

Gal Debotton  
Full Professor, Deputy  
Department of Mechanical Engineering  
Rector's Office  
Email: [debotton@bgu.ac.il](mailto:debotton@bgu.ac.il)



## Research interests

Composite materials in finite deformations,  
Active materials and polymers,  
Soft biological tissues,  
Vibration and predictive maintenance

## Qualifications

PhD, The Constitutive Behavior of Nonlinear Anisotropic Composites , University of Pennsylvania  
1989 → 1993

Master, The Representation of a Force System by Stresses, Ben-Gurion University of the Negev  
1986 → 1989

## Research outputs

### Experimental Study of Nitinol Springs: Apparatus and Results

Alexandron, I. & deBotton, G., 1 Sep 2024, In: *Experimental Mechanics*. 64, 7, p. 981-994 14 p.

### Statistical field theory of polarizable polymer chains with nonlocal dipolar interactions

Khandagale, P., Garcia-Cervera, C., Debotton, G., Breitzman, T., Majidi, C. & Dayal, K., 1 Apr 2024, In: *Physical Review E*. 109, 4, 044501.

### Plane-stress analysis of a holed membrane at finite equibiaxial stretch

Friedberg, I. Z. & deBotton, G., 1 Jan 2024, (Accepted/In press) In: *Mathematics and Mechanics of Solids*.

### Electroelasticity of copolymer networks

Friedberg, I. Z. & deBotton, G., 1 Jun 2023, In: *Journal of the Mechanics and Physics of Solids*. 175, 105295.

### Stretchable Fibrous Materials with Different Micro-Geometries of Wavy Fibers

Ben-Or Frank, M. & deBotton, G., Jun 2022, *Solid (Bio)mechanics: Challenges of the Next Decade* . Sommer, G., Li, K., Ogden, R. W. & Haspinger, D. C. (eds.). Springer Cham, p. 407-427 21 p. (Studies in Mechanobiology, Tissue Engineering and Biomaterials; vol. 24).

### Statistical field theory for the free energy of an electro-mechanical polymer chain: non-local dipole-dipole interactions in the fixed applied field ensemble

Khandagale, P., Cervera, C. G., Debotton, G., Majidi, C. & Dayal, K., Mar 2022.

### Statistical mechanics of a dielectric polymer chain in the force ensemble

Grasinger, M., Dayal, K., deBotton, G. & Purohit, P. K., 1 Jan 2022, In: *Journal of the Mechanics and Physics of Solids*. 158, 104658.

### Performance Analysis of the Direct-Charge $\beta$ -Radiation Energy-Harvesting Method

Haim, Y. & Debotton, G., 1 Jun 2021, In: *IEEE Transactions on Electron Devices*. 68, 6, p. 2917-2925 9 p., 9422111.

**Experimental Study of the Direct-Charge Beta Radiation Method for Energy Harvesting**

Haim, Y. & Debotton, G., 1 Nov 2020, In: IEEE Transactions on Electron Devices. 67, 11, p. 5076-5081 6 p., 9186841.

**Experimental study of muscle permeability under various loading conditions**

Nudel, I., Hadas, O. & Debotton, G., 15 Aug 2019, In: Biomechanics and Modeling in Mechanobiology. 18, 4, p. 1189-1195 7 p.

**Micromechanically-motivated analysis of fibrous tissue**

Ben-Or Frank, M., Niestrawska, J. A., Holzapfel, G. A. & Debotton, G., 1 Aug 2019, In: Journal of the Mechanical Behavior of Biomedical Materials. 96, p. 69-78 10 p.

**Analytical and numerical analyses of neo-Hookean thin-wall composite spheres**

Weil, G. & Debotton, G., 1 Jun 2019, In: Mathematics and Mechanics of Solids. 24, 6, p. 1800-1820 21 p.

**Tunable direct beta-radiation harvester at the nanowatt scale**

Haim, Y., Marciano, Y. & deBotton, G., 1 Nov 2018, In: Sensors and Actuators, A: Physical. 283, p. 228-234 7 p.

**The compartment syndrome: Is the intra-compartment pressure a reliable indicator for early diagnosis?**

Nudel, I., Dorfmann, L. & Debotton, G., 1 Dec 2017, In: Mathematical Medicine and Biology. 34, 4, p. 547-558 12 p.

**The evolution of the dielectric constant in various polymers subjected to uniaxial stretch**

Cohen, N., Oren, S. S. & Debotton, G., 1 Oct 2017, In: Extreme Mechanics Letters. 16, p. 1-5 5 p.

**Thin-wall composite sphere in finite shear deformation**

Weil, G. & Debotton, G., 15 Aug 2017, In: International Journal of Solids and Structures. 121, p. 33-44 12 p.

**Corrigendum to "Band-gaps in electrostatically controlled dielectric laminates subjected to incremental shear motions" [Journal of the Mechanics and Physics of Solids 60 (2012) 1970–1981]**

Shmuel, G. & Debotton, G., 1 Aug 2017, In: Journal of the Mechanics and Physics of Solids. 105, p. 21-24 4 p.

**Electroelasticity of polymer networks**

Cohen, N., Dayal, K. & DeBotton, G., 1 Jul 2016, In: Journal of the Mechanics and Physics of Solids. 92, p. 105-126 22 p.

**Electromechanical Interplay in Deformable Dielectric Elastomer Networks**

Cohen, N. & Debotton, G., 20 May 2016, In: Physical Review Letters. 116, 20, 208303.

**Towards a physics-based multiscale modelling of the electro-mechanical coupling in electro-active polymers**

Cohen, N., Menzel, A. & DeBotton, G., 1 Feb 2016, In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. 472, 2186, 20150462.

**The electromechanical response of polymer networks with long-chain molecules**

Cohen, N. & DeBotton, G., 3 Jul 2015, In: Mathematics and Mechanics of Solids. 20, 6, p. 721-728 8 p.

**Optimal energy harvesting cycles for load-driven dielectric elastomer generators under equibiaxial deformation**

Bortot, E., Gei, M. & deBotton, G., 5 Jun 2015, In: Meccanica. 50, 11, p. 2751-2766 16 p.

**Optimization of Load-driven Soft Dielectric Elastomer Generators**

Bortot, E., Springhetti, R., DeBotton, G. & Gei, M., 1 Jan 2015, In: Procedia IUTAM. 12, p. 42-51 10 p.

**Optimal energy-harvesting cycles for load-driven dielectric generators in plane strain**

Springhetti, R., Bortot, E., DeBotton, G. & Gei, M., 1 Oct 2014, In: IMA Journal of Applied Mathematics. 79, 5, p. 929-946 18 p.

**Multiscale instabilities in soft heterogeneous dielectric elastomers**

Rudykh, S., Bhattacharya, K. & DeBotton, G., 8 Feb 2014, In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. 470, 2162, 20130618.

**Magnetoactive elastomers with periodic and random microstructures**

Galipeau, E., Rudykh, S., DeBotton, G. & Ponte Castañeda, P., 1 Jan 2014, In: International Journal of Solids and Structures. 51, 18, p. 3012-3024 13 p.

**Multiscale analysis of the electromechanical coupling in dielectric elastomers**

Cohen, N. & DeBotton, G., 1 Jan 2014, In: European Journal of Mechanics, A/Solids. 48, 1, p. 48-59 12 p.

**Optimal energy-harvesting cycles for load-driven soft dielectric generators**

Springhetti, R., Bortot, E., deBotton, G. & Gei, M., Jan 2014, *Fourth international conference on Electromechanically Active Polymer (EAP) transducers & artificial muscles: EuroEAP Conference 2014*.

**Homogenized estimates for soft fiber-composites and tissues with two families of fibers**

deBotton, G., Oren, T., Shmuel, G. & Rudykh, S., 2014.

**Axisymmetric wave propagation in finitely deformed dielectric elastomer tubes**

Shmuel, G. & DeBotton, G., 8 Jul 2013, In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. 469, 2155, 20130071.

**Analysis of microstructural induced enhancement of electromechanical coupling in soft dielectrics**

Rudykh, S., Lewinstein, A., Uner, G. & DeBotton, G., 15 Apr 2013, In: Applied Physics Letters. 102, 15, 151905.

**Axisymmetric bifurcations of thick spherical shells under inflation and compression**

DeBotton, G., Bustamante, R. & Dorfmann, A., 15 Jan 2013, In: International Journal of Solids and Structures. 50, 2, p. 403-413 11 p.

**Analytical and numerical analyses of the micromechanics of soft fibrous connective tissues**

DeBotton, G. & Oren, T., 1 Jan 2013, In: Biomechanics and Modeling in Mechanobiology. 12, 1, p. 151-166 16 p.

**Snap-through actuation of thick-wall electroactive balloons**

Rudykh, S., Bhattacharya, K. & DeBotton, G., 1 Mar 2012, In: International Journal of Non-Linear Mechanics. 47, 2, p. 206-209 4 p.

**The Rayleigh-Lamb wave propagation in dielectric elastomer layers subjected to large deformations**

Shmuel, G., Gei, M. & DeBotton, G., 1 Mar 2012, In: International Journal of Non-Linear Mechanics. 47, 2, p. 307-316 10 p.

**Instabilities of hyperelastic fiber composites: Micromechanical versus numerical analyses**

Rudykh, S. & DeBotton, G., 1 Feb 2012, In: Journal of Elasticity. 106, 2, p. 123-147 25 p.

**Soft Dielectrics: Heterogeneity and Instabilities**

Rudykh, S., DeBotton, G. & Bhattacharya, K., Feb 2012.

**Band-gaps in electrostatically controlled dielectric laminates subjected to incremental shear motions**

Shmuel, G. & DeBotton, G., 1 Jan 2012, In: Journal of the Mechanics and Physics of Solids. 60, 11, p. 1970-1981 12 p.

**Dielectric elastomer composites**

Tian, L., Tevet-Deree, L., DeBotton, G. & Bhattacharya, K., 1 Jan 2012, In: Journal of the Mechanics and Physics of Solids. 60, 1, p. 181-198 18 p.

**Stability of anisotropic electroactive polymers with application to layered media**

Rudykh, S. & deBotton, G., 1 Dec 2011, In: *Zeitschrift für Angewandte Mathematik und Physik*. 62, 6, p. 1131-1142 12 p.

**Finitely strained dielectric elastomer layers as waveguides for electroelastic waves**

Shmuel, G., Gei, M. & deBotton, G., Oct 2011, *SES 2011*.

**Generalized Rayleigh-Lamb wave propagation in finitely deformed dielectric elastomers**

Shmuel, G., Gei, M. & DeBotton, G. H., 2011, *International Conference on EAP Transducers and Artificial Muscles*.

**A new variational estimate for the effective response of hyperelastic composites**

deBotton, G. & Shmuel, G., 1 Apr 2010, In: *Journal of the Mechanics and Physics of Solids*. 58, 4, p. 466-483 18 p.

**Out-of-plane shear of fiber composites at moderate stretch levels**

Shmuel, G. & deBotton, G., 1 Jan 2010, In: *Journal of Engineering Mathematics*. 68, 1, p. 85-97 13 p.

**Microscopic and Macroscopic Instabilities in Dielectric Composite Actuators**

Gei, M., Bertoldi, K., deBotton, G. & Lewinstein, A., 2010, *Actuator 10: Conference Proceedings*. Borgmann, H. (ed.). WFB Wirtschaftsförderung Bremen, p. 838-841 (Actuator-International Conference and Exhibition on New Actuators and Drive Systems).

**Evaluation of numerical methods for simulation of weak impact**

Kochavi, E., Shafir, I., Gruntman, S. & DeBotton, G., 21 Sep 2009, *2008 Proceedings of the 9th Biennial Conference on Engineering Systems Design and Analysis*. p. 325-332 8 p. (2008 Proceedings of the 9th Biennial Conference on Engineering Systems Design and Analysis; vol. 2).

**Optimal stresses and load capacity for structures**

Segev, R., Falach, L. & De Botton, G., 21 Sep 2009, *2008 Proceedings of the 9th Biennial Conference on Engineering Systems Design and Analysis*. p. 209-215 7 p.

**Mechanics of composites with two families of finitely extensible fibers undergoing large deformations**

deBotton, G. & Shmuel, G., 1 Aug 2009, In: *Journal of the Mechanics and Physics of Solids*. 57, 8, p. 1165-1181 17 p.

**Modelling of dielectric composites in finite deformation elasticity**

DeBotton, G., Gei, M. & Lewinstein, A., 2009, *AIMETA 2009*. p. 1-7 7 p.

**On the macroscopic response of electroactive composites in finite strain**

Gei, M., Lewinstein, A. & DeBotton, G. H., 2009, *EUROMECH Solid Mechanics conference ESMC 2009*. p. 469-470 2 p.

**The coupled energy-density function of dielectric composites in finite deformation elasticity**

DeBotton, G. H., Gei, M. & Lewinstein, A., 2008, *3rd International Conference on Smart Materials, Structures and Systems*. p. 38-38 1 p.

**The influence of microstructural arrangement on the response of polymer composites in planar impact**

deBotton, G. & Shaine, D., 1 Dec 2007, In: *International Journal of Solids and Structures*. 44, 24, p. 7841-7861 21 p.

**Stress-modulated collagen fiber remodeling in a human carotid bifurcation**

Hariton, I., deBotton, G., Gasser, T. C. & Holzapfel, G. A., 7 Oct 2007, In: *Journal of Theoretical Biology*. 248, 3, p. 460-470 11 p.

**Electroactive heterogeneous polymers: Analysis and applications to laminated composites**

DeBotton, G., Tevet-Deree, L. & Socolsky, E. A., 1 Sep 2007, In: *Mechanics of Advanced Materials and Structures*. 14, 1, p. 13-22 10 p.

**Stress-driven collagen fiber remodeling in arterial walls**

Hariton, I., DeBotton, G., Gasser, T. C. & Holzapfel, G. A., 1 Jan 2007, In: *Biomechanics and Modeling in Mechanobiology*. 6, 3, p. 163-175 13 p.

**Electroactive polymer composites - Analysis and simulation**

DeBotton, G. & Tevet-Deree, L., 16 Oct 2006, *Smart Structures and Materials 2006 - Active Materials: Behavior and Mechanics*. Armstrong, W. D. (ed.). San Diego, CA, Vol. 6170. p. 2401-2410 (Proceedings of SPIE - The International Society for Optical Engineering).

**On norms of force functionals and stress representations**

Segev, R. & DeBotton, G., 1 Jun 2006, In: *Mathematics and Mechanics of Solids*. 11, 3, p. 229-250 22 p.

**Out-of-plane shear deformation of a neo-Hookean fiber composite**

deBotton, G. & Hariton, I., 22 May 2006, In: *Physics Letters, Section A: General, Atomic and Solid State Physics*. 354, 1-2, p. 156-160 5 p.

**Neo-Hookean fiber-reinforced composites in finite elasticity**

DeBotton, G., Hariton, I. & Socolsky, E. A., 1 Mar 2006, In: *Journal of the Mechanics and Physics of Solids*. 54, 3, p. 533-559 27 p.

**Universal diagnostic method and system for engines**

Gal, D. (Inventor) & Eran, S. (Inventor), 2006, IPC No. G01M 15/ 12 A I, Patent No. IL144010, Priority date 26 Jun 2001, Priority No. IL20010144010

**Minimizing the rebound velocity of a weight striking a cantilever beam**

Kochavi, E., Gruntman, S., Shafir, I. & De Botton, G., 1 Dec 2005, *12th International Congress on Sound and Vibration 2005, ICSV 2005*. p. 5254-5261 8 p. (12th International Congress on Sound and Vibration 2005, ICSV 2005; vol. 6).

**How to incorporate collagen fiber orientations in an arterial bifurcation?**

Hariton, I. & DeBotton, G., Sep 2005, *Proceedings of the 3rd IASTED International Conference on Biomechanics, Benidorm, Spain*. Hamza, M. H. (ed.). Anaheim: ACTA Press, p. 101-104

**Transversely isotropic sequentially laminated composites in finite elasticity**

DeBotton, G., 1 Jun 2005, In: *Journal of the Mechanics and Physics of Solids*. 53, 6, p. 1334-1361 28 p.

**The response of a fiber-reinforced composite with a viscoelastic matrix phase**

DeBotton, G. & Tevet-Deree, L., 3 Aug 2004, In: *Journal of Composite Materials*. 38, 14, p. 1255-1277 23 p.

All-organic dielectric-percolative three-component composite materials with high electromechanical response

Huang, C., Zhang, Q. M., DeBotton, G. & Bhattacharya, K., 31 May 2004, In: *Applied Physics Letters*. 84, 22, p. 4391-4393 3 p.

**Studying the relationship between the vibration signature and the combustion process in diesel engines**

Goldwine, G., DeBotton, G., Rivin, B. & Sher, E., 1 Jan 2004, *2004 SAE World Congress*. SAE International

**The response of a glass fibers reinforced epoxy composite to an impact loading**

Zaretsky, E., deBotton, G. & Perl, M., 1 Jan 2004, In: *International Journal of Solids and Structures*. 41, 2, p. 569-584 16 p.

**Assessment of the quality of combustion in compression ignition engines through vibration signature analysis**

Goldwine, G., Rivin, B., Sher, E. & DeBotton, G., 2004.

**Experimental and computational study of pressure pulsation in a centrifugal pump**

Timouchev, S., DeBotton, G. & Reznik, A., 1 Dec 2003, p. 1897-1904. 8 p.

**The nearly isotropic behaviour of high-rank nonlinear sequentially laminated composites**

Hariton, I. & De Botton, G., 8 Jan 2003, In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. 459, 2029, p. 157-174 18 p.

**Rank-infinity laminated composites attaining the Hashing-Shtrikman bounds**

Debotton, G. & Hariton, I., 20 May 2002, In: Physics Letters, Section A: General, Atomic and Solid State Physics. 297, 5-6, p. 442-445 4 p.

**Gas-dissolved gasoline spray - An experimental study**

Sher, E., Rashkovan, A., Debotton, G. & Kholmer, V., 1 Jan 2002, In: SAE Technical Papers.

**High-rank nonlinear sequentially laminated composites and their possible tendency towards isotropic behavior**

DeBotton, G. & Hariton, I., 1 Jan 2002, In: Journal of the Mechanics and Physics of Solids. 50, 12, p. 2577-2595 19 p.

**Online detection of cylinder-to-cylinder variations by a vibration analysis system**

Debotton, G., Sher, E., Frenkel, E., Rivin, B., Henig, I., Cumming, B. & Watts, M., 1 Jan 2002, In: SAE Technical Papers.

**Experimental and numerical study of the response of a woven glass/epoxy 7781 composite on the planar impact loading: Proceedings of the Explomet 2000 conference Albuquerque**

Tzuberly, R., deBotton, G., Zaretsky, E. & Perl, M., Feb 2001, *Fundamental Issues and Applications of Shock-Wave and High-Strain-Rate Phenomena*. Staudhammer, K. P., Murr, L. E. & Meyers, M. A. (eds.). Elsevier Science, p. 135-142

**Vibration monitoring as a predictive maintenance tool for reciprocating engines**

de Botton, G., Ben-Ari, J. & Sher, E., 1 Dec 2000, In: Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering. 214, 8, p. 895-903 9 p.

**Vibration monitoring as a predictive maintenance tool for reciprocating engines**

deBotton, G., Ben-Ari, J. & Sher, E., 1 Aug 2000, In: Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering. 214, 8, p. 895-903 9 p.

**ולשיכה תא רוצעל - היחז הקוחא**

ג., 2000, In: לווהינו הישעת. 48, p. 46-48 3 p.

**On the jetting stage of a waterdrop impact by liquid-wedge impact simulation**

DeBotton, G., 1 Dec 1999, In: American Society of Mechanical Engineers, Pressure Vessels and Piping Division (Publication) PVP. 396, p. 59-64 6 p.

**Fault detection in internal combustion engines by the vibrations analysis method**

Ben-Ari, J., Debotton, G., Itzhaki, R. & Sher, E., 1 Jan 1999, In: SAE Technical Papers.

**The interaction of a coated target and an impinging waterdrop**

Debotton, G., 4 Aug 1998, In: Wear. 219, 1, p. 60-72 13 p.

**Vibration signature analysis as a fault detection method for si engines**

Debotton, G., Ben-Ari, J., Itzhaki, R. & Sher, E., 1 Jan 1998, In: SAE Technical Papers. p. 1-6

**Elasticity based approach to the buckling of reinforced solids**

Debotton, G., 1998, *The 27th Israel Mechanical Engineering Conference*. Technion – Israel Institute of Technology, p. 613-615

**Analysis of stresses and damage due to high-velocity waterdrop impact on coated targets**

DeBotton, G., 1 Dec 1997, In: American Society of Mechanical Engineers, Pressure Vessels and Piping Division (Publication) PVP. 355, p. 295-301 7 p.

**Closure to "Discussion of 'Bifurcation of Orthotropic Solids'"**

DeBotton, G. & Schulgasser, K., Mar 1997, In: Journal of Applied Mechanics, Transactions ASME. 64, 1, p. 245-246 1 p.

**Modeling the impact of waterdrops on targets with a thin protective layer**

DeBotton, G., 1997, In: Computer Modeling and Simulation in Engineering. 2, 2, p. 177-194 18 p.

**Force theory for multiphase bodies**

Segev, R., Fried, E. & DeBotton, G., 1 Nov 1996, In: Journal of Geometry and Physics. 20, 4, p. 371-392 22 p.

**Bifurcation of orthotropic solids**

DeBotton, G. & Schulgasser, K., 1 Jan 1996, In: Journal of Applied Mechanics, Transactions ASME. 63, 2, p. 317-320 4 p.

**The effective yield strength of fiber-reinforced composites**

DeBotton, G., 1 Jan 1995, In: International Journal of Solids and Structures. 32, 12, p. 1743-1757 15 p.

**Variational estimates for the creep behaviour of polycrystals**

DeBotton, G. & Ponte Castañeda, P., 1 Jan 1995, In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. 448, 1932, p. 121-142 22 p.

**Elastoplastic constitutive relations for fiber-reinforced solids**

deBotton, G. & Castañeda, P. P., 1 Jan 1993, In: International Journal of Solids and Structures. 30, 14, p. 1865-1890 26 p.

**Effective properties of nonlinear inhomogeneous dielectrics**

Ponte Castañeda, P., DeBotton, G. & Li, G., 1 Jan 1992, In: Physical Review B. 46, 8, p. 4387-4394 8 p.

**On the ductility of laminated materials**

DeBotton, G. & Castañeda, P. P., 1 Jan 1992, In: International Journal of Solids and Structures. 29, 19, p. 2329-2353 25 p.

**On the consistency conditions for force systems**

Segev, R. & DeBotton, G., 1 Jan 1991, In: International Journal of Non-Linear Mechanics. 26, 1, p. 47-59 13 p.

**The motion of a charged particle in an electrodynamic chamber**

Bar-Ziv, E., DeBotton, G., Bar-Ziv, R. H., Martsiano, Y. & Ben Dor, G., 1 Jan 1991, In: Aerosol Science and Technology. 14, 1, p. 127-137 11 p.

**The motion of a charged particle in an electrodynamic chamber under feedback control**

Bar-Ziv, E. & DeBotton, G., 1 Jan 1991, In: Aerosol Science and Technology. 15, 1, p. 1-7 7 p.