

A Note from History: The Discovery of Blood Cells

Steven I. Hajdu

Keywords: history of science, red blood cells, white blood cells

Naked-eye inspection of blood at phlebotomy was practiced far back to ancient times. Invention of the compound microscope in Holland around 1590 by Hans and Zacharias Janssen made possible the examination of the content of the blood.

In 1658, the Dutch naturalist, Jan Swammerdam (1637–1680) was the first person to observe red blood cells under the microscope. Another Dutch microscopist, Antoni van Leeuwenhoek (1632–1723), who was an acquaintance of Swammerdam, described the size and shape of “red corpuscles” and rendered the first illustration of them in 1695 (Fig. 1) [1]. During the next 150 years if anybody looked at blood at all under the microscope, nothing other than the “red corpuscles” were seen.

Gabriel Andral (1797–1876), a French professor of medicine, and William Addison (1802–1881), an English country practitioner, reported simultaneously the first descriptions of leukocytes (1843); both concluded that the red as well as the white globules of the blood were altered in disease [2,3]. Addison also deduced that pus cells were blood leukocytes that had passed through the wall of capillary vessels.

Physicians in France and England made landmark discoveries in the mid 1800s that established the foundations of a new field in medicine: hematology. Alfred Donné (1801–1878) a French public health physician who in 1837 discovered and illustrated *Trichomonas vaginalis* in vaginal secretion of Parisien prostitutes, was an avid microscopist [4]. In 1842, he discovered a third element, the platelets, in blood [5]. Despite indifference and often even

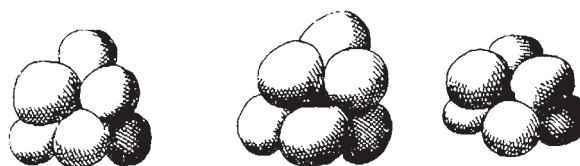


Fig 1. Illustration of “red corpuscles” of blood by A van Leeuwenhoek (Letter 42 of *Arcana Natura*, 1695) [1].

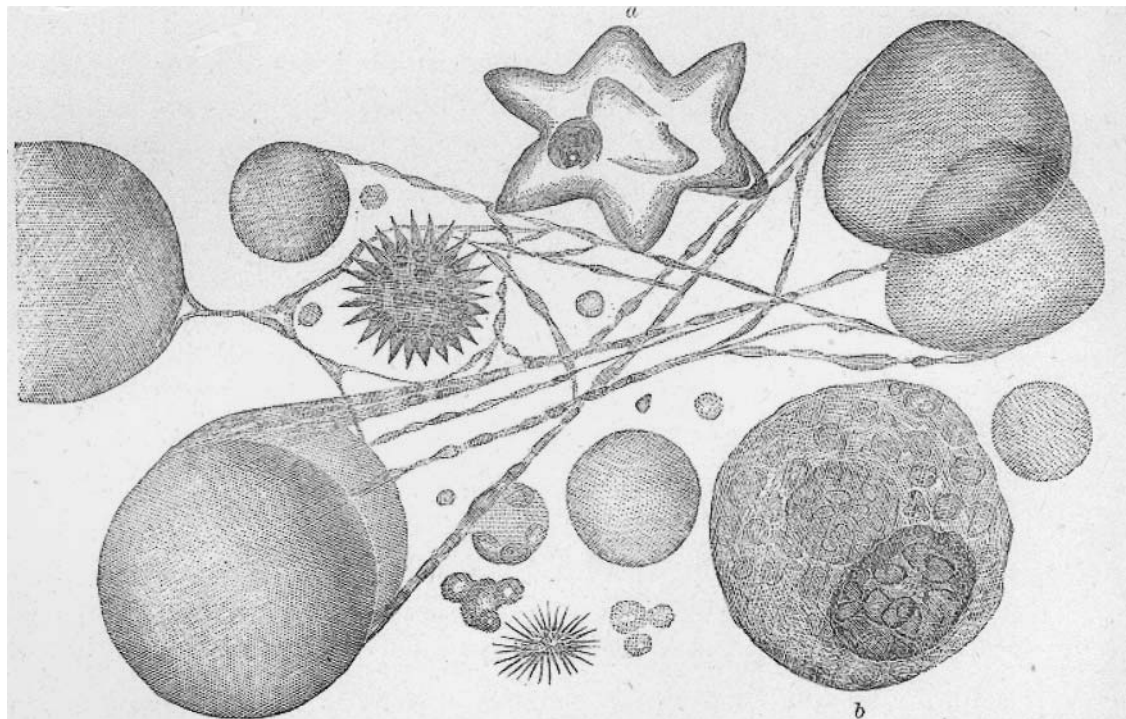
open hostility by his colleagues, Donné gave evening classes in medical microscopy (the first microscopic workshops in medicine) that attracted French as well as foreign students.

One of Donné’s foreign students was John Hughes Bennett (1812–1875), a physician from Edinburgh, Scotland. He studied with Donné for a couple of years and, while in Paris, he helped to found the Medical Society of Paris and became its first president. In 1841, shortly after returning to Edinburgh, Bennett published a book on the use of the microscope for the diagnosis of diseases [6].

In 1845, Bennett in Scotland and Rudolph Virchow (1821–1902) in Germany simultaneously reported detailed descriptions of the blood cells in leukemia [7,8]. Virchow gave the condition its present name, leukemia.

At this point in medical history, despite the fact that iodine, saffron, and ammonia carmine were available for staining tissues and cells, practically no advances were made in knowledge about the morphology of blood cells. The state of hematology from the 1850s to the 1870s was delineated by Lionel Beale (1828–1906), a British professor of physiology, pathology, and medicine, in a book [9] that went through several editions. Beale illustrated and described “the various corpuscles met within healthy

Address correspondence to Steven I. Hajdu, M.D., 4 Forest Court, Oyster Bay Cove, Syosset, NY 11791-1119, USA; tel 516 922-5967; fax 516 922-1588.



Red and white corpuscles in blood from the finger. $\times 2800$ linear. The large smooth circular bodies are the red corpuscles. Three very small red corpuscles are less than the $\frac{1}{8000}$ of an inch in diameter. The smallest particles are composed of matter like that of which the white blood corpuscle (*b*) consists. Threads of fibrine undergoing coagulation are observed between the corpuscles in the upper and lower part of the field. *a*, red corpuscle, exhibiting annular projections. Below it, and to the left, is another, with still more pointed processes. September, 1863.

Fig 2. Illustration of “red and white corpuscles” in blood by Beale. The legend under the illustration indicates that the picture was originally printed in September 1863. (Plate 38, page 261, *The Microscope in Medicine*, 1877) [9].

blood” (Fig. 2). The standstill in progress ended suddenly, in 1879, when Paul Ehrlich (1854 – 1915) at age 25 published his technique for staining blood films and his method for differential blood cell counting [10].

References

1. Leeuwenhoek A van. *Arcana Natura Detecta*, Delphis, Batav, 1695.
2. Andral, G. *Essai d'Hématologie Pathologique*. Fortin, Masson & Cie, Paris, 1843.
3. Addison, W. *Experimental and Practical Researches on Inflammation and on the Origin and Nature of Tubercles of the Lung*. J Churchill, London, 1843.
4. Hajdu, SI. The discovery of *Trichomonas vaginalis*. *Acta Cytologica* 1998;42:1075.
5. Donné A. De l'origine des globules du sang de leur mode de formation et leur fin. *Compt Rend Acad Sci* 1842;14: 366-368.
6. Bennett, JH. *The Employment of the Microscope in Medical Studies*. Stewart, Edinburgh, 1841.
7. Bennett, JH. Case of hypertrophy of the spleen and liver, in which death took place from suppuration of the blood. *Edinb Med Surg J* 1845;64:413-423.
8. Virchow RLK. *Weisses Blut*. *N Notiz Geb Natur-u Heilk* 1845;36:151-156.
9. Beale, LS. *The Microscope in Medicine*. J. & A Churchill, London, 1877.
10. Ehrlich, P. *Methodologische Beiträge zur Physiologie und Pathologie der verschiedenen Formen der Leukocyten*. *Z Klin Med* 1879;1:553-560.