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RE: Evaluation of Marco Antonio Meggiolaro

Although I am now retired I still maintain an active teaching and research program. My area of expertise is fatigue and fracture. For many years I have served on the Promotion and Tenure Committee at the University of Illinois and am, therefore, very familiar with the process and expectations.

I first met Prof. Meggiolaro fifteen years ago during a trip to Brazil. Since that time I have actively kept up with his published work and always look forward to discussions with him at international conferences. Our last meeting was only a few weeks ago in Spain.

First let me state that I strongly support his promotion to Professor. His academic work and publication record are typical of those that we have promoted to Full Professor at the University of Illinois.

Here I will discuss only three of his more recent contributions. First is his work on 5D cyclic plasticity models which also serves as a basis for his most recent work on incremental damage. Plasticity models have traditionally been derived in either 6D space or with tensors. These formulations introduce numerical errors and violate plastic incompressibility. This is particularly difficult for neutral nonproportional loading. For the first time, he derived the incremental plasticity equations in 5D space. It avoids the incompressibility problem and no information is lost since the hydrostatic stresses are elastic.

The second paper in this body of work is related to editing complex 6D loading histories so that the dominate nonproportional loading effects are captured but smaller amplitude cycles

eliminated. This is needed to have a computationally efficient and stable solution. He solved this difficult problem by creating a filtering surface similar to the conventional yield surface in traditional plasticity models. He then developed a set of evolution equations to track the movement of the filtering surface. This work is original and unique. No one else in the field has thought about doing it this way.

The third paper in this body of work is work on incremental damage models. A few years ago Prof. Maggiolaro asked me what I thought was the biggest unsolved problem in multiaxial fatigue. I told him that the existing multiaxial models are limited because they require knowledge about the future to compute the fatigue damage. Yet any real material accumulates damage but knows nothing about the future. He solved a problem that has eluded me for twenty-five years. He recognized the importance of damage memory and plasticity and, most importantly, that the evolution of damage and plasticity are not linked. Many of the existing critical plane approaches can be accommodated in this new incremental damage model. For the critical plane approach, shear-shear damage surfaces are able to combine both Mode II and III damage in each candidate plane even under non-proportional loading.

When considering promotion, there is always an issue when a faculty member collaborates and has many publications with more senior faculty. Does the senior faculty act in a collaborative mentoring role, or do they direct the research? In this case I can state, without any reservation, the work I described above is the original work of Prof. Maggiolaro. How do I know? I still develop and maintain my own computer codes. When I first saw his papers I wanted to implement some of the ideas in my code to see how they worked. In this process I had many discussions with him about the how and why of the derivations. He described his thought process to me during our discussions.

I like going to conferences and listening to his presentations. There is always something new and exciting about his work. Frankly, I was surprised to learn that he has not already been promoted.

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