

# Saved representations and contraction hysterises of $N$ -dimensional oscillators plus a constant force

Jamil Daboul

*Physics Department, Ben Gurion University of the Negev,  
84105 Beer Sheva, Israel*

*E-mail: daboul@bgu.ac.il, jdaboul@gmail.com*

I study the contraction of the  $N$ -dimensional oscillator with a constant force  $\mathbf{f}$ ,

$$H = \frac{\mathbf{p}^2}{2m} + \frac{k}{2}\mathbf{x}^2 - \mathbf{f} \cdot \mathbf{x} ,$$

and show that one obtains a ‘*contraction hysteresis*’, as the parameters  $k$  and  $f$  approach zero in different order. I show that the quadrupole moments provide a natural *saved realization* of the contracted  $su(N)$  algebras.