

Markandeya Misra (Lucknow University): *Original Contributions of Aryabhata* (in Hindi).

K. S. Shukla (Lucknow University): *Astronomy in India before Aryabhata I*.

An exhibition of 127 manuscripts (including photocopies and transcripts) on Hindu astronomy and mathematics was also held during the celebrations.

(More MEETINGS on pp. 155, 156, 204)

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CORRESPONDENCE

This department welcomes comments on the contents or policy of HM, corrections of errors in the literature, questions and discussion of previously published questions, brief notices of historical discoveries, and other communications of interest to the history of mathematics community.

C. S. PEIRCE AND DE MORGAN ON THE FOUR-COLOUR CONJECTURE

*A letter from
Norman L. Biggs (University of London),
E. Keith Lloyd (University of Southampton), and
Robin J. Wilson (The Open University)*

A recent letter (in your August 1976 issue, *HM* 3(3), 329-330) from John Wilson drew attention to a reference by De Morgan to the four-colour problem, in the journal *Athenaeum* [1860, 501-503]. We should like to make some further comments on this important discovery.

The *Athenaeum* article is the first known printed reference to the four-colour problem. Also, it is almost certainly the article referred to by C. S. Peirce in a manuscript, now in the Houghton Library at Harvard. Peirce cites, in vague terms, a reference by De Morgan to the four-colour problem in the *Athenaeum*, and he goes on to mention his own attempted solution, which he presented to a mathematical society at Harvard in the 1860s. Of course, Peirce was primarily a logician and philosopher, which explains why he would have read De Morgan's review of Whewell's book *The Philosophy of Discovery*. He retained a lifelong interest in the four-colour problem and addressed the National Academy of Sciences on the subject in November 1899. It is quite possible that he was the first American to interest

himself in the problem, and that the *Athenaeum* article was thus the means by which the problem first came to the attention of American scholars.

The information concerning C. S. Peirce was kindly communicated to us by Carolyn Eisele, during the preparation of our book, *Graph Theory 1736-1936* [1976]. We surmised that the article to which Peirce so vaguely refers was also the 'some-where' mentioned by Cayley [1879]. Accordingly, we searched the pages of the *Athenaeum*, but, as we admit in a footnote to our book (p. 92), we failed to find the relevant passage. Our failure is partly explained by the fact that the review in question is not explicitly attributed to De Morgan.

John Wilson has discovered an important missing link in the story of the four-colour problem, and he deserves the thanks of all historians of mathematics.

REFERENCES

- Anonymous 1860 *Athenaeum* No. 1694 (14 April), 501-503
Biggs, N L, Lloyd, E K & Wilson, R J 1976 *Graph Theory 1736-1936* Oxford (Clarendon Press)
Cayley, A 1879 On the colouring of maps *Proc. Roy. Geog. Soc.* 1, 259-261
Pierce, C S 1899 Report of meeting of Scientific Session, 15 November 1899 *Rep. Nat. Acad. Sci.*, 12-13

ANSWER TO QUESTION ON P. 152: The Banach-Tarski paradox.

The Four Colour Theorem is famous for being the first long-standing mathematical problem to be resolved using a computer program.Â Indeed, most mathematical papers on the subject pay only lip service to the continuous statement and quickly (and informally) rephrase the problem in graph theory: colouring a map is trivially equivalent to colouring the graph obtained by taking the regions of the map as nodes, and linking every pair of adjacent regions. There, he sought out Augustus De Morgan, William Stanley Jevons, and William Kingdon Clifford,[26] British mathematicians and logicians whose turn of mind resembled his own.Â Peirce's reputation rests largely on academic papers published in American scientific and scholarly journals such as Proceedings of the American Academy of Arts and Sciences, the Journal of Speculative Philosophy, The Monist, Popular Science Monthly, the American Journal of Mathematics, Memoirs of the National Academy of Sciences, The Nation, and others. See Articles by Peirce, published in his lifetime for an extensive list with links to them online.Â Peirce's most important work in pure mathematics was in logical and foundational areas. The Four Color Theorem, or the Four Color Map Theorem, in its simplest form, states that no more than four colors are required to color the regions of any map so that no two adjacent regions have the same color. As promised, that's a theorem any elementary-level student can grasp.Â Francis shared his original observation as well as his fruitless attempts with Frederick to ask & enroll De Morgan on the quest to bring forth a conjecture. De Morgan was unable to give an answer, however, as history shows he was instantly hooked. On 23 October 1852, he wrote the following to William Hamilton, a famous Irish mathematician & astronomer: A student of mine asked me today to give him a reason for a fact which I did not know was a fact " and do not yet.