



# BIOMEDICAL ENGINEERING

[Site Index](#)
[Video Index](#)
[Contact Us](#)


[HOME](#)
[DEPARTMENT OVERVIEW](#)
[ACADEMICS](#)
[RESEARCH](#)
[PEOPLE](#)
[CAREERS](#)
[NEWS AND EVENTS](#)
[RESOURCES](#)
[GLOBALIZATION](#)
**QUICK LINKS:**
[BME Newsletter Fall 09](#)
[Graduate Student Handbook](#)
[Graduate Seminar](#)
[Undergraduate Program](#)
[Graduate Program](#)
[SEAS Bulletin](#)
[Contact Us](#)
[Directions](#)
[<-- Return to the previous page](#)

## GERARD ATESHIAN

Gerard Ateshian  
 Professor of Mechanical Engineering and Biomedical Engineering  
 242 S. W. Mudd  
 500 West 120th Street, Mail Code: 4703

Phone: +1 212-854-8602

Fax: +1 212-854-3304

Email:

[Home Page](#)



### EDUCATION

- 1986: B.S., Mechanical Engineering, Columbia University
- 1987: M.S., Mechanical Engineering, Columbia University
- 1990: M.Phil., Mechanical Engineering, Columbia University
- 1991: Ph.D., Mechanical Engineering, Columbia University

### PROFESSIONAL EXPERIENCE

- 1991-95: Assistant Professor of Mechanical Engineering, Columbia University
- 1991-99: Associate in Orthopaedic Research, Columbia University
- 1996-2002: Associate Professor of Mechanical Engineering, Columbia University
- 1996- : Director, Musculoskeletal Biomechanics Laboratory, Columbia University
- 1998-2002: Associate Professor of Biomedical Engineering, Columbia University
- 1999-2002: Vice-Chair, Department of Biomedical Engineering, Columbia University
- 2002- : Professor of Mechanical Engineering and Biomedical Engineering, Columbia University

### PROFESSIONAL COMMITTEES AND ACTIVITIES (SELECTED)

- 2001- : Executive Committee Member, ASME Bioengineering Division
- 2001- : Editorial Board Member, International Journal of Biomechanics and Mechanobiology
- 2000- : Associate Editor, ASME Journal of Biomechanical Engineering

- 1999- : Editorial Consultant, Journal of Biomechanics

## HONORS AND AWARDS

- 2003: Fellow of the American Institute for Medical and Biological Engineering
- 2002: Great Teachers Award, Society of Columbia Graduates, 2002.
- 1998: USNCB Delegate to the Fifth Japan-USA-Singapore-China meeting, Sendai, Japan, August 9-13, 1998.
- 1997: YC Fung Young Investigator Award, ASME
- 1991: Sigma Xi, Honor Society.
- 1987-1991: Frank E. Stinchfield Fellowship in Orthopaedic Bioengineering, Department of Orthopaedic Surgery, Columbia University
- 1986-87: Fellowship Award, Department of Mechanical Engineering, Columbia University, 1986-1987.
- 1986: William A. Hadley Award in Mechanical Engineering, Columbia University
- 1984: Tau Beta Pi, Engineering Honor Society.
- 1985-86: President, Pi Tau Sigma, Mechanical Engineering Honor Society, Columbia University Chapter

## GRANTS (ACTIVE)

- National Institutes of Health, R01 AR43628, "Biotribology of Diarthrodial Joints," Principal Investigator, \$845,205 (TC), 6/1/00-5/31/04.
- The National Institutes of Health, R01, "Anisotropy and Nonlinearity of Cartilage Mechanics," Principal Investigator, R01 AR46532, \$724,377 (TC), 2/1/00-1/31/04.
- The National Institutes of Health, "Physiologic Loading for Cartilage Tissue Engineering," R01 AR46568, Co-Investigator, \$831,444 (TC), 1/1/00-12/31/03.
- The National Institutes of Health, "Intervertebral Disc Response to Cyclic Loading In Vivo," R01 AR49922, Co-Investigator, \$1,041,497 (TC), 09/26/02-08/31/06.

## BOOK CHAPTERS

- Mow, V.C., Ateshian, G.A., and Rosenwasser, M.P. (1988) Development of finite element models for diarthrodial joints. In: Computational Methods in Bioengineering, ASME, R.L. Spilker and B.R. Simon (eds.), 9:1-14.
- Soslowsky, L.J., Ateshian, G.A., and Mow, V.C. (1990) Stereophotogrammetric Determination of Joint Anatomy and Contact Areas. In: Biomechanics of Diarthrodial Joints, V.C. Mow, A. Ratcliffe, and S.L.-Y. Woo (eds.), Springer-Verlag, New York, 2:243-268.
- Mow, V.C., Ateshian, G.A., and Ratcliffe, A. (1992) Anatomic Form and Biomechanical Properties of Articular Cartilage of the Knee Joint. In: Biology and Biomechanics of the Traumatized Synovial Joint, The Knee as a Model, G.A.M. Finerman, and F.R. Noyes (eds), AAOS, 55-81.
- Ateshian, G.A., Colman, W.W., and Mow, V.C. (1994) Quantitative Anatomy of the Knee Joint. In: Knee Surgery, F.H. Fu, C.D. Harner, and K.G. Vince (eds), Williams & Wilkins, Baltimore, Maryland, Vol. 1, pp. 55-76.
- Mow, V.C., Ateshian, G.A., and Spilker, R.L. (1995) Biomechanics of Diarthrodial Joints: A Review. In: The Laureate of the Dragon, Kai-Ming

- Ateshian, G.A., and Soslowsky, L.J. (1997) Quantitative anatomy of diarthrodial joint articular layers. In: Basic Orthopaedic Biomechanics, V.C. Mow and W.C. Hayes (eds), Raven Press, New York, 2nd ed, pp. 253-273.
- Mow, V.C., and Ateshian, G.A. (1997) Friction, Lubrication, and Wear of Diarthrodial Joints. In: Basic Orthopaedic Biomechanics, V.C. Mow and W.C. Hayes (eds), Raven Press, New York, 2nd ed, pp. 275-315.
- Mow, V.C., Flatow, E.L., and Ateshian, G.A. (2000) Biomechanics. In: Orthopaedic Basic Science, J. A. Buckwalter, T.A. Einhorn, and S.R. Simon (eds), American Academy of Orthopaedic Surgeons, Rosemont, IL, 2nd ed, pp. 133-180.
- Ateshian, G.A., and Wang, X. (2000) Boundary Conditions at the Viscous Sliding Interface of Incompressible Porous Deformable Media. In: Multifield Problems, State of the Art. A.-M. Sändig, W. Schiehlen, W. Wendland (eds), Springer Verlag, Berlin, pp. 115-124.
- Ateshian, G.A., and Hung, C.T.: Functional Properties of Native Articular Cartilage. In: Functional Tissue Engineering: The Role of Biomechanics. F. Guilak, D. Butler, S.A. Goldstein, D. Mooney (eds), Springer-Verlag, New York, In Press.

## PUBLICATIONS

- Froimson, M.I., Ateshian, G.A., Soslowsky, L.J., and Mow, V.C. (1989) Quantification of the surfaces at the patellofemoral articulation. Institution of Mechanical Engineering, London, 5: 73-78.
- Ateshian, G.A., Soslowsky, L.J., and Mow, V.C. (1991) Quantitation of articular surface topography and cartilage thickness in knee joints using stereophotogrammetry. Journal of Biomechanics, 24: 761-776.
- Ateshian, G.A., Rosenwasser, M.P., and Mow, V.C. (1992) Curvature characteristics and congruence of the thumb carpometacarpal joint: Differences between male and female joints. Journal of Biomechanics, 25: 591-607.
- Soslowsky, L.J., Flatow, E.L., Bigliani, L.U., Pawluk, G.A., Ateshian, G.A., and Mow, V.C. (1992) Quantitation of in situ contact areas at the glenohumeral joint: A biomechanical study. Journal of Orthopaedic Research, 10: 524-534.
- Ateshian, G.A. (1993) A least-squares B-Spline surface-fitting method for articular surfaces of diarthrodial joints. Journal of Biomechanical Engineering, 115: 366-373.
- Mow, V.C., Ateshian, G.A., and Spilker, R.L. (1993) Biomechanics of Diarthrodial Joints. Journal of Biomechanical Engineering, ASME 115: 460-467.
- Ateshian, G.A., Kwak, S.D., Soslowsky, L.J., and Mow, V.C. (1994) A stereophotogrammetric method for determining in situ contact areas in diarthrodial joints, and a comparison with other methods. Journal of Biomechanics, 27: 111-124.
- Mow, V.C., Bachrach, N.M., and Ateshian, G.A. (1994) The effects of a subchondral bone perforation on the load support mechanism within articular cartilage. Wear, 175: 167-175.
- Ateshian, G.A., Lai, W.M., Zhu, W.B., and Mow, V.C. (1994) An asymptotic solution for the contact of two biphasic cartilage layers. Journal of Biomechanics, 27: 1347-1360.
- Flatow, E.L., Ateshian, G.A., Soslowsky, L.J., Pawluk, R.J., Grelsamer, R.P., Mow, V.C., and Bigliani, L.U. (1994) Computer Simulation of Glenohumeral and Patellofemoral Subluxation: Estimating Pathological Articular Contact. Clinical Orthopaedics and Related Research, 306: 28-33.

- Ateshian, G.A., Ark, J.W., Rosenwasser, M.P., Pawluk, R.J., and Mow, V.C. (1995) Contact areas in the thumb carpometacarpal joint. *Journal of Orthopaedic Research*, 13: 450-458.
- Ateshian, G.A., and Wang, H. (1995) A theoretical solution for the frictionless rolling contact of cylindrical biphasic articular cartilage layers. *Journal of Biomechanics*, 28: 1341-1355.
- Ateshian, G.A. (1997) A theoretical formulation for boundary friction in articular cartilage. *Journal of Biomechanical Engineering, ASME*, 119: 81-86.
- Wang, H., and Ateshian, G.A. (1997) The normal stress effect and equilibrium friction coefficient of articular cartilage under steady frictional shear. *Journal of Biomechanics*, 30: 771-776.
- Kwak, S.D., Colman, W.W., Ateshian, G.A., Grelsamer, R.P., Henry, J.H., and Mow, V.C (1997) Anatomy of the human patellofemoral joint articular cartilage: a surface curvature analysis. *Journal of Orthopaedic Research*, 15: 468-472.
- Ateshian, G.A., Warden, W.H., Kim, J.J., Grelsamer, R.P., and Mow, V.C. (1997) Biphasic finite deformation material properties of bovine articular cartilage from confined compression experiments. *Journal of Biomechanics*, 30: 1157-1164.
- Ateshian, G.A., and Wang, H. (1997) Rolling resistance of articular cartilage due to interstitial fluid flow. *Journal of Engineering in Medicine, IMechE*, 211: 419-424.
- Ateshian, G.A., Wang, X. (1998) Sliding tractions on a porous deformable layer. *Journal of Tribology, ASME*, 120: 89-96.
- Ateshian, G.A., Wang, H., and Lai, W.M. (1998) The role of interstitial fluid pressurization and surface porosities on the boundary friction of articular cartilage. *Journal of Tribology, ASME*, 120: 241-251.
- Xu, L., Strauch, R.J., Ateshian, G.A., Pawluk, R.J., Mow, V.C., and Rosenwasser, M.P. (1998) Topography of the osteoarthritic carpometacarpal joint and its variations with gender, age, site, and osteoarthritic stage. *Journal of Hand Surgery*, 23A: 454-464.
- Ahmad, C.S., Kwak, S.D., Ateshian, G.A., Warden, W.H., Henry, J.H., Steadman, J.R., Grelsamer, R.P., Blankevoort, L., Gardner, T.R., and Mow, V.C. (1998) Effects of patellar tendon adhesion to the anterior tibia on knee mechanics. *American Journal of Sports Medicine*, 26: 715-724.
- Mow, V.C., Ateshian, G.A., Lai, W.M., and Gu, W.Y. (1998) Effects of fixed charges on the stress-relaxation behavior of hydrated soft tissues in a confined compression problem. *International Journal of Solids and Structures*, 35: 4945-4962.
- Soltz, M.A., and Ateshian, G.A. (1998) Experimental verification and theoretical prediction of cartilage interstitial fluid pressurization at an impermeable contact interface in confined compression. *Journal of Biomechanics*, 31: 927-934.
- Cohen, Z.A., McCarthy, D.M., Kwak, S.D., Legrand, P., Fogarasi, F., Ciaccio, E.J., and Ateshian, G.A. (1999) Knee cartilage topography, thickness, and contact areas from MRI: In vitro calibration and in vivo measurements. *Osteoarthritis and Cartilage*, 7: 95 -109.
- Kelkar, R., and Ateshian, G.A. (1999) Contact creep of biphasic cartilage layers: Identical layers. *Journal of Applied Mechanics, ASME*, 66: 137-145.
- Donzelli, P.S., Spilker, R.L., Ateshian, G.A., and Mow, V.C. (1999) A finite element investigation of contact between transversely isotropic layers of biphasic cartilage. *Journal of Biomechanics*, 32: 1037-1047.
- Soltz, M.A., and Ateshian, G.A. (2000) Interstitial fluid pressurization during confined compression cyclical loading of articular cartilage. *Annals*

- Kwak, S.D., Ahmad, C.S., Gardner, T.R., Grelsamer, R.P., Henry, J.H., Blankevoort, L., Ateshian, G.A., Mow, V.C. (2000) Hamstrings and iliotibial band forces affect knee kinematics and contact pattern. *Journal of Orthopaedic Research*, 18: 101-108.
- Kwak, S.D., Blankevoort, L., and Ateshian, G.A. (2000) A mathematical formulation for 3D quasi-static multibody models of diarthrodial joints. *Computer Methods in Biomechanics and Biomedical Engineering*, 3: 41-64.
- Mauck, R.L., Soltz, M.A., Wang, C.C.B., Wong, D.D., Chao, P-H.G., Valhmu. W.B., Hung, C.T., and Ateshian, G.A. (2000) Functional tissue engineering of articular cartilage through dynamic loading of chondrocyte-seeded agarose gels. *Journal of Biomechanical Engineering, ASME*, 122: 252-260.
- Lai, W.M., Mow, V.C., Sun, D.D., Ateshian, G.A. (2000) On the electric potentials inside a charged soft hydrated biological tissue: Streaming potential vs. diffusion potential. *Journal of Biomechanical Engineering, ASME*, 122: 336-346.
- Rivers, P.A., Mow, V.C., Pawluk, R.J., Strauch, R.J., Rosenwasser, M.P., and Ateshian, G.A. (2000) Osteoarthritic changes in biochemical composition of thumb carpometacarpal joint cartilage and its correlation with biomechanical properties. *Journal of Hand Surgery*, 25A: 889-898.
- Felson, D.T., Lawrence, R.C., Dieppe, P.A., Hirsch, R., Helmick, C.G., Jordan, J.M., Kington, R.S. Lane, N.E., Nevitt, M.C., Zhang, Y., Sowers, M.F., McAlindon, T., Spector, T.D., Poole, A.R., Yanovski, S.Z., Ateshian, G.A., Sharma, L., Buckwalter, J.A., Brandt, K., Fries, J.F. (2000) Osteoarthritis – New insights. Part 1: The disease and its risk factors. *Annals of Internal Medicine*, 133: 635-646.
- Soltz, M.A., Ateshian, G.A. (2000) A conewise linear elasticity mixture model for the analysis of tension-compression nonlinearity in articular cartilage. *Journal of Biomechanical Engineering, ASME*, 122: 576-586.
- Kelkar, R., Bigliani, L.U., Flatow, E.L., Newton, P.M., Ateshian, G.A., Pawluk, R.J., and Mow, V.C. (2001) Glenohumeral mechanics: A study of articular geometry, contact, and kinematics. *Journal of Shoulder and Elbow Surgery*, 10: 73-84.
- Ahmad, C.S., Cohen, Z.A., Levine, W.N., Ateshian, G.A., and Mow, V.C. (2001) Biomechanical and topographic considerations for autologous osteochondral grafting in the knee. *American Journal of Sports Medicine*, 29: 201-206.
- Kitano, T., Ateshian, G.A., Mow, V.C., Kadoya, Y., and Yamano, Y. (2001) Constituents and pH changes in protein rich hyaluronan solution affect the biotribological properties of artificial cartilage. *Journal of Biomechanics*, 34: 1031-1037.
- Cohen, Z.A., Roglic, H., Grelsamer, R.P., Henry, J.H., Levine, W.N., Mow, V.C., and Ateshian, G.A. (2001) Patellofemoral stresses during open and closed kinetic chain exercises: An analysis using computer simulation. *American Journal of Sports Medicine*, 29: 480-487.
- Huang, C-Y., Mow, V.C., and Ateshian, G.A. (2001) The role of flow-independent viscoelasticity in the biphasic tensile and compressive responses of articular cartilage. *Journal of Biomechanical Engineering*, 123: 410-417.
- Dykyj, D., Ateshian, G.A., Trepal, M.J., and MacDonald, L.R. (2001) Articular geometry of the medial tarsometatarsal joint in the foot: Comparison of metatarsus primus adductus and metatarsis primus rectus. *The Journal of Foot & Ankle Surgery*, 40: 357-365.
- Hohe, J., Ateshian, G.A., Reiser, M., Englmeier, K-H., Eckstein, F. (2002) Surface size, curvature analysis, and assessment of knee joint incongruity with MR imaging in vivo. *Magnetic Resonance in Medicine*, 47: 554-561.

- Wang, C. C-B., Guo, X. E., Sun, D., Mow, V. C., Ateshian, G. A. and Hung, C. T. (2002) The functional environment of chondrocytes within cartilage subjected to compressive loading: a theoretical and experimental approach. *Biorheology*, 39:11-25.
- Lai, W.M., Sun, D.D., Ateshian, G.A., Guo, X.E., and Mow, V.C. (2002) Electrical signals for chondrocytes in cartilage. *Biorheology*, 39:39-45.
- Mauck, R.L., Seyhan, S.L., Ateshian, G.A., and Hung, C.T. (2002) The influence of seeding density and dynamic deformational loading on the developing structure/function relationships of chondrocyte-seeded agarose hydrogels. *Annals of Biomedical Engineering*, 30:1046-1056.
- Ateshian, G.A., Soltz, M.A., Mauck, R.L., Basalo, I.M., Hung, C.T., and Lai, W.M. (2003) The role of osmotic pressure and tension-compression nonlinearity in the frictional response of articular cartilage. *Transport in Porous Media*, 50:5-33.
- Wang, C.C-B., Deng, J-M., Ateshian, G.A., and Hung, C.T. (2002) An automated approach for direct measurement of two-dimensional strain distributions within articular cartilage under unconfined compression. *Journal of Biomechanical Engineering*, 124:557-567.
- Ahmad, C.S., Cohen, Z.A., Levine, W.N., Gardner, T.R., Ateshian, G.A., and Mow, V.C.: Co-dominance of the Individual PCL Bundles: An Analysis of Bundle Lengths and Orientation. *American Journal of Sports Medicine*, In Press.
- Wang, C.C-B., Chahine, N.O., Hung, C.T., and Ateshian, G.A.: Optical determination of anisotropic properties of bovine articular cartilage in compression. *Journal of Biomechanics*, In Press.
- Huang, C-Y., Soltz, M.A., Kopacz, M., Mow, V.C., and Ateshian, G.A.: Experimental verification of the role of intrinsic matrix viscoelasticity and tension-compression nonlinearity in the biphasic response of cartilage in unconfined compression. *Journal of Biomechanical Engineering*, In Press.
- Cohen, Z.A., Henry, J.H., McCarthy, D.M., Mow, V.C., and Ateshian, G.A.: Computer simulations of patellofemoral joint surgery: Tuberosity transfers on patient-specific models. *American Journal of Sports Medicine*, In Press.

Cartilage mechanics, biotribology, and tissue engineering, diarthrodial joint mechanics, soft tissue mechanics, computer-assisted surgery.