A BRIEF GUIDE TO SOME ERRATA AND ADDENDA

The additive infinite loop space theory in “The Geometry of Iterated Loop Spaces” is completed in essential respects in

J.P. May
E_∞ spaces, group completions, and permutative categories.
London Math. Soc. Lecture Notes Series Vol. 11, 1974, 61–93.

Errata and addenda to that paper and to “Geometry” can be found in “The Homology of Iterated Loop Spaces”, pages 485–490. In turn a minor mistake in “Homology” is corrected on page 635 of the rather dyspeptic paper

J.P. May
Infinite loop space theory revisited.
Lecture Notes in Mathematics
Vol 741. Springer-Verlag 1979, 625–642.

That paper is a kind of downbeat sequel to

J.P. May
Infinite loop space theory.
Bull. Amer. Math. Soc. 83(1977), 456-494.

The latter paper can still be recommended for a description of additive and multiplicative infinite loop space theory as I understood them in 1975.

There is a serious mistake in “E_∞ Ring Spaces and E_∞ Ring Spectra”, in that the passage from bipermutative categories to E_∞ ring spaces that is described in VI§4 fails. All of the applications of the book depend on that passage. The mistake is rectified in

J.P. May.
Multiplicative infinite loop space theory.
J. Pure and Applied Algebra 26(1983), 1–69.

Appendix A of that paper explains the mistake in detail. The cited paper is itself in need of some minor corrections of a combinatorial nature. Time permitting, I will tex them up when I get a chance, or I may incorporate them in a projected work that will give the equivariant version of the theory. The incorrect details do not effect the validity of any of the results of that paper. An alternative approach to some but not all of its results has recently been given in

A.D. Elmendorf and M.A. Mandell.
Rings, modules, and algebras in infinite loop space theory.

Advances in Math. 205 (2006), no. 1, 163–228.

That paper shows how to recognize E_∞-module spectra as well as E_∞-ring spectra, which my earlier theory failed to do. However, there are things worth advertising that are done in "Multiplicative infinite loop space theory" that cannot be done in the newer approach. Most importantly, many of the applications of "E_∞ ring spaces and E_∞ ring spectra" are based on a good understanding of the spectrum of units (originally denoted FR but denoted $gl_1 R$ in the current literature) associated to an E_∞ ring spectrum R. The relevant results appear to be inaccessible to the Elmendorf-Mandell machine. What is still missing from multiplicative infinite loop space theory is a comparison of outputs, analogous to the result in

J.P. May and R. Thomason.
The uniqueness of infinite loop space machines.
Topology 17(1978), 205-224.

There are two sequels to the uniqueness result given there.

J.P. May.
The spectra associated to permutative categories.
Topology 17(1978), 225–228.

J.P. May.
The spectra associated to $\mathcal{I}$-monoids.
Math. Proc. Camb. Phil. Soc. 84(1978), 313–322.

The second is the more interesting and less obvious. It explains how to compare use of permutative categories and use of the linear isometries operad to recognize infinite loop spaces of interest in geometric topology.

Some of the homological calculations in "The homology of iterated loop spaces" appear to depend on the erroneous step of "E_∞ Ring Spaces and E_∞ Ring Spectra". The way around this is explained in

Z. Fiedorowicz and J.P. May.
Homology operations revisited.
Canadian Math. J. 3(1982), 700–717.

That paper also compares the May and Segal approaches to infinite loop space theory in calculational terms, explaining how homology operations appear in the Segalic approach.