

## Giovanni Barla

([giovanni.barla@polito.it](mailto:giovanni.barla@polito.it); [giovanni.barla2@gmail.com](mailto:giovanni.barla2@gmail.com))



Giovanni Barla graduated in mining engineering from Politecnico di Torino in 1965. He moved to Columbia University, New York, where he obtained the MScEng degree in 1967 and the DScEng degree in 1970, with a thesis on the analytical and numerical (finite element method) analysis of stress distribution around underground

excavations. He came back to Italy and joined the Politecnico di Torino as assistant professor and was in charge of the first course on rock mechanics taught in the Italian universities.

Subsequently, Giovanni Barla became associate professor and then full professor of rock mechanics at the Politecnico di Torino in 1980. There he developed and taught courses on rock mechanics principles, advanced topics in rock mechanics and rock engineering, and numerical methods in geotechnical engineering. His lectures are published in Italian and are available in ppt format and note-books. Also available is a 25 hour lecture series on rock mechanics fundamentals prepared in 2005, currently broadcasted by the Nettuno TV Open Sky University Network.

In the mid-seventies he was appointed as associate professor of rock mechanics at Columbia University, New York, where he taught post graduate courses on rock mechanics and rock engineering, and numerical methods. He carried out research in the framework of contracts financed by the US Department of Energy and by the US Bureau of Mines. At the Politecnico di Torino Giovanni Barla has been vice-president of the School of Engineering and head of the Department of Structural and Geotechnical Engineering from 2003 to 2011.

The research interests of Giovanni Barla span over a variety of topics in the fields of rock mechanics, tunnel engineering, rock slope and dam engineering, numerical methods in geomechanics. It should be observed that he is among

the small group of European researchers who studied and applied the finite element method in the field of rock and soil mechanics since the early developments of the technique. Giovanni Barla is author and co-author of more than 300 papers that appeared in international journals, in proceedings of national and international conferences and as chapters of edited books.

These papers cover a number of subjects, such as: laboratory and in situ testing, with major interests in weak rocks and rock discontinuities; rock mass characterization and classification; numerical modelling; performance monitoring and back analysis; rock-structure interaction for underground works and tunnels; surface and underground mining; near-surface tunnels, with particular reference to ground treatment, pre-stabilization, and pre-support; tunnels and cavities in weak rocks with major interest in squeezing and swelling ground; mechanized tunneling; stability assessment of artificial cuts and natural slopes; rock falls; active and passive protective measures; stabilization and reinforcement measures; analysis of the foundations of dams.

Due to his intense and broad research activity, Giovanni Barla received relevant recognitions such as the ISRM Fellow nomination in 2012, the IACMAG award for outstanding contributions in 2014, and the Emeritus Membership of AGI, the Italian Geotechnical Society, in 2015. He is Honorary Professor of Chongqing University and member elected of the Torino Academy of Science. He was and is invited to deliver lectures in a number of European and Oversea universities and at international conferences, including webinars and online conferences. He delivered on 16 December 2016 the 16<sup>th</sup> ISRM Online Lecture.

He was president of AGI (Italian Geotechnical Association), vice-president for Europe of ISRM; president of the ISRM Commission on squeezing rocks in tunnels. Giovanni Barla is currently editor of the Rock Mechanics and Rock Engineering Journal, publishing more than 200 papers per year. Prior to becoming editor of the above journal, he has been member of the editorial boards of the International Journal of Rock Mechanics and Mining Sciences, of the International Journal of Numerical and Analytical Methods in Geomechanics and of the International Journal of Geomechanics.

Giovanni Barla organized and chaired a number of international symposia and workshops. Among them, it is worth to mention the joint US-Italy Workshop on Characterizing and Modelling Rock Mass for Design and Construction of Underground Cavities (1982); Eurock'96-International ISRM Symposium on

“Prediction and Performance in Rock Mechanics and Rock Engineering” (1996); the 11<sup>th</sup> IACMAG Conference (2005). Since 1986, Giovanni Barla organizes every two years at the Politecnico di Torino the series of MIR (Meccanica ed Ingegneria delle Rocce) workshops on emerging issues in rock mechanics and rock engineering, which are always published in book format.

Giovanni Barla is also an active international consultant. His activity is strictly related to his studies, providing valuable hints for pursuing new research topics, and brought him to become, during the nineties, principal and member of the International Board of Golder Associates. The projects in which he acted as designer, geotechnical consultant or responsible of the numerical studies are numerous and concern a variety of topics in rock engineering, including rock slopes, deep seated rock slides, dam foundations, conventional and mechanized tunnel excavations, and mining engineering.

Giovanni Barla is presently involved in a number of underground projects in Italy and abroad. He is contributing significantly at the design stage and during construction of the Alpine Base Tunnels and tunnels being excavated in difficult ground conditions, by using both conventional and/or mechanized excavation methods. In these cases rock mechanics and rock engineering concepts, including analytical and numerical modelling coupled with performance monitoring, are being applied systematically and novel methods for efficient and safe construction underground are being developed.

Giovanni Barla is as well working on a number of rock slope stability problems dealing with high rock cuts, natural rock slopes and deep seated landslides, with interest in the analysis of the interaction with man-made structures such as dams, civil infrastructures, tunnels (both hydroelectric and railway/highway tunnels), including inhabited areas. Also in these cases rock mechanics and rock engineering concepts, including numerical modelling and performance monitoring are being applied systematically. In particular the interest is devoted to the development of civil protection strategies for rockslide hazard assessment, methods for real time monitoring and early warning.

Giovanni Barla has wide experience in forensic geotechnical engineering, when dealing with important cases in Italy and Abroad, where the main effort has been and is to apply science and engineering within the rules and practice of the legal system. In these cases, the main effort has always been and is to be effective in properly representing reality and resolving conflicts. Cases of

significance are problems dealing with tunnels during excavation in terms of stability conditions and related accidents, selection of design solutions in difficult tunneling conditions, and cases where tunneling resulted in interaction with the ground surface (e.g. reactivation of dormant landslides and induced subsidence) and manmade structures (e.g. buildings, bridges, viaducts).

### **Selected Technical Papers (2010 to present)**

“Time dependent deformations in squeezing tunnels” - International Journal of Geoengineering - Case Histories, vol. 2 n. 1, pp. 40-65, 2010 (M. Bonini, D. Debernardi).

“Performance monitoring and analysis of a yield-control support system in squeezing rock” - Eurock 2010, Lausanne, June 15-18, 2010. pp. 459-462 (M. Bonini, M. Semeraro)

“Three-dimensional mixed continuum-discontinuum numerical simulation of the Beauregard Landslide” - .European Rock Mechanics Symposium, Lausanne, Switzerland, 15-18 June 2010. pp. 639-642 (K.S. Kalenchuk, D.J. Hutchinson, M.S. Diederichs, M. Barla, G. Piovano)

“Monitoring of the Beauregard landslide (Aosta Valley, Italy) using advanced and conventional techniques”, Engineering Geology, vol. 116, pp. 218-235, 2010 (F. Antolini, M. Barla, E. Mensi, G. Piovano)

“Progress in the understanding of deep-seated landslides from Massive Rock Slope Failure” - ISRM - International Symposium, New Delhi, October 23-27, 2010

“Engineering geology of Alpine Tunnels: past, present and future” - 11<sup>th</sup> IAEG Congress, Auckland, September 5-10, 2010. pp. 201-254 (S. Loew, M. Diederichs)

“Stability Analysis of a Rock Column in Seismic Conditions” - Rock Mechanics and Rock Engineering, vol. 43, pp. 845-855, 2010 (M. Barbero)

“Integration of Ground-Based Radar interferometry and conventional techniques for monitoring the Beauregard deep-seated landslide” - 8<sup>th</sup> International Symposium on Field Measurements in GeoMechanics 2011, Berlin, 12-16 September 2011 (F. Antolini, M. Barla, E. Mensi, G. Piovano)

“Wave propagation in jointed rock masses by analytical and distinct element methods” - 13<sup>th</sup> International Conference of the International Association for

Computer Methods and Advances in Geomechanics, Melbourne (Australia), 9 - 11 May 2011, pp. 817-822 (A. Perino)

“Analysis of the behaviour of a yield-control support system in squeezing rock” - Tunnelling and Underground Space Technology, vol. 26, pp. 146-154, 2011 (M. Bonini, M. Semeraro)

“Seismic response of a single and a set of filled joints of viscoelastic deformational behaviour” - Geophysical Journal International, pp. 1315-1330, 2011 (J.B. Zhu, A. Perino, G.F. Zhao, J.C. Li, G.W. Ma, J. Zhao)

“FEM/DEM modeling of a slope instability on a circular sliding surface” - 13<sup>th</sup> International conference of Iacmag, Melbourne, 9-11 May 2011. pp. 1135-1140 (G. Piovano, M. Barla)

“3D numerical modelling and settlement monitoring during excavation of the Metro -Torino South extension” - 7<sup>th</sup> International Symposium TC28, Rome, 16-18 May 2011 (M. Barla, G. Leuzzi)

“Geotechnical monitoring of a subway tunnel in service below the rail link under construction in Torino” - Geomechanics und Tunnelling, vol. 4, n. 5, pp. 393-404, 2011 (M. Alessio, F. Antolini, M. Barla, M. Gilardi)

“Stabilization of a landslide in Valgrisenche, Italy” - 12<sup>th</sup> International Congress on Rock Mechanics, Beijing, 19-22 October 2011, pp. 695-696, 2011 (F. Antolini, M. Barla)

“Rock Slide Simulation with the Combined Finite Discrete Element Method” – International Journal of Geomechanics, vol. 12, n. 6, 2012 (M. Barla; G. Piovano; G. Grasselli)

“Wave Propagation in Discontinuous Media by the Scattering Matrix Method” - Rock Mechanics and Rock Engineering, vol. 45, n. 5, pp. 901-91, 2012 (A. Perino, R. Orta)

“Resonant column apparatus tests and DEM analyses of intact and fractured rock specimens” - Second International Conference on Performance-based design in earthquake geotechnical engineering, Taormina (Italy), May 28-30, 2012 (A. Perino)

“Geotechnical aspects of the L'Aquila earthquake” - Special Topics in Earthquake Geotechnical Engineering/Sakr M.A., Ansal A. Springer, Dordrecht Heidelberg London New York, pp. 1-66, 2012 (P. Monaco, G. Totani, A. Cavallaro, A. Costanzo, A. D'Onofrio, L. Evangelista, S. Foti, S. Grasso, G. Lanzo, C. Madiati, M. Maraschini, S. Marchetti, M. Maugeri, A. Pagliaroli, O. Pallara, A. Penna, F. Santucci De Magistris, A. Saccenti, G. Sca)

“Turin Metro Line 1 south extension - modelling and settlement monitoring” – Geomechanics and Tunnelling, vol. 5, n. 3, 2012 (M. Barla, G. Gianoglio)

“Torino subsoil characterisation by combining site investigations and numerical modeling” – Geomechanics and Tunnelling, vol. 3, n. 8, 2012 (M. Barla)

“Analytical and numerical modelling of underground structures in seismic conditions” - WTC 2012, Bangkok - Thailand, 18-23 May 2012 (Q. Lu, A. Perino)

“2D and 3D continuum static and dynamic modeling of a large span powerhouse cavern in Italy” - Eurock 2012, Stockholm, 28-30 May 2012 (Q. Lu, A. Perino)

“The Saint Martin La Porte access adit (Lyon-Turin Base Tunnel) revisited” - Tunnelling and underground Space Technology, vol. 30, pp. 38-54, 2012 (M. Bonini)

“3D numerical modelling and settlement monitoring during excavation of the Metro-Torino South extension” - Geotechnical Aspects of Underground Construction in Soft Ground, Rome, September 2012, pp.911-918, (M. Barla, G. Leuzzi)

“Time-Dependent Modeling of Tunnels in Squeezing Conditions” - International Journal of Geomechanics, vol. 12, n. 6, pp. 697-710, 2012 (D. Debernardi, D. Sterpi)

“State of Stress in Tunnel Lining in Squeezing Rock Conditions” - Rock Mechanics and Rock Engineering, vol. 46 n. 2, pp. 405-411, 2013 (G. Lancellotta, M. Bonini)

“A Laboratory Shear Cell Used for Simulation of Shear Strength and Asperity Degradation of Rough Rock Fractures” - Rock Mechanics and Rock Engineering, vol. 46, n. 4, pp. 683-699, 2013 (M. Asadi, V. Rasouli)

“Continuum-Discontinuum Modelling of Failure and Evolution Mechanisms of Deep Seated Landslides” – Sixth International Conference on Discrete Element Methods (DEM 6), Golden, August 2013 (F. Antolini, M. Barla, G. Piovano)

“Is 3D modeling of TBM excavation in squeezing rock a feasible and useful design tool?” - Luis Vigl Festschrift zum 60. Geburtstag, September 2013

“Key aspects in 2D and 3D Modelling for the Stability Assessment of a High Rock Slope” - Workshop "Failure Prediction in Geotechnics" - 62<sup>nd</sup> Geomechanics Colloquy, Salzburg, October 2013 (F. Antolini, M. Barla, A. Perino)

“Guidelines for TBM tunnelling in squeezing conditions - a case study” - Géotechnique Letters 4 (4), pp.83-87, April 2014 (M. Barla, M. Bonini, D. Debernardi)

“Resonant Column Apparatus Tests on Intact and Jointed Rock Specimens with Numerical Modelling Validation” - Rock Mechanics and Rock Engineering, vol. 48, n. 1, pp. 197-211, 2014 (A. Perino)

“Analysis of Seasonal Slope Acceleration at the Beauregard Dam Site (Italy) Using CrEAM”, XII IAEG Congress, Torino, September 2014 (A. Engl, M. E. Martinotti, D. Kieffer)

“3D simulation of TBM excavation in brittle rock associated with fault zones: The Brenner Exploratory Tunnel case” Engineering Geology, October 2014 (K. Zhao, M. Janutolo, G. Chen)

“Underground powerhouse stability in sandstone and siltstone formations”, MIR 2014 Conference, November 2014, Torino

“TBM Tunnelling in deep underground excavation in hard rock with spalling behavior”, 43, Geomechanik-Kolloquium, November 2014, Freiberg

“Full face excavation in difficult ground”, Geomechanics and Tunnelling, vol. 7, n. 5, 2014 (P. Lunardi)

“3D thermo-hydro modeling and real-time monitoring for a geothermal system in Torino, Italy”, XVI ECSMGE 2015, Edimburg (M. Barla)

“Computational modelling of the mechanised excavation of deep tunnels in weak rock” - Computers and Geotechnics, vol. 66, pp. 158-171, 2015 (K. Zhao, M. Bonini, D. Debernardi, M. Janutolo, G. Chen)

“Lessons learned on deep-seated landslides activated by tunnel excavation” - Eurock 2015, Salzburg, October 7-10, 2015, published in Geomechanics and Tunnelling, vol. 8 (5), 2015 (D. Debernardi, A. Perino)

“FEM analysis of the existing and new linings for diversion tunnels no. 1 & 2 - Rogun dam & HPP project” - Eurock 2015, Salzburg, October 7-10, 2015

“Impact of Advance Rate on Entrapment Risk of a Double-Shielded TBM in Squeezing Ground” - Rock Mechanics and Rock Engineering, vol. 48, n. 3, pp. 1115-1130, 2015 (R. Hasanpour, J. Rostami)

“Geotechnical risk management approach for TBM tunnelling in squeezing ground conditions” - Tunnelling and Underground Space Technology, January 2016 (N. Swannel, M. Palmer, M. Barla)

“InSAR monitoring of tunnel induced ground movements” - Geomechanics and Tunnelling, vol. 9, n. 1, pp. 15-22, 2016 (S. Del Conte, A. Tamburini, C. Giannico)

“3D Laser scanner and thermography for tunnel discontinuity mapping” - Geomechanics and Tunnelling, vol. 9, n. 1, pp. 29-36, 2016 (F. Antolini, G. Gigli)

“Full-face excavation of large tunnels in difficult conditions” - Journal of Rock Mechanics and Geotechnical Engineering, March 2016

“Applications of numerical methods in tunnelling and underground excavations: Recent trends” - Eurock 2016, Cappadocia, August 2016

“Comprehensive study including testing, monitoring and thermo-hydro modelling for design and implementation of a geothermal system in Torino (Italy)”, Geomechanics and Geophysics for Geo-Energy and Geo-Resources, ISSN: 2363-8419 (Print) 2363-8427 (March 2017, Online)

“A TBM assembly cavern in the French Alps”. Geomechanics and Tunnelling Volume 10, June 2017, 3, pp. 256-264 (F. Gamba et al.)

“Case studies of tunnel instability and interaction with the ground surface and manmade structures”, Proceedings of the IF CRASC2017 Congress on Forensic Engineering, Milan, 14-17 September 2017

“Numerical modelling of deep-seated landslides interacting with man-made structures, Proceedings of the 15<sup>th</sup> IACMAG Conference on Computer Methods and Advances in Geomechanics, Wuhan, 19-23 October 2017