Blocks, curves, and splits: A glimpse into the O'Leary toolbox

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But first, let's observe that a huge part of Dianne's impact derives from her 24 PhD students.

Mansuk Song 1978		David Fisher 1985
John Conroy 1986		Pil Seong Park 1991
Chiou-Ming Huang 1992		Peter Whitman 1993
Yuan-Jye Jason Wu 1995		Weichung Wang 1996
Tamara Gibson Kolda 1997		Misha Kilmer 1997
Ilya Zavorin 2001		Bita Khoshvaghti 2003
Daniel Dunlavy 2005		Haw-ren Fang 2006
Simon Schurr 2006		Elena Zotenko 2007
Jin Hyuk Jung 2008		Michael O'Hara 2008
Stacey Nicholls 2009		Konstantin Berlin 2010
Sungwoo Park 2011		David Schug 2012
Brianna Cash 2014		Viktoria Taroudaki 2015

And now for the tools.

1. Preconditioners.

Real-world tools with this name (of which there are many) are intended to bring something into a desired state.

"Healing properties" that "rebuild strength" (like Dianne's preconditioners).

Since 1976, Dianne's work has continued to be a major influence on the state of the art in Krylov methods.

Some of her work on "blocks" and "splits" (coming soon) is closely connected to CG. She has applied preconditioned CG to a variety of mathematical problems, including PDEs, quadratic programs, and interior-point methods, and to scientific/engineering applications.

She is an expert on the details of the complicated and fascinating history of these methods. (A section of the online summary of her publications is called "History of Scientific Computing".)

2. Blocks.

Tools for blocking occur in contexts ranging from weaving to sanding. These are from sanding.

"...will enhance any project you're working on...the ideal blocking solution for projects requiring absolute perfection"

Dianne and blocks.

During the 1970s (when Dianne and I were PhD students), "block" methods were part of the ethos in Serra House (where the numerical analysis PhD students had offices then).

Serra House in the 1970s. The numerical analysis group was on the ground floor. Photo credit: Walter Gander

In 1985, in "Data-flow algorithms for parallel matrix computations", Dianne and Pete Stewart proposed a common framework for data-flow algorithms involving matrix computations in parallel, based on partitioning the matrix in blocks. The conclusions of their paper contains a memorable sentence:

> *The main drawbacks of the data-flow approach are that it makes it easy to design bad algorithms and difficult to analyze good ones.*

And in 2015, a paper by Dianne and Sungwoo Park has proposed an infeasible primal-dual interior-point method that uses constraint reduction and is applicable when the data matrices are block diagonal.

3. Splits.

One of the leading uses of "splitting" tools involves wood, and offers an appealing variety of options, just as in matrix computations.

Some well-split wood.

4. Curves.

What more is there to say about Dianne?

LOTS!

Adapted from the preface to the first edition of *Mastering the Art of French Cooking*, by S. Beck, L. Bertholle, and J. Child:

> *A complete treatise on Dianne would be about the size of an unabridged dictionary; even printed on Bible paper, it would have to be placed on a stand. To produce a talk of acceptable length, we have made an arbitrary selection. Many splendid creations are not included, and there are tremendous omissions. One may well ask "Why is there no latent semantic indexing? Where are the deblurred images? Why only four tools and no theorems? No advice to graduate students? No pressed duck?"*
> *NO ROOM!*

But there is a perhaps unexpected connection to be created between Dianne and a candidate for President of the United States. . .

How could he possibly be connected with Dianne?

Some might say that they share many properties: well-considered opinions on complicated issues, modesty, kindness, and respect for the feelings of others.

Some would disagree.

But everyone accepts that he has what may be the *world's best nickname*.

THE DONALD