

Program PowerMEMS 2010

November 30	
19:00 - 21:00	Get-Together / Welcome reception PowerMEMS

Day 1	December 1st	
08:00 - 09:00	Registration + Welcome coffee	
09:00 - 09:30	Opening + Welcome speech	
09:30 - 10:15	Invited: Prof. Peter Notten <i>3D all-solid-state batteries: a challenging route towards autonomous integrated devices</i>	
10:15 - 10:55	Parallel session: 'Promotiezaal' (odd)	Parallel session: 'Museumzaal' (even)
	Session 1: Fuel cells	Session 2: Coolers
10:55 - 11:15	Break	
11:15 - 12:15	Session 3: Piezo electric energy harvesters	Session 4: Micro ignition
12:15 - 14:00	Lunch Break	
14:00 - 14:45	Invited: Prof. Yuji Suzuki <i>Development of a MEMS Energy Harvester with High-Performance Polymer Electrets</i>	
14:45 - 16:05	Session 5: Energy harvesters	Session 6: Fuel cells
16:05 - 16:30	Break	
16:30 - 18:30	Poster session 1	
18:30	Departure to brewery	
19:30	Brewery visit	

Day 2	December 2nd	
08:30 - 08:45	Conference announcements	
08:45 - 09:30	Invited: Dr. Pelle Rangsten <i>Six-Wafer-Stack MEMS thrusters in space</i>	
	Parallel session: 'Promotiezaal' (odd)	Parallel session: 'Museumzaal' (even)
09:30 - 10:30	Session 7: Microthrusters and heat engines	Session 8: Energy storage
10:30 - 11:00	Break	
11:00 - 12:20	Session 9: Energy harvesters for remote sensors	Session 10: Power management
12:20 - 14:00	Lunch Break	
14:00 - 14:45	Invited: Prof. Suresh Garimella <i>Small-Scale Solutions to Grand Challenges in Thermal Management</i>	
14:45 - 15:45	Session 11: Microcoolers and thermal switches	Session 12: Electrets and capacitive energy harvesters
15:45 - 16:15	Break	
16:15	Poster session 2	
18:15	Guided tour towards Faculty club	
19:15	Conference dinner	

Day 3	December 3rd	
09:00 - 09:15	Conference announcements	
09:15 - 10:00	Invited: Prof. Dr. Paul Muralt, <i>Piezoelectric Thin Film Micro Structures: From Fabrication to Energy Harvesting</i>	
	Parallel session: 'Promotiezaal' (odd)	Parallel session: 'Museumzaal' (even)
10:00 - 11:00	Session 13: Energy harvesting for remote sensors	Session 14: Bearings and turbines
11:00 - 11:30	Break	
11:30 - 12:50	Session 15: Piezoelectric energy harvesters	Session 16: Thermoelectric systems
12:50	Conference adjourn	

Oral Presentations

(The numbers behind the papers refer to the page numbers in the Oral Proceedings)

Day 1: December 1, 2010

INVITED 1

09:30 - 10:15 - Location: Promotiezaal

- 3D all-solid-state batteries: a challenging route towards autonomous integrated devices,** 1
Prof. Peter Notten

Parallel Session 1 - Fuel cells

10:15 - 10:55 - Location: Promotiezaal - Session Chair: Danick Briand

- Fully Integrated System of Micro PEM Fuel Cell with NaBH₄ Hydrogen Generator** 7
Taegyu Kim, Jongkwang Lee
- Critical Importance of Water Transport Towards the Anode in Miniature Air-Breathing Polymer Electrolyte Membrane Fuel Cells** 11
Simon Hamel, Luc G. Frechette

Parallel Session 2 - Coolers

10:15 - 10:55 - Location: Museumzaal - Session Chair: Shuji Tanaka

- Geometric control of the fluid-transport meniscus in a passive phase-change microfluidic electronics cooling device** 15
Navdeep Dhillon, Albert Pisano, Matthew Hopcroft, Christopher Hogue
- Radial Type Micro Thermoelectric Device for LED Chip Cooling** 19
Jung Yup Kim, Kwang-Eun Lee, Hee-Jung Lee, Hyun-Sung Park, Seung-Woo Han

Parallel Session 3 - Piezo electric energy harvesters

11:15 - 12:15 - Location: Promotiezaal - Session Chair: Reza Ghodssi

- Power Optimization Using Resonance and Anti Resonance Characteristics of MEMS Piezoelectric Vibration Energy Harvesters** 23
Michael Renaud, Rene Elfrink, Rob van Schaijk
- Micromachined bulk PZT piezoelectric vibration harvester for low amplitude and low frequency vibrations** 27
Hugo Durou, Gustavo A Ardila, Adrien Ramond, Xavier Dollat, Carole Rossi, Daniel Esteve
- Nonlinear Magnetic Coupling of a Piezoelectric Energy Harvesting Cantilever combined with Velocity-Controlled Synchronized Switching Technique** 31
Yuyin Chen, Dejan Vasic, Francois Costa, Wenjong Wu, Chihkung Lee

Parallel Session 4 - Micro ignition

11:15 - 12:15 - Location: Museumzaal - Session Chair: Robert Richards

- Improvement of uniformity and ignition characteristics of micro igniter on glass wafer for micro solid-propellant thruster** 35
Daeban Seo, Jongkwang Lee, Sejin Kwon
- Nanoenergetics on a chip: technology and application for micro ignition in safe arm and fire systems** 39
Marine Petrantoni, Mehdi Bahrami, Ludovic Salvagnac, Veronique Conedera, Carole Rossi, Pierre Alphonse
- A Shadowmask-Evaporated Topside PyroMEMS Igniter** 43
David De Koninck, Danick Briand, Nico De Rooij

INVITED 2

14:00 - 14:45 - Location: Promotiezaal

- Development of a MEMS Energy Harvester with High-Performance Polymer Electrets,** 47
Prof. Yuji Suzuki

Day 1: December 1, 2010

Parallel Session 5 - Energy harvesters

14:45 - 16:05 - Location: Promotiezaal - Session Chair: Amit Lal

- Design, Analysis of Broadband Vibration Energy Harvester Using Magnetolectric Transducer** 53
Jin Yang, Mei Wen, Ping Li, Xianzhi Dai, Ming Li
- Power Output Enhancement of Vibration-Driven Electret Generator Using Concave Electrodes** 57
Tatsuakira Masaki, Kenji Sakurai, Toru Yokoyama, Masashi Doi, Tomonori Seki, Masatoshi Oba
- Wireless power transmission via magnetic coupling to an electrodynamic receiver** 61
Shuo Cheng, David Arnold
- Novel electrode geometry for electrostatic energy conversion with tuning capability** 65
Daniel Hoffmann, Bernd Folkmer, Yiannos Manoli

Parallel Session 6 - Fuel cells

14:45 - 16:05 - Location: Museumzaal – Session Chair: Masanori Hayase

- Micro-Solid Oxide Fuel Cells as power supply for small portable electronic equipment** 69
Anja Bieberle-Huetter, Ludwig Gauckler, Paul Muralt, Thomas Maeder, Dimos Poulikakos, Alex Dommann
- Reaction-specific platinum electrodes for implantable glucose fuel cells: versatile fabrication by cyclic electrodeposition** Arne Kloke, Christian Koehler, Roland Zengerle, Sven Kerzenmacher, Felix von Stetten 73
- Development of a Novel Air-Breathing Micro Direct Methanol Fuel Cell Stack Using MEMS Technology** Xiaowei Liu, Yufeng Zhang, Zhenyu Yuan, Bo Zhang, Xilian Wang, Jianmin Li 77
- A compact and fully-integrated SU-8 micro direct methanol fuel cell** Juan Pablo Esquivel Bojorquez, Tobias Senn, Joaquin Santander, Patricia Hernandez-Fernandez, Sergio Rojas, Neus Sabate 81

Day 2: December 2, 2010

INVITED 3

08:45 - 09:30 - Location: Promotiezaal

- Six-Wafer-Stack MEMS thrusters in space**, Pelle Rangsten 85

Parallel Session 7 - Micro-thrusters and heat engines

09:30 - 10:30 - Location: Promotiezaal - Session Chair: Carol Livermore

- Centimeter-Scale High Pressure Vessel Pneumatic Power Source** 91
Venkata Siva Prasad Pulla, Amit Lal
- Experimental Results of an Ejector Driven Micro Turbine Generator** 95
William Gardner, Andrew Camacho, Ivan Wang, Hardy Shen, Justin Jaworski, Chris Gilmore
- Experimental verification of compressor performance for an ultra-micro gasturbine** 99
Jan Peirs, Tobias Waumans, Kun Liu, Eleonora Ferraris, Tom Verstraete, Dominiek Reynaerts

Parallel Session 8 - Energy storage

09:30 - 10:30 - Location: Museumzaal – Session Chair: David Arnold

- Sugar Batteries - Working without Anodic Catalysts or Membranes** 103
Bor Yann Liaw, Daniel Scott
- High-Current Zn-Air Microbattery Based On A Micromachined Multilayer Lateral Metallic Scaffold** 107
Andac Armutlulu, Yichen Fang, Seong-Hyok Kim, Chang-Hyeon Ji, Sue Ann Bidstrup Allen, Mark Allen
- Design, Fabrication and Testing of a Polymer-based Micro Direct Methanol Fuel Cell** 111
Xiaowei Liu, Luwen Wang, Hong He, Shibo Wang, Yufeng Zhang

Day 2: December 2, 2010

Parallel Session 9 - Energy harvesters for remote sensors

11:00 - 12:20 - Location: Promotiezaal - Session Chair: Paul Mitcheson

- A New, High Efficiency, Bidirectional, Electromagnetic Vibration Energy Harvester for Aeronautical Applications** Sebastian Moest, Martin Kluge, Juergen Heinz, Gerhard Kroetz 115
- Electrostatic Energy Harvester for Low-Frequency Vibration by Human Physical Motions using Liquid** Dong-hoon Choi, Chang-Hoon Han, Hyeon-Don Kim, Jun-Bo Yoon 119
- Vibration harvesting in railway tunnels** 123
Martin Wischke, Gregor Fehrenbach, Yawar Abbas, Giovanni Biancuzzi, Peter Woias
- Enhancing output power of streaming current by two phase flow technique** 127
Yanbo Xie, Albert van den Berg, Jan Eijkel

Parallel Session 10 - Power management

11:00 - 12:20 - Location: Museumzaal – Session Chair: Eric Yeatman

- Electromechanical Inductors for Power Converter Applications** 131
Yaxing Zhang, David Arnold
- A Single Inductor DICO converter with ultra low power MPPT and thin-film LIPON battery for piezoelectric energy harvesting and management** 135
Adrien Ramond, Marjorie Sanchez, Kaiyu Li, Hugo Durou, Bruno Jammes, Carole Rossi
- Autonomous Piezoelectric Energy Harvesting System for Improved Energy Extraction Using a CMOS Integrated Interface Circuit** Thorsten Hehn, Christoph Eichhorn, Peter Woias, Yiannos Manoli 139
- High Efficiency Piezoelectric Energy Harvester with Self Triggered SSHI Interface** 143
Philipp Becker, Daniel Hoffmann, Erwin Hyman, Bernd Folkmer, Yiannos Manoli

INVITED 4

14:00 - 14:45 - Location: Promotiezaal

- Small-Scale Solutions to Grand Challenges in Thermal Management,** 147
Prof. Suresh Garimella

Parallel Session 11 - Microcoolers and thermal switches

14:45 - 15:45 - Location: Promotiezaal - Session Chair: Luc Frechette

- Micro Thermal Switch with Stiffness Enhanced Thermal Isolation Structure** 153
Takashiro Tsukamoto, Masayoshi Esashi, Shuji Tanaka
- A Liquid Contact Thermal Switch with Electrowetting Actuation** 157
Aric McInahan, Cecilia Richards, Robert Richards
- A thermopneumatic valve for single phase liquid cooling for microelectronics** 161
Radu Donose, Jan Peirs, Dominiek Reynaerts

Parallel Session 12 - Electrets and capacitive energy harvesters

14:45 - 15:45 - Location: Museumzaal – Session Chair: Carole Rossi

- Vibration-driven MEMS energy harvester with vertical electrets** 165
Kiyotaka Yamashita, Makoto Honzumi, Kei Hagiwara, Yoshinori Iguchi, Yuji Suzuki
- Nano-cluster-enhanced High-performance Perfluoro-polymer Electrets** 169
Kimiaki Kashiwagi, Kuniko Okano, Yoshitomi Morizawa, and Yuji Suzuki
- High-Speed Electret Charging Method Using Vacuum UV Irradiation** 173
Makoto Honzumi, Kei Hagiwara, Yoshinori Iguchi, Yuji Suzuki

Day 3: December 3, 2010

INVITED 5

09:15 - 10:00 - Location: Promotiezaal

Piezoelectric Thin Film Micro Structures: From Fabrication to Energy Harvesting,
Prof. Dr. Paul Muralt

Parallel Session 13 - Energy harvesting for remote sensors

10:00 - 11:00 - Location: Promotiezaal - Session Chair: Hiroki Kuwano

- A Vibration Harvesting System for Bridge Health Monitoring Applications** 179
Tzeno Galchev, James Mccullagh, Rebecca Peterson, Khalil Najafi
- Harvesting Energy From Airflow With Micromachined Piezoelectric Harvester Inside A Helmholtz Resonator** 183
Svetla Matova, Rene Elfrink, Ruud Vullers, Rob van Schaijk
- Body motion powered wireless transmission platform,** 187
Michail Kiziroglou, David Yates, Cairan He, Eric Yeatman

Parallel Session 14 - Bearings and turbines

10:00 - 11:00 - Location: Museumzaal – Session Chair: Sejin Kwon

- A New Performance Regime for Microfabricated Ball Bearings** 191
Brendan Hanrahan, Mustafa Beyaz, Matthew Mccarthy, C. Mike Waits, Reza Ghodssi
- Micro-generator For Ultra Micro Gas Turbine** 195
Olivier Dessornes, Christof Zwysig
- Aerodynamic journal bearing with a flexible, damped support operating at 7.2 million DN** 201
Tobias Waumans, Jan Peirs, Farid Al-bender, Dominiek Reynaerts

Parallel Session 15 - Piezoelectric energy harvesters

11:30 - 12:50 - Location: Promotiezaal - Session Chair: Paul Mitcheson

- Energy Harvesting MEMS Device based on an Epitaxial PZT Thin Film: Fabrication and Characterization** 203
Don Isarakorn, Danick Briand, Pattanaphong Janphuang, Stefano Gariglio, Alessia Sambri, Jean-Marc Triscone
- A compact piezoelectric energy harvester with a large resonance frequency tuning range** 207
Christoph Eichhorn, Raoul Tchagsim, Nikolai Wilhelm, Frank Goldschmidtboeing, Peter Woias
- Piezoelectric Aluminum Nitride Corrugated Beam Energy Harvester** 211
Taku Hirasawa, Ting-Ta Yen, Paul Wright, Albert Pisano, Liwei Lin
- Pendulum-driven passive self-tuning energy harvester for rotating applications** 215
Lei Gu, Carol Livermore

Parallel Session 16 - Thermoelectric systems

11:30 - 12:50 - Location: Museumzaal – Session Chair: Robert Richards

- Aerosol Deposition and Mold-Filling Method for Micro Thermoelectric Generator** 219
Norinao Kouma, Kenjiro Hayashi, Yoshihiro Mizuno, Osamu Tsuboi, Shintaro Sato, Taisuke Iwai
- Dispenser-Printed Thick Film Thermoelectric Materials** 223
Alic Chen, Deepa Madan, Paul Wright, James Evans
- Silicon nanowire arrays as thermoelectric material for a power microgenerator** 227
Diana Davila, Albert Tarancon, Neus Sabate, Carlos Calaza, Marc Salleras, Luis Fonseca
- Heat generator in humans and its interaction with wearable thermoelectric energy scavenger** 231
Vladimir Leonov

Poster Presentation

There are two poster sessions : Session 1 on Wednesday 16:30-18:30 and Session 2 on Thursday 16:15-18:15. The authors of the *odd* numbered posters are asked to present their poster in Session 1, in Session 2 the *even* numbered ones will be presented. However, all posters should be put on the boards before session 1 and will be visible during both sessions.

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4	Acoustic energy harvester fabricated using sol/gel PZT thin film , Shu Kimura, Tomohisa Sugou, Syungo Tomioka, Satoshi Iizumi, Kyohei Tsujimoto, Yasuhiro Nishioka	13
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6	Indoor Micro-light Energy Harvesting System for Low Power Wireless Sensor Node , Hua Yu	21
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8	System design of a piezoelectric energy harvesting module , Alexander Frey, Ingo Kuehne, Julian Seidel	29
9	3D vibration harvesting using free moving ball in PZT microbox Eric Simon, Yuichiro Hamate, Sumito Nagasawa, Hiroki Kuwano	33
10	Remote RF Battery Charging , Hubregt Visser, Ruud Vullers, Valer Pop, Bert Op Het Veld.	37
11	Analysis of Scalable Rectenna Configurations for Harvesting High Frequency Ambient Radiation , Manuel Pinuela, Paul D. Mitcheson, Stepan Lucyszyn	41
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13	3-D Capacitive Vibrational Harvester for Autonomous Low Power Sensors , Ulrich Mescheder, Antwi Nimo	49
14	Improved Performance of Nonlinear Piezoelectric Energy Harvesters , Qiliang Xu, Igor Paprotny, Richard White, Paul Wright	53
15	A rotation energy harvester using cantilever beam and magnetostrictive /piezoelectric composite transducer , Yumei Wen, Ming Li, Ping Li, Jin Yang, Xianzhi Dai,	57
16	High Efficient, Low Cost Electret Charging Set-up For MEMS Based Energy Harvesting Systems , Ulrich Mescheder, Awad Saad, Antwi Nimo, Bernhard Mueller	61
17	Harvester scavenging ac magnetic field energy of appliance cords using piezomagnetic/piezoelectric ME transducers , Yumei Wen, Ping Li, Jin Yang	65
18	On practical and theoretical limits of the power density of electromagnetic energy harvesters at miniaturization , Clemens Cernik, Ulrike Wallrabe	69
19	Performances Evaluation of an Autonomous Sensing Network Node for Rail Vehicles Supplied by a Piezoelectric Energy Harvester , Giorgio De Pasquale Aurelio, Soma Federico, Fraccarollo	73
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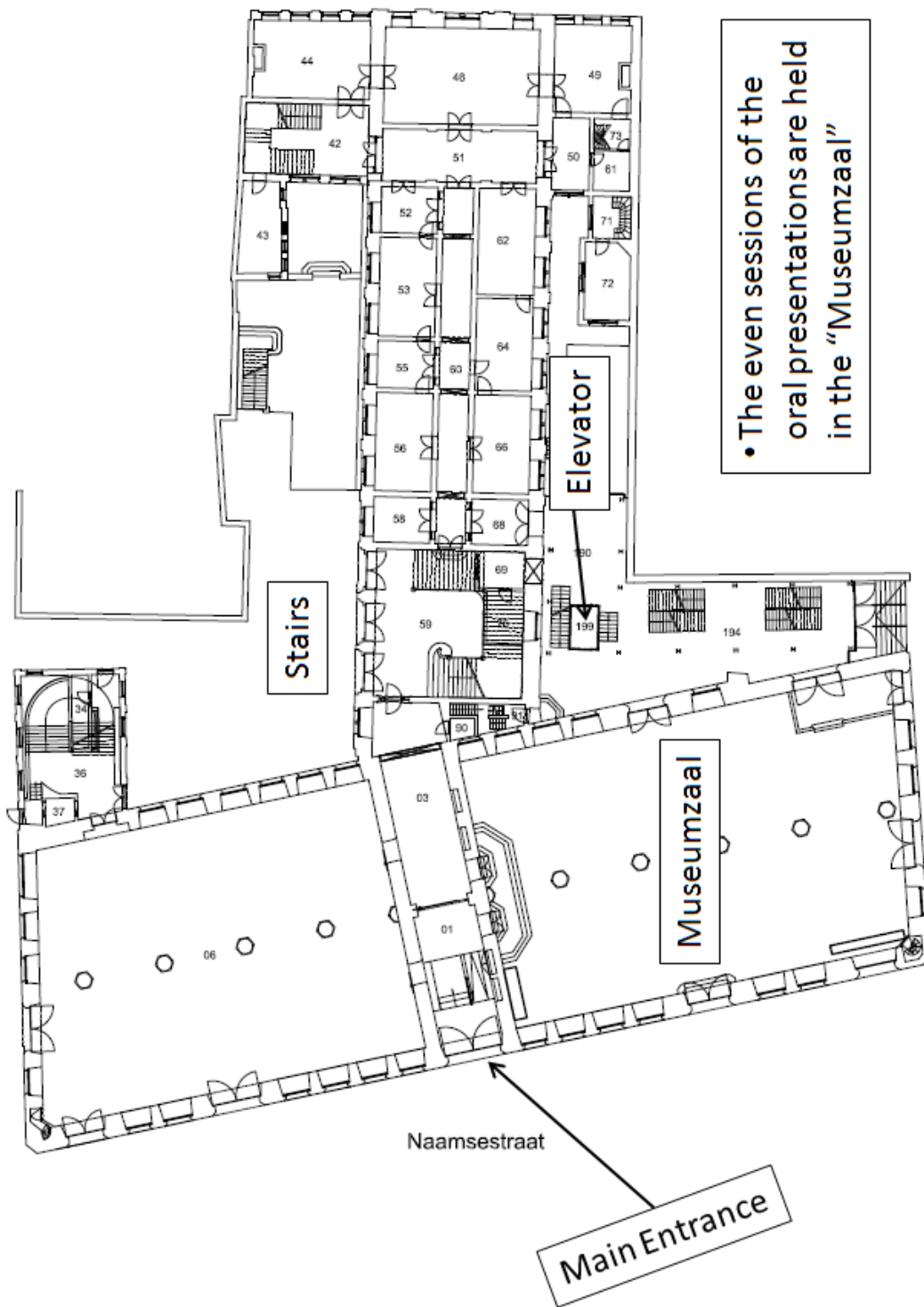
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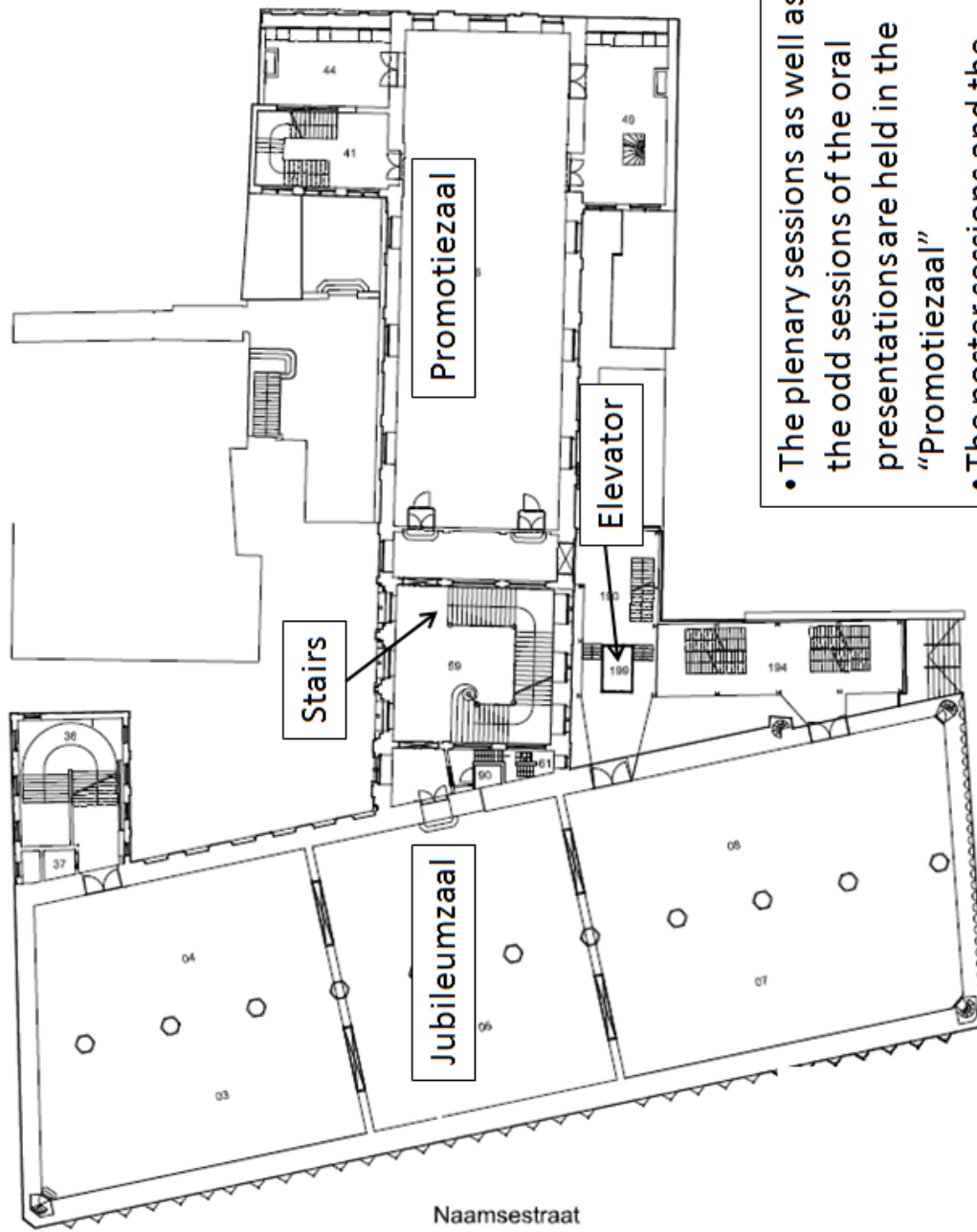
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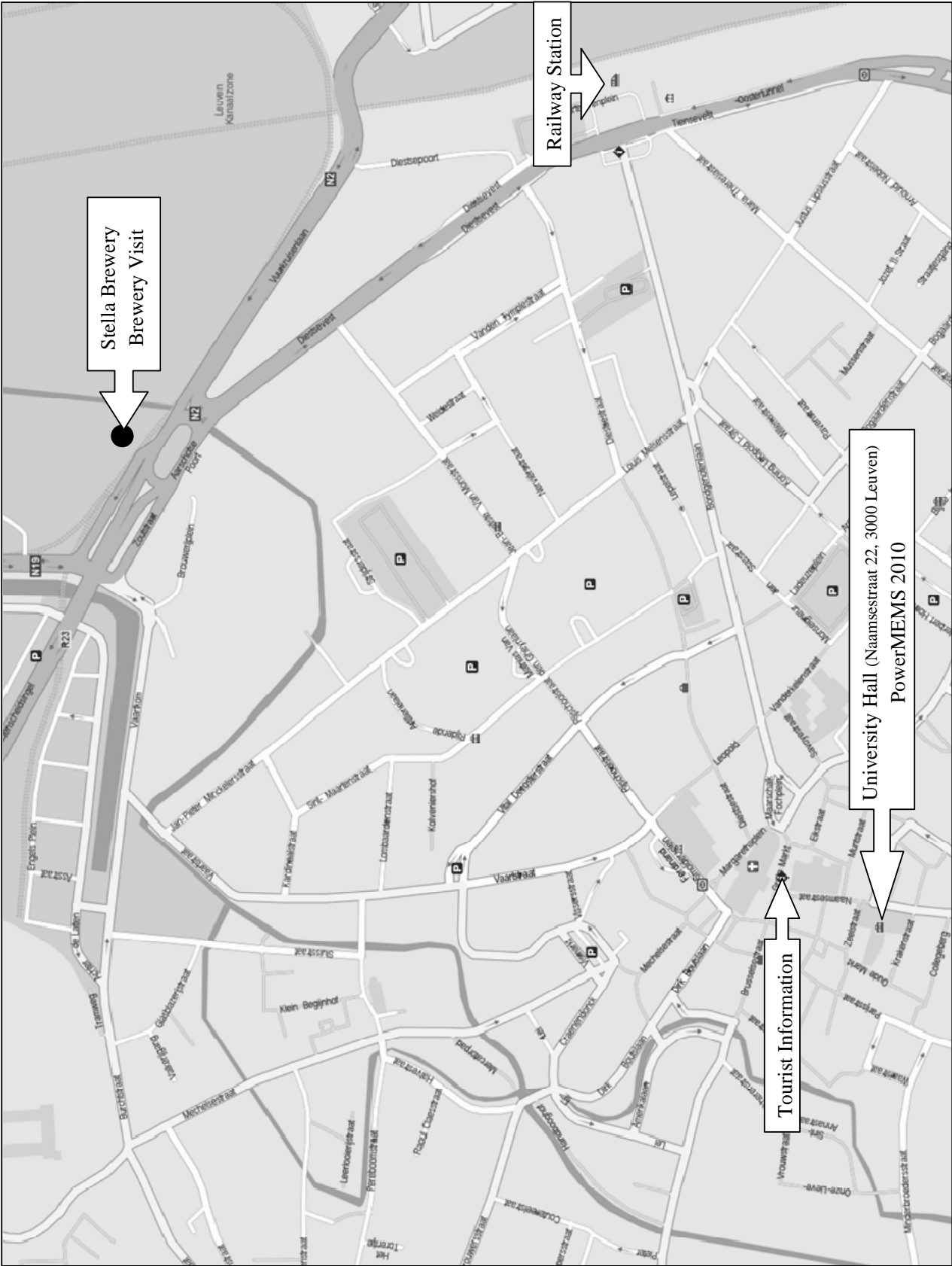
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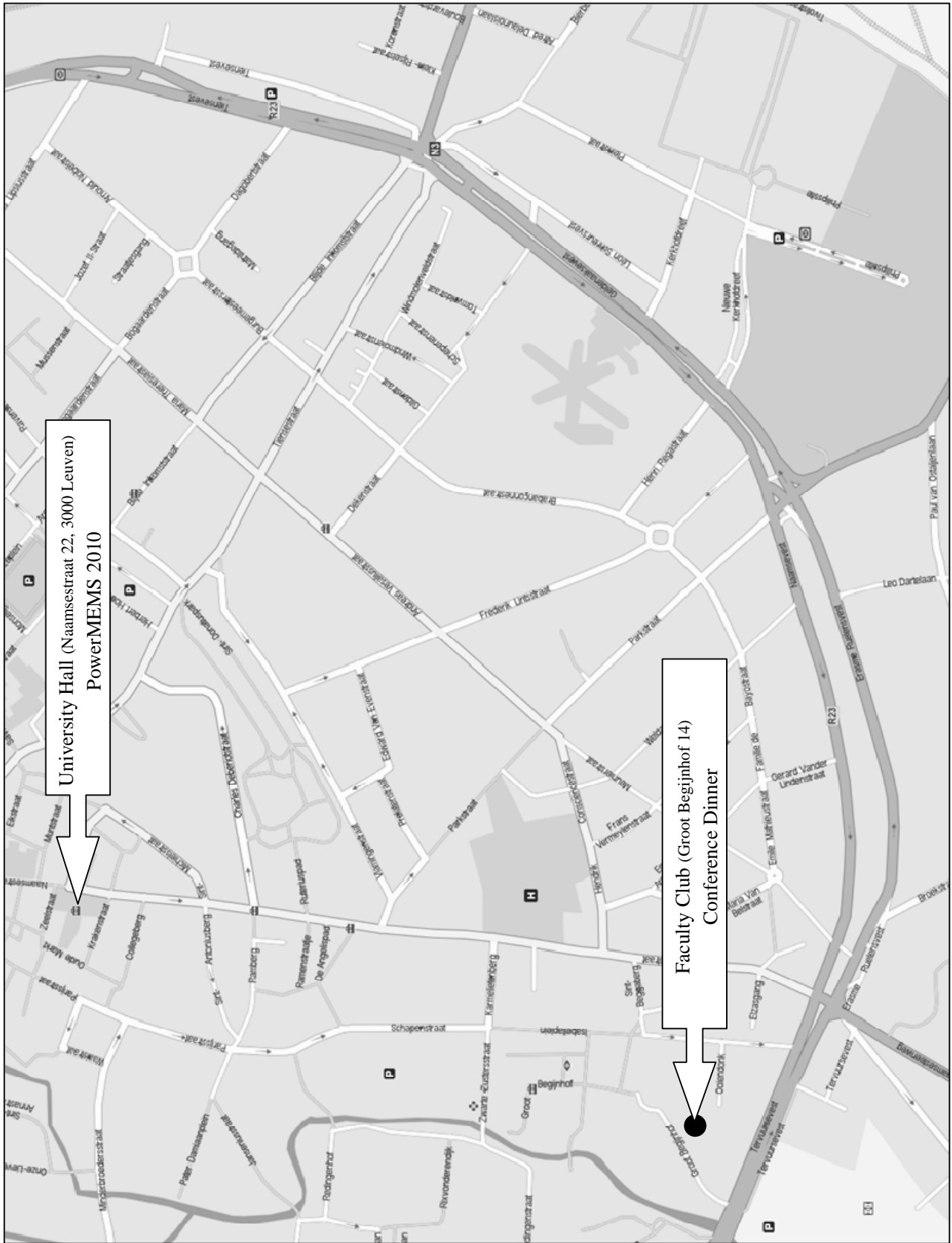


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- The plenary sessions as well as the odd sessions of the oral presentations are held in the "Promotiezaal"
- The poster sessions and the breaks are in the "Jubileumzaal"





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PowerMEMS 2010

Faculty Club (Groot Begijnhof 14)
Conference Dinner