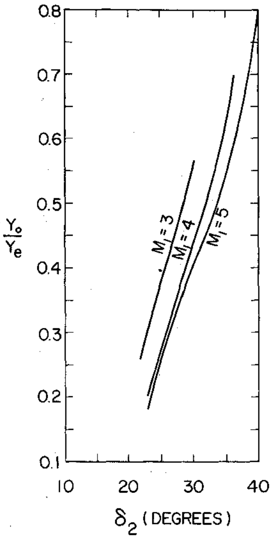

Fig. 7 Height of Mach stem.

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Errata

Errata: "Roots of the Cylindrical Shell Characteristic Equation for Harmonic Circumferential Edge Loading"

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IN the aforementional paper[1] various versions of the cylindrical shell characteristic equation for harmonic circumferential edge-loading were solved numerically and the roots compared. It has been brought to the author's attention[1] that the coefficients of the complete Flügge equation are incorrect. The required changes are that Eqs. (3b) and (3c) should be rewritten as

Table 1 Values of the roots of the complete Flügge characteristic equation for edge-loaded cylindrical shells

n	p_{n1}	q_{n1}	p_{n2}	q_{n2}
0	4.04809	4.08501	...	...
2	4.56863	3.63890	0.45591	0.37916
4	6.13012	2.98441	2.02105	1.03738
6	8.05787	2.63703	3.94978	1.38578
8	10.04291	2.44489	5.93561	1.57873
10	12.03906	2.32061	7.93266	1.70390
12	14.03797	2.23082	9.93260	1.79469
14	16.03758	2.16084	11.93343	1.86580
16	18.03728	2.10326	13.93454	1.92464
18	20.03686	2.05395	15.93577	1.97532
20	22.03626	2.01043	17.93705	2.02032
22	24.03546	1.97111	19.93838	2.06120
24	26.03445	1.93492	21.93977	2.09901
26	28.03322	1.90113	23.94123	2.13448
28	30.03178	1.96919	25.94280	2.16811
30	32.03012	1.83870	27.94447	2.20029
32	34.02824	1.80934	29.94628	2.23129
34	36.02613	1.78088	31.94824	2.26132
36	38.02378	1.75310	33.95038	2.29057
38	40.02119	1.72585	35.95270	2.31915
40	42.01835	1.69897	37.95522	2.34718
42	44.01524	1.67233	39.95797	2.37473
44	46.01184	1.64581	41.96096	2.40187
46	48.00816	1.61931	43.96421	2.42868
48	50.00416	1.59272	45.96774	2.45518
50	51.99984	1.56593	47.97156	2.48143
52	53.99519	1.53884	49.97570	2.50746
54	55.99017	1.51134	51.98018	2.53330
56	57.98479	1.48332	53.98501	2.55899
58	59.97901	1.45466	55.99021	2.58454
60	61.97281	1.42524	57.99582	2.60998
62	63.96619	1.39492	60.00183	2.63534
64	65.95912	1.36355	62.00829	2.66064
66	67.95158	1.33097	64.01520	2.68589
68	69.94354	1.29698	66.02260	2.71113
70	71.93499	1.26138	68.03050	2.73636
72	73.92590	1.22392	70.03893	2.76163
74	75.91626	1.18431	72.04790	2.78694
76	77.90603	1.14223	74.05745	2.81233
78	79.89521	1.09724	76.06759	2.83782
80	81.88376	1.04886	78.07836	2.86344
82	83.87166	0.99644	80.08976	2.88922
84	85.85889	0.93915	82.10182	2.91520
86	87.84544	0.87586	84.11457	2.94142
88	89.83128	0.80497	86.12802	2.96790
90	91.81639	0.72403	88.14219	2.99470
92	93.80076	0.62893	90.15710	3.02186
94	95.78438	0.51150	92.17275	3.04943
96	97.76724	0.34948	94.18917	3.07746
98[a]	99.59688	99.90177	96.20635	3.10602
100[a]	101.31252	102.14876	98.22430	3.13516

[a] The complete Flügge equation yields two pairs of real roots, the magnitudes of which are tabulated as p_{n1} and q_{n1}.

$$\alpha_2 = 4 + [(11 - 3\nu)/2]k + 9[(1 - \nu)/2]k^2 \tag{3b}$$

$$\alpha_3 = 6 + 3(2 - \nu)k - \nu^2 k^2 \tag{3c}$$

The roots of the various equations were recalculated for R/h of 10, 20, and 50 and n varying from 1 to 300 with the use of a double-precision polynomial root extraction routine DPRBM.[2] The corrected results for the complete Flügge equation for n varying by steps of 2 from 0 to 100 and $R/h = 10$ are shown in Table 1. Some additional results for $R/h = 10$ and $n = 150$, 200, 250, 300 are given for all three characteristic equations in Table 1a. Figure 1 is corrected as shown.

The corrected results indicate that the roots of the complete and simplified Flügge equations are in good agreement over a much larger range of n than was previously found. In both cases the pattern of the roots shifts from all complex roots to four real roots and four complex roots for large n. The value of n at

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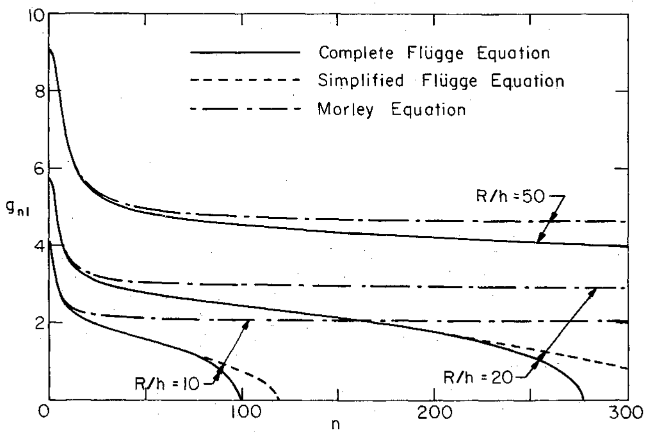

Fig. 1 Comparison of imaginary parts of roots of various characteristic equations.

Table 1a Additional Values of the roots of the various characteristic equations for edge-loaded cylindrical shells

n	Equation	p_{n1}	q_{n1}	p_{n2}	q_{n2}
150	Complete	148.67766[a]	153.64343[a]	148.77528	4.18929
	Simplified	151.36940[a]	153.16379[a]	147.73066	3.25097
	Morley	152.03074	2.05994	147.96593	2.00486
200	Complete	197.07033[a]	204.62290[a]	199.06941	5.60617
	Simplified	200.98887[a]	203.75899[a]	197.62401	3.56021
	Morley	202.03115	2.05295	197.96635	2.01175
250	Complete	245.82860[a]	255.57224[a]	249.19554	7.03704
	Simplified	250.78380[a]	254.17507[a]	247.51891	3.82807
	Morley	252.03140	2.04892	247.96661	2.01587
300	Complete	294.70866[a]	306.52728[a]	299.25778	8.46025
	Simplified	300.65097[a]	304.51040[a]	297.41794	4.06524
	Morley	302.03156	2.04616	297.96678	2.01862

[a] The complete Flügge equation yields two pairs of real roots, the magnitudes of which are tabulated as p_{n1} and q_{n1}.

Table 2 Some values of the coefficients of the characteristic equation $A_0 + A_1\lambda_n^2 + A_2\lambda_n^4 + A_3\lambda_n^6 + A_4\lambda_n^8 = 0$ ($R/h = 10$, $\nu = 0.30$)

	A_0	1.00063318 *E*16	9.99800010 *E*15	9.99800010 *E*15
	A_1	−4.00180197 *E*12	−3.99926003 *E*12	−3.99940002 *E*12
100	A_2	6.00366045 *E*8	5.99941092 *E*8	5.99941093 *E*8
	A_3	−4.00415037 *E*4	−3.99994000 *E*4	−3.99980000 *E*4
	A_4	1.00166458 *E*0	1.00000000 *E*0	1.00000000 *E*0
	A_0	2.56200523 *E*18	2.55987200 *E*18	2.55987200 *E*18
	A_1	−2.56150866 *E*14	−2.55988160 *E*14	−2.55990440 *E*14
200	A_2	9.60656082 *E*9	9.59976109 *E*9	9.59976109 *E*9
	A_3	−1.60167819 *E*5	−1.59999400 *E*5	−1.59998000 *E*5
	A_4	1.00166458 *E*0	1.00000000 *E*0	1.00000000 *E*0
	A_0	6.56632158 *E*19	6.56085420 *E*19	6.56085420 *E*19
	A_1	−2.91779343 *E*15	−2.91594006 *E*15	−2.91595140 *E*15
300	A_2	4.86338852 *E*10	4.85994611 *E*10	4.85994611 *E*10
	A_3	−3.60378345 *E*5	−3.59999400 *E*5	−3.59998000 *E*5
	A_4	1.00166458 *E*0	1.00000000 *E*0	1.00000000 *E*0

which this occurs is somewhat less for the complete equation than for the simplified equation.

It is to be re-emphasized that quite small differences in the coefficients of the characteristic equation lead to large differences in the roots. Some of the sets of coefficients are shown in Table 2. Such findings indicate, it would appear, that attempts to "improve" simplified versions of the theory of cylindrical shells may be ill-advised. The relative ease with which roots of the characteristic equation may be obtained by use of a digital computer also makes such attempts meaningless.

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