

LANGUAGE, LEARNING, AND THOUGHT

Science and Philosophy

Reason and faith, stars and numbers: how Jewish thinkers of the Islamic world and Iberia shaped philosophy, astronomy, and mathematics, and helped carry knowledge between Muslims and Christians.

WHERE

Baghdad, Kairouan, Córdoba, Saragossa, Toledo, Barcelona, Provence, Salamanca, and Lisbon, from the tenth to the sixteenth centuries.

BIG QUESTION

Can reason and revelation agree? Jewish philosophers answered in very different ways, often writing in Arabic.

SCIENCE

Jewish scholars wrote on astronomy, geometry, arithmetic, and medicine, and designed instruments for measuring the sky.

BRIDGES

As translators, Jews helped move Greek and Arabic learning into Hebrew, Latin, and Castilian, reaching scholars across Europe.

A thousand years ago, some of the world's liveliest centers of learning were in the Islamic world. Greek philosophy and science had been translated into Arabic, and scholars of every faith read, argued about, and added to them. Jewish thinkers took part fully. They wrote philosophy in Arabic, often in Hebrew letters, studied the stars and the human body, and later helped pass this knowledge on to Christian Europe. Their story belongs to the history of science and ideas, and it shows how Muslims, Christians, and Jews learned from one another.

How ideas traveled

A chain of languages. Many works traveled from Greek to Arabic, then to Hebrew or Latin, and later to European languages. After Christian Castile took Toledo in 1085, the city, where Christians, Muslims, and Jews lived side by side, became famous for translation: first under Archbishop Raymond in the twelfth century, and again under King Alfonso X, "the Learned," in the thirteenth. Historian Norman Roth notes that there was no single formal "school" of translators.

Jews as translators. Jewish scholars who knew Arabic, Hebrew, and the local Romance language were valued partners. At Alfonso's court, Jewish translators worked almost entirely on science, and their work helped shape written Castilian. Under Alfonso, two Jewish astronomers, Judah ben Moses ha-Cohen and Isaac ben Sid, compiled the famous Alfonsine Tables in Toledo between 1262 and 1272.

The Ibn Tibbon family

Judah ibn Tibbon (about 1120 to 1190) was born in Granada and settled in Lunel, in Provence. Called the "father of translators," he put Bahya's *Duties of the Heart*, Saadia's *Beliefs and Opinions*, and HaLevi's *Kuzari* into Hebrew. His son Samuel translated Maimonides' *Guide* (1204, revised 1213). Later family members translated Euclid and Averroes, and Jacob ben Machir designed a new astronomical quadrant. Together they built a Hebrew library of philosophy and science.

Reason and faith: the philosophers

Saadia Gaon (882 to 942)

Born in the Fayyum in Egypt, Saadia became head of the Sura academy in Babylonia. His *Book of Beliefs and Opinions*, written in Arabic, named four sources of knowledge: the senses, reason, inference, and reliable tradition. He held that reason can explain many commandments, while others are known through revelation alone.

Source: Stanford Encyclopedia of Philosophy

Isaac Israeli (about 855 to 955)

A physician who moved from Egypt to Kairouan, in today's Tunisia, and is said to have served the founder of the Fatimid dynasty. His books on fevers, foods and drugs, and urine were translated into Latin at the medical school of Salerno and studied for centuries. One of the earliest Jewish Neoplatonists, he was quoted by Thomas Aquinas.

Source: Stanford Encyclopedia of Philosophy

Bahya ibn Paquda (eleventh century)

A judge, probably in Saragossa, Bahya wrote *The Book of Direction to the Duties of the Heart* in Judeo Arabic. He argued that the inner duties of thought and feeling had been neglected in favor of outward "duties of the limbs." Scholars note influences from Sufism and other Islamic thought. The book has been loved by Jewish readers for centuries.

Sources: Posen Library; My Jewish Learning; Jewish Virtual Library

Solomon ibn Gabirol (about 1021 to 1058)

Born in Málaga, a poet and philosopher. His *Fountain of Life*, an Arabic dialogue between teacher and student, survives mainly in a twelfth century Latin translation, *Fons Vitae*. Christian scholars knew its author as "Avicebron" and assumed he was Muslim or Christian. Only in the nineteenth century did scholar Solomon Munk show he was Ibn Gabirol.

Source: Stanford Encyclopedia of Philosophy

Yehuda HaLevi (died 1141)

A physician and poet, probably from Tudela. His *Kuzari*, written in Judeo Arabic, imagines a king of the Khazars who questions a philosopher, a Christian, a Muslim, and finally a Jewish sage. HaLevi argued that reasoning works well in logic and mathematics, but that knowledge of God comes through experience and tradition more than philosophical proof.

Source: Stanford Encyclopedia of Philosophy

Maimonides (1138 to 1204)

Born in Córdoba, he lived in Fez before settling in Egypt, where he was also a physician. His *Guide of the Perplexed* (1190), written for a student torn between philosophy and religion, sought to reconcile the two. Translated into Latin, it influenced Albertus Magnus, Duns Scotus, and Thomas Aquinas, who admired how he harmonized the Bible with Aristotle.

Sources: Stanford Encyclopedia of Philosophy; Library of Congress treasures, Jewish Virtual Library

Stars, numbers, and navigation: the scientists

Abraham bar Hiyya (active before 1136)

A Barcelona scholar known in Latin as Savasorda. His Hebrew book on practical geometry, translated into Latin by Plato of Tivoli in 1145, is called the earliest presentation of Arab algebra written in Europe. The great Italian mathematician Fibonacci drew on it. He also wrote on astronomy and the Jewish calendar.

Source: Dictionary of Scientific Biography

Abraham ibn Ezra (born about 1093)

Born probably in Tudela, he left Spain after the Almohad attacks of 1140 and wandered through Rome, Lucca, Rouen, London, and Béziers. Alongside Bible commentary and poetry, he wrote an arithmetic textbook and a manual on the astrolabe, and coined Hebrew terms for ideas such as the sine. Several of his works circulated in Latin.

Sources: Stanford Encyclopedia of Philosophy; Biographical Encyclopedia of Astronomers

The Alfonsine Tables (1262 to 1272)

Compiled in Castilian at Toledo by Judah ben Moses ha-Cohen and Isaac ben Sid for Alfonso X, the tables predicted the positions of the planets and improved on the earlier Toledo Tables of the Muslim astronomer al Zarqali. Printed in Venice in 1483, they stayed in use until Kepler's tables replaced them in the seventeenth century.

Source: Institute of Mathematics, University of Seville

Gersonides (1288 to 1344)

Levi ben Gershom lived in Provence, in southern France, mostly in Orange. A philosopher and astronomer, he invented an instrument for measuring angles between stars, later known as "Jacob's staff." He trusted his own careful observations over Ptolemy's, and his astronomy was translated into Latin in his lifetime.

Sources: Stanford Encyclopedia of Philosophy; John Carter Brown Library

Abraham Zacuto (1452 to about 1515)

Born in Salamanca, he compiled astronomical tables there. Refusing to convert in 1492, he became court astronomer in Lisbon. A Latin version, the *Almanach Perpetuum* (1496), became essential for navigation, and Columbus knew his work. He advised on Vasco da Gama's voyage, then fled Portugal's forced conversions in 1497.

Sources: University of Washington; Biographical Encyclopedia of Astronomers; Brown University

Baruch Spinoza (1632 to 1677)

Born in Amsterdam's Spanish and Portuguese Jewish community, to a family descended from Jews who had left Iberia, Spinoza became one of the most influential philosophers of the early modern era. The community excommunicated him in 1656; the exact reasons are debated. His *Ethics* appeared after his death.

Source: My Jewish Learning

Common misconceptions

- **"In the Middle Ages, religion and science were enemies."** Many of these scholars were religious leaders who saw the study of nature as worthy work.
- **"Knowledge passed straight from Muslims to Christians."** Jewish translators and scholars were often one of the links between Arabic and Latin learning, working alongside Muslim and Christian colleagues.
- **"Jewish philosophers all agreed."** Maimonides championed philosophy; HaLevi stressed its limits; Bahya turned inward. Debate was part of the tradition.
- **"It was a time of perfect harmony."** Cooperation was real, but so were persecutions: Ibn Ezra and Maimonides' family left Spain in the time of the Almohads, and Zacuto was expelled twice.

Words to know

Philosophy *Greek, Arabic falsafa*

The use of reason to ask questions about truth, nature, and how to live.

Al Andalus *Arabic*

The Muslim ruled parts of the Iberian Peninsula.

Judeo Arabic

Arabic as written by Jews, usually in Hebrew letters.

Neoplatonism

A philosophy, inspired by Plato, in which all reality flows from a single source.

Aristotelianism

Thought built on Aristotle's logic and science, central to Maimonides.

Astrolabe

An instrument for measuring the positions of the sun and stars and telling time.

Jacob's staff

A tool for measuring angles between stars, credited to Gersonides.

Astronomical tables

Charts predicting the positions of the sun, moon, and planets, used for calendars and navigation.

Translation movement

The work of carrying texts from Greek and Arabic into Hebrew, Latin, and Castilian.

Avicbron *Latin*

The name by which Christian Europe knew Solomon ibn Gabirol.

Bringing these ideas to life

In the public school classroom

- Build a timeline of the history of science that includes Jewish, Muslim, and Christian scholars side by side.
- Trace one book's journey, such as Ibn Gabirol's *Fountain of Life*, from Arabic to Latin, and discuss why its author was forgotten.
- Make a simple paper astrolabe or cross staff and measure angles, connecting geometry to navigation.
- Discuss Zacuto's complex legacy: his science aided voyages of exploration that also led to conquest.
- Study the philosophers' arguments as ideas; do not ask students to practice any religion.

In Jewish schools and communities

- Stage a debate between Maimonides and HaLevi on whether philosophy leads to God.
- Read a passage from Bahya's *Duties of the Heart* and discuss inner and outer duties.
- Use the Sephardi & Mizrahi Education Toolkit to bring Sephardic thinkers into science and Jewish studies classes.

At home and with family

- Look at the night sky together and find the stars these astronomers charted.
- Read a short story about Maimonides or Zacuto, and talk about learning in more than one language.
- Ask relatives about scientists, doctors, or scholars in your family's story, and share it with JIMENA's oral history project.

Questions for discussion

- Why were translators so important to the history of science? Who plays that role today?
- Maimonides trusted philosophy; HaLevi questioned it. Which argument do you find more convincing, and why?
- How should we remember a scientist like Zacuto, whose work helped explorers whose voyages had very different effects on different peoples?

Learn more

Watch and listen

Classes and Education video collection (JIMENA)

jimena.org/videos/classes-and-education

Read

***The Ornament of the World*, by María Rosa Menocal** (Little, Brown, 2002). A popular, upbeat history of Muslims, Jews, and Christians in medieval Spain; some historians find it too rosy.
kirkusreviews.com/book-reviews/maria-rosa-menocal/the-ornament-of-the-world/print

***Maimonides: The Life and World of One of Civilization's Greatest Minds*, by Joel L. Kraemer** (Doubleday, 2008). Detailed biography.
publishersweekly.com/9780385511995

***The Cambridge Companion to Medieval Jewish Philosophy*, edited by Daniel H. Frank and Oliver Leaman** (Cambridge University Press, 2003). Scholarly.
scholars.uky.edu/en/publications/the-cambridge-companion-to-medieval-jewish-philosophy

From Distinctions, JIMENA's journal

"The Poetry of Exile and Return," by Sarah Sassoon Ibn Gabirol, HaLevi, and the poets of Spain, physicians and philosophers among them.
distinctionsjournal.org/the-poetry-of-exile-and-return

From JIMENA

Sephardi & Mizrahi Education Toolkit (designed mainly for Jewish day schools)
sepharditoolkit.org

JIMENA Bibliography
jimena.org/bibliography

JIMENA Oral History
jimena.org/oral-history

Explore online

Maimonides (Stanford Encyclopedia of Philosophy, like the next five entries)
plato.stanford.edu/entries/maimonides

Saadia
plato.stanford.edu/entries/saadya

Isaac Israeli
plato.stanford.edu/entries/israeli

Solomon ibn Gabirol
plato.stanford.edu/entries/ibn-gabirol

Judah HaLevi
plato.stanford.edu/entries/halevi

Gersonides
plato.stanford.edu/entries/gersonides

The Work of Maimonides: Passion and Compassion (Library of Congress treasures, Jewish Virtual Library)
jewishvirtuallibrary.org/passion-and-compassion-judaic-treasures

The Book of Direction to the Duties of the Heart (Posen Library)
posenlibrary.com/node/12819

How Contributions from Christopher Columbus' Sephardic Astronomer Illustrate Complex Legacies (University of Washington)
jewishstudies.washington.edu/sephardic-studies/how-contributions-from-christopher-columbus-sephardic-astronomer-illustrate-complex-legacies-of-exploration-and-conquest

Jews and the Dissemination of Geographical Knowledge (John Carter Brown Library, Brown University)
brown.edu/Facilities/John_Carter_Brown_Library/exhibitions/judaica/pages/geography+.html

The Astronomical Tables of King Alfonso X (University of Seville)
institucional.us.es/blogimus/?p=15786

Spinoza (My Jewish Learning)
myjewishlearning.com/article/spinoza



About JIMENA

JIMENA, Jews Indigenous to the Middle East and North Africa, preserves and shares the history, heritage, and living culture of Sephardic and Mizrahi Jews. Explore more explainers, oral histories, videos, and teaching resources at jimena.org/cultural-heritage.

A note for educators

This explainer is written to support teaching *about* religion and culture. In public schools, present customs, texts, and prayers as subjects of study, and do not ask students to perform rituals, recite blessings, or take part in religious practice. Share your family's story with JIMENA at jimena.org/share-your-story.

Sources consulted include the Stanford Encyclopedia of Philosophy; Posen Library; Jewish Virtual Library (Library of Congress treasures); My Jewish Learning; Encyclopaedia Judaica and Dictionary of Scientific Biography (via Encyclopedia.com); Biographical Encyclopedia of Astronomers (Springer); University of Washington Stroum Center for Jewish Studies; John Carter Brown Library; University of Seville; and Distinctions. Links checked October 2026; jimena.org links point to JIMENA's new website. © 2026 JIMENA. May be freely shared and printed for educational use.