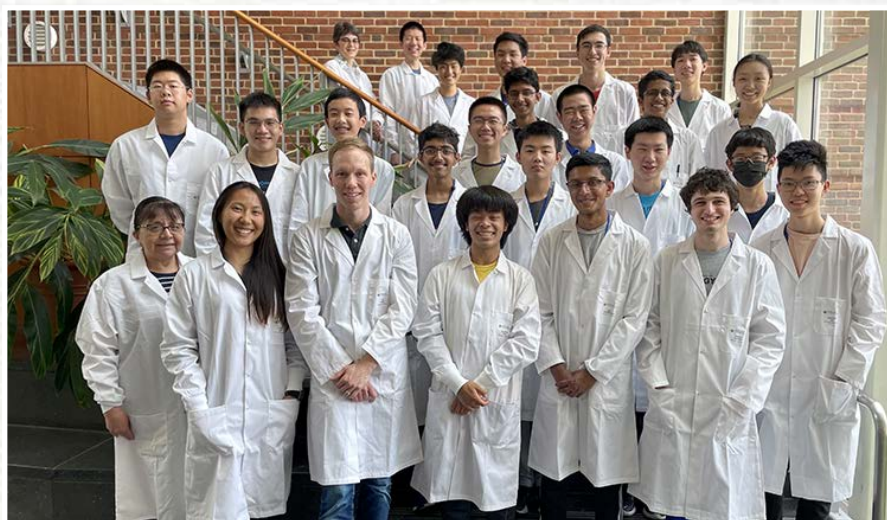




United States National Chemistry Olympiad

39th Summary Report



U.S. NATIONAL CHEMISTRY OLYMPIAD

39th SUMMARY REPORT

2022

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2022 CHEMISTRY OLYMPIAD COMPETITION

The 54th International Chemistry Olympiad (IChO) was held remotely and organized by China from July 10 -18, 2022, 326 students from 84 countries participated in the competition. Team USA earned one gold and three silver medals.

The American Chemical Society (ACS), and other donors supported the participation of the U.S. Alpha Pi team. **Nathan Yihe Ouyang** of University High School, CA (Orange County LS) earned gold medal, while **Jack Liu** from Carmel High School, IN (Indiana LS), **Phoenix Wu** from Seven Lakes High School, TX (Greater Houston LS) and **Gideon Tzafirri** from Lexington High School, MA (Northeastern LS) all received silver medals, ranking 6th, 37th, 60th and 94th positions respectively.

This year 146 Local Sections registered for the competition and the majority organized competitions using a digital exam provided by USNCO office and proctored by local sections virtually using different platforms while some hosted in person exams where students took the exam on paper. 2225 students took the Local Exam in the ACS Learning Center between March 1 and 31, 2022. A total of 127 Local Sections nominated 798 students to sit for the national exam administered April 23-May 1, 2022 that included Part III laboratory for the first time in three years.

Twenty students who excelled on the national examination participated in USNCO study camp June 5-18, 2022 hosted at the campus of the University of Maryland College Park. Students received training in various major areas of chemistry by faculty of the University of Maryland College Park, Department of Chemistry and Biochemistry, and from mentors Dr. Joseph Houck (chemistry professor, Penn State University, PA), Mrs. Esther Hines (chemistry teacher, Billerica Memorial High School, MA) and Dr. Laura Serbulea (chemistry professor, University of Virginia, VA). This year two peer mentors: Alec Zhu and Miss Yitian Zhu (both students at MIT, MA) assisted the mentors in training the students. Students participated in guest lectures given by: Dr. John Warner (Beyond Benign, MA), Dr. Lyle Issacs (University of Maryland, MD), Dr. Seth Brown (University of Notre Dame, IN and Chair of USNCO Exams), Dr. Hedy Edmonds (National Science Foundation, VA), Dr. Robert Gilliard (University of Virginia, VA), and Dr. Pratyush Tiwary (University of Maryland, MD).

Students also enjoyed recreational activities such as sightseeing in Washington DC with a Monuments by Moonlight Trolley Tour, hiking in Great Falls National Park followed by BBQ at the Frat House, bowling and pizza at the UMD's Terp Zone as well as walks around UMD campus and games organized by peer mentors.

Dr. Angela Wilson, 2022 ACS President was a keynote speaker at the Study Camp banquet for the students held at Samuel Riggs IV Alumni Center at UMD. Dr. Tom Connelly, ACS CEO joined students at the banquet and gave opening remarks.

At the conclusion of the camp, the members of the U.S. team and two alternates were selected. The 2022 alternates were: 1st alternate: Yufei Chen from University High School, CA (Orange County LS) and 2nd alternate: Mingwen Duan from East Lyme High School, CT (Connecticut Valley LS).

The 54th IChO was organized virtually and hosted from Nankai University in Tianjin, China between July 10-18, 2022. Team USA students and mentors traveled to Washington DC where they participated in IChO activities. For most of the competition students and mentors followed separate schedules to ensure the fairness and security of the competition. Students were chaperoned by the following ACS staff: Mr. Travis Long, Ms. Robin Polk and Ms. Malgorzata Thatcher. IChO organized prepared a virtual platform where students engaged in various activities including virtual tours of chemical facilities, video presentations, and had an opportunity to meet and talk to other participants from other countries. Students took the five-hour IChO exam at the ACS headquarters proctored by ACS staff member Dr. Alvin Collins on July 13th. Students also completed the virtual lab experiments provided by the IChO for which all Team USA students received the Golden Monkey Awards. Exam translation, grading and arbitration was done virtually by the USNCO 2022 mentor team.

After the exam students had an opportunity to visit several Washington D.C. museums and landmarks, took a trip to the Steven F. Udvar-Hazy Air and Space Museum in Chantilly, VA, visited a historic George Washington Mansion at Mount Vernon in Virginia and enjoyed the performance of Chinese dance and culture at the Kennedy Center for the Performing Arts with the mentors. Team USA students, mentors and ACS staff watched the virtual closing ceremony broadcasted live from Nankai University in Tianjin, China on July 18th when the results of the 54th IChO were announced.

The American Chemical Society views the USNCO program as an investment in the future of young chemists in this country. The goals of the program are to:

- stimulate young people to achieve excellence in chemistry;
- recognize outstanding chemistry students and, by doing so, encourage additional learning at a formative time in their intellectual development;
- recognize the excellent achievement of the teachers of these students and the importance of the school environment in which they learn;
- promote contact between ACS local sections and area schools and foster the interest and influence of professional chemists in the teaching of chemistry;
- challenge the chemical knowledge and skills of young students in an international arena; and,
- foster cross-cultural experiences and acquaint students with similarities and differences between themselves and their counterparts in other nations.

Since 1984, the USNCO program has been sponsored by the Donald F. and Mildred Topp Othmer Chemistry Olympiad Endowment.

The following corporations and donors supported the program through financial support and in-kind donations

- **Carolina Biological**
Laboratory goggles and gloves

- **Macmillan Learning**
Analytical and organic chemistry textbooks
- **Pearson Education Company**
Physical and inorganic chemistry textbooks
- **Texas Instruments Inc.**
Scientific calculators
- **ThermoFisher Scientific**
Laboratory coats
- **Individual private donors**

The ACS USNCO staff appreciates the dedication, enthusiasm, and contribution of time given by:

- The 2022 members of the USNCO Subgroup of the Society Committee on Education, which provided policy direction for this program,
- The members of the USNCO examinations task forces, the grading team, and the mentor selection task force,
- The faculty of the Department of Chemistry and Biochemistry of UMD College Park, and
- The mentors and peer mentors who taught and guided the 2022 Alpha Pi Team.

Thank you!



PARTICIPATING ACS LOCAL SECTIONS

<u>Local Section (YP***)</u>	<u>Coordinator</u>	<u>Local Section (YP***)</u>	<u>Coordinator</u>
1. Akron (28)	Carol Kercher	64. Midland (37)	Michael Tulchinsky
2. Alabama (31)	Shirley Ginwright	65. Milwaukee (36)	Wujie Zhang
3. Ames (29)	Adam Wade	66. Minnesota (38)	Hoonseok Oh
4. Auburn (11)	Catherine Situma	67. Mississippi (27)	Jonathan Broome
5. *Baton Rouge (38)	Christopher Nalepa	68. Mobile (37)	Pamela Clavenger
6. Binghamton (35)	Vincent Van Nostrand	69. Mojave Desert (13)	Patrick Fedick
7. *Brazosport (11)	Bindu Krishnan	70. *MO-Kan-OK (21)	Dilip Paul
8. California (39)	Eileen Nottoli	71. Nashville (35)	Amanda Carroll
9. California Los Padres (24)	Ahmed Awad	72. Nebraska (9)	Martha Morton
10. Carolina-Piedmont (25)	Tim Champion	73. New Haven (36)	Olivier Nicaise
11. Central Arizona (35)	Kimberly Horsley	74. New York (39)	Stephen Goldberg
12. Central Arkansas (39)	Noureen Siraj	75. North Carolina (36)	Michael Bruno
13. Central Massachusetts (16)	Mathangi Krishnamurthy	76. North Jersey (39)	Steven Chen
14. Central New Mexico (37)	Jacqueline Veauthier	77. *Northeast Georgia (9)	Maurice Snook
15. Central New York (37)	Neal Abrams	78. Northeast Tennessee (31)	Rong Xu
16. Central North Carolina (25)	Chris Fowler	79. Northeastern (39)	S. Lantos/A.Crosby
17. Central Pennsylvania (36)	Robert White	80. Northeastern Indiana (33)	Dennis Roberts
18. Central Texas (37)	Anting Chen	81. Northeastern Ohio (20)	Christopher Kulp
19. Central Utah (30)	Emily Heider	82. Northern Oklahoma (37)	Keith Lawson
20. *Central Wisconsin (31)	Dana Haagenson	83. Northern West Virginia (36)	Harry Finklea
21. Chattanooga (36)	Rebecca Stimson	84. Oklahoma (39)	Reza Latifi
22. Chemical Soc. of Wash. (39)	Adam Smolinsky	85. Ole Miss (21)	Jason Ritchie
23. Chicago (39)	R. Kohnken/D. Crumrine	86. Omaha (15)	Edmund Tisko
24. Cincinnati (39)	Jill Page	87. Orange County (38)	Brent Shenton
25. Cleveland (36)	Anne O'Connor	88. Orlando (30)	Mary Roslonowski
26. Colorado (39)	Daniel Danahower	89. *Ozark (34)	Madhuri Manapadi
27. Columbus (35)	Mary Wahba	90. Panhandle Plains (15)	Jarred Nusz
28. Connecticut Valley (39)	Edward Fitzgerald	91. Penn-Ohio Border (37)	Michael Serra
29. Dallas-Fort Worth (32)	Kathleen Holley	92. *Pensacola (38)	Patrick Barber
30. Dayton (36)	Weijie Lu	93. Permian Basin (11)	Pat Kesavan
31. Delaware (38)	Sharon Archer	94. Philadelphia (38)	C. McClure/L. Grande
32. Detroit (38)	Mark DeCamp	95. Pittsburgh (39)	Kevin Noonan
33. East Central Illinois (8)	Rebecca Ulrich	96. Portland (37)	Armando Heberlin
34. East Tennessee (33)	Lilian Frazier	97. Princeton (27)	Danielle Jacobs
35. Eastern New York (36)	Eric Davenport	98. Puerto Rico (31)	M. Santiago/ M. Arrojo
36. Eastern North Carolina (30)	Stephen Gabriel	99. Puget Sound (31)	J. Mayer/C. Bhat
37. *Erie (37)	Christine Saber	100. Richland (30)	Padmaja Gunda
38. Florida (33)	Nicholas Simpson	101. *Rio Grande Valley (19)	Kevin Houston
39. Georgia (33)	Heather Abbott-Lyon	102. Rochester (36)	Alexey Ignatchenko
40. Greater Houston (38)	Jerry Yang	103. *Rock River (39)	Matthew Bork
41. Hampton Roads (38)	S. Black/K. Simmons	104. Sacramento (32)	Slava Bekker
42. Hawaii (38)	Pamela Fujinaka	105. Salt Lake (38)	Ryan Stolley
43. *Hong Kong (11)	David Lee Phillips	106. San Antonio (37)	E. Robert Fanick
44. Huron Valley (29)	Larry Kolopajlo	107. San Diego (38)	Joan Schellinger
45. Idaho (37)	R. Rodriguez/B. Nelson	108. San Geronio (38)	D. Pederson/ E. DiMauro
46. Illinois-Heartland (33)	Udo Schnupf	109. San Joaquin Valley (11)	Kristi Closser
47. Indiana Kentucky Border (33)	T. Thananattanachon	110. Savannah River (37)	Ken Roberts
48. Indiana (39)	Robert Pribush	111. *Shanghai Int. Chapter (8)	Xuefeng Jiang
49. Inland Northwest (14)	Parker Britton	112. Sierra Nevada (20)	Sean Casey
50. Jacksonville (37)	Michael Lufaso	113. Silicon Valley (36)	N.McClure/D. Shingnapurkar
51. Joliet (37)	Chris Condeiu	114. Sioux Valley (6)	Rachel Willand-Charnley
52. Kanawha Valley (27)	Michael Fultz	115. *Snake River (14)	Marian DeWane
53. Kansas City (38)	Alcinda Ruuskanen	116. South Carolina (35)	Amy Rogers
54. LaCrosse Winona (20)	Basudeb Bhattacharyya	117. South Florida (30)	Venkatesh Shanbhag
55. Lehigh Valley (35)	Gail Marsella	118. South Korea Int. Chapter (6)	Cheol-Hong Cheon
56. Lexington (15)	Meghan Knapp	119. South Plains (22)	Anthony Cozzolino
57. Louisiana (22)	Abha Verma	120. South Texas (29)	Ludivina Avila
58. Louisville (25)	Kaya Muller	121. Southeastern Pennsylvania (38)	Todd Trout
59. Mark Twain (34)	Scott Luaders	122. Southern Arizona (20)	Iman Daryaei
60. Maryland (34)	Beatrice Salazar	123. Southern California (39)	G. Delker/B. Belmont
61. Memphis (37)	Dennis Merat	124. Southern Illinois (29)	G. Kinsel/ M. Kinsel
62. Michigan State University (37)	Virginia Cangelosi	125. Southern Indiana (7)	James Clark
63. Mid-Hudson (37)	Lori Wojciechowicz	126. Southern Nevada (37)	Mark Garner

PARTICIPATING ACS LOCAL SECTIONS

Local Section (YP***)

127. Southwest Georgia (36)
128. St. Joseph Valley (37)
129. St. Louis (39)
130. Taiwan Int. Chapter (5)
131. Tampa Bay (17)
132. Texas A & M (14)
133. Toledo (27)
134. Trenton (38)
135. *Tulsa (34)
136. *University of Arkansas (12)

Coordinator

Yakov Woldman
Susan DelValle
Bruce Hamper
I-Jy Chang
Kimberly Fields
Stephanie McCartney
Somnath Dutta
Danielle Jacobs
Patrick Idwasi
Stefan Kilyanek

Local Section (YP***)

137. *Upper Peninsula (23)
138. *Virginia Blue Ridge (20)
139. Virginia (38)
140. *Wabash Valley (35)
141. Wakarusa Valley (12)
142. Washington-Idaho Border (11)
143. Western Carolinas (34)
144. Western Connecticut (38)
145. Western New York (37)
146. *Wichita Falls-Duncan (33)

Coordinator

Momoko Tajiri
Kimberly Lane
Sarah Porter
Teresa Tarbuck
Lisa Sharpe Elles
Kristopher Waynant
John Kaup
Amy Broderick
Mariusz Kozik
Jianguo Shao

*Participated in the Local Section competition but not the National Exam

*** YP - Number of years of participation in the USNCO

USNCO STUDY CAMP PARTICIPANTS

<u>STUDENT/GRAD. YEAR</u>	<u>SCHOOL/TEACHER</u>	<u>LS/COORDINATOR</u>
Anantshri Asthana 2024	John Foster Dulles High School, TX Long Ngan	Greater Houston Jerry Yang
Luke Chen 2023	Blue Valley North High School, KS Amy Schulte	Kansas City Alcinda Ruuskanen
Yufei Chen 2025	University High School, CA Nicholas Brighton	Orange County Brent Shenton
Neil Chowdhury 2022	Phillips Exeter Academy, NH Jeffrey Ward	Northeastern Steve Lantos
Nipun Dour 2023	Mira Loma High School, CA James Hill	Sacramento Borislava Bekker
Mingwen Duan 2024	East Lyme High School, CT Lori Singer	Connecticut Valley Edward Fitzgerald
Alexander Gu 2022	Gunn High School, CA Heather Mellows	Silicon Valley Natalie McClure
Canaan He 2023	Carmel High School, IN Cynthia Henry	Indiana Robert Pribush
Brian Li 2023	Acton Boxborough Regional High School, MA Leah Marsh	Northeastern Steve Lantos
Alice Liu 2024	Marquette High School, MO Kathy Farrar	St. Louis Bruce Hamper
Jack Liu 2022	Carmel High School, IN Cynthia Henry	Indiana Robert Pribush
Jiaxu Liu 2023	Detroit County Day School, MI Marc Drougel	Detroit Mark DeCamp
Nathan Yihe Ouyang 2024	University High School, CA Nicholas Brighton	Orange County Brent Shenton
Anurag Sodhi 2024	Centennial High School, MD Robert Astri	Maryland Beatrice Salazar
Alan Song 2023	Parkway West High School, MO Kim Tarpey	St. Louis Bruce Hamper
Albert Tang 2024	The Westminster Schools, GA Tina Davis	Georgia Heather Abbott-Lyon
Gilford Ting 2022	Cupertino High School, CA Sierra Rothlisberg	Silicon Valley Nathalie McClure
Gideon Tzafiriri 2022	Lexington High School, MA Parul Kumar	Northeastern Steve Lantos
Phoenix Wu 2023	Seven Lakes High School, TX Sadaf Snyder	Greater Houston Jerry Yang
Caleb Zhao 2023	Montgomery Blair High School, MD Erik Lodall	Chemical Society of Washington Adam Smolinsky

54th INTERNATIONAL CHEMISTRY OLYMPIAD RESULTS

In the 54th International Chemistry Olympiad 326 students from 83 countries participated and were awarded 210 medals and 23 Honorable Mentions (HM)

36 students received gold, 70 students received silver, and 103 students received bronze medals

COUNTRY (number of years of participation)	MEDALS	COUNTRY (number of years of participation)	MEDALS
1. Afghanistan (1)		43. Moldova (15)	4 bronze
2. Argentina (26)	1 silver, 3 bronze	44. Mongolia (16)	2 silver, 2 bronze
3. Armenia (7)	1 silver, 3 bronze	45. Montenegro (8)	
4. Australia (35)	2 silver, 2 bronze	46. Nepal (1)	1 bronze
5. Austria (47)	2 silver, 2 bronze	47. Netherlands (42)	1 bronze, 2 HM
6. Azerbaijan (23)	1 silver, 3 bronze	48. New Zealand (30)	1 silver, 3 bronze
7. Bangladesh (2)	1 bronze	49. Nigeria (10)	
8. Belgium (42)	1 HM	50. North Macedonia (10)	2 bronze
9. Brazil (22)	3 bronze, 1 HM	51. Norway (41)	2 bronze
10. Bulgaria (53)	1 gold, 3 silver	52. Oman (2)	
11. Canada (36)	3 bronze, 1 HM	53. Pakistan (17)	1 HM
12. China (35)	4 gold	54. Paraguay (1)	
13. Chinese Taipei (23)	4 gold	55. Peru (16)	
14. Costa Rica (12)		56. Philippines (6)	2 bronze, 2 HM
15. Cuba (29)		57. Poland (54)	1 gold, 2 silver, 1 bronze
16. Cyprus (33)	1 HM	58. Portugal (19)	
17. Czech Republic (54)	1 gold, 1 silver, 1 bronze	59. Qatar (3)	
18. Denmark (42)	3 bronze, 1 HM	60. Romania (51)	2 gold, 1 silver, 1 bronze
19. Ecuador (1)		61. Saudi Arabia (12)	1 silver, 2 bronze, 1 HM
20. El Salvador (10)	1 bronze, 1 HM	62. Serbia (11)	4 bronze
21. Estonia (29)	3 bronze, 1 HM	63. Singapore (33)	2 gold, 2 silver
22. Finland (45)	2 bronze	64. Slovakia (28)	2 silver, 2 bronze
23. France (41)	1 silver, 3 bronze	65. Slovenia (31)	3 bronze, 1 HM
24. Georgia (9)	1 silver, 2 bronze, 1 HM	66. South Africa (6)	
25. Germany (32)	2 silver, 2 bronze	67. Spain (26)	1 bronze, 1 HM
26. Greece (27)	4 bronze	68. Sri Lanka (3)	1 silver, 3 bronze
27. Hungary (54)	3 silver, 1 bronze	69. Sweden (47)	1 silver, 3 HM
28. Iceland (21)		70. Switzerland (36)	1 bronze, 1 HM
29. India (23)	4 silver	71. Syria (13)	4 bronze
30. Indonesia (26)	4 silver,	72. Tajikistan (18)	1 bronze, 1 HM
31. Iran (30)	2 gold, 2 silver	73. Thailand (33)	4 silver
32. Ireland (25)	1 bronze	74. Türkiye (30)	1 gold, 3 silver
33. Israel (17)	1 gold, 1 silver, 2 bronze	75. Turkmenistan (19)	1 gold, 2 silver, 1 bronze
34. Japan (20)	4 gold	76. Ukraine (28)	3 silver, 1 bronze
35. Kazakhstan (25)	1 gold, 3 silver	77. UAE (3)	4 bronze
36. Korea (31)	2 gold, 2 silver	78. United Kingdom (40)	4 silver
37. Kyrgyzstan (23)	2 bronze	79. USA (39)	1 gold, 3 silver
38. Latvia (32)	4 bronze	80. Uruguay (24)	
39. Lithuania (21)	2 bronze	81. Uzbekistan (10)	4 silver
40. Luxembourg (3)	1 HM	82. Venezuela (2)	1 bronze
41. Malaysia (15)	1 silver, 2 bronze	83. Vietnam (27)	4 gold
42. Mexico (31)	1 bronze, 1 HM		

Observing countries:

Kuwait

USNCO NATIONAL EXAM STATISTICAL INFORMATION
(TOTAL STUDENTS – 738)

Gender		
Male	405	70%
Female	153	27%
Other	6	1%
Prefer not to disclose	11	2%
Responses	575	100%
Ethnic Background		
African American	11	2%
Asian	345	60%
Hispanic	22	4%
White	147	26%
Native American	1	0%
Pacific Islander	1	0%
Prefer not to disclose	26	5%
Other	22	4%
Responses	575	100%
Grade in School		
12th Grade	130	22%
11th Grade	309	54%
10th Grade	106	19%
9th Grade	27	5%
Responses	572	100%
Years of H.S. Chemistry		
0	21	4%
1	189	33%
2	332	58%
3	31	5%
4	4	0%
5 or more	0	0%
Responses	577	100%
Average time per week spent doing experiments in HS Chemistry Lab		
Less than ½ hour	247	44%
Between ½ and 1 hour	213	38%
Between 1 and 2 hours	88	16%
More than 2 hours	11	2%
Responses	559	100%
Intended College Major		
Biological Sciences/Pre-Medicine	230	22%
Chemistry or other Chemical Science	303	29%
Engineering/Mathematics/Physics	275	27%
Other Science discipline	106	10%
Other or undecided	122	12%
I am not planning to attend college	1	0%
Responses	1037	100%

As a result of participating in USNCO students: (96% responded)	Strongly agree	Agree	Disagree	Strongly disagree
Plan to study more chemistry	36%	56%	5%	2%
Plan to major in chemistry	11%	42%	41%	6%
Have more positive view about chemistry	41%	50%	7%	1%

USNCO STATISTICAL INFORMATION

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Local Exam Local Sections	45	90	115	133	138	137	142	142	136	140	138
Natl. Exam Local Sections	45	90	115	133	138	137	142	142	136	138	138
Natl. Exam Nominees	209	500	600	650	706	689	719	684	638	940	900
Countries participating in IChO	21	22	22	26	26	26	28	31	33	38	41
Students participating in IChO	76	83	86	103	104	104	111	118	131	149	156

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Local Exam Local Sections	131	136	142	147	145	143	142	146	135	131	134
Natl. Exam Local Sections	121	130	127	134	130	126	121	133	130	125	128
Natl. Exam Nominees	875	840	838	880	851	809	796	850	829	800	909
Countries participating in IChO	42	45	47	55	51	54	54	57	59	61	59
Students participating in IChO	163	170	184	185	199	216	210	225	232	234	225

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Local Exam Local Sections	133	139	127	129	133	135	141	141	143	144	142
Natl. Exam Local Sections	125	128	117	125	128	126	134	135	137	134	128
Natl. Exam Nominees	890	917	868	916	930	941	1034	1062	1011	1010	983
Countries participating in IChO	66	66	66	65	68	70	72	73	75	75	67
Students participating in IChO	254	256	257	250	267	273	283	291	291	290	264

USNCO STATISTICAL INFORMATION

	2017	2018	2019	2020	2021	2022					
Local Exam Local Sections	144	150	152	160 intended 110 organized	141	146					
Natl. Exam Local Sections	138	139	143	105	129	127					
Natl. Exam Nominees	982	1025	1017	778	861	738					
Countries participating in IChO	76	76	80	60	83	83					
Students participating in IChO	297	300	309	253	312	326					

IChO PARTICIPATING TEAMS RESULTS 1984–2022

1984 – Frankfurt, West Germany – 16th IChO

Name	School	Local Section	Medals	Ranking
Seth Brown	Taylor Allderdice H.S., Pittsburgh, PA	Pittsburgh	Silver	13 (of 76)
Keith Rickert	The Latin School of Chicago, IL	Chicago	Bronze	37
Aaron DiAntonio	Clayton H.S., MO	St. Louis	Bronze	50
Peter Capofreddi	Newton High H.S., MA	Northeastern	D. R.*	

1985 – Bratislava, Czechoslovakia – 17th IChO

Name	School	Local Section	Medals	Ranking
Keith Rickert	The Latin School of Chicago, IL	Chicago	Silver	12 (of 83)
David Maymudes	University H.S., Los Angeles, CA	Southern California	Silver	25
Glen Whitney	Medfield H.S., MA	Northeastern	Bronze	44
Eric Kelson	Bountiful H.S., UT	Salt Lake City	Bronze	54

1986 – Leiden, Holland – 18th IChO

Name	School	Local Section	Medals	Ranking
Keith Rickert	The Latin School of Chicago, IL	Chicago	Gold	3 (of 86)
David Maymudes	University H.S., Los Angeles, CA	Southern California	Silver	20
Howard Lee	Lowell H.S., San Francisco, CA	California	Bronze	49
Hedy Edmonds	Greenwich H.S., CT	Western Connecticut	D. R.*	

1987 – Veszprem, Hungary – 19th IChO

Name	School	Local Section	Medals	Ranking
Anthony West	Kempsville H.S., Virginia Beach, VA	Hampton Roads	Silver	23 (of 103)
Cecil Huang	Pequannock Townsh. H.S., Pompton Pl., NJ	North Jersey	Silver	34
Jeffrey Snyder	Amherst Central H.S., NY	Western New York	Bronze	48
Kevin Crellin	Highland H.S., Salt Lake City, UT	Salt Lake City	D. R.*	

1988 – Helsinki, Finland – 20th IChO

Name	School	Local Section	Medals	Ranking
David Cliffl	Plainfield H.S., IL	Joliet	Silver (tie)	15 (of 104)
Laurance Lee	Lowell H.S., San Francisco, CA	California	Silver (tie)	15
Brian Kantsiper	Spring Valley H.S., Columbia, SC	South Carolina	Silver	26
Kurt Huang	New Terier H.S., Winnetka, IL	Chicago	Bronze	43

1989 – Halle, German Democratic Republic – 21st IChO

Name	School	Local Section	Medals	Ranking
Raphael Lehrer	Highland Park H.S., NJ	North Jersey	Bronze	40 (of 104)
Jon Kleinberg	Iroquois Central School, Elma, NY	Western New York	Bronze	42
Michael Furlanetto	Cherry Hill East H.S., PA	Philadelphia	Bronze	64
Roger Moore	Thompson Valley H.S., Loveland, CO	Colorado	D. R.*	69

* D.R. - Diploma of Recognition

ICHO PARTICIPATING TEAMS RESULTS 1984–2022

1990 – Paris, France – 22nd IChO

Name	School	Local Section	Medals	Ranking
Wayne Whitney	Medfield H.S., MA	Northeastern	Gold	6 (of 111)
Marc Dionne	La Jolla H.S., CA	San Diego	Silver	30
Roger Moore	Thompson Valley H.S., Loveland, CO	Colorado	Silver	31
Steve Gubser	Cherry Creek H.S., Greenwood Village, CO	Colorado	Silver	32

1991 – Lodz, Poland – 23rd IChO

Name	School	Local Section	Medals	Ranking
Forrest Michael	Naperville Central H.S., IL	Chicago	Gold	12 (of 118)
Dean Chung	Mountain Lakes H.S., NJ	North Jersey	Silver	26
Ashley Reiter	NC School of Sci.& Math, Durham, NC	North Carolina	Bronze	39
Susan Kuhn	Girls Preparatory School, Chattanooga, TN	Chattanooga	Bronze	41

1992 – Washington, DC/Pittsburgh, PA, USA – 24th IChO

Name	School	Local Section	Medals	Ranking
Swaine Chen	O'Fallon Township H.S., IL	St. Louis	Gold	15 (of 131)
Logan McCarty	Amherst Central H.S., NY	Western New York	Silver	21
Jeffrey Chuang	Bellaire H.S., TX	Southeastern Texas	Silver	35
Christopher Herzog	Highland Park H.S., NJ	North Jersey	Bronze	44

1993 – Perugia, Italy – 25th IChO

Name	School	Local Section	Medals	Ranking
Chris Herzog	Highland Park H.S., NJ	North Jersey	Gold	5 (of 149)
Daniel Katz	Torrey Pines H.S., San Diego, CA	San Diego	Gold	14
David Hutz	Fox Chapel H.S., Pittsburgh, PA	Pittsburgh	Silver	27
Robert West	Oak Park H.S., Kansas City, MO	Kansas City	Silver	49

1994 – Oslo, Norway – 26th IChO

Name	School	Local Section	Medals	Ranking
Jessen Yu	T. Jefferson H.S. for S&T, Alexandria, VA	Washington, DC	Gold	12 (of 156)
Justin McCarty	Amherst Central H.S., NY	Western New York	Gold	19
Nicholas Loehr	Midlothian H.S., VA	Virginia	Silver	47
James Grimmelman	Horace Mann H.S., Riverdale, NY	New York	Bronze	59

1995 – Beijing, China – 27th IChO

Name	School	Local Section	Medals	Ranking
Jason Wong	Jefferson H.S. for S&T, Alexandria, VA	Washington, DC	Silver	43 (of 163)
T. Prashant Mishra	Detroit Country Day S., Beverly Hills, MI	Detroit	Silver	56
Elliot Waingold	Central York H.S., PA	Southeastern PA	Bronze	79
Michael Sawka, Jr.	Gunn H.S., Palo Alto, CA	Santa Clara Valley	Bronze	106

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1996 – Moscow, Russia – 28th IChO

Name	School	Local Section	Medals	Ranking
Henry Fu	Brecksville-Broadview Hts. H.S., OH	Cleveland	Gold	8 (of 170)
Alex MeVay	Groton School, MA	Northeastern	Silver	39
Michael Sawka, Jr.	Gunn H.S., Palo Alto, CA	Santa Clara Valley	Silver	45
Jason Chen	Claremont H.S., CA	San Gorgonio	Bronze	63

1997 – Montreal, Canada – 29th IChO

Name	School	Local Section	Medals	Ranking
Jason Chen	Claremont H.S., CA	San Gorgonio	Gold	2 (of 184)
Jordan Krall	Harvard-Westlake S., N. Hollywood, CA	Southern California	Silver	38
Andrew Heckerling	Niles West H.S., Skokie, IL	Chicago	Silver	51
Ian Baker	The McCallie School, Chattanooga, TN	Chattanooga	Bronze	112

1998 – Melbourne, Australia – 30th IChO

Name	School	Local Section	Medals	Ranking
Thomas Snyder	Amherst Central H.S., NY	Western New York	Gold	2 (of 185)
Ian Baker	The McCallie School, Chattanooga, TN	Chattanooga	Gold	6
Alexander Ioannidis	Bel Air H.S., MD	Maryland	Silver	30
Wei Ho	New Berlin West H.S., WI	Milwaukee	Bronze	86

1999 – Bangkok, Thailand – 31st IChO

Name	School	Local Section	Medals	Ranking
Timothy Jones	NC School of Sci.& Math, Durham, NC	North Carolina	Top Gold	1 (of 196)
Alexander Ho	Niles West H.S., Skokie, IL	Chicago	Gold	9
Wei Ho	New Berlin West H.S., WI	Milwaukee	Gold	20
Lisa Carlivati	T.Jefferson H.S. for S&T, Alexandria, VA	Washington, DC	Silver	36

2000 – Copenhagen, Denmark – 32nd IChO

Name	School	Local Section	Medals	Ranking
David Kurtz	Skyline H.S., Idaho Falls, ID	Idaho	Top Gold	1 (of 216)
Charles Duan	Beverly Hills H.S., CA	Southern California	Gold	13
Luke McSpadden	OK School for Science & Math, Tulsa, OK	Oklahoma	Bronze	69
Albert Wang	Bellaire H.S., TX	Greater Houston	Bronze	74

2001 – Mumbai, India – 33rd IChO

Name	School	Local Section	Medals	Ranking
Sean Kedrowski	Baylor H.S., Chattanooga, TN	Chattanooga	Gold	7 (of 210)
Binghai Ling	Brighton H.S., Rochester, NY	Rochester	Gold	15
Albert Wang	Bellaire H.S., TX	Greater Houston	Silver	25
Collin Martin	OK School for Science & Math, Tulsa, OK	Oklahoma	Silver	27

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2002 – Groningen, The Netherlands – 34th IChO

Name	School	Local Section	Medals	Ranking
Helen Shi	OK School for Science & Math, Tulsa, OK	Oklahoma	Gold	21 (of 225)
Daniel Cissell	Walnut Hill H.S., Cincinnati, OH	Cincinnati	Gold	25
Colin Whittaker	Wayland H.S., MA	Northeastern	Silver	36
Timothy Davenport	OK School for Science & Math, Tulsa, OK	Oklahoma	Bronze	90

2003 – Athens, Greece – 35th IChO

Name	School	Local Section	Medals	Ranking
Wei-Han Bobby Liu	Cookeville H.S., TN	Nashville	Silver	80 (of 233)
Eric Brown	The McCallie School, Chattanooga, TN	Chattanooga	Bronze	98
Frances Hocutt	Redondo Union H.S., Redondo Beach, CA	Southern California	Bronze	104
Benjamin Kaduk	Naperville North H.S., IL	Chicago	Bronze	100

2004 – Kiel, Germany – 36th IChO

Name	School	Local Section	Medals	Ranking
Eric Brown	The McCallie School, Chattanooga, TN	Chattanooga	Silver	56 (of 234)
John L. Kiappes Jr.	Memorial H.S., Houston, TX	Greater Houston	Silver	78
Emily Tsui	Montgomery Blair H.S., Silver Spring, MD	Washington, DC	Silver	66
Fan Zhang	Bergen County Academies, NJ	North Jersey	Silver	75

2005 – Taipei, Taiwan – 37th IChO

Name	School	Local Section	Medals	Ranking
Jacob Sanders	Acad. for the Adv. of S&T, Hackensack, NJ	North Jersey	Silver	48 (of 225)
Nicholas Sofroniew	Harvard-Westlake S., N. Hollywood, CA	Southern California	Silver	64
Allen Cheng	Arcadia H.S., CA	Southern California	Silver	72
Scott Rabin	Miami Palmetto H.S., FL	South Florida	Bronze	109

2006 – Gyeongsan, Republic of Korea – 38th IChO

Name	School	Local Section	Medals	Ranking
Michael Blaisse	Bishop McDevitt H.S., PA	Southeastern PA	Silver	55 (of 254)
Gregory Brockman	Red River H.S., ND	Red River Valley	Silver	65
Andrew Freddo	Manalapan H.S., NJ	Monmouth County	Silver	77
Alexander Zozula	East Brunswick H.S., NJ	North Jersey	Bronze	94

2007 – Moscow, Russia – 39th IChO

Name	School	Local Section	Medals	Ranking
Brian Lee	Aca. for the Adv. of S&T, Hackensack, NJ	North Jersey	Silver	40 (of 256)
Justin Koh	Stockdale H.S., CA	Southern California	Silver	43
Kenneth Brewer	Timpview H.S., UT	Central Utah	Silver	65
Sofia Izmailov	W. Windsor-Plainsboro H.S. South, NJ	Trenton	Bronze	152

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2008 – Budapest, Hungary – 40th IChO

Name	School	Local Section	Medals	Ranking
Jonathan Lee	Harvard-Westlake H.S., N. Hollywood, CA	Southern California	Silver	70 (of 257)
Yuxin Xie	East Brunswick H.S., NJ	North Jersey	Bronze	89
Jenny Lu	Pomperaug H.S., Southbury, CT	New Haven	Bronze	132
Andrew Liu	Parkway Central H.S., Chesterfield, MO	St. Louis	Bronze	137

2009 – Cambridge, England – 41st IChO

Name	School	Local Section	Medals	Ranking
Yixiao Wang	Westfield H.S., NJ	North Jersey	Gold	25 (of 250)
Nathan Benjamin	W. H. Harrison H.S., West Lafayette, IN	Purdue	Silver	34
Brian Seifried	Chamblee H.S., GA	Georgia	Silver	37
Colin Lu	Vestal H.S., NY	Binghamton	Silver	59

2010 – Tokyo, Japan – 42nd IChO

Name	School	Local Section	Medals	Ranking
Colin Lu	Vestal H.S., NY	Binghamton	Gold	21 (of 267)
Alex Siegenfeld	Hopkins School, CT	New Haven	Gold	22
Richard Li	River Hill H.S., MD	Maryland	Silver	52
Utsarga Sikder	S. Brunswick H.S., NJ	North Jersey	Bronze	94

2011 – Ankara, Turkey – 43rd IChO

Name	School	Local Section	Medals	Ranking
Konstantin Borisov	North Allegheny H.S., PA	Pittsburgh	Gold	9 (of 273)
Joe Tung	Gretchen Whitney H.S., CA	Southern California	Gold	24
Elmer Tan	John P. Stevens H.S., NJ	North Jersey	Silver	48
Tayyab Shah	Vestal H.S., NY	Binghamton	Silver	80

2012 – Washington, D.C. – 44th IChO

Name	School	Local Section	Medals	Ranking
Chris Hillenbrand	Regis H.S., NY	New York	Gold	16 (of 283)
Sidhart Chand	Detroit Country Day School, MI	Detroit	Silver	64
James Deng	Choate Rosemary Hall, CT	New Haven	Silver	70
Jason Ge	Westview H.S., CA	San Diego	Silver	80

2013 – Moscow, Russia – 45th IChO

Name	School	Local Section	Medals	Ranking
David Liang	Carmel H.S., IN	Indiana	Gold	21 (of 291)
Runpeng Liu	Ladue Horton Watkins H.S., MO	St. Louis	Gold	26
Stephen Ting	Monta Vista H.S., CA	Santa Clara Valley	Silver	36
Saaket Agrawal	Mira Loma H.S., CA	Sacramento	Silver	47

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2014 – Hanoi, Vietnam – 46th IChO

Name	School	Local Section	Medals	Ranking
Robert Kao	Edwin O. Smith High School, CT	Connecticut Valley	Gold	28 (of 291)
Derek Wang	North Allegheny Senior High School, PA	Pittsburgh	Silver	41
Stephen Li	Troy High School, MI	Detroit	Silver	44
Andrew Chen	W. Windsor-Plainsboro H.S. South, NJ	Trenton	Silver	50

2015 – Baku, Azerbaijan – 47th IChO

Name	School	Local Section	Medals	Ranking
David Wang	Monta Vista High School, Cupertino, CA	Santa Clara Valley	Gold	7 (of 290)
Janice Ong	T. Jefferson H.S. for S&T, Alexandria, VA	Washington, DC	Silver	76
Bryce Cai	Barrington High School, IL	Chicago	Silver	82
Soorajmath Boominathan	OK School of Sci. and Math., OK	Oklahoma	Silver	83

2016 – Tbilisi, Georgia – 48th IChO

Name	School	Local Section	Medals	Ranking
Alex Liu	The Village School, Houston, TX	Greater Houston	Gold	8 (of 264)
Kevin Tang	Solon High School, OH	Cleveland	Silver	44
Joyce Tian	T. Jefferson H.S. for S&T, Alexandria, VA	Washington, DC	Silver	66
Zilu Pan	Canyon Crest Academy, San Diego, CA	San Diego	Bronze	102

2017 – Nakhon Pathom, Thailand – 49th IChO

Name	School	Local Section	Medals	Ranking
Harrison Wang	Hinsdale Central High School, IL	Chicago	Gold	5 (of 297)
Joshua Park	Lexington High School, MA	Northeastern	Gold	16
Steven Liu	Monta Vista High School, CA	Santa Clara Valley	Gold	28
Brendan Yap	Carmel High School, IN	Indiana	Gold	32

2018 – Bratislava, Slovakia, Prague, Czech Republic – 50th IChO

Name	School	Local Section	Medals	Ranking
Jeffrey Shi	Marcellus High School, NY	New York	Gold	4 (of 300)
Michelle Lu	Pomperaug High School, CT	New Haven	Gold	10
Andrew Wu	Park Tudor School, IN	Indiana	Gold	12
Yutong Dai	Princeton International School for M&S, NY	Princeton	Gold	13

2019 – Paris, France – 51st IChO

Name	School	Local Section	Medals	Ranking
Yajvan Ravan	Churchill High School, MI	Detroit	Gold	19 (of 309)
Anton Ni	University High School, CA	Orange County	Gold	28
Edward Jin	Arnold O. Beckman High School, CA	Orange County	Gold	30
Albert Liu	North Hollywood High School, CA	Southern California	Silver	59

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2020 – Virtual, Istanbul, Turkey – 52nd IChO

Name	School	Local Section	Medals	Ranking
Alex Li	Lexington High School, MA	Northeastern	Top Gold	1 (of 235)
Alec Zhu	Lexington High School, MA	Northeastern	Gold	8
Ananthan Sadagopan	Westborough High School, MA	Central Massachusetts	Gold	12
Anugrah Chemparathy	Dougherty Valley High School, CA	California	Gold	24

2021 – Virtual, Osaka, Japan – 53rd IChO

Name	School	Local Section	Medals	Ranking
Quyiang Zhou	Princeton International School for M&S, NY	Princeton	Gold	13 (of 309)
Yitian Zhou	Seven Lakes High School, TX	Greater Houston	Gold	27
Nikhil Seshadri	University City High School, CA	San Diego	Silver	42
Kien Phuong	Landon School, MD	Washington, DC	Silver	73

2022 – Virtual, Tianjin, China – 54th IChO

Name	School	Local Section	Medals	Ranking
Nathan Yihe				
Ouyang	University High School, CA	Orange County	Gold	6 (of 323)
Jack Liu	Carmel High School, IN	Indiana	Silver	37
Phoenix Wu	Seven lakes High School, TX	Greater Houston	Silver	60
Gideon Tzafri	Lexington High School, MA	Northeastern	Silver	94

54th International Chemistry Olympiad, China Team USA Members' Essays



Team USA members at the Albert Einstein memorial in Washington D.C. Photo by M. Thatcher

Jack Liu

When I first landed in Washington D.C, I was overwhelmed by both pride and anxiety. Having been in D.C. only a few weeks ago for the USNCO Study Camp, it felt like I had made a grandly ominous return. I can only relate the feeling to how Katniss Everdeen must have felt when she returned to the Hunger Games, although my situation was certainly a lot less deadly.

Nevertheless, the tense atmosphere was sharply contrasted by the bright, amicable personalities of my three teammates: Nathan, Phoenix, and Gideon. United by our similarly satirical sense of humor and our motivation to succeed, we quickly evolved to become more than just a quartet of chemistry nerds. From dubbing Nathan a “golden snub-nosed monkey” (an iconic animal in China), losing to Phoenix nine times in a row in Chinese card games, and poking fun at Gideon for accidentally cutting himself while shaving, our inside jokes and conversations about life brought us closer together. In one short week, we became more than just friends: we became each other’s allies, our supporters, and our biggest fans.

While the IChO exam was a challenge, I appreciated how much the problems focused on the real-world applications of chemistry. For instance, this year’s IChO educated me on the complexity of lithium-sulfur batteries, with their high specific energy being hindered by the progressive leakage of cathodic material. Another problem highlighted carbon dioxide capture through sodalite-type metal-organic

frameworks, while yet another described the method of using gold nanoparticles for the detection of COVID-19. Furthermore, the exam also detailed fascinating organic compounds and reactions, such as the use of chiral phosphine ligands as catalysts for asymmetric reactions.



Team USA students working on the virtual lab assignment with the team mascot Testudo. Photo by M. Thatcher

After the test, finally freed from the shackles of the 5-hour exam, we spent the remaining days of our virtual IChO experience roaming around our nation's capital. Between Italian ravioli, Japanese ramen, Chinese Peking duck, and more, Washington D.C. gave us a taste of all sorts of countries around the world. Meanwhile, we also explored the wonders of our own country: the breathtaking Washington National Cathedral, the serenely exquisite US Botanical Garden, the complex saga of the African American History Museum, and the historically pristine Mount Vernon, just to name a few. As the political center of our nation, Washington D.C. is a beautiful amalgamation of American patriotism and foreign culture. Without having been able to travel overseas, I cannot imagine spending my virtual IChO anywhere else.

Overall, IChO 2022 was an amazing and unforgettable experience. Throughout my long USNCO career, I have heard many people talk about how they spent X hours per day grinding problems or read some textbook Y times. And while this amount of effort is to be applauded, if my experience over the years has taught me anything, it is that the most valuable part of USNCO isn't the competition, exam results, or even

the knowledge you gain; rather, what I cherished most was the opportunity to connect with others. Chemistry may not be in my life forever, but the bonds that I made along the way will last a lifetime.

USNCO has introduced me to so many great people over the years, both online and within my school. Chemistry helped me find a niche within my community, and I would be nowhere near where I am today without my friends' support. In my junior year, I became acquainted with a fellow chemistry-loving sophomore at my school, and I soon realized how driven and talented he was. We worked together, motivated each other, and forced each other to study harder. Our loose association eventually blossomed into a great friendship, sharing many hobbies outside of chemistry and creating our own style of quirky humor. He pushed me to make it farther than I ever would have made it alone, and I was thrilled when we could be a part of Team Alpha Pi together.

And about Team Alpha Pi... where do I even start? From shouting "SHEEEESH" at the top of our lungs, singing made-up songs about the classic internet meme "Big Chungus," and making the same joke every 10 seconds (I wish this was an exaggeration) relating to a very specific children's video game, the culture at the Team Alpha Pi study camp bordered between an intricate web of inside jokes

and an incomprehensible melting pot of random phrases that these 20 “bozos” somehow thought were funny. Even the mentors joined in on our crazy antics, creating the now world-famous “Chunguscollin” molecule. Those 20 students were one of the most unique groups of people I have ever met, and I loved my experience with every single one of them. I would not give up our absolutely nonsensical sense of humor for anything else.

And for my fellow IChO teammates on Team USA: from struggling on organic schemes and masterminding the oddly tedious virtual labs (earning us all the “Golden Monkey Award”) to playing cards together and telling each other stories about our lives, I am overjoyed that I got to share my IChO journey with three of the most interesting people that I have ever met. No matter what they choose to do in their future endeavors, I will always have their backs. I barely knew any of them only a month and a half ago, but now I know that they will be a group of people that I will never forget.



Team USA in front of The White House. Photo by M. Thatcher

Finally, I would like to express my gratitude to all the people who made this year’s IChO possible. I want to thank Ms. Thatcher, Mr. Long, and Ms. Polk for their friendly banter and for “babysitting” us for a week. Thank you to Dr. Raines for organizing the activities at camp and IChO. Thank you to our mentors Dr. Houck, Mrs. Hines, and Dr. Serbulea for sharing their expertise with us. Thank you to our peer mentors Yitian, for her endless positivity, and Alec, for his endless comic relief and for trying to convince me to buy him breakfast at the airport on the last day of camp (true story). Thank you to my teammates Nathan, Phoenix, and Gideon for making my IChO experience the best it could be. Thank you to my high school chemistry teachers Dr. Huang and Mrs. Kundrat for sharing their passion for chemistry with me. And finally, thank you to all of the people I have met and who have supported me along my long USNCO journey. I hope that our paths will cross again.

Nathan Yihe Ouyang

My path through USNCO has been truly incredible from start to end. Learning chemistry has paid off tremendously, allowing me to encounter creative and enjoyable problems, interesting knowledge that has broadened my horizons, and lifelong friends at my school and camp. From rallying using strange objects as paddles in ping-pong, gambling with chips in card games, and participating in “3 in 1” to puzzling over chemistry problems together, every moment at the camp

was time well spent. The pinnacle of my career in the USNCO at the International Chemistry Olympiad was just as incredible and rewarding.

We flew from all over the country — California, Texas, Indiana, and Massachusetts, converging at Washington D.C. and bound by our love for chemistry and drive to learn more. Seeing my three other teammates again after three weeks of collaboration and studying online almost completely erased my fatigue from the five-hour flight. Our years of preparation and learning had brought us to represent Team USA, but I also felt that I was representing my friends, family, and teachers who supported me and rooted for me throughout. I was nervous but determined to do well.

The IChO exam itself was five arduous hours long. One problem detailed the efficient detection of COVID with cleverly designed gold nanoparticles; one introduced the capture of carbon dioxide using a flow reactor electrolyzer. Another problem presented real-world applications of equilibria for the plethora of polysulfide species in lithium-sulfur batteries. Although it was a test, the creatively written problems were satisfying and enjoyable to solve, combining once-abstract concepts only appearing in textbooks and formulas with real-life applications and cutting-edge technology. Despite that, the exam was only a drop in the ocean compared to our fun activities.

Posing the camp mascot Testudo for pictures was our favorite pastime on our expeditions that wonderful week. He and the team experienced the captivating narratives of the Museum of African American History, discovered the wonders and history of the skies at the Air and Space Museum, and visited the intimately historic Mount Vernon. One particularly memorable experience was passing through the spectacular canopy walkway at the Botanical Gardens, walking through a smoke screen of mist while admiring the lush tropical array of plants. There we learned much about water vapor pressure and green chemistry.

Even though we could not go to China in person, our host prepared impressively detailed virtual labs and Chemzone, a fun and unique online platform to meet other participants. In the Chemzone cyberspace, we enjoyed minigames, went fishing, rode a Ferris wheel together, and made our avatars look ridiculous. We also watched a variety of the organizer-prepared videos, which allowed us to virtually tour Tianjin and its spectacular nighttime skyline, appreciate the multifaceted and elegant Chinese calligraphy and painting, and learn about the wild cousins of the IChO mascot, a lovable golden monkey.

During that week, we talked about every topic imaginable, debating if photographers were limited by their cameras or the other way around, and guessing the number of bricks on a street. Jack reliably gave 100 percent accurate statements and predictions to any of our questions, and Gideon found ridiculous internet posts that we could laugh at. At night, we ate snacks, listened to and commented on each others' music tastes, and played video games. Most of the time, though, was spent losing to Phoenix in cards. We grew closer and closer, learning about each other and growing unbreakable friendships.

Alongside my great teammates who never failed to make me laugh, my seven-day trip went by in a breeze, and our team was as close-knit as a family of golden snub-nosed monkeys.

I want to thank our host Nankai University and the IChO organizers for working tirelessly to host this wonderful and engaging event and making the next generation of chemists. Thank you to ACS and their staff for making USNCO and our IChO experience the best it could possibly be. Thank you to Dr. Raines for managing the USNCO program, and Ms. Thatcher for organizing USNCO and its activities. Thank you to Mr. Travis and Ms. Polk for being our chaperones, watching over us, and putting up with us for a whole week! Thanks to our mentors Dr. Houck, Dr. Serbulea, and Mrs. Hines for supporting, teaching, and helping us compete at IChO behind the scenes! Thank you to my teacher Dr. Huang, who inspired me with his passion for chemistry and stories from when he was studying chemistry. Finally, I want to mention my family who unconditionally supports me, especially my brother, who introduced me to chemistry and always teaches and guides me.



Team USA at the Udvar-Hazy Air and Space Museum, VA. Photo by M. Thatcher

Gideon Tzafiri

My summer had already been packed with trips to the DC area for the USNCO Study Camp and National Science Bowl, so I had already experienced the typical “DC tourist experience” when I drove to our hotel with Travis, one of our chaperones. But during our eight days at the International Chemistry Olympiad, the American Chemical Society sponsored our exploration of unique parts of Washington D.C. as well as chemistry.

Because the USNCO Study Camp had been in person for the first time in three years, all four of us had already become closer over those several weeks of difficult theoretical and practical exams and study sessions. Our first day at IChO after driving from the airport was spent getting comfortable in our hotel rooms and eating at a Ramen place near our hotel. This was already a completely different experience from the camp - instead of twenty students eating meals and sharing stories, we were only four. With our chaperones Robin and Travis, we discovered a soda unknown to all of us and laughed about stories from our hometowns. Like at the study camp, once our day ended around 8 PM, we were free to choose to relax or study for the upcoming exam. We all chose to relax, of course.

In hindsight, day two was perhaps the most unique day of my life during the entire Olympiad. From 8 AM to 5 PM, all four of us worked together to solve the most difficult problems we could find in preparation for the IChO exam the next day. Studying in a room with three of the best high schoolers in the country at chemistry was an unforgettable experience. The speed and intuition of my teammates was remarkable to bear witness to, and truly felt like the ultimate culmination of my journey through chemistry olympiad. After raking through any possible holes in our knowledge-base we could find, I discovered in the last five minutes of our study session that after solving several difficult organic schemes, I was struggling with assigning R and S configurations to chiral carbon centers! I slept early to give my mind the rest it needed for the exam.

The morning of the exam didn't feel stressful for me, but rather exciting. We ate an amazing breakfast at the commissary, helping to prepare ourselves for five hours of nonstop problem solving. As we walked from the restaurant to the ACS Headquarters where we would be taking the exam, I was prepared for a fun and interesting test paper that would challenge my chemistry knowledge. I was also excited to see how our team would fare in the exam. In the several hours we had before the test started, we didn't spend time cramming or reviewing. Instead, we played card games like Dou dizhu and Cheat to enjoy our experience and cleanse our minds of any stress or pressure. I found that camaraderie to be a memorable part of my IChO experience.

The actual theoretical exam itself was mentally tasking, but well worth the effort because of the many interesting tasks provided. The relevance of problem one and its exploration of antibody-coated gold nanoparticles for COVID-19 testing fascinated me, as I had not previously seen the mechanism of action of this proposed method of viral detection. While I was greatly challenged by carbon dioxide sequestration in problem three, I was reminded by its treatment of the structure of ZIF-8 metal-organic frameworks (MOFs) of my own research proposal earlier in the year that involved biomedical



Team USA at Mount Vernon, VA. Photo by M. Thatcher

applications of ZIF-8 MOFs. The IChO exam amazed me with the ability of one simple polymer to act as both a potent catalyst filled with porous reactive sites as well as a delivery nanoshuttle for small molecules inside the human body.

The abundance of inorganic chemistry questions emphasized the importance of all the periodic table's elements in shaping our modern world, especially lithium and sulfur in their namesake lithium-sulfur batteries. By exploring modern ongoing research into these batteries, IChO piqued my interest in a growing field within chemistry and chemical engineering. The organic chemistry problems all centered around important, relevant topics - using phosphines and appropriate metal catalysts for asymmetric cycloaddition reactions, difficult peptide syntheses, spiro-catalysts for asymmetric organic reactions used frequently in synthesizing important medicinal compounds, and synthetic sugar chemistry. I could go on endlessly about my appreciation for the exam's questions and quality, but that would force me to gloss over the time we spent during the next five days that had no connection to chemistry.

Our exploration of Washington D.C. began in Chinatown, where we finally were reunited with our mentors from the camp: Dr. Houck, Dr. Serbulea, and Mrs. Hines - as well as our exam invigilator Dr. Collins and Dr. Raines, and Ms. Thatcher from ACS. Because we had all previously met, it was a great opportunity for us to all catch up together on both our past month since the camp as well as our future plans.

Over the next several days, we visited amazing museums: the National Museum of African American History and Culture standing out - as well as explored Washington D.C. on foot during the night.

These were sites I had not yet visited during the summer, so it was fun finally seeing new parts of DC. We also participated individually in an online practical exam that China organized specifically for this year's IChO. The exam consisted of a qualitative analysis section using prepared videos of each test, as well as five labs spread across chemistry that were to be completed using a virtual reality set-up. I found this to be a unique and fun way to experience the practical exam and am thankful that the Chinese hosts created this program for us.

In the days before results were announced, we did not sit around waiting anxiously. Instead, we enjoyed spending our time continuing to travel around the DC area to George Washington's residence in Mount Vernon, the Udvar-Hazy Air and Space Museum to watch planes land at Dulles Airport, and watched the Shen-Yun performance at the Kennedy Center. We also tried many new high-end restaurants and cuisines and learned about fine dining customs from our chaperones. My most memorable experience from those days were our continuations of our card-games from before the IChO exam. Even though Phoenix may have repeatedly and mercilessly destroyed us every night in Dou dizhu, it was fun growing closer as a team with relaxing pastimes.

Finally, the 5 AM wake-up call came on Monday that told me it was time to leave our hotel for the ACS Headquarters. It was finally time for the award ceremony, where all our results would be announced. I did not feel especially stressed during the whole ceremony, not only because of my low personal expectations and the entertainment provided by China, but because of my excitement for seeing how our team would perform. It was amazing watching our whole team win medals on the international stage and felt great to have come so far in just several months.

I would like to thank Yitian and Alec for making my camp experience so enjoyable as peer mentors with their personal insight and non-chemistry related quotes. Dr. Houck, Dr. Serbulea, and Mrs. Hines all pushed me to improve in rigor to achieve my full potential at the study camp and created many useful resources as well as provided helpful advice to reach this final stage. I would like to also thank Travis and Robin for spending the week helping to take care of us as chaperones as well as China for hosting such an amazing competition. Finally, I'd like to thank Alex Li, a previous IChO alumni from my school, for spending an uncountable number of hours helping me grasp every imaginable chemistry concept over the past four years and serving as such an amazing role model - I would never have reached this stage without his generosity and support.

Phoenix Wu

Circling around the Washington monument, mesmerized by the scenic aerial view, I landed at the Reagan airport for the second time in only a few weeks to start off the unforgettable experience that was the 54th IChO. Upon meeting my fellow teammates, I was reminded of all the hard work and amazing memories that had led up to this fateful week: the bonding over two weeks of intensive chemistry lectures, lab practicals, and exams at the study camp, hilarious late night conversations both in person and over discord, and of course the making of a wonderful mosaic of organic structures (and amongus's) as we worked through countless total syntheses in preparation for IChO on an online collaborative whiteboard.

The week at DC was simply unforgettable, in great part due to our amazing guides, Ms. Polk, Mr. Long, and Ms. Thatcher. Travis, dubbed the "crazy uncle," made sure we fit right in with native Washingtonians, while Ms. Polk and Ms. Thatcher made sure we did not run too wild without our parents. Since we hailed from across the nation, DC was an amazing opportunity to taste exquisite food, see our nation's history firsthand, and view some breathtaking architecture that simply doesn't exist in our native cities. From trying out local crab cakes, exotic cheeses, and rabbit confit; from walking through Mount Vernon and visiting longtime establishments; from strolling around the White House under a beautiful gibbous moon to discovering a lit-up cathedral (with a Darth Vader Gargoyle!), our time spent was so much richer than I could have imagined.

However, we could not just have a week-long tour of DC without taking the IChO exam, which we did on the fateful morning of July the 13th. After a relatively subdued breakfast, we entered the conference room under an atmosphere thick enough to cut with a knife. Even after loosening up with some card games, we all knew that everything we had been preparing for this entire year was about to culminate in one exam. The test covered a multitude of fascinating topics, such as the kinetics of catalytic converters, the thermodynamics of potentially groundbreaking sulfur-lithium batteries, and organic synthesis using revolutionary Iridium catalysts. Everybody left that room knowing they had done the best they could, and I felt a massive weight lifted off my back. After we finally met with our mentors for dinner for the first time since study camp ended, we caught up over some fantastic Chinese food and underwent some friendly interrogation about how we did.

Despite the online format, I am truly grateful for the efforts that our mentors and Nankai University put towards letting us have as close of an in-person experience as possible. The virtual labs were surprisingly detailed and really gave me an opportunity to apply what we had learned during the study camp lab sessions, albeit thankfully without the unexpected spillage or dirty glassware that inevitably accompanies anything in the real world. ChemZone was both highly entertaining and a good way to decompress, and we collectively lost it when we discovered character customization and emotes. Chatting with other IChO competitors from countries as diverse as Slovakia, South Korea, and Serbia granted me a broader understanding of their cultures, future dreams, and even the legal drinking age in several European countries. It is still hard to believe that across vastly different regions, we were able to communicate under our common passion for chemistry. Above all, I want to give my gratitude to my other three teammates for being such amazing friends. To Gideon, who I met for the first time at study camp just a few weeks ago, thank you for all the insight you have given me, whether it be about organic chemistry, college, or the wonders of Jane Street. To Jack, notably the best clash royale player among us, your deadpan humor is hilarious, and I cannot wait to see you do great things in the future. To Nathan, the tiny "bottomless pit" that DC restaurants failed to fill, I cannot believe how you can be so down to earth yet so talented - just make sure you do not drop any more food. Altogether, this week would not have been the highlight of my years doing USNCO without the synergy we had. I will never forget our delirious late nights in each other's rooms, coming up with photogenic poses across DC for

our mascot Testudo, or winning 9 rounds of cards in a row and watching y'all's disbelief every time I snatched victory from the jaws of defeat. Despite Team USA sweeping the Golden Monkey awards, the true treasure that we obtained through this experience was the friends we made along the way.

Because of my participation in the 54th IChO, I gained a much deeper appreciation for the entirety of my path through Chemistry Olympiad. At the beginning of freshman year, the USNCO process seemed so intimidating, so out of reach for just an ambitious high schooler. My passion for chemistry stemmed initially from competition in Science Olympiad, something that was enabled and reinforced throughout high school by the wonderful leadership of my coach Mrs. Irving. Additionally, Mrs. Irving and other teachers such as Mrs. Snyder, Mrs. Colombani, and especially my AP Chemistry teacher Mr. Ramos, allowed me to reach my fullest potential. They all provided me with valuable advice outside of class, allowed me to practice in the lab after school, and gave me the freedom to



Team USA students and mentors with ACS staff in front of the Chinatown Arch, Washington, D.C. Photo by T. Long

explore chemistry as I wished. Furthermore, many students and other mentors were such priceless sources of guidance. I met a brilliant friend at my school during my freshman year who had already competed in the USNCO competition in previous years. We studied together, improved each other, and eventually were even able to attend the study camp together twice! Moreover, every year at the study camp, collaboration with the other talented campers and genius peer mentors only inspired me to work harder and allowed me to see concepts in a new light.

Finally, I would like to emphasize the hard work that Dr. Houck, Dr. Serbulea, Mrs. Hines, Ms. Thatcher, Dr. Raines, Mr. Long, Ms. Polk, ACS, and UMD staff put in to make the study camp and IChO run as smoothly as it did. Thank you for organizing all the activities, for taking care of us all these weeks, for making the transition back to an in-person experience so flawless. An immense thanks to the peer mentors Alec and Yitian who did so much behind the scenes work in preparation for our labs, who spent countless hours writing up custom solutions to complicated problems and tortured us with equally challenging unique problems for us to puzzle through. The dedication of all these people to chemistry and the USNCO program is unbelievable, and I am immensely appreciative of their support.

FOR IMMEDIATE RELEASE

U.S. team selected for the 54th International Chemistry Olympiad

WASHINGTON, June 21, 2022 — The American Chemical Society (ACS) is proud to announce the team that will represent the U.S. at the [54th International Chemistry Olympiad](#) on July 8 to 18. Originally scheduled to take place in Tianjin, China, the 2022 Olympiad will be held online due to continuing concerns about the coronavirus pandemic.

The members of the 2022 Team USA, are:

Jack Liu, Carmel High School, Indiana

Nathan Yihe Ouyang, University High School, Irvine, California

Gideon Tzafriri, Lexington High School, Massachusetts

Phoenix Wu, Seven Lakes High School, Katy, Texas

Alternates:

1st Yufei Chen, University High School, Irvine, California

2nd Mingwen Duan, East Lyme High School, Connecticut

The team is supported by these mentors:

Head mentor: **Joseph Houck, Ph.D.**, Pennsylvania State University

High school mentor: **Esther Hines**, Billerica Memorial High School, Massachusetts

College mentor: **Laura Serbulea, Ph.D.**, University of Virginia



L to R: Yufei Chen, Gideon Tzafriri, Nathan Yihe Ouyang, Phoenix Wu, Jack Liu, Mingwen Duan

Photo credit Robin Polk

After outscoring hundreds of other students on a national exam, the top 20 were invited to an intensive study camp. There, they received college-level chemistry training with an emphasis on organic chemistry via a series of lectures, problem-solving exercises, lab experiments and tests. The four highest-scoring students during the study camp make up the USNCO team.

ACS has sponsored the American team annually since the U.S. joined the Olympiad in 1984. Principal funding is through the ACS Donald F. and Mildred Topp Othmer Chemistry Olympiad Endowment, with additional support from other donors. For a complete list of sponsors, visit the [USNCO website](#).

The International Chemistry Olympiad originated with Czechoslovakia, Poland, and Hungary in 1968. Soon, other Eastern European countries joined the event; Western Europe began participating in 1974. The first U.S. team competed in 1984 winning one silver and two bronze medals.

The American Chemical Society (ACS) is a nonprofit organization chartered by the U.S. Congress. ACS' mission is to advance the broader chemistry enterprise and its practitioners for the benefit of Earth and all its people. The society is a global leader in promoting excellence in science education and providing access to chemistry-related information and research through its multiple research solutions, peer-reviewed journals, scientific conferences, eBooks, and weekly news periodical *Chemical & Engineering News*. ACS journals are among the most cited, trusted, and widely read within the

scientific community; however, ACS itself does not conduct chemical research. As a leader in scientific information solutions, its CAS division partners with global innovators to accelerate breakthroughs by curating, connecting, and analyzing the world's scientific knowledge. ACS' main offices are in Washington, D.C., and Columbus, Ohio.

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US team selected for 2022 Chemistry Olympiad

4 high school students will compete online against teams from over 80 countries

by **Nina Notman**, special to C&EN

June 23, 2022



Credit: Robin Polk

Yufei Chen (from left), Gideon Tzafirri, Nathan Yihe Ouyang, Phoenix Wu, Jack Liu, Mingwen Duan will represent the US at the International Chemistry Olympiad.

Four high school students will represent the US in the 54th International Chemistry Olympiad, which will be hosted remotely by China July 10–18. The US team was finalized after the [Chemistry Olympiad Study Camp](#) held at the University of Maryland, College Park, June 5–18.

The 2022 team consists of: Jack Liu, from Carmel High School in Indiana; Nathan Yihe Ouyang, from University High School in California; Gideon Tzafirri, from Lexington High School in Massachusetts; and Phoenix Wu, from Seven Lakes High School in Texas. The first alternate is Yufei Chen, from University High School in California. The second alternate is Mingwen Duan, from East Lyme High School in Connecticut.

“We have very strong students and they performed very well at the camp,” says head mentor, Joseph Houck, an associate teaching professor at Penn State University.

Tzafirri says of the camp that it has been “the most fun experience I have had during high school. In Lexington, there were not many other people for me to talk about chemistry with and interact with on this level, but here, we just live and breathe chemistry.”

Liu is thrilled to interact with teammates and mentors during the final competition. “All of them are very capable and very intelligent people, I am really excited to spend more time with them and learn more from them,” he says.

Looking forward to the final competition, Wu says, “we are going to have a great time and we’re going to do great this year.”

Ouyang agrees but also admits to feeling disappointment that the competition is online. “I just hope to do well and make Team USA proud,” he adds. The International Chemistry Olympiad will be held online this year due to the COVID-19 pandemic.

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PHYSICAL CHEMISTRY

China takes home the top 3 golds in 54th International Chemistry Olympiad

US wins 1 gold and 3 silver medals at the annual high school chemistry competition

by **Nina Notman**, special to C&EN

July 19, 2022



Credit: Margaret Thatcher

Jack Liu (from left), Nathan Ouyang, Phoenix Wu, and Gideon Tzafriri represented the US at the International Chemistry Olympiad.

High school students from China earned the top three gold medals in the **54th International Chemistry Olympiad (ICHO)**, which was hosted remotely from Tianjin July 10–18. The US team was awarded one gold and three silver medals.

Jack Liu, a graduate of Carmel High School in Indiana; Nathan Ouyang, from University High School in Irvine, California; Gideon Tzafriri, a graduate of Lexington High School in Massachusetts; and Phoenix Wu, from Seven Lakes High School in Texas, made up the US team.

More than 300 students from 84 countries took part in this year's virtual IChO. Ouyang was placed 6th, earning him a gold medal, while Liu, Wu, and Tzafriri were placed 37th, 60th, and 94th, respectively, earning silver medals.

"We're really proud of our team. They worked really hard. It was a tough exam and they came out with good results," says the US team's head mentor, **Joseph Houck**, an associate teaching professor at Penn State University.

The US team took the 5-hour theoretical exam, in front of a supervisor, at the American Chemical Society offices in Washington, DC, on Wednesday, July 13. The topics covered in the questions included rapid COVID-19 detection techniques, carbon dioxide capture and transformation, and lithium-sulfur batteries.

“A lot of the exam was focused on real-world problems, which I think made the test interesting,” says Liu. “I was a big fan of the kinetics-based question about catalysts that are used in cars to convert nitric oxides into less environmentally-harmful gases. I’m generally a big fan of physical chemistry,” adds Wu.

Organizers of IChO provided a chat room through which all participating teams could interact. The same online platform was used to host online chemistry lectures and virtual field trips to sites local to Tianjin such as Nankai University.

“For the virtual events, we had an online platform called ChemZone where you could meet other IChO participants. It was pretty fun,” says Ouyang.

The US team also visited sightseeing destinations around Washington, DC, including George Washington’s Mount Vernon, the National Air and Space Museum, and John F. Kennedy Center for the Performing Arts.

“The highlight of the week was spending time with my team from the US,” says Tzafirri. “For both the **camp** and the international olympiad, the majority of our time is not spent on doing tests; it is spent on growing better connections to others.”

In addition to Houck, mentors for the US team included **Esther Hines** of Billerica Memorial High School in Massachusetts and **Laura Serbulea** of the University of Virginia.

Liu and Tzafirri will both start college in the fall at the Massachusetts Institute of Technology and the University of Massachusetts Amherst, respectively. Ouyang will be a high school junior and Wu a high school senior.

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