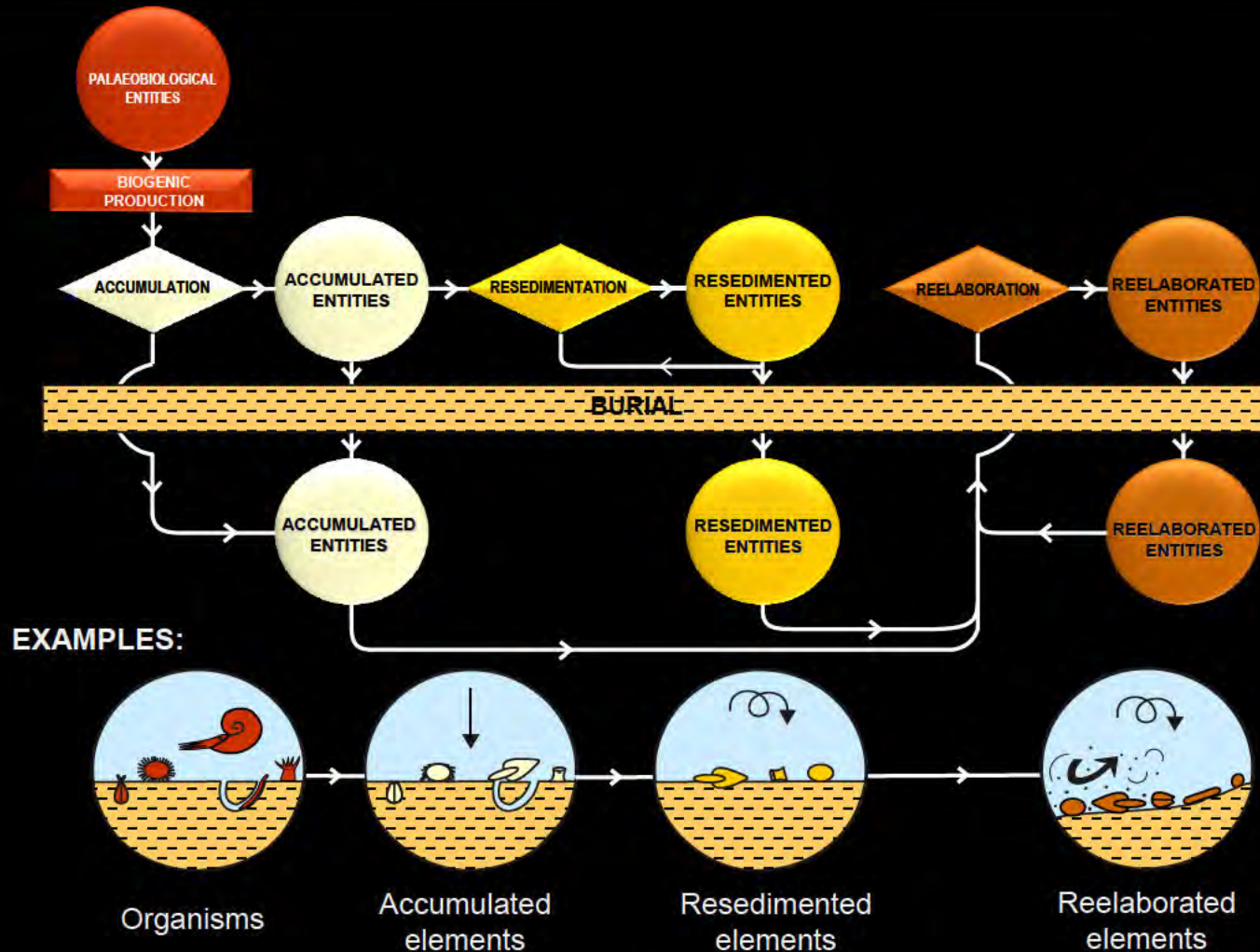
Criteria of taphonomic reelaboration

Ten classes of taphonomic criteria used to diagnose and test reelaborated ammonites have been listed. For each criterion, links to the figured examples have been included, pointing the most relevant and educational.

Processes and mechanical states of preservation

- **Taphonomic accumulation:**
process of incorporation into the lithosphere of taphonomic elements biogenically produced.
- **Taphonomic reworking, remotion or removal:**
displacement of taphonomic elements, previously accumulated, by resedimentation or reelaboration.
 - **Taphonomic resedimentation:**
displacement , before their burial, of taphonomic elements previously accumulated.
 - **Taphonomic reelaboration:**
exhumation and displacement of taphonomic elements previously accumulated or resedimented.

Model of taphonomic reelaboration



Preservation states

- **Accumulated fossils:**

1

- **Resedimented fossils:**

2

3

- **Reelaborated fossils:**

4

5

6

7

8

9

10

11

12

13

14

15

16

17

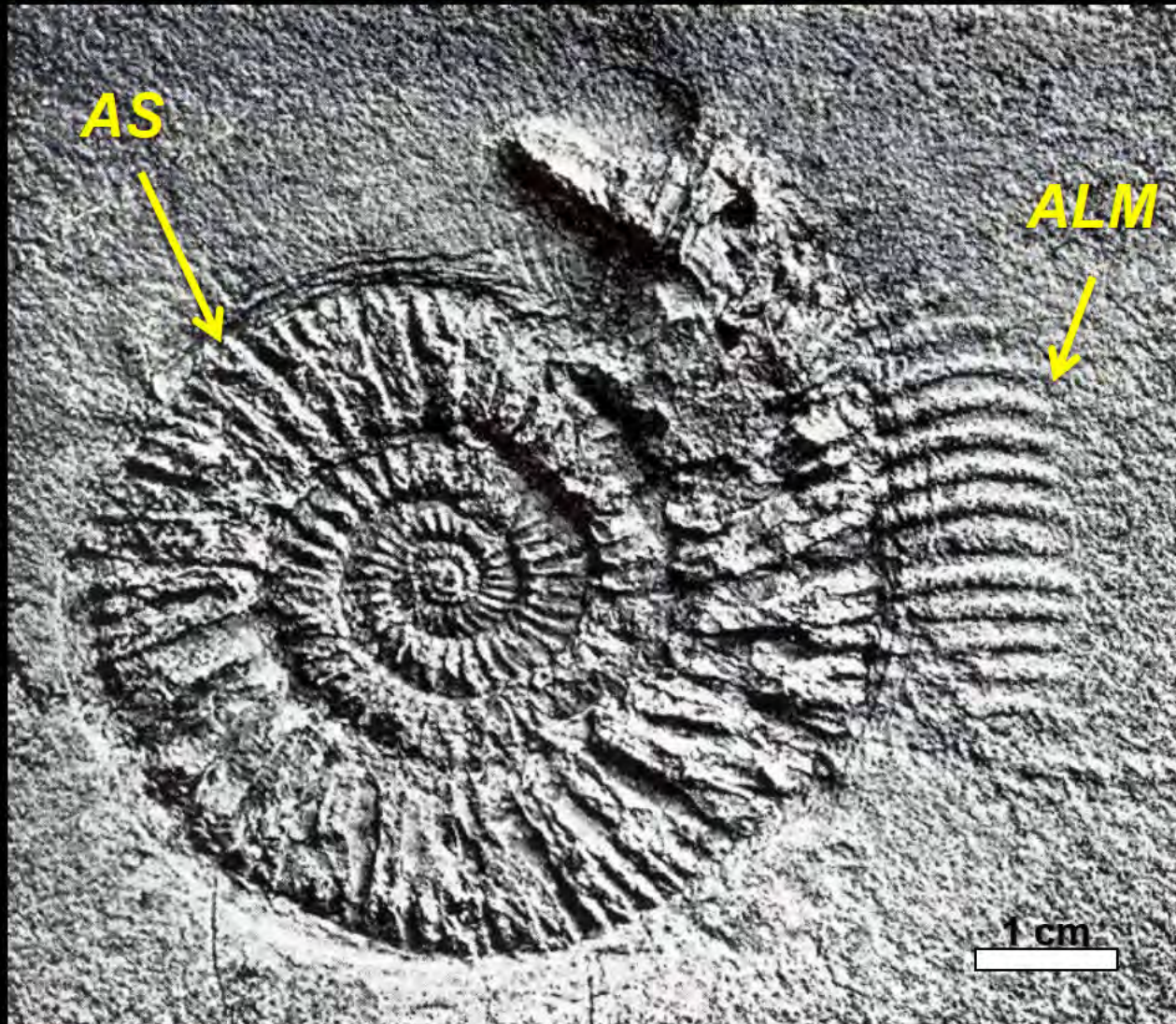
18

19

20

1. Accumulated ammonites

Accumulated landing mark (ALM) and accumulated shell (AS).



2. Resedimented ammonites

Shell and internal mould with ferruginous ooids produced in high energy environments.



3. Resedimented ammonites

Shells and internal moulds showing structural continuity between infill and matrix (SC).



Criteria of taphonomic reelaboration

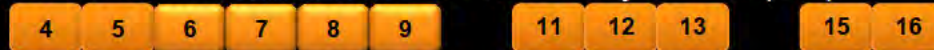
- Difference in chemical, mineralogical and/or petrological composition between internal mould and sedimentary matrix (*PD*).



- Textural difference between internal mould and sedimentary matrix (*TD*).



- Structural discontinuity between internal mould and sedimentary matrix (*SD*).



- Several phases of sedimentary filling and cementation (*SC*)



- Reverse geopetal structure (*RG*)



- Fracture surface of internal mould (*F*).



- Disarticulation surface of internal mould (*D*).



- Abrasion surface of internal mould (*A*).



- Bioerosion trace of internal mould (*B*).

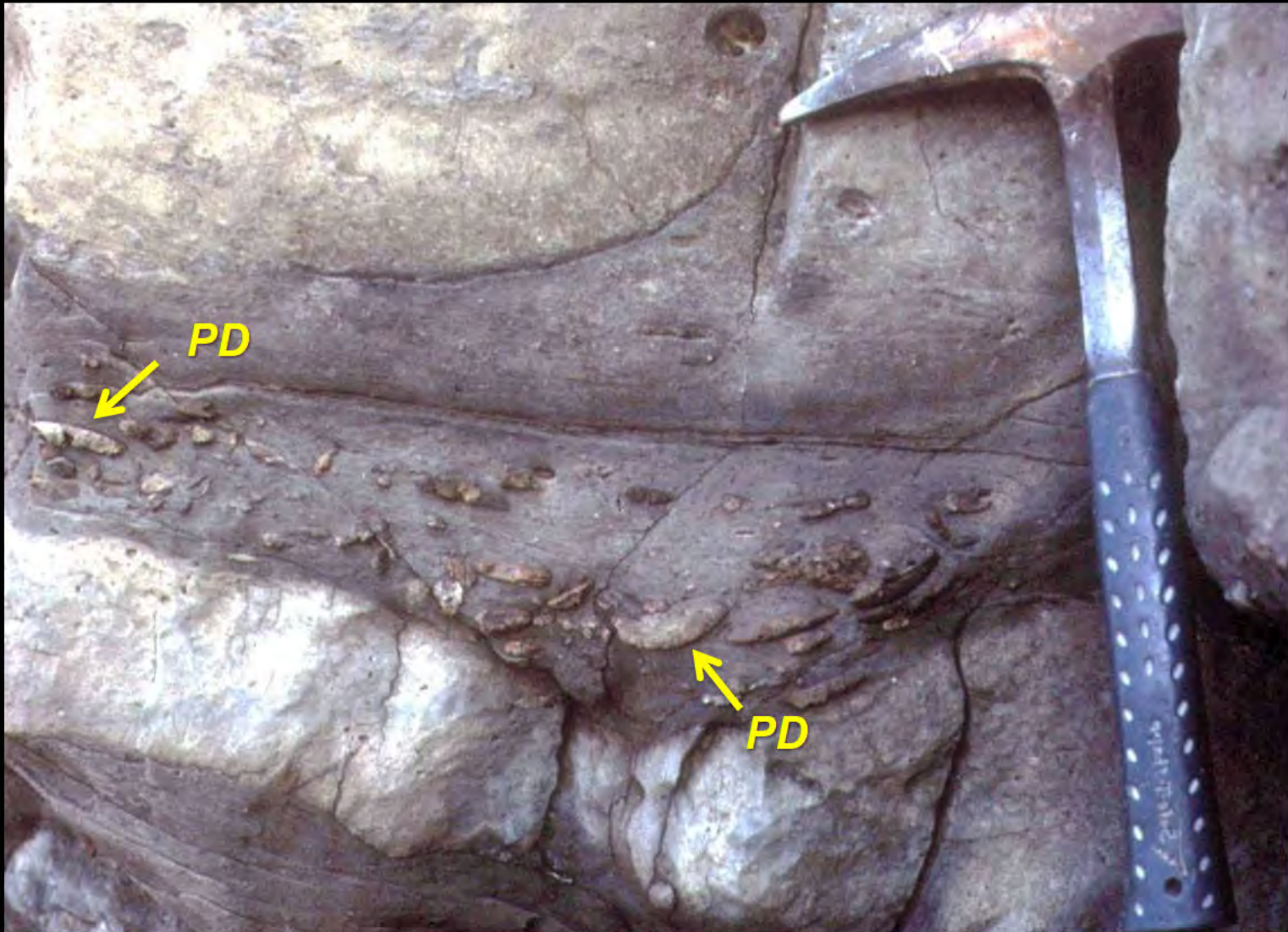


- Encrusting trace of internal mould (*E*).



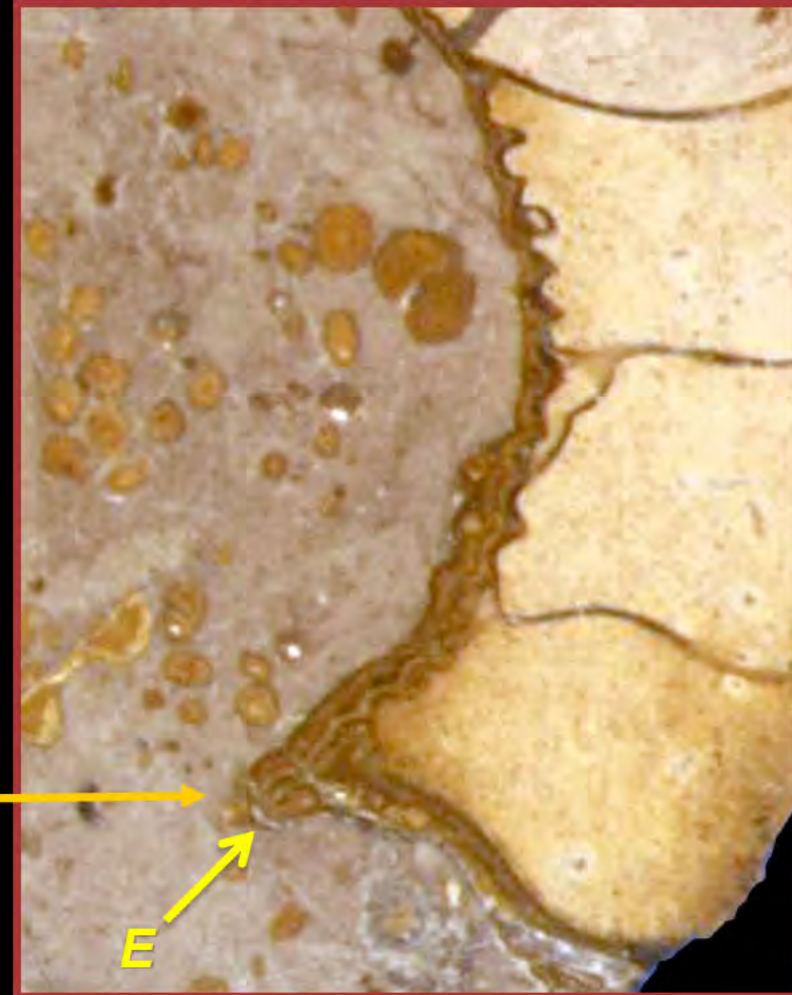
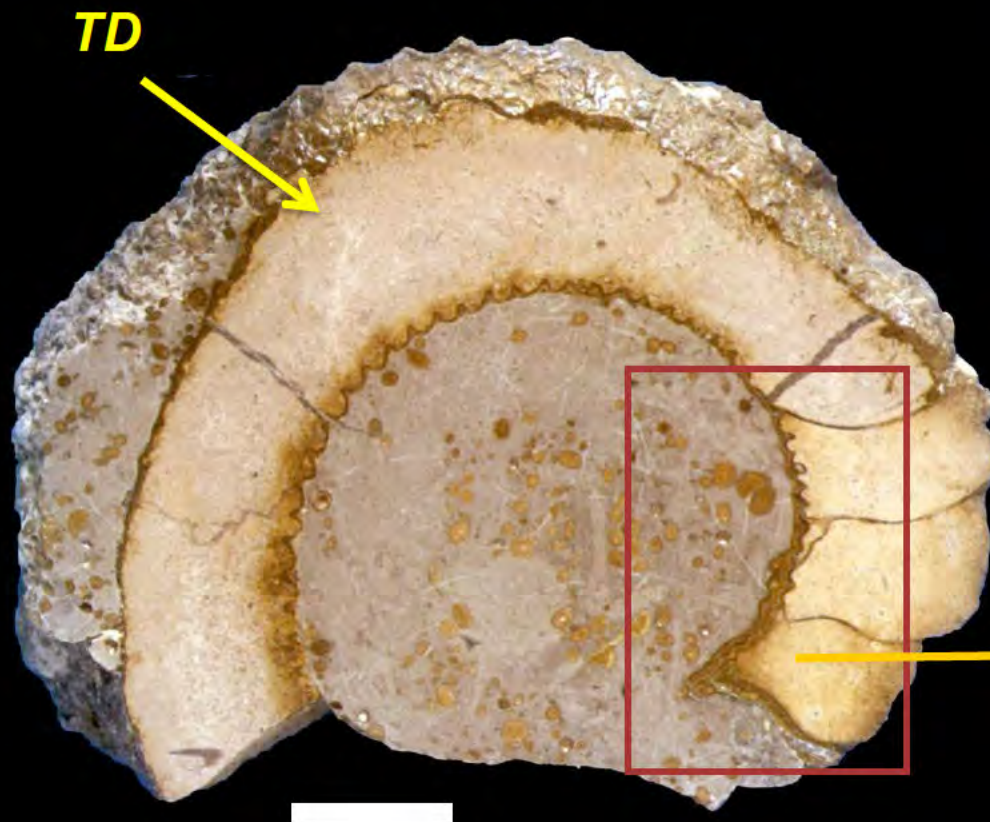
4. Reelaborated ammonites

Phosphatized, concretionary internal moulds (PD), enclosed in marly limestones.



5. Reelaborated ammonites

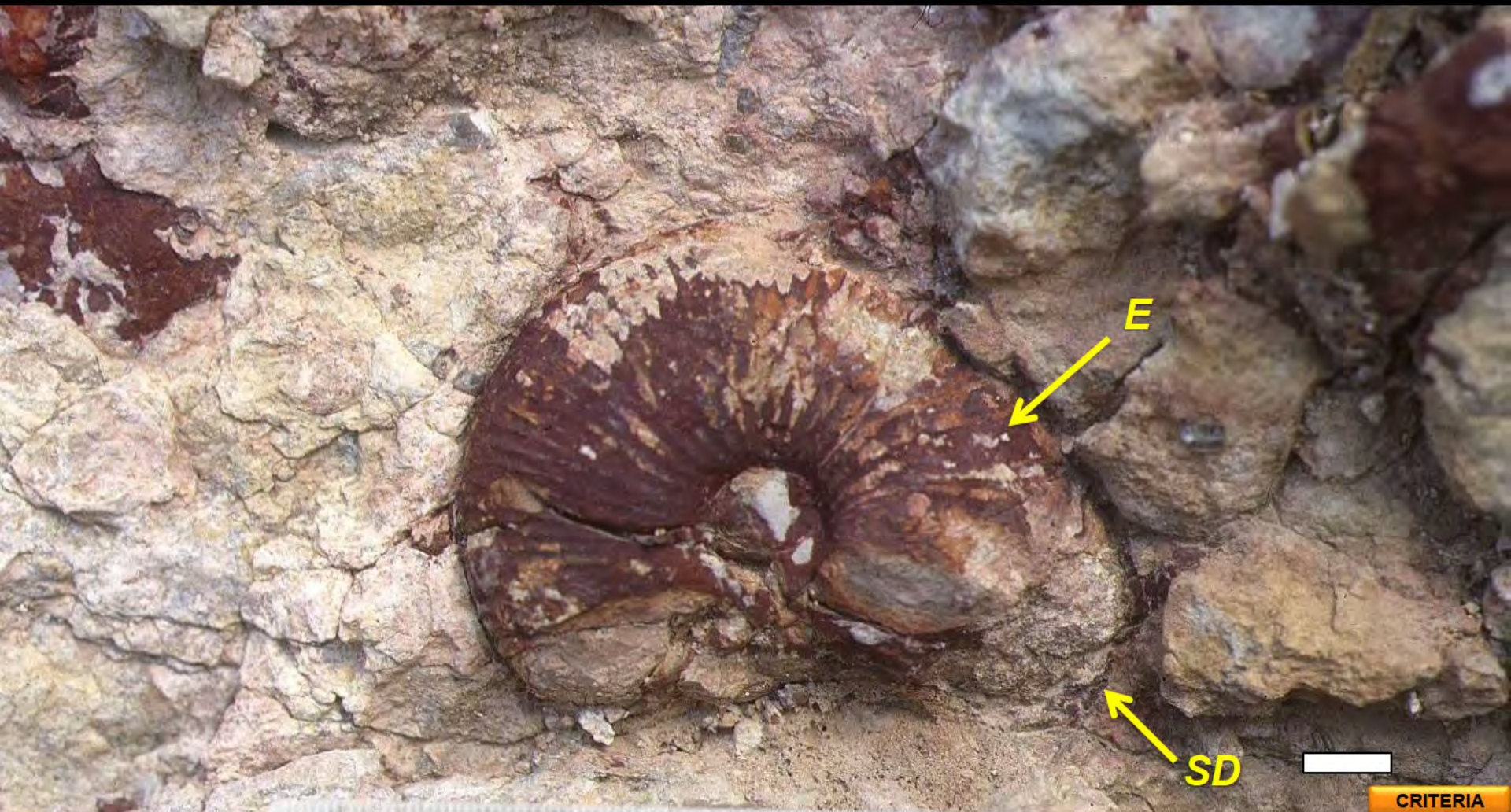
*Micritic, concretionary internal mould, enclosed in limestone with ferruginous ooids (TD).
Ferruginous encrusting of internal mould (E).*



6. Reelaborated ammonites

Structural discontinuity between internal mould and sedimentary matrix (SD).

Coating by iron-crusts (E).



7. Reelaborated ammonites

Structural discontinuity between internal mould and sedimentary matrix (SD).



8. Reelaborated ammonites

Structural discontinuity between internal mould and sedimentary matrix (SD).



9. Reelaborated belemnites

Structural discontinuity between internal mould and sedimentary matrix (SD).



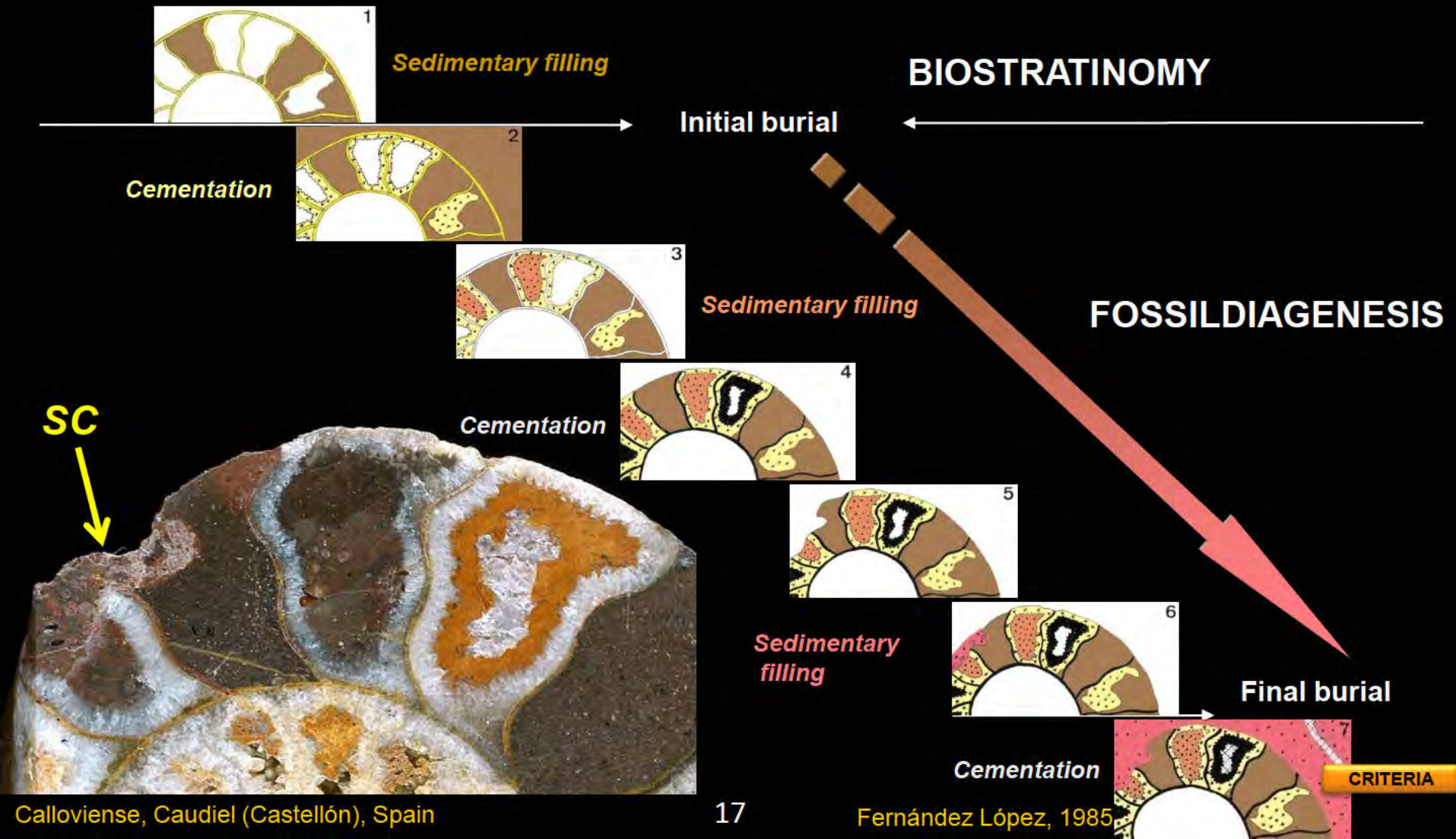
10. Reelaborated ammonites

Reverse geopetal sedimentary infill (RG).



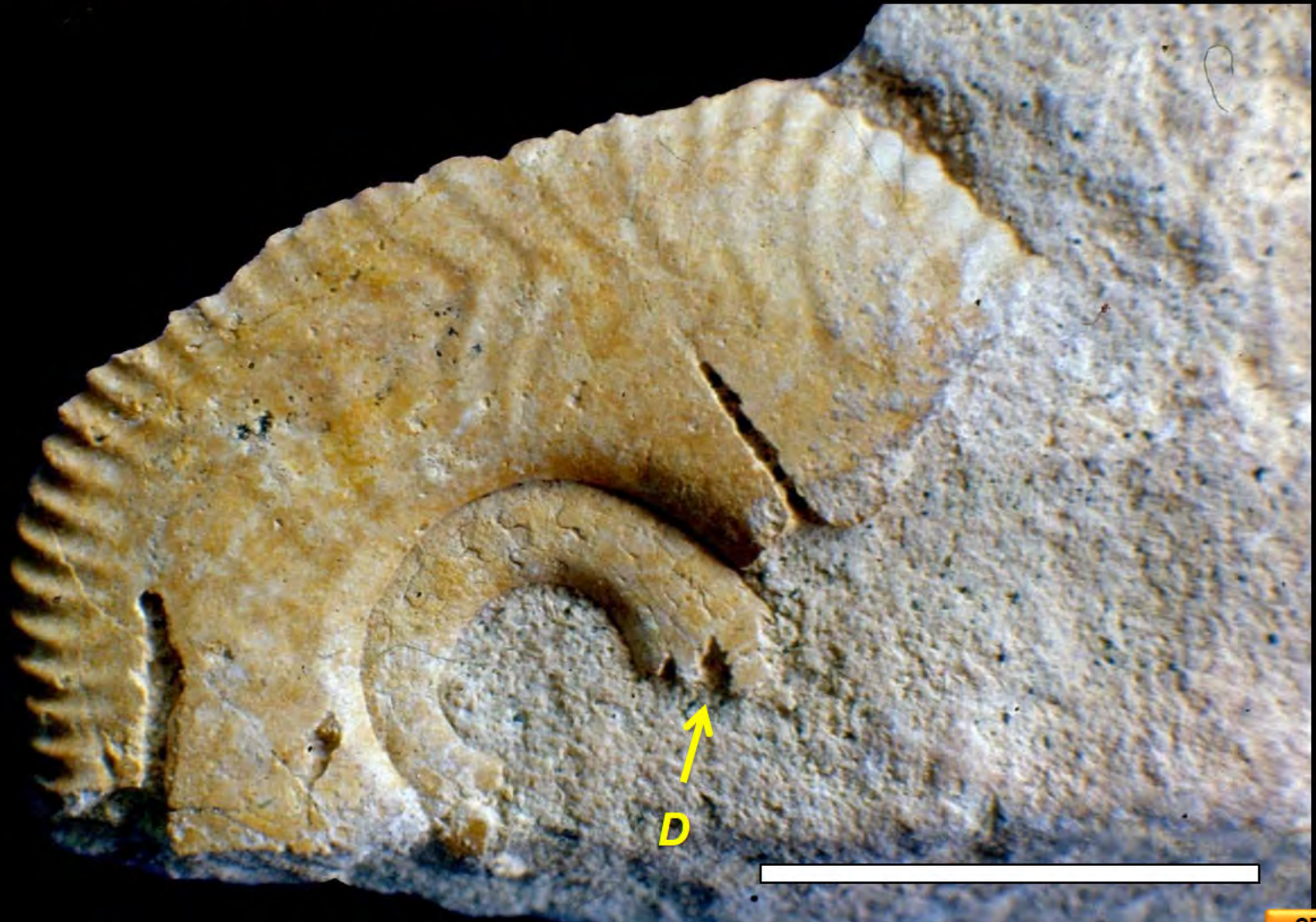
11. Reelaborated ammonites

Several phases of sedimentary filling and cementation (SC).



12. Reelaborated ammonites

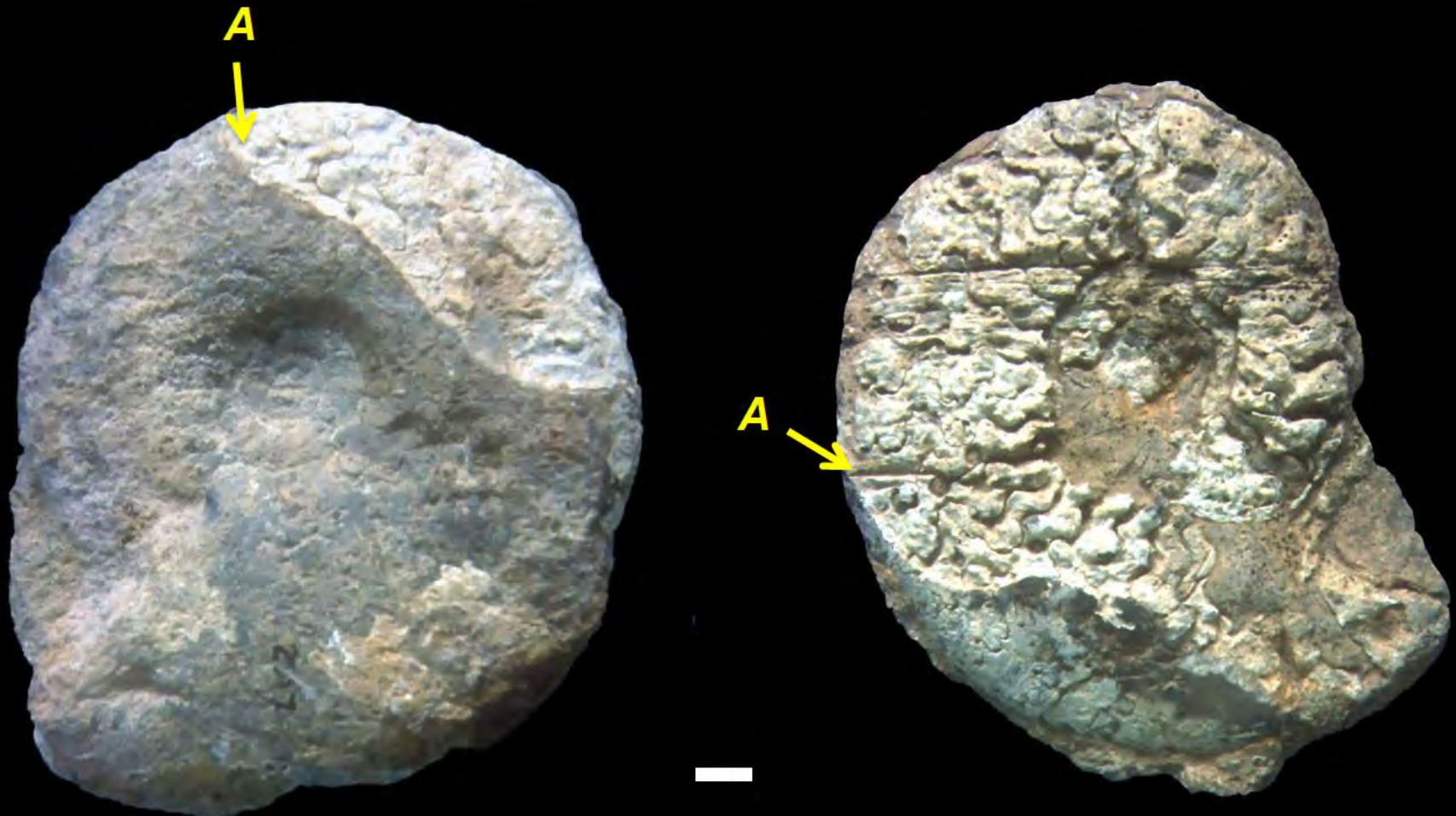
Disarticulation surface of internal mould (D).



CRITERIA

13. Reelaborated ammonites

Truncation facet of internal mould (T).



14. Reelaborated ammonites

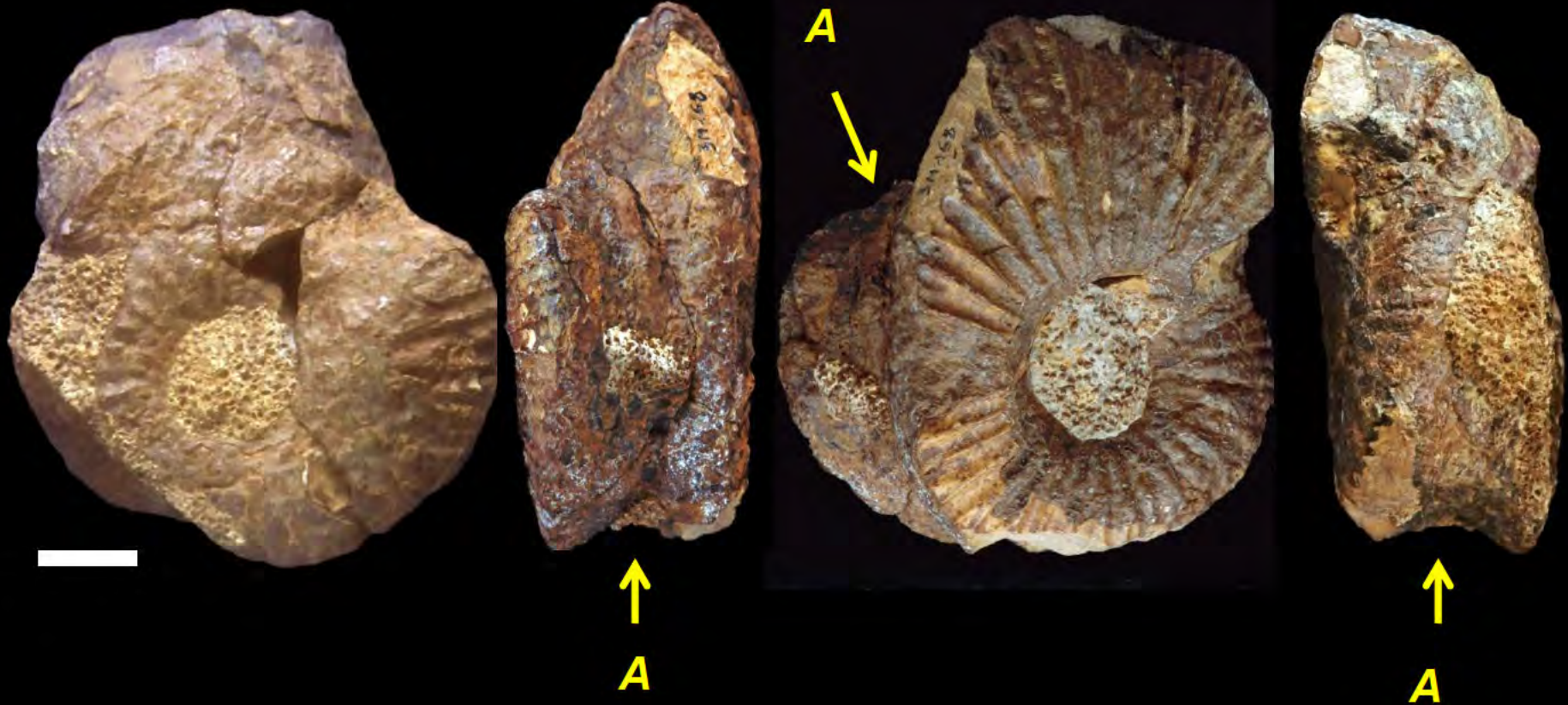
Ellipsoidal abrasion facet on the last third of the last preserved whorl (A).



CRITERIA

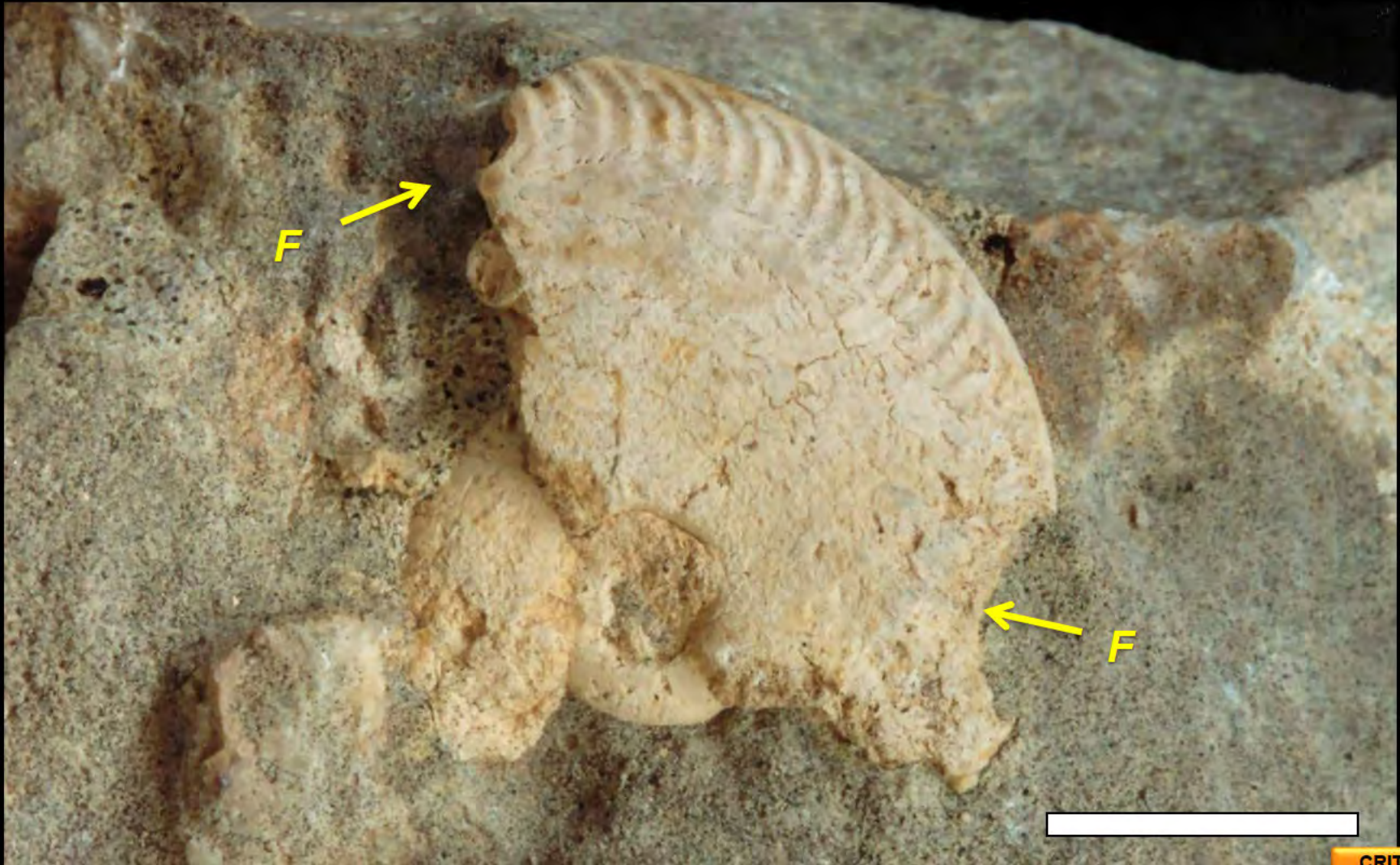
15. Reelaborated ammonites

Annular abrasion furrow (A).



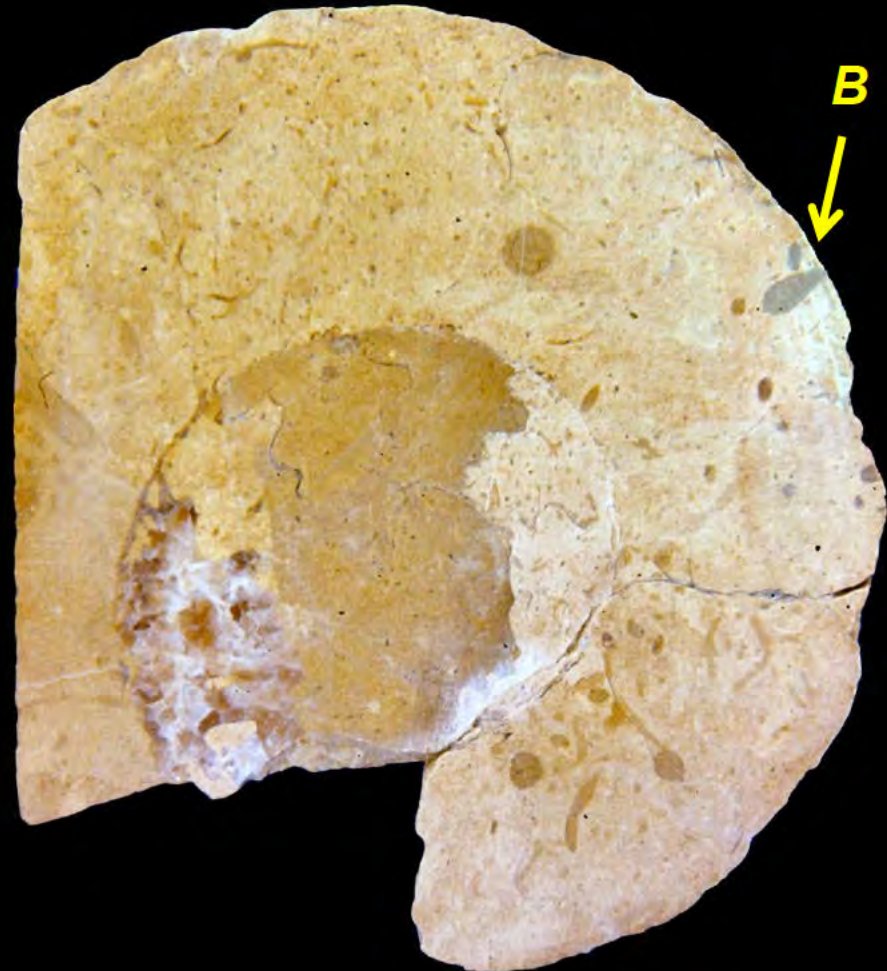
16. Reelaborated ammonites

Fracture surface of internal mould (F).



17. Reelaborated ammonites

Bioerosion traces of internal mould (B).



18. Reelaborated ammonites

Ferruginous encrusting of internal mould (E).



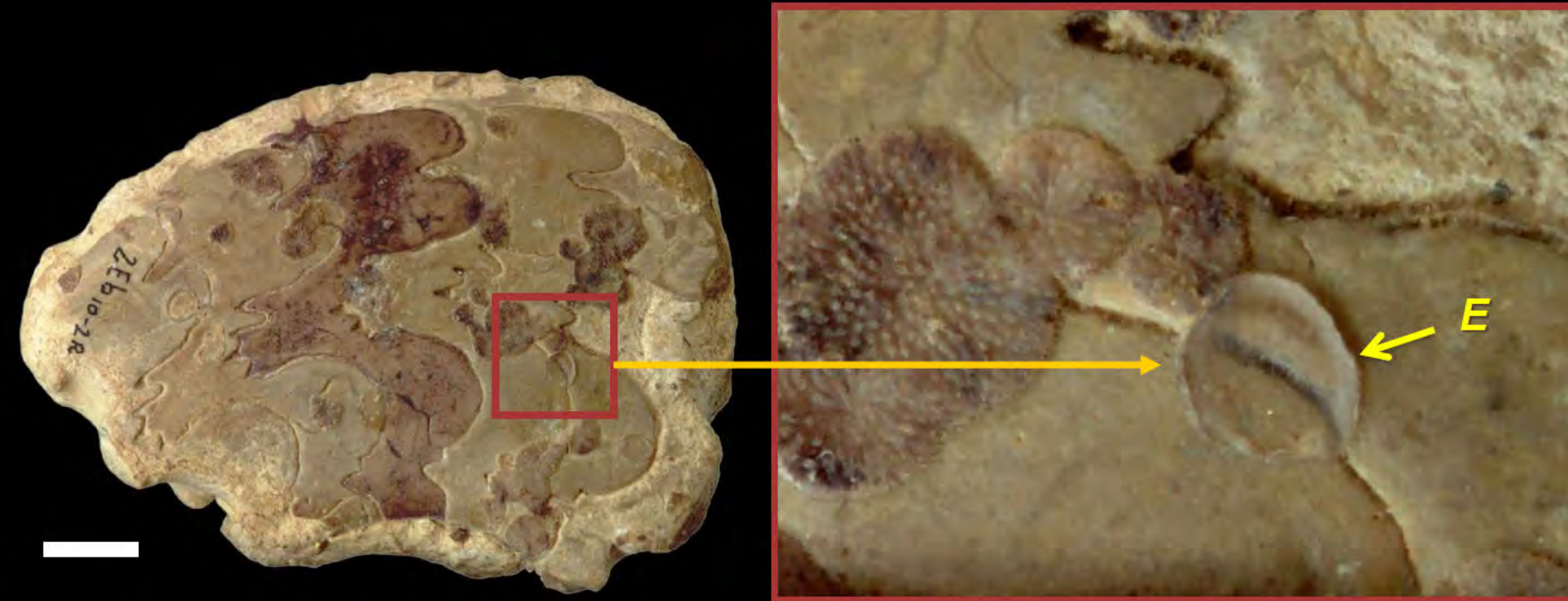
19. Reelaborated ammonites

Microbial encrusting on a flank of internal mould (E). Ammonite half-lump.



20. Reelaborated ammonites

Remains of bryozoans and oyster encrusting internal mould (E).



BIBLIOGRAPHY

- Arkell, W. J.; Kummel, B. y Wright, C. W. 1957. Mesozoic Ammonoidea. pp: L80 - L465. En: Moore, R.C. (Ed.). *Treatise on Invertebrate Paleontology. Part L. Mollusca 4. Cephalopoda, Ammonoidea*. Geological Society of America and University of Kansas Press, Lawrence. 490 pp.
- Fernández-López, S. 1985. Criterios elementales de reelaboración tafonómica en ammonites de la Cordillera Ibérica. *Acta Geológica Hispánica*, 19 (1984): 105-116.
- Fernández-López, S. 1991. Taphonomic concepts for a theoretical Biochronology. *Revista Española de Paleontología*, 6: 37-49.
- Fernández-López, S. 1995. Taphonomie et interprétation des paléoenvironnements. En: Gayet, M. y Courtinat, B. (Eds.). First European Palaeontological Congress, Lyon 1993. *Geobios*, M.S. 18: 137-154.
- Fernández-López, S. 1999. Tafonomía y Fosilización. pp: 51-107. En: Meléndez, B. (Ed.). *Tratado de Paleontología* (1998). Consejo Superior de Investigaciones Científicas, Madrid. 457 pp.
- Fernández-López, S. 2000. *Temas de Tafonomía*. Depto. Paleontología, Universidad Complutense, Madrid: 167 pp.
- Fernández-López, S. R. 2008. Distinction between fill channels and abrasion furrows on ammonoid internal moulds. *Geobios*, 41: 5-13.
- Fernández-López, S. y Gómez, J.J. 1990. Facies aalenienses y bajocienses, con evidencias de emersión y carstificación, en el sector central de la Cuenca Ibérica. Implicaciones paleogeográficas. *Cuadernos de Geología Ibérica*, 14: 67-111.
- Fernández-López, S. y Meléndez, G. 1994. Abrasion surfaces on inner moulds of ammonites as palaeobathymetric indicators. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 110: 29-42.
- Fernández-López, S. y Meléndez, G. 1995. Taphonomic gradients in Middle Jurassic ammonites of the Iberian Range (Spain). En: Gayet, M. y Courtinat, B. (Eds.). First European Palaeontological Congress, Lyon 1993. *Geobios*, M.S. 18: 155-165.
- Fernández-López, S.; Duarte, L.V. y Henriques, M.H.P. 2000. Ammonites from lumpy limestones (Lower Pliensbachian, Portugal). Taphonomic analysis and palaeoenvironmental implications. *Revista Sociedad Geológica de España*, 13: 3-15.

Recibido: 11 noviembre 2010.

Aceptado: 10 octubre 2011.