# Appendix

The writer is pleased to have been given this opportunity to offer an Editorial to Issue 4, Volume 7, 2015, of our journal, for the first time. The major focus of this Editorial is on the paper, "A theoretical derivation of the Hoek-Brown failure criterion for rock materials" by Jianping Zuo, Huihai Liu and Hongtao Li, published in this Issue. In the following, this paper will be referred to as Zuo et al. (2015). Using this paper as a vehicle, some comments will be offered on this journal's important peer review system. The paper is one of a great many that have appeared in the rock mechanics literature over the past 25–30 years dealing with the Hoek-Brown empirical strength criterion for rocks and rock masses. In the writer's opinion, the present paper is one of the best and most valuable of those papers. Some of these papers have criticised the criterion, others have sought to modify or adapt it in various ways, while still more have used the criterion in developing analytical or numerical solutions to real or imagined rock engineering problems. The great value of the paper by Zuo et al. (2015) is that it considers the basis and derivation of the Hoek-Brown criterion for intact rock using a fundamental, mechanically rigorous, fracture mechanics approach. Interestingly, in a review paper prepared in 2008, the writer (Brown 2008) referred positively to a then recently published paper by Zuo et al. (2008) that is referenced in their present paper. The Hoek-Brown empirical strength criterion was developed in the mid-to-late 1970s during the preparation of the book by Hoek and Brown (1980) in order to fill a perceived need in the tools and techniques then available in rock mechanics and rock engineering. The initial development was the work of Dr. Evert Hoek who, as indicated in the important recent paper by Hoek and Martin (2014), had worked on brittle fracture and Griffith crack theory early in his career. It is not often acknowledged that the original form of what came to be known as the Hoek-Brown criterion given by Eqs. (25) and (26) in Zuo et al. (2015) was chosen to be mathematically similar to the classical Griffith criterion discussed by Zuo et al. (2015) in their Introduction. This mathematical form is reflected by the square root terms in Eqs. (25) and (26).

The present paper by Zuo et al. (2015) shows how the Hoek-Brown criterion for intact rock material may be derived from first principles using micro-mechanics principles. Importantly, a comparison of Eqs. (24) and (26) shows that the Hoek-Brown parameter, $m$, may be expressed as $m = \mu\sigma_c/(\beta\sigma_t)$, where $\sigma_c$ and $\sigma_t$ are the uniaxial compressive and tensile strengths of the rock, respectively; $\mu$ is the coefficient of friction for the pre-existing sliding crack surfaces, and $\beta$ is a fracture mechanics parameter defined by Zuo et al. (2015).

Brown (2008) showed that, under some reasonable assumptions, $\mu/\beta \approx 1$, so that $m \approx \sigma_c/\sigma_t$. The paper also makes a significant contribution to the understanding of the brittle-ductile transition concept. Importantly, Eq. (28) shows that the confining pressure, at which internal micro-failure processes are completely constrained and the brittle-ductile transition is triggered, is also a function of the parameters $\mu$, $\beta$, $\sigma_c$ and $\sigma_t$. It is also shown that the value of the ratio $\sigma_c/\sigma_t$ influences the value of the confining pressure at the brittle-ductile transition.

Obviously, the international reputation and standing of a journal such as this depends on the quality of the papers that it publishes. Equally obviously, the quality of those papers reflects primarily the quality of the work carried out by the authors, but it also reflects the quality of the journal's internal review and editorial processes. It is essential that the review process be intellectually rigorous, thorough, honest and constructive, all with a view to ensuring that only high-quality, original papers are accepted for publication. It is one of the responsibilities of reviewers to suggest improvements to the paper where they are able to do so. In this journal, we also ask authors to declare whether or not they have any conflict of interest in submitting the paper for publication. The Editorial Board and Editorial Office depend greatly on the voluntary contributions of the journal's many reviewers. A list of the almost 300 people who acted as reviewers in 2014 was published on the last page of Volume 6, Issue 6.

A feature of the review process is that the identities of the two independent reviewers normally chosen to review each paper submitted for consideration for publication are not revealed to the authors. This is an essential safeguard for the overall integrity of the review process. However, the writer is now about to break this convention of confidentiality in order to make a salient point. The writer acted as one of the reviewers of the paper by Zuo et al. (2015) published in this Issue. Because he was already familiar with the work of Dr. Zuo and his colleagues through their earlier paper (Zuo et al. 2008), because he had a close personal connection with the subject of the paper, and not least because of the overall quality of the paper, the writer found his review task to be straightforward, stimulating and enjoyable. He was pleased to be able to recommend unhesitatingly that the paper be accepted for publication and, as is almost invariably the case even with the very best of papers, he may have suggested that a small number of minor changes be made to the text.

However, when he came to read the "in press" or online version of the paper before preparing this editorial, the writer quickly discovered a small number of errors in the text, one of them not exactly minor, that he had apparently overlooked in his initial review. (Thankfully, the Editorial Office has now corrected these errors

in the printed version of the paper.) This was a salutary experience for the writer who immodestly considers himself to be an experienced reviewer and editor having a good eye for detail. It also demonstrates how the quality of published papers depends, in part, on the rigour and thoroughness brought to their important tasks by our many volunteer reviewers. We are most grateful to them and to the authors who offer their contributions for publication in our journal. We all must be eternally vigilant in order to achieve and maintain the highest publication standards.

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## References

Brown ET (2008) Estimating the mechanical properties of rock masses. In: Potvin Y, Carter J, Dyskin A, Jeffrey R (eds.) Proceedings of the 1st Southern Hemisphere international rock mechanics symposium (Vol. 1), Perth, Australian Centre for Geomechanics. Perth, Australia, pp 3–22

Hoek E, Brown ET (1980) Underground excavations in rock, Institution of Mining and Metallurgy. London, UK

Hoek E, Martin CD (2014) Fracture initiation and propagation in intact rock e a review. J Rock Mech Geotech Eng 6(4):287–300

Zuo JP, Li HT, Xie HP, Ju Y, Peng SP (2008) A nonlinear strength criterion for rocklike materials based on fracture mechanics. Int J Rock Mech Min Sci 45(4):594–9

Zuo JP, Liu HH, Li HT (2015) A theoretical derivation of the Hoek-Brown failure criterion for rock materials. J Rock Mech Geotech Eng 7(4):361–6

## Note

The referred papers of Dr. Zuo (Zuo et al. 2008 and 2015) mentioned above have been given thorough demonstrations in Chaps. 2–4, respectively.