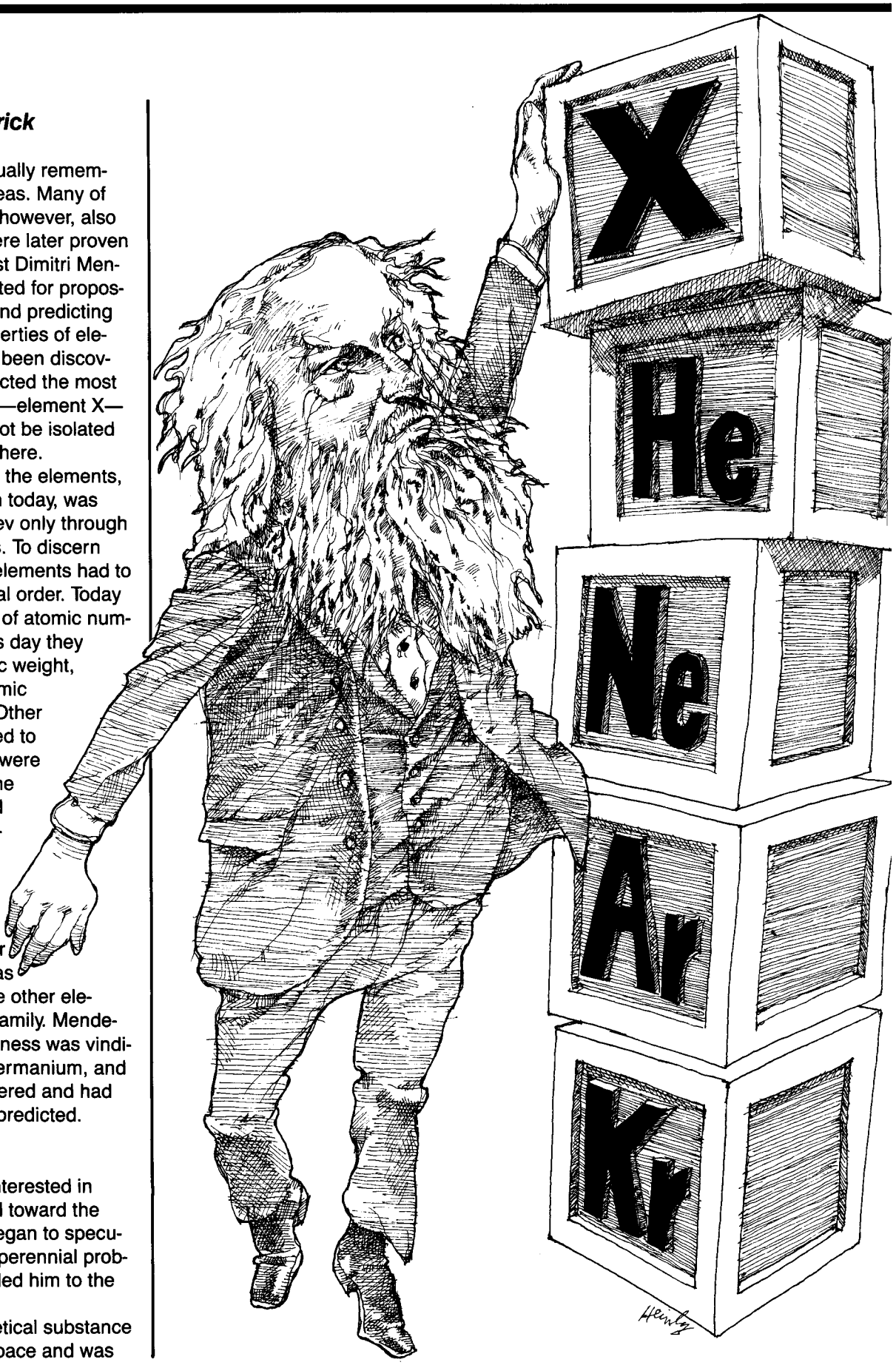
ELEMENT X

by Joseph D. Ciparick

Great scientists are usually remembered for their great ideas. Many of these same scientists, however, also proposed ideas that were later proven wrong. Russian chemist Dimitri Mendeleev is justly celebrated for proposing the periodic table and predicting the existence and properties of elements that had not yet been discovered. But he also predicted the most fantastic element of all—element X—and said that it could not be isolated because it was everywhere.

The periodic table of the elements, familiar as it may seem today, was perceived by Mendeleev only through extraordinary boldness. To discern periodic patterns, the elements had to be listed in some logical order. Today they are listed in order of atomic number, but in Mendeleev's day they were ordered by atomic weight, and many of these atomic weights were in error. Other scientists had attempted to find patterns, but they were not willing to change the atomic weights that did not fit, nor allow for undiscovered elements. Iodine has a lower atomic weight than tellurium, yet Mendeleev placed iodine after tellurium because it was obviously related to the other elements of the halogen family. Mendeleev felt that such boldness was vindicated when gallium, germanium, and scandium were discovered and had the properties he had predicted.



Ethereal element

Mendeleev was also interested in many other topics, and toward the end of his career he began to speculate about the *ether,* a perennial problem of science, which led him to the mysterious element X.

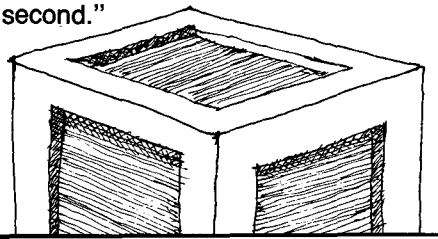
Ether was a hypothetical substance that made up empty space and was

the medium through which light traveled. Scientists found it difficult to imagine a wave traveling from one place to another without some vibrating medium. Sound waves, for example, must travel through air, water, or some other substance and cannot pass through a vacuum. It was believed that light waves required a medium as well. Therefore there had to be a medium, which penetrated solid material such as glass, that filled the space between the stars and transmitted light. That medium—the ether—might prove to be undetectable because it passed freely through other substances and was inert.

Smallest family member

It was the discovery of the inert gases, in the 1890s, that started Mendeleev thinking about element X. If, by using chemical analogies, he had successfully predicted the existence and properties of elements heavier than hydrogen, why couldn't the same process be used to predict elements lighter than hydrogen? The inert gases, which had long eluded discovery because they didn't react with other elements, provided a model. Helium in particular was known to penetrate liquids and even certain solids. Ether—if it existed—must also be inert and able to penetrate other bodies. Could there be an undiscovered, infinitesimally light, inert element that might be the atom of ether? Mendeleev boldly predicted the existence of element X and placed it in the inert gas group in a new period (period 0).

Mendeleev asserted that X was "capable of moving freely everywhere throughout the universe, [with] an atomic weight nearly one millionth that of hydrogen, and traveling with a velocity of about 2250 kilometers per second."



Mendeleev wrote, "Without going into a further development of our subject, I should like to acquaint the reader with some, at first sight, auxiliary circumstances that guided my thoughts and lead me to publish my opinions. These consist of a series of physicochemical phenomena that are not subject to the ordinary doctrines of science. . . . This more especially refers to radioactive phenomena." He went on to describe his observation of radioactive uranium and thorium in the laboratory of Pierre and Marie Curie. Because uranium and thorium are heavy elements, he reasoned, they might be capable of attracting and "dissolving" element X. X would then emanate from these heavy elements, manifesting its presence by scintillations on a zinc sulfide screen—a phenomenon common in radioactivity.

Not bad reasoning! But alas, it was wrong. Mendeleev also put forward other faulty ideas.

When the electron was discovered, Mendeleev resisted the concept because electrons were said to come from within atoms. He fought *any* suggestion that atoms might have some internal structure. Atoms, he believed, were unique—not composed of more basic matter. Mendeleev's approach was both scientific and emotional. There just *had* to be a periodic pattern to the elements. Notions about the internal structure of atoms were wrong, he felt, because "No general relation is possible between things unless they have some individual character resident in them." He predicted that the hypothesis of electrons would "in time occupy a position in the history of our science similar to that long ago accorded to phlogiston."

Today electrons are in and ether is out. Is the great man not so great after all? By no means! If it were not for his strong conviction about the uniqueness of elements and their mysterious family relationships, he might not have been so bold as to propose the Periodic Law.

Prospects for petroleum

Mendeleev was "wrong" in another interesting speculation: the origin of petroleum. Geologists believe that petroleum was formed by the decomposition of ancient plants and animals, but Mendeleev asserted that petroleum had a nonbiological origin. He claimed that water, seeping downward through cracks and fissures in the Earth's crust, reacted with carbides of iron in the very hot upper mantle to produce hydrocarbons (much as calcium carbide will react with water to produce acetylene). His hypothesis was ignored. Everyone knew that petroleum came from organic matter. But, in Siberia, oil fields were found in geological formations that are seemingly devoid of previous life.

Recently, scientist Thomas Gold asserted that certain oil deposits were formed from primordial methane that was trapped in the crust during the formation of the earth. Evidence of nonbiological petroleum deposits in Sweden prompted the Swedish government to start exploratory drilling. Interestingly enough, the Russians are now carrying out similar tests. Is it Gold's nonbiogenic theory they are testing—or Mendeleev's?

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