

Table of Contents

Foreword	xxi
1 Cooling buildings: tailored or ‘prêt-à-porter’ solutions? <i>E. de Oliveira Fernandes</i>	1
2 Energy performance regulations as a tool for the performance assessment of buildings: keep it simple! <i>P. Wouters, D. Van Orshoven, X. Loncour</i>	7
3 Potentials of urban heat island mitigation <i>H. Akbari</i>	11
4 Passive cooling in the works of A.N. Tombazis and associates <i>A.N. Tombazis</i>	23
5 Natural ventilation of urban buildings – summary of URBVENT project <i>C. Ghiaus, F. Allard, M. Santamouris, C. Georgakis, C.-A. Roulet, M. Germano, F. Tillenkamp, N. Heijmans, F. Nicol, E. Maldonado, M. Almeida, G. Guarracino, L. Roche</i>	29
6 Human factor in thermal performance of natural ventilated buildings <i>G. Gomez-Azpeitia, A. Alcántara, P. Barragán, B. Givoni</i>	35
7 Using the utilization factor concept for natural ventilation <i>F. Sánchez, J.M. Salmerón, Á. Ruiz, R. González, S. Álvarez</i>	41
8 Sensitivity analysis of a maritime located night ventilated library building <i>D. Connolly, D. Finn, P. Kenny</i>	47
9 CFD reliability issues in analysis of naturally ventilated buildings <i>J.M. Horan, D.P. Finn</i>	53
10 Effect of vents’ opening and insect screen on greenhouse ventilation <i>C. Kittas, N. Katsoulas, T. Bartzanas, T. Boulard, M. Mermier</i>	59
11 Natural and mixed ventilation design via CFD and architectural modeling <i>M. Todorovic, O. Ecim, A. Marjanovic, I. Randjelovic</i>	65
12 Wind tower a natural cooling system in Iranian traditional architecture <i>P.S. Ghaemmaghami, M. Mahmoudi</i>	71
13 Study on the numerical predictive accuracy of wind pressure distribution and air flow characteristics. Part 1: Optimization of turbulence models for practical use <i>T. Endo, T. Kurabuchi, M. Ishii, K. Komamura, E. Maruta, T. Sawachi</i>	77

14	Study on the numerical predictive accuracy of wind pressure distributions and air flow characteristics. Part 2: Prediction accuracy of wind pressure distribution of various shaped buildings <i>M. Ishii, T. Kurabuchi, T. Endo, E. Maruta, T. Sawachi</i>	83
15	Cool colored roofs to save energy and improve air quality <i>H. Akbari, R. Levinson, W. Miller, P. Berdahl</i>	89
16	A comparative study of the thermal performance of reflective coatings for the urban environment <i>A. Synnefa, M. Santamouris, I. Livada</i>	101
17	Assessing the thermal environment of major cities in Greece <i>M. Stathopoulou, C. Cartalis, A. Andritsos</i>	108
18	Estimating the ecological footprint of the heat island effect over Athens, Greece <i>M. Santamouris, K. Paraponiaris, G. Mihalakakou</i>	113
19	Canyon effects: Calculation of wind speed in an urban street canyon with the aid of a semi-empirical model based on experimental data <i>C. Georgakis, M. Santamouris</i>	117
20	A study of temperature and wind distribution inside two urban street canyons in Athens <i>K. Niachou, I. Livada, M. Santamouris</i>	125
21	The impact of wind on air temperature distribution in Athens and in Santorini <i>I. Livada, K. Niachou, M. Santamouris</i>	133
22	Heating demands differences between central and surrounding areas in the coastal town of Patras <i>Y.G. Caouris, A. Giannopoulos, M. Santamouris</i>	139
23	Thermo-graphic analyses for monitoring urban areas in Rome to study Heat Islands <i>C. Atturo, L. Fiumi</i>	145
24	Guidelines for energy optimization through landscape architecture in hot humid regions <i>S. Arias</i>	151
25	Glass architecture: is it sustainable? <i>F.M. Butera</i>	161
26	Refurbishment of old buildings for sustainable use <i>S. Burton, S. Kesidou</i>	169
27	Environmental sustainable Iranian traditional architecture in hot-humid regions <i>M. Shohouhian, F. Soflaee</i>	173
28	The potential for zero emissions/energy development in China <i>A. Pitts, B. Chen</i>	179

- 29 Energetic rehabilitation of an office building in Barcelona by use of passive ventilation strategy and active solar technologies as shading device and corporate identity element 185
T. Maseck
- 30 An innovative passive system for preventive conservation of the ancient stained glass windows in the Assisi's St. Francis Basilica Superior Church 191
A. Mingozzi, S. Bottiglioni
- 31 Passive and low energy cooling techniques for the Czech Republic 197
M. Lain, J. Hensen
- 32 Thermal performance of an underground museum in Turkey 203
M. Mas Gomez
- 33 Energy efficient strategies for JSX building in Jakarta, Indonesia 207
T.H. Karyono, G. Bahri
- 34 Passive cooling techniques as part of energy rehabilitation measures in office buildings in Greece 213
Ch.J. Koinakis
- 35 Maximum temperatures in buildings to avoid heat discomfort 219
F. Nicol, M. Humphreys
- 36 Adaptive thermal comfort evaluation in a field study 225
B. Moujalled, R. Cantin, G. Guarracino
- 37 Climate optimised building parameters for low energy summer comfort under a discomfort index 231
L. Pagliano, P. Zangheri
- 38 Summer thermal comfort in traditional buildings of the 19th century in Florina, north-western Greece 239
A. Oikonomou
- 39 Optimisation of indoor thermal comfort outside the heating season 245
S. Croce, L.P. Gattoni, R. Arlunno
- 40 Thermal comfort in boats 251
K. Kritsonis, F. Nicol
- 41 Comparison of the HQE method and the Ev assessment 257
P. Kosmopoulos, I.-P. Frigidou
- 42 Thermal comfort study of occupants in University of Patras 263
A.K. Aggelakoudis, M.G. Athanasiou
- 43 Eliminating the need for mechanical cooling 269
A. Rivera
- 44 Improvement of summer comfort in wood frame buildings 275
G. Fraisse, V. Trillat-Berdal, B. Souyri
- 45 On the impact of energy pricing on low energy design of buildings 279
A.M. Papadopoulos, A. Stylianou, S. Oxizidis
- 46 EULEB – European High Quality Low Energy Buildings 285
J. Schlenger, H.F.O. Müller

47	The contribution of contemporary technology to the environmental protection and sustainable development <i>P.A. Patargias</i>	289
48	Ecology in architecture design: Testing an advanced educational path <i>P. Caputo, M. Molina, A. Roscetti, J. Vicari, C. Milani, I. Rega, P. Schettino</i>	299
49	CLEAR, A multi-media package for Comfortable Low Energy Architecture <i>A. Jacobs, F. Nicol, M. Wilson, J. Solomon</i>	305
50	Thermal comfort educational software for hot climates <i>I. Marincic, J.M. Ochoa, A. Isalgué</i>	309
51	Social attitudes about environmental design and RES – Field study in Cyprus <i>P. Kosmopoulos, Th. Ioannou</i>	315
52	Discrepancies between indications deriving from energy and economic issues in the design of building thermal insulation <i>G.L. Brunetti</i>	321
53	The challenges of teaching bioclimatic architectural design <i>D.C.C.K. Kowaltowski, L.C. Labaki, S.M.G. Pina, G.C.R. Gutierrez, V. Gomes da Silva</i>	327
54	A matrix tool for assessing the performance of intelligent buildings <i>G. Sutherland, G. Stavrakakis, D. Kolokotsa, S. Karatassou, M. Santamouris</i>	333
55	A free user-friendly design tool that shows how to reduce cooling energy in buildings <i>M. Milne, C. Gomez, D. Leeper, P. LaRoche, J. Morton</i>	339
56	Thermal mass vs. thermal response factors: determining optimal geometrical properties and envelope assemblies of building materials <i>K.J. Kontoleon, D.K. Bikas</i>	345
57	Energy buildings management methodology <i>P.R.S. Jota, V.R.B. Silva</i>	351
58	Dormitory optimized energy performance using spatial archetypes <i>E. Primikiri, M. Kokkolaras, P. Papalambros</i>	357
59	A calculation model for Trombe walls and its use as a passive cooling technique <i>Á. Ruiz, J.M. Salmerón, F. Sánchez, R. González, S. Álvarez</i>	365
60	Application of the Ev matrix in Xanthi, Greece <i>P. Kosmopoulos</i>	371
61	Numerical analysis of the microclimate conditions around a new telescope in La Palma, Spain <i>D. Pérez, G. Houzeaux, J. Cipriano</i>	379
62	A comparative analysis using multiple thermal analysis tools <i>A. Marsh, F. Al-Oraier</i>	385
63	Solar irradiation graphs <i>Th.N. Stasinopoulos</i>	393

- 64 The air infiltration and ventilation center: The history and technical program of IEA Annex V 397
M. Sherman
- 65 Hybrid ventilation performance assessment using Fitness functions 403
M. El Mankibi, P. Michel
- 66 Local dynamic similarity concept as applied to evaluation of discharge coefficients of ventilated buildings. Part 1: Basic idea and underlying wind tunnel tests 409
T. Kurabuchi, T. Endo, M. Ohba, T. Goto, Y. Akamine
- 67 Local dynamic similarity concept as applied to evaluation of discharge co-efficients of cross-ventilated buildings. Part 2: Applicability of local dynamic similarity concept 415
T. Goto, M. Ohba, T. Kurabuchi, T. Endo, T. Otsuki, Y. Akamine
- 68 Local dynamic similarity concept as applied to evaluation of discharge coefficients of ventilated buildings. Part 3: Simplified method for estimating dynamic pressure tangential to openings of cross-ventilated buildings 421
Y. Akamine, M. Kamata, T. Kurabuchi, T. Endo, M. Ohba, T. Goto
- 69 Wind driven flow through building openings 427
P. Karava, T. Stathopoulos, A.K. Athienitis
- 70 Performance of natural, hybrid and mechanical ventilation systems in urban canyons 433
K. Niachou, M. Santamouris, S. Hassid
- 71 Design of a hybrid ventilation system: the Cli'Nat project 441
P. Michel, M. Elmankibi, S. Buseyne, E. Chéron, W. Jäger
- 72 Building's imitation of a human body's thermal behavior 447
B. Todorovic
- 73 Improving ventilation and envelope characteristics in order to decrease the energy consumption in existing buildings 453
J.M. Salmerón, F. Sánchez, Á. Ruiz, R. González, S. Álvarez
- 74 Evaluation of the thermal performance of the envelope of an innovative construction system for low cost buildings 459
J.R. García Chávez
- 75 Building envelope design as a passive cooling technique 467
E.M. Okba
- 76 Monitoring system for the evaluation of the energetic behaviour of PCM containing walls 475
P. Principi, C. Di Perna, G. Borrelli, A. Carbonari
- 77 Experimental energetic evaluation of changeable thermal inertia PCM containing walls 481
P. Principi, C. Di Perna, G. Borrelli, A. Carbonari
- 78 Efficient energy thermal insulation façade systems for optimal savings and flexibility in architectural design 487
G.K. Rouni

79	A preliminary study of hygrothermal performance of autoclaved aerated concrete blocks under hot humid climate of Thailand <i>Y. Ungkoon, J. Hirunlabh, J. Khedari, U-C. Shin, P. Yodovard</i>	493
80	Innovative low energy renovation of a single family dwelling for summer comfort <i>L. Vandaele, A. Deneyer, N. Heijmans, F. Dobbels</i>	501
81	Potential of innovative daylighting and passive cooling systems for achieving luminous and thermal comfort in commercial buildings <i>J.R. García Chávez, K. Tsikaloudaki</i>	507
82	Cooled soil as a cooling source for buildings <i>B. Givoni</i>	515
83	A novel multi-stage down-draft evaporative cool tower for space cooling. Part 1: Aerodynamic design <i>E. Erell, Y. Etzion, D. Pearlmutter, R. Guetta, D. Pecornik, H. Zimmermann, F. Krutzler</i>	521
84	A novel multi-stage down-draft evaporative cool tower for space cooling. Part 2: Preliminary experiments with a water spraying system <i>E. Erell, Y. Etzion, D. Pearlmutter, R. Guetta, D. Pecornik, H. Zimmermann, F. Krutzler</i>	529
85	The case for building-integrated hydroponics <i>T. Caplow</i>	537
86	A nonequilibrium molecular dynamics simulation of evaporation <i>Z.-J. Wang, M. Chen, Z.-Y. Guo</i>	543
87	Thermal efficiency characteristics of indirect evaporative cooling systems <i>B. Costelloe, D.P. Finn</i>	549
88	Passive draught evaporative cooling applied to an auditorium <i>J.J. Correia da Silva</i>	555
89	Limits and potentials of office building climatisation with ambient air <i>U. Eicker, M. Huber, P. Seeberger, J. Schumacher, C. Vorschulze</i>	561
90	The potential for evaporative cooling in Turkey <i>M. Ateş, D. Baker</i>	567
91	Passive cooling effect of building features in traditional Japanese buildings <i>H. Yoshino, K. Hasegawa, S. Matsumoto</i>	573
92	Logical use of traditional technologies for housing passive cooling in hot humid Italian climate areas <i>A. Mingozzi, S. Bottiglioni</i>	579
93	Environmental design studio design for Arriyadh, Saudi Arabia <i>G. Loehlein</i>	585
94	Low energy cooling in historical library office hall <i>K. Kabele</i>	587
95	Bioclimatic architecture concepts applied to CEFET's building <i>M.S.S. Bracarense, R.P. Papa, P.R.S. Jota</i>	591

96	Design and retrofitting of a hybrid building in Athens <i>A. Gavalas</i>	597
97	Energy rehabilitation of modern office building in the region of Xanthi <i>P. Kosmopoulos, P. Kiriakidis</i>	603
98	Efficient retrofit actions and advanced control strategies for a student hostel <i>S. Ferrari</i>	609
99	Climatic responsive architecture in hot and dry regions of Iran <i>A. A'zami, S.H. Yasrebi, A. Salehipoor</i>	613
100	Passive cooling and energy conservation design strategies of school buildings in hot, arid region: Riyadh, Saudi Arabia <i>W. Abanomi, Ph. Jones</i>	619
101	Adaptive strategies for office spaces in the UK climate <i>I. Gallou, E. Chatzigeorgiou</i>	631
102	Cooling potential of heating-cooling wall panels <i>A. Krainer, R. Perdan, G. Krainer</i>	639
103	Hybrid photovoltaic-thermal technology and solar cooling: The CRF solar façade case study <i>F. Butera, R.S. Adhikari, N. Aste, R. Bracco</i>	645
104	Feasibility study of the passive solar room dehumidifying system using the sorption property of a wooden attic space through field measurement <i>N. Areemit, Y. Sakamoto</i>	651
105	Evaluation of solar driven thermal systems for urban buildings <i>S. Oxizidis, A. Wemmers, A.M. Papadopoulos, A. Avgelis, A. Stylianou</i>	657
106	Optimization and study of an autonomous solar desiccant cooling system <i>C. Maalouf, E. Wurtz, L. Mora, F. Allard</i>	663
107	Solar cooling potential in tourist complexes in the North Aegean <i>N. Mamounis, A. Dimoudi</i>	669
108	Evaluation of PV technology implementation in the building sector <i>J.J. Bloem, A. Colli, P. Strachan</i>	677
109	Potential use of geothermal energy from mine water in Europe for cooling and heating <i>E. Demollin-Schneiders, Z. Malolepszy, D. Bowers</i>	683
110	Energy efficient office buildings with passive cooling – Results and experiences from a research and demonstration programme in Germany <i>K. Voss, S. Herkel, J. Pfafferott, A. Wagner</i>	687
111	Planning and design strategies for sustainable low energy development in Seoul, Korea <i>A. Pitts, K. Kim</i>	693
112	Traditional Indian architecture - The future solar buildings <i>D. Vyas</i>	699
113	Passive solar design in Antonio Gaudi's domestic architecture <i>E. Usón Guardiola, E. Cunill de la Puente</i>	705

114	Environmental strategies in retrofitting of educational buildings – The integrated approach <i>E. Triantis</i>	709
115	Natural cooling systems in sustainable traditional architecture of Iran <i>F. Soflaee, M. Shokouhian</i>	715
116	Statistical simulation of user behaviour in low-energy office buildings <i>J. Pfafferoth, S. Herkel</i>	721
117	Exploitation of solar energy in buildings, particularly in the natural and low energy heating and cooling. The case study of an energy-efficient residence in Nikaia, Larissa <i>A. Dimou, C. Koroneos</i>	727
118	The passively cooled KfW building in Germany - Monitoring results <i>A. Wagner, M. Kleber, K. Rohlfss</i>	733
119	Bioclimatic design of a residential complex for the elderly <i>V. Simantira, K. Stefopoulou, D. Triantafillidi, K. Xanthopoulos, E. Trianti</i>	737
120	The London heat island and building cooling design <i>M. Kolokotroni, Y. Zhang, R. Watkins</i>	743
121	The effect of water-sprinkling on the surface temperatures of the materials used on the "skin" of greek cities <i>F. Bougiatioti</i>	749
122	Thermal comfort in open spaces: A study in the northeast of Brazil <i>A.D.L. Costa, L.C. Labaki, V.M. Dantas de Araujo</i>	755
123	Thermal comfort conditions in outdoor spaces <i>N. Gaitani, M. Santamouris, G. Mihalakakou</i>	761
124	The problems of a shade-shadow and light in a design of open-air market stall <i>R. Ernest</i>	767
125	The effect of shading on the surface temperatures of the materials used on the "skin" of Greek cities <i>F. Bougiatioti</i>	775
126	Green areas in open urban spaces <i>G. Peretti, D. Marino, E. Montacchini</i>	781
127	Thermal comfort in urban spaces: The case of very warm and dry climate <i>J.M.I. Ochoa, I. Marincic</i>	785
128	Schematic design proposals of the implementation of PDEC in the urban open spaces of Athens <i>E. Evangelinos, F. Bougiatioti, A. Oikonomou</i>	791
129	The impacts of the EPBD upon the summer performance of buildings <i>E. Maldonado</i>	797
130	Composite insulating materials as a tool for the reduction of cooling loads <i>A.M. Papadopoulos, A. Avgelis, A. Karamanos, S. Hاديarakou, Ch. Nikolopoulos, H. Pesmatzoglou</i>	803

131	Potentialities of lightweight construction solutions for sustainability <i>M. Almeida, L. Bragança, P. Mendonça</i>	809
132	The potentiality of reflected sunlight through Rawshan screens <i>E. Aljofi</i>	817
133	The impact of envelope insulation and ventilation on summer performance <i>K.M.S. Chvatal, E.A.B. Maldonado, M.H.P. Corvacho</i>	823
134	Sustainability, embodied in the local context: A study on the cultural aspects of environmentally symbiotic housing in Japan <i>K. Iwamura</i>	829
135	Solar contribution evaluation for building attached sunspace in the Mediterranean climate <i>G. Oliveti, M. De Simone, S. Ruffolo</i>	841
136	Studying natural lightning in a hot climate <i>D.C. Avila</i>	849
137	A study of double facades with phase-change storage and photovoltaics <i>A.K. Athienitis, J. Zhang, D. Feldman</i>	855
138	Ventilation benefit accrued from PV module installed in building <i>J.K. Tonui, Y. Tripanagnostopoulos</i>	861
139	Study of a new concept of photovoltaic-thermal hybrid collector <i>Y.B. Assoa, C. Menezo, R. Yezou, G. Fraisse, T. Lefebvre</i>	867
140	Responsive glazing for solar control shading <i>G. Savineau</i>	873
141	Thermal performance of different glazing surfaces in a hot climate <i>A.P.A.S. Castro, L.C. Labaki, G.C.R. Gutierrez, R.M. Caram de Assis</i>	879
142	Optimum geometry and orientation of a building opening with an electrochromic glazing <i>M.N. Assimakopoulos, A. Tsangrassoulis, M. Santamouris, G. Guarracino</i>	885
143	Dynamic thermal simulation of a solar chimney with PV modules <i>J. Martí-Herrero, M.R. Heras-Celemin</i>	891
144	A solar multifunctional roof: photovoltaic and thermal coupling <i>N. Aste, G. Chiesa, L. Tagliabue</i>	897
145	Aristotle's theory as a tool for inspiration in architecture. The shelter of the archaeological site at Akrotiri <i>N. Fintikakis</i>	901
146	Study on the thermal and visual performance of eleven residential buildings <i>K. Pavlou, A. Sfakianaki, M. Santamouris, E. Mouriki, M. Kechrinioti, I. Stolidou, D. Psychogios</i>	905
147	Design and commissioning of the low-energy office building in Prague <i>M. Lain, M. Bartak, F. Drkal, J. Hensen</i>	913
148	Passive and green building design: a residential complex for the elderly in Andria (Italy) <i>G.R. Dell'Osso, F. Iannone</i>	917

149	Towards better building and urban design in Hong Kong <i>E. Ng</i>	923
150	Daylighting analysis and energy saving measures in the Sino-Italy Environment & Energy Building (SIEEB) <i>F. Butera, R.S. Adhikari, N. Aste</i>	929
151	The Sino-Italy Environment & Energy Building (SIEEB): A model for a new generation of sustainable buildings <i>F. Butera, R.S. Adhikari, P. Caputo, S. Ferrari, P. Oliaro, N. Aste</i>	935
152	Analysis of the typology and orientation of 19th century traditional architecture in Florina, north-western Greece <i>A. Oikonomou</i>	941
153	Environmental impacts and compatible urban design: Case study of Bam Citadel <i>N. Mohajeri</i>	947
154	The effect of shading design and control on building cooling demand <i>A. Tzempelikos, A.K. Athienitis</i>	953
155	On the potential of Internet based energy services in Greece during cooling season <i>S. Karatasou, V. Geros, M. Santamouris</i>	959
156	Integrating the cellular method for shading design with a thermal simulation <i>E. Kaftan, A. Marsh</i>	965
157	Recent market assessment and legal framework for BEMS in Greece <i>T. Nikolaou, E. Maria, P. Zalimidis, D. Kolokotsa</i>	971
158	The fresnel lens concept for solar control of buildings <i>Y. Tripanagnostopoulos, Ch. Siabekou, J.K. Tonui</i>	977
159	Generative Skin <i>S. Yannas</i>	983
160	Comparative analysis of control strategies for passive cooling <i>P. Michel, M. Elmankibi</i>	985
161	Solar control devices; balance between thermal performance and daylight <i>M. Mehrotra</i>	991
162	Evaluation of hybrid ventilation control strategies in residential buildings <i>D. Jreijiry, A. Husaunndee, J.G. Villenave, C. Inard</i>	997
163	Effect of vent configuration and insect screen on greenhouse microclimate <i>T. Bartzanas, N. Katsoulas, C. Kittas, T. Boulard, M. Mermier</i>	1003
164	Natural ventilation due to wind action: practice knowledge against experimental airflow visualization <i>A.M. Toledo, F.O.R. Pereira</i>	1009
165	Potential of inertial ventilation for passive cooling in Brazilian climates <i>P. Hollmuller, R. Lamberts, F. Westphal, M. Ordenes, J. Carlo</i>	1015
166	Badgir in traditional Iranian architecture <i>A. A'zami</i>	1021

167	Comparison of computed and measured wind fields within street canyons <i>V.D. Assimakopoulos, C. Georgakis, M. Santamouris</i>	1027
168	Cooling buildings in hot humid climates – a decision model for ventilation <i>J. C. Bonetti, H. Corvacho, F. Brandão Alves</i>	1033
169	Multicriteria assessment of natural ventilation potential of a site <i>M. Germano, C.-A. Roulet</i>	1039
170	Effect of air movement in building <i>S. Heidari</i>	1045
171	Air-conditioning avoidance: lessons from the windcatchers of Iran <i>S. Roaf</i>	1053
172	Architects, clients and bioclimatic design: a solar neighborhood POE <i>S. Vainer, I.A. Meir</i>	1059
173	The influence of building design features on microclimatic modification in the warm periods of the year. Discussion based on temperature measurements <i>K.N. Axarli</i>	1065
174	The window in the building tradition of the sub humid tropic <i>A. Gómez, A. Alcántara, E. Alvarado</i>	1073
175	Evaluation of influences of the external temperature in the building energy consumption <i>R.P. Papa, P.R.S. Jota</i>	1077
176	Cooling season post-occupancy evaluation of a low energy complex school (City Academy) in the UK <i>I. Pegg, A. Cripps, M. Kolokotroni</i>	1083
177	Responsive and sustainable architectural strategies for temperate regions <i>S.M. Mofidi</i>	1091
178	Site layout as a function of shading in Karst region <i>Ž. Kristl, A. Krainer</i>	1097
179	Climatic architectural tradition of India <i>V. Padmavathi</i>	1103
180	Indoor environment for energy performance of buildings – a new European draft standard <i>O. Seppänen, B. Olesen, A. Boerstra</i>	1109