

Hacking the Atom

EXPLORATIONS IN NUCLEAR RESEARCH, VOL. 1

The new science of low-energy nuclear reactions (1990-2015)

Steven B. Krivit

Edited by Michael J. Ravnitzky



Pacific Oaks
Press

SAN RAFAEL, CALIFORNIA

Hacking the Atom: Explorations in Nuclear Research, Vol. 1

Copyright © 2016 by Steven B. Krivit

All rights reserved. No part of this book may be reproduced in whole or in part without written permission from the publisher, except by reviewers who may quote brief excerpts in connection with a review in a newspaper, magazine, or electronic publication; nor may any part of this book be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic without permission from the publisher.

Pacific Oaks Press / *New Energy Times* / www.newenergytimes.com

369-B 3rd St. #556, San Rafael, CA 94901

Library of Congress Control Number: 2016902974

Krivit, Steven B., author.

Hacking the atom / Steven B. Krivit ; editors,
Michael Ravnitzky, Cynthia Goldstein, Mat Nieuwenhoven.

pages cm -- (Explorations in nuclear research ; vol. 1)

Includes bibliographical references and index.

LCCN 2016902974

ISBN 978-0-996886444 (hbk.)

ISBN 978-0-996886451 (pbk.)

ISBN 978-0-996886468 (Kindle)

ISBN 978-0-996886475 (ePUB)

1. Low-energy nuclear reactions--Research--History.
2. Electroweak interactions--Research--History.
3. Science--Social aspects. I. Ravnitzky, Michael, editor. II. Goldstein, Cynthia, editor. III. Nieuwenhoven, Mat, editor. IV. Title. V. Series: Krivit, Steven B. Explorations in nuclear research ; v. 1.

QC794.8.L69K754 2016 539.7'5

QBI16-600060

Cover design: Lucien G. Frisch (Photograph: © Jahoo | Dreamstime.com)

Interior design template: Book Design Templates Inc.

Typeset in Crimson 11 pt., designed by Sebastian Kosch

Editors: Michael Ravnitzky (Developmental Editor), Cynthia Goldstein (Copy Editor), Mat Nieuwenhoven (Technical Editor)

Index: Laura Shelly

Index

Page numbers in **bold** indicate figures, tables, and photos.

- ABC (TV network), 140
abundance. *See* elemental (natural) abundances; isotopic abundance
accelerator. *See* particle accelerator
Ahern, Brian, 380
Alabin, Kirill, **239**, 240
Alimuhambetova, Anna Alexandrouna, 254
Allan, Sterling, 385
alpha (particle, emission), 34, 66, 318, 399, 415
 beta-delayed alpha decays, 284
alpha decay, 403
aluminum, 73, 415
Ambadkar, Abhay, 78
American Chemical Society (ACS), 46, 184–185, 189, 235, 358, 365, 366–367
 Marwan and, 81, 333, 365, 367
American Institute of Physics (AIP), 226, 366
American Nuclear Society, 136
American Physical Society (APS), 5, 96, 226, 254, 308. *See also* Chubb, Scott R.; Park, Robert L.; Riordon, James
Anderson, Phillip, 49
Arata, Yoshiaki, 189–191, **190**, 192, 341, 342
Argonne Laboratory, 18
Army Research Laboratory, 214
aromatic rings, 290
atom, structure of, 29–32. *See also* electrons; neutrons; nucleus; nuclides; protons
atomic emission spectrometer (AES), 92, 95
Atomic Energy Commission, 263
atomic transformation. *See* transmutation
Auger electron spectroscopy (AES), 133, 147, 148
Azzam, Ahmed M., **21**, 22
Baard, Erik, 49
Baldwin, Richard S., 52
Ballinger, Ronald, 187
Barnhart, Beverly (Defense Intelligence Agency), 334–335
Barron's (magazine), 264
Bass, Robert W., 71, 169–170, 375
Battelle Memorial Institute, 18
Bazhutou, Yuri, 52, 331
BBC Horizon (film), 79–80
BBC television, 96
Begley, Sharon (writing for *Newsweek*), 25–26, 43
Belous, Pavel, **239**
Benson, Thomas, 255
Bernstein, Michael, 366
beta (particle, emission), 7, 34, 36, 37, 66, 69, 260, 301, 415
beta decay, 265, 387–388, 412
 beta-minus decay, 98
 inverse beta decay, 265–266
 in nucleosynthetic reaction networks, **283**, 283–287, **284**, **285**
Bethe, Hans, 300, 414
Bhabha Atomic Research Centre (BARC), 7, 55–56, 269, 318, 373
 light-water experiments, 52, 53, 54, 57, 59–60, **60**
 neutrons and, 181
 Scaramuzzi experiments, 180–181
 tritium and, 15, 16, 54
Bhardwaj, Ramesh, 35
Biberian, Jean-Paul, 85, 234
biological transmutations, 243, 414
Biryukov, Artyom, **239**
Bishop, Jerry (writing in *Popular Science*), 144
Blackett, Patrick Maynard Stewart, xxiii
Blacklight Power Inc., 48
Bockris, John O'Mara, xxi, 15, 16, 20–25, **21**, **23**, 66, 72, 123–129, 150, 177–178, 204, 375
 "Low-Energy Nuclear Reaction" meetings, 118–123, 124–126, 129, 137–138
 Miley and, 124–125, 137, 142–143, 150, 152

- transmutation work, 14, 24–25, 79, 102–103, 118–119, 122–126, 138, 143, 150, 165
 Champion and, 19, 23, 25–27, 35–43, 45, 79, 121
 others questioning his work, 15–16, 17–18, 19–20, 99–114, 115, 118, 126, 129, 162
- Bockris, Lillian "Lily," 19, 124, 128, 129
- Boeing Corp., 270
- Born, Max, 277–278
- Born-Oppenheimer approximation, 277–278
- boron, 73, 136, 188, 250, 318–320, 413
 palladium-boron alloy, 157, 158, 160
- boron trifluoride neutron detector, 317
- Bose, Amar, 56, 58
- Bose Corp. light-water electrolysis experiments, 56, 57–59, 141
- Boss, Roger, 82
- Boston Herald* (newspaper), 187
- Bowler-Reed, John W., 21
- Brady, Patrick, 386
- Brandon, John, 385–386
- Breen, John J., 58
- Bressani, Tullio, 154
- Briggs, Roger, 112–113
- Brilliant Light Power, 48
- British Petroleum (BP), 372
- Britz, Dieter, 145
- Brown, Mozelle, 228
- Brown, Thomas M., 112
- Bryan-College Station Eagle* (newspaper), 102, 103, 105–107, 119
- Burbidge, Geoffrey and Margaret, 414
- Burns, Paul (aka Paul Story), 382–383
- Bush, Benjamin Frederick, 9, 153, 179, 184–185, 189
- Bush, Robert, 47–48, 51, 52, 53–54, 56, 57, 58, 72, 119
- Bushnell, Dennis, 394
- cadmium, 147, 287
- calcium, 51, 54, 87
- calcium oxide, 197
- California Institute of Technology (Caltech), 168, 215, 371–372
- calorimetry, 55, 56, 57, 59, 65, 141, 264, 380, 392
 isoperibolic calorimetry, 389
 mass-flow calorimetry, 380, 389
 McKubre and SRI's use of, 55, 56, 57, 59
 SPAWAR and, 157, 158–159, 160–161
- Cameron, Frank, 203, 203
- Canadian Broadcasting Corp., 223, 256
- carbon, 31–32, 32, 285, 364
 carbon-arc experiment, 24
 carbon fullerenes, 290
 transmutation to nitrogen and helium, 284, 284–285
- Carnegie Institute of Technology, 262
- Case, Leslie Catron, 180–182, 375
 efforts to replicate experiment of, 182, 183, 185, 226, 229, 361, 361–362
- cathodes, 76–77, 188, 218
 double-structure, 190, 190
 foil, 76–77, 80, 91–92, 152, 218
 gold, 129, 130, 147, 221, 274
 nickel-mesh, 219–220, 220
 palladium, 87, 89, 120, 129, 130, 135–136, 156, 157, 158, 161, 195–198, 196, 200, 217, 362–364, 393
 platinum, 89
 surfaces of, 76, 221, 236, 273, 395
 thermal imaging of, 219–220, 220
 tungsten, 193, 241–244, 245–247, 246, 247
- Cattaneo, Luigi, 391
- Cavendish laboratory, 413
- cavitation, 250, 255
- CBS-TV, 345, 359, 383, 397
- Celani, Francesco, 235, 339–340, 382
- CERN (European Organization for Nuclear Research), 7, 414
- cesium, 285, 339
 transmutation to praseodymium, 202, 212, 343–344, 353
- Chadwick, James, 138, 213, 265, 413
- Champion, Joseph, 19, 23, 25–27, 35–43, 45, 103, 112–113, 121
- Chandrasekhar, Subrahmanyan, 263, 265
- Chapline, George, Jr., 4
- Chatzidimitriou-Dreisimann, C. Aris, 274
- Chaudhary, Irfan, 315–316
- Chellappan, Kumar, 373
- Chemical and Engineering News (journal), 332
- Chernobyl nuclear power plant, 236–237

- Cherokee Investment Partners, LLC, 381
 Chidambaram, Rajagopala, 55–56, 373–374
 chromium, 73, 87, 92, 132–133, **134**, 135, **136**, 147
Chronicle of Higher Education (newspaper), 100
 Chubb, Scott R., 10, 54, 97, 159, 208, 210, 212, 219, 315, 328, 331, 365, 375
 at American Physical Society, 182–183, 312–313, 372
 Chubb, Talbot A., 10, 208, 213, 229, 232, 269, 317, 340, 375
 Cirillo, Domenico, 40, 214–243, **241**, 244, 260, 318–319, **320**
 Claytor, Thomas, 16, 125
 Clean Energy Technologies Inc., 140
 Close, Frank, xxi, 349
 Clustron Sciences Corp., 145
 Cochrane, Patrick, 248–250, 253–254
 Cockcroft, John, 413
 Cocanougher, Benton, 112, 113
 co-deposition method of SPAWAR, 152, 156, 158, 215–222, **220**, **221**
 Coffey, Timothy P., 162
 "cold fusion" (room temperature deuterium-deuterium) fusion idea, xviii, 6–7, 47, 64–66, 199
 claimed as $d+d \rightarrow he-4 + 23.8 \text{ MeV}$ reaction, 6–7, 10, 61, 154–155, 212, 224, 229–230, 232, 325, 327, 331, 332, 338, 360, 361, 398
 McKubre promoting with manufactured evidence, 355–360, 361–362, 365
 critics of, 48, 62, 66, 117, 184–185, 188, 191–192, 194, 272–273, 305–306, 310, 373–374
 Huizenga's three miracles, 257–258, 260
 defenders of, 144, 151–152, 179, 192, 231, 258, 311, 314, 331–338, 346, 367, 369–370
 by Hagelstein, 4–5, 6–7, 10, 62, 154–155, 210, 212, 327, 331, 356, 360
 by McKubre, 179–180, 200, 335, 358, 360, 361–362
 resistance against Widom-Larsen theory, 317–330
 distinction from low-energy nuclear reactions, xix–xx, 261, 310, 328–330, 359–360
 DOE 1989 review of, xx–xxi, 14, 15, 95, 96, 168, 186, 222, 223, 224, 225, 232, 258, 308, 349
 Fleischmann and Pons experiment claimed as fusion, 45–46, 62, 118, 170, 332. *See also* Fleischmann-Pons experiment
 history of development of, xviii–xx, 1–10
 hypothetical D+D "cold fusion" idea, 368
 idea questioned by
 Hagelstein, 10, 11, 61, 66, 110, 154
 Kruit, 325–326, 329, 355–364, 367–369
 Larsen, 331–332, 360–361, 367
 McKubre, 211–212
 Mainstream Cold Fusion Hypothesis" (MCFH), 210
 Patterson's "cold fusion" kits, 140
 Cold Fusion Research Advocates, 145
 collective effects, many-body quantum, 266, 274–277, 279, 280, 288, 298, 301, 304, 312, 313, 392, 411–414
 Compton scattering, 292
 Conference on Cold Fusion
 First Annual Conference (1990), 6, 47, 92, 187
 Second Annual (1992), 10, 46, 47, 156, 219
 Third annual using new name. *See* International Conference on Cold Fusion, ICCF-3
 Conference on Future Energy (COFE), 168
 Consiglio Nazionale Ricerche (National Research Council), 391
 Conte, Elio, 272
 Continuum Energy Technologies LLC, 380
 Conway, Brian Evans, 21, 22
 copper, 93, 94, 132, **133**, **134**, 147, 194
 changes in isotopes, 73, 132, **336**, 337
 Corey, James "Jim," 212, 214
 Correa, Paulo N., 146
 Cotton, Frank Albert, 107–109, 112, 113, 119, 125
 Coulomb barrier, 5, 9, 63, 155, 258, 259,

- 260, 282, 291, 305, 333, 413
 CR-39 (solid-state nuclear track)
 detector, 318–320
 Cravens, Dennis, 72, 202, 206, 272, 274,
 336, 384
- D+D thermonuclear fusion, 5, 11, 61, **61**,
 64–65, 183–184, 258, 302, 314, 342,
367–368
- D₂ Fusion, 255
 D₂O. *See* heavy water
 Daddi, Lino, 258–259, 260
Dallas Morning News (newspaper), 17,
 18, 40, 41, 103, 104, 105, 111–112, 119
 Darden, Thomas Francis, II, 381
 Darwin, Charles Galton, 301, 304, 413
 Dash, John, **76**, 85, 91, 130, 147, 152, 219,
 221, 342–343, 375
 demonstrations, 80, 81–84
 receiving patent, 87
 thin-foil electrolysis, 75–79, 86, 87,
 88–90, 91, 99, 125, 152, 212, 219
 topographical features seen, **88–89**,
 219, 273
- Daviss, Bennett (writing for *New
 Scientist*), 159, 161, 219, 226
The Day (newspaper), 228
 DeBroglie wave functions, 293
 decay. *See* radioactivity, radioactive
 decay
- Deccan Chronicle* (newspaper), 373
 DeChiaro, Louis, 334
 Deck, Robert, 313–314
 Decker, James F., 223
 Defense Advanced Research Projects
 Agency (DARPA), 3, 166, 180, 213, 322,
 327, 338, 341, 344, 345–346, 378
 Defense Intelligence Agency (DIA), 334
 Defense Threat Reduction Agency
 (DTRA), 214, 306, 310, 322, 323, 341,
 375
- Dehmer, Patricia, 229, 230–231
 Del Giudice, Emilio, 164, 165, 362, 375
 De Ninno, Antonella, 362–364
Deseret News (newspaper), 171
 deuterium, xviii, 5, 29, 45, 51, 57, 73, 116,
 130, 149, 153, 155, 180, 189, 273, 284,
 293, 356, 387
 deuterium gas experiments, 6, 7, 45,
 115, 189–191, 195, 198–200, 199,
 201, 339, 340, 344, 353, 373
 of Case, 180–183, 185, 226, 229,
 361–362
 deuterium nuclei, 8, 155
 disintegration, atomic, 34, 126, 244, 413
 Dominguez, Dawn, 157, 158, 159–161, 162,
 165
- Dornan, Frederick, 253
 Dresselhaus, Mildred, 225
 Dubna Joint Institute for Nuclear
 Research, 237
 Duncan, Robert V., 345–346, 383
 Dunn, Jim, 380
 Durham, Kenneth W., 35, 101, 102, 104,
 111
 Dye, Lee, 8
- Eagleton, Robert, 53–54, 72
 eCatNews (blog), 382–383
 Egan, Harold, **21**
 Einstein, Albert, 300, 302, 304, 414
 electrically dominated LENR reactions,
 411–412
 Electric Power Research Institute (EPRI),
 6, 120, 121, 166, 342
 funding for LENR research, 3, 55, 57–
 58, 178, 183, 186
 sponsoring workshops and
 conferences, 91, 225
 TR-104195 report, 187
 TR-107843-V1 report, 186, 356–357,
 358–359, 416
 including "M4" experiment,
 356–358, 360, 361
- electrodes, 56, 70, 79, **88**, 120, 127, 130,
 138, 141, 220, 221, 244, 270, 302
 ultramicroelectrodes, 22, 216, 217
 electrolysis, 15–16, 91, 120, 141, 152, 162,
 180, 357, 389
 experiments using, 187–188
 Arata and Zhang, 189–190, **190**
 Case, 181
 Dash, 75–78, 82, **87**, 87–88, 91
 De Ninno and Frattolillo
 (ENE), 362–363
 Fleischmann and Pons, 6, 216,
 362
 Iwamura (Mitsubishi), 195–
 200, **201–202**
 Miles, 48, 153, 162

- Miley, 138, 141, **146**, 146–149, 267–268
- Mizuno, **132**, 132–136, **133**, **134–136**, 193–194, 245–247, 392
- Ohmori and Enyo, 129–130, 131
- Rolison, 91, 93–95
- Srinivasan (BARC), 53, 59
- Valat, **86**, 86, 88–89, **90**
- Violante, 335–336
- electrolytic co-deposition. *See* co-deposition method
- electromagnetic force, 31, 33, 34, 275, 277, 288, 333, 336, 415
- electron capture, 98, 253, 413
- K-shell electron capture, 265, 272, 273
- "electron-induced nuclear reaction model" (Iwamura), 198
- electrons, 29, **30**, **31**. *See also* surface plasmon electrons
- collective many-body excitations of, 298, 301
- electron antineutrinos, 271, 283
- heavy electrons, 284, 293, 296–297, 298, 313, 412
- reacting with protons to form a neutral particle, 265
- secondary electron emission, 300, 302
- electrostatic repulsion. *See* Coulomb barrier
- electroweak interactions, xviii, 288, 411
- Glashow, Salam/Weinberg modern electroweak theory, 414
- Widom-Larsen process, 282–284
- elemental (natural) abundances, 77, 86, 130, 132, 133, 194, 263, 265, 266–268, **267**, **268**
- elements, 29–32. *See also* isotopes; transmutations, with or to heavy elements
- emissions. *See* alpha (particle, emission); beta (particle, emission); gamma rays (gamma radiation, gamma emission)
- ENECO, 71–73, 166, 322, 323
- Energetic Materials Intelligence Symposium, 212
- Energetics Technologies LLC, 345, 346, 393
- energy-dispersive X-ray spectroscopy (EDX), 14, 85, 87, 90, 147, 272
- energy production, 54, 65, 346, 348
- hydrogen as a source, 396
- Widom-Larsen theory supporting LENRs as possibility, 387
- Enyo, Michio, 129–131, 142
- ERAB 1989 "cold fusion" report, **13**, 230
- Erice, Italy 1989 workshop on "cold fusion," xxi
- Esaki, Leo, 330
- Essén, Hanno, 378–379
- European Organization for Nuclear Research. *See* CERN
- European Patent Office, 298
- Evans, Todd, 220
- excess heat, 153, 399
- claim of helium-4 and 24 MeV of heat relationship. *See* helium-4
- correlation with transmutation, 129–130
- findings in experiments, 45–46, 47–48, 64–65, 66–67, 69–70, 73, 187–191, 193–194, 195–198, 203–204, 382, 383, 389
- Arata and Zhang, 191
- Dash, 75–80, 81–84, 85, 87–90
- McKubre (SRI), 79–80, 186
- Miles, 155–161. *See also* "Tri-Navy Program"
- Mizuno, 392, 393
- Ohmori and Enyo, 129–130
- Oriani, 173
- Piantelli, 115–118, 294–296, 389–390
- SPAWAR's video and thermal imaging, 219–221
- Valat, 85–86
- Yamaguchi, 180–181
- findings in light (normal) water experiments, 45, 46
- Bush, 53–54
- Dash, 77
- Mills, 48–49
- NASA research, 52
- Noninski, 52
- Notoya, 49–51
- Srinivasan (BARC), 52, 56–58, **60**
- flash boiling and high-temperature events, 89, 219, 220–222, **222**, 411–

- 412
 heavy-element transmutations and, 149–150, 193–194
 Miley's exaggerated claims, 384–385
 positive thermal feedback effect and, 389
 exothermic production. *See* excess heat
 exploding-wire phenomenon, 235–236, 237, **238**, 240–241, 289
 explosion in Mizuno's lab, 245–247, **246**, 247
- Faccini, Riccardo, 319
 Fackler, John, 105
 Faile, Samuel, 72
 Fairbanks, Auard, 72
 Fairbanks, John, 224–225
 Farmer, Joseph C., 13–14, 24
 Feder, Toni (writing in *Physics Today*), 226, 247–248
 Federal Bureau of Investigation (FBI), 40, 43, 99, 101–102, 112–113
 Federal State Unitarian Enterprise Scientific Research Institute (LUCH), 67–68, 133
 First Nation, 256
 Fisher, John Crocker, 330, 331, 333, 334
 fission. *See* nuclear fission
 flash boiling, 89, 221, **222**
 Flatow, Ira, 366
 Fleischmann, Martin, xxi, 10, **21**, 22, 77, 120, 160, 165, 203, 208–209, 252, 273, 327, 329, 389, 397
 death of, 375, 397
 Faraday efficiency, 58–59
 figurehead of "cold fusion" movement, 51, 397
 H₂O rather than D₂O, 45–46, 47
 heavy-element transmutations validity, 235
 journal articles
 in *Fusion Technology*, 58–59
 in *Journal of Electroanalytical Chemistry*, 45–46
 Miles and, 9, 158, 162, 389
 negative feedback received, 5, 6, 45, 96–97, 167, 187, 209, 216, 291, 312, 372, 399
 praise and defense of, 9, 55, 213, 217, 249, 264, 324, 327, 328, 332, 360
- Fleischmann-Pons experiments, 45–46, 158, 214, 259, 273, 388–389, 397. *See also* Fleischmann, Martin; Pons, Stanley
 article for *Nature* (journal), 45–46
 comments and attempts to confirm by others, 6, 8, 9, 10, 47–48, 55, 58, 61–62, 75–77, 80, 118, 131, 149–150, 155, 156, 172, 175, 206, 215, 217, 229, 264, 324, 332, 338, 350, 393
 ENECO acquiring patents from University of Utah, 72, 323
 helium-4 production, 9–10, 362
 impurities in D₂O, 158
 positive thermal feedback effect, 388–389
 praise and defense of, 328
 press conference about, xxi, 1, 5, 37, 81, 209, 234
 reasons claim of fusion considered wrong, 258, 291
 room-temperature fusion claimed, 4, 397
- Florin, Karen, 228
 Focardi, Sergio, 117, 192, 325, 375, 392–393
 Footlick, Jerrold, xxi
 Forsley, Larry, 83, 139–140, 322, 334
 Foster, Candace L., 228
 Foster, Ronald, 253
 Fox, Hal, 72, 118, 119–120, 144, 151, 375
Fox News (TV program), 385–386
 Fralick, Gustave Clarence, 52
 Frattolillo, Antonio, 362
 Frisch, Otto, 414
 Fry, Ed, 17
 fusion. *See* nuclear fusion
 Future Energy Applied Technology. *See* ENECO
- Gage, E. Dean, 17, 102–103
 Galileo Galilei, 105–106, 107, 128, 170
 gamma rays (gamma radiation, gamma emission), 34, 70, 415
 associated with neutron-capture process, 279
 Compton scattering, 292
 expected from D+D nuclear fusion, 258, 260, 291

- gamma conversion to infrared radiation (gamma shielding, gamma suppression), 204, 279, 280, 284, 291–304, **292**, 309, 390, 412. *See also* Widom-Larsen theory
- Piantelli gas experiment illustrating, **294**, 294–296, **295–296**, 390
- lack of in LENRs, 269, 278, 280, 286, 293–294, 297, 309, 390. *See also* low-energy nuclear reactions
- low-energy gamma rays, 291, 296, 415
- ganglioside, 116
- Garwin, Richard L., xx–xxi, 15, 96, 168, 186, 308–310, 312, 359, 370–371
- Gates, Bill, 398
- Gedridge, Robert W., 164
- General Atomics Inc., 220
- General Electric Co., 172, 330
- General Motors Corp., 18
- George, Darcy Russ, 254–256
- Gerischer, Heinz, 46
- Giaever, Ivar, 330
- Glashow, Sheldon, 414
- Glenn Research Center, 368
- "glow discharge" experiments, 66–67, 69–70, 73, 273
- Gluck, Peter, 174–177, **177**
- gold, transmutation from other elements, xxii–xxiii, 11–13, 19–20, 122, 133, 148, 149, 243
- Arata-Zhang, 190, 191
- Bockris-Champion, from mercury and lead, 25–26
- Bockris-Champion from mercury and lead, 27, 35–43, **39**, 99, 103, 104, 106, 110
- Cirillo and Iorio, from tungsten, 241–244
- Dash, 87, 89
- Nagaoka, 244
- gold cathodes, 129, 130, 147, 221, 274
- Good Morning America (TV show), 140
- Goodstein, David, 168–169, 371–372
- Gordon, Frank, 214, 215, 218, 219, 322–323
- Gotoh, Tomio, 245–247, **246**, **247**
- Gozzi, D., 416
- Grabowski, Kenneth, 337, 351, 353
- Greene, Daniel Lawson, 351–352
- greenhouse gas emissions, lack of, 1, 396
- Gregory, Steve, 72
- H₂O. *See* light water
- Habel, Roberto, 117, 192
- Hagelstein, Peter L., 1–5, **2**, 64, 67, 72–73, 110, 204, 207–208, 225, 242, 260, 315, 329, 334, 383
- "cold fusion" idea, 6–7, 10, 61, 154–155, 212, 224, 229–230, 232, 327, 331, 356, 360, 398
- at times abandoning fusion idea, 10, 11, 62–63, 64–66, 110, 154, 232
- Dash excess-heat demonstration, 84, 212
- DOE, working with, 1–2, 4–5, 223, 226, 229, 231, 232, 361, **361**
- IESI and, 249, 252–253
- isotopic shifts, 62–63
- light-water, excess heat, 50–51, 194
- Malloué and, 208, 209, 210, 227
- McKubre and, 3, 4, 57, 58, 209, 225, 227, 249, 398
- neutron hopping theory, 119, 312
- Widom-Larsen theory, 306, 312–313, 315–316, 320
- Hahn, Otto, 126, 138, 177, 414
- Haldane, John Burdon Sanderson, 401
- Hall, Michael, 18, 27, 99, 102, 103, 111
- Harrington, Bill, 204–206
- Harris, Sidney, 259, **259**
- Hart, Roger and Hart Scientific, 161
- Hawkins, Marvin, xxi
- heat. *See* excess heat
- heavy elements transmutations. *See* transmutations, with or to heavy elements
- heavy hydrogen. *See* deuterium
- heavy water (D₂O), 131–136, 185, 364
- deuterium and heavy water, 153, 180, 190
- excess heat and, 47–48, 57–58, 75–76, 82, 83, 89, 115, 153
- experiments comparing light water and heavy water, 93–94, 141, 266–268, **267–268**, 388
- palladium and heavy water, 48, 55, 116, 135, **135–136**, 141–142, 152,

- 195–196, 215, 326
- Heffner, Horace, 377
- Hekman, Randall, 222, 223, 224, 229, 231
- helium, xxiii, 190, 235–241, 364, 416
- helium-3, 61, 61, **367**, **368**, 413
- excess heat and, 183–184
 - structure of, 29–30, **30**, **31**
- helium-4, 8–9, 14, 61, 70, 388, 413
- belief that it was primary reaction product, 179, 213
 - experiments
 - Case, 180–182, 185
 - De Ninno (ENEA) helium-4 in light water, 362–364
 - McKubre (SRI) from deuterium, 179–180
 - McKubre (SRI) from light water, **361**, 361–362
 - Miles-Bush, 9–10
 - Urutskoev's exploding-wire experiment, 240–241
 - Walling and Simons finding helium-4, 8–9
 - Yamaguchi's experiments, 179
 - and Hagedorn's fusion concept, 155
 - helium-4 and claim of 24 MeV of heat relationship, 7, 153, 179, 314, 324–325, 331, 355–356, 359, 367
 - irrelevance of, 61, 365, **367–368**, 367–370
 - lack of evidence of, 329, 367, 369
 - McKubre's experiments, 183–185, 210, 356–358, 360, 361
 - Miles' experiments, 153, 155–162, 179
 - as primary products of LENRs, 324–325
- Larsen's drawing depicting nuclear processes that produce helium-4, **271**
- nucleosynthetic reaction network for transmutation of carbon-12 to helium-4, **283–284**, 284–285
- primary nuclear products of LENRs, 324–325
- production of as "proof" of "cold fusion, 314–315
- as a product of deuterium-deuterium fusion, 11
- structure of, **31**
 - Widom-Larsen theory explaining, 305, 364
- Henry, Gene, 229
- Herringshaw, John F., **21**
- high-energy particles, 126, 260, 286, 334, 411–412
- high-energy physics, xvii, 12, 13, 33, 98, 103, 109, 170, 334, 411
- High-Energy Science and Technology Assessment meeting, 306–308, 310
- high-temperature events, 220–222, **221**, **222**, 276, 411–412
- Hioki, Tatsumi, 346
- Hoffmann, Darleane, 186
- Hokkaido University, xix, 49, 125, 129, 198
- Honda, 73
- Horwitz, James, 229
- Houston Press* (newspaper), 42–43
- Houtermans, Fritz, 413
- Hoyle, Fred, 265–266, 414
- Hubler, Graham K., 72, 97, 213, 229, 232, 337, 341, 346
- Huggins, Robert, 72
- Huizenga, John Robert, 257–258, 260, 308, 349
- Hull, Larry (letter in *Chemical and Engineering News*), 242
- hydride-forming metals, 273, 416
- surfaces of, 274–275, 278, 280, 288, 297, 392
- HydroCatalysis Power Corp., 48
- hydrogen, 392–393. *See also* light water
- also called protium, 45
 - hydrogen-hydrogen fusion, 414
 - hydrogen-to-helium transmutation, xxiii, 190
 - as a source of new clean energy, 396
 - used by Piantelli gas experiment, 115–118, 294–296, 325, 389–390, **390**, **391**, 392–393
 - Widom-Larsen four-step process (beta-decay example), 282, **283**
- Ikegami, Hideo, 47
- Imam, Ashraf, 157, 158, 159, 162, 219
- Independent Review (newspaper), 41
- Indian Academy of Sciences, 289
- Indian Atomic Energy Commission, 55–

- 56, 384
- Indian National Institute for Advanced Studies, 318
- Indian National Science Academy, 373
- Indian Physics Association, 373, 374
- indium, 73, 287, 301
- inertial confinement fusion (ICF), 136, 137
- Infinite Energy* (magazine), 75, 109, 116, 131, 141, 145, 181, 183–184, 198, 208, 365
- infrared radiation. *See* gamma rays (gamma radiation, gamma emission)
- infrared video camera, 219, 220, 277, 395
- Innovative Energy Solutions, Inc. (IESI), 248–254
- Institut Minoru de Recherche Avancée (IMRA), 389
- International Advisory Committee (IAC), 166
- International Atomic Energy Commission, 22
- International Center for Technology Assessment, 395
- International Conference on Cold Fusion (ICCF), 77, 145, 166–167, 234, 325, 359
 changing name to International Conference on Condensed Matter Nuclear Science in 2007, 331
 "ICCF-1" and "ICCF-2." *See* Conference on Cold Fusion
- ICCF-3 (1992), 49, 53, 62–63, 141, 180–181
 first use of this name, 47
- ICCF-4 (1993), 52, 54, 56, 59–60, 72, 73, 75, 86–90, 99
- ICCF-5 (1995), 121, 138, **139**
- ICCF-6 (1996), 141–143, 150, 152, 154, 155
- ICCF-7 (1998), 154, 155, 166–167, 182, 193–194, 196
- ICCF-8 (2000), 183–184, 192–194, **193**, 199–200, 325, 336, 356–357
- ICCF-9 (2002), 191–192, 211–212, 270, 335, 336
- ICCF-10 (2003), 68, 78, 145, 191, 210, 212, 214, 219, 222, 223–224, 235, 336, 337, 340, 342
 Krivit interviewing attendees, 207–209, 256
- ICCF-11 (2004), 229–230, 234, 235, 238–239, 242–243, 269, 336–337
- ICCF-12 (2005), 247, 251, 255, 258, 337
- ICCF-13 (2007), 331
- ICCF-14 (2008), 320, 321–322, 323–324, 325–326, 331, 341, 342, 375
- ICCF-15 (2009), 259, 320–321, 337, 338, 339, 343–344, 353
- ICCF-16 (2011), 372–373, 374, 382, 384
- ICCF-18 (2013), 344–345
- International Conferences on Emerging Nuclear Energy Systems (ICENES), 15, 363, 383
- International Low-Energy Nuclear Reactions Conferences
 1st conference (1995), 118–123, 129
 2nd conference (1996), 124–126, 129, 131, 137–138, 141, 142, 144, 146–150
- International Thermonuclear Experimental Reactor (ITER), 84–85
- International Workshop on Anomalies in Hydrogen/Deuterium-Loaded Metals (2007), 317
- lorio, Vincenzo, 40, 241–244
- iridium, 190–191, 302, 303
- Irion, Clarence E., xxii, 235. *See also* Wendt and Irion's experiments
- iron, 73, 87, 92, 129–130, 132–133, **134**, 147, 149, 189, 197, 414
- isotopes, 30–32
 fissionable isotopes, 287
 isotopic fractionation, 32
 isotopic separation, 32
 radioactive isotopes, 120, 285–286, 339
 stable isotopes, 31, 39, 94, 98, 130, 286
 unstable isotopes, 39, 98, 121, 285, 286, 287, 412
- isotopic abundance, 31, 77, 86, 92, 122, 125, 126, 135, 187, 188
- isotopic shifts, xviii, xxi, 5, 11, 32, 85–86, 87, 130, 150, 195, 232, 336, 393, 399, 412
 Kidwell critique, 341
 omitted from second DOE review of research, 229–230
 reported detection of

- Arata and Zhang, 342
 Dash, 91
 Iwamura (Mitsubishi), 195–198, 339
 Johnson Matthey (from Fleischmann-Pons cathodes), 62
 Mizuno, 132–136, **132–137**, 141
 NRL and LLNL, 11, 62, 92
 Passell, 189–191, 371
 Rolison, 91–92, 97
 Sakano, 199
 Sauvatimoua, Karabut, and Kucherou, 73, 87, 133
 Urutskoev, 237
 Valat, 85–86
 Violante (ENEA), 335, **336**
 Widom-Larsen theory, 273, 281, 304, 336, 412
- Italian National Agency for New Technologies, Energy and the Environment (ENEA), 180, 231, 319, 362
 Italian National Institute of Nuclear Physics (INFN), 339–340
 Italian Naval Academy, 258
 Italian Physics Society, 116
 Itoh, Takehiko, 195
 Iwamura, Yasuhiro, 195–198, **197**, 354
 articles
 in *Fusion Technology*, 196–197, 340
 in *Japanese Journal of Applied Physics*, 353
 attacks on his research, 339–346, 347–354
 confirmations of work of, 198–199, 212–213, 339–340, 351–352
 deuterium gas-permeation experiments, **201**, 321, 339–340
 electrolysis diffusion method, 195–197, **196**, 200
 electron-induced nuclear reaction model, 197–198
 importance of neutrons, 242, 260, 272–273, 340
 patents, 344, 347–354
 transmutation results, 200, **201**, **202**, 213, 225, 235, 259, 270, 273, 339, 344, 355
- Iwate University, 352
- Iyengar, Padmanabha Krishnagopala, 15, 55–56, 373, 375, 384
- Jaeger, Fred, 166
 Japan CF Research Society, 198
 JASON evaluation, 186
 Johnson, Jacqueline, 226
 Johnson Matthey, 62, 157
 John Wiley & Sons, 144, 337, 355, 366
 Joliot-Curie, Frédéric and Irène, 413
 Jones, Steven, xxi
 Josephson, Brian, 255, 330, 376
 promoting "cold fusion" scam, 255
 Joule heating, 216, 218, 220
- Kailas, S., 374
 Karabut, Alexander B., **67**, 67, 68, 70, 71, 73, 75, 86–87
 article in *Physics Letters*, 70
 Keith, Jack W., 348, 349, 350–351
 Kemp, W. Michael, 35, 103, 104, 111, 123
 Kennedy, Robert A., 103, 111
 Keruran, Corentin Louis, 120, 414
 Kidwell, David Allan, 321, 342–343, 344, 348
 claiming contamination at Mitsubishi, 343–344, 351, 353
 efforts to discredit research of others, 339, 341–342, 344–345, 346
- Kim, Yeong, 307, 310, 346
 King, Robert, 380
 Kirsch, John, 119
 Knies, David, 345
 Kobe University, 352
 Koldamasov, Alexander Ivanovitch, 251, **251**, 254
 Koonin, Steven, 96, 372
 Kouar, Dennis, 229, 230–231
 Kozima, Hideo, 330
 Krivit, Steven B., 81, 144, 175–177, **177**
 corrections to Storms' *Naturwissenschaften* article, 369–370
 in India, 268–269, 318, 374
 interviews, 207–209, 234–235, 256, 309, 378, 379, 397
 on irrelevance of 24 MeV ratio between excess heat and helium-4, 367–370
 on lack of evidence for D+D "cold

- fusion" idea 355–361
 Marwan and, 365–367
 Mosier-Boss and, 82, 83, 91, 216,
 320–321, 355–357, 364, 378
New Energy Times Web site, 72, 162,
 219, 254, 261, 315, 324, 353, 356,
 358, 366, 368, 378
 publications
 "Cold Fusion is Neither," 370–
 371
 Encyclopedia of
 Electrochemical Power
 Sources (Elsevier), 311
*Fusion Fiasco: Explorations in
 Nuclear Research*, Vol. 2
 (1989–1990), xx–xxi, 5–6, 11,
 62, 222, 397, 398
 Journal of Environmental
 Monitoring, 230
 Lost History: Explorations in
 Nuclear Research, Vol. 3,
 xxii–xxiv, 12, 301, 397
The Rebirth of Cold Fusion
 (Kruit and Winocur), 79,
 233, 261
 white paper on "cold fusion"
 (co-authored with Winocur),
 223, 226, 233
 third LENR symposium at ACS, 333
 Widom-Larsen theory, 257–261, 289–
 290, 306, 311–316, 324
 K-shell electron capture, 265, 272, 273
 Kucherou, Yan, 66–68, 67, 71, 72–73, 75,
 86–87, 375
 Kurchatou Institute, xxii, 99, 236–237,
 239
 Lagowski, Joseph J., 189
 Laing, Jonathan, 264
 Landsberger, Sheldon, 143–144
 Langley Research Center, 368
 Larsen, Lewis, xix, 39–40, 64, 89, 97–98,
 153, 194, 217, 224–225, 246, 257–264,
 307, 332, 359–360, 362–364, 373, 398
 drawing of nuclear processes that
 produce helium-4, 271
 on fuel needed to produce neutrons,
 387–388
 on irrelevance of 24 MeV ratio, 365,
 396, 399
 low-energy nuclear reactions, 287,
 393–395. *See also* low-energy
 nuclear reactions
 LENRs bridging nuclear and
 chemical realms, 299
 Miley and, 264, 265–270
 on Nagaoka experiment, 244
 patents issued to, 292, 293, 298, 309
 plasmonics, 336
 Sternglass and, 299, 304
 on thermal output of first nuclear
 fission reactor, 391–392
 Widom-Larsen theory, 257–261, 279–
 280, 288–289. *See also* Widom,
 Allan; Widom-Larsen theory
 laser-triggering experiments, 204, 206,
 272, 273, 274
 Lattice Energy LLC, 224, 257, 270, 272,
 290, 394
 Lawrence Livermore National Laboratory
 (LLNL), 4, 11, 13, 13–14, 24, 62, 92, 224,
 270
 lead, 132, 147, 196, 280, 415. *See also*
 transmutations, with or to heavy
 elements
 Lee, Corissa, 78, 78–79
 Lehn, Henri, 240
 Lenntech, 364
 Leonard, Carlo, 378
 Letts, Dennis, 19, 128, 202–206, 203, 272,
 274, 336
 Levanov, Aleksey, 239
 Lewan, Mats, 381, 382, 385
 writing for *Ny Teknik*, 377
 Lewis, Durwood, 100
 Lewis, Nathan, 92, 186, 215, 312, 372
 Lewis Research Center, 51
 Li, Xing Zhong, 255, 329–330
 light water (H₂O, normal water), 45–52
 BARC research on, 52, 53–55, 59–60,
 60
 De Ninno group discovering helium-
 4, 362–364
 heavy-water researchers attacking
 light-water claims, 47–48, 50–51,
 53–54, 55–56, 58–59, 130–131
 lower cost of light-water
 experiments, 117
 transmutation products in light
 water, 136–138

- use of by, 48, 52, 266
 - Bose Corp., 57–58
 - Bush, 53–54
 - Cirillo-lorio, 241–242
 - Dash, 77, 82, 89
 - Miley, 48–49, 141–143, **143**, 144–150
 - Mizuno-Ohmori, 193–194, 245–247
 - Noninski, 52
 - Notoya, 49–51
 - Srinivasan, 56–58
- Lin, Guang H., 35, 36, 118, 124–125
- Linton, Hedda (aka Rosenberg, Hanna), 22
- Lipson, Andrei, 375
- lithium, 73, 158, 272, 287, 400, 413
 - isotopic shifts, 14, 62–63, 73
 - lithium to helium-4, 285, 364
- lithium deuterioxide, 48
- Lochak, Georges, 238
- Los Alamos National Laboratory (LANL), 16, 18, 46, 125, 171, 322
- Los Angeles Times* (newspaper), 8, 96
- low-energy nuclear reactions (LENRs), xvii, 11, 53, 63–64, 245–247, 411–412
 - Bockris/Lin meetings on. *See* International Low-Energy Nuclear Reactions Conferences
 - delays in development of LENR research, 398–400
 - distinctions between LENRs and "cold fusion," xix–xx, 261, 310, 329, 359–360
 - DOE 2004 review of, xix, 1–2, 4–5, 222, 223–224, 226, 227, 229–232, 233, 248, 356, 359, 361
 - energy calculation examples, **285**
 - first known public use of term, 124
 - gamma radiation and. *See* gamma rays (gamma radiation, gamma emission)
 - LENRs bridging nuclear and chemical realms, **299**
 - LENRs primarily a surface rather than bulk effect, 298
 - magnetically dominated LENR reactions, 289, 411, 412
 - nanotechnology as a key element in developing working LENRs, 395
 - neutron-based reactions as way to explain, 259–260. *See also* Widom-Larsen theory
 - neutrons and neutron emissions in Cirillo's experiments, 244, 318–319
 - claims of no neutron emissions, 286, 317, 319
 - SPAWAR experiments, 320
 - Sternglass experiments, 301–304
 - weak interaction as source of low-energy neutrons, 217–218
 - opinions of scientists
 - acceptance of, 310, 334
 - critics of concept of, 225, 349–350
 - efforts to discredit production of neutrons, 318, 319–320
 - process toward acceptance, 401
 - as a source of new clean energy, 396
 - stable isotopes produced in, 189, 285–287
 - theories
 - attempts to explain as D+D "cold fusion," 340, 346
 - Widom-Larsen theory, 257–261
- Lusk, Liska, 40
- "M4." *See* McKubre, Michael Charles
- Machiels, Albert, 358
- Maddox, John (editor of *Nature*), 96
- magnesium, 147, 206
- magnetically dominated LENR reactions, 289, 411, 412
- Maguire, Stephen J., 58
- Mainstream Cold Fusion Hypothesis" (MCFH), 210
- Mallett, Ron, 35
- Malloué, Eugene, **8**, 145, 151, 167–168, 170, 183–184, 187, 192, 194, 208, 213
 - as editor
 - for *Cold Fusion* (journal), 116
 - for *Infinite Energy*, 75, 109, 141, 183
 - efforts to discredit him, 209, 210
 - murder of, 227–229
 - publications of

- Cold Fusion: Fire from Water
 (video), 187, 371–372
 Fire from Ice (book), 145
 reviewing Krivit/Winocur white
 paper, 226–227
 many-body collective effect. *See*
 collective effects, many-body quantum
- Markolia, Almaskhan, **239**
 Marshall Space Flight Center (NASA),
 380
- Marwan, Jan, 81, 333, 365–367
 Massachusetts Institute of Technology
 (MIT), 3, 4, 6, 11, 66, 119, 187, 215, 225
- McDaniel, Patrick, 334
 McDonald, Bob (journalist), 223
 McDonald, Robert C. (chemist), 58
 MCFH. *See* Mainstream Cold Fusion
 Hypothesis
- McKubre, Michael Charles, 1–5, **2**, 55–56,
 57, 58, 59, 78–79, 141, 171, 183–185,
 191–192, 194, 223, 229, 232, 334, 360,
 398
 and 2004 DOE review of LENRs, 229,
 230, 232, 248
 Case's deuterium-gas experiment,
 182, 183, 185, 229, **361**, 361–362
 errors and discrepancies found
 in data embedded in slides,
 362
 closing comments for ICCF-7, 166–167
 Hagelstein and, 3, 4, 57, 58, 209,
 225, 227, 249, 398
 on helium permeation in metals
 analysis, 416
 on IESI claims, 248, 249, 252
 in India, 268–269, 318, 374
 Krivit interview of, 207
 Letts and, 204
 "M4" heat and helium experiment,
 356–358, 360, 361
 manufacturing evidence of fusion,
 355–360, 361–362, 365
 Melich and, 327–328
 Nowak supporting research of, 166
 Passell's isotopic analysis, 187–189
 patterns in Mizuno and Miley's
 experiments, 269
 personal definition of fusion, 333
 on production of helium and excess
 heat, 183, 185
 promoting "cold fusion" idea, 325,
 331, 332, 338, 355–361, 371
 resigning from SRI, 390
 Rossi and, 376, 377, 383
 on transmutations, 268–269
 Widom-Larsen theory, 306
 efforts to cast doubts on
 research that supported,
 317–318, 319
- Meitner, Lise, 138, 177, 414
- Melich, Michael, **2**, 2, 163, 213–214, 307,
 310, 320–324, 326–328, 337, 338, 374–
 375
 and 2004 DOE review of LENRs, 229
 attack on Iwamura (Mitsubishi)
 experiments, 339, 340–341, 342
 Krivit's criticism of, 325
 promoting idea of fusion and
 discrediting neutron-based idea,
 344
 Rossi and, 376, 377, 381–382
 sketch of, **316**
 as technical advisor to ENECO, 323
- Melich, Mitchell, 326–327
- Melosh, Nicholas A., 273–274
- Mengoli, Giuliano, 389, 390
- Meulenberg, Andrew, 315
- Micro-Tel, Inc., 144, 145–146
- Miles, Mary, 82–83
- Miles, Melvin, **9**, **9**, 82, 150, 153, 219, 332,
 364, 389
 belief in "cold fusion" idea, 332
 Pirelli Research Group and, 164, 165
 presenting a paper at ICCF-14, 324
 "Tri-Navy Program" and, 155–162,
 163–165
- Miley, George, 122–123, 124, 126, 131,
 136–138, **137**, 141–143, 146–149, 151,
 152, 171, 194, 210, 224, 388
 depth-profiling analyses of
 transmutation samples, 273
 DOE grant for LENR research, 167–
 168, 169
 editor for
Fusion Technology, 122–123,
 136–137
Laser and Particle Beams and
Journal of Plasma Physics,
 136
- Larsen and, 264, 265–270, 272, 305

- organizer of a transmutation session at ICCF-14, 321–322
- patents issued to, 348
- patterns in Mizuno's and Miley's experiments and Widom-Larsen theory, 266–269, **267–268**
- Patterson and, 138–139, 140, 141
- questions on research work of, 212
- Rossi and, 383
- Rothwell and, 147–150
- transmutation product yields, 143
- work with nickel and light water, 146–149
- Millikan, Robert Andrews, 413
- Mills, Randall "Randy," 48–49, 52
- Minevski, Zoran, 35, 148, 416
- Minhas, Harpal, 230
- Mintek, 35
- miracles to describe "cold fusion" idea, 257–258, 259
- Mitsubishi Heavy Industries Ltd., xix, 321, 339–346, 393, 398
- attempts to file for U.S. patents, 344, 347–354
- cooperative research agreement with NRL, 351
- Iwamura research for, 195–202, **196**, 212, 213. *See also* Iwamura, Yasuhiro
- Mizhiritsky, Valery, **239**
- Mizuno, Tadahiko, 125, 126, 132–136, **133**, **134–136**, **137**, 141, 142–143, 148, 150, 151, 175, 178, 193–194, 219, 260, 272–273, 388
- craters as evidence of rapid heating and cooling, 219, 221
- difficulties encountered at ICCF-14, 324
- early work on deuterium absorption into titanium, 131–132
- high heat output in an electrolysis experiment, 392, 393
- high-voltage electrolytic experimental method with tungsten cathode, 241, 245–247, **247**
- palladium/deuterium electrolysis experiment, **132**, 132–136, **133**, **134–136**, 141, 266
- patterns in Mizuno's and Miley's experiments and Widom-Larsen theory, 266–269, **267–268**
- transmutations reported at the ICCF-8 presentation, **193**
- molybdenum, 73, **201**, 340
- Mondt, Johannes P., 352–354
- Monti, Roberto, 37, 120
- Morrison, Douglas, 7, **8**, **50**
- Morrison, Philip, 300–301
- Moscow Institute of Physics and Technology, 239
- Moscow State University, 251
- Mosier-Boss, Pamela, 157–158, 162, 214–219, **216**, 322, 334
- Krivit and, 82, 83, 91, 216, 320–321, 355–357, 364, 378
- muon-catalyzed fusion, 346
- Murray, Rich, 350
- Myers, Ira Thomas, 52
- Nagaoka, Hantaro, 244
- Nagel, David, 97, 156, 162, 163, 222, 223, 229, 260, 261, 307, 310, 312, 320, 321, 323, 325, 374
- opposition to Widom-Larsen theory, 374–375
- Rossi and, 376, 383
- support of Widom-Larsen theory, 257–258
- Nagorka, Jennifer, 17, 18
- Nanos, George Peter, 322–323
- nanotechnology as a key in developing working LENRs, 395
- NASA, 22, 52, 368, 380, 394
- National Institute for Fusion Science, 47
- National Institute of Nuclear Physics, 340
- National Organization for New Energy, 242
- National Public Radio, 366
- National Radioprotection and Nuclear Safety Institute, 84
- National Science Foundation, 23, 91, 262
- National Science Foundation and Electric Power Research Institute Workshop on Anomalous Effects in Deuterided Metals (1989), 91
- Natowitz, Joseph, 17, 105, 119
- natural nuclear disintegration. *See* disintegration, atomic

- Nature* (journal), 12, 278
- Naturwissenschaften (journal), 12
- Naval Air Weapons Station (China Lake), 156–162, 163–164, 165, 179, 219
- Naval Ocean Systems Center, 156, 215.
See also SPAWAR
- Naval Ordnance Laboratory, 300, 303
- Naval Postgraduate School (NPS), 326, 327
- Naval Research Laboratory (NRL), 11, 24, 62, 72, 91, 92, 97, 98, 150, 155–162, 163, 182, 213, 219, 321, 323, 337, 343
- cooperative research agreement with Mitsubishi, 351
 - effort to discredit Mitsubishi experiments, 341
 - on LENRs on surfaces of metal cathodes, 273
- Naval Surface Warfare Center, 334
- "Navy Program to Understand Anomalous Effects in Electrochemically Loaded Materials." *See* "Tri-Navy Program"
- Neighbor, Leona, 326
- Nelson, Michael, 380
- neutrino, 198, 266, 282, **285**, 414
- antineutrino, 281, 283
- neutron activation analysis (NAA), 94, 147, 184, 189
- neutron capture, 54, 63, 97–98, 213, 244, 283–288, **285**, 299, 305, 318, 333–334, 364, 396, 411, 412, 413, 414
- gamma ray emission and, 279, 280, 291, 292–293, 296
 - ultra-low-momentum neutrons (ULMNs), 279, 281, 282–283, 284, 286, 292, 293, 396, 398
- neutron creation (not specifically neutronization), 242, 243, 259, 414
- neutronization, 265–266, 272–276, 301, 414. *See also* nucleosynthesis
- Widom-Larsen theory, 275–277, 282–284
- neutrons, 29, **30**, **31**, 260, 367, 413
- fluxes of neutrons, 131, 181, 232, 237, 279, 282, 286, 293, 304, 318–320, **320**, 393
 - efforts to discredit finding of, 319–320, **320**
 - Widom-Larsen theory
 - explaining, 304
 - found by Iwamura, 195
 - Rutherford proposing existence of, 265
 - spallation neutrons, 269
 - ultra-low-momentum neutron (ULMN), 64, 269, 271, 396. *See also* Widom-Larsen theory
 - and LENRs, 286–287, 288, 292–293, 299, 312
 - quantum mechanical wavelengths of, 281
 - surface plasmon electron role, 282
 - Widom-Larsen mechanism, 64, 257, 279, 280–282, 297, 299, 412
 - use of boron for detection, 318–320
 - virtual neutrons, 63–64
- New Energy Development Organization, 165
- New Energy Technology Symposium for low-energy nuclear reaction research, 81
- New Energy Times* Web site. *See* Krivit, Steven B.
- New Hydrogen Energy LENR research, 170
- Newton, H. Joe, 128
- New Yorker* (magazine), Sidney Harris cartoon in, 259, **259**
- nickel, 49, 52, 54, 59–60, 149, 189, 230, 285, 390
- in Dash's experiments, 87
 - isotopic changes to nickel-60 and nickel-61, 73
 - light-water experiments with, 48, 52, 56–58, 141–150, **143**, 211, 266
 - neutron capture on nickel isotopes, 296
 - nickel-64 and neutron-capture, 287
 - in Patterson's experiments, 138–139, **139**
 - in Piantelli gas experiment, 115–118, 294–296, 325, 389–390, **390**, **391**, 392–393
 - in SPAWAR experiments, 93, 94, 219–220
 - thin-film electrolysis, 139, 142, **146**, 146–149, 152, 335, 336

- Niedra, Janis M., 52
 Nippon Telegraph & Telephone Corp., 180
 Nissan, Robin, 164
 nitrogen, 29, 180–181, **284**, 363, 392–393
 nitrogen-15, **285**
 noble gases, xxii, 132, 364
 noble metals, 24–25
 Noninski, Vesselin C., 52
 Northeastern University, 257, 279
 Nosenzo, Luigi, 391
 Notoya, Reiko, 49–51, **50**, 52, 54, 57
 Noua Research Inc., 72
Novedades (newspaper), 41
 Nowak, Robert J., 37, 156, 158, 159, 161,
 163, 165–166, 180, 377
 nuclear binding energy, 188, 189, 191,
 288, 387–388, 413
 nuclear chain reaction, 411, 413
 not resulting from LENRs, 287–288,
 396
 nuclear fission, xvii, 66–67, 126, 171, 177,
 193, 215, 244, 282, 287, 402, 411, 414
 "fusion-fission" reaction, 73, 334
 nuclear fission reactors, 39, 285–286,
 339, 391, 412
 nuclear fusion, xvii, 333
 of deuterons, 413
 fusion-fission reaction, 73, 334
 thermonuclear fusion. *See*
 thermonuclear fusion
 nuclear processes. *See* alpha decay, beta
 decay, nuclear fission; nuclear fusion;
 weak force and weak interactions
 nuclear radiation. *See* radioactivity
 (radiation, radioactive emissions)
 nuclear transformation. *See*
 transmutations
 nucleosynthesis, **39**, 414
 nucleosynthetic pathways, 39, **39**,
 39–40, **284**
 nucleosynthetic reaction networks,
 97–98, **98**
 Larsen's work on, 271–290
 nucleus, 29–31, **30**, **31**, **32**, 33, 41, 51, 54,
 283, 283, 286, 292. *See also* neutron
 capture; neutrons; protons
 nuclides, 98, 188, 286–287
Nullius in Verba (motto of the Royal
 Society of Great Britain), **xvi**, xvii
- Oak Ridge National Laboratory (ONRL),
 16, 182, 213
 Office of Naval Research (ONR), 37, 156,
 157, 159, 161, 163, 165–166, 217
 O'Grady, William E., 24
 Ohmori, Tadayoshi, 125, 129–130, 131,
 142, 150, **193**, 193–194, 219, 221
 Oliphant, Mark, 413
 Oppenheimer, J. Robert, 277–278
 Oriani, Richard, 172–174, **173**, 177
 Osaka University, 190, 212, 313, 339, 351,
 393
 Ostapenko, Gennady, **239**
 Oxford University, xxi
 oxygen, 29, 36, 45, 82, 190, 246, 247. *See*
 also heavy water (D₂O); light water
- Packard, Ronald C., 46
 Packham, Nigel, 16, 17–18, 100, 128
 palladium, 55, 62, 189, 286–287, 342
 deuterium-palladium ratio, 197
 palladium-boron cathodes, 158, 160
 palladium cathodes, 59, 70, 76, 85–
 86, 88, 89, 120, 129, 130, 135–136,
 156, 157, 158, 161, 195–198, **196**,
 197, 200, 362, 362–364, 363, 393
 palladium-deuterium experiments,
 48, 55, 211, 213, 271–272, 317, **318**,
 373, 389
 of Arata and Zhang, 189–191
 of Letts, 203–204
 of McKubre, 187–189, 390, 399
 of Mizuno, 132–136, **133**, **134**–
 136, 141, 266
 of Passell, 187–189
 of Sakano, 198–200
 palladium foil cathodes, 76–77, 80,
 92
 palladium isotopic shifts, 86, **86**, 189,
 190–191
 palladium-on-carbon catalyst, 181
 unusual structures (crater or
 volcano-like) found, **87**, **88**, 221
 Paneth, Friedrich Adolf (Fritz), xxiii, 190
 Park, Robert L., 49, 96, 168, 179, 308,
 310–311, 333, 371, 375
 accepting LENRs, 308, 310, 333
 rejecting "cold fusion" in book
 Voodoo Science: The Road from
 Foolishness to Fraud, 96

- Parker, Ronald R., 4, 187
- Parratt, Lyman, 301
- Parsons, Roger, 21, 22
- particle accelerator, 12, 411, 412, 413
- particles. *See* alpha (particle, emission); beta (particle, emission); electrons; gamma rays (gamma radiation, gamma emission); neutrons; protons
- Passell, Thomas O., 8, 120–121, 185–189, 186, 191–192, 225, 255, 285n341, 358
reports of isotopic changes, 187, 188, 189–191, 342, 371
- Patterson, James A., 138–142, 140, 146, 147, 149, 152, 375
- Pedersen, Shelsea, 78
- peer review, problems with, 169
- Peters, Kurt Gustav Karl, xxiii, 190
- "The Philadelphia Project," 35–43, 99, 100, 103, 112–113
- Phillips Petroleum, 185
- PHLburg Technologies Inc., 323
- photoelectric effect, 300
- photons, 34, 288, 292, 293. *See also* gamma rays (gamma radiation, gamma emission)
- "physical transport mechanism," 94
- Piantelli, Francesco, 116–118, 192–193, 294, 294–296, 325–326, 389–391, 390, 391, 392–393
article in *Il Nuovo Cimento* (journal), 116
- piezoelectric transducer, 220
- Pilloni, Alessandro, 319
- Pirelli Corporation (Pirelli Research Group), 164, 165
- Planck, Max Karl Ernst Ludwig, 401
- plasmonics, 273–274, 387. *See also* surface plasmon electrons
- platinum, xxii–xxiii, 37, 38, 39, 59, 115
nucleosynthetic pathways, 39
platinum anodes, 93, 195–196, 196, 204
platinum cathodes, 87, 89
- platoritons. *See* surface plasmon electrons
- Polosa, Antonio D., 319
- Pons, Stanley, xx, xxi, 4, 5, 6, 37, 46, 55, 58–59, 62, 72, 120, 160, 165, 175, 189, 192, 234–235, 264, 327, 329, 332, 389.
See also Fleischmann–Pons experiment
- articles
in *Fusion Technology*, 58–59
in *Journal of Electroanalytical Chemistry*, 45–46
negative feedback received, 5, 45, 96–97, 187, 216, 291, 312, 372
praise and defense of, 9, 213, 217, 264, 324, 327, 328, 332, 360
- Portland State University, 75, 83, 85, 89, 99, 130
- Poston, John, 17
- potassium, 54, 87
- potassium carbonate, 48, 49, 52, 54, 193, 242, 245
- Potter, Edward C., 21
- power. *See* energy production; excess heat
- praseodymium, Kidwell's claim of Mitsubishi contamination of, 343–344, 351, 353
- Preparata, Giuliano, 10, 279
- Preston, John, 380
- Project NUMONKI, 213
- prompt gamma activation analysis (PGAA), 188
- protium. *See* hydrogen
- protons, 29, 30, 31, 367
capturing electrons, 272, 273
combining with electron to form a neutral particle, 265
creating patches of protons or deuterons surfaces, 274–276
free protons reacting with electrons, 273
physics forces affecting, 33
Sternglass work on forming neutrons from, 301–304
surface plasmon electrons reacting with, 282
- Purdue University, 307, 346
- quantum electrodynamics, 279, 299
- quantum mechanics, 34, 277–278, 281, 293, 330, 392, 396
particles quantum-mechanically entangled, 274–275, 411
- quantum theory, 49, 302
- radioactivity (radiation, radioactive emissions), 34, 189

- in Bockris-Champion transmutation experiments, 37–38
- radioactive decay. *See* beta decay; disintegration, atomic
- types of, 415. *See also* alpha (particle, emission); beta (particle, emission); gamma rays (gamma radiation, gamma emission)
- radio-frequency triggering, 204
- radionuclide, 287
- Radio One* (radio program), 223
- Ramamurthy, Halasyam, 60
- Raman spectroscopy, 216
- Ramsay, William, 416
- Raunitzky, Michael, 160
- recombination effects, 50, 56–57, 58–59, 60
- Rees, David, 261, 313, 314
- rhodium found in Rolison's experiment, 92–95, 98
- Riley, Andy, 3
- Riordon, James, 366
- Rolison, Debra R., 24, 91–95, 97–98, 150, 152, 156, 159, 161, 163, 338, 343
 - article in *Analytical Chemistry*, 97
- room-temperature "cold fusion," 4, 5, 54, 144, 151, 186, 229, 259, 303, 305, 330, 331, 355, 365, 398
 - "three miracles" required, 257–258, 260
- Rosenberg, Hanna, 21, 22
- Rossi, Andrea, 174, 177, 328, 376, 377–386
- Rothwell, Jed, 144–150, 152, 174, 183, 184–185, 192, 243, 260
 - article in *Infinite Energy* on Sakano presentation, 198–200
 - contributor to *Cold Fusion* (journal), 145
- Roulette, Thierry and Jeanne, 389
- Royal College of Science Electrochemistry Group, 21, 22
- Royal Dutch Shell plc, 394
- Royal Institute of Technology, 378
- Royal Society of Chemistry, 230
- Royal Society of Great Britain, xvi, xvii
- rubidium, 54, 73
- rubidium carbonate, 54
- Rudder, Ron, 352
- Ruocco, Giancarlo, 319
- Russian National Research Institute of Atomic Engineering, 251
- Russian Presidential Academy of National Economy and Public Administration, 239
- Russian Space Agency, 251
- Rutherford, Ernest, xxiii, 138, 236, 265, 413
- Saalfeld, Fred, 156, 157, 159, 161, 162
- Saida (last name unknown), 239
- Sakano, Mitsuru, 198–200
- Salam, Abdus, 414
- "Sam" (anonymous donor), 233–234, 321, 326, 384–385
- Sampson, Mark, 366
- Sánchez, Erik, 85
- Sanderson, Katharine (writing for *Nature*), 366
- Sandia National Laboratories, 212, 214, 224, 270
- Sankaranarayanan, Thevarmadhom Krishna, 54–55
- Savannah River National Laboratory, 349
- Savvatimova, Irina Borisouna, 24, 67, 67–69, 69, 71–73, 75, 86–87, 324
- scams in "cold fusion" research
 - George, Darcy Russ, 254–256
 - Josephson, Brian, supporter of, 255
 - IESI, 248–254
 - Rossi, 376, 377–386
- scanning electron microscope (SEM), 85, 88, 90, 90, 221
- Scaramuzzi, Francesco, 10, 180–181
- Schaffer, Chad, 228
- Schimmoller, Brian, 358
- Schopenhauer, Arthur, 400
- Schulz, Trish, 19, 21
- Schwartz, Phillip R., 182
- Schweikert, Emile, 118, 124, 125
- Science Friday* (radio program), 366
- scientific method and repeatability, 15, 351, 352
- Seaborg, Glenn, 185
- secondary ion mass spectroscopy (SIMS), 90, 90, 133, 147, 149
- Securities and Exchange Commission (SEC), 40, 43, 99, 102
- Sensitive Application Warning System

- (SAWS), 347–349
 Seymour, Kevin, 165
 Shanahan, Kirk, 349–350, 352–353
 Shell Global Solutions International, 394
 Shkedi, Zvi, 58, 59
 Shpakouskii, Timofey, **239**
 silicon, 93, 94, 133, 147, 149, 399
 silver, transmutations to, 73, 76, 78, **87**,
 87, 89, 90, **90**, 92–98, **98**, 133, 143, 147,
 149, 157, 272, 301, 302, 335, 414
 Simnad, Massoud, 220
 Simons, John, 8–9
 Sinha, Krityunjai Prasad, 315
 Sivakumar, Balasubramanian, 374
 60 Minutes (TV show), 345–346, 359,
 383, 397
 Skalbania, Nelson, 256
 Smith, Jerry, 214, 217
 Smithson, Shelly, 119
 Sobel, Annette, 346
 Sokhumi Institute of Physics and
 Technology, **239**, 240
 Solid State Fusion, Inc., 145
 "solid state nuclear physics," 65
 solid-state nuclear track detector. *See*
 CR-39 (solid-state nuclear track)
 detector
 Soriaga, Manuel, 17, 18
 SPAWAR (Space & Naval Warfare
 Systems Center), 82, 83, 91, 97, 214,
 261, 297, 313, 317, 320, 322, 334, 395
 Admiral Brady terminating LENR
 research in response to *Fox News*
 story, 386
 Stephen Russell following Brady's
 orders, 386
 co-deposition method of, 152, 156,
 158, 215–222, **220**, **221**
 Spindletop Corp., 4, 227
 sputtering technique, 147
 SRI International laboratory, 2, 3, 55–58,
 78–79, 166, 178, 179, 183, 185, 186, 204,
 206, 226, 325, 338, 346, 355, 356, 364
 McKubre resigning from, 390
 Srinivasan, Mahadeva, 7, **8**, 53, 54, 55–
 60, 268, 337, 373–374, 375, 376, 384
 article in *Cold Fusion*, 59
 Sriuastava, Yogendra N., 289–290, 373
 Staker, Michael, 214
 Star Scientific Ltd., 346
 State Atomic Energy Corporation, 240
 Stenger, Victor J. as author of "ESP and
 Cold Fusion: Parallels in
 Pseudoscience," 151
 Stephenson, Lane, 111
 Sternglass, Ernest, 299–304, 414
 author of *Before the Big Bang—The
 Origin of the Universe and the
 Nature of Matter*, 299
 Steshenko, Georgy, **239**
 Storms, Edmund, 16, 72, 124–125, 145,
 171–172, 194, 207, 212, 223, 227, 242–
 243, 272, 305, 324–325, 369
 article published in
Naturwissenschaften that Krivit
 commented on, 369–370
 article rejected by *Nature* (journal),
 332
 as a "cold fusion" promoter, 383
 efforts to discredit Mallove, 209, 210
 Rossi and, 383–384
 Widom-Larsen theory and, 306, 311–
 312, 314, 315, 317, 332
 Story, Paul. *See* Burns, Paul (aka Paul
 Story)
 Strackbein, Hillary B., 228
 Strassmann, Fritz, 414
 Stringham, Roger, 254–255
 strong force, 33, 411. *See also*
 electromagnetic force
 in Widom-Larsen four-step process,
 282–283, **283**
 strontium, 54
 isotopic changes to strontium-87 and
 strontium-88, 73
 strontium-90, 285, 287
 transmutation of, **201**, 340
 subatomic particles. *See* electrons;
 muon-catalyzed fusion; neutrino;
 neutrons; protons; tritons
 sulfur, 87
 sulfuric acid, 82, 83, 89
 Surface Enhanced Raman Scattering
 (SERS), 22
 surface plasmon electrons, 244, 273, 274,
 276–277, 279, 288, 336–337
 heavy mass surface plasmon
 electrons, 282, 294, 314, 387
 Sutton, Rich, 307
 Suensson, Peter, 385

- Swartz, Mitchell, 307, 310
 Szilárd, Leó, 413
 Szpak, Stan, 156, 157, 214–215, 217–219
- Takahashi, Akito, 258–259, 313, 315,
 329–330, 340, 398
 Talcott, Carol, 171
 Tanzella, Francis, 3, 56, 317–318, **318**,
 356, 357, 364
 Taubes, Gary, 15–16, 349
 article in *Science*, 16, 17–18, 100, 111
 Taylor, Harold John, 413
 Teflon, 132
 Telander, William Leon, 26, 27, 35, 40–
 43, 99, 100, 101, 102, 103, 104, 111, 112–
 113
 Teller, Edward, xxi, 4, 92, 259–260
 Tether, Tony, 378
 Texas A&M University (TAMU), 14–16,
 345
 Bockris-Champion transmutation
 experiments, 25–27, 35–43, 45
 Bockris filing a grievance, 123–
 124
 university response to, 17–18,
 22–23, 104, 109, 111, 113–114,
 115, 118, 129
 thallium, anomalous production of, xxii–
 xxiii
 Thatje, Sven (editor of
Naturwissenschaften), 369
 "thermal experiments" of Champion, 35–
 43, 45
 thermal feedback, self-sustaining, 388–
 391, 396
 thermal runaway events, 391, 400. *See*
also excess heat
 thermonuclear fusion, 11, 70, 84, 190,
 234, 240, 264, 314, 324, 329, 342, 413
 Thompson, John Alfred, 183, 375
 Thornton, William S., 101
 "three miracles" to have D+D fusion at
 room temperatures, 257–258, 260
Times of India (newspaper), 374
 tin, 132–136
 titanium, 7, 73, 77, 87, 89–90, 132–136,
 147, 180, 237
 Tohoku University, 195, 353
 Toland, Joe, 102
 Tomlinson, John W., 21
- Topolotron, 169–170
 TORE-SUPRA reactor, 84–85
 Toyoda, Minoru, 47
 Toyota Central Laboratories, 321, 346,
 353, 389, 393
 transmutations, biological, 414
 transmutations, with or to heavy
 elements, 11–14, 23, 29, 32–33, 62, 70,
 118–123, 129, 131–138, 148, 194, 225,
 281, 342, 370
 Bockris' experiments, 25, 42, 99, 126,
 129
 correlation with excess heat, 129–130
 Dash's experiments, 77, 86, 87–88, 99
 dismissal of claims for, 154, 184–185,
 212, 229–230, 273, 324, 339–346
 from glow discharge experiments, 73,
 75, 87, 99
 isotopic changes/shifts and, 66, 130,
 150, 195, 197, 229–230, 232, 273,
 339, 341, 345, 370
 Iwamura's experiments, 195–200,
 201–202, 212, 213, 225, 235, 321,
 339
 from light-water experiments, 141,
 143, 166, 212
 Miley's light-water
 transmutational and isotopic
 shifts, 136, 141–143, **143**
 McKubre resistance to concept of,
 211–212
 Mizuno's heavy-water
 transmutations and isotopic shifts,
 131–136, 185
 omitted from 2004 DOE review of
 LENR research, 229–230
 patterns in Mizuno's and Miley's
 experiments and Widom-Larsen
 theory, 266–268, **267**, **268**
 use of term impurities rather than,
 24, 73, 87, 338
 Wolf's claims, 120–121
 Trevithick, Matthew, 4, 209
 "TRIGA" reactor, 143
 "Tri-Navy Program," 155–162, 163, 179
 tritium, xviii, 11, 14–16, 27, 42, 54, **61**, **61**,
 67, 70, 122, 211, **367**, **368**, 373, 387, 412
 from co-deposition method, 218
 findings by
 BARC, 7, 15

- Bockris, 14–15
Iwamura, 195, 198
Storms and Talcott, 171
Wolf, 120–121
- tritons, 64–65, 387
- Trounson, Edward "Ed," 303
- Tully, John, 278
- tungsten
transmutation of, 235–236, 241–244, 242
tungsten cathodes, 193, 242–247, 246, 247
- Turner Broadcasting System, 206
- "The 2004 Cold Fusion Report" (Kriivit and Winocur), 223, 226
- "UA1" and "UA2" collaborations of
European Organization for Nuclear Research, 414
- Ullrich, George, 307
- ultra-high temperature superconductors, 290
- ultra-low-momentum neutron (ULMN).
See neutrons
- ultrasonic waves stimulating cavitation and nuclear effects, 255
- United States Steel Corp., 172
- University Fusion Association, 136
- University of California, Berkeley, 139, 185, 186
- University of California, San Diego, 220
- University of Chicago
first nuclear fission reactor, 391–392
Larsen and, 262, 263, 265
Wendt and Irion's experiments, xxii, 235–236, 237, 240–241
- University of Illinois, xix, 122–123, 136, 143, 147, 264
- University of Missouri, 345, 356, 383
- University of Pavia confirmation of Piantelli gas experiment, 390, 391
- University of Rome, 259, 319
- University of Siena, 115, 116
- University of Texas, 9, 179, 189, 203
- University of Torino, 154
- University of Utah
Dash excess-heat demonstration, 82, 83
Fleischmann and Pons experiments, 7–8, 165, 327
- ENECO acquiring patents from, 72, 323
press conference, xxi, 1, 5, 37, 209, 234
- uranium, 32, 326–327, 414
- Urutskoev, Leonid, 239
in Chernobyl, 236–237
exploding-wires experiments, 237–241, 238
publishing report in *Prikladnaya Fizika* (Applied Physics), 240
- U.S. Army Research Laboratory, 214
- U.S. Army Research Office, 87, 89
- U.S. Department of Defense (DOD), 214
- U.S. Department of Energy (DOE), 71, 167–168, 214, 270, 307
1989 review of "cold fusion" research, xx–xxi, 14, 15, 95, 96, 168, 186, 222, 223, 224, 225, 232, 258, 308, 349
2004 review of LENR research, xix, 1–2, 4–5, 222, 223–224, 226, 227, 229–232, 233, 248, 356, 359, 361
DOE/EPRI workshop on thermoelectric devices (2004), 225
Santa Fe "Workshop on Cold Fusion Phenomena" (1989), 14–15
- U.S. Intelligence Advanced Research Projects Activity (IARPA), 383
- U.S. Patent and Trademark Office (USPTO) and Iwamura/Mitsubishi, 347–354
- Valat, Mathieu, 84–86, 86, 88, 90, 91
"valley of stability," 286
- Valone, Thomas (letter to *Science*), 168
- vanadium, 73, 77, 87
- Van Noorden, Richard, 310
- Veranth, Joe, 56, 58
- Violante, Vittorio, 231–232, 319–321, 320, 335–338, 336, 398
- virtual neutrons, 63–64, 154
- Volgodonsk University, 254
- Vysotskii, Vladimir, 251
- Wakefield, Dawn Lee, 99–102, 104, 111
- Walling, Cheues, 8–9
- Wallstin, Brian, 42–43
- Walton, Ernest, 413

- Washington Post (newspaper), 4
- Watson, Rex, 22
- wavelength and momentum, inverse function of, 281
- weak force and weak interactions, 238–239, 243, 387, 414. *See also* neutronization
- LENR processes based on, 64, 217–218, 259, 260, 305, 398
- Weinberg, Steven, 414
- Weiss, Jeffrey, 41, 103, 105, 111–112
- Wendt, Gerald L., xxii, 235
- Wendt and Irion's experiments, xxii, 235–236, 237, 240–241
- West, Gaines, 112–113
- Wetterholm, Allan, 21
- Wiatt, Robert E., 100–101, 102, 104
- Wick, Gian-Carlo, 413
- Widom, Allan, xix, 64, 217, 224, 289–290, 307, 373. *See also* Widom-Larsen theory
- co-author of Cirillo research paper, 319
- co-author of "Ultra-Low-Momentum Neutron Catalyzed Nuclear Reactions on Metallic Hydride Surfaces" (Widom and Larsen), 257–261
- patents issued to, 292, 293, 298, 309
- Widom-Larsen theory, 64, 257–261, 269–270, 291, 376, 398, 412. *See also* nucleosynthesis
- article published in *European Physical Journal C- Particles and Fields*, 260, 289, 306, 307
- articles in *Pramana Journal of Physics*, 289, 373, 374
- energy release mechanisms, 284–285
- explaining helium-4, 364. *See also* helium-4
- extending the theory, 289–290
- four-step Widom-Larsen process, 282–284
- gamma-conversion mechanism, 279, 280, 291–304, 292, 294–296, 309, 390, 412
- going public with, 288–290
- key concepts of, 298–299
- LENRs as possible practical energy source, 387
- LENRs bridging nuclear and chemical realms, 299
- methods of calculating reaction rates, 277–278, 285
- neutronization process, 275–277. *See also* neutronization
- patterns in Mizuno's and Miley's experiments and Widom-Larsen theory, 266–268, 267, 268
- reactions to, 305–316
- acceptance of, 310–311, 317, 330
- Kruit publishing critiques of, 313–314
- negative reactions, 305–306, 311–313, 314, 315, 317–330, 334–335, 366, 369, 399
- ultra-low momentum neutron, 257, 280–282, 284, 412
- Winocur, Nadine (co-author with Steven B. Kruit). *See* Kruit, Steven B., publications of
- Wolf, Kevin, 14–15, 17–18, 120–121
- Wood, Lowell, 4
- Woods, Michael, 366
- World Green Energy Symposium, 384
- Worledge, David H., 6
- Wrighton, Mark, 215
- X-ray photoelectron spectroscopy (XPS), 92–93, 133, 147, 199
- X-rays, 155, 158, 196, 216, 258, 309, 414
- Yamaguchi, Eiichi, 180–181
- Yang, Hyunik, 250–251, 254
- Yang, Jian-yu, 416
- yttrium, 147
- Yurkovic, Julie, 83–84
- Zawodny, Joseph, 368–369, 394–395
- Zhang, Yue-Chang, 190, 190–191, 192, 341, 342
- Zhotikov, Gleb, 239
- Zimmerman, Ben, 78
- Zimmerman, Peter D., 96–97, 159, 168
- zinc, 147, 189
- zinc-64, 190, 191
- zirconium, 73, 147
- isotopic changes to zirconium-90 and zirconium-91, 73

About the Author



Steven B. Krivit lives in San Rafael, California, and is an investigative science journalist and international speaker. He studied industrial design at the University of Bridgeport (Connecticut) and completed his bachelor's degree in business administration and information technology at National University (Los Angeles). He was a computer network systems engineer until 2000, when he became curious about low-energy nuclear reaction (LENR) research. He founded the

New Energy Times Web site and online news service to share what he learned. By 2016, he had spoken with nearly all the scientists who were involved in the field. He has lectured nationally and international to scientific as well as lay audiences. He has advised the U.S. intelligence community, the U.S. Library of Congress, members of the Indian Atomic Energy Commission and the interim executive director of the American Nuclear Society. He is the leading author of review articles and chapters about LENRs, including invited papers for the Royal Society of Chemistry (2009), Elsevier (2009 and 2013) and John Wiley & Sons (2011). He was an editor for the American Chemical Society 2008 and 2009 technical reference books on LENRs and editor-in-chief for the 2011 Wiley *Nuclear Energy Encyclopedia*.

Krivit was the first science journalist to publicly identify and teach the distinctions between the unproven theory of "cold fusion" and the experimentally confirmed neutron-catalyzed LENRs. He did so in 2008 at the 236th national meeting of the American Chemical Society. His chapters in the *Elsevier Encyclopedia of Electrochemical Power Sources* were the first chapters on LENRs in a print encyclopedia.

Other Volumes in This Series



Fusion Fiasco: Explorations in Nuclear Research, Vol. 2

This book tells the behind-the-scenes story of the 1989-1990 fusion fiasco, one of the most divisive scientific controversies in recent history. It explains how credible experimental low-energy nuclear reactions research emerged from the erroneous idea of "cold fusion."



Lost History: Explorations in Nuclear Research, Vol. 3

This book explores the story of forgotten chemical transmutation research during the 1910s and 1920s, a precursor to modern low-energy nuclear reactions research. This work has been obscured and absent in the dialogue of the scientific community for a century.

For More Information
www.stevenbkrivit.com