## *An Introduction to Granular Flow*

*by K. Rao and P. Nott*
*Cambridge (2009) $155.00*

**Reviewed by**
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Granular flows are ubiquitous in nature and industry, particularly in systems involving food, pharmaceutical, and chemical processes. Although it is extremely important to be able to characterize and model these systems, granular flow behavior is still not well-understood. A number of theoretical and empirical models have been proposed to describe the behavior of particulate systems, but there is still much room for refinement. This book gives a solid discussion of a broad range of topics related to granular flow, with much emphasis on theoretical modeling. The authors focus on continuum models, although there is some attention to discrete models as well. Overall, the book is well-written and provides a thorough overview of the current state of granular flow research.

The book begins with an introduction that previews a large number of areas including interparticle forces, packing, granular statics and flow, and modeling, with most of these topics covered in more detail in subsequent chapters. The authors do a good job of briefly describing each of these topics, and offer a lot of external references for further consideration. In my opinion, this chapter could easily be broken into two chapters, with the modeling sections discussed separately, in order to better organize the material. Some portions are a bit choppy and incomplete because too much information is presented at once. Dividing the material and adding more detail in certain places would definitely help with this.

The rest of the book delves into a detailed theoretical discussion of slow plane and three-dimensional flows, flows through hoppers and bunkers, and rapid flows. The material seemed a little unorganized and incomplete in places, and I was disappointed with the quality and placement of many of the figures and tables. I think the authors did an especially good job with Chapter 6 (Flow through Axisymmetric Hoppers and Bunkers), however. They provided a good mix of theory and experimental data, and I thought their figures in this section were interesting and useful.

Since most of the material is based on complex theories, the authors offer several appendices that provide a basic mathematics review. Operations with vectors and tensors, a brief analysis of the stress tensor, and methods to evaluate common integrals are a few topics covered here. I was very happy to see these appendices, because the authors assume the readers have a good understanding of advanced mathematics when discussing the material in the main portion of the text.

Each chapter ends with a set of practice problems. These problems were challenging but appropriate for the material in each section. It was interesting to note that many of the problems were adapted from other sources. I especially appreciated that each problem was labeled with a heading that described what concept was being tested. I am not sure if the authors offer a solutions manual for this textbook, but it would certainly be useful for instructors adopting the book for a course.

I disagree with the authors when they state that this book is appropriate for advanced undergraduates or beginning graduate students, at least in the chemical engineering discipline. The material is presented at a much higher level than what I would expect an undergraduate chemical engineering student to be able to handle. The amount of mathematics and modeling background required to understand the material and the authors' use of specialized vocabulary makes this book more appropriate for graduate students concentrating in particle technology related fields. I would recommend students first take an introductory particle technology course using an intermediate text such as Rhodes[1] so that they are better prepared for the material presented in this book.

My comments about the incompleteness of certain topics stem from the overwhelming amount of information available on granular flows. It would be impossible to cover everything without developing a series of texts about the topic. My overall impression of *An Introduction to Granular Flow*, however, is very positive, and I commend the authors for providing a solid reference for those interested in granular flows. They do a nice job of summarizing peripheral topics while going into the appropriate detail in their focus areas.

[1] *Rhodes,* Introduction to Particle Technology, *John Wiley & Sons, 2nd ed., 2008*

## *Good Mentoring: Fostering Excellent Practice in Higher Education*

*by Jeanne Nakamura and David J Shernoff*
*with Charles H. Hooker*
*Josey-Bass, 303 pages, $40 (2009)*

**Reviewed by**
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Is good mentoring in the genes? Can successful mentors automatically transmit their knowledge, skills, and values to the next generation of students? If so, how can these attributes be transmitted in a way that is most useful to their academic offspring? In an effort to better understand "how to keep what has been learned from being lost" *Good Mentoring* examines three lineages of scientists and the ability of their skills, values, and practices to be transmitted to their students and successive generations.

The general question that the authors are seeking to address is: "Can one generation's 'good workers' nurture similar com-

mitments in members of the next generation even as changing sociocultural conditions pose new challenges to the pursuit of excellence and ethics in a field?" Included in this question was a particular emphasis on the transmission of orienting values and principles uniting excellence with responsible practice. The authors postulate that "the best chance for their cultivation is likely to lie with teachers who embody these values and practices and the learning environments that the teachers create." Since graduate science education has a strong reliance on learning by apprenticeship, it is an ideal situation for examining mentoring of future generations.

While the subtitle is "Fostering Excellent Practice in Higher Education," the book is most relevant to a smaller subset of higher ed. In particular, the focus of the book is effective mentoring for supervisors in research. While the case studies focus on mentoring of graduate students and post-doctoral researchers in academia, the same outcomes are also applicable in any research mentoring situation including undergraduate researchers, government, or industrially sponsored research laboratories. Finally, both mentors and their students can gain insight into successful relationships from this work.

*Good Mentoring* is divided into three distinct parts. Part One presents case studies of each of the three lineages. Part Two summarizes the transmission of knowledge, practices, and values across the mentoring generations. Part Three then summarizes the key lessons learned and draws out implications for practitioners and researchers.

In Part One, the authors examine three scientists and their lineages through the second and third generation of academic offspring. In perhaps a bit of irony, all three of these academic lineages are in the field of genetics. The goal of these chapters is to provide a qualitative view of the approaches of each scientist towards successful research and mentoring. Subsequent discussion of second and third generations then provides insight into what knowledge was successfully passed down. From these second- and third-generation profiles, we also obtain some insight into how individual scientists affected the overall memes (building blocks of culture) of the lineage.

In Part Two, the authors take a quantitative approach to complement the previous profiles. Values and practices specific to each lineage are identified and the successful transition of these memes through three generations is quantified. Categories of memes common to all three lineages were also investigated.

From their quantitative analysis, the authors found that even the most widely inherited memes are inherited less from generation to generation. However, this is compensated for by the larger number of offspring in each generation and thus the absolute effect remains high. The mentors in this study transmitted memes "through two intertwined aspects: mentor's direct impact on the student through verbal exchanges and the mentor's indirect impact through student participation in the lab community." Contrary to the author's expectation, the influence on students by example and shaping the culture of the lab was just as important as intense personal interactions. The defining characteristic of positive mentoring was supportiveness. Supportiveness included: consistent availability and involvement, balance between freedom and guidance, frequent and specific positive feedback, treatment as respected colleagues, and individualized interest in the student. Good mentoring does not appear to include hectoring, guilt trips, yelling, insults, or subtle jabs.

In Part Three, the most important results are discussed and then concrete suggestions for mentor, mentees, and institutions are presented. For mentors, the most commonly cited resource was to facilitate students' building of social capital. For mentees, the authors recommend seeking out multiple influences since many of the worst cases of mentoring occur when a single person has significant control over the student. Finally, for institutions, good mentoring is a sound investment for the future and the reward structure should reflect this. There also need to be places in the institution for advisees to evaluate mentoring experiences similar to the way teaching evaluations provide feedback to classroom instructors.

All of the examples and conclusions are drawn from mentoring relationships between graduate students and their advisor (a faculty member). There is a significant amount of mentoring that goes on in higher education outside of what is investigated and discussed in this book, such as advisor/undergraduate researcher relationships and teacher/student classroom relationships. There are even mentoring relationships between established faculty members and new faculty members. While the authors don't investigate all of the higher education mentoring relationships, the conclusions from this study can help in all. In fact, one of the ripest areas for application of these conclusions would appear to be in the opportunities for institutions to improve the mentoring of new faculty by senior faculty.

How can this book best be used by faculty members today? Clearly, the most direct place is in the laboratory when mentoring students. The main results from the study indicate that simply being there for the students, showing a strong work ethic, and being flexible will result in a positive experience for the student and transmit desired good work practices on to the next generation of researchers. However, the ideas from this book can also be applied in the classroom. In addition, simply providing a welcoming, open, and safe environment for all can have positive results.

Since the authors examine the ability of effective mentoring memes to be passed down from advisor to academic offspring, the work becomes very mentor focused. Only in the last chapter do the authors discuss how a mentee should use the results of their study. Again, as a result of their premise, the authors tend to focus on academic offspring who have done well in academia. The applicability of mentoring on non-academic offspring does not appear to be addressed. Finally, while the point of this work was to investigate "stars" since they were capable of doing good academic work in parallel with performing good mentoring, the ability and effectiveness of "non-star" researchers to instill responsible practice in their academic offsprings is still unknown. ❐