

**CURRICULUM VITAE (08/18)**

**CHING-CHANG KO DDS, MS, PhD**

**PERSONAL INFORMATION**

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   University of North Carolina at Chapel Hill  
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**EDUCATION**

<u>Institution</u>	<u>Degree</u>	<u>Date Conferred</u>	<u>Major</u>
University of Minnesota	Certificate	June 2006	Orthodontics
University of Michigan	PhD	June 1994	Bioengineering and Biomaterials
National Yang-Ming University, Taiwan, R.O.C.	MS	June 1989	Bioengineering
Kaohsiung Medical College, Taiwan, R.O.C.	DDS	June 1984	Dentistry

Specialty Certification

2007-2022     Diplomate, American Board Orthodontics

**PROFESSIONAL EXPERIENCE**

Academic Appointments

2017-present     Chair, Department of Orthodontics, University of North Carolina- Chapel Hill.  
2014-present     Hale Distinguished Professor, Department of Orthodontics, University of North  
   Carolina- Chapel Hill.  
2014-present     Vice Chair, Department of Orthodontics, University of North Carolina- Chapel  
   Hill.  
2014-present     Program Director, Department of Orthodontics, University of North Carolina-  
   Chapel Hill.  
2013-2014         Interim Program Director, Department of Orthodontics, University of North  
   Carolina- Chapel Hill.

Curriculum Vitae  
Ching-Chang Ko

- 2012-present Professor, Department of Orthodontics, School of Dentistry, University of North Carolina
- 2010-present Adjunct Professor, Department of Materials Sciences and Engineering School of Engineering, North Carolina State University
- 2006-2012 Associate Professor, Department of Orthodontics, School of Dentistry, University of North Carolina
- 1999-2006 Graduate Faculty Member, Biophysics Program, University of Minnesota
- 1997-2006 Assistant Professor, Department of Oral Science, School of Dentistry, University of Minnesota
- 1994-1997 Research Associate, Department of Oral Science, School of Dentistry, University of Minnesota
- 1990-1994 Graduate Research Assistant, Department of Biological and Materials Sciences University of Michigan
- 1987-1989 Graduate Research Assistant, Biomedical Engineering, National Yang-Ming Medical University, Taiwan, R.O.C.

Dental Practice

- 1984-1986 Army Dentist, Military Service, Taiwan, R.O.C.
- 1986-1987 Dentist, Private Dental Office, Taipei, Taiwan, R.O.C.
- 2004-2006 Resident License, University of Minnesota School of Dentistry, MN, USA
- 2006-2018 Instructor License, University of North Carolina School of Dentistry, NC, USA

**HONORS**

- 2017 Guest Professorship, Peking University, China
- 2017 Faculty of Year in Full Time Teaching, Department of Orthodontics at UNC
- 2016 Faculty of Year in Full Time Teaching, Department of Orthodontics at UNC
- 2016 Fellow, ADEA Institute Leadership.
- 2015 Faculty Mentor Award by Student Research Group UNC SOD
- 2014 Faculty of Year in Full Time Teaching, Department of Orthodontics at UNC (Elected by the Graduating Residents)
- 2014 Faculty Member, Omicron Kappa Upsilon (OKU) Dental Honor Society
- 2009 Faculty Lecture Award, Southern Association of Orthodontists
- 2009 Faculty of Year in Full Time Teaching, Department of Orthodontics at UNC
- 2007 B.F. Dewell Memorial Research Award, AAOF (American Association of Orthodontists Foundation)
- 2004-2006 NIH MinnCrest Clinical Fellow
- 1993 Rackham Research Partnership Award, University of Michigan
- 1991 University Council on International Academic Affairs Travel Award, University of Michigan
- 1989 Sun Li-Yang Memorial Scholarship Award, National Yang-Ming University, Taiwan, R.O.C.
- 1989 Chung Hua Rotary Scholarship Award, Taiwan, R.O.C.
- 1978-1980 Kaohsiung Medical College Scholarship, Taiwan, R.O.C.

## BIBLIOGRAPHY

### Book Chapters

1. **Ko CC**, Chen S, Zhang H. Mechanical properties of various archwires and their clinical application in the PASS system. In Physiologic Anchorage Control - A New Orthodontic Concept and its Clinical Application. Ed. Xu TM. Springer Nature. 2017: pp71-85.
2. Chen H, Lee D-J, Zhang H, Arnold R, **Ko CC**. Antimicrobial effects of formable gelatinous hydroxyapatite-calcium silicate nanocomposites for biomedical applications. In Advances in Bioceramics and Porous Ceramics VII. Jan. 2015. DOI: 10.1002/9781119040392.ch3
3. **Ko CC**, Wang Z, Tseng, H, Lee DJ, Guez C. Design, synthesis, and evaluation of polydopamine-laced gelatinous hydroxyapatite nanocomposites for orthopedic applications. In Advances in Bioceramics and Biotechnologies II: Ceramic Transactions. ed. by Joanna McKittrick, Roger Narayan, Hua-Tay Lin. Wiley. 2014: Vol 247:135-148.
4. **Ko CC**, Rocha E, Larson M. Past, present, and future of finite element analysis in dentistry. In: Moratal D, ed., Finite Element Analysis - From Biomedical Applications to Industrial Developments. InTech-Open Access: [www.intechopen.com](http://www.intechopen.com). Croatia, 2012: 3-24.
5. **Ko CC**, Ferreira J, Myers S. Developing Future Bioceramics for Temporomandibular Joint Tissue Engineering. In: McNamara Jr JA, Kapila SD, eds. Temporomandibular Disorders and Orofacial Pain: Separating Controversy from Consensus. Monograph 46, Craniofacial Growth Series, Department of Orthodontics and Pediatric Dentistry and Center for Human Growth and Development, University of Michigan, Ann Arbor; 2009: 311-51.
6. Velly AM, Look J, Myers S, **Ko CC**, Kaimal S, Ferreira J, Springsteen J, Schiffman E, Rhodus N, Friction J. Temporomandibular Muscle and Joint Disorders: Progress in Research with NIDCR's TMJ Implant Registry and Repository. In: McNamara JA Jr, Kapila SD, eds. Temporomandibular Disorders and Orofacial Pain: Separating Controversy from Consensus. Monograph 46, Craniofacial Growth Series, Department of Orthodontics and Pediatric Dentistry and Center for Human Growth and Development, University of Michigan, Ann Arbor; 2009: 265-81.
7. **Ko CC**, Somerman MJ, An K-N. Motion and bone regeneration. In: Bronner F, Farach-Carson MC, Mikos AG, eds. Engineering of Functional Skeletal Tissues, Volume 3 in Topics in Bone Biology series. Springer-Verlag London Limited; 2007: 110-28.
8. Kohn DH, **Ko CC**, Hollister SJ, Snoeyink D, Awerbuch J, Ducheyne P. Methods of detecting and predicting microfracture in titanium. In Brown SA, Lemons JE, eds., *Medical applications of titanium and its alloys: the material and biological issues*, ASTM STP 1272. American Society for Testing and Materials, Philadelphia, PA: 1996:117-35.

### Journal Articles (Peer-Reviewed)

1. Kim S-J; Ha YD; Kim E; Hwang S; Nguyen T; **Ko CC**; Choi YJ; Kim K-H. Dynamics of bone healing after the removal of temporary anchorage devices. Submitted to AJODO. 2018

2. Lee J-H, Jeong T-S, Garcia-Godoy F, **Ko CC**, Kwon YH. Comparison of Mechanical Properties between Nanofiller-containing Flowable Resins and Nanocomposite Resins" Submitted to *J Operative Dentistry*. 2017.
3. Chen Si, Wang Li, Gang Li, Diachina S, Lee Y-T, Xu T, Shen D, **Ko CC**. Machine learning in Orthodontic imaging to assess maxillary asymmetry in unilateral impacted canine patients via 3D auto-segmentation and auto-landmark detection. Submitted to *Angle Orthodontist*. 2018.
4. Geng H, Su H, Whitley J, Lin F-C, **Ko CC**. The Effect of Clinical Use on The Mechanical Characteristics of Nickel-Titanium Closed-Coil Springs. Submitted to *Journal of International Medical Research*. 2018.
5. Jacox LA, Mihas P, Cho C, Lin F-C, **Ko CC**. Understanding Technology Adoption By Orthodontists. In press. *Am J Orthod Dentofacial Orthop*. 2018.
6. Ahn MS, Shin SM, Wu T-J, Lee DJ, **Ko CC**, Chung C, Kim Y-I. Correlation between the cross-sectional morphology of the mandible and the three-dimensional facial skeletal pattern: a structural equation modeling approach. In press. *Angle Orthodontist*. 2018.
7. Lee S-M, Yoo K-H, Yoon S-Y, Kim I-R, Park B-S, Son W-S, **Ko CC**, Son S-A, Kim Y-I. Enamel anti-demineralization effect of orthodontic adhesive containing bioactive glass and graphene oxide: an in vitro study. *Materials* 2018, 11, 1728; doi:10.3390/ma11091728.
8. Jung J-H, & Kim D-H, Yoo K-H, Yoon S-Y, Kim Y & Bae M-K, Chung J, **Ko CC**, Kwon YH, Kim YI. Dentin sealing and antibacterial effects of silver-doped bioactive glass/mesoporous silica nanocomposite: an in vitro study. In press. *Clinical Oral Investigations*. 2018. April. 6. <https://doi.org/10.1007/s00784-018-2432-z> PMID: 29623418
9. Jeong T-S, Park J-K, **Ko CC**, Garcia-Godoy F, Kwon YH. Difference assessment of composite resins and sound tooth applicable in the resin-imbedded tooth for resin repair using fluorescence, microhardness, DIAGNOdent, and X-ray image. In press. *Clinical Oral Invest*. 2018. April. 18. <https://doi.org/10.1007/s00784-018-2436-8>. PMID: 29671053
10. Li Y, Jacox L, Little HS, **Ko CC**. Orthodontic Tooth Movement: the Biology and Clinical Implication. *Kaohsiung Journal of Medical Sciences*. 2018. 34(4): 207-214. <https://doi.org/10.1016/j.kjms.2018.01.007>. PMID: 29655409
11. Han S-G; Shin SM; Choi Y-S; Kim SY; **Ko CC**. Morphometric analysis for evaluating the relation between incisal guidance angle, occlusal plane angle, and functional temporomandibular joint shape variation. *Acta Odontologica Scandinavica*. 2018. doi.org/10.1080/00016357.2017.1420227.
12. Gibson C, Lin F-C, Phillips C, Edelman A, **Ko CC**. Characterizing Constraining Forces in the Alignment Phase of Orthodontic Treatment. *Angle Orthodontist*. 2018. Jan;88(1):67-74. PMID: 28949763.
13. Yoo JH, Lee S-M, Bae MK, Lee DJ, **Ko CC**, Kim Y-I, Kim HJ. Effect of Orthodontic Force on The Osteogenic Differentiation of Human Periodontal Ligament Stem Cells. *Japan Science and Technology Information Aggregator, Electronic (J-STAGE)*. 2018. May. 24. doi: 10.2334/josnusd.17-0310. PMID: 29794399.
14. Kim SH, Shin SM, Choi YS, **Ko CC**, Kim SS, Park SB, Son WS, Kim YI. Morphometric analysis of the maxillary root apex positions according to crowding severity. *Orthod Craniofac Res*. 2017 Nov; 20(4):202-208. PMID: 28857415.

15. Rowan S, Prasad JL, Newness EJ, **Ko CC**, Tetradis S, Sanchez A. Should Student Evaluation of Teaching Play a Significant Role in the Formal Assessment of Faculty? Two Viewpoints. *J Dent Education*. 2017. 81(11):1362-1372. PMID: 29093150
16. Lee DJ, Lee Y-T, Daniel R, **Ko CC**. Polydopamine-Laced Biomimetic Material Stimulation of Bone Marrow Derived Mesenchymal Stem Cells to Promote Osteogenic Effects. *Scientific Reports*. 2017; 7:12984. Doi:10.1038/s41598-017-13326-y. PMID: 29021583
17. **Ko CC**, Yi D-H, Lee DJ, Kwon J, Garcia-Godoy F, Kwon YH. Diagnosis and staging of caries using spectral factors derived from the blue laser-induced autofluorescence spectrum. *J Dentistry*. Oct 6, 2017. 67:77-83. <https://doi.org/10.1016/j.jdent.2017.09.015> PMID:28993243
18. Atieh M, Ritter AV, **Ko CC**, Duqum I. Accuracy Evaluation of Intra-Oral Optical Impressions: A Clinical Study Using a Reference Appliance. *The Journal of Prosthetic Dentistry*. 2017 Sep;118(3):400-405. PMID:28222869.
19. Chen S, Bai B, Lee D-J, Diachina S, Li Y, Wong SW, Wang Z, Tseng HC, **Ko CC**. Dopaminergic enhancement of cellular adhesion in bone marrow derived mesenchymal stem cells (MSCs) *J Stem Cell Research & Therapy*, Aug. 10, 2017. NIHMS931669
20. Ólafsson V.G., Ritter A.V., Swift E.J., Boushell L.W., **Ko CC**, Jackson G.R., Ahmed S.N., Donovan T.E. Effect of composite type and placement technique on cuspal strain. *J Esthet Restor Dent*. 2017 Oct 16. doi: 10.1111/jerd.12339. PMID: 29034597
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22. Jackson T, Guez C, Lin F-C, Proffit W, **Ko CC**. The Modern Likelihood of Orthodontic Tooth Extraction. *AJODO*. 2017;151:456-62. PMID:28257729
23. Uhler R, Mayo V, Lin PH, Chen S, Lee Y-T, Garland H, Lin F-C, **Ko CC**. Biomechanical Characterization of the Periodontal Ligament: Orthodontic Tooth Movement. *Angle Orthodontist*. 2017; 87:183–192. PMID: 27542105.
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33. Zhang H, Yang S, Masako N, Lee DJ, Cooper L, **Ko CC**. Proliferation of preosteoblasts on TiO<sub>2</sub> nanotubes is FAK/RhoA related. *RSC Advances.* 2015. 5:38117–38124. DOI: 10.1039/C4RA16803H. NIHMSID 685853. PMCID: PMC4467958
34. Ku R-M, **Ko CC**, Jeong C-M, Park M-G, Kim H-I, Kwon YH. Effect of flowability on the flow rate, polymerization shrinkage, and mass change of flowable composites. *Dental Materials Journal* 2015; 34(2): 168–174. PMID: 25740163.
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36. Chiu C-K, Dong Joon Lee DJ, Chen H, Chow LC, **Ko CC**. *In-situ* hybridization of calcium silicate and hydroxyapatite-gelatin nanocomposites enhances physical property and *in vitro* osteogenesis. *J Mater Sci: Mater Med.* 2015, 26:92. DOI: 10.1007/s10856-015-5456-9
37. Son S-A, Park J-K, Jung K-H, **Ko CC**, Jeong C-M, Kwon YH. Effect of 457nm Diode-Pumped Solid State Laser on the Polymerization Composite Resins: Microhardness, Cross-Link Density, and Polymerization Shrinkage. *Photomedicine and Laser Surgery.* 33(1):3-8, 2015. DOI: 10.1089/pho.2014.3786. PMID [25549163](#).
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42. Cox, C, Nguyen T, Koroluk L, **Ko CC**. In Vivo Force Decay of Niti Closed Coil Springs. *Am J Orthod Dentofacial Orthop.* 145(4): 505–513, April. 2014. NIHMSID#558064. YMOD4561.

43. Park J-K, Lee G-H, Kim J-H, Park M-G, **Ko CC**, Kim H-I, Kwon YH. Polymerization shrinkage, flexural and compression properties of low-shrinkage dental resin composites. *Dental Materials*. 2014; 33(1): 104–110.
44. Park M-G, Ro J-H, Park J-K, **Ko CC**, Kwon YH. Effect of a DPSS laser on the shear bond strength of ceramic brackets with different base designs. *Lasers Med Sci* 2013; 28:1461–1466. DOI 10.1007/s10103-012-1227-8.
45. Ferreira JR, Padilla R, Urkasemsin G, Yoon K, Goeckner K, Hu W-S, **Ko CC**. Titanium-enriched Hydroxyapatite-Gelatin Scaffolds with Osteogenically Differentiated Progenitor Cell Aggregates for Calvaria Bone Regeneration. *Tissue Engineering Part A*. 2013 Aug;19(15-16):1803-16. PMID: PMC3700087
46. **Ko CC**. Commentary: Effects of vertical positions of anterior teeth on smile esthetics in Japanese and Korean orthodontists and orthodontic patient (1). *Journal of Esthetic and Restorative Dentistry*. 2013, 25(4):283.
47. Kim T-H, Garcia-Godoy F, **Ko CC**, Park J-K, Kim H-I, Kwon Y-H. Effect of temperature on the mass and color stability of additional photoinitiator-containing composite resins. *Dental Materials J*. 2013;32(4):628-36.
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52. Chiu C-K, Ferreira J, Luo T-J M, Geng H, Lin F-C, **Ko CC**. Direct Scaffolding of Biomimetic Hydroxyapatite-gelatin Nanocomposites using Aminosilane Cross-linker for Bone Regeneration. *J Mater Sci: Mater Med*. 2012; 23(9):2115-2126. PMID:PMC3509178
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54. Chi L, Cheng M, Hershey HG, Nguyen T, **Ko CC**. Biomechanical Re-evaluation of Orthodontic Asymmetric Headgear, *Angle Orthodontist* 2012 Jul. 82(4): 682-690.
55. Anchieta RB, Rocha EP, Almeida EO, Freitas Jr AC, Martin Jr M, Martini AP, Archangelo CM, **Ko CC**. Influence of customized composite resin fiberglass posts on the mechanics of restored treated teeth. *Int Endodontic Journal* 2012; 45(2):146-155.
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57. Shin D-H, Yun D-I, Park M-G, **Ko CC**, Garcia-Godoy F, Kim H-I, Kwon YH. Influence of DPSS Laser on Polymerization Shrinkage and Mass Change of Resin Composites. *Photomedicine and Laser Surgery* 2011;29(8):545-550.
58. Kim Y-O, Park S-B, Son W-S, **Ko CC**, Franklin G-G, Kim H-II, Kwon YH. Diode-pumped solid-state laser for bonding orthodontic brackets: effect of light intensity and light-curing time. *Lasers Med Sci* 2011;26(5):585-9.
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61. Park J-K, Hur B, **Ko CC**, García-Godoy F, Kim H-I, Kwon YH. Effect of light-curing units on the thermal expansion of resin nanocomposites. *Am J Dent* 2010;23:331-4. PMID:PMC3178456
62. Park SB, Kang EH, Son WS, **Ko CC**, Kim HI, Kwon YH. Effect of DPSS laser on the shear bond strength of orthodontic brackets. *Am J Dent* 2010;23(4):205-7. PMID:PMC3178458
63. Park JK, Kim TH, **Ko CC**, García-Godoy F, Kim HI, Kwon YH. Effect of staining solutions on discoloration of resin nanocomposites. *Am J Dent* 2010 Feb;23(1):39-42. PMID:PMC3178459
64. Larson BE, Sievers MM, **Ko CC**. Improved Lateral Cephalometric Superimposition Using an Automated Image Fitting Technique. *Angle Orthod* 2010;80(3):474-9.
65. Luo T-J M., **Ko C.C.**, Chiu C-K, Llyod J, Huh H. Aminosilane as an effective binder for hydroxyapatite-gelatin nanocomposites. *J Sol-Gel Sci & Tech* 2010;53:459-65. PMID: PMC3702191. NIHMSID: NIHMS450862
66. Huang H-L, Fuh L-J, **Ko CC**, Hsu J-T, Chung H-Y, Chen C-C. Biomechanical effects of a maxillary implant in the augmented sinus: a three-dimensional finite element analysis. *Int J Oral Maxillofac Implants* 2009;4(3):455-62.
67. Seong WJ, Kim UK, Swift JQ, Hodges JS, **Ko CC**. Correlations between physical properties of jawbone and dental implant initial stability. *J Prosthet Dent* 2009;101(5):306-18.
68. Seong WJ, Swift J, Hodges J, Heo YC, **Ko CC**. Elastic properties and apparent density of human edentulous maxilla and mandible. *International Journal of Oral & Maxillofacial* 2009;38:1088-93.
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70. **Ko CC**, Luo T-JM, Chi L, Ma A. Hydroxyapatite/gemosil nanocomposite. In Narayan R. and Colombo P. eds., *Advances in Bioceramics and Porous Ceramics: Ceramic Engineering and Science Proceedings*, 2009; 29(7): 123-34.



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72. Oyen ML, **Ko CC**. Indentation variability of natural nanocomposite materials. *J. Mater. Res* 2008;23(3):760-7.
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74. Huang HL, Hsu JT, Fuh LJ, Tu MG, **Ko CC**, Shen YW. Bone stress and interfacial sliding analysis of implant designs on an immediately loaded maxillary implant: A non-linear finite element study. *J Dent* 2008;36(6):409-17.
75. **Ko CC**, Cao Y, Tanikawa C, Ford D, Mayhew M. Parametrization of the curve for dental arch. In Takada K, Kreiborg S, eds. *Silico Dentistry—the evolution of computational oral health science*. Osaka University, Mouth and Face Forum 2008:121-4.
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78. Huang H-L, Chang C-H, Hsu J-T, Fallgatter AM, **Ko CC**. Comparisons of Implant Body Designs and Thread Designs of Dental Implants: A Three-Dimensional Finite Element Analysis. *Int J Oral & Maxillofac Implants* 2007;22:551–62.
79. Oyen ML, **Ko C-C**. Examination of Local Variations in Viscous, Elastic, and Plastic Indentation Responses in Healing Bone, *J Mater Sci Mater Med* 2007;18(4):623-8.
80. Tantbirojn D, Feigal RJ, **Ko CC**, Versluis A. Remineralized dentin lesions induced by glass ionomer demonstrate increased resistance to subsequent acid challenge. *Quintessence Int* 2006;37(4):273-81.
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#### Journal Abstracts

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4. Pollei J, Rocha E, Ko CC. Effect of Varying Orthodontic Miniscrew Angulation: A Finite Element Analysis. *AAO Meeting*, Denver, 2008.
5. Luo T-J Mark, Ko CC. Nanostructured Silica Enforced Hydroxyapatite. *TMS (Minerals, Metals & Materials Society) Meeting*, New Orleans, 2008.
6. Ko CC, Ma A, Kaku M, Liu K-L, Luo T-J M, Tulloch JFC, Hu W-S. The Effect of Hydroxyapatite/GEMOSIL Nanocomposites on Extracellular Matrix Patterning Through the Promotion of Osteoblast Self-organization. *8th World Biomaterials Congress*, Amsterdam RAI, the Netherlands, 2008.
7. Ko CC, Friction J, Hu W-S. A new hydroxyapatite-gelatin nanocomposite for TMJ tissue engineering. *American Society of TMJ Surgeons Annual Meeting*, Phoenix, 2005.
8. Ko CC, Oyen M, Fallgatter A. Effects of gelatin on mechanical properties of hydroxyapatite-gelatin nanocomposites. *Material Research Society Fall Meeting*, Boston, 2005.

9. Fallgatter A, Ko CC, Chou C-H. Crush absorbing energy of white spot lesion measured by indentation tests. *Material Research Society Fall Meeting*, Boston, 2005.
10. Ko CC, Douglas WH, Chu T-M, Chang MC, Narayanan RA, Hu W-S. Forming 3D Scaffolds of Hydroxyapatite-Gelatin Nano-Composites using Mechanical Method and Selective Solid Etching Method. *7<sup>th</sup> World Biomaterials Congress*, Sydney, Australia, 2004.
11. Oyen M, Ko CC. Variability of nanoindentation responses of bone and artificial bone-like composites. *ASME Winter Annual Meeting*, 2004.
12. Oyen ML, Ko CC. Finite Element Modeling of Bone Ultrastructure as a Two-phase Composite. *Material Research Society Fall Meeting*, Boston, 2004.
13. Huang Y-C, Chen M, Shin Y-P, Ko CC. Experiments in the Use of Point-to-Point Iterative Learning Control for Improving Intra-Oral Hydraulic Loading System of Dental Implants. *Chinese Automatic Control Conference and Bio-Mechatronics System Control and Application Workshop*, Taipei, 2003.

Invited Oral Presentations (National and International)

- 2018 “Polydopamine-laced biomimetic materials for stem cell-mediated bone tissue engineering. COAST, FASEB Science Research Conference. Sep. 14, 2018.
- 2018 “Contemporary orthodontic treatment: constraining forces and tooth movement in the alignment phase.” The 96<sup>th</sup> IADR, London, England. July 25, 2018.
- 2018 “Machine Learning in Dentistry” Lunch & Learn in the AADR Meeting, Fort Lauderdale, Fla., USA, March 21-24, 2018.
- 2017 “Initial Alignment and Its Biomechanics” The 5th Yangtze River Oral Medicine Forum, Renmin Hospital, Wuhan University. June 17, 2017.
- 2017 “Role of Optneurin in the Pathogenesis of Paget’s Disease of the Bone” Peking University, China. May 8, 2017.
- 2017 “Orthodontic Stage 1 Biomechanics” The 10th Annual Meeting of the Society of Chinese Dental Practitioner, Hangzhou, China. May 10-12, 2017.
- 2017 “Developing 3D Technology and Clinical Trials to Climb the Stairway to Heaven” The Annual Meeting of American Association of Orthodontics, San Diego, April 21-25, 2017
- 2017 “Characterizing Constraining Forces in the Alignment Phase of Orthodontic Treatment” The Angle Society North Atlantic Component Annual Meeting. Washington DC, April 5-8, 2017.
- 2016 “Lifelong Learning and Bone Composites” The 25<sup>th</sup> Anniversary Symposium of Minnesota Dental Research Center for Biomechanics and Biomaterials. Minneapolis, Oct. 17-18, 2016.
- 2016 “Investigating Problems in Orthodontic Biomechanics: Learning to be seen through the 3D technology and clinical trials.” Annual Meeting of Society of Chinese Orthodontics. Xi’an, China. Oct. 12, 2016.
- 2015 Lecture on orthodontic biomechanics (1 week). Roseman University, Las Vegas, US. 3/21/2016-3/25/2016
- 2015 “Contemporary biomechanics and biomaterials decrypt orthodontic myth and fiction.” The Annual Scientific Meeting of the Association for Dental Sciences of the Republic of China (ADS-ROC). Taipei, Taiwan. Oct. 16-18, 2015.

- 2015 “Introducing a polydopamine-laced hydroxyapatite-gelatin nanocomposite for customized scaffolding in bone tissue engineering.” 4<sup>th</sup> International conference on Tissue Science and Regenerative Medicine. Rome, Italy. July 27-29, 2015.
- 2015 “Are we ignoring biomechanical principles in an age of computer generated treatment planning?”, Chendu, China. 5/6 and 5/8/2015.
- 2015 Lecture on orthodontic biomechanics (1 week). Roseman University, Las Vegas, US. 4/20/2015-4/24/2015.
- 2014 “Bioceramics from mussel may be the key to bone replacement”, Department of Orthodontics, School of Stomatology, Peking University. Oct. 21<sup>st</sup>, 2014.
- 2014 “Orthodontic treatment timing and biomechanical principle”, The 13<sup>th</sup> Chinese Orthodontic Society Annual Meeting, Chengdu, China, Oct. 16<sup>th</sup>, 2014.
- 2014 Lecture on orthodontic biomechanics (1 week). Roseman University, Las Vegas, US. 5/27/2014-5/30/2014.
- 2014 “The Prevalence of Tooth Extraction in Contemporary Orthodontics: Where We’ve Been and Where We’re Going”; and “Complex adjunctive treatment and orthognathic surgery in adult orthodontics.” Continuous Education, Foshan, China, 4/9/2014.
- 2013 Design, synthesis and evaluation of gelatinous hydroxyapatite nanocomposites for orthopedic applications. PACRIM10 (The 10<sup>th</sup> Pacific Rim Conference on Ceramic and Glass Technology). The American Ceramics Society. San Diego, US. 6/4/2013.
- 2013 Engineering HAP-GEL nanocomposites with MAPC cells for Calvarium Bone Regeneration. Chang Gung Memorial Hospital, Taipei, Taiwan. May 30, 2013.
- 2013 Lecture on Tissue Engineering, Dental Implants, and Orthodontic Biomechanics. Kaohsiung Medical University, Taiwan. May 21-23, 2013.
- 2013 Lecture on orthodontic biomechanics (1 week). Roseman University, Las Vegas, US. 1/28/2013-2/1/2013.
- 2012 Lecture orthodontic biomaterials and biomechanics (7 hours). USC, California. 10/19/12
- 2012 Past, present, and future finite element analysis in dentistry. Forum Dentistry, Cancun, Mexico, 10/13/2012.
- 2012 Image-based 4D Biomechanics: Past, Present, and Future Computer Modeling in Orthodontics. American Association of Orthodontics (AAO) Annual Meeting, Honolulu, Hawaii, May, 2012.
- 2011 Dental Education in the US. Jining Medical University, Shandong, China.
- 2009 Facial Growth and Orthodontics. National Taiwan University, Taiwan ROC.
- 2009 Growth and Development of Craniofacial Structures. Kaohsiung Medical University, Taiwan ROC.
- 2009 Advanced GEMOSOL technology towards craniofacial bone regeneration. Annual Meeting at Association for Dental Sciences of the Republic of China.
- 2009 Investigating Problems in Craniofacial Skeletal Structures and Tissue Adaptation. Department of Human Physiology, University of Oregon.
- 2009 Faculty Lecture in Developing a Biomimetic Material for Bone Tissue Engineering, SAO (Southern Association of Orthodontics, AAO).
- 2008 Structure, Design, and Evolution of the Curriculum in Orthodontics UNC-Chapel Hill Perspective. China Medical University, Taichung, Taiwan.
- 2008 Developing future bioceramics for temporomandibular joint tissue engineering. Moyers Presymposium. Ann Arbor, Michigan.

- 2008 Interfacial Biomechanics of Dental Implants. Hokkaido Health Science University, Hokkaido, Japan.
- 2008 Dental arch form and its mathematical expression. The Mouth and Face Forum in Silico Dentistry, Osaka, Japan.
- 2008 Hydroxyapatite/GEMOSIL nanocomposite. Next Generation Bioceramics symposium at the 32<sup>nd</sup> International Conference & Exposition on Advanced Ceramics & Composites, Daytona Beach, FL.
- 2007 Biomimetic Nanocomposites for Bone Regeneration. Colgate-Palmolive Co.
- 2006 Nano-biomaterials in Dentistry. International Bioengineering Conference, Taipei, Taiwan.
- 2006 Biomechanics of Oral Implants. UMKC School of Dentistry, US.
- 2005 Chinese Dental Science Association ROC.
- 2005 Potential role for implant healing time in alveolar bone adaptation to a functionally loaded dental implant. Implant Symposium: Mechanotransduction, IADR, Baltimore, MD.
- 2004 Development of Nanotechnologies for the Application of Oral Implants. Bioengineering Symposium, Taiwan, ROC.
- 2003 Effects of Functional Loading on Implant Osseointegration. Lunch and Learn Leader. IADR, Göteborg, Sweden.
- 2002 International Symposium of Biomedical Engineering and Technology, Taiwan.
- 2002 Evidence on Effect of Early Loading on Enhanced Implant Osseointegration. ITI World Symposium: Exploring Current Trends in Implant Dentistry with an Evidence-Based Approach, San Diego.
- 2001 Bioengineering in Dentistry. National Cheng-Kung University, Taiwan.
- 2001 Implant Biomechanics. Yansei University, Seoul, Korea; Chosun University, Kwangju, Korea; Kyunghee University, Seoul, Korea.

## TEACHING ACTIVITIES

### Major Teaching Responsibilities (Courses)

- 2014-present Advanced Clinical Orthodontics (18 residents)
- 2013-present Graduate Course ORTHO Case Review, UNC (6 students)
- 2013-present Graduate Course ORTHO Clinical Seminar, UNC (6 residents)
- 2008-2016 Graduate Course ORTHO 806 Clinical Biomechanics, UNC (9 students and 10 hours taught)
- 2008-present Graduate Course ORTHO 820 Advanced Biomechanics, UNC (6 students and 18 hours taught)
- 2008-2017 Graduate Course ORTHO 801 Technique Course, UNC (9 students and 39 hours taught)
- 2007-2013 Undergraduate Course ORTHO Level IV (Dent 305): Growth and Development, UNC (80 students and 5 hours taught)
- 2006-present Graduate Course ORTHO 807: Biomaterials, UNC (6 students and 28 hours taught)
- 2001-2005 Graduate OBIO 8027: Biological Structure and Biomaterials, University of Minnesota (UMN) (3-5 students and 6 hours taught)

### Teaching Participation

2008-present	Course Faculty, OBIO721/730: Extracellular Matrix, UNC (15 students, 4 hours taught)
2007-present	Course Faculty, DENG 701: Introduction to Research Design, UNC (20-30 students and 1 hour taught)
2006-present	Course Faculty, ORTHO 203: Diagnosis and Treatment Planning, UNC (9 students and 4 hours taught)
2006-2008	Course Faculty, ORTHO 206: Clinical Biomechanics, UNC (9 students and 8 hours taught)
2005	Graduate Course DENT 7081: Basic Concepts in Skeletal and Craniofacial Development, UMN (20 students and 4 hours taught)
2003-2004	Group Leader for Seminar Class - Dent 5301 Introduction to Oral Biology, UMN (nine sections) (10 students and 9 hours taught)
2003	OBIO 8023: Physical Biology of the Oral Cavity, UMN. Topics in Bone Mechanobiology (20 students and 2 hours taught)
2001	OBIO 8025: Early Diagnosis of Dental Caries, UMN. Topics in Cariology (10 students and 2 hours taught)
1999-2003	OBIO 5001: Biomaterials Approaches to Clinical Problems, UMN. Topics in Methods in Research and Writing (10 students and 1 hour taught)
1997-2001	Dental Materials (DE5601) to the 1 <sup>st</sup> year dental students, UMN. Topics included “Amalgam,” “Dental Alloys,” “Gypsum,” and “Bony Interfaces: Implants” (4 Lectures/year)
1997-1999	Group Leader for Biomaterial Seminar Class (DE5201) to the 1 <sup>st</sup> year dental students (10 sections each year), UMN. The seminar is to develop critical thinking skills that help students determine whether new dental products are based on a solid research design.

### Predoctoral (DDS) Research Mentoring Projects Supervised

2017	Gene analysis of human dental cervical fluid for accelerated tooth movement. Shannyn Holder Won DDS Turner Award, UNC DRRD 2018 Won DDS2 AADR Student Research Fellowship, 2017
2017	Correlation between alignment mechanics and rotation of irregular teeth. Tyler Hill DDS2
2017	Multifactorial analysis of orthodontic tooth extraction. Ryan Gross DDS2
2015-2016	Decision tree for orthodontic extraction Mary Lanier Zaytoun DDS3 Summer Research Awards, UNC, 2015 Won Turner Award 1 <sup>st</sup> place DDS Category, UNC DRRD 2016
2015-2016	Biomechanical characterization of the human periodontal ligament

- Phillip Hamilton  
2014-2015 DDS2 Summer Research Awards, UNC, 2015  
Biomechanical characterization of the periodontal ligament.
- Virginia Mayo  
2013-2014 DDS2 Summer Research Award, UNC, 2014  
Bawden Award, UNC DRRD, 2015  
ADA/Dentsply Award, 2015  
Nano-Crystalline ceramic coatings for the reduction of sliding resistance of orthodontic archwires
- Bryan Whitecotton  
2013-2014 DDS3  
Small Animal Model of Apicoectomy procedures in Evaluating Endodontic Biomaterials
- Jed V Arbon  
2010-2011 DDS3  
Characterization of Cross-linking in GEMISOL by Factor XIII.
- Kelly Higgins  
2010-2011 DDS2 Summer Research Award  
2011 Excellence in Student Research in Dental Research Review Day  
2011 AADR BIOC Travel Award
- 2010-2011 Viscoelastic Properties of Periodontal Ligament  
Rick Uhlir, DDS3
- 2009-2010 Investigation of Craniofacial Deficiency of *Evc2/Lbn* Mutant Mice using Lateral Cephalometric Technique and MicroCT  
Mahshid Bahadoran, DDS3  
2010 IADR Research Presentation  
2010 IADR BIOC Travel Award
- 2007-2008 Three-dimensional Space Analysis of Alveolar Bone for Orthodontic Mini-implant  
Brandon Burke, DDS3  
Summer Research Awarded
- 2007-2008 Histological assessment of craniofacial bone formation via bioengineering regeneration  
Ryan Wood, DDS3  
Summer Research Awarded  
2008 AADR Presentation  
Dentsply International Award at UNC table clinic, 2008.
- 2007-2008 Scaffolding for Gemosil nanocomposites  
Crystal Cox, DDS2
- 2007-2008 Biocompatibility of osteoblasts MC3T3-E1 on Gemosil Composites  
Alice Ma, DDS1 Work Study  
2008 AADR Presentation  
Manuscript published  
Procter & Gamble Oral Excellence in Science Award for excellence in the sciences at UNC table clinic, 2008.
- 2005 A parametric study on lateral cephalometric image superimposition

Matt Sievers, DDS2 Summer Research Fellowship UMN  
Manuscript published

Master Thesis (MS) Mentoring

- 2018-Present Identifying factors that impact orthodontist decision making, job satisfaction and earning potential. (Thesis Advisor)  
Catherine Campbell, Orthodontics Resident, MS  
\*Received AAOF Research Aid Award, 2018
- 2018-Present Shape analysis of cleft palatal defects using machine learning.  
(Thesis Advisor)  
Matthew Pastewait, Orthodontics Resident, MS
- 2108-Present Effectiveness of intrusion and extrusion of tooth movement using Invisalign therapy (Thesis Advisor)  
Phillips Hamilton, Orthodontics Resident, MS
- 2017-Present Analysis of orthodontic tooth movement using 3D imaging  
(Thesis Advisor)  
Christian Piers, Orthodontics Resident, MS
- 2017-Present Roles of Digital Dentistry in Orthodontics  
(Thesis Advisor)  
Laura Jacox, Orthodontics Resident, MS  
\*Received MS Research Support Grant  
\*Received AAOF Research Aid Award, 2018
- 2017-Present Effects of malocclusion factors on the extraction threshold in orthodontics.  
(Advisor)  
Mart Lanier Zaytoun, Orthodontics Resident, MS
- 2016-Present The Role of Autophagy during Orthodontic Tooth Movement.  
(Thesis Advisor)  
Yina Li, Orthodontics Resident, MS  
\*3<sup>rd</sup> Place 2018 AAO Charley Shultz Resident Research Award
- 2016-Present Accelerated Invisalign Therapy in Conjunction with AcceleDent: A Randomized Clinical Trial. (Thesis Advisor)  
Brian Bragassa, Orthodontics Resident, MS  
\*2<sup>nd</sup> Place 2018 AAO Table Clinic.  
\*MS Turner Award, UNC DRRD 2018
- 2015-Present Biomechanical Factors in Stage 1 Orthodontic Tooth Movement- In Vivo Assessment. (Thesis Advisor)  
Bryan Whitecotton, Orthodontics Resident, MS
- 2015-Present Design of Orthodontic Brackets using 3D Metal Printing  
(Thesis Advisor)  
Christine Jackson, Orthodontics Resident, MS  
\*MS Turner Award, UNC DRRD 2017  
\*Won the 1<sup>st</sup> Place in Clinical Science, AAO Charley Schultz Resident Scholar Award 2017
- 2014- 2016 Limiting Factors Affecting Stage I Treatment: A Biomechanical Perspective.  
(Thesis Advisor)

- Christopher Gibson, Orthodontics Resident, MS  
\*Won MS Turner Award, UNC DRRD 2016  
2014- 2016 Shear bond strength of orthodontic brackets with varying bonding protocols.  
(Committee)
- Jeremy Grabouski, Department of Orthodontics, MS  
2014- 2016 Dentin Bond Strength of Conventional and Modified Glass Ionomer Cements.  
(Thesis Advisor)
- Anmar Adnan Kensara, Department of Operative Dentistry, MS  
2014- 2016 Accuracy Evaluation of Intra-oral Optical impressions: A novel approach.  
(Committee)
- Mohammad A. Atieh, Department of Operative Dentistry, MS  
2014- 2015 Effect of composite type and placement technique on polymerization shrinkage  
stress. (Committee)
- Vilhelm Grétar Ólafsson, Department of Operative Dentistry, MS  
2013- 2015 A Contemporary Perspective on Extractions in Orthodontics. (Thesis Advisor)
- Camille Guez, Orthodontics Resident, MS  
2013- 2015 Accuracy and Effectiveness of CAD/CAM Designed Orthodontic Brackets.  
(Committee)
- Matt Brown, Department of Orthodontics, MS  
2013- 2015 Three-dimensional evaluation of mandibular growth changes associated with  
Herbst treatment in Class II patients (Committee)
- Thomas Covington, Department of Orthodontics, MS  
2012- 2014 Biomechanical characterization of the periodontal ligament: orthodontic tooth  
movement. (Thesis Advisor)
- Rick Uhler, Orthodontics Resident, MS  
\*SAO Research Award, 2013  
\*Charley Schultz Resident Scholar Awards – Basic Research (3<sup>rd</sup> place) in AAO  
Annual Meeting, New Orleans, 2014  
2012-2014 Evaluation of a New Biomimetic Cement (Gemosil) for Use in Endodontic  
pulp Therapy as Compared to the Widely-Used Mineral Trioxide Aggregate  
(MTA) (Thesis Advisor)
- Hsin Chen, Endodontic Resident, MS  
\*AAE Foundation Award; Turner Award 2<sup>nd</sup> Place at Research Review Day,  
UNC, 2013  
2010-2012 Biomechanics of canine retraction using absolute anchorage: comparison of a  
finite element model with clinical data. (Thesis Advisor)
- Matt Larson, Orthodontics Resident, MS  
\*1<sup>st</sup> Place, UNC Orthodontic Alumni Research Award, 2012  
2010-2012 Evaluation of force decay properties of NiTi coil springs after intra-oral use and  
comparison with matched laboratory analysis. (Thesis Advisor)
- Crystal Cox, Orthodontics Resident, MS  
\*Turner Award 1<sup>st</sup> Place at Research Review Day, UNC, 2012; 3<sup>rd</sup> Place,  
\*Charley Schultz Resident Scholar Awards – Clinical Research; and  
\*Joseph E. Johnson Clinical Awards for Table Clinic, AAO, Honolulu, 2012  
2009-2011 A novel biomechanical model assessing orthodontic, continuous archwire  
activation in incognito lingual braces. (Thesis Advisor)



- Chris Canales, Orthodontics Resident, MS  
Manuscript in preparation
- 2009-2011 Effectiveness and efficiency of a customized versus conventional orthodontic bracket system. (Thesis Committee)  
Dennis Weber, Orthodontics Resident, MS  
Manuscript submitted
- 2008-2010 Re-evaluation of force distribution on asymmetric headgears. (Thesis Advisor)  
Lu Chi, Applied and Materials Sciences Program UNC, MS  
Manuscript submitted
- 2006-2009 Finite element analysis of miniscrew placement in maxillary bone with varied angulation and material type. (Thesis Advisor)  
Jason Pollei, Orthodontics Resident, MS  
Published in SAO Magazine
- 2004-2006 NCAADR Derek Turner Award in the UNC Research Review Day, 2009.  
Evaluation of retrieved human temporomandibular joint Proplast/Teflon<sup>®</sup> and Silastic<sup>®</sup> implants - pilot study. (Thesis Co-Advisor)  
Joao Ferreira. TMJ Resident at UMN, MS  
Manuscripts published
- 2004-2006 Molecular mechanisms of mandibular distraction osteogenesis and the role of parathyroid hormone (PTH). (Thesis Advisor)  
Alison Fallgatter, Orthodontics Resident at UMN, MS  
NSF Graduate Student Award in the Material Research Society Fall Meeting 2005.  
Manuscripts published
- 1999-2001 Quantification of white spot lesions in orthodontic patients using digital imaging. (Thesis Co-Advisor)  
John Christopher Aamodt, Orthodontics Resident at UMN, MS.
- 1998-2000 Quantification of dental plaque on orthodontic patients using digital imaging. (Thesis Advisor)  
Kimberly Bohlig, Orthodontics Resident at UMN, MS.
- 1998-2000 Microshear and conventional shear bond strength of a dentin bonding agent. (Thesis Co-advisor)  
Mariano Andres Polack, Prosthodontics Resident at UMN, MS.
- 1997-1999 Clinical evaluation of the color properties of a new maxillofacial silicone. (Thesis Co-advisor)  
Jason Bortolussi, Prosthodontics Resident at UMN, MS
- 1996-1998 Color measurements of *in vivo* white spot lesions (Thesis Advisor)  
William Scott Becker, Orthodontics Resident at UMN, MS.

#### PhD Dissertation Mentoring

- 2018- OPTN-ROS axis for osteoclastic modulated bone remodeling.  
(Advisor)
- 2015-Present Allen Hu, PhD Student in Oral Biology at UNC-CH SOD  
Role of Optineurin in the Pathogenesis of Paget's Disease of the Bone  
(Advisor)

- Sing Wai Wong, PhD Student in Oral Biology at UNC-CH SOD  
\*Ruth L. Kirschstein Postdoctoral Research Education Training Award,  
NIDCR/NIH 2016-2017
- 2014-Present Dopamine analog for bone tissue engineering  
(Dissertation Co-Advisor)
- 2009-2014 Huamin Hu, PhD Student in Chemistry at UNC-CH  
Biomimetically designed polymers for hard tissue scaffolding applications  
(Dissertation Co-Advisor)  
Jason Dyke, PhD Student in Chemistry at UNC-CH  
Manuscripts published
- 2010-2012 Current status: High school teacher, US University School, OH  
Cell engineering principles for Gemosil nano-composite towards bone  
regeneration. (Dissertation Co-Advisor)  
Li Zhang, PhD Student in Capital University of Medical Sciences, Beijing,  
China, PhD  
Current status: Faculty in Capital University of Medical Sciences, Beijing,  
China
- 2008-2012 Engineering sol-gel nanocomposites for medical and electrical applications  
(Dissertation Co-Advisor)  
C-K Chiu, PhD Student in Materials Science and Engineering at North Carolina  
State University (NCSSU)  
Current status: Engineer in Intel Inc., Portland, Oregon.  
Manuscripts submitted
- 2007-2011 Engineering Hap-Gel nanocomposites with MAPC cells for calvarium bone  
regeneration. (Dissertation Advisor)  
Joao Ferreira, PhD Student in Oral Biology at UNC-CH.  
\*Four-year fellowship award from Foundation for Science and Technology of  
the Government of the Portuguese Republic  
Manuscripts published
- 2002-2007 Current status: Assistant Professor, NU Singapore Faculty of Dentistry  
Interaction of bone cells with biomimetic hydroxyapatite gelatin  
nanocomposites towards developing bone tissue engineering. (Dissertation  
Advisor)  
Yin-Lien Wu, PhD Student in Oral Biology at UMN.  
St. Jude Medical Award in graduate student poster section at Minnesota  
Medical Alley Health Care Technology Conference and Expo, 2003  
Current status: Private practice and part-time faculty in the Department of  
Periodontics at UMN.
- 2001-2006 Relationships between the physical properties of human jawbone and the initial  
stability of dental implant, and their dependency on anatomical regions of  
jawbone. (Dissertation Advisor)  
Wook-Jin Seong, PhD student in Oral Biology at UMN.  
Manuscripts published
- 2002-2005 Current status: Assistant Professor in the Department of Prosthodontics at UMN  
Ultrastructural characterization of time-dependent inhomogeneous materials and  
tissues. (Dissertation Advisor)

- Michelle L. Oyen, PhD Student in Biophysics at UMN  
Manuscripts published  
2<sup>nd</sup> Place for the PhD Student Paper Competition at 2004 International  
Mechanical Engineering Congress and Exposition (IMECE)  
Current status: Senior Lecturer in the Department of Material Sciences at  
University of Cambridge, UK.
- 2001-2005 Biomechanical analysis of implants designs on mandibular molar edentulous  
restoration. (Dissertation Co-Advisor)  
Henry Huang, PhD student in Bioengineering at National Cheng Kung  
University, Taiwan ROC  
Manuscripts published  
Current status: Associate Professor in Dental Materials at China Medical  
University, Taiwan ROC.
- 1999-2002 Biomechanical analysis of a MOD restored human premolar. (Dissertation Co-  
Advisor)  
C-L Lin, PhD student in Bioengineering at National ChengKung University,  
Taiwan ROC  
Manuscripts published  
Current status: Professor in Bioengineering at National Yang-Ming Medical  
University, Taiwan ROC.

Undergraduate (BS) Research Mentoring

- 2015-2016 Jane Kwon (College of Engineering, Cornell University)
- 2013-2014 Kun H Yoon (Department of Chemistry, UNC)  
Current Status: Dental Student at Columbia University 2015
- 2013-2014 Xuan Hong Lam (Department of Chemistry, UNC)
- 2013-2014 Luke Current (Department of Biology, UNC)  
Current Status: Dental Student at East Carolina University 2015
- 2013 Hannah Yoo (Department of Chemistry): Howard Hughes Medical Institute  
Future Scientists and Clinicians program.  
Current Status: Dental Student at Harvard Dental School
- 2004-2012 Biological Science: Ten undergraduate students (Xuan Hong Lam, Luke  
Current, Matthew Guan, Natalie, Hannah Yoo, Heath Bart, Christina  
Barthold, Ben Adam, Ross Tyler, and Michael Vick) who majored in biology  
and chemistry took a laboratory course with me. They were trained to perform  
material synthesis, cell culture and animal surgery. Two of these were from  
UMN; seven were from UNC-CH and one from NCSU. Four were later  
enrolled into dental school.
- 2002-2004 Biomedical Engineering: Three undergraduate students (Amelia Wang, Adam  
Kochendorfer, Jin-Hong Kim) at UMN, who majored in bioengineering, took  
a laboratory course with me to study cell engineering and material processing.  
Two of them went on to dental school and one went to a PhD graduate  
program at California Institute of Technology (Cal Tech).

### Other Mentoring Experience

I have mentored 5 high school students and 18 visiting scholars (3 oral surgeons, 4 engineers, 1 mathematician, and 10 orthodontists) during the past 15 years. All high school students graduated and went on to prestigious colleges (Cal Tech, Stanford, Northwestern, Cornell, and UNC-CH); 1 student won the Flint Hills Resources Discovery Scholarship at graduation. The exchange of international scholars has resulted in cross-disciplinary areas for dental bioengineering research. A visiting postdoc (Masahiko Terajima) won the Joseph E. Johnson Table Clinic Award at the 2010 AAO Annual Meeting in Washington, DC.

### **GRANTS AND CONTRACTS**

#### Active

- 2018 – 2019 Smartee “Accelerated Aligner Therapy: A Clinical Trial” 4/1/2018-3/31/2019  
PI: CC Ko 5%  
Total Award: \$125,000.  
The goal is to study the tooth movement of Invisalign therapy.
- 2014 - 2019 R01DE022816-01 NIH/NIDCR “Engineering Novel Bio-inspired Materials for Stem Cell-Mediated Bone Regeneration” 4/1/2014-3/31/2019, PI: CC Ko 25% effort  
Total Award: \$2,107,981.00  
The goal is to develop a polydopamine-laced hydroxyapatite-gelatin nanocomposite scaffold for bone tissue engineering. The neural-osseous biological effect of dopamine on osteogenesis will be investigated.
- 2014 - 2017 R44DE022218-02 NIH/NIDCR “Phase II: Nano-Crystalline ceramic coatings for the reduction of sliding resistance of orthodontic archwires.” 9/1/2014-8/31/2017. PI: JE Burns (N<sub>2</sub>Bio Inc)  
Role: subcontract UNC PI (\$573,957.00) 15% effort.  
Total Award: \$1,362,022.00  
The goal of this project is to develop a nanocrystal coating on orthodontic archwires to reduce friction. The clinical trial will be performed to evaluate the efficacy of this new wire.
- 2011 – Present Biomaterial Recharge Center “Bone Tissue Engineering” CC Ko  
Total: \$54,007.42

#### Completed

- 2012 – 2014 AAE Foundation “Evaluation of a New Biomimetic Cement (Gemosil) for Use in Endodontic Pulp Therapy as Compared to the Widely-Used Mineral Trioxide Aggregate (MTA)” PI: H Chen; Advisor: CC Ko  
Total: \$11,935
- 2012-2013 Invisalign “ Incisor retraction with Invisalign aligners utilizing a full model Finite Element Analysis (FEA)” PI: E Rossouw, Co-PI: CC Ko  
Total Award: \$25,000

Curriculum Vitae  
Ching-Chang Ko

- 2011-2012 3M ESPE “Precision of Orthodontic Treatment with the Incognito Appliance”  
PI: D Grauer, Investigator: CC Ko (no cost to the grant)  
Total Award: \$47,828
- 2011-2012 Carolina KickStart, CTSA UNC-CH “Ironwood Material Science's Carolina  
KickStart Commercialization Award” PI: CC Ko  
Total Award: \$28,000
- 2010-2011 1R43DE020971-01 “A Novel Biomimetic Bone Cement For Immediately  
Loaded Dental Implants” NIH/NIDCR PI: D Gaul, Co-Principal Investigator:  
CC Ko (UNC PI, 10% effort)  
Total Award: \$210,849
- 2008-2012 FCT - *Fundacao para a Ciencia e a Tecnologia* (Foundation for Science and  
Technology of the Government of the Portuguese Republic) “Osteochondral  
Tissue Regeneration of the Mandibular Condyle with a Hydroxyapatite  
gel/Poly-L-lactic acid Composite Scaffold” PI: J Ferreira, Mentor: CC Ko  
(Supervisor; no cost to grant)  
Total Award: \$141,024
- 2008-2012 NIH/NIDCR, K08DE018695-01 "Engineering a new biomaterial for stem cell-  
mediated bone regeneration" PI: CC Ko 75% effort  
Total Award: \$507,830
- 2008-2011 NC Biotech Grant #2008-MRG-1108 “Developing GEMOSOL Technology for  
New Biomaterials” PI: CC Ko 5% effort  
Total Award: \$200,000
- 2007-2008 AAOF Biomedical Research Award, PI: CC Ko  
Total Award: \$15,000
- 2007-2009 University Research Council Award, UNC  
Total Award: \$5,000
- 2008 Faculty Creativity Grant, UNC, PI: CC Ko  
Total Award: \$4,000
- 2003-2006 NIH/NIDCR, 1R21 DE015410-01 “A New Nanocomposite Scaffold for TMJ  
Tissue Engineering” PI: CC Ko 15% effort  
Total Award: \$345,409
- 2002-2007 NIH/NIDCR, N01-DE-22635 “The National Institute of Dental Craniofacial  
Research (NIDCR) TMJ Implant Registry and Repository (TIRR)” PI: J Fricton,  
Director of Biomaterial Core: CC Ko 20% effort  
Total Award: \$5,955,157
- 2001-2005 3M Dental Products “Hydroxyapatite/Gelatin Nano-composites with Preferred  
Orientation for Biomimetic Replacement of Bone and the Dental Hard Tissues”  
PI: CC Ko 15% effort  
Total Award: \$150,000
- 1997-2002 NIH/NIDRC, R01-DE12225 “Virtual Dental Patient” PI: R DeLong, Co-  
investigator: CC Ko 20% effort  
Total Award: \$1,300,000
- 2000-2001 Office of Vice President for Research, UMN “3D X-ray Method Diagnosing  
Bone Quality Around Dental Implants” PI: CC Ko  
Total Award: \$18,614

- 1998-2001 Whitaker Foundation, Biomedical Engineering Research Grant #GR-97-0455  
“The Interfacial Biomechanics of Early Bone Loss Around Dental Implants” PI:  
CC Ko 25% effort  
Total Award: \$200,472
- 1996-1999 NIH/NIDCR, SBIR 5 R44 DE11076 “New Organosilicon Maxillofacial  
Prosthetic Materials” PI: J Lai, Co-investigator: CC Ko 20% effort  
Total Award: \$1,000,000
- 1997-1998 NIDCR 3 P30 DE09737 MN Oral Health Clinical Research Center, PI: BL  
Pihlstrom  
Pilot project: “Color measurement Evaluation of White Spot Lesions” funded  
by the MN Oral Health Clinical Research Center, PI: CC Ko  
Total Award: \$9,142

## PROFESSIONAL SERVICE

### University of North Carolina at Chapel Hill

- 2015 Member: Search Committee for Orthodontic Faculty, School of Dentistry  
2015 Member: Search Committee for Orthodontic Staff  
2014-2015 President: NCAADR  
2014 Member, Post Tenure Review Committee, School of Dentistry  
2013-2014 Secretary, NCAADR  
2013 Search Committee Chair for Orthodontic Graduate Program Director, School of  
Dentistry  
2011-present Member—Institutional Research Executive Committee, School of Dentistry  
2010-2011 Chair of the Faculty, School of Dentistry  
2009-2010 Secretary of the Faculty, School of Dentistry  
2008-present Chair—Conflict of Interest Committee, School of Dentistry  
2008-present Member—Institutional Research Advisory Committee, School of Dentistry

### National/International (Dentistry and Bioengineering)

- 2017 Ad hoc member, NIDCR DRS Study Section, Feb. 23-24, 2017.  
2016-2020 Editorial Board Member of the Chinese Journal of Orthodontics.  
2016-2019 Editorial Board Member of the Angle Orthodontist Journal.  
2016 Ad hoc NIH/NIDCR Study Section, ZRG1 MOSS-D 10, June 15-16, 2016  
2015 Ad hoc Member, Oral, Dental, and Craniofacial Sciences SBIR/STTR ZRG1  
MOSS-K(11), February 17-18, 2015.  
Ad hoc member  
2015 Ad hoc Member, Special Emphasis Panel 2015/01 ZRG1 MOSS-K (11) B,  
November 18-19, 2014.  
2014 Ad hoc Member, NIDCR Special Grants Review Committee 2014/10 Council  
DSR 1, June 19-20, 2014.

- 2014 Chair—Oral Section “Development of Novel Glass and Cement-Based Materials” IADR, Cape Town, June 26.
- 2013 Temporary Member, the Comparative Medicine (CM) Special Emphasis Panel (SEP) on Stem Cell applications, NIH/NCATS
- 2013 Temporary Member, the SBDD Study Section, NIH/NIDCR
- 2013 External examiner for the PhD Dissertation, The University of British Columbia.
- 2011-present Honorary Liaison Officer—Advanced Dental for conducting continuous education in Orthodontics, Periodontics/Implant & Aesthetics/Prosthodontics in China
- 2010-present External Grant Reviewer—The Research Grants Council (RGC) of Hong Kong
- 2009-2013 External Grant Reviewer—Natural Sciences and Engineering Research Council of Canada
- 2009 Chair—Oral Section “Bone and Mineral Substitutes,” IADR, Miami, April.
- 2004-2006 Ad Hoc—for NIH/NIDCR Special Emphasis Study Section.
- 2005 Editor—Material Research Society (MRS) Fall Symposium Proceeding.
- 2005 Organizer—MRS (Material Research Society) Fall Symposium: Mechanical Behavior of Biological and Biomimetic Materials, Boston.
- 2004 Section Chair—MRS (Material Research Society) Spring meeting.
- 2001-2004 Member—Bioengineering Study Section for National Health Research Institute (NHRI), Taiwan, ROC

#### Service and engagement activities

- 2011-2012 President—Taiwanese American Association in North Carolina (TAANC).
- 2010-2012 Board Member—TAANC.
- 2010-2011 Vice President—TAANC.
- 2010-present Liaison Officer—a global relationship between Jining Medical University, China and the University of North Carolina—Chapel Hill.
- 2010 Oral Health Forum: Perfect Teeth with Hollywood Smile, North America  
Taiwanese Engineers’ Association (NATEA) NC.
- 2009-present Co-founder, Ironwood Materials Science Inc.
- 2004 Chair—Taiwanese Cultural Exhibits of Minnesota Festival of Nations.  
Excellence Award
- 1999-2000 President—Taiwanese American Association at Minnesota Chapter.

#### Peer review journals (Dentistry and Bioengineering)

- 2015- Reviewer—Bone Research
- 2015- Reviewer—International Journal of Metallurgy and Metal Physics
- 2014-present Reviewer—PLoS One
- 2013-present Reviewer—BioMedical Engineering
- 2012-present Reviewer—American Journal of Orthodontics and Dentofacial Orthopedics
- 2011-present Reviewer—Computer Methods in Biomechanics and Biomedical Engineering
- 2011 Reviewer—Bioinorganic Chemistry and Applications
- 2010-present Reviewer—Int J Biomaterials
- 2010-present Reviewer—Journal of Mechanics in Medicine and Biology

2010-present Reviewer—Orthodontics & Craniofacial Research  
2010-present Reviewer—Clinical Oral Implant Research  
2010-present Reviewer—Medical Engineering & Physics  
2010-present Reviewer—Tribology Letters  
2010-present Reviewer—Thin Solid Film  
2009-present Reviewer—Surface and Interface Analysis  
2009-present Reviewer—Journal of Periodontology  
2008-present Reviewer—Acta Biomaterialia  
2008-present Reviewer—Tissue Engineering  
2008-present Reviewer—Journal of Royal Society Interface  
2008-present Reviewer—J Esthetics and Restorative Dentistry  
2007-present Reviewer—J Biomed Mater Res  
2007-present Reviewer—Angle Orthodontist  
2007-present Reviewer—Int J Nanomanufacturing  
2006-present Reviewer—Biomaterials  
2005-present Reviewer—Int J Oral & Maxillofac Implants  
2005-present Reviewer—J Prosthodontics  
2004-present Reviewer—Journal of Dental Research  
2003-present Reviewer—Journal of Biomechanics  
2003-present Reviewer—J Mater Res

Society memberships

2017-present Angle Society of Orthodontists, North Atlantic Component.  
2010-2017 Orthopedic Research Society (ORS)  
2007-present American Association of Orthodontists (AAO)  
2007-2016 American Ceramic Society (ACS)  
2004-2016 Materials Research Society (MRS)  
1990-present American Association for Dental Research (AADR)  
1991-2006 American Society of Mechanical Engineering (ASME).