The place of the history of mathematics in teacher training.
The situation in The Netherlands.

Jan van Maanen*
University of Groningen, Dept. of Mathematics,
P.O. Box 800, NL-9700 AV Groningen)

Playing with the Dutch saying "There are many ways leading to Rome', we may safely say: "There are many ways leading to a teaching degree'. Actually, there are two different degrees. The lower of the two, the 'second degree' qualifies for teaching at the lower secondary level (which applies to scondary schools which have a four-years programme, and the first three classes of schools which have a five- or six-years programme; with the existence of different types of schools for the same age groups the Dutch system differs from most of the other European countries). The higher of the two, the 'first degree' qualifies for all secondary education.

Universities grant the first degree without a previously obtained second degree, after 5 years (4 years of mathematical studies and 1 year of in-service teacher training). After having obtained the second degree a student can continue the study for the first degree at a university, but generally one starts to teach, and has to do further studies in the evening hours. There are five Polytechnics (at Amsterdam, Leeuwarden, Rotterdam, Tilburg and Utrecht) which offer a part-time programme leading to the first degree (one day or two evenings a week plus a tough portion of home-work during 3 years). One can also work through the obligatory subjects via self-study and apply for a state-examination (the so-called M.O. B examination).
Remains the question "How to earn the second degree?". This degree is granted by a great number of Polytechnics all over The Netherlands, after a programme of 4 years, which a student can take on a full-time basis, but also on a part-time basis. The programme consists of mathematical and theoretical educational studies alternating with an amount of practical teaching in schools which increases during the years.
How is history of mathematics represented in these institutions?
At the Universities history of mathematics is taught at Amsterdam (Free University), Delft and Enschede (both are Technical Universities), Groningen and Utrecht, but as an optional part of the mathematics curriculum, and not directly with the perpective of training teachers.
The M.O. B examination does not require knowledge of the history of mathematics. Of the five Polytechnics which grant the first degree Central Netherlands Polytechnic at Utrecht has an obligatory course of 60 contact hours, in which history of mathematics is studied in its own right, but students also have to give it a go as an educational tool. The other four do not have regular courses in the history of mathematics, but at some of them students may do optional work in history on an individual basis. An inquiry along the Polytechnics which grant the second degree shows a broad spectrum:

- "No special course, but some historical topics integrated in the mathematics lessons" (Leeuwarden),

- "Students are obliged to do 3 weeks of self-study after which they present the results of their work. In the middle of the period there isone guest-speaker who gives an overview." (PTH Eindhoven)

- "We do not offer a structural course, but regularly individual students write a paper about a historical subject" (Algemene Hogeschool Amsterdam)

- "History appears with other subjects in the course "About Mathematics", 40 H.S.W. (= hours of students work) in total" (Hogeschool Holland, Amsterdam),

- At Tilburg and Sittard the same course is taught, from a text that was developed at Tilburg. Subjects: Babylonian, Egyptian and Greek period up to 500 A.D., little about the Middle Ages (apart from some attention to the Arab period), algebra in 16th C Italy, the origin of the differential and integral calculus). At Tilburg 80 H.S.W., at Sittard 120 H.S.W.

- At Utrecht there are two courses (both 80 H.S.W.), one in the 2nd year, with contents comparable to Tilburg and Sittard, and one in the 3rd year called "Old mathematics in modern education". Central in the latter course is the question how to use history in mathematics teaching (as far as I know this is the first regular HiMEd course in The Netherlands). Students first read articles about the subject and study existing texts in which history is used to teach mathematics. Then they work in groups on the task to develop some HiMEd lessons, which, at the end of the course, they present to the other students in their class. In preparing these lessons they can use a collection of historical sources selected and xeroxed for this purpose in the University Library (in an earlier year two students had compiled this collection as their final work before getting their degree).

- Also at Zwolle a course is taught comparable to the ones at Sittard and Tilburg. Here the original Dutch version *Van Ahmes tot Euclides* of the book by Bunt, Jones and Bedient *The historical roots of elementary mathematics* is used for the ancient period, and it is supplemented by various more recent topics (solving equations in relation with complex numbers, geometrical constructions and Galois theory; the origin of probability theory and the needle experiment; non-Euclidean geometry).

In general the teachers of these course describe their students as active and enthousiastic. Teaching these courses is heavy, they say, but rewarding.