

CURRICULUM VITAE

PUI-TAK (PETER) LEUNG
(May, 2012)

Education

<u>Degree</u>	<u>Year</u>	<u>Subject and institution</u>
Ph.D.	1982	Physics, State University of New York (SUNY) at Buffalo, U.S.A.
M.A.	1979	Physics, SUNY at Buffalo, U.S.A.
M.Ed.	1979	Science Education, SUNY at Buffalo, U.S.A.
B.Sc.	1976	Physics, The Chinese University of Hong Kong, H.K.

Employment

<u>Title and institution</u>	<u>Dates</u>
Professor of Physics Portland State University, Oregon	September, 1996 - present
Affiliate Staff Scientist Pacific Northwest National Laboratories, Washington	December, 1994 - December, 1997
Associate Professor of Physics Portland State University, Oregon	September, 1991 - August 1996
Visiting Scientist IBM Almaden Research Center, California	June, 1991 - June, 1992
Consultant Amersham International plc Buckinghamshire, England	May, 1989 - May, 1992
Assistant Professor of Physics Portland State University, Oregon	September, 1988 - August, 1991
Postdoctoral Research Fellow Department of Physics, SUNY at Buffalo, New York	August, 1985 - August, 1988
Associate Professor of Physics Tamkang University, Taiwan	August, 1982 - July, 1985
Teaching Assistant Department of Physics, SUNY at Buffalo, New York	September, 1977 - July, 1982

Research Areas

- Plasmonics and Metamaterials
- Theoretical Optical and Atomic Physics
- Theoretical Surface Physics
- Numerical Modeling
- Semiconductor Surface Cleaning and Processing
- Sensors and Device Design

Recent Research Activities

The following projects have been going on in collaboration with outside research groups as well as graduate students here at PSU :

(i) **Theoretical Studies of Plasmonics and Nano-Optics:**

We have been studying the possibly novel optical properties of metallic nanoparticles and nanoshells. These properties originated mainly from the localized collective excitation of the free electrons at the particle surfaces (surface plasmon excitation). These excitations can lead to very strong local evanescent fields which can be applied to various spectroscopy and sensor technologies. Our interest is mainly in the possible quantum effect on these excitations as the metallic structure gets to ultra-small sizes (below ~ 10 nm). While such dimensions are small enough for one to start worrying about possible quantum effects, they still require huge amount of computation starting with the Schrodinger equation for the system. To compromise, we have adopted a phenomenological approach using the formulations from nonlocal optics. We have also applied our results to study possible novel spectroscopic features such as those from surface enhanced Raman scattering (SERS) from metallic nanoshells.

(ii) **Surface Physics:**

Besides nanostructures, our long-term effort has been devoted to the study of various optical phenomena at metallic and semiconducting surfaces. Our main effort has been in the theoretical modeling of various phenomena involving the interactions of light and admolecules/particles in the vicinity of a solid surface. This ranges from laser-induced particle-removal from contaminated semiconductor surfaces, to the application of surface plasmon resonance (SPR) to the modification of molecular fluorescence and biosensing at metal surfaces. In particular, work has been carried out in the modeling of SERS and fluorescence of molecules near complex structures such as a sinusoidal grating or a microcavity made of multilayer structure. For the latter system, we have developed a relatively powerful approach to the modeling of the phenomena using the Green dyadic formulation.

For the research in SPR optical sensing which started in 1989 with the group from Amersham International plc in England, we have been in collaboration lately with the research group at the National Taiwan Ocean University in the exploration of various physical (optical) factors which will enhance the sensitivity of the sensor. To this end, we have studied the technique via phase measurements; the possible enhancement using a "particle (colloidal gold) linkage technique"; and the effects on the sensitivity due to the variation of temperatures in the sensing environment.

Other novel optical phenomena at metallic surfaces have also been studied from time to time. One interesting discovery from our recent study is the possibility of observing *very large* backward lateral displacement of the incident beam (known as negative Goos-Hanchen shift) at a vacuum-metal interface (Pub. # 82). This effect has since been verified by experiments [see, Opt. Exp. **15**, 15928 (2007)]. Possible application of this displacement to optical sensing was also explored (Pub. #83).

Another collaboration took place in 1991 with the IBM (Almaden) group in the study of the laser cleaning technique of contaminated surfaces. In this technique, a liquid layer (microns thick) is deposited on the surface and exploded by the fast heating of an excimer laser pulse (~20 ns). This project has since been completed by the IBM group, although we still keep our interest alive on the study of optothermal effects from the interaction of a solid surface with a laser pulse.

(iii) **Interaction of Ionizing Charged Particles with Matter:**

This was my original Ph.D. research area. One of our previous work on the correction of Bethe's stopping power theory (Pub. #34) has been cited to be significant in the comparison of theories with experiments [Phys. Rev. A **46**, 5761 (1992), Nucl. Instr. and Meth.in Phys.Res.B **107**, 56 (1996), *ibid* **187**, 285 (2002)]. We have recently launched a project to improve our previous 1989 work. Our first step is to improve the relativistic corrections on the Bethe sum rule which the 1989 theory applied (Pubs. # 58 and 79). The next step will involve a generalization of the results to include exchange effects (according to the Pauli exclusion principle) so that incident electrons can also be treated.

Significant Professional Development Activities

- (1) **Outstanding Referee**, recognition from American Physical Society, 2012.
- (2) **Visiting Professor** at National Taiwan Ocean University, 2008, 2009, 2010, 2011, 2012.
- (3) **Visiting Scholar** at National Taiwan University, R. O. C.: summer, 2010; summer, 2011.
- (4) **Fulbright Scholar and Visiting Professor** at National Taiwan University, R. O. C. : August 1, 2008 to July 31, 2009.
- (5) **National Research Council Panelist** : March, 2001; March, 2002; March, 2003; March, 2005; March 2006; March 2007; March 2008.
- (6) **Affiliate Staff Scientist** at Pacific Northwest National Laboratories (PNNL), Washington : December, 1994 – December 1997
- (7) **Visiting Lecturer** at Tohoku University in Sendai, Japan : August 1 - 4, 1994
- (8) **Visiting Scholar** at Academia Sinica of Taiwan, R. O. C. : September, 2003; August, 2001; August, 2000; August 1, 1999 – March 31, 2000; July 16 - August 15, 1997; July 1 - August 31, 1996; June 4 - 30, 1994
- (9) **Visiting Scientist** at the IBM Almaden Research Center, California : June, 1991 - June,1992.
- (10) **Consultant** to the Amersham International public limited company, Buckinghamshire, England : May, 1989 - May 1992.

- (11) **Invited visitor** to the Pollards Wood Laboratories, England - the central research facilities of Amersham International plc : September, 1989.
- (12) **Invited speaker** at the SPIE (Society of Photo-Optical Instrumentation Engineers) International Conference in Los Angeles, California : January, 1989.

Grants, Fellowships, and Awards

- (1) Research support for sabbatical leave at NTU from the National Research Council of Taiwan, NTD 197,0000 (~ \$66,000), 2008-09.
- (2) Fulbright Research Scholarship for studies in theoretical plasmonics, on my sabbatical visit at National Taiwan University, NTD 400,000 (~ \$13,500), 2008-09.
- (3) John Eliot Allen Outstanding Teaching Awards, \$500, 2008.
- (4) Portland State University Faculty Enhancement Program for proposal entitled “Computational Studies of the Quantum Effects in Plasmonics with Metallic Nanoparticles”, \$2,250, 2008-09.
- (5) Intel Corporation Research Grant for proposal entitled “Modeling Microscopic Optical Properties of Nanostructures: Applied computational approach”, \$50,000, 2005-06.
- (6) Portland State University Faculty Development Grant for proposal entitled “Theoretical Studies of the Optical Properties of Metallic Nanostructures”, \$2,700, 2005-06.
- (7) John Eliot Allen Outstanding Teaching Awards, \$500, 2005.
- (8) Portland State University Faculty Development Grant for proposal entitled “Studies of the Theoretical and Computational Aspects of Field Emission from Carbon Nanotubes”, \$7,614, 2002-03.
- (9) John Eliot Allen Outstanding Teaching Awards, \$500, 2002.
- (10) M.J.Murdock Charitable Trust Grant for proposal entitled “Quantum Mechanics and Nanoparticle Sciences”, \$14,000, 2001-03.
- (11) Portland State University Faculty Development Grant for proposal entitled “Proposed New Directions in the of Research of Nano-particle Sciences”, \$2,250, 2000-01.
- (12) John Eliot Allen Outstanding Teaching Awards, \$400, 1999.
- (13) Portland State University Faculty Development Grant for proposal entitled “Studies of Energy-Deposition from Particle Beams for Cancer Radiotherapy”, \$6,622, 1998-99.
- (14) Portland State University Faculty Development Grant for proposal entitled “Studies of Photo-molecular Processes at Structured Metal Surfaces”, \$2,500, 1997-98.
- (15) Research Grant received from Oregon Medical Systems for proposal entitled “Computational Electrodynamics Modeling of a Cardiac Monitoring Device”, \$ 39,658, 1997.
- (16) US Department of Energy Faculty Fellowship for research in “Near Field Optics”, \$ 8,876, 1995.

- (17) Portland State University Faculty Development Grant for proposal entitled “ Optimization of the Laser Cleaning Technique for Treatment of Contaminated Surfaces ”, \$2,250, 1994-95.
- (18) IBM Equipment Grant for proposal entitled " Opto-thermal Processing at Solid Surfaces ", estimated market value : \$ 4,250, 1992.
- (19) Portland State University Research and Scholarship Grant Program for proposal entitled " Optical Biosensing and Opto-thermal Processing at Solid Surfaces ", \$4,000, 1992-1993.
- (20) Portland State University Outstanding Junior Faculty Award for proposal entitled " Optical Biosensing and Opto-thermal Processing at Solid Surfaces ", \$4,000, 1992-1993.
- (21) IBM Visiting Scientist Fellowship, (\$64,000 + \$5,000 allowance), 1991-1992, to perform research in " Laser Cleaning of Surfaces " at the Almaden Research Center.
- (22) Award of a complete set of computation equipment (valued at \$ 7,000) by Amersham International plc (1989) for the joint venture in research and development of " the Surface Plasmon based Biosensor " .
- (23) Portland State University Research and Publications Committee for proposal entitled " Investigation of Possible Novel Photophysical and Photochemical Processes at Corrugated Metal Surfaces and Thin Films ", \$700, 1990-1991.

List of Publications and Recent Presentations

Refereed Journal Articles (in reversed chronological order) :

- (112) H. Y. Chung, **P. T. Leung**, and D. P. Tsai, “ Equivalence between the mechanical model and energy-transfer theory for the classical decay rates of molecules near a spherical particle ” **J. Chem. Phys.** **136**, 184106 (2012).
- (111) C. W. Chen, H.-P. Chiang, D. P. Tsai, and **P. T. Leung**, " Temperature dependence of the surface-plasmon-induced Goos-Hanchen shifts " **Appl. Phys. B** **107**, 111-118 (2012).
- (110) H. Y. Chung, **P. T. Leung**, and D. P. Tsai, "An effective medium approach to the dynamic optical response of a graded index plasmonic nanoparticle" **J. Opt. Soc. Am. B** **29**, 970-976 (2012).
- (109) H. Y. Chung, **P. T. Leung**, D. P. Tsai, " Fluorescence characteristics of a molecule in the vicinity of a plasmonic nanomatryoska: nonlocal optical effects " **Opt. Commun.** **285**, 2207-2211 (2012).
- (108) H. Y. Chung, **P. T. Leung**, and D. P. Tsai, “ Modified long wavelength approximation for the optical response of a graded index plasmonic nanoparticle” **Plasmonics** **7**, 13-18 (2012).
- (107) C. W. Chen, Y. W. Gu, H.-P. Chiang, E. J. Sanchez, and **P. T. Leung**, “ Goos-Hanchen shift at an interface of a composite material: effects of particulate clustering ” **Appl. Phys. B** **104**, 647-652 (2011).

- (106) H. Y. Chung, G. Y. Guo, H. P. Chiang, D. P. Tsai, and **P. T. Leung**, “ Accurate description of the optical response of a multilayered spherical system in the long wavelength approximation ” **Phys. Rev. B** **82**, 165440 (2010).
- (105) H. Y. Chung, **P. T. Leung**, and D. P. Tsai, “ Enhanced intermolecular energy transfer in the vicinity of a plasmonic nanorice ” **Plasmonics** **5**, 363-368 (2010).
- (104) C. W. Chen, H. Y. Chung, H. -P. Chiang, J. Y. Lu, R. Chang, D. P. Tsai, and **P. T. Leung**, “ Nonlocality and particle-clustering effects on the optical response of composite materials with metallic nanoparticles **Appl. Phys. A** **101**, 191 (2010).
- (103) C. W. Chen, L. S. Liao, H. P. Chiang, and **P. T. Leung**, “ Temperature effects on the polarizability of mesoscopic metallic nanoparticles ” **Appl. Phys. B** **99**, 223 (2010).
- (102) **P. T. Leung** and K. Young, “ Gauge invariance and reciprocity in quantum mechanics ” **Phys. Rev. A** **81**, 032107 (2010).
- (101) H. Y. Xie, **P. T. Leung**, and D. P. Tsai, “ Reciprocity theorem for nonlocal optics: completion of proof and application to spectroscopic analysis ” **J. Opt. A** **12**, 035006 (2010).
- (100) H. Y. Xie, H. Y. Chung, **P. T. Leung**, and D. P. Tsai, “ Plasmonic enhancement of Forster energy transfer at a metallic nanoparticle: nonlocal optical effects ” **Phys. Rev. B** **80**, 155448 (2009).
- (99) H. Y. Chung, H. Y. Xie, **P. T. Leung**, and D. P. Tsai, “ Optical properties of metallic nanoshell composites: effects of temperature and particle-clustering ” **Solid State Commun.** **149**, 2151-2154 (2009).
- (98) H. Y. Chung, **P. T. Leung**, and D. P. Tsai, “ Dynamic modifications of polarizability for large metallic spheroidal nanoshells ” **J. Chem. Phys** **131**, 124122 (2009).
- (97) H. Y. Xie, **P. T. Leung**, and D. P. Tsai, “ Clarification and extension of the optical reciprocity theorem ” **J. Math. Phys.** **50**, 072901 (2009).
- (96) H. Y. Xie, **P. T. Leung**, and D. P. Tsai, “ Molecular decay rates and emission frequencies in the vicinity of an anisotropic metamaterial ” **Solid State Commun.** **149**, 625-629 (2009).
- (95) J. H. Huang, R. Chang, **P. T. Leung** and D. P. Tsai, “ Nonlinear dispersion relation for surface plasmon at a metal-Kerr medium interface ” **Opt Commun.** **282**, 1412-1415 (2009).
- (94) **P. T. Leung** and G. J. Ni, " Reply to comment on 'A note on the formulation of the Maxwell equations for a macroscopic medium" **Eur. J. Phys.** **30**, L17-L18 (2009).
- (93) H. Y. Xie, **P. T. Leung** and D. P. Tsai, “ General proof of optical reciprocity for nonlocal electrodynamics ” **J. Phys. A.** **42**, 045402 (2009).
- (92) H. Y. Xie, **P. T. Leung**, and D. P. Tsai, “ General validity of reciprocity in quantum mechanics ” **Phys. Rev. A** **78**, 064101 (2008).

- (91) C. W. Chen, H.-P. Chiang, **P. T. Leung**, and D. P. Tsai, "Temperature dependence of enhanced optical absorption and Raman spectroscopy from metallic nanoparticles" **Solid State Commun.** **148**, 413-416 (2008).
- (90) P. Dragulin and **P. T. Leung**, "Green dyadic for the Proca fields" **Phys. Rev. E** **78**, 026605 (2008).
- (89) **P. T. Leung** and G. J. Ni, "A note on the formulation of the Maxwell equations for a macroscopic medium" **Eur. J. Phys.** **29**, N37-N41 (2008).
- (88) **P. T. Leung** and R. Chang, "Reciprocity in nonlocal nanooptics" **J. Opt. A.**, **10**, 075201 (2008).
- (87) **P. T. Leung**, Z. W. Chen and H. P. Chiang, "Addendum to 'Large negative Goos Hanchen shift at metal surfaces'" **Opt. Commun.** **281**, 1312-1313 (2008).
- (86) **P. T. Leung**, "Singular behaviour of the electrodynamic fields of an oscillating dipole" **Eur. J. Phys.** **29**, 137-141 (2008).
- (85) Z. E. Goude and **P. T. Leung**, "Surface Enhanced Raman Scattering from Metallic Nanoshells with Nonlocal Dielectric Response" **Solid State Commun** **143**, 416-420 (2007).
- (84) C. W. Chen, C. H. Lin, H. P. Chiang, Y. -C. Liu, **P. T. Leung** and W. S. Tse, "Temperature Dependence of the Sensitivity of a Long-Range Surface Plasmon Optical Sensor" **Appl. Phys A** **89**, 377-380 (2007).
- (83) C.-W. Chen, W.-C. Lin, L.-S. Liao, Z.-H. Lin, H.-P. Chiang, **P. T. Leung**, E. Sijercic and W. S. Tse, "Optical Temperature Sensing Based on the Goos-Hanchen Effect" **Appl. Optics** **46**, 5347-5351 (2007).
- (82) **P. T. Leung**, Z. W. Chen and H. P. Chiang, "Large negative Goos Hanchen shift at metal surfaces" **Opt. Commun.** **276**, 206-208 (2007).
- (81) J. Vielma and **P. T. Leung**, "Nonlocal optical effects on the fluorescence and decay rates for admolecules at a metallic nanoparticle" **J. Chem. Phys.** **126**, 194704 (2007).
- (80) H.-P. Chiang, Z. W. Chen, J. J. Wu, H. L. Li, T. Y. Lin, E. J. Sánchez and **P. T. Leung**, "Effects of temperature on the surface plasmon resonance at the metal-semiconductor interface of a Schottky barrier" **Thin Solid Films** **515**, 6953-6961 (2007).
- (79) H. Sinky and **P. T. Leung**, "Relativistic corrections to a generalized sum rule" **Phys. Rev. A** **74**, 034703 (2006).
- (78) **P. T. Leung** and G. J. Ni, "On the singularities of the electrostatic and magnetostatic dipole fields" **Eur. J. Phys.** **27**, N1-N3 (2006).
- (77) R. Chang and **P. T. Leung**, "Nonlocal optical effects on the optical and molecular interactions with metallic nanoshells" **Phys. Rev. B** **73**, 125438 (2006); *ibid* **75**, 079901(E) (2007).

- (76) H. P. Chiang, J. L. Lin, R. Chang, Z. W. Chen and **P. T. Leung**, " High resolution angular measurement using surface-plasmon-resonance heterodyne interferometry at optimal incident wavelengths " **Proc. SPIE** vol. **6002**, 600218: 1-10 (2005).
- (75) R. Chang and **P. T. Leung**, " Theoretical study of nonlocal effects in the optical response of metallic nanoshells" **Proc. SPIE** vol. **6002**, 60020V: 1-10 (2005).
- (74) H. P. Chiang, J. L. Lin, R. Chang, S. Y. Su and **P. T. Leung**, " High resolution angular measurement using surface-plasmon-resonance via phase interrogation at optimal incident wavelengths " **Opt. Lett.** **30**, 2727-2729 (2005).
- (73) Railing Chang, H.-P. Chiang, **P. T. Leung**, D. P. Tsai and W. S. Tse, " Nonlocal effects in the optical response of composite materials with metallic nanoparticles " **Solid State Commun.** **133**, 315-320 (2005); erratum: *ibid.* **137**, 343 (2006).
- (72) H. P. Chiang, H. T. Yeh, C. M. Chen, J. C. Wu, S. Y. Su, R. Chang, Y. J. Wu, D. P. Tsai, S. U. Jen, and **P. T. Leung**, " Surface plasmon resonance monitoring of temperature via phase measurement" **Opt. Commun.** **241**, 409-418 (2004)
- (71) **P. T. Leung**, " A note on the 'system-free' expressions of Maxwell's equations " **Eur. J. Phys.** **25**, N1-N4 (2004).
- (70) R. Chang, H. P. Chiang, **P. T. Leung**, and W. S. Tse, " Nonlocal electrodynamic effects in the optical excitation of the surface plasmon " **Opt. Commun.** **225**, 353-361 (2003).
- (69) H. P. Chiang, Y. C. Wang, and **P. T. Leung**, " Effect of temperature on the incident angle-dependence of the sensitivity for surface plasmon resonance spectroscopy " **Thin Solid Films** **425**, 135-138 (2003).
- (68) M. H. Hider and **P. T. Leung**, " Nonlocal electrodynamic modeling of fluorescence characteristics for molecules in a spherical cavity ", **Phys. Rev. B** **66**, 195106 (2002).
- (67) H. P. Chiang, A. H. La Rosa, **P. T. Leung**, K. P. Li, and W. S. Tse, " Optical spectroscopy for single-molecules near a microstructure at varying substrate temperatures " **Opt. Commun.** **205**, 343-350 (2002).
- (66) R. L. Hartman and **P. T. Leung**, " Dynamical theory for modeling dipole-dipole interactions in a microcavity: The Green dyadic approach " **Phys. Rev. B** **64**, 193308 (2001).
- (65) H. P. Chiang, Y. C. Wang, **P. T. Leung**, and W. S. Tse, " A theoretical model for the emperature-dependent sensitivity of the optica sensor based on surface plasmon resonance " **Opt. Commun.** **188**, 283-289 (2001).
- (64) R. Chang, **P. T. Leung**, S. H. Lin and W. S. Tse, " Surface-enhanced Raman scattering at cryogenic substrate temperatures " **Phys. Rev. B** **62**, 5168-5173 (2000).
- (63) R. L. Hartman, **P. T. Leung** and S. M. Cohen, " Molecular fluorescence in the vicinity of a gradient-index medium " **J. Opt. Soc. Am. A** **17**, 933-936 (2000).

- (62) H. P. Chiang, **P. T. Leung** and W. S. Tse, "Remark on the substrate-temperature dependence of surface-enhanced Raman scattering" **J. Phys. Chem. B** 104, 2348-2350 (2000).
- (61) **P. T. Leung**, "Addendum: 'Bethe stopping-power theory for heavy target atoms'" **Phys. Rev. A** 60, 2562-2564 (1999); **A** 63, 069902 (2001) (E).
- (60) S. M. Cohen and **P. T. Leung**, "Comment on 'Relativistic correction of the generalized oscillator strength sum rules'" **Phys. Rev. A** 59, 4847 (1999).
- (59) R. L. Hartman, S. M. Cohen and **P. T. Leung**, "A note on the Green Dyadic calculation of the decay rates for admolecules at multiple planar interfaces" **J. Chem. Phys.** 110, 2189-2194 (1999).
- (58) S. M. Cohen and **P. T. Leung**, "General formulation of the semirelativistic approach to atomic sum rules" **Phys. Rev. A** 57, 4994-4997 (1998).
- (57) H. P. Chiang, **P. T. Leung** and W. S. Tse, "The surface plasmon enhancement effect on adsorbed molecules at elevated temperatures" **J. Chem. Phys.** 108, 2659-2660 (1998).
- (56) W. L. Blacke and **P. T. Leung**, "Molecular fluorescence at a rough surface: the orientation effects" **Phys. Rev. B** 56, 12625-12631 (1997).
- (55) **P. T. Leung**, "Emission frequency of single molecules at a metallic aperture: the applicability of the image theory" **Opt. Commun.** 136, 360-364 (1997); 139, 336 (1997).
- (54) H. P. Chiang, **P. T. Leung** and W. S. Tse, "Optical properties of composite materials at high temperatures" **Solid State Commun.** 101, 45-50 (1997).
- (53) **P. T. Leung**, M. H. Hider and E. J. Sanchez, "Surface enhanced Raman scattering at elevated temperatures" **Phys. Rev. B** 53, 12659-12662 (1996).
- (52) R. X. Bian, R. C. Dunn, X. S. Xie and **P. T. Leung**, "Single molecule emission characteristics in near-field microscopy" **Phys. Rev. Letts.** 75, 4772-4775 (1995).
- (51) **P. T. Leung** and W. S. Tse, "Nonlocal electrodynamic effect on the enhancement factor for surface enhanced Raman scattering" **Solid State Commun.** 95, 39-44 (1995).
- (50) T. Xiong, **P. T. Leung** and T. F. George, "Modeling of decay rates for molecules at an island surface" **J. Chin. Chem. Soc.** 42, 249-254 (1995).
- (49) **P. T. Leung** and T. F. George, "Molecular fluorescence spectroscopy in the vicinity of a microstructure" **J. de Chim. Phys. (France)** 92, 226-247 (1995).
- (48) **P. T. Leung**, "Magnetic monopole and Poynting's theorem" **Euro. J. Phys.** 16, pp. 43-44 (1995).
- (47) **P. T. Leung**, D. Pollard-Knight, G. P. Malan and M. F. Finlan, "Modelling of particle - enhanced ensitivity of the surface-plasmon-resonance biosensor" **Sensors and Actuators B** 22, pp. 175-180 (1994).
- (46) M. J. Pliska, E. D. Sanchez, **P. T. Leung** and T. F. George, "Effect of particle-clustering on decay rates of admolecules at the interface of a composite material substrate" **Solid State Commun.** 89, pp. 397-401 (1994).

- (45) N. Do, L. Klees, A. C. Tam, **P. T. Leung** and W. P. Leung, " Photodeflection probing of the explosion of a liquid film in contact with a solid heated by pulsed excimer laser irradiation " **J. App. Phys.** **74**, pp. 1534-1538 (1993).
- (44) H. K. Park, X. Xu, C. P. Grigoropoulos, N. Do, L. Klees, **P. T. Leung** and A. C. Tam, " Transient optical transmission measurement in excimer-laser irradiation of amorphous silicon films " **J. Heat Transfer** **115**, pp. 178-183 (1993).
- (43) **P. T. Leung** and M. H. Hider, " Nonlocal electrodynamic modeling of frequency shifts of molecules at rough metal surfaces " **J. Chem. Phys.** **98**, pp. 5019-5022 (1993).
- (42) E. Bodegom and **P. T. Leung**, " A surprising twist to a simple capacitor problem " **Euro. J. Phys.** **14**, pp. 57-58 (1993).
- (41) O. Yavas, N. Do, A. C. Tam, **P. T. Leung**, W. P. Leung, H. K. Park, C. P. Grigoropoulos, J. Boneberg and P. Leiderer, " Temperature dependence of optical properties for amorphous silicon at wavelengths of 632.8 and 752 nanometer " **Opt. Lett.** **18**, pp. 540-542 (1993).
- (40) A. C. Tam, N. Do, L. Klees, **P. T. Leung** and W. P. Leung, " Explosion of a liquid film in contact with a pulse-heated solid surface detected by the probe-beam deflection method " **Opt. Lett.** **17**, pp. 1809-1811 (1992).
- (39) **P. T. Leung**, N. Do, L. Klees, W. P. Leung, F. Tong, L. Lam, W. Zapka and A. C. Tam, " Transmission studies of explosive vaporization of a transparent liquid film on an opaque solid surface induced by excimer-laser-pulsed irradiation " **J. App. Phys.** **72**, pp.2256-2263 (1992).
- (38) H. K. Park, X. Xu, C. P. Grigoropoulos, N. Do, L. Klees, **P. T. Leung** and A. C. Tam, " Temporal profile of optical transmission probe for pulsed-laser heating of amorphous silicon films " **App. Phys. Lett.** **61**, pp. 749-751 (1992).
- (37) N. Do, L. Klees, **P. T. Leung**, F. Tong, W. P. Leung and A. C. Tam, " Temperature dependence of optical constants for amorphous silicon " **App. Phys. Lett.** **60**, pp. 2186-2188 (1992).
- (36) M. H. Hider and **P. T. Leung**, " Frequency shifts of molecules at rough metal surfaces " **Phys. Rev. B** **44**, pp. 3262-3265 (1991).
- (35) **P. T. Leung**, " Decay of molecules at spherical surfaces: nonlocal effects " **Phys. Rev. B** **42**, pp. 7622-7625 (1990).
- (34) **P. T. Leung**, " Bethe stopping power theory for heavy target atoms " **Phys. Rev. A** **40**, pp. 5417-5419 (1989).
- (33) **P. T. Leung**, Y. S. Kim and T. F. George, " Photochemistry at corrugated thin metal films : a phenomenological approach " **SPIE Conference Proceeding** **1056**, pp. 139-146 (1989).
- (32) **P. T. Leung**, Y. S. Kim and T. F. George, " Photoabsorption of molecules at corrugated thin metal films." **J.Chem. Phys.** **90**, pp. 7472-7477 (1989).

- (31) **P. T. Leung**, Y. S. Kim and T. F. George, " Decay of molecules at corrugated thin metal films " **Phys. Rev. B** **39**, pp. 9888-9893 (1989).
- (30) **P. T. Leung** and T. F. George, " Molecular spectroscopy at corrugated metal surfaces " **Spectroscopy** **4**, pp. 35-41 (1989).
- (29) D. A. Jelski, **P. T. Leung** and T. F. George, " Photochemistry at structured surfaces: a classical electromagnetic approach " **Int. Rev. Phys. Chem.** **7**, pp. 179-207 (1988).
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Presentations at Research Institutions/Professional Meetings
(Including Publication of Abstracts)

- (1) "Optical properties of inhomogeneous metallic particles"—presented at the Center for Theoretical Sciences of National Taiwan University in Taipei, Taiwan (August 12, 2011).
- (2) "Plasmonic effects on the lateral displacements of light beam at material interfaces"—presented at the National Center for Theoretical Sciences in Taipei, Taiwan (July 23, 2010).
- (3). "Nonlinear and nonlocal effects on dispersion relation for surface plasmon at a metal/Kerr medium interface" presented with J. H. Huang and R. Chang in the American Physical Society meeting in Portland, Oregon (March, 16, 2010).
- (4) "Plasmonic enhancement of Forster energy transfer at a metallic nanoshell: nonlocal optical effects" presented with H. Y. Xie, H. Y. Chung and D. P. Tsai in the American Physical Society meeting in Portland, Oregon (March, 17, 2010).
- (5) "Dynamic modifications of polarizability for large metallic spheroidal nanoshells" presented with H. Y. Chung and D. P. Tsai in the American Physical Society meeting in Portland, Oregon (March, 19, 2010).
- (6) "Unusual lateral displacements of light beam at material interfaces" – presented at the Institute of Optoelectronic Sciences at the National Taiwan Ocean University, Keelung, Taiwan (June 11, 2009).
- (7) "Research in plasmonics and surface optics: Two roles of a theoretical physicist" – presented at the Physics Department of the National Sun Yat San University, Kaoshiung, Taiwan (May 7, 2009).
- (8) "Molecular processes via plasmonic interactions with metallic nanoparticles" - **invited talk** at *Nanophotonics and Metamaterials International Conference* in Taipei, Taiwan (May 1, 2009).
- (9) "Electromagnetic fields with finite photon mass" – presented at the Physics Department of the National Taiwan University, Taipei, Taiwan (November 4, 2008).
- (10) "Theoretical research in plasmonics and surface optics" – presented at the Physics Department of the National Taiwan University, Taipei, Taiwan (October 20, 2008).
- (11) "Effects of temperature on the surface plasmon resonance at a metal-semiconductor interface" - presented with H. P. Chiang et al, at the International Workshop on Plasmonics and Applications for Nanotechnologies," Singapore (Dec. 5-7, 2006).
- (12) " Theoretical studies of nonlocal effects in the optical response of metallic nanoshells " and "High resolution angular measurement using surface-plasmon-resonance heterodyne interferometry at optimal incident wavelengths " – presented with R. L. Chang and H.-P. Chiang et al, at the SPIE (Society of Photo-Optical Instrumentation Engineers) OpticsEast Conference in Boston, Massachusetts (October, 2005).

- (13) " Molecular fluorescence at surfaces: an overview " – presented at the Physics Department of Zhongshan University in Guangzhou, China (September, 2003).
- (14) " Theoretical studies on the substrate temperature dependence of surface-enhanced Raman scattering" **invited paper** co-presented at the XVIIth International Conference On Raman Spectroscopy (ICORS 2000), in Beijing, China (August, 2000). Abstract published in *Proceedings of The XVIIth International Conference on Raman Spectroscopy*, pp 656-657 (John Wiley & Sons, New York, 2000).
- (15) " Bethe stopping power theory for heavy target elements " – presented with S. M. Cohen and H. Sinky at the Centennial meeting of the American Physical Society (March, 1999). Abstract published in the Bulletin of the American Physical Society 44, 635 (1999).
- (16) " Molecular fluorescence in the vicinity of inhomogeneous environments " - presented at the solid-state seminar of the Physics Department at Oregon State University (April, 1998).
- (17) " Molecular fluorescence at a rough surface : the orientation effects " - presented with W. L. Blacke at the Annual Meeting of the Oregon Academy of Science, Portland, Oregon (February, 1997).
- (18) " Dual possibility for the variation of molecular lifetimes in the vicinity of a nontrivial environment " presented at the Battelle Memorial Institute - the Pacific Northwest Laboratory in Richland, Washington (August, 1995).
- (19) " Molecular fluorescence and near field optics " - presented at Portland State University (October, 1994).
- (20) " Molecular fluorescence spectroscopy in the vicinity of a microstructure " - presented at the Battelle Memorial Institute - the Pacific Northwest Laboratory in Richland, Washington (August, 1994).
- (21) " Molecular fluorescence at metal surfaces " - presented at Tohoku University in Sendai, Japan (August, 1994).
- (22) " Modeling of a sensitivity-enhancement mechanism for the optical biosensor based on surface plasmon resonance " – presented with T. Xiong at the Annual Meeting of the Oregon Academy of Science, Corvallis, Oregon (February, 1994).
- (23) " Theoretical studies of the surface-plasmon-resonance enhanced quantum efficiency for a metal-semiconductor junction at elevated temperatures " - presented with E. J. Sanchez at the Annual Meeting of the Oregon Academy of Science, Corvallis, Oregon (February, 1994).
- (24) Nonlocal electrodynamic modeling for molecular excitations at rough metal surfaces " - presented with M. H. Hider at the Meeting of the American Physical Society in Seattle, Washington (March, 1993). Abstract published in the Bulletin of the American Physical Society 38, 827 (1993).
- (25) " Effect of particle-clustering on decay rates of admolecules at the interface of a composite material substrate " - presented with M. J. Pliska and E. D. Sanchez at the Meeting of the American Physical Society in Seattle, Washington (March, 1993). Abstract published in the Bulletin of the American Physical Society 38, 828 (1993).

- (26) " Some inquisitive questions of physics " - presented with E. Bodegom at the American Association of Physics Teachers - Oregon Section Meeting at Pacific University in Forest Grove, Oregon (October, 1992).
- (27) " Optical phenomena at interfaces : biosensing, optothermal processing, and molecular fluorescence " - presented at the Battelle Memorial Institute - the Pacific Northwest Laboratory in Richland, Washington (September, 1992).
- (28) " Optical probing of the temperature and pressure in an exploding liquid film on an opaque substrate due to pulsed laser irradiation " - presented with A. C. Tam et al at the American Physical Society (joint meeting with the Optical Society of America), Albuquerque, New Mexico (September, 1992). Abstract published in the Bulletin of the American Physical Society 37, 1213 (1992).
- (29) " Mechanism of laser ablation of a thin liquid film on an opaque surface " - presented with L. Klees et. al. at the Conference on Lasers and Electro-Optics, CLEO 1992 in Los Angeles, California (May, 1992). Abstract published in CLEO '92 Conference Digest, p.502.
- (30) " Temperature dependence of the refractive indices and optical band gap of thin amorphous silicon films " - presented with N. Do et. al. at the Conference on Quantum Electronics and Laser Science, QELS 1992 in Los Angeles, California (May, 1992). Abstract published in QELS '92 Conference Digest, p.212.
- (31) " Optical biosensing based on surface plasmon resonance " - presented at the Oregon Advanced Science & Technology Institute Executives Conference in Portland, Oregon (May, 1992).
- (32) " Pulsed laser ablation of a transparent liquid film for removal of surface particulates " - presented with A. C. Tam et al at the Meeting of the American Physical Society in Indianapolis, Indiana (March, 1992). Abstract published in the Bulletin of the American Physical Society 37, 559 (1992).
- (33) " Interface temperature measurements in explosive vaporization of a liquid film by pulsed laser irradiation " - presented at the Meeting of the American Physical Society in Indianapolis, Indiana (March, 1992). Abstract published in the Bulletin of the American Physical Society 37, 84 (1992).
- (34) " Transient thermodynamics of a laser-induced exploding liquid film on an opaque surface with application to microscopic particulate removal " - presented at the IBM Almaden Research Center in San Jose, California (March, 1992).
- (35) " Surface plasmon resonance : from molecular fluorescence to biosensing " - presented at the Physics Department of the Chinese University of Hong Kong, Hong Kong (June, 1991).
- (36) " Surface plasmon resonance : from molecular fluorescence to biosensing " - presented at the Physics Department of the South Dakota School of Mines and Technology in Rapid City, South Dakota (May, 1991).
- (37) " Optical sensing based on surface plasmon resonance " - presented at the Oregon Advanced Science & Technology Institute Executives Conference in Eugene, Oregon (April, 1991).

- (38) " Surface plasmon resonance : from molecular fluorescence to biosensing " - presented at the IBM Almaden Research Center in San Jose, California (March, 1991).
- (39) " Frequency shifts of molecules at rough metal surfaces " - presented with M. H. Hider at the Annual Meeting of the Oregon Academy of Science, Monmouth, Oregon (February, 1991).
- (40) " Surface plasmon resonance : from molecular fluorescence to biosensing " - presented at the Physics Department of Oregon State University, Corvallis, Oregon (November, 1990).
- (41) " Fluorescence of molecules in the vicinity of a rough metal surface : the island surface model " - presented at the Oregon Conference on Modern Optics Research, Corvallis, Oregon (September, 1990).
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- (43) " Fluorescence of molecules at corrugated thin metal films " - presented at the Oregon Academy of Science Annual Meeting, Portland, Oregon (February, 1989).
- (44) " Photochemistry at corrugated thin metal films : a phenomenological approach " - **invited talk** at the SPIE (Society of Photo-Optical Instrumentation Engineers) International Conference in Los Angeles, California (January, 1989).