Unearthed Treasures in the Work of a Late-13th-Century Chinese Mathematician?

To the Editor:

With interest I read Philip Davis's book review "Why Didn't They . . . ?" in *SIAM News* (January/February 2009, page 6; www.siam.org/news/news.php?id=1515). Encouraged by his recommendation, I borrowed the book *A History of Chinese Mathematics* by J.-C. Martzloff from the library. However, I am somewhat disappointed by the coverage of Zhu Shijie (ca. 1300) in this book.

LETTERS TO THE EDITOR

See Needham, Vol. 3, pp. 138, 139, for formulas due to Zhu Shijie (written by Needham as Chu Shih-Chieh), which were reformulated by Askey (*Orthogonal Polynomials and Special Functions*, SIAM, 1975, pp. 59, 60) as Vandermonde's sum (the explicit summation of the terminating Gauss hypergeometric function of argument-1). Vandermonde's sum is now called the Chu–Vandermonde sum by the special functions community.

Martzloff, however, does not mention this work by Zhu Shijie. He does treat in some detail in Chapter 18 the much later (19th century) work of Li Shanlan. The formula (18.1) there can be reformulated as a special case of Saalschutz's formula for hypergeometric $_3F_2(1)$. According to secondary sources quoted by Askey, this formula (18.1), too, seems to go back to Zhu Shijie. However, the only mention of Zhu Shijie in Chapter 18 is in a quote from the preface of the book by Li Shanlan:

"Master Zhu Shijie from the Yuan dynasty is the only one who has made use of the prescriptions relating the piling up of heaps in the chapters of his Siyuan yujian. . . . But his intention was only to expound the algebra and for that reason he presents the piling up of heaps neither precisely nor methodically."

Martzloff speculates in this chapter about influences on Li Shanlan by Western mathematical work. But if some of Li Shanlan's formulas go back to Zhu Shijie, then Western influence on this part is less probable.

Needham, after the formulas quoted by Askey, hints at "many other formulas of similar nature" given by Chu Shih-Chieh. I would like to see a transcription of this part of Chu's writings, to learn what further treasures his work might contain.—*Tom Koornwinder, Korteweg-de Vries Institute for Mathematics, University of Amsterdam.*