

That flux would be very similar in Birmingham, where the author was a member of the particle-physics group for more than 50 years. The present head of that group, Paul Newman, is thanked in the author's acknowledgements, but is, in turn, the writer of a short tribute to author Kenyon, who sadly died while the book was in the final stages of production. Kenyon was also the author of undergraduate textbooks on particle physics, classical and quantum optics, and quantum physics under the title of *Quantum 20/20*. Kenyon's view of dark energy is that it is a scalar field that behaves, in most respects, like Einstein's cosmological constant. He sounded less sure about inflation being the manifestation of another scalar field.

Oh. Am I supposed to tell you which tome I have adopted for Physics 116 here at UC Irvine? Naturally, the one that Kip Thorne told me is the best General Relativity text ever written. No, not *MTW*. Hartle's *Gravity*. —VIRGINIA TRIMBLE.

To the Stars: Women Spacefarer's Legacy, by Umberto Cavallaro (Springer) 2023. Pp. 594, 23.5 × 14.5 cm. Price £34.99 (paperback; ISBN 978 3 031 19859 5).

Here are 75 women cosmonauts, astronauts, taikonauts, and possibly other designations for those who have flown well above the Earth's atmosphere between 1963 and 2022. At least a few are, or have been, national heroines — Valentina Vladimirovna Tereshkova (born 1937) in Russia and the Soviet Union; Sally Kristen Ride (1951–2013) in the United States; and (I hope) Helen Patricia 'Lenochka' Sharman (born in Sheffield in 1963) in Britain, though she flew on a Soyuz mission (TM-12). The volume is chock full of firsts, some by nation (Liu Yang the first female taikonaut, Chiaki Mokui of Japan, Yi So-Yeon of Korea, on to Anousheh Ansari, the first Iranian spacewoman, again on a Soyuz (TNA-0)).

Others are first mother in space, first teacher, first actress, first EVA (Extra-Vehicular Activity) by a woman, the first astronaut's daughter in space (Laura Shepherd Churchley), not to mention other extremes like Wally Funk at age 82 on *Blue Origin NS-16*, the oldest person to fly, 60 years after she had been the youngest of the *Mercury 13* women who were briefly tested and trained by NASA but never flew.

The author gives his affiliation as the Italian Astrophilately Society in Torino and here demonstrates his passion for stamps showing astronauts by illustrating his short biographies with images of 'first day cancellations' of most of the women featured. Sally Ride, who appears on stamps of 13 different countries, was herself a collector, whose personal stamp collection was donated by her surviving partner, Tam O'Shaughnessy, to the National Postal Museum in Washington, DC.

Every one of the capsule stories has a 'gee whiz' item. One woman played her flute on the *International Space Station*; another later headed NASA's Astronaut Office. Elena Kardakova was born the year of the *Sputnik* launch. The youngest American astronaut to date (Hayley Arceneaux) is a cancer survivor who flew with a prosthetic limb. Kathryn Thornton (and Story Musgrave) were the first civilians assigned to a military Shuttle flight (they launched an ELINT). MD Bonnie Bondar has received 24 honorary doctorates from Canadian and American universities. Ellen Ochoa, born in Los Angeles the year NASA was established, is living proof that it is better to be a professional electrical engineer and an amateur classical flautist than the other way around, and has served as Director (the 11th) of the Johnson Space Flight Center in Houston, Texas.

Nearly every page has a purple mark — not for errors (I have done no fact-checking) but for “ah ha!” moments — one of the women was a Girl Scout (no luck checking which one: the index is very sparse); another attended a high school that shared its name, Sidney Lanier (also not indexed), with the local public library of my childhood (both have probably been renamed). There really were icicles on the launch tower the day Judy Resnik (the first Jewish woman to fly) took off for the second, devastatingly brief, time. Karen Nyberg was the first astronaut to operate all three robotic arms on the Shuttle, and she also enjoys quilting, and made a dinosaur toy for her son out of Russian velcro-like fabric that lined their food containers. Megan McArthur celebrated her 50th birthday in space, the zeroth having been celebrated in Honolulu, because her father was a career naval officer.

Appendices list all the women, in chronological order by first flight (Tereshkova, Savitskaya, Ride, Resnik, McAuliffe...on to Mae Jamison (the first female African-American astronaut) and Elena Kondakova (third Russian woman, who appears in Appendix IV because of being married to another cosmonaut)), and on to the last eight, nearly all on commercial flights, beginning with Beth Moses. The other appendices list female EVAs (the longest 60 hours in ten separate activities by Peggy Wilson); astronauts with military affiliations; astronaut marriages and a good many divorces.

All in all a fascinating book, which is probably best read a few stories at a time, like consuming a large box of candy of many different flavours.

Of the women, I knew only Sally Ride, having met her when she was still a graduate student at Stanford, and then having served on her advisory board when she was running the California Space Institute (CalSpace) from UC San Diego. — VIRGINIA TRIMBLE.

Quantum Processes & Measurement. Theory & Experiment, by Claude Fabre (Cambridge University Press), 2023. Pp. 303, 26 × 18.5 cm. Price £49.99/\$64.99 (hardbound; ISBN 978 1 108 47777 2).

We are rapidly approaching the centenary of the first papers on what is now called quantum mechanics, and the number of published textbooks on the subject must certainly also be close to 100. Early ones often emphasized puzzling aspects of the subject — that a careful calculation never gave an exact result for the product of a well-defined particle collision, for instance, but only the distribution of probabilities over the range of possible final states. Most of the later texts (at least in English) have been of the ‘shut up and calculate’ variety. Author Fabre takes a third approach, beginning with recent experiments that involve the detection of single quantum entities, photons, particles, and energy levels of an atom. Subsequent chapters alternate between theory (especially as required to understand recent experiments — entanglement and all) and those experiments. The experiments end with SQUIDs and the theory with quantum non-demolition.

The last 100 pages include 11 appendices, from qubits to quantum mechanics of electrical circuits, 187 references (from Aaronson to Zurek), and the usual inadequate 2¼-page index characteristic of physics texts. Each chapter and each appendix ends with exercises, some requiring serious derivations; others inviting the reader to attempt an order-of-magnitude estimate of some quantity she had probably never thought of before. She will, however, find lots of old friends in the list of references: Aharonov and Bohm, Bell, Bohr, and Born, Hanbury Brown and Twiss, Dirac, Podolsky, and Rosen, Landau (looking lonely without his Lifshitz), Planck, Robertson, and Schrödinger, von Neumann and Wigner.