NIHONIUM MOSCOVIUM TENNESSINE OGANESSON

Darryl Francis
Brampton, Cumbria, England
darryl.francis@yahoo.co.uk

Over the last five decades, the names and symbols of the chemical elements have been explored in much detail in Word Ways. We've had transposals (eg **rhenium/inhumer**), transdeletions (eg **platinum/implant**), transadditions (eg **silver/shrivel**) and substitute-letter transposals (eg **radium/myriad**). We've seen how words can run on between the names of adjacent elements (eg **umber** from **lithium beryllium**). We've seen how some of the elements' symbols, when taken in order, spell out words (eg **conic** from Co Ni Cu). And we've seen how moving king-wise (as in chess) between adjacent symbols in the periodic table can spell out words (eg **nonpasses** from N-O-N-P-As-Se-S).

We've noted that there have been temporary names and symbols for the newly created artificial elements – for example, the element with atomic number 114 was temporarily named ununquadium, with temporary symbol Uuq.

The International Union of Pure and Applied Chemistry (IUPAC) is the body which sets the rules on the naming of new elements, and ultimately decides on new names for elements. The IUPAC has previously agreed these names for the artificial elements with the atomic numbers shown:

100 fermium
101 mendelevium
102 nobelium
103 lawrencium
104 rutherforium
105 dubnium
106 seaborgium
107 bohrium
108 hassium
109 meitnerium
110 darmstadtium
111 roentgenium
112 copernicium
114 flerovium

116 livermorium

The gaps at atomic numbers 113, 115, 117 and 118 have remained temporarily named until recently, the temporary names being ununtrium, ununpentium, ununseptium and ununoctium.

However, on November 28, 2016, after a 5-month consultation period, the IUPAC approved new permanent names for these four elements. Thus

113 **nihonium** with symbol Nh
115 **moscovium** with symbol Mc
117 **tennessine** with symbol Ts
118 **oganesson** with symbol Og

So, why these names, where did they come from, and why the mix of endings (-ium, -ine and -on)?

The IUPAC has published guidelines for the naming of newly discovered elements. In keeping with tradition, they require that new elements can be named after:

(a) a mythological concept or character, including an astronomical object;
(b) a mineral or similar substance;
(c) a place, or geographical region;
(d) a property of the element, or
(e) a scientist.

Additionally, the IUPAC requires the names of all new elements should have an ending that reflects and maintains historical and chemical consistency. This would be "-ium" for elements belonging to groups 1-16, "-ine" for elements of group 17 (such as fluorine, chlorine, bromine, iodine and astatine) and "-on" for elements of group 18 (such as neon, argon, krypton, xenon and radon). So, on this basis, elements 113 and 115 would need to end with -ium, element 117 would need to end with -ine, and element 118 would need to end with -on.

Let's see how each of the four new names was derived.

nihonium (atomic number 113, symbol Nh): the discoverers of this new element are based in Japan; nihon is one of the two ways to say "Japan" in Japanese, and literally means "the Land of Rising Sun". The name was

approved to make a direct connection to the nation where the element was discovered.

moscovium (atomic number 115, symbol Mc): discoverers of this element were from the Russian Joint Institute for Nuclear Research. Although this research team is based in Dubna, Russia, the placename Dubna has already been used for dubnium (element 105), so it was agreed to base the name on the Russian capital, Moscow.

tennessine (atomic number 117, symbol Ts): this name is in recognition of the contribution of the Tennessee region, including Oak Ridge National Laboratory (at Oak Ridge, Tennessee), Vanderbilt University (at Nashville), and the University of Tennessee (at Knoxville).

oganesson (atomic number 118, symbol Og): the co-discoverers are based at the Joint Institute for Nuclear Research (Russia) and the Lawrence Livermore National Laboratory (USA). Their joint proposal was to honor the scientist Professor Yuri Oganessian for his pioneering contributions in researching new elements.

So, having set the scene, what items of logological interest can be found for the new element names?

Transposals
Unfortunately, none of the four new element names has a valid transposal. If you can find one, please let the Editor know.

Transdeletions
For NIHONIUM, deleting the U and rearranging the remaining letters gives HOMININ (a primate of the tribe Hominini; Oxford English Dictionary, OED). There doesn't seem to be a single-letter transdeletion for MOSCOVIUM – but there is a two-letter transdeletion. Removing OV and rearranging the remaining letters gives COMMIUS (an ambassador from Caesar to the Briton in the first century BC; Dictionary of Universal Biography, by Hyamson). It's interesting to note that there is a three-letter transdeletion of MOSCOVIUM – removing COV and rearranging the remainder gives OSMIUM, the name of another chemical element. TENNESSINE can be transdeleted – removing an S allows us to get to NINETEENS. And OGANESSON can also be transdeleted – removing an S and rearranging gives NONGASES, the plural of NONGAS (Webster's Second, W2).

Transadditions

NIHONIUM doesn't seem to have a single-letter transaddition – but adding the two letters AT and rearranging all the letters gives INHUMATION (Webster's Third, W3). MOSCOVIUM is a particularly difficult word to find transadditions for. Adding the 6 letters EEKNPST allows for the hyphenated transaddition SMOKE-CONSUMPTIVE (W2), and adding 9 letters allows for SEMICIRCUMVOLUTION (W2). There is a single-letter transaddition of TENNESSINE – namely, INTENSENESS (W3). We had hoped to find LENIENTNESS in a dictionary somewhere – but this single-letter transaddition eluded us. And OGANESSON has two single-letter transadditions. There's OCEANSONGS (plural of OCEANSONG, undefined, but presumably a song of the ocean!; OED) and NONGASEOUS (W2).

Substitute-Letter Transposals

Just a quick reminder about substitute-letter transposals. Remove a letter, add a different letter, rearrange the new set of letters – the result is a substitute-letter transposal. Because of the flexibility allowed by deleting any one letter and replacing it with any of 25 other letters, there are several valid substitute-letter transposals for all four new element names.

For NIHONIUM, there's CUMINOIN (W3), HOMINIAN (W3), HOMININE (W3), INHUMING (W3), MIS-UNION (W2, but spelled solidly in an OED quote), MUNITION (W3), THIONIUM (W3) and UNIONISM (W3).

For MOSCOVIUM, there's MOOD MUSIC (OED) and MUSIC ROOM (W2). There's also two variant spellings of MOSCOVIUM which were suggested before the MOSCOVIUM spelling was finally settled – namely, MOSCOWIUM and MUSCOVIUM (both from Google searches).

TENNESSINE has a goodly clutch of substitute-letter transposals. There's EISENSTEIN (Russian film director; Random House Dictionary), ENTIRENESS (W3), INNATENESS (W3), INTENTNESS (W3), NON-SIENESE (W2), TENNESSEAN (W3) and SENTIENCES (W3).

And OGANESSON has these substitute-letter transposals: OCEANSONG (OED), SEASONING (W3), SONSONATE (a city in El Salvador; Webster's Geographical Dictionary, 1969 edition) and SWAN GOOSE (W3).

Other

The February 2015 edition of Word Ways carried our article King's Moves in the Periodic Table, where words can be formed by moving between the symbols in the periodic table in "king's move" fashion. One example given was DYES, moving down diagonally to the right from Dy (dysprosium, atomic number 66) to Es (einsteinium, atomic number 99).

Two new words can be traced out using the symbols of the four new elements. There's the simple word POTS, moving down diagonally to the right from Po (polonium, atomic number 84) to Ts (tennessine, atomic number 117). And much more obscure is TSOG, moving right from Ts (tennessine, atomic number 117) to Og (oganesson, atomic number 118). What is TSOG, though? In Buddhism, TSOG is a most profound method of purification, a profound way of gaining realisations.

Readers are encouraged to submit to the Word Ways editor other items of interest about the names of the four new elements.