

*From: **Lost History**, The Enduring Legacy of Muslim Scientists, Thinkers, and Artists*

By: Michael Hamilton Morgan

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BAGHDAD, A.D. B6 5 — Many muezzins are calling at dawn from mosques at every point of the compass. The caliphal city is slowly awakening to the silhouette of minaret and dome against brightening sky, to the growing thunder of horses and camels on pontoon bridges and dusty roads pouring into city gates. Thousands of men and women are on the move. Laughter from unseen courtyards resounds; secret whispers are muffled in lush and grandiose gardens and plazas; arguments are heard from the shuttered windows of the great houses, where the rich and brilliant celebrate, debate, tell stories.

An ocean of shouts and noise echoes from the backstreets where the workers, the fishermen, the stevedores and camel drivers, the hucksters and magicians, the undertakers and sweepers and washerwomen live and sleep.

About 230 years after the death of the Prophet, the quickening rush to the great Muslim cities is coursing fast, a current of hundreds of thousands pulled away from former lives on deserts or fields or from older, smaller places now falling out of fashion, all of them impelled toward the light of excitement and change.

The rise of the cities is driven in part by a prophecy that calls for a society fair and humane; a prophecy that elevates the quest for knowledge and learning; a prophecy dignifying commerce, just as the Prophet was a man of commerce; a vision of a society clean and healthy just as the Prophet recommended.

And what does this new culture of urbanity mean to the Muslims? To the thinkers and artists and inventors it means patronage and income; it means libraries; it means centers of learning and discussion; it means debates and arguments, the interaction of many minds trying through agreement and dispute to find the universal answers. It means places of taste and sophistication, and palaces of the imagination where the ideas of many can be accumulated and aggregated. It means centers where men can attempt to rise above the level of struggling to find enough food, water, and shelter to stay alive and have energy and time left over to consider the great questions.

To the rulers the cities mean memorials and stone testimonials, civic architecture in mosques and palaces that will outlive them and inspire and embody their ideals and their visions. The cities mean court societies where the best and brightest will be nearby and at hand, making life richer and more interesting.

To the families of commerce, cities mean meeting places, points of intersection where buyer and seller connect, large groupings of people who must be clothed and fed and entertained.

To the women, these cities mean a better chance of survival for their children, the possibility of a future brighter than the past, clean and plentiful food and water. The cities offer beautiful clothes and jewels and coloring for the lips and eyes and hair. The cities give them some freedom and anonymity.

And to the administrators of these places, cities mean assessing taxes and spending them on water and building materials and roads, on markets and schools and mosques. And cities mean the need for public health. Because these clusters of millions of people at the nerve centers of states with millions more cannot function if cities are also centers of contagion and infection, of squalor and misery. Society is only as healthy as its individual members, whether caliph or water carrier.

Against this backdrop in about 865, a slender sixtyish, gray-bearded teaching doctor employed by the Abbasids pauses at midday in his courtyard near Baghdad's House of Wisdom to take a quiet lunch with one of his prize students, a Persian boy with an unusually prominent head. The boy has been sent from Ray to obtain the best of learning from many masters. Together they look at a vial of yellowish liquid taken from a cadaver.

"Do you think Galen is right about the humors?" this student asks his teacher, and the teacher does not answer. First, because few people if any have ever seriously questioned Galen's theories. And second, because it shows that his young student is thinking for himself. "Maybe you and I should start work on a book about Galen," says the teacher, and the student's big face lights up. "But I warn you: Many people will be upset to hear questioning of the master."

The teacher is from an old Jewish family of Merv known as the Sahl's who have converted to Islam, and his name is Ali ibn Sahl Rabban al-Tabari. Al-Tabari has been trained in the Persian and Greek methods based largely on a Greek thinker and medical doctor from Pergamon in Anatolia, named Galen, 600 years ago.

The Persian boy is Zakaria al-Razi, of a family possibly also converted from Judaism to Islam.

Long-dead Galen is showing them the way to medical wisdom. For the Byzantines and the Muslims and the Europeans some 1,300 years after his death, Galen is to medicine as Ptolemy is to the planets and Aristotle to reason. With very little medical science to draw on, Galen had created a comprehensive body of knowledge and information, some of it very prescient, much of it dead wrong, that nonetheless provided the first unified attempt to understand the connections between the organs within the body, and nutrition, environment, disease, injury, pharmacology, and surgery. And Galen had not only gathered theoretical knowledge; he had been checking out his ideas first-hand, dissecting live pigs to see how the organs were functioning before they expired. He had cut a pig's spine to show how paralysis sets in; he had tied off urinary ducts to show that urine comes from the kidneys; he had looked at live beating hearts, heaving lungs spurting blood, and clusters of nerves.

Galen had also conducted surgery on live humans, including one heart-stopping technique for removing cataracts. He would insert a needle into the eyeball just behind the lens and either dislodge or extract the cataract, an operation where a slip of the hand or a sneeze could leave his patient blind, or worse.

Flourishing in the fertile time of imperial Rome of the second century A.D. and of Marcus Aurelius, Galen was not constrained by later Christian concepts of sin and sacrilege. He had given himself permission to find out how organisms work. And he had been the primary conveyor of the much older thoughts of another Greek physician, Hippocrates, from the fourth century B.C.

To the early Muslims like al-Tabari, Galen is deemed religiously acceptable because he said that all organic life and functions spring from a single source: nature. For the Muslim theologians this is close enough to their monotheistic belief that all life springs from God.

But now in the ninth century, Galen for the first time has serious competition. Some of it comes from the waning light of the Byzantines. But increasingly, the medical innovators are Muslims like al-Tabari. Unlike the Europeans of the time, the Muslims do not feel as constrained by superstition or anti-intellectualism, or by some Christian Stoic-inspired beliefs that the miseries of physical life must be endured so as to cleanse the soul for heaven. The Muslims are not so wedded to the

idea that the body is a place of corruption and sin. Their Prophet had several times repeated divine guidance on medical matters that revealed a very matter-of-fact and modern outlook. So the Muslims will pick up where Galen left off.

"Galen's humors are really Hippocrates's humors," says al-Tabari, and the young al-Razi nods. "The body is composed of a balance between the four elements present on Earth — fire, earth, water, and air — they are manifested in the body as yellow bile, black bile, blood, and phlegm."

"What if there is more at work in the body than the humors?" ventures al-Tabari, following the line of the question offered by his young student. "Take this vial. There are many substances that we cannot yet even isolate. Hippocrates was doing his best, but that was more than a thousand years ago."

After lunch, they go back to their study of the organs of the body. In that moment, al-Tabari is pleased to have this bright boy at his side and pleased to think that maybe destiny will make them collaborators over many coming decades. But that is not to be. In just a few years the teacher will be dead, while his student will travel home to Ray and then back to Baghdad to head up two great teaching hospitals.

And while al-Tabari will pass on into the footnotes of history, the odd looking boy al-Razi will grow to become the first great Muslim doctor, whose work will be translated into Latin and who will bring to Europeans medical innovations of Galen and Hippocrates and the Muslim world.

While al-Tabari will be largely forgotten, al-Razi will be remembered by his Latin name of Rhazes. And for the Europeans a hundred years later, Rhazes, along with ibn Sina, another Persian, will be the greatest of all Muslim physicians.

Al-Razi will author some two hundred major manuscripts on nearly every known aspect of medicine, as well as on philosophy, alchemy, and metaphysics. He will be the first physician to clinically and scientifically describe the scourge of smallpox and the less dire disease of measles, and to show that they are separate afflictions. In his book *Kitab al-Jadari wd'l Hasbah*, or *The Book of Smallpox and Measles*, he writes:

The eruption of smallpox is preceded by a continued fever, pain in the back, itching in the nose and nightmares during sleep. These are the more acute symptoms of its approach together with a noticeable pain in the back accompanied

by fever and an itching felt by the patient all over his body. A swelling of the face appears, which comes and goes, and one notices an overall inflammatory color noticeable as a strong redness on both cheeks and around both eyes. One experiences a heaviness of the whole body and great restlessness, which expresses itself as a lot of stretching and yawning. There is a pain in the throat and chest, and one finds it difficult to breathe and cough. Additional symptoms are dryness of breath, thick spittle, hoarseness of the voice, pain and heaviness of the head, restlessness, nausea and anxiety. (Note the difference: restlessness, nausea and anxiety occur more frequently with measles' than with smallpox. At the other hand, pain in the back is more apparent with smallpox than with measles). Altogether one experiences heat over the whole body, one has an inflamed colon, and one shows an overall shining redness, with a very pronounced redness of the gums.

In the vision of al-Razi, disease has specific, scientifically based physical causes. It is not a punishment visited on men by God.

He will reject superstition and primitive dogma that is not based in observable physical reality. And this fierce rationalism will lead him to undertake the project first mentioned by his old teacher al-Tabari — to critically analyze some of the bedrock lessons of Galen in his *Shukuk ala Alinosor*, or *Doubts about Galen*:

I prayed to God to direct and lead me to the truth in writing this book. It grieves me to oppose and criticize the man, Galen, from whose sea of knowledge I have drawn much. Indeed, he is the Master and I am the disciple. Although this reverence and appreciation will and should not prevent me from doubting, as I did, what is erroneous in his theories.

I imagine and feel deeply in my heart that Galen has chosen me to undertake this task, and if he were alive, he would have congratulated me on what I am doing. I say this because Galens's aim was to seek and find the truth and bring light out of darkness. I wish indeed he were alive to read what I have published.

Al-Razi will also undertake chemical experiments that suggest that there are other characteristics of physical matter than Galens's fire, water, earth, and air. Al-Razi will specify inflammability, saltiness, oiliness, and sulphurousness as other qualities of matter.

Out of the flood of his works will also come conclusions about allergic asthma and the origin of hay fever, the theory that fever is the body's natural defense

mechanism, the first hints of a mind-body disease connection, and his belief that individuals are responsible for their health through their behavior and diet.

He will sympathize with the doctor who must treat the patient who refuses to take responsibility for his lifestyle. He will invent the pharmaceutical mortar, spatula, and vials; mercurial ointments; and treatments for common ailments such as constipation, headache, colds, coughs, and even depression. His depression treatments will include the use of poppies for their euphoric narcotic effect.