

Contents

I. Stereocilia	1
The contribution of transduction channels and adaptation motors to the hair cell's active process <i>P. Martin, F. Jülicher and A. J. Hudspeth</i>	3
Active amplification by critical oscillations <i>F. Jülicher, S. Camalet, J. Prost and T. A. J. Duke</i>	16
Formation and remodeling of hair bundles promoted by continuous actin polymerization at the tips of stereocilia: Mechanical considerations <i>M. E. Schneider, A. Rzadzinska, C. Davies and B. Kachar</i>	28
Mechanical-to-chemical transduction by motor proteins <i>J. Howard</i>	37
Investigation of the mechanoelectrical transduction at single stereocilia by AFM <i>M. G. Langer, S. Fink, K. Löffler, A. Koitschev and H.-P. Zenner</i>	47
Immunocytochemical investigations of the distribution of calbindin and calretinin in the turtle cochlea <i>C. M. Hackney, S. Mahendrasingam and R. Fettiplace</i>	56
The effects of calcium on mechanotransducer channel kinetics in auditory hair cells <i>R. Fettiplace, A. C. Crawford and A. J. Ricci</i>	65
Signal processing by transducer channels in mammalian outer hair cells <i>T. Dinklo, S. M. van Netten, W. Marcotti and C. J. Kros</i>	73
Measured and modeled motion of free-standing hair bundles in response to sound stimulation <i>A. J. Aranyosi and D. M. Freeman</i>	81

Viscoelasticity of active actin-myosin networks <i>L. Le Goff, F. Amblard and E. M. Furst</i>	89
Mechanical stresses and forces in stereocilia bundles of inner and outer hair cells <i>R. Mueller, H. Maier, F. Boehnke and W. Arnold</i>	91
Two adaptation processes in auditory hair cells together can provide an active amplifier <i>A. Vilfan and T. A. J. Duke</i>	93
II. Hair cells	95
Some pending problems in cochlear mechanics <i>P. Dallos</i>	97
Functional properties of prestin – how the motormolecule works work <i>B. Fakler and D. Oliver</i>	110
Allosteric modulation of the outer hair cell motor protein prestin by chloride <i>V. Rybalchenko and J. Santos-Sacchi</i>	116
ROCK ‘n’ Rho in outer hair cell motility <i>M. Zhang, G. Kalinec, F. Kalinec, D. D. Billadeau and R. Urrutia</i>	127
Ultrastructure of lateral walls of outer hair cells observed by atomic force microscopy <i>H. Wada, M. Sugawara, H. Usukura, K. Kimura, Y. Katori, S. Kakehata, K. Ikeda and T. Kobayashi</i>	136
The strain ratio of the outer hair cell motor protein <i>R. Hallworth</i>	144
Piezoelectric properties enhance outer hair cell high-frequency response <i>A. A. Spector, A. S. Popel and W. E. Brownell</i>	152

Fast nonlinear currents in outer hair cells from the basal turn of the cochlea <i>X.-X. Dong, M. Ospeck and K. H. Iwasa</i>	161
Membrane electromechanics at hair-cell synapses <i>W. E. Brownell, B. Farrell and R. M. Raphael</i>	169
Determination of the elastic modulus of thin gels using the atomic force microscope <i>E. K. Dimitriadis, F. Horkay, B. Kachar, J. Maresca and R. S. Chadwick</i>	177
Measurement of mechanical properties of the outer hair cell with atomic force microscopy <i>M. Sugawara, H. Wada and Y. Ishida</i>	179
Mechanical responses of cochlear outer hair cells <i>D. Z. Z. He</i>	181
No correlates for somatic motility in freeze-fractured hair-cell membranes of lizards and birds <i>C. Köppel, A. Forge and G. A. Manley</i>	185
Tension-dependence of the active and passive modes of energy generated in the outer hair cell wall <i>A. A. Spector and R. P. Jean</i>	187
Hair cell responses and harmonic phase <i>M. A. Cheatham and P. Dallos</i>	189
Diverse and dynamic expression patterns of voltage-gated ion channel genes in rat cochlear hair cells <i>K. W. Beisel and B. Fritzsch</i>	191
A KCNQ-type potassium current in cochlear inner hair cells <i>D. Oliver and B. Fakler</i>	194

III. Whole-organ mechanics	197
Development of cochlear mechanics in the gerbil <i>E. H. Overstreet, III, A. N. Temchin and M. A. Ruggero</i>	199
Measurement of basilar membrane vibration using a scanning laser interferometer <i>T. Y. Ren, Y. Zou, J. F. Zheng, A. L. Nuttall, E. Porsov and S. Matthews</i>	211
Cochlear mechanical distortion products for complex stimuli in the chinchilla basal region <i>W. S. Rhode and A. Recio</i>	220
Harmonic distortion in intracochlear pressure: Observations and interpretation <i>E. S. Olson</i>	228
The local mechanical response of the basilar membrane for electrical stimulation of the cochlea <i>A. L. Nuttall, K. Grosh, J.F. Zheng, T.Y. Ren and E. de Boer</i>	237
Fast effects of efferent stimulation on basilar membrane motion <i>J. J. Guinan Jr. and N. P. Cooper</i>	245
Response to amplitude modulated waves in the apical turn of the cochlea <i>S. M. Khanna</i>	252
Baseline position shifts and mechanical compression in the apical turns of the cochlea <i>N. P. Cooper and W. Dong</i>	261
High-frequency vibration of the organ of Corti <i>in vitro</i> <i>M. P. Scherer, M. Nowotny, E. Dalhoff, H.-P. Zenner and A. W. Gummer</i>	271
Micromechanics in the gerbil hemicochlea <i>C.-P. Richter and P. Dallos</i>	278

Visualizing cochlear mechanics using confocal microscopy <i>M. Ulfendahl, J. Boutet de Monvel and A. Fridberger</i>	285
Low-frequency oscillations in outer hair cells and homeostatic regulation of the organ of Corti <i>R. B. Patuzzi</i>	292
Micromechanics of <i>Drosophila</i> audition <i>M. C. Göpfert and D. Robert</i>	300
Active auditory mechanics in insects <i>D. Robert and M. C. Göpfert</i>	308
Is the cochlear amplifier a fluid pump? <i>K. D. Karavitzaki and D. C. Mountain</i>	310
IV. Cochlear models	313
Cellular cooperation in cochlear mechanics <i>G. Zweig</i>	315
Properties of amplifying elements in the cochlea <i>E. de Boer and A. L. Nuttall</i>	331
Nonlinear behavior in an active cochlear model with feed-forward <i>K. M. Lim and C. R. Steele</i>	343
Time-domain responses from a nonlinear sandwich model of the cochlea <i>A. E. Hubbard, D. C. Mountain and F. Chen</i>	351
Analysis of forces on inner hair cell cilia <i>C. R. Steele and S. Puria</i>	359
Notes on physical properties of the tectorial membrane <i>S. M. Novoselova</i>	368
An improved cochlea model with a general user interface <i>H. Duifhuis, J. M. Kruseman and P. W. J. van Hengel</i>	376

The role of micromechanics in explaining two-tone suppression and the upward spread of masking <i>J. B. Allen and D. Sen</i>	383
The helicotrema: Measurements and models <i>D. C. Mountain, A. E. Hubbard, D. R. Ketten and J. Trehey O'Malley</i>	393
Computation of modes and motion analysis in a transverse section of the cochlea <i>H. Cai and R. S. Chadwick</i>	400
A life-sized, hydrodynamical, micromechanical inner ear <i>W. Hemmert, U. Dürig, M. Despont, U. Drechsler, G. Genolet, P. Vettiger and D. M. Freeman</i>	409
The silicon cochlea: From biology to bionics <i>L. Turicchia and R. Sarpeshkar</i>	417
Explanation of two curious phenomena regarding the relationship between tectorial membrane and basilar membrane dynamics <i>R. Nobili</i>	425
Dynamic behavior of the organ of Corti: Finite-element method analysis <i>M. Andoh and H. Wada</i>	427
Are outer hair cells pressure sensors? Basis of a <i>SAW</i> model of the cochlear amplifier <i>A. Bell</i>	429
Generalised description of the mammalian cochlear map <i>E. L. LePage</i>	432
Mathematical modelling of the role of outer hair cells in cochlear homeostasis <i>G. A. O'Beirne and R. B. Patuzzi</i>	434

V. Emissions	437
Wave interference in the generation of reflection- and distortion-source emissions <i>C. A. Shera</i>	439
Growth of otoacoustic emissions with frequency: Inside the human cochlear vestibule <i>S. Puria</i>	454
Difference-tone response areas in rabbits <i>G. K. Martin, B. B. Stagner and B. L. Lonsbury-Martin</i>	464
Temporal characteristics of otoacoustic emissions <i>R. H. Withnell, S. Dhar, C. L. Talmadge, L. A. Shaffer, E. de Boer, R. Roberts and D. McPherson</i>	472
The tectorial membrane stabilizes spontaneous otoacoustic emissions <i>G. A. Manley</i>	480
Dynamic changes in spontaneous otoacoustic emissions produced by contralateral broadband noise <i>J. Smurzynski, G. Lisowska, A. Grzanka, G. Namyslowski and R. Probst</i>	488
Contralateral DPOAE suppression in humans at very low sound intensities <i>T. Janssen, D. D. Gehr and Z. Kevanishvili</i>	498
Effects of the medial olivocochlear reflex on cochlear mechanics: Experimental and modeling studies of DPOAE <i>D. O. Kim, X. M. Yang and S. T. Neely</i>	506
Modeling otoacoustic emissions and related psychoacoustic measures in humans and other mammals <i>C. L. Talmadge, A. Tubis and G. R. Long</i>	517
Otoacoustic emissions simulated in the time-domain by a hydrodynamic model of the human cochlea <i>R. Nobili, A. Vetešnik, L. Turicchia and F. Mammano</i>	524

Growth of distortion-product otoacoustic emissions in a nonlinear, active model of cochlear mechanics <i>S. T. Neely, M. P. Gorga and P. A. Dorn</i>	531
Modeling electrically evoked otoacoustic emissions <i>K. Grosh, N. Deo, A. A. Parthasarathi, A. L. Nuttall, J.F. Zheng and T.Y. Ren</i>	539
Developing a noninvasive measure of middle-ear sound transmission <i>C. A. Shera and A. J. Miller</i>	547
Assessment of sensitivity and compression of outer hair cell amplifiers by means of DPOAE I/O-functions in humans <i>J. Oswald, A. Klein and T. Janssen</i>	549
DPOAE phase pattern: Evidence for a low frequency resonance in the f_2 place <i>A. N. Lukashkin and I. J. Russell</i>	551
Phenomenology of post-stimulus changes of DPOAE <i>A. N. Lukashkin and I. J. Russell</i>	553
Magnitude of distortion-product OAEs in a nonlinear model of the cochlea <i>H. Taiji</i>	555
Phase behavior of the primaries in distortion product analysis <i>A. Vetešnik and R. Nobili</i>	557
Two-tone interference caused by active amplification <i>T. A. J. Duke, D. Andor and F. Jülicher</i>	559
VI. Discussion session	561
Hopf bifurcation	564
Prestin	570
Stereociliary versus somatic motility	572

An ideal approach to cochlear modelling	579
Low-frequency responses of the basilar membrane and the nerve	582
Multiple travelling waves on the basilar membrane	583
Kinocilium function	586
Fluid component of the travelling wave	587
Physical reason for the cochlear amplifier	588
Wilson's hair-cell swelling model	589
Pressure at the round window	590
Shape of the stereocilia bundle	590
Author Index	593
Subject Index	597

