

**Ton-That, Tuong; Tran, Thai-Duong****Poincaré's proof of the so-called Birkhoff-Witt theorem.** (English) [Zbl 0958.01012](#)

Rev. Hist. Math. 5, No. 2, 249-284 (1999).

Who developed the universal enveloping algebra of a Lie algebra (real or complex)? Who introduced the canonical map of the symmetric algebra onto the universal enveloping algebra? *Garrett Birkhoff's* article is dated 1937 [Ann. Math. (2) 38, 526-532 (1937; [Zbl 0016.24402](#))] as is *Ernst Witt's* [J. Reine Angew. Math. 177, 152-160 (1937; [Zbl 0016.24401](#))]. Poincaré's proof appeared in 1900 [see C. R. 128, 1065-1069 (1899; [JFM 30.0334.01](#))]. There are three pages of historical introduction; four pages of Poincaré on Lie groups; 25 pages on concepts, algebras, polynomial bases, and proof; and a conclusion and bibliography of 40 items, and E. T. Bell's book of fairy tales. Much of the argument is long formulae, but the paper is clear, easy to read, and bites where it should.

Reviewer: [James J.Cross \(Parkville\)](#)**MSC:**

[01A60](#) History of mathematics in the 20th century  
[17-03](#) History of nonassociative rings and algebras  
[01A55](#) History of mathematics in the 19th century  
[17B35](#) Universal enveloping (super)algebras

Cited in **1** Review  
Cited in **3** Documents

**Keywords:**[Henri Poincaré](#); [Lie algebra](#); [universal enveloping algebra](#); [Garrett Birkhoff](#); [Ernst Witt](#); [symmetric algebra](#)**Full Text:** [arXiv](#)