

The New York Section of the American Chemical Society  
INVITES YOU TO THE UNVEILING OF THE  
**GIANT 3D PERIODIC TABLE OF ELEMENTS**

Constructed by 1000+ Participants from 50+ Organizations



International Year  
of the Periodic Table  
of Chemical Elements

FRIDAY  
OCTOBER 18, 2019  
2:30 P.M.

THE GREAT HALL  
NEW YORK HALL OF SCIENCE



ACS Local Section  
New York



---

# International Year of the Periodic Table Committee

**Dr. Ping Furlan, Chair**

**Dr. Paul Sideris, Co-Chair**

**Mr. Joseph Wiener, Co-Chair**

**Ms. Erin Thelen, NYSCI Liaison**

**Dr. Pairs Svoronos**

**Dr. Neil Jespersen**

**Dr. Justyna Widera-Kalinowaska, NYACS Chair**

**Dr. Brian Gibney, NYACS Webmaster**

**Mr. Frank Romano, NYACS Treasurer**



**ACS** Local Section  
New York

American Chemical Society's New York Section, Inc. | <http://newyorkacs.org>

---

8A

## IUPAC Periodic Table of the Elements

1A		2A		3A		4A		5A		6A		7A		8A			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 <b>H</b> hydrogen [1.00784, 1.00823]	2 <b>He</b> helium 4.0026	3 <b>Li</b> lithium [6.941, 6.991]	4 <b>Be</b> beryllium 9.0122	5 <b>B</b> boron [10.811, 10.821]	6 <b>C</b> carbon [12.010, 12.012]	7 <b>N</b> nitrogen [14.006, 14.008]	8 <b>O</b> oxygen [15.999, 16.000]	9 <b>F</b> fluorine 18.998	10 <b>Ne</b> neon 20.180	11 <b>Na</b> sodium [22.990, 22.991]	12 <b>Mg</b> magnesium [24.304, 24.307]	13 <b>Al</b> aluminum [26.982, 26.987]	14 <b>Si</b> silicon [28.086, 28.087]	15 <b>P</b> phosphorus [30.974, 30.974]	16 <b>S</b> sulfur [32.065, 32.070]	17 <b>Cl</b> chlorine [35.45, 35.457]	18 <b>Ar</b> argon 39.948
19 <b>K</b> potassium 39.098	20 <b>Ca</b> calcium 40.078(4)	21 <b>Sc</b> scandium 44.956	22 <b>Ti</b> titanium 47.887	23 <b>V</b> vanadium 50.942	24 <b>Cr</b> chromium 51.996	25 <b>Mn</b> manganese 54.938	26 <b>Fe</b> iron 55.845(2)	27 <b>Co</b> cobalt 58.933	28 <b>Ni</b> nickel 58.933	29 <b>Cu</b> copper 63.546(3)	30 <b>Zn</b> zinc 65.38(2)	31 <b>Ga</b> gallium 69.723	32 <b>Ge</b> germanium [72.630(8), 72.630(8)]	33 <b>As</b> arsenic 74.922	34 <b>Se</b> selenium [78.9718, 78.9718]	35 <b>Br</b> bromine [79.907, 79.907]	36 <b>Kr</b> krypton 83.798(2)
37 <b>Rb</b> rubidium 85.468	38 <b>Sr</b> strontium 87.62	39 <b>Y</b> yttrium 88.906	40 <b>Zr</b> zirconium 91.224(2)	41 <b>Nb</b> niobium 92.906	42 <b>Mo</b> molybdenum 95.95	43 <b>Tc</b> technetium	44 <b>Ru</b> ruthenium 101.07(2)	45 <b>Rh</b> rhodium 102.91	46 <b>Pd</b> palladium 106.42	47 <b>Ag</b> silver 107.87	48 <b>Cd</b> cadmium 112.41	49 <b>In</b> indium 114.82	50 <b>Sn</b> tin 118.71	51 <b>Sb</b> antimony 121.76	52 <b>Te</b> tellurium 127.60(3)	53 <b>I</b> iodine 126.90	54 <b>Xe</b> xenon 131.29
55 <b>Cs</b> cesium 132.91	56 <b>Ba</b> barium 137.33	57-71 lanthanoids	72 <b>Hf</b> hafnium 178.49(2)	73 <b>Ta</b> tantalum 180.95	74 <b>W</b> tungsten 183.84	75 <b>Re</b> rhenium 186.21	76 <b>Os</b> osmium 193.22	77 <b>Ir</b> iridium 192.22	78 <b>Pt</b> platinum 195.08	79 <b>Au</b> gold 196.97	80 <b>Hg</b> mercury 200.59	81 <b>Tl</b> thallium [204.38, 204.39]	82 <b>Pb</b> lead 207.2	83 <b>Bi</b> bismuth 208.98	84 <b>Po</b> polonium	85 <b>At</b> astatine	86 <b>Rn</b> radon
87 <b>Fr</b> francium	88 <b>Ra</b> radium	89-103 actinoids	104 <b>Rf</b> rutherfordium	105 <b>Db</b> dubnium	106 <b>Sg</b> seaborgium	107 <b>Bh</b> bohrium	108 <b>Hs</b> hassium	109 <b>Mt</b> meitnerium	110 <b>Ds</b> darmstadtium	111 <b>Rg</b> roentgenium	112 <b>Cn</b> copernicium	113 <b>Nh</b> nihonium	114 <b>Fl</b> flerovium	115 <b>Mc</b> moscovium	116 <b>Lv</b> livermorium	117 <b>Ts</b> tennessine	118 <b>Og</b> oganesson

Key:

atomic number  
Symbol  
name  
atomic weight  
atomic weight  
atomic weight  
atomic weight  
atomic weight  
atomic weight



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

57 <b>La</b> lanthanum 138.91	58 <b>Ce</b> cerium 140.12	59 <b>Pr</b> praseodymium 140.91	60 <b>Nd</b> neodymium 144.24	61 <b>Pm</b> promethium	62 <b>Sm</b> samarium 150.36(2)	63 <b>Eu</b> europium 151.96	64 <b>Gd</b> gadolinium 157.25(3)	65 <b>Tb</b> terbium 158.93	66 <b>Dy</b> dysprosium 162.50	67 <b>Ho</b> holmium 164.93	68 <b>Er</b> erbium 167.26	69 <b>Tm</b> thulium 168.93	70 <b>Yb</b> ytterbium 173.05	71 <b>Lu</b> lutetium 174.97
89 <b>Ac</b> actinium 227.04	90 <b>Th</b> thorium 232.04	91 <b>Pa</b> protactinium 231.04	92 <b>U</b> uranium 238.03	93 <b>Np</b> neptunium	94 <b>Pu</b> plutonium	95 <b>Am</b> americium	96 <b>Cm</b> curium	97 <b>Bk</b> berkelium	98 <b>Cf</b> californium	99 <b>Es</b> einsteinium	100 <b>Fm</b> fermium	101 <b>Md</b> mendelevium	102 <b>No</b> nobelium	103 <b>Lr</b> lawrencium

For notes and updates to this table, see [www.iupac.org](http://www.iupac.org). This version is dated 28 November 2016.  
Copyright © 2016 IUPAC, the International Union of Pure and Applied Chemistry.



2019  
IYPT  
International Year  
of the Periodic Table  
Educational, Scientific and  
Cultural Organization  
of Chemical Elements



# Program

Welcome Remarks

**Dr. Neil Jespersen**

Councilor, NYACS

History of the Periodic Table and Its Importance

**Dr. Paris Svoronos**

Chemistry History Committee Chair, LIACS

Rational for International Year of the Periodic Table

**Dr. Justyna Widera-Kalinowska**

2019 Chair, NYACS

NYACS Giant 3D Periodic Table Exhibit

**Dr. Ping Furlan**

NCW/IYPT Committee Chair, NYACS

Salute to Excellence/Sponsorship Appreciation

**Dr. Justyna Widera-Kalinowska & Dr. Ping Furlan**

Q&A Panel with Eminent Guests

**Mr. Joseph Wiener**

IYPT Committee Co-Chair, NYACS

Winners of Element Design Categories

**Dr. Paul Sideris & Mr. Joseph Wiener**

IYPT Committee Co-Chairs, NYACS

Closing Remarks

**Dr. Neil Jespersen**

Councilor, NYACS

# Eminent Guests

**United States Senator Kirsten Gillibrand**

Represented by her **Senior Advisor Brook Gesser**

**United States Congresswoman Alexandria Ocasio-Cortez**

Represented by her **Deputy Director Naureen Akhter**

**New York State Assemblywoman Alicia Hyndman**

**Mr. David Deutsch**

American Institute of Chemical Engineers, New York Chapter

**Dr. James Wynne**

LASIK Inventor, IBM T. J. Watson Research Center

**Dr. James McGroddy**

The Gunn Effect in Semiconductors, Former Senior Vice President, Director of Research, IBM

**Dr. Lubomyr (Luby) Romankiw**

Magnetic Thin-film Storage Head Inventor, IBM T. J. Watson Research Center

**Ms. Linda Sanford**

Former Vice President, Enterprise Transformation, IBM

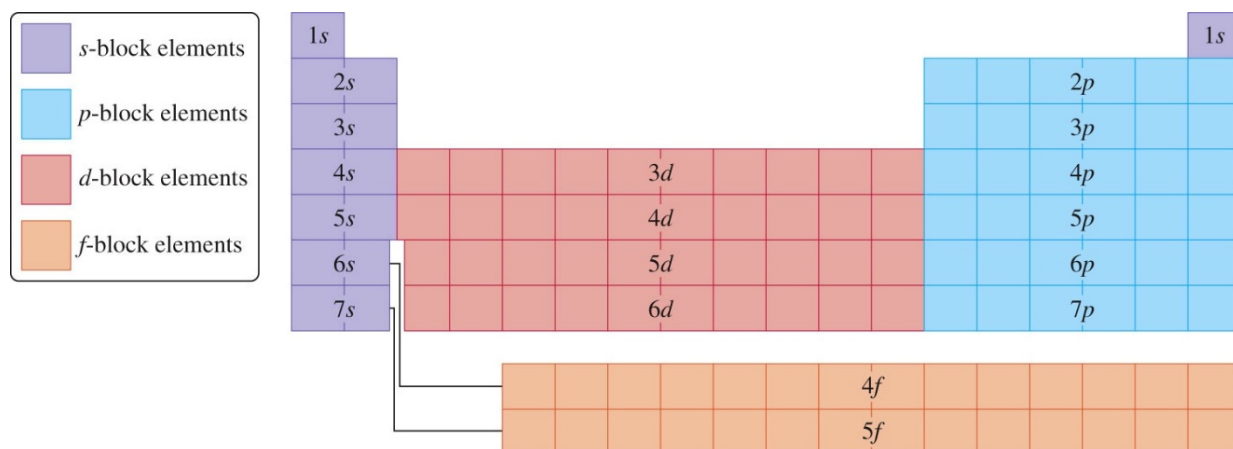
**Mr. Richard Goodman**

Recipient of the 2008 James Bryant Conant Award in High School Chemistry Teaching, ACS

# History of the Periodic Table

Dr. Paris Svoronos, History Committee Chair, LIACS

Individual common metals have been isolated and developed throughout centuries as they were being used in warfare. Other elements, such as carbon and sulfur, were known from the onset as naturally occurring. Alchemists, driven by developing a procedure to create gold, discovered elements such as phosphorus (Hennig Brand). In 1869 Russian chemistry Dimitri Mendeleev started to systematically place together elements in an incomplete table based on their known atomic weight. He called for scientists worldwide to isolate and identify the missing elements that would follow the atomic weight sequence his table was based on. In addition, he predicted the chemical properties of these unknown-at-the-time elements. This was a breakthrough in the history of chemistry as it eventually led to the concepts of noble gases, radioactivity, particles that comprise atoms, and theoretical quantum chemistry within the next 50 years. The latter, in turn, elegantly revealed the hidden structure of the Periodic Table.



The Periodic Table, showing how the elements are grouped according to the kind of subshell (*s*, *p*, *d*, *f*) being filled with electrons in the valence shell of each element.

# International Year of the Periodic Table

**Dr. Justyna Widera-Kalinowska, 2019 Chair, NYACS**

The United Nations has proclaimed the 2019 as the International Year of the Periodic Table of Chemical Elements (IYPT 2019). It has recognized the importance of raising global awareness of how chemistry promotes sustainable development and provides solutions to global challenges in energy, education, agriculture and health.

The International Year of the Periodic Table of Chemical Elements in 2019 is marking the 150<sup>th</sup> anniversary of the discovery of the Periodic system by Dmitry Mendeleev in 1869. It is a unique tool enabling scientists to predict the appearance and properties of matter on Earth and in the Universe. The [Periodic Table of Elements](#) is a great teaching tool and probably the most recognizable thing in chemistry. The development of the Periodic Table of the Elements is one of the most significant achievements in science with broad scientific implications in Chemistry and other areas of science such as: Astronomy, Physics, Biology, etc. The events presented by the American Chemical Society New York Section (NYACS) will enhance the understanding and appreciation of the Periodic Table and chemistry among public.

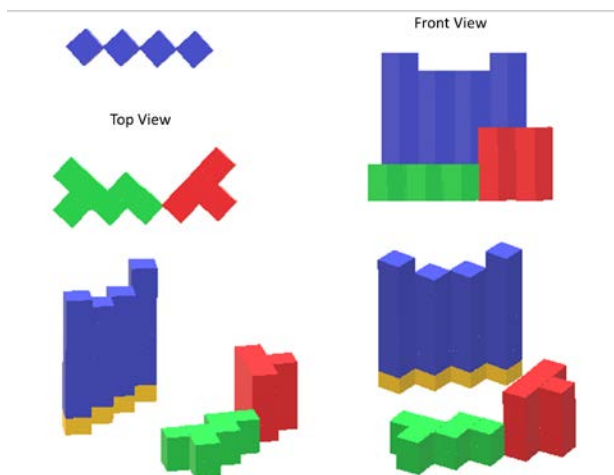
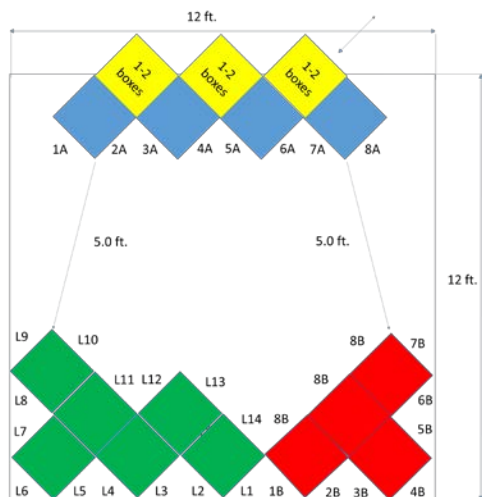
IYPT allows us to celebrate our profession, our members and our communities. In addition, to promoting and celebrating the significance of the Periodic table of elements and its applications to society, American Chemical Society wants to continue attracting the brightest young minds, in order to ensure the next generation of scientists, engineers and innovators in this field that will carry on the development of the Periodic Table journey.

# NYACS Giant 3D Periodic Table Exhibit

**Dr. Ping Furlan, NCW/IYPT Committee Chair, NYACS**

The New York Local Section of the American Chemical Society (NYACS) is joining the world-wide effort to celebrate the International Year of the Periodic Table in 2019 by constructing a giant three-dimensional Periodic Table for display at the New York Hall of Science (NYSCI) during National Chemistry Week (NCW), in conjunction with its annual award-winning Chemistry Spectacular Hands-on Show, that is set to take place on Sunday, October 20, 2019. This Table, composed of 118 individual element panels designed by participants, is approximately 12ft x 12ft x 11ft in size. It pays tribute to the glorious discovery of the periodicity of the chemical elements.

The Project brings thousands of NYACS members and affiliates, representing 50+ research centers, universities, colleges, high schools, chemical companies, for-profit and nonprofit organizations, together to explore chemistry, convey its importance to the public, and celebrate the legacy of science, discovery, innovation, and human collective endeavors in a most diversified and creative way. The Exhibit, a grand representation of human collective wisdom and achievement by itself, is on display at NYSCI – the Great Hall from October 18, 2019 to October 25, 2019.



**Artist's rendering of the periodic table design**



# NYACS Giant 3D Periodic Table Exhibit



## The Element Template

Each element template is 20" x 15" in size. It contains a FIXED section and a FREE Section.

The FIXED Section is for selected **Element Information**: atomic number (Z), symbol (X), name, atomic weight (AW), valence electron configuration (VEC), atomic size, electronegativity, and melting point.

- **Atomic Number** gives the number of protons in the nucleus of an atom, which determines the element identity.
- **Atomic Size** relates to the diameter of the isolated atom. It is represented by a brown circle, with 4" diameter representing 600 pm and 2" diameter 300 pm
- **Electronegativity** is a measure of the atom's ability to attract shared electrons to itself. It is represented by a red bar of 1" height, with 4" length representing 4.0 and 2" length 2.0 on Pauling's scale.
- **Melting Point** is the temperature at which a solid, given enough heat, becomes a liquid. It is represented by a blue bar of 1" height, with 4" length representing 4000 K and 2" length 2000 K.
- **Valence Electron Configuration** refers to the arrangement of electrons in the orbitals located in the outermost orbital shell. These electrons are of the highest energies in the atom and are most available and ready in taking part in the excitement of chemical reactions.
- The frame color indicates the s- (dark blue), p- (dark red), d- (dark green) or f- (black) block element.
- The background color indicates if the element is metal (peach), nonmetal (blue), or metalloid (purple).
- The Logo of the Element Designer Organization is placed in the bottom right corner.

The FREE Section is the right-side open space for **Element Design** created by the Project Contributors. The Contributor can choose any way to celebrate this element from real life images to an artistic rendering, using their original works.

# Salute to Excellence

For their Outstanding Contribution to the New York Section's 2019 IYPT Project and their Exemplary Leadership in Advancing STEM, promoting Chemistry, and Inspiring Future Scientists especially through National Chemistry Week Program.

New York Hall of Science

IBM T.J. Watson Research Center

PepsiCo

# Special Appreciation

For their Outstanding Participation in the New York Section's 2019 IYPT Project and their Exemplary Leadership in Supporting STEM, promoting Chemistry, and Inspiring Future Scientists especially through National Chemistry Week Program.

Senator Kirsten Gillibrand & Her Office

Congresswoman Alexandria Ocasio-Cortez & Her Office

Chemical Marketing & Economics (CME), NYACS

# Q&A Panel with Eminent Guests

## Dr. James Wynne

Dr. Wynne pioneered the use of excimer lasers for medical applications, most notably LASIK. He received the National Medal of Technology and Innovation in 2013 from President Obama for his contributions to laser eye surgery. Dr. Wynne was raised in Great Neck, graduating from Great Neck North HS in 1960, spent 9 years at Harvard, earning his PhD in applied physics, and joined IBM Research in 1969.

## Dr. James McGroddy

Dr. McGroddy was Senior Vice President, Director of Research at IBM. His early research led to the discovery of the Gunn effect in ternary alloys of III-V compounds, which he later translated into leading edge technology. Born in New York, Dr. McGroddy received a B.S. from St. Joseph's College and a Ph.D. from University of Maryland, College Park.

## Dr. Lubomyr (Luby) Romankiw

Dr. Romankiw is a materials scientist at IBM with a PhD from MIT, who made major improvement in the density of magnetic disc drives by introducing electroplating of **copper, iron, nickel, and cobalt** to the manufacture of read/write recording heads. Dr. Romankiw's innovations enabled a giant step in increased density of storage, which led to the era of personal computers.

## Ms. Linda Sanford

Dr. Sanford was one of the highest-ranking women at IBM and was inducted into the Women in Technology Hall of Fame in 1996. During 1990s, She headed up IBM Global Industries and was responsible for generating 70% of IBM's revenue. A graduate of St. John's University, Dr. Sanford received a M.S. from Rensselaer Polytechnic Institute and an honorary doctorate in commercial science from St. John's University.

## Mr. Richard Goodman

Mr. Goodman, a graduate from Columbia University, is a retired high school chemistry teacher and science department chair at Horace Greeley High School. A recipient of numerous prestigious teaching awards, Mr. Goodman has inspired many of his students to continue their chemistry studies in college and become chemists and chemistry teachers themselves.

# Winners of Element Design Categories

Award	Winner	Element
Best colored hand-drawn original artwork	Ms. Josephine Parlagreco Mepham High School	Lithium (Li)
Best non-colored hand-drawn original artwork	Mr. Kevin Tranchina Lynbrook High School	Antimony (Sb)
Best implementation of a school logo in a design	Stephanie Dulovic & Kristen Dulovic Adelphi University	Gold (Au)
Most clever design	Mr. Brandon McMurtry Columbia University	Flerovium (Fl)
Best design using an original photograph	Kristyn Gibney & Dalton Gibney Brooklyn College, CUNY	Carbon (C)
Best pop culture reference	Amy Trang Nguyen EF Academy New York	Krypton (Kr)
Most informative submission	Vijay Kumar Siripuram & Marc Flajolet The Rockefeller University	Sulfur (S)
Most humorous submission	Student Chapter of the ACS Iona College	Iron (Fe)
Design with the best word-play	Dilavnur Atmaca EF Academy New York	Cerium (Ce)
Most imaginative design	G. Patel, M. Hashemi, & H. Khoja Jose Marti STEM Academy	Cobalt (Co)
Best use of mythological reference	Jennifer Lin & Eileen McCaffrey Pearl River High School	Promethium (Pm)
Group that impacted the most people with its element	Science & Innovation Club U.S. Merchant Marine Academy	Sodium (Na)
Coordinator that inspired the most original & impressive designs	Ms. Young Seo Michelle Moon EF Academy New York	
Most elements reserved	Dr. Fernando Commodari EF Academy New York	

# Thanks to Our Element Design Contributors

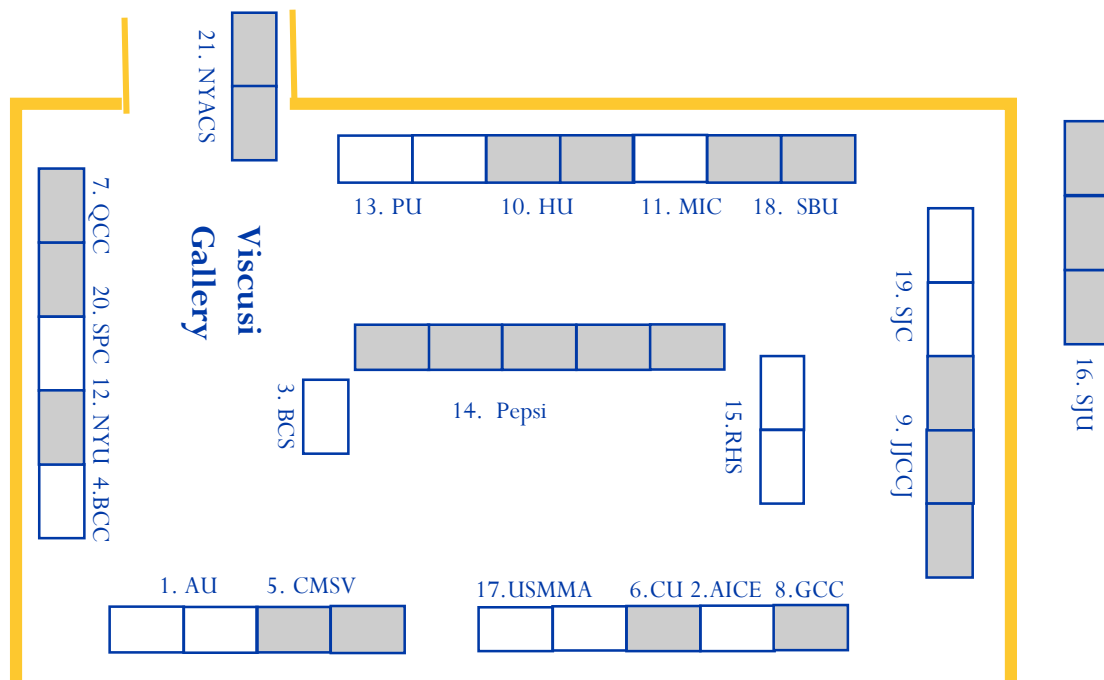
ACS-Hempstead Schools  
Adelphi University  
American Institute of Chemical Engineers – New York Section  
Archbishop Stepinac High School  
Baruch College, CUNY  
Benjamin N Cardozo High School  
Brookhaven National Laboratory  
Brooklyn College, CUNY  
ChemSource, Inc.  
College of Mount Saint Vincent  
College of New Rochelle  
Columbia University  
Consolidated Edison of New York  
CUNY York College  
Dumont High School  
EF Academy New York  
Firmenich, Inc.  
Garden City High School  
Hofstra University  
IBM T.J. Watson Research Center  
International High School  
    at LaGuardia Community  
Iona College  
Iona Preparatory School  
Jose Marti STEM Academy  
Laval University  
Lehman College  
Los Alamos National Laboratory  
Lynbrook High School  
Manhattan College  
Manufaktura Naukowcow  
Mattituck High School  
Mepham High School  
Monsignor Scanlan High School  
New York University  
Nyack High School  
Oak Ridge National Laboratory  
Pace University  
Pawling High School  
Pearl River High School  
Peekskill High School  
PepsiCo  
Q Studio Lab  
Queensborough Community College  
RMHC Poland  
Rye High ChemClub  
Saint Peter's University  
Sleepy Hollow High School  
St. Barnabas High School  
St. John's University  
St. Joseph's College  
Stern College for Women-Yeshiva University  
SUNY Old Westbury  
The Rockefeller University  
United States Merchant Marine Academy  
University of North Texas  
Vassar College

# Join Us For The 2019 NCW Chem. Demo Show































Sunday, October 20, 2019, 11:00am – 4:00pm, New York Hall of Science

## National Chemistry Week “Marvelous Metals” Chem. Demo Show Sponsors































<b>1. Adelphi University (AU)</b> Sand and Magnets; What Rocks are Magnetic	<b>2. AIChE, Metro New York (AIChE)</b> Making Models of Chemical Compounds	<b>3. Barnard Chemical Society (BCS)</b> Copper Color Change; Instant Crystals
<b>4. Bronx Community College (BCC)</b> Sodium Acetate; Silver Mirror; Silver Tree	<b>5. College of Mount Saint Vincent (CMSV)</b> Metallic Slime; Iron in Cereal; Redox Rxn	<b>6. Columbia University (CU)</b> Gels: Making Caviar from Juices and Sodas
<b>7. CUNY - Queensborough Community College (QCC) Magnetism</b>	<b>8. Guttman Community College (GCC)</b> Colorful Metals; Dirty Pennies	<b>9. John Jay College of Criminal Justice (JJCCJ) Who Did It (Crime Scene)</b>
<b>10. Hofstra University (HU)</b> Gallium Liquid; Memory Metal; Aluminum Rxn	<b>11. Maruzen International Co. (MIC)</b> Playing with Molecular Model	<b>12. New York University (NYU)</b> Exploding Foam; Cranberry Chemistry
<b>13. Pace University (PC)</b> Liquid Metal; Magnetic Slime; Thin Foil Bulb	<b>14. PepsiCo (PepsiCo)</b> Make Your Own Favorite Drinks	<b>15. Rye High School (RHS)</b> Iron and Oxidation; Wooly Willy and Magnets
<b>16. St. Johns University (SJU)</b> Malleability of Metals; Conductivity of Metals; Connecting Wires	<b>17. US Merchant Marine Academy (USMMA) Steel Wool-Vinegar Rxn; Coin Battery; Copper Solar Cell</b>	<b>18. Stony Brook University (SBU)</b> Uranium Glass; Density of Metals; Metal in Minerals; Ferrofluid
<b>19. St. Joseph's College (SJC)</b> Shrinkers	<b>20. Svoronos Potion Class (SPC)</b> Dyes, Colors, and pH of Household Items	<b>21. &amp; 22. NYACS &amp; NY Hall of Science</b> Safety Goggles; Giveaways; Passports
<b>Project Leaders: Dr. Ping Furlan, Dr. Dempsey Hyatt, Mr. Joseph Wiener, Ms. Erin Wasserman, Ms. Erin Thelen</b>		



# The QR Codes of the Elements































1 	2 	3 	4 	5 	6 
7 	8 	9 	10 	11 	12 
13 	14 	15 	16 	17 	18 
19 	20 	21 	22 	23 	24 
25 	26 	27 	28 	29 	30 

# The QR Codes of the Elements





























31 	32 	33 	34 	35 	36 
37 	38 	39 	40 	41 	42 
43 	44 	45 	46 	47 	48 
49 	50 	51 	52 	53 	54 
55 	56 	57 	58 	59 	60 



# The QR Codes of the Elements

61 	62 	63 	64 	65 	66 
67 	68 	69 	70 	71 	72 
73 	74 	75 	76 	77 	78 
79 	80 	81 	82 	83 	84 
85 	86 	87 	88 	89 	90 

# The QR Codes of the Elements

91 	92 	93 	94 	95 	96 
97 	98 	99 	100 	101 	102 
103 	104 	105 	106 	107 	108 
109 	110 	111 	112 	113 	114 
115 	116 	117 	118 		

---

# THANK YOU!!!

*We once again extend our heartfelt thanks to our*

## Platinum Sponsors

New York Hall of Science

Chemical Marketing & Economics (CME), NYACS

IBM T.J. Watson Research Center

PepsiCo

New York Section of the ACS

## And Many Volunteers

Including Mike Melcer, Tony Nigro, Kimani Stancil, John Sleckman, Marlon Moreno and Luis Vargas



ACS Local Section  
New York

American Chemical Society's New York Section, Inc. | <http://newyorkacs.org>

---