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***Five Quarts: A Personal and Natural History of Blood* by Bill Hayes**

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It is only natural to take for granted that with which we are most familiar. Just as a cell down-regulates its receptors in response to activating hormones, so humans quickly become habituated to novel experiences. The surgeon who at the

beginning of her training found the operating room to be a terrifying and exciting place, years later experiences it as a zone of comfort and security. In relationships, the thrill of reciprocated affection in time gives way to the quieter love of friendship, marriage, and family. But even as we cherish our dependable routines, we sometimes feel nostalgia for a time when the familiar was new. This is why the long-married couple still takes time out for formal dates. It may also explain why many physicians strive to impart their knowledge to younger generations. Through teaching, these seasoned professionals vicariously relearn their craft. Perhaps procreation is the most obvious example of the human desire to make the familiar new. Parents know that a child brings fresh eyes to the world, making the ordinary extraordinary again.

A layman's naiveté can likewise bring a unique sense of wonder to a complex subject like blood. This is certainly true with respect to Bill Hayes' new book, *Five Quarts: A Personal and Natural History of Blood*. Incorporating mythology, history, literature, medical science, and personal experience, the freelance writer Hayes has composed a fascinating exploration of the crucial red liquid that we physicians so matter-of-factly extract and study every day.

Hayes' discussion of the mythological figure Medusa near the beginning of *Five Quarts* serves as a launching point for the rest of the book. Besides having snake-hair and a face that turned all of its beholders to stone, Medusa's blood also possessed special qualities. If drawn from the left of her body, her blood brought instant death. But if extracted from Medusa's right side, it restored life. Hayes remarks that "this duality was an especially prescient invention of the ancient mythmakers, for we now understand in cellular detail how blood can bear both disease with deadly efficiency and save a person's life, as with vaccinations and transfusions." This idea of blood as both a killer and a savior, as a source of both dread and fascination, recurs throughout *Five Quarts*. Indeed, it flows from the deeper purpose of his book. Hayes' long-time partner is HIV positive, and one senses that

the author's exploration of blood is a quest to understand the mysterious substance that has afflicted his beloved.

As part of this quest, Hayes recounts the history of humanity's efforts to grasp blood's content and meaning. Particularly interesting in this respect is the story of Paul Ehrlich's life and work. Born in 1854 in a small German village, Ehrlich was the only son of Jewish parents who operated an inn. As a teenager, he was fascinated by his older cousin Carl Weigert's research staining cells with synthetic dyes. Generated by the flourishing German dye industry, these dyes revealed contrast and texture in biological specimens, making them easier to view under the microscope. In his own studies, Ehrlich observed that different dyes responded uniquely to certain cells or parts of cells. To him, this suggested the existence of distinct cellular receptors ("side chains") for the various dyes. The concept of cellular receptors ultimately led Ehrlich to his side-chain theory. It proposed that cells have receptors or side chains that bind invading toxins "like a key in a lock," thereby neutralizing them. The theory further held that a cell under threat grows additional side chains to bind the toxin and that these additional side chains break off to become antibodies that are circulated through the body. As Hayes reports, Ehrlich's revolutionary side-chain theory was just one of his many crucial contributions to the field of hematology.

Exploring blood's role in literature, the author considers Bram Stoker's *Dracula*. It turns out that the historical inspiration for the great novel's vampirism may have been the hematological disorder of congenital erythropoietic porphyria. Inbreeding within the isolated and remote Eastern European communities, such as the valleys of Transylvania, may have resulted in an unusually high prevalence of this rare condition during the Middle Ages. As Hayes writes, "The corpse-like appearance and odd behavior of sufferers may have given rise to whispers of vampirism." Folk knowledge about the disease may have gradually evolved into legend. Certain chemicals in garlic, for example, can exacerbate porphyria symptoms, thus giving rise to the idea that garlic repels vampires.

Toward the end of *Five Quarts*, Hayes writes about Dr. Jay Levy's codiscovery of HIV and his remarkable contributions to understanding and fighting the disease. The medical progress made possible by Levy and other scientists profiled in the book has prolonged the life of Hayes' HIV-positive partner. Much of the book can be read as a grateful tribute to their efforts.

For its beautiful writing, captivating stories, and eclectic approach to the subject of blood, I heartily recommend *Five Quarts*. It just might affect the way you look at your next blood smear.

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