Throughout the ages, the heart has been portrayed in poetry and on Valentine’s Day cards as an organ of the emotions. It wasn’t until the 17th century that scientists fully understood the heart’s role in the circulatory system.

Yet this physiological puzzle might have been solved as early as the 2nd century, by the Greek physician Galen, had he not been such a staunch advocate of Plato’s conception of the soul. For despite Galen’s eminence and erudition, his philosophical beliefs appear to have clouded his scientific judgment. But his fallibility is not a matter for modern-day smugness: the story of his research into the heart contains a caution that is still pertinent nearly 2,000 years later.

Galen was probably the most respected Greek doctor after Hippocrates, who codified medicine’s precepts in the Hippocratic Oath in the 5th century B.C. Galen knew a great deal about the heart, as evidenced by his extant writings—most notably On the Doctrines of Hippocrates and Plato.

Given Galen’s intellectual accomplishments, many scholars of more recent centuries have wondered how he failed to recognize the heart’s true role in circulating the blood. From a strictly scientific perspective, he could have—perhaps even should have—discovered the process of circulation. He had all the required pieces of the puzzle and could have easily conducted any of the observations and experiments that William Harvey used to finally describe the circulatory system in 1628.

Nevertheless, Galen failed to pursue the concept of circulation or to try the simple calculations that brought Harvey such success many centuries later. What was it that prevented this brilliant scholar from making the logical leap to seeing blood as a reusable vehicle that transports oxygen to the cells of the body? Why did he continue to hew to the idea of blood as a consumable fuel—like the wood used to stoke a fire or the water used to irrigate a field?

Many scholars feel that Galen had a philosophical bias that deterred him from understanding the
heart’s role in circulation. He was a devoted follower of Plato and disagreed vehemently with the opposing Stoics over the nature of the soul. Indeed, his advocacy for the Platonic view led him to disregard many experimentally verifiable facts that might have enabled him to conceive of the heart’s circulatory function.

**Pieces of the puzzle**

Charles Harris, a professor of the medical humanities, in his 1973 book *The Heart and the Vascular System in Ancient Greek Medicine,* examines the pieces of the puzzle that Galen held: Galen knew that the heart was associated with the pulsing of the arteries. He knew that the arteries and the veins ran parallel to each other and were connected. And he knew that both contained blood, though blood of different types. Harris concludes that this information could have led Galen to an accurate understanding of the heart.

It is also worth noting that Galen was familiar with Erasistratus’s description of a pumping heart. Erasistratus, a 3rd-century b.c. Alexandrian, had accurately described the heart—right down to the critical role of the valves in allowing blood to flow in only one direction through the heart’s chambers. But Erasistratus failed to discover circulation because he believed that the arteries contained pneuma, or air. Galen, on the other hand, decisively refuted that belief in his On Blood in the arteries. In the process, he showed that he had a more than passing familiarity with Erasistratus’s writings. So it seems clear that Galen not only was familiar with the pump theory but embraced it himself.

If Galen understood this critical concept, he was barely a heartbeat away from Harvey’s most convincing piece of evidence for circulation. Harvey wrote that he first considered the circulation of the blood when he noted how much blood is expelled by the heart with each contraction. Over the course of a day, he concluded, the amount totaled more than the body’s daily intake of food by weight. With the aid of some rough calculations, Harvey proved beyond doubt that the blood must be reused. From there, conceiving of the process of circulation was but a short step. Yet Galen failed to perform this simple calculation and continued to view blood as a consumable fuel for the body.

Harvey’s other major points serve to further implicate Galen’s bias. In his seminal publication, *De motu cordis et sanguinis in animalibus* (On the movement of the heart and blood in living creatures), Harvey described how he could push a rod up a vein but was unable to push it down a vein because of the one-way nature of the valves. A nother of his experiments was equally simple and elegant. “Now let anyone make an experiment upon the arm of a man,” he wrote. “Let a ligament be thrown about the extremity and drawn as tightly as can be borne. . . . It will first be perceived that beyond the ligament, neither in the wrist nor anywhere else, do the arteries pulse.” On the basis of these observations, Harvey concluded, correctly, that blood flows out from the heart through the arteries and back toward the heart through the veins.

**Decisive demonstrations**

Harvey also demonstrated that the heart’s pumping action will spit blood from a cut artery. In ad-

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Have a heart!

For centuries, the heart has served for lovers and warriors, for parsons and poets, as a shorthand way of describing emotion—from passion and courage to grief and despair. Even long after the heart’s true physiological function was understood, the fist-sized organ has continued to serve a symbolic role. Here’s a selection of references to the heart by poets through the ages.

For May wol have no slogardie anyght. T h e sesou priketh every gentil h e r t e. A nd maketh hym out of his slep to sterete. — Geoffrey Chaucer (1343–1400)

To fret thy soule with crosses and with cares; T o eate thy h e a r t through comfortlesse dispaire. — Edmund Spenser (1553–1599)

A nd make my seated h e a r t knock at my ribs, A gainst the use of nature. Present fears A re les than horrible imaginings. — William Shakespeare (1564–1616)

The h e a r t of man is the place the Devil’s in: I feel sometimes a hell within myself. — Sir Thomas Browne (1605–1682)

Grief tears his h e a r t, and drives him to and fro In all the raging impotence of woe. — Alexander Pope (1688–1744)

Forever, Fortune, wilt thou prove A n unrelenting foe to love: A nd when we meet a mutual h e a r t, C ome in between and bid us part? — James Thomson (1700–1748)

A nd what shoulder, and what art, C ould twist the sinews of thy h e a r t? — William Blake (1757–1827)

T he music in my h e a r t I bore Long after it was heard no more. — William Wordsworth (1770–1850)

Oh, many a shaft at random sent Finds mark the archer little meant! A nd many a word at random spoken M ay soothe, or wound, a h e a r t that’s broken! — Sir Walter Scott (1771–1832)

From every place below the skies T h e grateful song, the fervent prayer— T he incense of the h e a r t— may rise To heaven, and find acceptance there. — John Pierpont (1785–1866)

The h e a r t bowed down by weight of woe To weakest hope will cling. — Alfred Bunn (1790–1860)

Love works at the centre, H e a r t—heaving alway; F orth speed the strong pulses To the borders of day. — Ralph Waldo Emerson (1803–1882)

I have you fast in my fortress, A nd will not let you depart, But put you down into the dungeon In the round-tower of my h e a r t. — Henry W. Longfellow (1807–1882)

But for the unquiet h e a r t and brain A use in measured language lies; T he sad mechanic exercise Like dull narcotics numbing pain. — Alfred Tennyson (1809–1892)

O n l y I discern I n f i n i t e passion, and the pain Of finite h e a r t s that yearn. — Robert Browning (1812–1890)

T he Land reposed in peace below; T he children in their glee W ere folded to the exulting h e a r t Of young M aternity. — Herman Melville (1819–1891)

It is not wisdom to be only wise, A nd on the inward vision close the eyes, But it is wisdom to believe the h e a r t. — George Santayana (1863–1952)

They change their skies above them, But not their h e a r t s that roam. — Rudyard Kipling (1865–1936)

I will arise and go now, for always night and day I hear lake water lapping with low sounds by the shore; W hile I stand on the roadway, or on the pavements grey, I hear it in the deep heart’s core. — William Butler Yeats (1865–1939)

A h, when to the heart of man W as it ever less than a treason To go with the drift of things, To yield with a grace to reason. — Robert Frost (1874–1963)

There is nothing to save, now all is lost, but a tiny core of stillness in the heart like the eye of a violet. — D. H. Lawrence (1885–1930)

I know I am but summer to your heart A nd not the full four seasons of the year. — Edna St. Vincent Millay (1892–1950)

M y h e a r t will laugh a little yet, if I M ay win of Thee this grace, Lord: on this high A nd sacrificial hill ’twixt earth and sky, To dream still pure all that I loved, and die. — Countee Cullen (1903–1946)

In the deserts of the heart Let the healing fountain start. — W. H. Auden (1907–1973)

Light breaks where no sun shines; Where no sea runs, the waters of the heart Push in their tides. — Dylan Thomas (1914–1953)

Dwell In our crowded hearts O ur steaming bathrooms, kitchens full of Things to be done, the Ordinary streets. — Denise Levertov (1923–)
dition, he noted that while a cut in an artery will quickly clear the whole arterial system of blood, there is no such effect with a cut vein. All of these observations could have been made just as readily in the 2nd century as in the 17th.

To conclude that Galen was intellectually incapable of realizing the significance of these observations seems absurd, given his general erudition. In many of his other anatomical explorations, experimental evidence led Galen to think quite creatively. For example, he suggested that unseen nerve channels allowed the brain to send message pneuma to the muscles. But in his investigations of the heart, Galen apparently ignored any observations that did not support his theory.

**Polemical objective**

What was it about Galen's theory of the heart that he held so dear? The answer to that question fairly leaps off the pages of On the Doctrines of Hippocrates and Plato, which contains much of Galen's analysis of the heart. From the book's introduction through the last of its surviving sections, Galen's polemical objective is clear: he wants to discredit the Stoics and their view of the soul, while upholding his own Platonic conception of the tripartite soul.

The theory of the tripartite soul had been proposed by Plato in the 4th century B.C. as an explanation for inner psychological disagreement and conflict. Plato fully expounded the concept in Book IV of his famous Republic and embellished the idea from a biological standpoint in the Timaeus. In the latter book, he opined that the heart acts as a sort of emotional guard-chamber, passing the commands and the spirit for applying reason on to the limbs of the body. Galen seems not only to have accepted these ideas but also to have augmented them—claiming that they were anticipated by Hippocrates. Galen's respect for both Plato and Hippocrates in this, as in other issues, is a hallmark of his style.

On the other hand, Galen saw the Stoics as a bunch of self-promoting, sophistical rabble-rousers. They had proposed some radical new theories: denying that emotions were legitimate, or that any part of the soul was located outside the heart, while affirming that reason made up the undivided soul. Their arguments were based on irrelevant poetry and etymology and on inaccurate, even deceptive, science. They hoped to supplant the theories of the ancients, such as Plato.

Galen felt that the Stoics' conception of an undivided soul offered no explanation for mental conflict, and so he aimed to prove their view wrong. Indeed, much of Galen's research was directed against the Stoics. Christopher Gill, a British classicist, describes Galen as "highly partisan and misleading" in single-mindedly defending Platonism.

Yet in taking this stance, Galen was merely reflecting the Zeitgeist of his time. He lived in the Second Sophistic era, a period characterized by much polemical public oratory. Heinrich Von Staden, a classicist at Yale, agrees that Galen's rhetorical methods and even his goals were influenced heavily by the combative spirit of his time. And, like many other partisans of the period, Galen...