A Review of the Jan 2016 Release PhL 1.6.16

Part I: The Sections

First of all, here is a review of the previous release of Nov 2011, 4 years earlier.

1	intro	
2	dashed hope, atoms, solve for bowl potential	not much changed
3	double bowl	not much changed
4	bowl charge density and capacitance	not much changed
5	toroidal coordinates: equations and plots	some moved to Section 1
6	gallery of bowl plots	not much changed
7	Mehler integrals	not much changed
8	bowl in elementary functions	not much changed, earlier format
9	Maple to plot bowl potential	not much changed
10	toroid potential and capacitance and limits and charge density	not much changed

So really the new release has the same structure as the old release. These 10 Sections consumed 33 pages in the original release, but they consume 86 pages in the new. So what are all these new pages about?

Here are Section length comparisons. Note there are 51 pages of increase.

	Nov 2011	Jan 2016	Change
Overview	1	4	3
1	0	9	9
2	6	10	4
3	3	5	2
4	3	12	9
5	4	6	2
6	2	3	1
7	3	9	6
8	1	3	2
9	3	3	0
10	6	19	13
	32	83	51

So let's try to explain these increases.

- old pdf has no bookmarks! Now sure why!

- In the new doc, each section starts on a fresh page. Let's say that creates a half blank page per Section, so that could account for up to 5 pages of the 41 increase.

- The overview grew by 3 pages, formerly called introduction at just one page. The new overview is longer because there are more general words, because of comment on Legendre functions, and because I added a full list of Section and Appendix summaries, by itself 2+ pages. So this is understood.

• Section 1 reviewing bipolars and toroidals *did not exist* and accounts for 9 added pages. My bipolar doc did not exist in 2011. I had some "equations" poorly presented in old Section 5, they are all cleanly done in this Section 1 including the large r stuff.

• Section 2. I show more math steps in getting the bowl potential. And the new elementary statement is much cleaner without that η stuff. I moved an integral derivation off to some appendix, but I then added section 2.5 with checks of the bowl result: surface, disk, large-r, full sphere. It is the more equation detail and these limit checks that accounts for the 4 page growth of Section 2.

• Section 3 grew really by about 1 page, few more steps shown, reader exercise.

• Section 4 went from 3 to 12 pages. First of all, I show the full calculation detail now, before I just quoted results. The new calc is 4 pages all by itself. Then my comparison with other sources section is perhaps 1 page larger. I added a Smythe comparison. Much better now. And I added a small hole section discussion in honor of Kirk with pictures, maybe another 2 pages, so 3+1+2 = 6 of the 9 increase. Ah. but then in 4.3 I add a section of checks, totally new, full sphere and flat disk, so that is 2 pages, so then 8.

• Section 5 used to review toroidals, now it just does those funny plots. This increased by 2 pages because, although I deleted the toroidal equations, I added lots more plots including comparison with polars which I find very helpful. But only a 2 pages increase here.

• Section 6, added comments at the start about meaning of the surface slope, up thus by 1 page.

• Section 7 up by 6 pages. I show more detail in the integral X calculation. Then I add a whole new section 7.4 showing plots of the Mehler functions and explaining my F forms and my continuation map comments, about 5 pages added just for that. So 1+5 = 6.

• Section 8 elementary functions up by 2. In the old I just quote the result basically, in the new I derive it and talk about convergence as well.

• Section 9 Maple. No change really!

• Section 10 is up by 13 on the toroid. How many terms in sum section is new (3p). And plotting the toroid potential is all new (3p), I had no plots at all in previous pdf! Capacitance has comments about series convergence. I compute σ in both papers and get the same result, but in the old I just quote and in the new I derive (maybe +2 pages). But in new doc I add two checks (+2) . The first is the thin wire limit, and then the surface charge integration check. Reason is that no one verifies my σ formula, so I am now better supported. Somehow this add adds up to 13 pages of increase! Then I have new section0 which plots the σ, had 1 tiny plot on that before with no support and a bad picture! . (+4) So that accounts for the 13 page increase. Torus is more developed in this new release.

Part II: The Appendices

In the old doc there were Appendices A through G, but new doc goes through M. Compare

	Nov 2011		Jan 2016	Change
A	1		3	2
B cap tor	4	conversion	7	3
C Kelvin	2		4	2
D Smythe	5		5	0
E Dual	3		5	2
F Abel	3		3	0
G double Ab	6		8	2
H	0	support	20	20
I	0	thin + horn	13	13
J	0	transforms	17	17
K	0	integ σ	5	5
L	0	M integrals	12	12
M	0	analytic	4	4
Refs	3		4	4
	27		110	86

So appendices went from 27 to 110 pages, accounting for 83 pages of increase.

So increase is this

Sections	51
Appendices	83
	134

Doc went from 60 to 60+134 = 194 (really 195).

The only thing truly wrong in the old doc is a small picture showing u incorrectly.

Conclusion: This new pdf is infinitely better. I surely will find typos, but I think it is good enough now to replace the researchgate version. So let's start that process now.

I see now that I never put the old version onto Researchgate. It is now up there 1/6/16.