

## Obituary

# An appreciation of Covadonga Brime (1950–2023)

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Covadonga Brime was born on 26 September 1950 in the town of Oviedo, Asturias, north-west Spain. She achieved her degree in Geological Sciences in June 1973 from the University of Oviedo, was awarded her PhD in Sciences (Geology) on 26 May 1978 (Oviedo University) and received her 'Proficiency in English' (Cambridge University) in June 1978. In October 1975, she joined the ETSIMO (Higher Technical School of Mining Engineers of Oviedo). She worked there as an assistant professor from October 1975 until February 1983 and then at the Department of Geology (Oviedo University) until 13 January 1987, when she was promoted to Profesor Titular de Universidad (Associate University Professor) chair, which she held until she retired 25 years later on 22 June 2012 (Fig. 1).

Passionate about teaching and learning, Covadonga was an excellent, disciplined, punctual, modest and well-organized teacher (as good an educator as she was) and lecturer (as an expert in mineralogy). She was not a mineralogist in the traditional sense, however. In Covadonga's courses, which always carried her personal style, the themes of her carefully structured and first-rate lectures were updated continuously and developed to be as clear as possible. Her practical sessions focused mainly on helping the students with basic knowledge of minerals and rocks, not just studying minerals in a traditional fashion (using hand specimens and under the microscope) but also providing context in terms of the processes and environments in which the rocks and minerals were formed, the relationships between ore deposits, their geochemistry, magmatism and geodynamics, the analytical methods used to characterize them and their role in the natural and environmental sciences. She also provided practical sessions using computer programs in which students learned to analyse actual mineralogical data. Covadonga worked hard to make sure that both her theoretical and practical classes along with fieldwork were presented in perfect harmony.

Covadonga was keen that her graduate students learned not just the fundamentals of mineralogical research; she also focused on encouraging them to think critically (in science and in everyday life), to analyse complex mineralogical problems and to devise effective solutions, all valuable skills they would draw upon for the rest of their professional careers in either an academic or industrial environment. She also engaged students in activities or assignments that provided them with opportunities to practise

or apply what they were learning in theoretical sessions. Her practical exercises were designed to provide the students with the knowledge and skills that support other courses throughout their degree course in geology. The exam questions she posed were based on the resolution of selected practical mineralogical problems and on writing assignments, which encouraged the students to keep up with required reading, to attend classes and practical sessions regularly and to make logical arguments based on the facts at hand. Her mineralogical seminars, which culminated in student presentations, and Covadonga's insightful comment on each one represented a collegial effort that her students remembered and appreciated after graduation, especially those who developed professional careers in laboratories, mines or in construction or extraction companies.

Appreciative of her influence on them, some of her students wrote warmly about Covadonga in their messages of condolence upon her passing away: 'She made the subject of each lecture (e.g. the principles of thermodynamics, phase diagrams and mineral stability) so easy to understand!' 'She was super demanding but at the same time fair, accessible and an endearing person.' 'She rewarded effort well.' 'Some lecturers, e.g. Covadonga, have such an influence that their students never forget them.' And 'She was a woman who argued for equal rights for men and women in society and at work, and fought discrimination, whether negative or positive.' Covadonga would have been delighted to read these messages.

In addition to her teaching and her relationships with her students, we must also make mention of the research work – so strongly related to her teaching – that Covadonga did, as well as the national and international collaborations and friendships that she maintained over many years and the many conferences and debates in which she participated (Fig. 2). From her debut on the international scene at the VI International Clay Conference held in Oxford in July 1978 until her retirement, Covadonga built strong international collaborations and mentored younger generations of geologists, passing on to them her interest in extending our academic knowledge and advancing analytical techniques. As the Spanish representative, Covadonga joined International Geological Correlation Programme (IGCP) No. 294 (1989–1993) on 'Very Low-Grade Metamorphism' (led by Professors Richard Bevins and Doug Robinson) and attended all of the meetings and field trips at select locations around the world. She was also a member of the 'Illite Crystallinity Working Group' (led by Professor Hannah Kish). Covadonga also served as the Chair of the Committee on Electronic Communications on behalf of The Clay Minerals Society (April 2010) upon invitation by the President, Dr Derek Bain.

Covadonga was widely known as an expert in the study of the processes and transformations in rocks during the early stages of

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PS. See also the note that appeared on page 392 of Volume 19, Number 6 (December 2023) of *Elements*, in which Kevin Murphy kindly wrote the following words: 'Covadonga Brime: A member of the Society and friend of the Mineralogical Society has departed this world. Covadonga Brime was a regular delegate at clay conferences and was easily recognized by her warm welcome and ready smile. Farewell.'

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**Figure 1.** Professor Covadonga Brime (Oviedo, Spain, spring 1983).

metamorphic recrystallization and low-degree metamorphism all over the world, but especially in north-west Spain, eastern Austria and in the Carnic Alps (Austria and Italy). The following lists many of her collaborations throughout her career: with Susana García López, Mariluz Valín, Fernando Bastida and Jesus Aller she studied the tectonothermal evolution of the western nappes in the Cantabrian Zone (Variscan Belt of north-west Spain). Together with Jose Antonio Sáenz de Santa María, she worked on the low-grade metamorphism in the Asturian

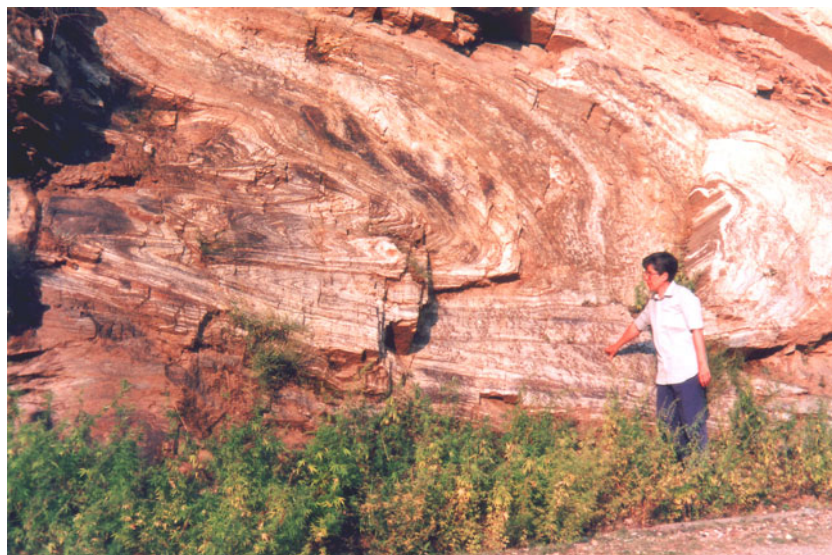
Central Coalfield (north-west Spain). She worked with the late John A. Talent and the late Ruth Mawson on the correlation between clay minerals and organic maturity indicators for the Silurian to Tournaisian of eastern inland Australia, and she studied thermal evolution in the Townsville Hinterland of north-eastern Australia. She worked with Robin Offler on low- and very-low-grade metamorphism in the Nambucca Block in the southern New England Fold Belt in eastern Australia. She collaborated with Enrique Estrada on clay digenesis in the San Jorge Gulf Basin (Argentina). Denny Eberl was her collaborator for work on the crystal-growth mechanisms of diagenetic low-grade illites determined using the shapes of crystal thickness distributions. Finally, she partnered with María Christina Perri, Monica Pondrelli, Claudia Spalletta and Corrado Venturini for work on the thermal evolution of the pre-Variscan sequence of the Carnic Alps (Austria and Italy).

All the while, Covadonga also managed to develop another of her passions: brachiopods (Fig. 3). With Fernando Alvarez and Gordon B. Curry, she conducted a comparative study of the structure (microstructure and composition) and growth of fossil and Recent Brachiopoda, taking their shells as an example of the controlled formation of biominerals. She also studied the variation in shell morphology and problems associated with the compilation of data matrices for phylogenetic analysis and the preparation of electronic databases.

She was invited to give two lectures, the first at Nanjing Academia Sinica (China) with the title 'Geological Evolution of the Iberian Peninsula, Spain' on 28 May 1992, and the second at Ruprecht Karls Universität, Heidelberg (Germany), with the title 'Diagenesis in the Palaeozoic rocks of the Cantabrian Mountains, Spain' on 2 December 1999. She attended 25 conferences in 11 countries, at which she presented 15 papers. She was an active member of 15 societies, of which four were Spanish. She made sabbatical visits at various universities and research centres around the world.

In 2012, Oviedo University awarded her a gold medal for her dedication to the institution.

Academic achievement is only part of the story, of course. Covadonga will be remembered as a jovial and very generous person, a strong woman but patient with her students, for her warmth and kindness, her ability to inspire, encourage and



**Figure 2.** Photo of Covadonga Brime, taken in September 1999, at the Khunjerab Pass, located at the border between Pakistan and China.





**Figure 3.** Covadonga Brime with (from left) Sir Alwyn Williams (University of Glasgow), Lady Joan Williams, and Fernando Alvarez (Roscoff, Brittany, Finisterre, September 1985).

support, her willingness to give sound, considered advice when asked, her deeply held sense of ethics and integrity, with a sharp mind and a wonderful sense of humour, a love of irony and an ability to see the funny side of most things, who was a joy to work with in the lab and in the field. Covadonga, we will miss your smiling face around here!

Covadonga suffered breast cancer in 2011, lived with a pace-maker from 2016 onwards and, having been diagnosed with chronic lymphoid leukaemia in 2019, died in August 2022 at the age of 72.

To finish, I will copy here a beautiful wish in Irish that Kevin Murphy sent me just after Covadonga has departed this world:

*'Ar dheis Dé do raibh a h'anam'* (May her soul be at God's right hand).

Kevin also performed a detailed and very much welcome review of this appreciation.

I treasure the written tributes from graduate students and colleagues and the many happy memories that will sustain me at this difficult time.

## Publications

- Aller J. & Brime C. (1985) Deformación y metamorfismo en la parte sur de la Cuenca Carbonífera Central (NO de España). Pp. 541–548 in: *Congrès international de Stratigraphie et de Géologie du Carbonifère. Compte Rendu Dixième*, vol. 3. Congress of Carboniferous Stratigraphy and Geology, Madrid, Spain.
- Aller J., Bastida F., Brime C. & Pérez-Estaún A. (1987) Cleavage and its relation with metamorphic grade in the Cantabrian Zone (Hercynian of north-west Spain). *Sciences Geologiques Bulletin*, **40**, 255–272.
- Aller J., Valín M.L., García-López S., Brime C. & Bastida F. (2005) Superposition of tectono-thermal episodes in the southern Cantabrian Zone (foreland thrust and fold belt of the Iberian Variscides, NW Spain). *Bulletin de la Société Géologique de France*, **176**, 487–498.
- Alonso O.E. & Brime C. (1990) Mineralogy, geochemistry, and origin of the underclays of the Central Coal Basin, Asturias, Spain. *Clays and Clay Minerals*, **38**, 265–276.
- Álvarez F. & Brime C. (1982) Aportaciones al conocimiento de las condiciones de formación de algunos depósitos fosilíferos de Devónico Cantábrico. *Trabajos de Geología*, **12**, 153–157.

- Álvarez F. & Brime C. (1983) Programa FORTRAN para el estudio biométrico de braquiópodos. *Estudios Geológicos*, **38**, 187–191.
- Álvarez F. & Brime C. (2000) Type specimens of athyrid brachiopods from the James Hall Collection. *The University of Kansas Paleontological Contributions (New Series)*, **12**, 1–15.
- Álvarez F., Brime C. & Brunton C.H.C. (1980) The authorship of the family Athyrididae (Brachiopoda). *Journal of Paleontology*, **54**, 1134–1135.
- Álvarez F., Brime C. & Curry G.B. (1987) Growth and function of the microfrills present on the Devonian brachiopod *Athyris campomanesi* (Verneuil & Archiac). *Transaction of the Royal Society of Edinburgh: Earth Sciences*, **78**, 65–72.
- Álvarez F., Brime C., Long S. & Trigo J. (2006) La concha de los braquiópodos: un ejemplo de formación controlada de biominerales. *Macla*, **6**, 49–52.
- Álvarez F., Curry G.B. & Brime C. (1985) Contribución al estudio comparativo de la estructura y crecimiento de la concha de braquiópodos actuales y fósiles. *Trabajos de Geología*, **15**, 211–217.
- Álvarez F., Curry G.B., Brime C. & Anadón N. (2010) Variation in the shell morphology of *Compsothyris* (Brachiopoda, Recent): an example of the problems associated with the compilation of data matrices for phylogenetic analysis and the preparation of electronic databases. In: *Evolution and Development of Brachiopod Shell* (F. Alvarez, & G.B. Curry, editors). *Special Papers in Palaeontology*, **84**, 13–39.
- Ayllón-Quevedo F., Bakker R.J., Warr L.N. & Brime C. (2000) A fluid inclusion study of syndeformation quartz–carbonate veins in the Stephanian rocks of the Cantabrian Zone, NW Spain (M. Frey & T. Bechstädt, editors). *Diagenesis and low grade metamorphism, Beriche der Deutschen Mineralogischen Gesellschaft z European Journal of Mineralogy*, **12**, 1.
- Bastida F., Brime C., García-Lopez S., Aller, J., Valín, M.L. & Sanz-López, J. (2002) Tectono-thermal evolution of the Cantabrian Zone (NW Spain) (S. García-Lopez & F. Bastida, editors). *Paleozoic conodonts from Northern Spain. Instituto Geológico y Minero de España, serie Cuadernos del Museo Geominero*, **1**, 105–123.
- Bastida F., Brime C., García-López S. & Sarmiento G.N. (1999) Tectonothermal evolution of the western nappes in the Cantabrian Zone (Variscan Belt of NW Spain). *International Journal of Earth Sciences (Geologische Rundschau)*, **88**, 38–48.
- Brime C. (1980) Influencia del modo de preparación de las muestras en la relación  $I(002)/I(001)$  de las micas. *Breviora Geológica Astúrica*, **24**, 24–28.
- Brime C. (1981) Postdepositional transformation of clays in Palaeozoic rocks of northwest Spain. *Clay Minerals*, **16**, 421–424.
- Brime C. (1981) Preparación de agregados orientados de arcillas para su estudio mediante difracción de rayos X. *Breviora Geológica Astúrica*, **25**, 13–16.
- Brime C. (1985) A diagenesis to metamorphism transition in the Hercynian of north west Spain. *Mineralogical Magazine*, **49**, 481–484.

- Brime C. (1985) Reproducibilidad de las determinaciones mineralógicas cuantitativas mediante difracción de rayos X. *Trabajos de Geología*, **15**, 291–298.
- Brime C. (1985) The accuracy of X ray diffraction methods for determining mineral mixtures. *Mineralogical Magazine*, **49**, 531–538.
- Brime C. (1991) Metamorphism in the north-eastern Iberian Massif (NW Spain). P. 10 in: *Low Temperature Metamorphic Processes in Contrasting Geodynamic Settings* (P.L.R. Browne & S.F. Simmons, editors). University of Auckland, Auckland, New Zealand.
- Brime C. (1999) Metamorfismo de bajo grado: ¿diferencias en escala o diferencias en grado metamórfico? *Trabajos de Geología*, **21**, 61–66.
- Brime C. (2004) Teaching clay sciences. (A. Rule & S. Guggenheim, editors). *Clay Minerals*, **39**, 511–512.
- Brime C. (2007) *Clay Mineralogy: An Introductory Course on a CD* by R. E. Ferrel. The Clay Minerals Society. *Clay Minerals*, **42**, 143–144.
- Brime C. & Álvarez F. (1984) Programa FORTRAN para el análisis monovariante y bivariante de poblaciones. *Trabajos de Geología*, **14**, 121–130.
- Brime C. & Eberl D.D. (2002) Crystal growth of diagenetic low grade illites determined using shapes of crystal thickness distributions. *Schweizerische Mineralogische und Petrographische Mitteilungen*, **82**, 203–209.
- Brime C. & Eberl D.D. (2002) Growth mechanisms of low-grade illites based on shapes of crystal thickness distributions. *Schweizerische Mineralogische und Petrographische Mitteilungen*, **82**, 203–209.
- Brime C. & Pérez-Estaún A. (1980) La transición diagénica metamorfismo en la región del Cabo de Peñas. *Cuadernos Laboratorio Geológico de Laxe*, **1**, 85–97.
- Brime C. & Sancho J.P. (1977) Análisis cuantitativo de cinabrio en mezclas de cuarzo y cinabrio por difracción de rayos X. *Industria Minera*, **173**, 43–49.
- Brime C. & Valín M.L. (2006) Asociaciones con cloritoide en rocas de bajo grado metamórfico de la Unidad del Pisuerga Carrión (Zona Cantábrica, NO de España). *Macla*, **6**, 105–108.
- Brime C., Castro M. & Valín M.L. (2001) Characterization of illitic assemblages in low grade rocks. P. 61 in: *Clay Minerals Society, 38<sup>th</sup> Annual Meeting, Abstracts*. Clay Minerals Society, Chantilly, VA, USA.
- Brime C., Castro M. & Valín M.L. (2002) Recognizing illitization progress from diagenesis to very-low grade metamorphism in rocks of the Cantabrian Zone (NW Spain). *Schweizerische Mineralogische und Petrographische Mitteilungen*, **82**, 211–219.
- Brime C., García-López S., Bastida F., Valín M.L., Sanz-López J. & Aller J. (1999) Análisis de la variación del índice de alteración del color de los conodontos (CAI) en el sector NW de la Zona Cantábrica. *Colección Temas Geológico-Mineros*, **26**, 196–198.
- Brime C., García López S., Bastida F., Valín M.L., Sanz-López J. & Aller J. (2001) Transition from diagenesis to metamorphism near the front of the Variscan regional metamorphism (Cantabrian Zone, northwestern Spain). *Journal of Geology*, **109**, 363–379.
- Brime C., Perri M.C., Pondrelli M., Spalletta C. & Venturini, C. (2003) Thermal evolution of Palaeozoic-Triassic sequences of the Carnic Alps: Kübler Index and conodont Colour Alteration Index evidence. *Atti Ticinensi di Scienze della Terra*, **9**, 77–82.
- Brime C., Perri M.C., Pondrelli M., Spalletta C. & Venturini, C. (2008) Polyphase metamorphism in the eastern Carnic Alps (N Italy–S Austria): clay minerals and conodont Colour Alteration Index evidence. *International Journal of Earth Sciences*, **97**, 1213–1229.
- Brime C., Sancho J.P. & Verdeja, L.F. (1978) Possible utilization of some Spanish Tertiary clays as alumina ore. *Proceedings of 4th International Congress of ICSOBA*, **3**, 18–30.
- Brime C., Talent J.A. & Mawson R. (1998) Transition from diagenesis to metamorphism in the Townsville hinterland of northeastern Australia. Presented at: *IGCP 421*, Sydney, Australia.
- Brime C., Talent J.A. & Mawson R. (2000) Thermal evolution in The Townsville Hinterland of northeastern Australia. Presented at: *IGCP 421*, Sydney, Australia.
- Brime C., Talent J.A. & Mawson R. (2001) Thermal evolution in the Townsville Hinterland of northeastern Australia. Presented at: *EUG XI*, Strasbourg, France.
- Brime C., Talent J.A. & Mawson R. (2003) Low-grade metamorphism in the Palaeozoic sequences of the Townsville Hinterland, northeastern Australia. *Australian Journal of Earth Sciences*, **50**, 751–767.
- Brime C., Valín M.L. & Castro M. (2000) Illitization in very low grade rocks. Characterization using deconvolution analysis. *Berichte der Deutschen Mineralogischen Gesellschaft/European Journal of Mineralogy*, **12**, 23.
- Brime C., Valín M.L. & Castro M. (2001) Recognizing Illitization processes in very low grade rocks. Presented at: *EUG XI*, Strasbourg, France.
- Castro M., Brime C., Sáenz de Santa María J.A. & Gutierrez A. (2000) Indicadores de metamorfismo de bajo grado en el Carbonífero de la Cuenca Central Asturiana. *Geotemas*, **1**, 219–222.
- Castro M., Brime C., Valín M.L. & Sáenz de Santa María J.A. (2000) Caracterización de los porcosos de illitización en el Carbonífero de la Cuenca Carbonífera Central Asturiana. *Cadernos do Laboratorio Xeolóxico de Laxe*, **25**, 211–214.
- Estrada E. & Brime C. (1996) Filossilicatos de las formaciones Meseta Espinosa y Cañadón Seco (Cretácico Superior, Sector SE de la Cuenca del Golfo San Jorge). *Boletín Asociación Argentina de Arcillas*, **8**, 365–367.
- Estrada E. & Brime C. (1997) Clay diagenesis in the San Jorge Gulf Basin (Argentina). Pp. 49–50 in: *Clay Mineral Evolution. Basin Maturity and Mudrock Properties* (R. Merriman, editor). British Geological Survey, Nottingham, UK.
- Estrada E. & Brime C. (1997) Evolución diagénica de los filossilicatos de la Cuenca del Golfo San Jorge (Argentina). *Boletín de la Sociedad Española de Mineralogía*, **20**, 115–116.
- Estrada E. & Brime C. (1998) Formación autigénica de illita, en el Cretácico Superior del Koluél Kaike (Cuenca del Golfo San Jorge). Pp. 59–68 in: *Actas de la VII Reunión Argentina de Sedimentología*. V.M. Hanne, Salta, Argentina.
- Estrada E. & Brime C. (1999) Transformación progresiva de interestratificado I/S con la diagénesis en la Cuenca del Golfo San Jorge: Estudio mediante microscopía electrónica de transmisión de alta resolución. Pp. 456–459 in: *XIV Congreso Geológico Argentino, Actas I*. V.M. Hanne, Salta, Argentina.
- García-López S., Bastida F., Brime C., Aller J., Valín M.L., Sanz-López J. *et al.* (1999) Los episodios metamórficos de la Zona Cantábrica y su contexto estructural. *Trabajos de Geología*, **21**, 177–187.
- García-López S., Brime C., Bastida F. & Sarmiento G.N. (1997) Simultaneous use of the thermal indicators to analyse the transition from diagenesis to metamorphism: an example from the Variscan Belt of northwest Spain. *Geological Magazine*, **134**, 323–334.
- García-López S., Brime C., Valín M.L., Sanz-López J., Bastida F., Aller J. & Blanco-Ferrera, S. (2007) Tectonothermal evolution of a foreland fold and thrust belt: the Cantabrian Zone (Iberian Variscan Belt, NW Spain). *Terra Nova*, **19**, 469–475.
- García-Ramos J.C., Aramburu C. & Brime C. (1984). Kaolin tonstein of volcanic ash origin in the Lower Ordovician of the Cantabrian Mountains (NW Spain). *Trabajos de Geología*, **14**, 121–130.
- Kisch H.J., Arkai P. & Brime C. (2004) On the calibration of the illite Kübler Index (illite 'crystallinity'). *Mineralogische und Petrographische Mitteilungen*, **84**, 313–321.
- Liu S.F., Offler R. & Brime C. (1993) Low and very low grade metamorphism in the Nambucca Block in the southern New England Fold Belt, eastern Australia. Pp. 223–229 in: *New England Orogen, Eastern Australia* (P.G. Flood & J. C. Aitchison, editors). University of New England, Armidale, Australia.
- Offler R. & Brime C. (1994) Characterization of the low grade metamorphism in the Nambucca Block (NSW, Australia). *Revista Geológica de Chile*, **21**, 285–293.
- Sancho J.P., Igeasias J.J., Brime C. & Verdeja L.F. (1981) Mechanical activation of non bauxitic aluminous ores. *Travaux ICSOBA*, **16**, 71–82.
- Sancho J.P., Verdeja L.F., Brime C. & Encinas M. (1981) Activación y reactividad de materiales aluminosos no bauxíticos. *Revista de Minas*, **2**, 19–50.
- Sancho J.P., Verdeja, L.F., Encinas M. & Brime C. (1981) Some new contributions on the processing on non bauxitic aluminous ores. *Travaux ICSOBA*, **16**, 83–87.
- Valín M.L., García-López S., Brime C., Bastida F. & Aller J. (2016) Tectonothermal evolution in the core of an arcuate fold and thrust belt: the south-eastern sector of the Cantabrian Zone (Variscan Belt, north-western Spain). *Solid Earth*, **7**, 1003–1022.