

## Chris Diederich

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### Chris J. Diederich, Ph.D.



**Professor**  
**Director of Clinical Hyperthermia Physics Section &  
Thermal Therapy Research Group**  
**Department of Radiation Oncology**

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### Professional Focus

#### Clinical

Dr. Diederich's clinical expertise includes treatment planning, quality assurance, and delivery of hyperthermia therapy (thermal therapy) in conjunction with radiation therapy and chemotherapy. He has over 25 years of experience as a Medical Physicist in the field of Hyperthermia Therapy, with applications of ultrasound and electromagnetic systems for delivering superficial, interstitial, and deep hyperthermia. He is Director of Clinical Hyperthermia Physics. This clinical service includes standard of care procedures, as well as

scientific investigations of (1) the use of ultrasound to preferentially target ThermoDox, a thermally sensitive nanoparticle, for treatment of recurrent breast cancer, (2) catheter-based ultrasound hyperthermia in conjunction with HDR brachytherapy for the treatment of locally advanced prostate and cervix cancer, and (3) deep hyperthermia for pelvic tumors.

## Research Focus

His main focus of research has been the development of ultrasound devices and treatment delivery strategies for targeted hyperthermia, thermal ablation therapies, and drug delivery. This includes integration of devices with magnetic resonance (MR) and ultrasound (US) imaging techniques to guide and monitor therapy delivery. Areas of expertise include ultrasound physics, bioacoustic thermal modeling and control, MR and US image guidance, and theoretical and experimental techniques to develop and evaluate thermal therapy devices prior to clinical implementation. Dr. Diederich's lab group is investigating methods of applying hyperthermia or moderate thermal therapy (40-45 °C) to tissue to significantly enhance radiation therapy, chemotherapy, gene therapy, immunotherapy, and drug delivery/activation (e.g., nanoparticles). Further, high temperature (50-80+ °C) thermal therapy is being investigated to outright destroy tumors or permanently change the physical properties of tissue. The image-guided ultrasound devices and methods developed by his group can produce precise shaped heating patterns and are more controllable than other modalities, thus potentially providing more conformable heating, better response and lower complication rates; the technology has demonstrated potential for cancer therapy and treatment of non-malignant disease. Catheter based ultrasound devices and a delivery system developed by his group are currently being applied in an NIH sponsored clinical study at UCSF for applying hyperthermia in conjunction with HDR brachytherapy for the treatment of locally advanced prostate and cervix cancer (FDA IDE G040168). Research funded projects include development of catheter-based, endoluminal, and endocavity ultrasound technology for thermal therapy treatment of prostate cancer, cervix cancer, pancreatic cancer, uterine fibroid ablation, and bone and spinal tumor ablation.

## Education

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1984	University of California, San Diego	BS	Bioengineering
1986	University of Arizona	MSEE	Electrical Engineering
1990	University of Arizona	Ph.D.	Electrical Engineering

## Professional Experience

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2006-present	UCSF	Department of Radiation Oncology	Professor
2000-2006	UCSF	Department of Radiation Oncology	Associate Professor
1990-2000	UCSF	Department of Radiation Oncology	Assistant Professor

## Awards & Honors

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1993	Recipient of Whitaker Biomedical Engineering Research Award
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Physics Councilor (96-98), North American Hyperthermia Society (NAHS)

1996

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1999-2003 Vice President Elect, President-Elect, President, and Past-President of the North American Hyperthermia Society ?NAHS

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2000 Recipient, Norby-Smith Award for Minimally Invasive Surgery, North American Spine Society

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2001-2002 17th President, North American Hyperthermia Society (Now STM)

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2007-2011 Secretary Treasurer, Society of Thermal Medicine (NAHS)

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2008-2011 Executive Board Member, International Society of Therapeutic Ultrasound

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2010 Recipient of the 2010 Robinson Award ? Society for Thermal Medicine

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2011 Targeted Drug Delivery - Steering Committee, Focused Ultrasound Surgery Foundation

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2011-2015 AAPM Meeting Coordination Committee, Program, and Ultrasound Track

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2013-2016 AAPM Task Group Member, TG-241 MR guided Focused Ultrasound

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2014-2017 Executive Board Member, International Society of Therapeutic Ultrasound

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2013-2015 Co-Chair, UC Berkeley and UC San Francisco Joint Bioengineering Graduate Program

#### Recent Significant Publications :

Salgaonkar VA, Diederich CJ. **Catheter-based ultrasound technology for image-guided thermal therapy: Current technology and applications.** Int J Hyperthermia. 2015 Mar; 31(2):203-15. PubMed

Zagar TM, Vujaskovic Z, Formenti S, Rugo H, Muggia F, O'Connor B, Myerson R, Stauffer P, Hsu IC, Diederich C, Straube W, Boss MK, Boico A, Craciunescu O, Maccarini P, Needham D, Borys N, Blackwell KL, Dewhirst MW. **Two phase I dose-escalation/pharmacokinetics studies of low temperature liposomal doxorubicin (LTLT) and mild local hyperthermia in heavily pretreated patients with local regionally recurrent breast cancer.** Int J Hyperthermia. 2014 Aug; 30(5):285-94. PubMed

Scott SJ, Salgaonkar V, Prakash P, Burdette EC, Diederich CJ. **Interstitial ultrasound ablation of vertebral and paraspinal tumours: parametric and patient-specific simulations.** Int J Hyperthermia. 2014 Jun; 30(4):228-44. PubMed

Salgaonkar VA, Prakash P, Rieke V, Ozhinsky E, Plata J, Kurhanewicz J, Hsu IC, Diederich CJ. **Model-based feasibility assessment and evaluation of prostate hyperthermia with a commercial MR-guided endorectal HIFU ablation array.** Med Phys. 2014 Mar; 41(3):033301. PubMed

Myerson RJ, Moros EG, Diederich CJ, Haemmerich D, Hurwitz MD, Hsu IC, McGough RJ, Nau WH, Straube WL, Turner PF, Vujaskovic Z, Stauffer PR. **Components of a hyperthermia clinic: recommendations for staffing, equipment, and treatment monitoring.** Int J Hyperthermia. 2014 Feb; 30(1):1-5. PubMed

Schlesinger D, Benedict S, Diederich C, Gedroyc W, Klivanov A, Lerner J. **MR-guided focused ultrasound surgery, present and future.** Med Phys. 2013 Aug; 40(8):080901. PubMed PMC3724793

Sommer G, Pauly KB, Holbrook A, Plata J, Daniel B, Bouley D, Gill H, Prakash P, Salgaonkar V, Jones P, Diederich C. **Applicators for magnetic resonance-guided ultrasonic ablation of benign prostatic hyperplasia.** Invest Radiol. 2013 Jun; 48(6):387-94. PubMed

Prakash P, Salgaonkar VA, Diederich CJ. **Modelling of endoluminal and interstitial ultrasound hyperthermia and thermal ablation: applications for device design, feedback control and treatment planning.** Int J Hyperthermia. 2013 Jun; 29(4):296-307. PubMed

Sommer G, Bouley D, Gill H, Daniel B, Pauly KB, Diederich C. **Focal ablation of prostate cancer: four roles for magnetic resonance imaging guidance.** Can J Urol. 2013 Apr; 20(2):6672-81. PubMed

Diederich CJ, Wootton J, Prakash P, Salgaonkar V, Juang T, Scott S, Chen X, Cunha A, Pouliot J, Hsu IC. **Catheter-based ultrasound hyperthermia with HDR brachytherapy for treatment of locally advanced cancer of the prostate and cervix.** Proc Soc Photo Opt Instrum Eng. 2011 Feb 22; 7901:79010O. PubMed

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