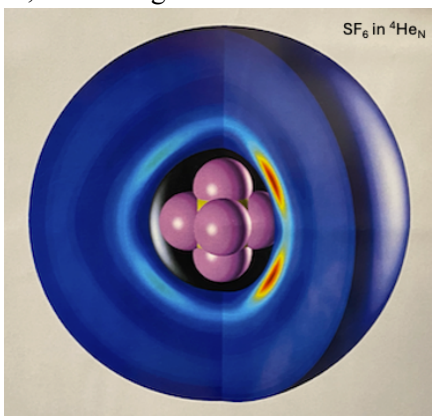
Berkeley, California
May 20, 2025

Dear Peter,

My very best wishes to you on your 95th birthday! I have good memories of my visits to the Abteilung Toennies in the Max Planck Institute on the Bunsen Strasse in Goettingen, first in 1990 and then again in 1992 and 1994. I still recall when you visited Jerusalem in 1985 and talked about the first experiments on helium droplets, which prompted me to think about the superfluid properties of these unusual bosonic cluster and to carry out calculations for these. This led to those visits in Goettingen, followed by a sabbatical visit as an Alexander von Humboldt Fellow in 1996-1997. At that time, you and your group were just learning how to embed the first molecules into these clusters, while with Yongkyung Kwon in my group we had developed path integral techniques that allowed us to quantify the local degree of superfluidity around such molecular impurities within the clusters. During my sabbatical in your group in spring 1997, I was thrilled to be able to share with you and your group our finding that for molecules like SF_6 that had a relatively strong interaction with ^{4}He, the helium-molecule interaction resulted in removal of a fraction of the superfluid in the first solvation shells of the molecule, converting this to an immobilized normal fluid component retaining the molecular symmetry that we showed for SF_6 was quantitatively responsible for the spectrum for SF_6 in ^{4}He droplets that you and your group together with Roger Miller had measured in 1995, which appeared consistent with a freely rotating SF_6 molecule possessing an increased moment of inertia. The conundrum was resolved! We termed the additional mass responsible for this a "molecular-interaction induced non-superfluid", demonstrating its origin as removal of some local helium density from participation in the extended permutation exchange paths that characterize superfluid ^{4}He. I was pleased to see that you could then go on to further confirm our predictions of this behavior for heavier molecules in helium and its implications for molecular spectroscopy in ^{4}He droplets with an experiment for OCS in helium droplets in 1998, where you then referred to this behavior as a 'microscopic Andronikashvili' effect. The rest was history, as they say - a large number of subsequent works on doped helium clusters, with both strongly and weakly bound impurities, neutral and doped, as well as many related studies with hydrogen clusters, in which the local solvation balance between superfluid and non-superfluid and its dependence on the molecule-helium interaction was mapped out. It was an exciting time for cluster science and for a new generation of studies of superfluidity in confined geometries and at interfaces!



After much time away from the topic in the past 20 years, I am now back looking at superfluid helium systems with Josephson junctions for sensors, once again focused on the molecular level interactions which reveal so much about the superfluid behavior in nanoscale systems. And so I think again of the many vigorous and stimulating discussions that we all had in the relatively small helium droplet community back in 1996-1997, when my group discovered the molecular-interaction induced non-superfluid around SF_6 and its role in the molecular spectroscopic measurements of molecules in helium droplets that you and your group were pioneering.

I wish you many more years of scientific discussions and, above all, the continued pleasure of finding things out and analyzing the often unexpected ways that nature can surprise us!

With my very best wishes,

Birgitta

Birgitta Whaley
Professor of Chemical Physics,
University of California, Berkeley