This Week's Citation Classic

Myers W D & Swiatecki W J. Nuclear masses and deformations.
Nucl. Phys. **81**:1-60, 1966.
[Lawrence Radiation Laboratory, University of California, Berkeley, CA]

A semi-empirical theory of nuclear masses and deformations is presented in this paper. It combines the liquid-drop model with an innovative approach to the 'shell effects' that are associated with the packing of nucleon wave functions into the mean field potential well of the nucleus. [The *SCI*® indicates that this paper has been cited in over 515 publications since 1966.]

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"When I was a beginning graduate student in physics at the University of California, Berkeley, my adviser (and coauthor of this paper) W.J. Swiatecki gave me the task of developing graphical means for determining the values of coefficients appearing in a nuclear mass formula. The model he was developing constituted a major breakthrough in our understanding of the origin of 'shell effects' in nuclei and their dependence on nuclear deformation. I believe that this breakthrough is the main reason our paper is so often cited. We planned to use a computer to generate a table of nuclear properties (such as masses, deformations, and fission barriers) that could be deduced from the model. In the years that followed, the scope of this project grew substantially beyond what we had originally envisioned. In fact, it became the arena in which I learned what it means to be a scientist. This paper was originally published as a report[1] which included an extensive table of nuclear properties.

"We dealt with a large and diverse set of measurements: some 1,200 nuclear masses, 240 quadrupole moments, and 40 fission barriers. By stripping away one layer after another of the apparent complexity in the data we were able to display the underlying simplicity and determine the coefficients we required. I remember how delighted we were with small discrepancies that arose in the course of the work. 'Nature was trying to tell us something.' Indeed, my thesis project grew out of one such discovery,[2] which eventually led to the publication of a revised table of nuclear properties.[3]

"In addition to giving a unified picture of many of the macroscopic aspects of nuclei, the model also predicted the possible existence of an 'island of stability' beyond the heaviest elements now known. These predictions, and the support they received from calculations based on Strutinsky's ideas,[4] triggered a worldwide effort to produce such 'super-heavy elements' in nuclear collisions, which is another reason the work is so often cited. It was a heady experience for me, as a graduate student, to have the pleasure of working so closely with my mentor, on such interesting work, and then suddenly to find myself in demand as a conference speaker."

1. **Myers W D & Swiatecki W J.** *Nuclear masses and deformations.* Berkeley, CA: Lawrence Radiation Laboratory, University of California, 27 May 1965, UCRL-11980. 395 p.
[The *SCI* indicates that this report has been cited in over 275 publications since 1965.]
2. ------------------------------------. Average nuclear properties. *Ann. Phys. NY* **55**:395-505, 1969.
3. **Myers W D.** *Droplet model of atomic nuclei.* New York: IFI/Plenum, 1977. 150 p.
4. **Strutinsky V M.** Microscopic calculations of the nucleon shell effects in the deformation energy of nuclei. *Ark. Fysik* **36**:629-32, 1967.