




Guillem Pratx

Assistant Professor of Radiation Oncology (Radiation Physics)

Radiation Oncology - Radiation Physics

 Curriculum Vitae available Online

Bio

BIO

Guillem Pratx, PhD is an assistant professor of Radiation Oncology and Medical Physics at Stanford University. During his doctoral and post-doctoral research, he developed several innovative instruments and algorithms for in vivo cancer imaging. Now, as head of the Physical Oncology Laboratory, he investigates how novel physical approaches can solve longstanding problems in oncology. For instance, his lab uses single-cell radionuclide imaging to measure the uptake of clinical PET tracers in heterogeneous cell populations and, in this way, derive a new interpretation of PET scans that accounts for factors such as cell diversity (cancer cells, immune cells and stromal cells), tumor heterogeneity and cell metabolism. Other areas of investigation include in vivo cell tracking and radiation therapy. Dr. Prof. Pratx was named a Damon Runyon Innovator and a Society of Nuclear Medicine Young Investigator. He has published over 50 papers and been principal investigator on several NIH grants.

ACADEMIC APPOINTMENTS

- Assistant Professor, Radiation Oncology - Radiation Physics
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute
- Faculty Fellow, Stanford ChEM-H

HONORS AND AWARDS

- Innovator Award, Damon Runyon Cancer Foundation (2014)
- Young Investigator Award, Society of Nuclear Medicine and Molecular Imaging (2014)
- Radiation Physics Impact Award, Stanford University (2013)
- Young Investigator Award - Semifinalist, World Molecular Imaging Congress (2013)
- Dean's Fellowship, Stanford (2010)
- Postdoctoral Fellowship, DoD Breast Cancer Research Program (2010)
- Research Seed Grant, American Association of Physicists in Medicine (2010)
- Top Student Paper, IEEE Medical Imaging Conference (2008)
- Bio-X Graduate Fellowship, Stanford University (2006)
- Bradley-Alavi Fellow, Society of Nuclear Medicine (2006)
- NVIDIA Fellowship, NVIDIA Corp (2006)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, AACR (2016 - present)
- Member, AAPM (2014 - present)

PROFESSIONAL EDUCATION

- Ph.D., Stanford University , Electrical Engineering (2010)
- M.S., Stanford University , Electrical Engineering (2006)
- B.S., Ecole Centrale Paris , Engineering (2004)

LINKS

- Lab website: <http://pratxlab.stanford.edu>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The Physical Oncology Lab is interested in making a lasting impact on translational cancer research by building novel physical tools and methods. Areas of active research include:

- Single-cell radionuclide assays to assess uptake of clinical PET tracers in heterogeneous cell populations. The goal is to use these assays to identify specific subpopulation of cells that contribute significantly to PET uptake seen in vivo in clinical scans, and in this way build a better biological interpretation of clinical PET scans.
- Cancer imaging and cell tracking, using molecular imaging. Work in this area is focused on developing novel imaging approaches such as XLCT (which uses X-ray to stimulate optical emission in vivo) and cell tracking PET tracers for regenerative medicine.
- Physical approaches to enhance radiation therapy, including combining high-Z nanoparticles with radiation-responsive molecules.

Teaching

COURSES

2018-19

- Physics and Engineering of Radionuclide-based Medical Imaging: BIOE 221, RAD 221 (Win)

2017-18

- Physics and Engineering of Radionuclide-based Medical Imaging: BIOE 221, RAD 221 (Win)

2016-17

- Physics and Engineering of Radionuclide-based Medical Imaging: BIOE 221, RAD 221 (Win)

2015-16

- Physics and Engineering of Radionuclide Imaging: BIOE 221, RAD 221 (Win)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Kyungoh Jung, Syamantak Khan, Justin Klein

Postdoctoral Research Mentor

Kyungoh Jung, Syamantak Khan, Justin Klein

Publications

PUBLICATIONS

- **Ultra-high dose rate FLASH irradiation may spare hypoxic stem cell niches in normal tissues.** *International journal of radiation oncology, biology, physics*
Pratx, G., Kapp, D. S.
2019
- **Radioluminescence Microscopy: A Quantitative Method for Radioisotopic Imaging of Metabolic Fluxes in Living Cancer Cells.** *Methods in molecular biology (Clifton, N.J.)*
Sengupta, D., Pratx, G.
2019; 1928: 45–53
- **Multiplexed Single-Cell Measurements of FDG Uptake and Lactate Release Using Droplet Microfluidics.** *Technology in cancer research & treatment*
Sengupta, D., Mongersun, A., Kim, T. J., Mongersun, K., von Eyben, R., Abbyad, P., Pratx, G.
2019; 18: 1533033819841066
- **Lactic acid accumulation in the tumor microenvironment suppresses 18F-FDG uptake.** *Cancer research*
Turkcan, S., Kiru, L., Naczynski, D. J., Sasportas, L. S., Pratx, G.
2018
- **Radioluminescence in biomedicine: physics, applications, and models.** *Physics in medicine and biology*
Klein, J., Sun, C., Pratx, G.
2018
- **A gold nanoparticle system for enhancement of radiotherapy and simultaneous monitoring of reactive-oxygen-species formation.** *Nanotechnology*
Choi, J., Jung, K., Graves, E. E., Pratx, G.
2018
- **Development and MPI tracking of novel hypoxia-targeted theranostic exosomes.** *Biomaterials*
Jung, K. O., Jo, H., Yu, J. H., Gambhir, S. S., Pratx, G.
2018; 177: 139–48
- **Flexible optically stimulated luminescence band for 1-D *in vivo* radiation dosimetry.** *Physics in medicine and biology*
Kim, T. J., Jung, K., Fahimian, B. P., Pratx, G.
2018
- **Single-Cell Imaging Using Radioluminescence Microscopy Reveals Unexpected Binding Target for [18F]HFB MOLECULAR IMAGING AND BIOLOGY**
Kiru, L., Kim, T., Shen, B., Chin, F. T., Pratx, G.
2018; 20 (3): 378–87
- **Cherenkov-Activated Phototherapy** *INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS*
Pratx, G., Kapp, D. S.
2018; 101 (2): 494–95
- **Is Cherenkov luminescence bright enough for photodynamic therapy?** *NATURE NANOTECHNOLOGY*
Pratx, G., Kapp, D. S.
2018; 13 (5): 354
- **Development and characterization of a scintillating cell imaging dish for radioluminescence microscopy** *ANALYST*
Sengupta, D., Kim, T., Almasi, S., Miller, S., Marton, Z., Nagarkar, V., Pratx, G.
2018; 143 (8): 1862–69
- **In silico optimization of radioluminescence microscopy** *JOURNAL OF BIOPHOTONICS*
Wang, Q., Sengupta, D., Kim, T., Pratx, G.
2018; 11 (3)
- **Towards a droplet radiometric assay for single-cell analysis.** *Analytical chemistry*
Gallina, M. E., Kim, T. J., Shelor, M., Vasquez, J., Mongersun, A., Kim, M., Tang, S. K., Abbyad, P., Pratx, G.

2017

- **Modular low-light microscope for imaging cellular bioluminescence and radioluminescence** *NATURE PROTOCOLS*
Kim, T. J., Turkcan, S., Pratx, G.
2017; 12 (5): 1055-1076
- **Performance evaluation of F-18 radioluminescence microscopy using computational simulation** *MEDICAL PHYSICS*
Wang, Q., Sengupta, D., Kim, T. J., Pratx, G.
2017; 44 (5): 1782-1795
- **Flexible radioluminescence imaging for FDG-guided surgery** *MEDICAL PHYSICS*
King, M. T., Jenkins, C. H., Sun, C., Carpenter, C. M., Ma, X., Cheng, K., Quynh-Thu Le, Q. T., Sunwoo, J. B., Cheng, Z., Pratx, G., Xing, L.
2016; 43 (10)
- **Single-Cell Characterization of F-18-FLT Uptake with Radioluminescence Microscopy** *JOURNAL OF NUCLEAR MEDICINE*
Sengupta, D., Pratx, G.
2016; 57 (7): 1136-1140
- **Evaluation of a BGO-Based PET System for Single-Cell Tracking Performance by Simulation and Phantom Studies** *MOLECULAR IMAGING*
Ouyang, Y., Kim, T. J., Pratx, G.
2016; 15
- **Droplet Microfluidic Platform for the Determination of Single-Cell Lactate Release.** *Analytical chemistry*
Mongersun, A., Smeenk, I., Pratx, G., Asuri, P., Abbyad, P.
2016; 88 (6): 3257-3263
- **Imaging metabolic heterogeneity in cancer** *MOLECULAR CANCER*
Sengupta, D., Pratx, G.
2016; 15
- **Endoscopic detection of cancer with lensless radioluminescence imaging and machine vision.** *Scientific reports*
Türkcan, S., Naczynski, D. J., Nolley, R., Sasportas, L. S., Peehl, D. M., Pratx, G.
2016; 6: 30737-?
- **Imaging metabolic heterogeneity in cancer.** *Molecular cancer*
Sengupta, D., Pratx, G.
2016; 15: 4
- **Multiscale Framework for Imaging Radio labeled Therapeutics** *MOLECULAR PHARMACEUTICS*
Natarajan, A., Tuerkcan, S., Gambhir, S. S., Pratx, G.
2015; 12 (12): 4554-4560
- **Modular platform for low-light microscopy** *BIOMEDICAL OPTICS EXPRESS*
Kim, T. J., Tuerkcan, S., Ceballos, A., Pratx, G.
2015; 6 (11): 4585-4598
- **Bright Lu203:Eu Thin-Film Scintillators for High-Resolution Radioluminescence Microscopy** *ADVANCED HEALTHCARE MATERIALS*
Sengupta, D., Miller, S., Marton, Z., Chin, F., Nagarkar, V., Pratx, G.
2015; 4 (14): 2064-2070
- **β -Radioluminescence Imaging: A Comparative Evaluation with Cerenkov Luminescence Imaging.** *Journal of nuclear medicine : official publication, Society of Nuclear Medicine*
King, M. T., Carpenter, C. M., Sun, C., Ma, X., Le, Q., Sunwoo, J. B., Cheng, Z., Pratx, G., Xing, L.
2015; 56 (9): 1458-1464
- **beta-Radioluminescence Imaging: A Comparative Evaluation with Cerenkov Luminescence Imaging** *JOURNAL OF NUCLEAR MEDICINE*
King, M. T., Carpenter, C. M., Sun, C., Ma, X., Quynh-Thu Le, Q. T., Sunwoo, J. B., Cheng, Z., Pratx, G., Xing, L.
2015; 56 (9): 1458-1464
- **Efficient Radioisotope Energy Transfer by Gold Nanoclusters for Molecular Imaging** *SMALL*
Volotskova, O., Sun, C., Stafford, J. H., Koh, A. L., Ma, X., Cheng, Z., Cui, B., Pratx, G., Xing, L.

2015; 11 (32): 4002-4008

- **Single-Cell Analysis of [18F]Fluorodeoxyglucose Uptake by Droplet Radiofluidics.** *Analytical chemistry*
Türkcan, S., Nguyen, J., Vilalta, M., Shen, B., Chin, F. T., Pratx, G., Abbyad, P.
2015; 87 (13): 6667-6673
- **Single-Cell Tracking With PET Using a Novel Trajectory Reconstruction Algorithm** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Lee, K. S., Kim, T. J., Pratx, G.
2015; 34 (4): 994-1003
- **X-ray-Induced Shortwave Infrared Biomedical Imaging Using Rare-Earth Nanoprobes.** *Nano letters*
Naczynski, D. J., Sun, C., Türkcan, S., Jenkins, C., Koh, A. L., Ikeda, D., Pratx, G., Xing, L.
2015; 15 (1): 96-102
- **Efficient Radioisotope Energy Transfer by Gold Nanoclusters for Molecular Imaging.** *Small (Weinheim an der Bergstrasse, Germany)*
Volotskova, O., Sun, C., Stafford, J. H., Koh, A. L., Ma, X., Cheng, Z., Cui, B., Pratx, G., Xing, L.
2015
- **Bright Lu2 O3 :Eu Thin-Film Scintillators for High-Resolution Radioluminescence Microscopy.** *Advanced healthcare materials*
Sengupta, D., Miller, S., Marton, Z., Chin, F., Nagarkar, V., Pratx, G.
2015; 4 (14): 2064-70
- **Cerenkov Luminescence Endoscopy: Improved Molecular Sensitivity with beta(-)-Emitting Radiotracers** *JOURNAL OF NUCLEAR MEDICINE*
Carpenter, C. M., Ma, X., Liu, H., Sun, C., Pratx, G., Wang, J., Gambhir, S. S., Xing, L., Cheng, Z.
2014; 55 (11): 1905-1909
- **Fiber-Optic System for Dual-Modality Imaging of Glucose Probes F-18-FDG and 6-NBDG in Atherosclerotic Plaques** *PLOS ONE*
Zaman, R. T., Kosuge, H., Pratx, G., Carpenter, C., Xing, L., McConnell, M. V.
2014; 9 (9)
- **Clinical evaluation of a novel intraoperative handheld gamma camera for sentinel lymph node biopsy.** *Physica medica*
Olcott, P., Pratx, G., Johnson, D., Mitra, E., Niederkohr, R., Levin, C. S.
2014; 30 (3): 340-345
- **L-shell x-ray fluorescence computed tomography (XFCT) imaging of Cisplatin** *PHYSICS IN MEDICINE AND BIOLOGY*
Bazalova, M., Ahmad, M., Pratx, G., Xing, L.
2014; 59 (1): 219-232
- **Seeing the invisible: Direct visualization of therapeutic radiation beams using air scintillation** *MEDICAL PHYSICS*
Fahimian, B., Ceballos, A., Tuerkcan, S., Kapp, D. S., Pratx, G.
2014; 41 (1)
- **X-Ray Luminescence and X-Ray Fluorescence Computed Tomography: New Molecular Imaging Modalities** *IEEE ACCESS*
Ahmad, M., Pratx, G., Bazalova, M., Xing, L.
2014; 2: 1051-1061
- **Detection and quantitation of circulating tumor cell dynamics by bioluminescence imaging in an orthotopic mammary carcinoma model.** *PloS one*
Sasportas, L. S., Hori, S. S., Pratx, G., Gambhir, S. S.
2014; 9 (9): e105079
- **Hard X-ray-induced optical luminescence via biomolecule-directed metal clusters** *CHEMICAL COMMUNICATIONS*
Osakada, Y., Pratx, G., Sun, C., Sakamoto, M., Ahmad, M., Volotskova, O., Ong, Q., Teranishi, T., Harada, Y., Xing, L., Cui, B.
2014; 50 (27): 3549-3551
- **High-Resolution Radioluminescence Microscopy of F-18-FDG Uptake by Reconstructing the beta-Ionization Track** *JOURNAL OF NUCLEAR MEDICINE*
Pratx, G., Chen, K., Sun, C., Axente, M., Sasportas, L., Carpenter, C., Xing, L.
2013; 54 (10): 1841-1846
- **X-ray excitable luminescent polymer dots doped with an iridium(iii) complex.** *Chemical communications*
Osakada, Y., Pratx, G., Hanson, L., Solomon, P. E., Xing, L., Cui, B.

2013; 49 (39): 4319-4321

- **Distributed MLEM: An Iterative Tomographic Image Reconstruction Algorithm for Distributed Memory Architectures** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Cui, J., Pratx, G., Meng, B., Levin, C. S.
2013; 32 (5): 957-967
- **Development of XFCT imaging strategy for monitoring the spatial distribution of platinum-based chemodrugs: Instrumentation and phantom validation** *MEDICAL PHYSICS*
Kuang, Y., Pratx, G., Bazalova, M., Qian, J., Meng, B., Xing, L.
2013; 40 (3)
- **First Demonstration of Multiplexed X-Ray Fluorescence Computed Tomography (XFCT) Imaging** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Kuang, Y., Pratx, G., Bazalova, M., Meng, B., Qian, J., Xing, L.
2013; 32 (2): 262-267
- **X-ray acoustic computed tomography with pulsed x-ray beam from a medical linear accelerator** *MEDICAL PHYSICS*
Xiang, L., Han, B., Carpenter, C., Pratx, G., Kuang, Y., Xing, L.
2013; 40 (1)
- **Radioluminescence Microscopy: Measuring the Heterogeneous Uptake of Radiotracers in Single Living Cells** *PLOS ONE*
Pratx, G., Chen, K., Sun, C., Martin, L., Carpenter, C. M., Olcott, P. D., Xing, L.
2012; 7 (10)
- **Intraoperative Imaging of Tumors Using Cerenkov Luminescence Endoscopy: A Feasibility Experimental Study** *JOURNAL OF NUCLEAR MEDICINE*
Liu, H., Carpenter, C. M., Jiang, H., Pratx, G., Sun, C., Buchin, M. P., Gambhir, S. S., Xing, L., Cheng, Z.
2012; 53 (10): 1579-1584
- **Investigation of X-ray Fluorescence Computed Tomography (XFCT) and K-Edge Imaging** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Bazalova, M., Kuang, Y., Pratx, G., Xing, L.
2012; 31 (8): 1620-1627
- **Radioluminescent nanophosphors enable multiplexed small-animal imaging** *OPTICS EXPRESS*
Carpenter, C. M., Sun, C., Pratx, G., Liu, H., Cheng, Z., Xing, L.
2012; 20 (11): 11598-11604
- **Ultrafast and scalable cone-beam CT reconstruction using MapReduce in a cloud computing environment** *MEDICAL PHYSICS*
Meng, B., Pratx, G., Xing, L.
2011; 38 (12): 6603-6609
- **Monte Carlo simulation of photon migration in a cloud computing environment with MapReduce** *JOURNAL OF BIOMEDICAL OPTICS*
Pratx, G., Xing, L.
2011; 16 (12)
- **Fully 3D list-mode time-of-flight PET image reconstruction on GPUs using CUDA** *MEDICAL PHYSICS*
Cui, J., Pratx, G., Prevrhal, S., Levin, C. S.
2011; 38 (12): 6775-6786
- **Toward IMRT 2D dose modeling using artificial neural networks: A feasibility study** *MEDICAL PHYSICS*
Kalantzis, G., Vasquez-Quino, L. A., Zalman, T., Pratx, G., Lei, Y.
2011; 38 (10): 5807-5817
- **Toward real-time Monte Carlo simulation using a commercial cloud computing infrastructure** *PHYSICS IN MEDICINE AND BIOLOGY*
Wang, H., Ma, Y., Pratx, G., Xing, L.
2011; 56 (17): N175-N181
- **Online detector response calculations for high-resolution PET image reconstruction** *PHYSICS IN MEDICINE AND BIOLOGY*
Pratx, G., Levin, C.
2011; 56 (13): 4023-4040
- **Synthesis and Radioluminescence of PEGylated Eu³⁺-doped Nanophosphors as Bioimaging Probes** *ADVANCED MATERIALS*

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- Sun, C., Pratx, G., Carpenter, C. M., Liu, H., Cheng, Z., Gambhir, S. S., Xing, L.
2011; 23 (24): H195-H199
- **Limited-angle x-ray luminescence tomography: methodology and feasibility study** *PHYSICS IN MEDICINE AND BIOLOGY*
Carpenter, C. M., Pratx, G., Sun, C., Xing, L.
2011; 56 (12): 3487-3502
 - **GPU computing in medical physics: A review** *MEDICAL PHYSICS*
Pratx, G., Xing, L.
2011; 38 (5): 2685-2697
 - **Convex Optimization of Coincidence Time Resolution for a High-Resolution PET System** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Reynolds, P. D., Olcott, P. D., Pratx, G., Lau, F. W., Levin, C. S.
2011; 30 (2): 391-400
 - **Fast List-Mode Reconstruction for Time-of-Flight PET Using Graphics Hardware** *IEEE TRANSACTIONS ON NUCLEAR SCIENCE*
Pratx, G., Surti, S., Levin, C.
2011; 58 (1): 105-109
 - **Facile Synthesis of Amine-Functionalized Eu³⁺-Doped La(OH)₃ Nanophosphors for Bioimaging** *NANOSCALE RESEARCH LETTERS*
Sun, C., Carpenter, C., Pratx, G., Xing, L.
2011; 6
 - **Facile Synthesis of Amine-Functionalized Eu(3+)-Doped La(OH)₃ Nanophosphors for Bioimaging.** *Nanoscale research letters*
Sun, C., Carpenter, C., Pratx, G., Xing, L.
2011; 6 (1): 24
 - **X-Ray Luminescence Computed Tomography via Selective Excitation: A Feasibility Study** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Pratx, G., Carpenter, C. M., Sun, C., Xing, L.
2010; 29 (12): 1992-1999
 - **Tomographic molecular imaging of x-ray-excitabile nanoparticles** *OPTICS LETTERS*
Pratx, G., Carpenter, C. M., Sun, C., Rao, R. P., Xing, L.
2010; 35 (20): 3345-3347
 - **Effects of multiple-interaction photon events in a high-resolution PET system that uses 3-D positioning detectors** *MEDICAL PHYSICS*
Gu, Y., Pratx, G., Lau, F. W., Levin, C. S.
2010; 37 (10): 5494-5508
 - **Hybrid x-ray/optical luminescence imaging: Characterization of experimental conditions** *MEDICAL PHYSICS*
Carpenter, C. M., Sun, C., Pratx, G., Rao, R., Xing, L.
2010; 37 (8): 4011-4018
 - **Bayesian reconstruction of photon interaction sequences for high-resolution PET detectors** *PHYSICS IN MEDICINE AND BIOLOGY*
Pratx, G., Levin, C. S.
2009; 54 (17): 5073-5094
 - **Fast, Accurate and Shift-Varying Line Projections for Iterative Reconstruction Using the GPU** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
Pratx, G., Chinn, G., Olcott, P. D., Levin, C. S.
2009; 28 (3): 435-445