

Citation Classics

Skeggs L T Jr. An automatic method for colorimetric analysis. *Amer. J. Clin. Pathol.* 28:311-22, 1957.

This paper described the first completely automatic method for colorimetric analysis. It employed a new analytical technique that was performed in a continuously flowing stream. The determination of urea nitrogen in whole blood was described as one application of a generally applicable method. [The SCI® indicates that this paper was cited 356 times in the period 1961-1977.]

Leonard T. Skeggs

Veterans Administration Hospital

10701 East Boulevard

Cleveland, OH 44106

January 17, 1978

"The method described in this paper was conceived as a result of a serious need. I started my career as a supervisor of a clinical chemistry laboratory. We were understaffed, with far too much work to do. As a consequence, the quality of the work suffered. It seemed inexcusable to me that some of the results we were reporting might be inaccurate and misleading. I longed for a method that would perform analyses quickly and precisely without the possibility of human error.

"Suddenly one day in the laboratory, it occurred to me that one might do analyses continuously in a flowing stream rather than in batches of test tubes. In the course of the next two years I constructed several models of such a machine in my basement shop at home, using such equipment as I could make or adapt

for the purpose. These first machines were successful and gave satisfactory analytical results for blood urea or glucose at the rate of up to 40 samples per hour.

"In general, samples were introduced in succession into a flowing stream of reagents. Air bubbles were introduced into the stream in order to maintain separation between samples. The stream might then be dialyzed, heated or otherwise processed and finally be passed through a flowcell in a colorimeter equipped for recording.

"The equipment that was needed to carry out the method included a turntable for introduction of the samples, a multiple channel peristaltic pump, a dialyzer and a heating bath capable of processing flowing streams, and a recording flowcell colorimeter. Since none of these was available at the time, it seemed necessary for a manufacturer to make them if my method was to be generally useful.

"There followed a long and discouraging period during which I attempted to interest several different manufacturers in my method. Finally, the Technicon company undertook the project. Three years later, they brought my method to the market in the form of the Autoanalyzer. This first automatic single-channel analyzer was very successful and led directly to the development of today's large, multiple-channel, continuous-flow analyzers that can perform 20 different analyses on a blood sample every 20 seconds.

"I had great difficulty in getting my paper accepted by the *American Journal of Clinical Pathology*. When it did appear, it attracted very little attention. However, the situation changed rapidly after the autoanalyzer was introduced. People began to adapt the equipment to their own problems and soon there were publications citing my paper and describing the determination of many substances that could be performed by the continuous flow method of analysis."