You Voted, We Counted: The 50 Greatest Moments in Materials, Part II: Nos. 1–10

James J. Robinson

After months of speculation and participation, it is time to reveal the ten greatest materials moments.

On the following pages, you will find not only the final rankings, but an intriguing table showing differing perspectives on the top ten based on selected demographic groups.

A word about the original artwork: It was created by TMS's David Rasel, who drew stylistic inspiration from the etchings in Georgius Agricola's *De Re Metallica.* David's mix of anachronism, whimsy, and technical/historical artistic license adds a memorable stamp to the proceedings.

James J. Robinson is editor of *JOM*.

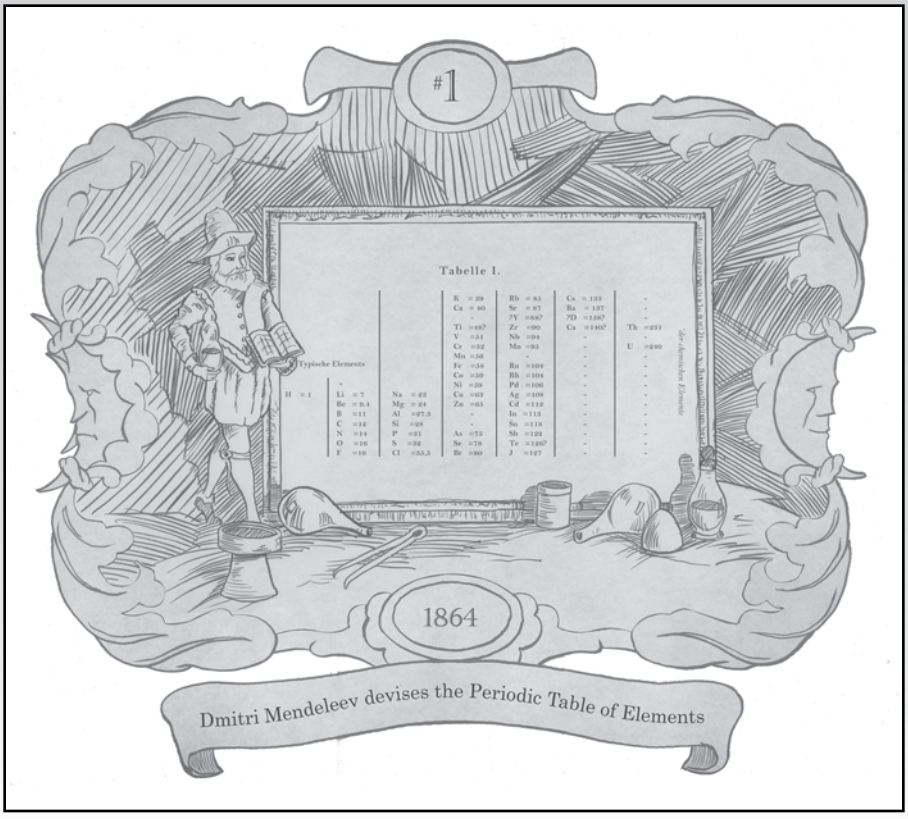
Greatest Materials Moments

Rank	Moment
1	1864: Dmitri Mendeleev devises the Periodic Table of Elements.
2	(estimated) 3500 BC: Egyptians smelt iron (perhaps as a by-product of copper refining) for the first time, using tiny amounts mostly for ornamental or ceremonial purposes.
3	1948: John Bardeen, Walter H. Brattain, and William Shockley invent the transistor.
4	(estimated) 2200 BC: The peoples of northwestern Iran invent glass.
5	(estimated) 1668: Anton van Leeuwenhoek develops optical microscopy capable of magnifications of 200 times and greater.
6	1755: John Smeaton invents modern concrete (hydraulic cement).
7	(estimated) 300 BC: Metal workers in south India develop crucible steel making.
8	(estimated) 5000 BC: In and around modern Turkey, people discover that liquid copper can be extracted from malachite and azurite and that the molten metal can be cast into different shapes.
9	1912: Max von Laue discovers the diffraction of x-rays by crystals.
10	1856: Henry Bessemer patents a bottom-blown acid process for melting low-carbon iron.

Moment 1

Dmitri Mendeleev devises the Periodic Table of Elements.

Introduces the ubiquitous reference tool of materials scientists and engineers.



Moment 2

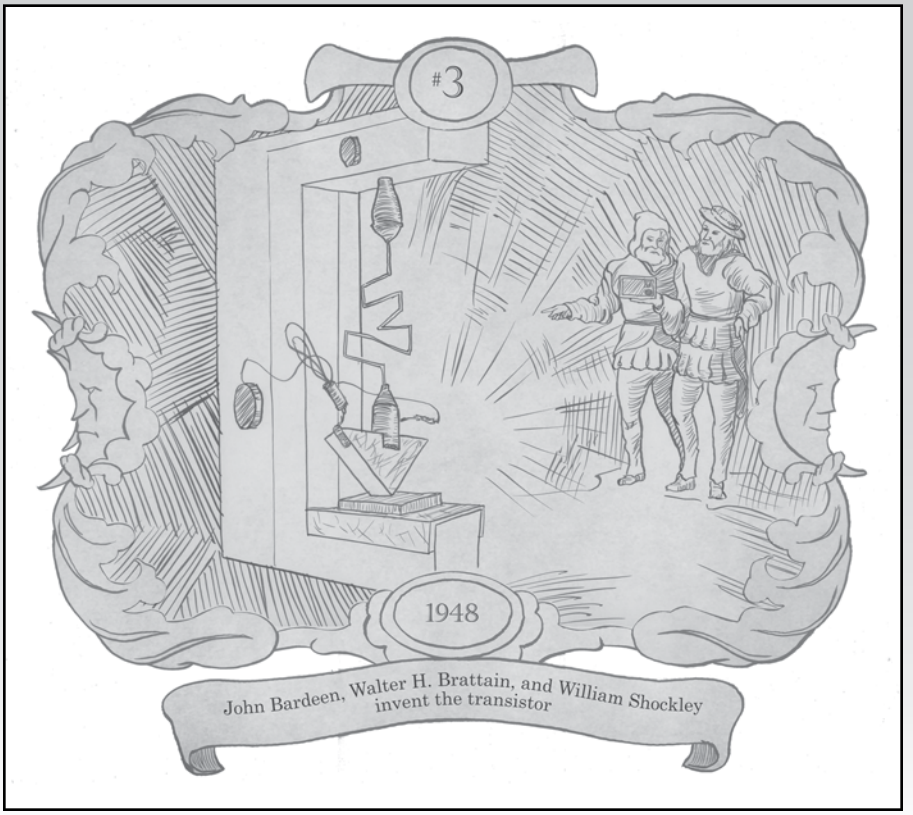
Egyptians smelt iron (perhaps as a by-product of copper refining) for the first time, using tiny amounts mostly for ornamental or ceremonial purposes.

Unlocks the first processing secret of what will become the world's dominant metallurgical material.

Moment 3

John Bardeen, Walter H. Brattain, and William Shockley invent the transistor.

Becomes the building block for all modern electronics and the foundation for microchip and computer technology.



Moment 4

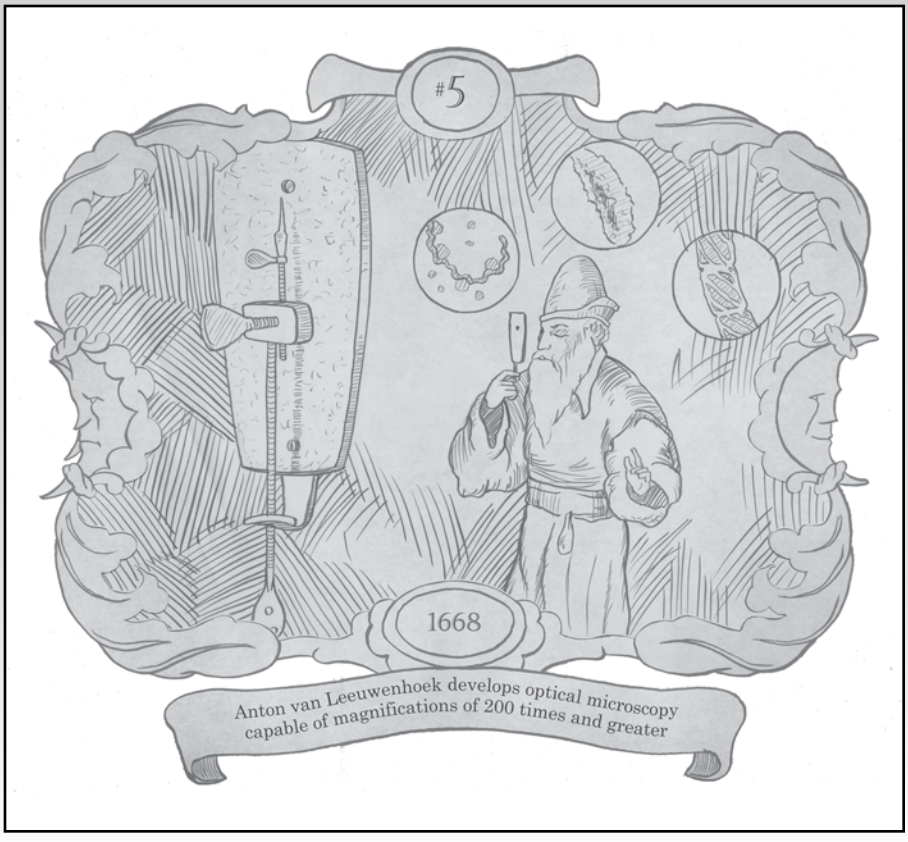
The peoples of northwestern Iran invent glass.

Introduces the second great nonmetallic engineering material (following ceramics).

Moment 5

Anton van Leeuwenhoek develops optical microscopy capable of magnifications of 200 times and greater.

Enables study of the natural world and its structures that are invisible to the unaided eye.



Moment 6

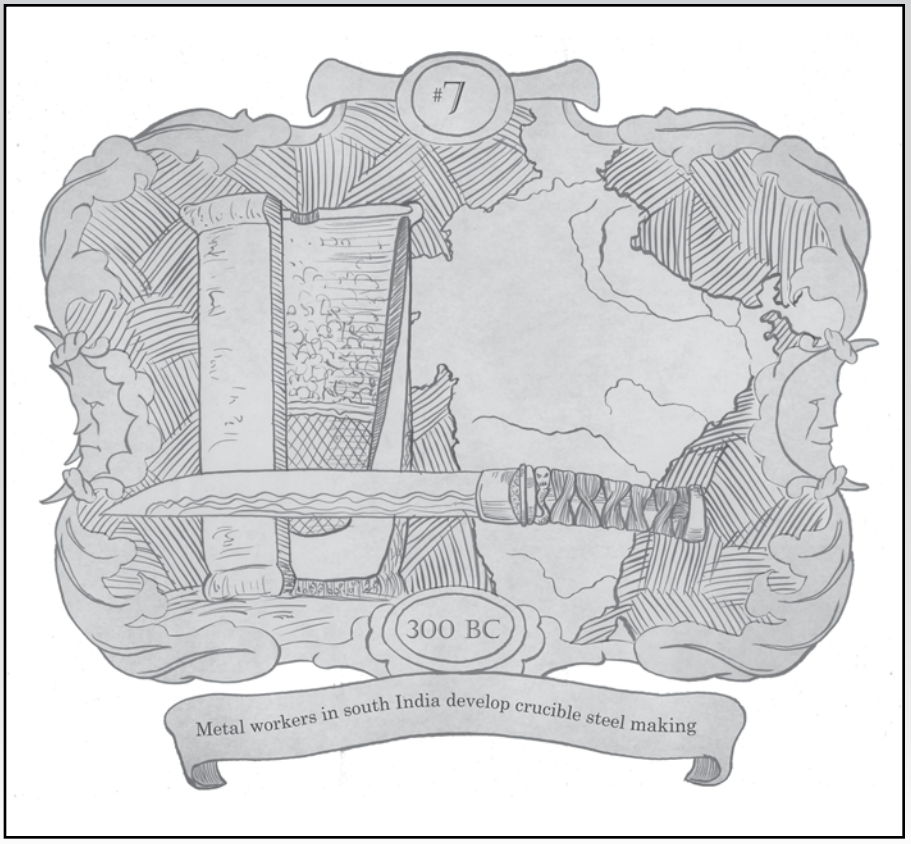
John Smeaton invents modern concrete (hydraulic cement).

Introduces the dominant construction material of the modern age.

Moment 7

Metal workers in south India develop crucible steel making.

Produces "wootz" steel which becomes famous as "Damascus" sword steel hundreds of years later, inspiring artisans, blacksmiths, and metallurgists for many generations to come.



Moment 8

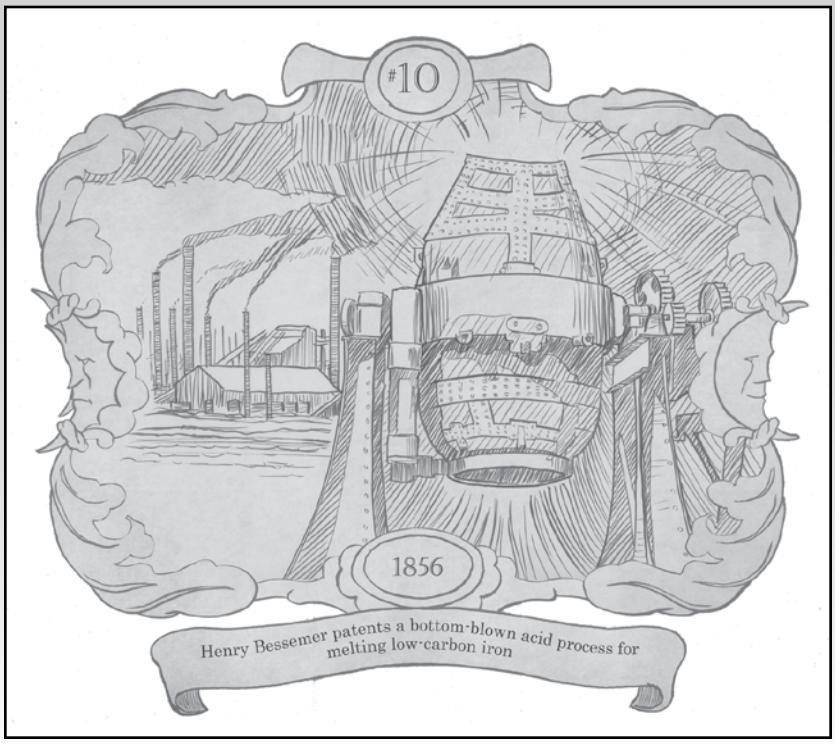
In and around modern Turkey, people discover that liquid copper can be extracted from malachite and azurite and that the molten metal can be cast into different shapes.

Introduces extractive metallurgy—the means of unlocking the Earth's mineralogical treasures.

Moment 9

Max von Laue discovers the diffraction of x-rays by crystals.

Creates means to characterize crystal structures and inspires W.H. Bragg and W.L Bragg in developing the theory of diffraction by crystals, providing insight into the effects of crystal structure on material properties.



Moment 10

Henry Bessemer patents a bottom-blown acid process for melting low-carbon iron.

Ushers in the era of cheap, large tonnage steel, thereby enabling massive progress in transportation, building construction, and general industrialization.

Other Perspectives on the Top Ten

Rank	TMS Members	MSE Students	Nonmembers
1	1864: Dmitri Mendeleev devises the Periodic Table of Elements.	1864: Dmitri Mendeleev devises the Periodic Table of Elements.	1864: Dmitri Mendeleev devises the Periodic Table of Elements.
2	3500 BC (estimated): Egyptians smelt iron (perhaps as a by-product of copper refining) for the first time, using tiny amounts mostly for ornamental or ceremonial purposes.	1912: Max von Laue discovers the diffraction of x-rays by crystals.	2200 BC (estimated): The peoples of north-western Iran invent glass.
3	1948: John Bardeen, Walter H. Brattain, and William Shockley invent the transistor.	1898: William Roberts-Austen develops the phase diagram for iron and carbon.	1755: John Smeaton invents modern concrete (hydraulic cement).
4	1876: J. Willard Gibbs publishes the first part of the two-part paper "On the Equilibrium of Heterogeneous Substances."	400 (estimated): Iron smiths forge and erect a seven meter high iron pillar in Delhi, India.	3500 BC (estimated): Egyptians smelt iron (perhaps as a by-product of copper refining) for the first time, using tiny amounts mostly for ornamental or ceremonial purposes.
5	1856: Henry Bessemer patents a bottom-blown acid process for melting low-carbon iron.	1876: J. Willard Gibbs publishes the first part of the two-part paper "On the Equilibrium of Heterogeneous Substances."	1948: John Bardeen, Walter H. Brattain, and William Shockley invent the transistor.
6	1668 (estimated): Anton van Leeuwenhoek develops optical microscopy capable of magnifications of 200 times and greater.	1668 (estimated): Anton van Leeuwenhoek develops optical microscopy capable of magnifications of 200 times and greater.	400 (estimated): Iron smiths forge and erect a seven meter high iron pillar in Delhi, India.
7	5000 BC (estimated): In and around modern Turkey, people discover that liquid Cu can be extracted from malachite and azurite and that the molten metal can be cast into different shapes.	2200 (estimated): The peoples of northwestern Iran invent glass.	300 BC (estimated): Metal workers in south India develop crucible steel making.
8	2200 BC (estimated): The peoples of north-western Iran invent glass.	1948: John Bardeen, Walter H. Brattain, and William Shockley invent the transistor.	1668 (estimated): Anton van Leeuwenhoek develops optical microscopy capable of magnifications of 200 times and greater.
9	1912: Max von Laue discovers the diffraction of x-rays by crystals.	1933: Max Knoll and Ernst Ruska build the first transmission electron microscope.	28,000 BC (estimated): The earliest fired ceramics—in the form of animal and human figurines, slabs, and balls—are manufactured starting about this time.
10	1898: William Roberts-Austen develops the phase diagram for iron and carbon.	1822: Augustin Cauchy presents his theory of stress and strain to the French Academy of Sciences.	5000 BC (estimated): In and around modern Turkey, people discover that liquid copper can be extracted from malachite and azurite and that the molten metal can be cast into different shapes.