AFTERWORD

After a valiant two years of battling glioblastoma multiforme, Joe Polchinski succumbed on the morning of February 2, 2018. He waited until his younger son Daniel came home from Northern California to join his older son Steven and me (his wife of thirty-seven years) in Santa Barbara. And then, when we were all together, he peacefully departed without fanfare, probably the way he would have wanted.

During his heroic battle with brain cancer, Joe tried to live life to the fullest. At first, he kept plugging away at his calculations, on his favorite pads of 8.5″ × 11″ ruled paper with three holes (each page dated and numbered so that he could file them in their appropriate three-hole binder), chewing on his signature Papermate 1.0 mm blue ballpoint pen, pen tip in mouth, tousling his hair and trying to concentrate. He went to his office at Kavli Institute of Theoretical Physics (KITP) daily as soon as he had recovered from the extensive radiation and chemotherapy treatments, attending lectures and talking to colleagues, students, and visitors to KITP.

When he realized that he wasn't able to do mathematical calculations (he once told me that he could start a calculation but

couldn't figure out how to bring it to a successful end), he decided to write his memoir. By this time, he was having great difficulty reading. He would look at words on a page or on the computer screen and not be able to decipher them. Yet he could understand spoken language perfectly, and when he discovered that he could have his MacBook Air read back any text to him, he was happy that all he needed was a good pair of earbuds and then he could read anything on the Internet or files on his laptop (except for his beloved comics, which didn't work with text-to-speech algorithms). In writing his memoir, he had some sense of how words should be spelled, but he wasn't always sure, and for each sentence he wrote, he would have to highlight the text and have it read back to him. For example, he once had to figure out that he had typed "children" instead of what he had wanted to type: "childhood." It took sheer courage, perseverance, and determination for him to finish his memoir despite not being able to read or spell words.

While I was proofreading the entire memoir, even though I couldn't understand any of the physics that he wrote about, I was struck repeatedly by how incredible his memory was. He was able to reconstruct his whole career and to remember when certain ideas came to him, what the state of knowledge was at any given time, who else was working on similar problems, and exactly what each person contributed to the process. This seems remarkable to me, that parts of his brain were ravaged with cancer and he was aphasic, yet his physics memory was apparently intact. We had hoped that by donating his brain to UCLA, scientists might be able to glean some interesting information from the brain of an extraordinary physicist, but alas, I was told that it was too devastated by the cancer to be useful.

Besides physics, one of the hardest things for Joe to give up was biking. He biked "competitively" and "socially," riding in multiple century (100-mile) races and also regularly on Wednesday afternoons with physicists and on the weekends with friends. He and I got a tandem bike for our twenty-fifth anniversary and had hoped to take bike trips as tourists all over the world in our retirement. After the first round of radiation and chemo, he felt good enough to get back on his bike, and we even did a few rides on our regular tandem bike. We tried a recumbent tandem as well but didn't take to it, so after biking became difficult, we instead took many walks around the neighborhood, trying to walk every street within a two-mile radius of home. We also tried to walk as much of the scenic shoreline as possible, covering miles of the coast both north and south of Santa Barbara.

As time and schedules permitted, we valued spending time with family, friends, and colleagues. And as he mentioned, he even tried out a new sport, pickleball, which was relatively easy to learn and play. As with everything he did, he played with zest and enthusiasm, smiling easily, enjoying the good play of others, and giving it his all.

To me, Joe's life partner for over forty years, he was the smartest person I knew, but he was also just the funny, athletic, love of my life and a wonderful father to our two sons. I have to admit that I didn't fully grasp just how brilliant a physicist he was and how significant his contributions to science were until reading the lengthy obituaries, for example, in the *New York Times*, after he passed away at the young age of sixty-three. Most impressive to so many of us was his ability to have ideas about physics light years ahead of others, express them all with handwritten calculations

using old technology (pen and paper), and yet be such a supportive husband and fully engaged father.

Joe was always tremendously supportive of my career and turned down numerous job offers at other institutions because they did not have a position for me. He always insisted on doing half of the housework, and a comfortable division of labor became the norm for our family. When the boys were young, Joe would play with them every evening while I cooked dinner. After dinner, he taught the boys to thank Mom "for the yummy supper," which they did every day.

Fortunately, we have many hours of home videos, taken from the time the boys were infants. In watching Joe as a young father, it is striking to see how loving and patient he was from the very start. When they were very young, he'd spend hours sitting with them and reading to them. After night feedings, he would assume the task of burping them. One night he was particularly quick in getting our son to go back to sleep, and when I asked him how he did it, he quipped, "I had to promise him a bike." Later, when the boys were older, he attended and supported all of Steven's and Daniel's academic and sporting events: he coached the elementary school math club for local math competitions, and even became their hockey coach, never having played the sport himself, but simply wanting to help the league and teach all of the kids good sportsmanship and fairness. If necessary, he would leave work early to attend hockey games and wrestling meets, making up for it by working late into the night.

We close with some lessons that he taught us, not just us, his family, but his students and colleagues all over the world, many of whom have written comments and letters to us. Joe showed

respect for everyone, from Nobel laureates to students; he had a way of treating everyone equally. He had an openness and willingness to engage with anyone and everyone, regardless of their status or fame. Always remarkably kind and extremely generous with his time and expertise, he was never too busy to welcome someone who came to his office who wanted to talk about a physics challenge they were having. He never made people feel inferior or on a lower level, and his own humble, positive nature put people at ease. He had a kind heart and a smile that lit up a room. There was an utter lack of pretension; what you saw was what you got. He was somehow the regular Joe who wasn't just ordinary.

Joe was a perfect example of what it means to be passionate and human about your work. (He loved talking about physics with anyone, from the chancellor of the university to his mother-in-law—my ever-curious mother—both of whom have repeatedly said that he made physics understandable to them.) And despite the fact that he had such intellectual capability, he was entirely down to earth. He even had a mischievous streak, was playful (and sometimes downright goofy), and he had a wonderful sense of humor. In short, he was an exceptional scientist *and* human being, a vibrant person, with an infectious laugh and an irrepressible grin, which reflected his pure zest and sheer joy for physics and for life. He left an indelible impression on so many and will always be in our hearts. We never want to lose the feeling of missing and loving him.

Dorothy, Steven, and Daniel Polchinski

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A Journey across the Landscape of Strings, Black Holes, and the Multiverse

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