

LAWRENCE RICHARD BERNSTEIN

285 Willow Road, Menlo Park, California 94025, U.S.A.

650-324-3344 • LawrenceRBernstein@gmail.com

HIGHLIGHTS

Inventor of drugs to treat cancer, infectious disease, bone disease, skin disease, pain, and inflammatory disease, one of which is in clinical trials • Expert in metal-based drug design and in the chemistry of gallium and germanium • Experienced author and editor of both technical and non-technical materials

EDUCATION



Stanford University
Stanford, California

Ph.D. (1985) geochemistry, mineralogy



Harvard University
Cambridge, Massachusetts

A.M. (1978) mineralogy, geochemistry
A.B. (1977) highest honors in geology

HONORS AND SCHOLARSHIPS

Phi Beta Kappa, Sigma Xi, Federal Junior Fellow, Harvard College Honorary Scholarship, John Harvard Honorary Scholarship, Full Harvard Graduate Scholarship, Full Stanford Graduate Scholarship, included in current *American Men and Women of Science*, included in current *Who's Who in America*

MAJOR PROFESSIONAL WORK EXPERIENCE



GALLIXA LLC (previously TERRAMETRIX), 285 Willow Road, Menlo Park, CA 94025
Founder & CEO, 1992-present: pharmaceutical, chemical, and cosmetic research and development



INTERNATIONAL CENTRE FOR DIFFRACTION DATA, 12 Campus Boulevard, Newtown Square, PA 19081
Editor, 1992-present: editor for scientific publications and international database



MINTZ LEVIN COHN FERRIS GLOVSKY AND POPEO, 1400 Page Mill Road, Palo Alto, CA 94304
Contractor, 2001-2006: assisted in writing, editing, and research involving patent applications



YASKAWA ELECTRIC MANUFACTURING COMPANY, INC., 2665 Marine Way, Mountain View, CA 94043
Laboratory Director and Senior Research Scientist, 1990-1992: materials science research



CENTER FOR MATERIALS RESEARCH, STANFORD UNIVERSITY, Stanford, CA 94305
Postdoctoral Researcher, Laboratory Manager, 1986-1989: materials & mineralogical research



U.S. GEOLOGICAL SURVEY, 345 Middlefield Road, Menlo Park, CA 94025
Geologist, 1982-1986: geological, mineralogical, and geochemical research



DEPARTMENT OF GEOLOGY, STANFORD UNIVERSITY, Stanford, CA 94305
Teaching Fellow, 1981-1985: taught undergraduates and graduates



BRITISH PETROLEUM, 100 Pine Street, San Francisco, CA 94111
Exploration Geologist, 1979-1981: oil and gas exploration and research



LOWELL HOUSE, HARVARD UNIVERSITY, Cambridge, MA 02138
Tutor in Geological Sciences, 1977-1978: taught and organized activities for undergraduates



DEPARTMENT OF EARTH AND PLANETARY SCIENCES, HARVARD UNIVERSITY, Cambridge, MA 02138
Teaching Fellow, 1976-1978: taught undergraduates and graduates



DEPARTMENT OF MINERAL SCIENCES, SMITHSONIAN INSTITUTION, Washington, DC 20560
Museum Assistant, 1971-1972 (summers): curatorial assistant

OTHER PROFESSIONAL AND BUSINESS EXPERIENCE

Co-Founder and Director of IT ENDS (Innovation To End Neglected Diseases), a not-for-profit organization dedicated to finding and distributing safe and effective treatments for neglected diseases such as African sleeping sickness, Chagas disease, leishmaniasis, and tuberculosis, 2013 - present



Co-Founder, Director, and CEO of GeoMed, Inc., 1995 - 2000 (acquired by Titan Pharmaceuticals, Inc., in 2000)

SPECIALIZED SKILLS

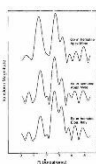
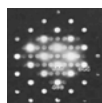
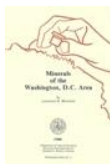
Skilled at operating: x-ray diffraction equipment; electron microprobe; SEM; TEM; polarizing microscope; atomic absorption, emission, visible, IR, UV, mass, and Mössbauer spectrometers; other laboratory equipment. Considerable experience in writing and editing technical and non-technical material. Experienced in writing scientific software.

PROFESSIONAL MEMBERSHIPS

American Chemical Society; American Society for Bone and Mineral Research; Mineralogical Society of America; Society of Biological Inorganic Chemistry; International Centre for Diffraction Data (Fellow)

PROFESSIONAL PUBLICATIONS

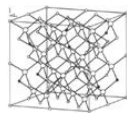
- Bernstein LR (1976) Minerals of Washington, D.C. and vicinity, *U.S. Geological Survey Open-File Report 76-849*, 195 pp., 84 fig., 3 plates.
- [Bernstein LR \(1979\) Coloring mechanisms in celestite, *American Mineralogist* 64:160-168.](#)
- Bernstein LR (1980) Minerals of the Washington, D.C. area, *Maryland Geological Survey Educational Series 5*, 148 pp., 66 fig., 3 plates.
- [Bernstein LR \(1982\) Monazite from North Carolina having the alexandrite effect, *American Mineralogist* 67:356-359.](#)
- Bernstein LR, Zerzan JM (1982) Three-dimensional interpretation of gravity data with applications in the Mississippi Embayment (abs.), *Geophysics* 47:446.
- Bernstein LR (1985) Geology and mineralogy of the Apex mine, Washington County, Utah, *U.S. Geological Survey Open File Report 85-511*, 21 pp.
- [Bernstein LR \(1985\) Germanium geochemistry and mineralogy, *Geochimica et Cosmochimica Acta* 49:2409-2422.](#)
- [Bernstein LR \(1986\) Renierite, \$Cu_{10}ZnGe_2Fe_4S_{16}-Cu_{11}GeAsFe_4S_{16}\$: a coupled solid solution series, *American Mineralogist* 71:210-221.](#)
- [Bernstein LR \(1986\) Geology and mineralogy of the Apex germanium-gallium mine, Washington County, Utah, *U.S. Geological Survey Bulletin* 1577, 9 pp.](#)
- [Bernstein LR, Cox DP \(1986\) Geology and sulfide mineralogy of the Number One orebody, Ruby Creek copper deposit, Alaska, *Economic Geology* 81:1675-1689.](#)
- [Bernstein LR, Waychunas GA \(1986\) EXAFS and XANES studies of germanium in some minerals and related substances \(abs.\), *Abstracts with Program, 14th General Meeting of the International Mineralogical Association*, pp. 56.](#)
- [Cox DP, Bernstein LR \(1986\) Descriptive model of Kipushi Cu-Pb-Zn, in *Mineral Deposit Models*, Cox DP and Singer DA, Eds., *U.S. Geological Survey Bulletin* 1693, pp.227.](#)
- [Bernstein LR, Waychunas GA \(1987\) Germanium crystal chemistry in hematite and goethite from the Apex Mine, Utah, and some new data on germanium in aqueous solution and in stottite, *Geochimica et Cosmochimica Acta* 51:623-630.](#)





14. [Ross CR, Bernstein LR, Waychunas GA \(1988\) Crystal structure refinement of stottite, FeGe\(OH\)₆, *American Mineralogist* 73:657-661.](#)

15. [Bernstein LR, Bockman RS \(1988\) EXAFS and XANES spectroscopy of gallium and calcium in bone and related materials \(abs.\), *Materials Research Society Fall Meeting 1988 Abstracts*, pp. 320.](#)



16. [Bernstein LR, Reichel DG, Merlino S \(1989\) Renierite crystal structure refined from Rietveld analysis of neutron diffraction data, *American Mineralogist* 74:1177-1181.](#)

17. [Bernstein LR \(1995\) Powder x-ray crystallography of gallium 3-hydroxy-4-pyronates, *Powder Diffraction* 10:140-142.](#)

18. [Bernstein LR \(1998\) Mechanisms of therapeutic activity for gallium, *Pharmacological Reviews* 50:665-682.](#)

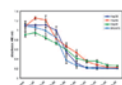
19. [Abdulghani A, Rose S, Bernstein LR, Gottlieb AB \(1999\) Immunosuppressive activity of spirogermanium on T-cell activation and inflammatory cytokine secretion in vitro \(abs.\), *Journal of Investigative Dermatology* 112:655.](#)



20. [Bernstein LR, Tanner T, Godfrey C, Noll B \(2000\) Chemistry and pharmacokinetics of gallium maltolate, a compound with high oral gallium bioavailability, *Metal Based Drugs* 7:33-48.](#)

21. [Bernstein LR \(2005\) Therapeutic gallium compounds, in *Metallotherapeutic Drugs and Metal-Based Diagnostic Agents: The Use of Metals in Medicine*, Gielen M and Tiekink ERT, eds., pp. 259-277, Wiley, New York.](#)

22. [Harrington JR, Martens RJ, Cohen ND, Bernstein LR \(2006\) Antimicrobial activity of gallium against virulent *Rhodococcus equi* in vitro and in vivo, *Journal of Veterinary Pharmacology and Therapeutics* 29:121-127.](#)



23. [Chua MS, Bernstein LR, Li R, So SKS \(2006\) Gallium maltolate is a promising chemotherapeutic agent for the treatment of hepatocellular carcinoma, *Anticancer Research* 26:1739-1744.](#)

24. [Martens RJ, Harrington JR, Cohen ND, Chaffin MK, Mealey K, Taylor RJ, Bernstein LR \(2006\) Gallium therapy: a novel metal-based antimicrobial strategy for potential control of *Rhodococcus equi* foal pneumonia, *American Association of Equine Practitioners Proceedings* 52:219-221.](#)

25. [Martens RJ, Miller NA, Cohen ND, Harrington JR, Bernstein LR \(2007\) Chemoprophylactic antimicrobial activity of gallium maltolate against intracellular *Rhodococcus equi*. *Journal of Equine Veterinary Science* 27:341-345.](#)

26. [Martens RJ, Mealey K, Cohen ND, Harrington JR, Chaffin MK, Taylor RJ, Bernstein LR \(2007\) Pharmacokinetics of gallium maltolate after intragastric administration in neonatal foals. *American Journal of Veterinary Research* 68:1041-1044.](#)

27. [Martens RJ, Cohen ND, Fajt VR, Nerren JR, Chaffin MK, Taylor RJ, Bernstein LR \(2010\) Gallium maltolate: safety in neonatal foals following multiple enteral administrations, *Journal of Veterinary Pharmacology and Therapeutics* 33:208-212.](#)

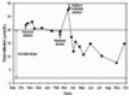
28. [Chaffin MK, Fajt V, Martens RJ, Arnold CE, Cohen ND, O'Connor M, Taylor RJ, Bernstein LR \(2010\) Pharmacokinetics of an orally-administered methylcellulose formulation of gallium maltolate in neonatal foals, *Journal of Veterinary Pharmacology and Therapeutics* 33:376-382.](#)

29. [Coleman M, Kuskie K, Liu M, Chaffin MK, Libal M, Giguère S, Bernstein LR, Cohen ND \(2010\) In vitro antimicrobial activity of gallium maltolate against virulent *Rhodococcus equi*. *Veterinary Microbiology* 146:175-178.](#)

30. [Arnold C, Chaffin MK, Cohen N, Fajt VR, Taylor RJ, Bernstein LR \(2010\), Pharmacokinetics of gallium maltolate after intragastric administration in adult horses. *American Journal of Veterinary Research* 71:1371-1376.](#)

31. [Nerren JR, Edrington TS, Bernstein LR, Farrow RL, Genovese KG, Callaway TR, Anderson RC, Krueger NA, Duke SE, Nisbet DJ \(2011\) Evaluation of the effect of gallium maltolate on fecal salmonella shedding in cattle. *Journal of Food Protection* 74:524-530.](#)

32. Chaffin MK, Cohen ND, Martens RJ, O'Connor M, Bernstein, LR (2011) Efficacy of gallium maltolate for chemoprophylaxis against *Rhodococcus equi* foal pneumonia. *Journal of the American Veterinary Medical Association* 72:945-957.
33. [Bernstein LR, van der Hoeven JJM, Boer RO \(2011\) Hepatocellular carcinoma detection by gallium scan and subsequent treatment by gallium maltolate: rationale and case study. *Anti-Cancer Agents in Medicinal Chemistry* 11:585-590.](#)
34. [Arnold CE, Bordin A, Lawhon SD, Libal MC, Bernstein LR, Cohen ND \(2012\) Antimicrobial activity of gallium maltolate against *Staphylococcus aureus* and methicillin-resistant *S. aureus* and *Staphylococcus pseudintermedius*: An *in vitro* study. *Veterinary Microbiology* 155:389-394.](#)
35. [Bernstein LR \(2012\) Successful treatment of refractory postherpetic neuralgia with topical gallium maltolate: Case report. *Pain Medicine* 13:915-918.](#)
36. [Bernstein LR \(2013\) Gallium, therapeutic effects, in *Encyclopedia of Metalloproteins*, Kretsinger RH, Uversky VN, and Permyakov EA, eds., pp. 823-835, Springer, New York.](#)
37. [Bernstein LR \(2013\) Gallium maltolate: a new topical analgesic agent. 4th International Congress on Neuropathic Pain, Toronto, Canada, 23-26 May 2013.](#)
38. [Sampieri F, Alcorn J, Allen AL, Clark CR, Vannucci FA, Pusterla N, Mapes S, Ball KR, Dowling PM, Thompson J, Bernstein LR, Gebhart CJ, Hamilton DL \(2014\) Pharmacokinetics of gallium maltolate in *Lawsonia intracellularis*-infected and uninfected rabbits. *Journal of Veterinary Pharmacology and Therapeutics* 37:486-499.](#)
39. [Sampieri F, Allen AL, Alcorn J, Clark CR, Vannucci FA., Pusterla N, Mapes SM, Ball KR, Dowling PM, Thompson J, Bernstein LR, Gebhart CJ, Hamilton DL \(2014\) Efficacy of gallium maltolate against *Lawsonia intracellularis* infection in a rabbit model. *Journal of Veterinary Pharmacology and Therapeutics* 37:571-578.](#)
40. [Fecteau M, Aceto HW, Bernstein LR, Sweeney RW \(2014\) Comparison of the antimicrobial activities of gallium nitrate and gallium maltolate against *Mycobacterium avium* subsp. *paratuberculosis* *in vitro*. *The Veterinary Journal* 202:195-197.](#)
41. [Bernstein LR \(2014\) Successful treatment of refractory trigeminal neuralgia with topical gallium maltolate. 15th World Congress on Pain, Buenos Aires, Argentina, 10 October 2014.](#)
42. [Cohen ND, Slovis NM, Giguère S, Baker S, Chaffin MK, Bernstein LR \(2015\) Gallium maltolate as an alternative to macrolides for treatment of presumed *Rhodococcus equi* pneumonia in foals. *Journal of Veterinary Internal Medicine* 29:932-939.](#)
43. [Rangel-Vega A, Bernstein LR, Mandujano-Tinoco EA, García-Contreras SJ, García-Contreras R \(2015\) Drug repurposing as an alternative for the treatment of recalcitrant bacterial infections. *Frontiers in Microbiology* 6: Article 282. DOI: 10.3389/fmicb.2015.00282.](#)
44. [Monk CS, Sweeney, RW, Bernstein LR, Fecteau M \(2016\) Serum and tissue concentrations of gallium after oral administration of gallium nitrate and gallium maltolate to neonatal calves. *American Journal of Veterinary Research* 77:151-155.](#)
45. [Hummig W, Neto JS, Benzecry de Almeida D, Bernstein LR \(2016\) Efficacy of topical gallium maltolate for neuropathic orofacial pain following surgery or radiotherapy. 16th World Congress on Pain, Yokohama, Japan, 27 September 2016.](#)
46. [Hijazi S, Visaggio D, Pirolo M, Frangipani E, Bernstein L, and Visca P \(2018\) Antimicrobial Activity of Gallium Compounds on ESKAPE Pathogens. *Frontiers in Cellular and Infection Microbiology* 8:316. doi: 10.3389/fcimb.2018.00316](#)
47. [Bernstein LR \(2018\) Topical gallium maltolate as a possible alternative to opioids in the treatment of chronic pain. 17th World Congress on Pain, Boston, Massachusetts, 16 September 2018.](#)



48. [Giacani L, Bernstein LR, Haynes AM, Godornes BC, Ciccarese G, Drago F, Parodi A, Valdevit S, Anselmi L, Tomasini CF, Baca AM \(2019\) Topical treatment with gallium maltolate reduces *Treponema pallidum* subsp. *pertenue* burden in primary experimental lesions in a rabbit model of yaws. PLoS Neglected Tropical Diseases 13\(1\): e0007076.](#)
49. [Cereceres S, Lan Z, Bryan L, Whitely M, Wilems T, Greer H, Alexander ER, Taylor RJ, Bernstein LR, Cohen N, Whitfield-Cargile C, Cosgriff-Hernandez E \(2019\) Bactericidal activity of 3D-printed hydrogel dressing loaded with gallium maltolate. APL Bioengineering 3, 026102.](#)
50. [Bernstein LR \(2020\) A pragmatic, general definition of pain. Pain Reports 5:e813.](#)
51. [Bernstein LR, Zhang L \(2020\) Gallium maltolate has *in vitro* antiviral activity against SARS-CoV-2 and is a potential treatment for COVID-19. Antiviral Chemistry and Chemotherapy 28:1-4.](#)
52. [Visaggio D, Frangipani E, Hijazi S, Pirolo M, Leoni L, Rampioni G, Imperi F, Bernstein L, Sorrentino R, Ungaro F, Visca P \(2021\) Variable susceptibility to gallium compounds of major cystic fibrosis pathogens. ACS Infectious Diseases; doi: 10.1021/acscinfecdis.1c00409.](#)

ISSUED U.S. PATENTS

1. [Bernstein LR \(1993\) Pharmaceutical compositions of gallium complexes of 3-hydroxy-4-pyrones. U.S. Patent 5,258,376, issued November 2, 1993.](#)
2. [Bernstein LR \(1996\) Pharmaceutical compositions of gallium complexes of 3-hydroxy-4-pyrones. U.S. Patent 5,574,027, issued November 12, 1996.](#)
3. [Bernstein LR \(1998\) Methods and compositions to inhibit keratinocyte proliferation. U.S. Patent 5,747,482, issued May 5, 1998.](#)
4. [Bernstein LR \(1998\) Topical administration of azaspiranes to prevent or treat skin conditions associated with hyperproliferation of keratinocytes. U.S. Patent 5,843,936, issued December 1, 1998.](#)
5. [Bernstein LR \(1999\) Solid dosage forms for the oral administration of gallium. U.S. Patent 5,883,088, issued March 16, 1999.](#)
6. [Bernstein LR \(1999\) Topical administration of certain azaspiranes to prevent or treat skin conditions associated with hyperproliferation of skin cells and/or immunologically mediated disorders. U.S. Patent 5,916,885, issued June 29, 1999.](#)
7. [Bernstein LR \(1999\) Gallium complexes of 3-hydroxy-4-pyrones to treat or prevent hypercalcemia. U.S. Patent 5,968,922, issued October 19, 1999.](#)
8. [Bernstein LR \(1999\) Gallium complexes of 3-hydroxy-4-pyrones to treat or prevent calcium homeostasis disorders. U.S. Patent 5,981,518, issued November 9, 1999.](#)
9. [Bernstein LR \(1999\) Gallium complexes of 3-hydroxy-4-pyrones to treat or prevent bone disease. U.S. Patent 5,998,397, issued December 7, 1999.](#)
10. [Bernstein LR \(1999\) Administration of gallium complexes of 3-hydroxy-4-pyrones to provide physiologically active gallium levels in a mammalian individual. U.S. Patent 6,004,951, issued December 21, 1999.](#)
11. [Bernstein LR \(2000\) Solid pharmaceutical compositions for the oral administration of gallium. U.S. Patent 6,048,851, issued April 11, 2000.](#)
12. [Bernstein LR \(2000\) Gallium complexes of 3-hydroxy-4-pyrones to treat cancer. U.S. Patent 6,087,354, issued July 11, 2000.](#)
13. [Bernstein LR \(2011\) Gallium compositions for the treatment of liver cancer and methods of use. U.S. Patent 8,076,371, issued December 13, 2011.](#)
14. [Bernstein LR \(2012\) Gallium complexes with polyalcohols and methods of use. U.S. Patent 8,153,687, issued April 10, 2012.](#)

15. [Bernstein LR \(2012\) Local administration of gallium compositions to treat pain. U.S. Patent 8,168,214, issued May 1, 2012.](#)
16. [Bernstein LR \(2012\) Local administration of gallium compositions to treat pain. U.S. Patent 8,293,268, issued October 23, 2012.](#)
17. [Bernstein LR \(2012\) Gallium compositions for the treatment of liver cancer and methods of use. U.S. Patent 8,293,787, issued October 23, 2012.](#)
18. [Bernstein LR \(2013\) Local administration of gallium compositions to treat pain. U.S. Patent 8,506,990, issued August 13, 2013.](#)
19. [Bernstein LR \(2014\) Gallium compositions for the treatment of liver cancer and methods of use. U.S. Patent 8,664,268, issued March 4, 2014.](#)
20. [Bernstein LR \(2014\) Local administration of gallium compositions to treat pain. U.S. Patent 8,871,246, issued October 28, 2014.](#)
21. [Bernstein LR \(2015\) Orally administrable gallium compositions and methods of use. U.S. Patent 9,040,063, issued May 26, 2015.](#)
22. [Bernstein LR \(2015\) Local administration of gallium compositions to treat pain. U.S. Patent 9,114,067, issued August 25, 2015.](#)
23. [Bernstein LR \(2016\) Orally administrable gallium compositions and methods of use. U.S. Patent 9,492,551, issued November 15, 2016.](#)
24. [Bernstein LR \(2016\) Local administration of gallium compositions to treat pain. U.S. Patent 9,517,198, issued December 13, 2016.](#)
25. [Bernstein LR \(2017\) Orally administrable gallium compositions and methods of use. U.S. Patent 9,616,133, issued April 11, 2017.](#)
26. [Bernstein LR \(2022\) Gallium in the treatment of coronavirus disease. U.S. Patent 11,213,530, issued January 4, 2022.](#)