HILDA PHOEBE HUDSON

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To most mathematicians of the older generation the name H. P. Hudson is associated almost exclusively with a large, rather formidable and much quoted treatise on "Cremona Transformations in Plane and Space" [23]. This was indeed her magnum opus, the culminating achievement of many years of scholarly research, in which she gathered into one connected account all the essential elements of what had long been a fashionable field of research and supplemented it with an impressive bibliography (37 pages and 417 items) covering sixty to seventy years of publications on the subject.

Born in Cambridge on 11 June, 1881, she came of a distinguished mathematical family. Her father, W. H. H. Hudson, was Fellow of St. John's College, Cambridge, and later Professor of Mathematics at King's College London; her mother was one of Newnham's earliest students; her brother, who was killed climbing in Wales in 1904, was senior wrangler in 1898; and her sister and she were bracketed with the 8th and 7th wranglers respectively in the years 1900 and 1903. After four years as a student at Newnham, 1900–1904, she spent the next year at the University of Berlin; the next five years as a lecturer at Newnham; the years 1910–1913 as Associate Research Fellow of Newnham—the last of them at Bryn Mawr College, U.S.A.; and the years 1913–1917 as lecturer at West Ham Technical Institute. Thereafter she entered the Civil Service for two years to do technical work for the Air Ministry, spent two further years, 1919–1921, as Technical Assistant with Parnell and Company, Bristol, and then retired from salaried work to devote her whole time to writing her book. Her last mathematical publication was her contribution on "Analytical Geometry, Curve and Surface" [24] to the 14th edition (1929) of the Encyclopaedia Britannica. She had a life-long interest in the Student Christian Movement, and was Finance Secretary of its Auxiliary Movement from 1927–1939. Among her honours were an Sc.D. of Trinity College, Dublin, and an O.B.E. (1919). She died on 26 November, 1965, at the age of 84.

As regards her published work, most of this was closely connected with Cremona transformations; but her contributions [11, 12, 13] to Applied Mathematics (in particular to Aeronautical Engineering) during, and immediately after, the first world war are a tribute to her versatility; and mention should be made also of her attractive monograph "Ruler and Compass" [22], first published in 1916, in which she included a lot of elegant geometry in an exposition of the range and limitations of ruler and compass constructions. The main bulk of her work on Cremona trans-

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formations, however, was notable for the reason that the methods she employed were basically elementary—largely analytical geometry—but her success in their use was the result of a powerful, almost uncanny, geometrical intuition which enabled her to extract correct answers in her own way to quite formidable problems. Her enthusiasm and conscientious attention to detail were phenomenal; but her style of exposition, especially in her book, is often off-putting, more especially for the reader who wishes to read what she has to say on a particular topic and finds himself up against a formidable barrage of abstruse abbreviations of her own devising.

The first task she set herself was to catalogue all the special types of the bilinear $T_{3,3}$ in which the base sextic curve breaks up into lines (distinct or coincident) [**1**]; and this was followed up by a complete catalogue of all the basic types—75 of them—of cubic Cremona transformations of space [**2**]. Then there came her studies on postulation and equivalence formulae for surfaces in S_3 [**5, 6, 7, 23**] in which, relying solely on her elementary methods and geometrical insight, she made notable advances. As an example of this work we quote her formulae [**6**]—no mean achievement—for the postulation P and equivalence E of the condition on surfaces of given order n that they should have s-point contact with a given surface f of order μ along a given curve ω of order m and rank r with δ ordinary double points, where f has β_α nodes of type B_α ($\alpha = 2, \ldots, s$) at simple points of ω with binodal edges not touching ω. She finds that

$$P = sP_\omega - \tfrac{1}{2}s(s-1)(\rho-\mu m) - \tfrac{1}{2}\sum_{\alpha=2}^{s}\{s(s-\sigma)-\tau(\sigma+1)\}\beta_\alpha,$$

$$E = sE_\omega - s(s-1)(\rho-\mu m) - \sum_{\alpha=2}^{s}\{s(s-\sigma)-\tau(\sigma+1)\}\beta_\alpha,$$

where $\rho = r+2m+2\delta$, the numbers σ and τ are the quotient and remainder in $s \div \alpha$, and P_ω, E_ω are the values of P, E for ω as a simple curve for surfaces of order n. Further papers of hers [**9, 21**] deal with problems concerning the composition of space Cremona transformations and with Incidence Relations for such transformations—these among the hardest of her papers to follow—all directed generally towards the problem of classification and ultimately towards the outstanding problem (among those listed at the end of her book) of finding an irreducible set (necessarily infinite) of Cremona space transformations from which all others can be compounded. Her book, published in 1927, virtually ended her period of productive research.

Miss Hudson was a distinguished mathematician, of great erudition and integrity; and she was also, throughout her long life, a woman of high ideals and standards. She will long be remembered by the mathematical world for her contributions to geometry and by Newnham and Cambridge as one of their distinguished alumni.

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LIST OF PUBLICATIONS

Papers

1. " On the 3-3 birational transformation in three dimensions ", *Proc. London Math. Soc.* (2), 9 (1911), 51–56, and 10 (1912), 15–47.
2. " On cubic birational space transformations ", *Amer. J. Math.*, 34 (1912), 203–210.
3. " On the product of two quadro-quadric space transformations ", *Amer. J. Math.*, 35 (1913), 183–188.
4. " On fundamental points in Cremona space transformations ", *Ann. di Mat.* (3), 19 (1912), 45–56.
5. " Curves of simple contact on algebraic surfaces ", *Math. Ann.*, 73 (1913), 73–85.
6. " Curves of contact of any order on algebraic surfaces ", *Proc. London Math. Soc.* (2), 11 (1913), 389–410.
7. " On binodes and nodal curves ", *Internat. Congr. Math. Rep.*, 2 (1913), 118–121.
8. " On pinch-points ", *Quart. J. pure appl. Math.*, 44 (1913), 161–166.
9. " On the composition of Cremona space transformations ", *Palermo Rend.*, 35 (1913), 286–288.
10. " The Cremona transformations of a certain plane sextic ", *Proc. London Math. Soc.* (2), 15 (1916), 385–400.
11. " An application of the theory of probabilities to the study of *a priori* pathometry ", Parts II and III (in collaboration with Sir Ronald Ross, K.C.B., F.R.S., *Proc. Roy. Soc., Ser. A* (650), 93 (1917), 225–240.
12. " The strength of laterally loaded struts ", *The Aeroplane*, 18 (1920), Aeronautical Engineering Supplement, 1178–1180.
13. " Incidence wires ", *Aeronautical Journal*, 24 (1920), 505–516.
14. " Euclidean constructions ", *Scientia*, Nov. 1921, 346–354.
15. " Plane homaloidal families of general degree ", *Proc. London Math. Soc.* (2), 22 (1924), 223–247.
16. " Cech's transformations ", *Proc. London Math. Soc.* (2), 23 (1924), pp. xxvii–xxix.
17. " Mathematics and Eternity ", *Math. Gaz.*, 12 (1925), 265–270.
18. " Double invariant points and curves of Cremona plane transformations ", *Palermo Rend.*, 50 (1926), 219–228.
19. " Linear dependence of the Schur quadrics of a cubic surface ", *J. Lond. Math. Soc.*, 1 (1926), 146–147.
20. (With T. L. Wren) " Involuntary point-pairs in the quadro-quadric Cremona space transformation ", *Proc. London Math. Soc.* (2), 24 (1926), pp. xxviii–xxix.
21. " Incidence relations for Cremona space transformations ", *Proc. London Math. Soc.* (2), 26 (1927), 453–469, with an addendum in *J. London Math. Soc.*, 3 (1928), 3.

Books and Monographs

22. *Ruler and compass*, first published as a monograph (Longmans Green, 1916), and then included in the compendium *Squaring the circle and other monographs* (Chelsea n.d.).
23. *Cremona transformations in plane and space*, pp. 454 (Cambridge, 1927).
24. Article on " Analytical geometry, curve and surface " in 14th edition (1929) of *Encyclopaedia Britannica*.