



Alexander Rachev, Ph. D., D.Sc.
Professor of Biomechanics

Personal data

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Phone: 404 325 2546
Family status: married
Date and place of birth: 18.08.1939, Sofia
Nationality: Bulgarian
Residency: Permanent American Resident
Languages: Bulgarian, English, Russian, Polish

Education

Doctor of Sciences (Biomechanics), Degree received: 1984
Institution: Bulgarian Academy of Sciences, Sofia;
Ph. D. (Theoretical and Applied Mechanics), Degree received: 1969;
Institution: Polish Academy of Sciences, Warsaw;
Diploma in Civil Engineering, Degree received: 1963
Institution: Faculty of Civil Engineering, Higher Institute of Civil Engineering, Sofia.

Professional activities in Bulgaria

1987 - 2004 Professor and Head of Department "Biomechanics of Tissues and Systems", Institute of Mechanics, Bulgarian Academy of Sciences (IM-BAS)
1978 - 1987: Associate Professor, (IM-BAS)
1973 - 1978: Associate Professor, Central Laboratory of Biomechanics, BAS
1965 - 1973: Research Fellow, Institute of Technical Mechanics, BAS
1963 - 1965: Research Engineer, Institute of Technical Mechanics, BAS

Professional activities outside Bulgaria

May 2004 – present Visiting Principal Research Engineer, Georgia Institute of Technology, Atlanta, USA
September 2002- October 2003 Visiting Principal Research Engineer, Georgia Institute of Technology, Atlanta, USA

November 2001- June 2002	Temporary Professional Advisor, Georgia Institute of Technology, Atlanta, USA
November 2000 - May 2001	Temporary Professional Advisor, Georgia Institute of Technology, Atlanta, USA
April, 200	Visiting Professor, Swiss Federal Institute of Technology, Lausanne (EPFL), Switzerland
September, 1999	Visiting Professor, (EPFL), Switzerland
April - May, 1999	Visiting Professor, University of Graz, Austria
February - March, 1999	Visiting Professor, Osaka University, Japan
August, 1996	Visiting Professor, (EPFL), Switzerland
May -August, 1995	Visiting Professor, (EPFL), Switzerland
May - September, 1994	Visiting Professor, (EPFL), Switzerland
June - July, 1993	Visiting Professor, (EPFL), Switzerland
February - March, 1992	Visiting Professor, (EPFL), Switzerland
September- November, 1984	Visiting Professor, University of Bologna, Italy
April – September, 1972	Visiting Scholar, Stanford University and ColumbiaUniversity,USA

Professional and academic organizations membership

Member of the World Council of Biomechanics
 Corresponding member of the European Mechanics Society for Bulgaria
 Member of the Scientific Council of the International Center of Biocybernetics, Poland
 Member of the Biomedical Engineering Society
 Member of the European Mechanics Society
 Member of the Executive Body of the Bulgarian Rheological Society
 Honorary Member of the Bulgarian Society of Biomechanics

Membership of Editorial Boards

Associate editor of *International Journal of Cardiovascular Medicine and Science*
 Member of the Editorial Board of the journal *Biomechanics and Modeling in Mechanobiology*
 Member of the Editorial Board of the journal *Russian Biomechanics*
 Member of the Editorial Board of the journal *Biocybernetics and Bioengineering* (Poland)
 Member of the Editorial Board of the journal *Biomechanics* (Bulgaria)

Research interests

Cardiovascular Biomechanics: Mechanical properties of living tissues; Blood flow in arteries; Growth and remodeling; Arterial grafting and stenting; Tissue engineered functional grafts.

Publications

More than 150 published journal papers and conference presentations with proceedings in the field of mechanics and biomechanics. More than 600 citations.

Recent Publication (partial listing)

1. Achakri, H., Rachev, A., Stergiopoulos, N., and Meister, J.-J., (1994), A theoretical investigation of spontaneous diameter oscillations in muscular arteries. In: *Proc. of the IFAC Symposium "Modeling and Control in Biomedical Systems"*, 27-30 March, Calveston, Texas, p. 25-26.
2. Achakri, H., Rachev, A., Stergiopoulos, N., and Meister, J.-J., (1994), A theoretical investigation of low frequency diameter oscillations of muscular arteries. *Annals of Biomedical Engineering*, 22, p. 253-263, 1994.
3. Greenwald, S., Rachev, A., Moore, J.E., and Meister, J.-J., (1994), The contribution of the structural components of the arterial wall to residual strains, In: *BED-vol.28, Advances in Bioengineering*, ASME 1994, p. 63-64.

4. Stergiopoulos, N., Pannatier, A., Rachev, A., and Meister, J.-J., (1994), Elastic response of the arterial wall under physiologic and nonphysiologic initial stress distribution: Applicability of the strain energy function, In: *BED-vol.28, Advances in Bioengineering*, ASME 1994, p. 67-68.
5. Rachev, A., (1994), Theoretical study of the effect of stress-dependent remodeling on arterial geometry under hypertensive conditions, (1994), In: *Biomedical Engineering: Recent Developments*, (J. Vossoughi, ed.), Proc. of the Thirteen Southern Biomedical Engineering Conference, Washington, DC, p. 799-802.
6. Rachev, A., Greenwald, S., Kane, T., Moore Jr, J. E., and Meister, J.-J., (1994), Effects of age-related changes in the residual strains on the stress distribution in the arterial wall. In: *Biomedical Engineering: Recent Developments*, (J. Vossoughi, ed.), Proc. of the Thirteen Southern Biomedical Engineering Conference, Washington, DC, p. 409-412.
7. Greenwald, S., Rachev, A., Moore, J. and Meister, J.-J. (1994), The contribution of the structural components of the arterial wall to residual strains. In: *Biomedical Engineering: Recent Developments*, (J. Vossoughi, ed.), Proc. of the Thirteen Southern Biomedical Engineering Conference, Washington, DC, p. 215-218.
8. Achakri, H., Stergiopoulos, N., Rachev, A., and Meister, J.-J., (1994), Mesure et modele des oscillations spontanees du diametre d'arteres musculaires, *Archive Inter. de Physiologie, de Biochimie et Biophysique*, , p. C70.
9. Delfino, A., Rachev, A., Moore, J., Ijspeert, A., Greenwald, S., and J.-J. Meister, (1994), Mise en evidence de la non homogeneite de la paroi arterielle au moyen de tests mecaniques, *Archive Inter. de Physiologie, de Biochimie et Biophysique*, p. C106.
10. Rachev, A., Residual strains and remodeling of arteries, (1994), In: *Biomechanics of Man '94*, Proceedings of 5th International Conference, p. 116-119.
11. Rachev, A., Greenwald, S., Kane, T., Moore Jr, J. E., and Meister, J.-J., (1995), Analysis of the strain and stress distribution in the wall of the developing and mature aorta, *Biorheology*, Vol. 32 No 4, pp. 473-485.
12. Achakri H., Stergiopoulos, N., Rachev, A., Meister, J.-J., (1995), Analyse de l'instabilite du diametre d'arteres musculaires a l'etat contracte , *Archives of Physiology and Biochemistry*, Vol. 103, No 3, C43 .
13. Rachev, A., Stergiopoulos, N. and Meister J.-J., (1995), Dynamics of arterial wall remodeling in response to changes in blood pressure, In: *Proc. of the 1995 Bioengineering Conference ASME, BED- Vol. 29*, pp.61-62.
14. Stergiopoulos, N., Pannatier, A., Rachev, A., and Meister, J.-J., (1995), Applicabilite de la fonction energie de deformation a une paroi arterielle in homogene et precontrainte, *Archives of Physiology and Biochemistry*, Vol. 103, No 3, C75.
15. Rachev, A., Stergiopoulos, N. and Meister J.-J., (1996), Theoretical study of dynamics of arterial wall remodeling in response to changes in blood pressure, *J. Biomechanics*, Vol. 29, No 5, pp.635-642.
16. Rachev A., (1996), Theoretical Study of the Effect of Smooth Muscle Contraction on Strain Distribution in Arteries, *Proceedings of 9th International Conference on Mechanics in Medicine and Biology*, Lubliana, Slovenia, June 30-July 4, 1996, p.351-354..
17. Rachev A., (1997), Adaptation of Arteries to Mechanical Factors, *Proceedings of the Ninth JSME Bioengineering Conference*, pp.129-133.
18. Rachev A., (1997) Theoretical study of the effect of stress-dependent remodeling on arterial geometry under hypertensive conditions' *J. Biomechanics*, Vol. 30, No 8, pp.819-827.
19. Greenwald S., Moore J., Rachev A., Kane T., and Meister J.-J., (1997) Experimental Investigation of the Distribution of Residual Strains in the Artery Wall, *Journal of Biomechanical Engineering - ASME*, Vol . 119, pp. 438-444.
20. Rachev A., Stergiopoulos, N. and Meister J.-J., (1998), A Model for Geometrical and Mechanical Adaptation of Arteries to Sustained Hypertension, *Journal of Biomechanical Engineering - ASME*, Vol. 120, pp. 9-17.

21. Rachev A., Hayashi K.,(1999) Theoretical Study of the Effects of Vascular Smooth muscle Contraction on Strain and Stress Distributions in Arteries, *Annals of Biomedical Engineering*, Vol. 27, pp. 459-468.
22. Rachev A., Manoach E., Berry J., and Moore J. ,(2000), Model of stress-induced geometrical remodeling of vessel segment adjacent to stents and artery/graft anastomosis. *J. Theor. Biol.* 206 (3), pp.429-443.
23. Hayashi K., Stergiopoulos, N., Meister, J.J, Greenwald, S.E. and Rachev A. (2001) Techniques in the Determination of the Mechanical Properties and Constitutive Laws of Arterial Walls, in *Biomechanic Systems and Applications*, Ed. C. T. Leondes, Gordon and Breach, pp.6.1-6.61
24. Rachev A., A Model of Arterial Adaptation to Alterations in Blood Flow (2001), *Journal of Elasticity*, **61**: 1-48.
25. Stergiopoulos N., Vulliémoz S., Rachev A. , Meister J.-J., and Greenwald S. E. (2001), Assessing the Homogeneity of the Elastic Properties and Composition of the Pig Aortic Wall, *J. Vascular Research* **38**: 237-246
26. Fridez P., Rachev A., Meister, J-J., Hayashi K., Stergiopoulos N.(2001), A biomechanical model for the geometrical and vascular smooth muscle tone adaptation in conduit arteries subjected to induced hypertension, *Am. J. Physiol. Heart Circ Physiol*, **280**: H2752-H2760.
27. Stergiopoulos N., Panatier, Rachev A. , Greenwald S. E. and Meister J.-J., (2001), Assessing of Mechanical Homogeneity of the Arterial Wall by an Artery-Inversion Test, *Cardiovascular Engineering* **1**: 31-36.
28. Berry, JE, Manoach E., Mekkaoui C., Rolland P.H., Moore Jr. J. E. and Rachev A., Hemodynamics and Wall Mechanics of a Compliance Matching Stent: In Vitro and In Vivo Analysis, (2002) *J. Vas, Interv. Radiol.*,**13**: 97-105.
29. Rachev, A. Remodeling of arteries in response to changes in their mechanical environment,(2003), In: *Biomechanics of Soft Tissue in Cardiovascular Systems*, Eds. G. Holzapfel and R. Ogden, CISM Courses and Lectures, Course and Lecture No 441, Springer, Wien New York, pp. 100-161
30. Rachev A., Greenwald S. E, Residual strains in conduit arteries, (2003), *J. Biomechanics*, **36**: 661-670.
31. Zulliger MA Rachev A., and Stergiopoulos N. A constitutive formulation of arterial mechanics including vascular smooth muscle tone. (2004), *Am J Physiol Heart Circ Physiol* 287: H1335-1343,.
32. Rachev, A., ElShazly, T. and Ku D. N., , Constitutive Formulation of the Mechanical Properties of Synthetic Hydrogels, (2004), *Proceedings of IMECE 04, ASME International Mechanical Engineering Congress*, Anaheim, California.
33. Rachev A., Felden.L , and Ku DN., Design and Fabrication of Mechanics- Matching Arterial Grafts, (2005) *Proceedings of the ASME Summer Bioengineering Conference*, Vail, Colorado.
34. Rachev A., Introduction to Remodeling of Arteries, (2005) **In**: *Advanced Course in Tissue Remodeling*, ACTR'04 Tissue Remodeling , Lecture Notes 3, ed/ J. Piekarski, IPPT, PAN, Warsaw, Poland, pp. 241-300.
35. Timmins LH, Michael R. Moreno' MR, Meyer CA, Criscione JC, Rachev-A and Moore JE Jr, , Stented artery biomechanics and device design optimization, (2007), *Med Bio Eng Comput*, Vol. 45, **5**: 505-513.
36. Rachev A., R. Vito, B. Wayman. Novel Process and System for Tissue Engineered Blood Vessels (2007), Georgia Institute of Technology, Invention Disclosure, ID # 4161.