



Sara with Alex (left), Max (right), and graduate student Mary Knapp (far left), at the Colosseum in Rome.

Astrophysics and the Single Mother

by Sara Seager



At dinner one spring evening in 2014, I was accounting for my most recent parental lapse to my kids, sons Max, 11, and Alex, 9. “I know I’ve been neglecting you during the past few days,” I acknowledged. “The reason is that I’ve been rushing to finish my team’s interim report on the Starshade Project,¹ which is due tomorrow. It’s about how to find ‘Earth 2.0.’” “And,” I paused, “Now I have to leave again for a few days to go to Washington, D. C.” Max looked quizzical, while Alex exclaimed, “What?! You have to find Earth 2.0 by tomorrow?” I laughed and explained that this was just a report deadline, not finding the actual Earth 2.0. Indeed, while chairing the Starshade Project is a huge privilege, it is an equally huge investment of time, with an impact on the family life of a single mother of two young boys.

¹ http://exep.jpl.nasa.gov/stdt/Exo-S_InterimReport.pdf

Sara and her son Alex with the starshade petal for his birthday show-and-tell at Alex's school.



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My career as an MIT astrophysics professor can often clash with my other life as a widowed single mother. Until three years ago, I had few, if any, daily imperatives on the home front: my husband Mike Wevrick was in charge of our family life as the stay-at-home parent. He oversaw everything from grocery shopping to household repairs, to school dropoff, sports practices and doctors' appointments. It wasn't until after we lost Mike to cancer in 2011 that I fully understood, and appreciated, the equation: children + home = a full-time job. The academic world is not designed to accommodate primary caregivers of young children, let alone single parents. Although I have managed to create a kind of equilibrium, it is an unstable one.

It soon dawned on my boys that our altered family life was not the norm in suburban Boston, and we often exchanged the following dialogue: "Mom, a normal family is one mom, one dad, one girl, one boy, one cat, one dog." To which I replied, "Hey, we have such a great life together. How many families go to rocket launches, travel around the world, make friends with scientists studying black holes, and have Star Wars theme parties where grad students can blow up the trash can with dry ice?"

Like all smart kids, my boys try to leverage their situation. For example, they sensed my guilt about having so much work travel away from home. "You know the prototype petal?" Alex once asked. He was referring to the 5.5 m (18 ft.) part of the starshade, used in a deployment demonstration,² and now converted into a cumbersome and difficult-to-transport public and professional outreach prop. It requires setup time and a large display area.

Alex continued, "I think you should bring it to my school for my birthday." To buy some time as I tried to think of how best to dissuade him from this idea, I jokingly asked, "Do you want cupcakes with that?" "Oh, no thanks, Mom," he said, as he well knew that having a space hardware prototype show-and-tell

² <http://exep.jpl.nasa.gov/stdt/StarshadeDeployment.mp4>

was both more desirable for his schoolmates and more realistic than getting homemade cupcakes from his Mom.

Impressing the boys' schoolmates and carving out quality family time are the easy parts of being a single parent. More difficult is making sure I have the time and energy to do my job as an MIT professor and astrophysicist. So, I've approached it like solving a multi-step problem set. First and foremost, I have set up a system of caretakers who are so much like family my boys say they have four moms. Second, I have a sequence of backup childcare options in place for the babysitter on days when I am out of town or have critical work meetings. Next, I outsource household chores as much as possible. As for travel—a necessary part of every professor's life—I either have family friends Jessica and Veronica staying at home with the boys or traveling with us as a family when the budget allows.

Despite this careful preemptive planning, the juggling act can go awry. Right after Alex's ninth birthday he broke his arm, using a new Stomp Rocket[®] toy. Soon afterward, Max sprained his foot and needed crutches. The dishwasher broke, summer camp application forms were overdue, and the IRS deadline was looming. On the work front, MIT's multiple end-of-semester deadlines were fast approaching when I learned a graduate student's funding had been inadvertently cancelled by an administrative oversight. The end result is that many MIT responsibilities are often displaced into late working nights. It can be frequently overwhelming to keep "all the balls in the air" and without the support and understanding of MIT as a whole and the Departments of Physics and EAPS in particular, I cannot imagine how I could sustain it. Truly, MIT's all-around support is the lynchpin of my success as a scientist.



Alex taking a family 'selfie' in Rome, March 2014.



Sara with her sons, their babysitters, and her graduate students on a group vacation at Pompeii, before a teaching trip to Politecnico di Torino, Italy.

It often helps me to recall that dinner conversation with my boys about the Starshade Project. And they still ask me about the deadline for finding Earth 2.0. “It’s in my lifetime,” I tell them. “But,” they ask, “What if you die?” (They’re still too young to know about scientific project delays and cost overruns.) “Well,” I tell them, “I’m training my MIT grad students, like Mary Knapp, to take my place.” “Well, what if Mary doesn’t make it?” I have to think about this for a moment. “Well,” I finally say, “Then perhaps it’ll be a child being born right now, or one of your friends, or it could even be one of you!” As a mother, I’m trying to tell them to think big, and that anything is possible. And then the smiles alighting on their faces tell me they are, when all’s said and done, excited to have a Mom who’s an astrophysicist.

SARA SEAGER is an astrophysicist and planetary scientist at MIT. Her science research focuses on theory, computation, and data analysis of exoplanets. Her research has introduced many new ideas to the field of exoplanet characterization, including work that led to the first detection of an exoplanet atmosphere. Professor Seager’s space instrumentation group is focusing on “ExoplanetSat,” a 3U CubeSat capable of high precision pointing, with the science goal of detecting small transiting exoplanets orbiting bright, sun-like stars. The prototype is intended to be the first of a planned fleet of nanosatellites, aimed to demonstrate the graduated growth of a constellation as a new paradigm for space science missions. In addition to being the PI of ExoplanetSat, Professor Seager is a co-I on the MIT-led TESS, a NASA Explorer Mission to be launched in 2017, an all-sky survey for transiting exoplanets, including a focus on finding rocky planets transiting small stars.

Before joining MIT in 2007, Professor Seager spent four years on the senior research staff at the Carnegie Institution of Washington, preceded by three years at the Institute for Advanced Study in Princeton, NJ. Her PhD is from Harvard University. Professor Seager is on the advisory board for Planetary Resources. Professor Seager is a 2013 MacArthur Fellow, the 2012 recipient of the Raymond and Beverly Sackler Prize in the Physical Sciences, and the 2007 recipient of the American Astronomical Society’s Helen B. Warner Prize. She has been recognized in the media, most recently in Nature’s “Top Ten” in 2011, and Time Magazine’s “25 Most Influential in Space” in 2012.