

The following review appeared in *Fireworks Business*, December, 2003.

The Design Criteria for Chrysanthemum Shells by T. Shimizu

Published by the Journal of Pyrotechnics as Part 4 of the Selected Pyrotechnic Publications of Dr. Takeo Shimizu.

The 91-year-old Takeo Shimizu is still active in fireworks; he has been spending much of his time lately translating some of his earlier works into English. Happily, one of those recently offered is his 1955 PhD thesis. It's everything you ever wanted to know about chrysanthemum shells – and more, much more.

Chrysanthemum shells are the epitome of Japanese fireworks. Who among us has failed to be awed by a flawlessly executed *warimono*? As the author pointed out in his Preface, such shells were always manufactured using the producer's experience and intuition. Dr. Shimizu's thesis aimed to introduce scientific methods of producing the magnificent shells by using experiments and calculations. The shells require proper stars and most importantly, the proper bursting charge. These matters he covered in amazing detail.

The book is organized into 8 chapters: 1) Preface. 2) Basic chrysanthemum construction. 3) Design problems. 4) Pre-calculations and preparation for experiments. 5) Burst charge experiments. 6) Star velocity formulas. 7) Ballistic tables for moving stars. 8) Comparison of calculated and experimental ballistics.

There are many, many tables, lots of illustrations, and some photographs. Sorry to say, the original photos were no longer available, and only photocopies of the photos were made available to the publisher, so the photos in the book are mostly of lesser quality.

The math is heavy and some of the tables are quite complicated with vast amounts of data, as would be expected in a PhD thesis. If you don't wish to handle the math or fold your intellect into the complexities of the tables, no harm is done for they merely prove the statements he makes in the text.

Anyone serious about his fireworks knowledge must have this publication in his library. It's a surprisingly easy read if you don't get involved in the math and complex tables.

At 164 pages, full size 8½x11", this book lays bare the secrets of Japanese chrysanthemum shell construction. It even has some formulations for the proper stars for this type of shell.

The cover price is \$40, but the price to fireworks people is \$24. It's available only from the Journal of Pyrotechnics, Inc.