ELIO MATTIA

Curriculum Vitæ

Name: Elio
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EXPERIENCE

Nov 2017 – Dec 2019 **Long-term travel sabbatical.**

Dec 2015 – Oct 2017 **Agile Scrum Developer at Ortec Finance, Amsterdam (the Netherlands).** Core back-end and front-end software development of the in-house PEARL framework, well known in the investment performance business.

Key focus on Oracle 11g and 12c SQL and PL/SQL techniques. Query performance and execution plan optimization. Technical analysis and implementation of performance attribution algorithms. Development of PL/SQL, Web, and Excel API interfaces. Responsible for Git project version management. Front-end Angular component unit testing.

Mar 2015 – Oct 2017 **Business Consultant Investment Performance at Ortec Finance, Amsterdam (the Netherlands).** Actively involved in sales to major international investment firms, banks, insurance companies, and pension funds. Responsible for investment performance computations at production level and client CFO reporting. Client support manager.

Guidance for clients to gather better insights into their investment decision process. On-site training in the form of multi-day courses, remote assistance and offline troubleshooting. Back-end implementation of client-specific requests within the PEARL framework.

Nov 2010 – Oct 2014 **Ph.D. in Origins of Life studies, Dynamic Combinatorial Chemistry and Systems Chemistry at the University of Groningen (the Netherlands)**. Supervisor: Prof. Sijbren Otto. Experimental and computational thesis entitled "Enabling Darwinian Evolution in chemical replicators" defended in May 2017.

Through experimental and computational work, a better understanding of molecular evolution has been achieved. Three main areas have been explored and advanced: exponential replication as an evolutionary advantage, replication under far-from-equilibrium conditions to enable evolution, and replicative propagation of sequence as an information transfer mechanism across generations. The kinetic behaviour of the experimental replicating system of supramolecular peptide-based fibrils arising from a dynamic combinatorial library was reproduced in silico by means of both an ensemble of differential models and stochastic approaches. *Thesis and code: https://www.rug.nl/research/portal/files/41616718/Complete_thesis.pdf*

EDUCATION

Oct 2005 – Oct 2010 **Diploma di Licenza at the Institute for Advanced Study (Istituto Universitario di Studi Superiori IUSS) of Pavia (Italy).** Average score on exams: 30/30 Cum Laude. Winner of the national admission competition. Computational thesis entitled "Protein structure comparison and motif retrieval by the generalized Hough transform". Ex novo development and C++ implementation of a bioinformatics algorithm, inspired by computer vision principles, targeting the identification of protein similarities. Supervisor: Prof. Virginio Cantoni.

The IUSS is a higher learning and research institute located in Pavia and supported by the Italian Minister of Education. Internal multidisciplinary courses are open on a merit base through a national competition. Its mission is that of contributing to the growth of a very small number of selected students by offering qualified programs enhancing their capabilities and knowledge.

July 2010	**Summa Cum Laude Master-level Degree (*Laurea Specialistica*) in Organic Chemistry and Physical Chemistry at the University of Pavia (Italy).** Average score on exams: 30/30 Cum Laude. Experimental thesis entitled: "The Meyer-Schuster reaction in synthetic one-pot processes". Supervisor: Prof. Giovanni Vidari.
July 2008	**Summa Cum Laude Bachelor-level Degree (*Laurea Triennale*) in Chemistry at the University of Pavia (Italy).** Average score on exams: 30/30 Cum Laude. Thesis entitled: "Spontaneous symmetry breaking in chemical systems and the effects of parity violation". Supervisor: Prof. Antonio Faucitano. Co-supervisor: Dr. Daniele Dondi.
July 2005	**Baccalaureate in Informatics at the Technical Institute Modesto Panetti of Bari (Italy).** Score: 100/100. Main subjects studied: Informatics, Computer Systems, Electronics, Probability and Statistics.

TEACHING AND SUPERVISION

Feb-Jun 2014	Project Supervisor of Tenzin Kunsel, M.Sc. programme in Nanoscience, University of Groningen (the Netherlands). Computational project: "Modelling the evolution of self-replicating molecules that form nano-sized assemblies".
October 2013	Teaching of tutorial courses: 1. "Bioorganic Chemistry", B.Sc. programme in Life Sciences, 2. "Organic and Biosynthesis", B.Sc. programme in Pharmacy. Faculty of Mathematics and Natural Sciences, University of Groningen (the Netherlands).
Sep 2012 – Sep 2013	Thesis supervisor of Wietse Smit, M.Sc. programme in Molecular Chemistry, University of Groningen (the Netherlands). Laboratory project: "Spontaneous chiral symmetry breaking using dynamic supramolecular assemblies".
Sep 2011 – Oct 2012	Practical direction, supervision, and teaching of laboratory course "Synthesis II", B.Sc. programme in Molecular Chemistry, Stratingh Institute for Chemistry, Faculty of Mathematics and Natural Sciences, University of Groningen (the Netherlands).
2005 – 2010	Chemistry tutorials for high school students.

AWARDS AND HONOURS

July 2010	Winner of scholarship for the best student of the Faculty of Mathematical, Physical and Natural Sciences of the University of Pavia (Italy).
September 2005	Invitation by the President of the Italian Republic Carlo Azeglio Ciampi to the Opening Ceremony of the School Year (as a medalist in the International Chemistry Olympiads 2005) held at the Monument to Vittorio Emanuele II in Rome (Italy).
July 2005	**Bronze Medal Winner at the International Chemistry Olympiads** (37th IChO) in Taipei (Taiwan). The International Chemistry Olympiads are a worldwide competition in which four selected young representatives of every nation meet in the organizing country to compete on their theoretical knowledge of the various branches of Chemistry and on their experimental abilities. The Olympiads are preceded by multiple selections phases at a regional and national level. Advanced multidisciplinary stages in preparation for the International Chemistry Olympiads for four Italian top students are held annually at the Almo Collegio Borromeo of Pavia (Italy).
2002 – 2005	**Gold Medal Winner**, for four times on annual basis (2002-2005), **at the Italian Chemistry Olympiads**, national competition held in Frascati (Rome, Italy). Served as a member of the Scientific Committee of the Italian Chemistry Olympiads (2006-2012).
March 2005	**Silver Medal Winner at the Italian Informatics Olympiads**, national competition held in Taormina (Messina, Italy) and based on programming problems involving the resolution of complex algorithmic problems. Advanced stages on algorithms and data structures in preparation for the International Informatics Olympiads for fifteen Italian top students are held at the Scuola Normale Superiore of Pisa (Italy).
December 2004	Award by the Italian Minister of Education Letizia Moratti, in Rome (Italy), for the participation to the International Chemistry Olympiads 2004.
December 2004	Invitation by the President of the Italian Republic Carlo Azeglio Ciampi to the Award Ceremony for Prominent Characters in School, Culture, and Art, at the "Palazzo del Quirinale" in Rome (Italy).
July 2004	Participation to the International Chemistry Olympiads (36th IChO) in Kiel (Germany).

PUBLICATIONS

1. Shuo Yang, Gaël Schaeffer, *Elio Mattia*, Andreas Hussain & Sijbren Otto. Chemical fueling enables complexification of self-replicating molecules. Submitted for publication.
2. *Elio Mattia*, Asish Pal, Giulia Leonetti & Sijbren Otto. Mechanism of building block exchange in stacks of self-replicating macrocycles. *Synlett* **2017**, 28, 1, 103-107.
3. Jan Sadownik, *Elio Mattia*, Piotr Nowak & Sijbren Otto. Diversification of self-replicating molecules. *Nature Chemistry* **2016**, 8, 3, 264-269.
4. Mathieu Colomb-Delsuc, *Elio Mattia*, Jan Sadownik & Sijbren Otto. Exponential self-replication enabled through a fibre elongation/breakage mechanism. *Nature Communications* **2015**, 6, 7427.
5. *Elio Mattia* & Sijbren Otto. Supramolecular systems chemistry. *Nature Nanotechnology* **2015**, 10, 111-119.
6. Saleh Hamieh, Vittorio Saggiomo, Piotr Nowak, *Elio Mattia*, R. Frederick Ludlow & Sijbren Otto. A "dial-a-receptor" dynamic combinatorial library. *Angewandte Chemie International Edition* **2013**, 52, 47, 12368-12372.
7. Virginio Cantoni & *Elio Mattia*. Essay: Hough transform for structural motif retrieval. Definitions: Hough transform; Range tree. *Encyclopedia of Systems Biology* **2013**, Werner Dubitzky, Olaf Wolkenhauer, Kwang-Hyun Cho, Hiroki Yokota (Eds.), Springer Science+Business Media LLC.
8. Saleh Hamieh, R. Frederick Ludlow, Olivier Perraud, Kevin R. West, *Elio Mattia* & Sijbren Otto. A synthetic receptor for nicotine from a dynamic combinatorial library. *Organic Letters* **2012**, 14, 21, 5404-5407.
9. *Elio Mattia*, Alessio Porta, Valentina Merlini, Giuseppe Zanoni & Giovanni Vidari. One-pot consecutive reactions based on the synthesis of conjugated enones by the Re-catalysed Meyer–Schuster rearrangement. *Chemistry – A European Journal* **2012**, 18, 38, 11894-11898.
10. Virginio Cantoni & *Elio Mattia*. Protein structure analysis through Hough transform and range tree, in New Tools and Methods for Pattern Recognition in Complex Biological Systems. *Nuovo Cimento C* **2012**, 35, 5, 1.

ACADEMIC TALKS

October 2014	*Towards Darwinian evolution of self-replicating molecules*. Research meeting, University of Groningen (the Netherlands).
June 2014	*How to achieve exponential replication?* COST Action CM 1304 Meeting SYSCHEM 2014 Conference, San Sebastián/Donostia (Spain).
June 2013	*How to achieve exponential replication?* Emergence in Chemical Systems 3.0 Conference, Anchorage (Alaska, USA).
March 2013	*Emergence of autocatalysis from dynamic combinatorial libraries*. XIV Netherlands Catalysis and Chemistry Conference, Noordwijkerhout (the Netherlands).
November 2012	*Dissipative self-replication*. Research meeting, University of Groningen (the Netherlands).
October 2011	*Attaining dynamic kinetic stability in a system containing a replicator and a simple metabolism*. Systems Chemistry III ESF-COST (European Science Foundation – European Cooperation in Science and Technology framework) conference, Crete (Greece).

POSTER PRESENTATIONS

November 2013	*First-order autocatalysis in networks of organic molecules: mechanosensitive self-replicators from dynamic combinatorial libraries*. Molecules: Synthesis and Properties conference, Lunteren (the Netherlands).
May 2013	*First-order autocatalysis in networks of organic molecules: mechanosensitive self-replicators from dynamic combinatorial libraries*. Patterns and Hydrodynamic Instabilities in Reactive Systems conference, Bruxelles (Belgium).
October 2012	*Homeostatic self-replication*. Design & Synthesis, Structure & Reactivity, Biomolecular Chemistry and Medicinal Chemistry conference, Lunteren (the Netherlands).
October 2011	*Attaining dynamic kinetic stability in a system containing a replicator and a simple metabolism*. "Systems Chemistry III" ESF-COST (European Science Foundation – European Cooperation in Science and Technology framework) conference, Crete (Greece).
July 2011	*Attaining dynamic kinetic stability in a system containing a replicator and a simple metabolism*. **Poster prize**, "Origins 2011" conference, Montpellier (France).
March 2011	*Autocatalysis leads to competition between self-assembling replicators emerging from a dynamic combinatorial library*. XII Netherlands Catalysis and Chemistry Conference, Noordwijkerhout (the Netherlands).

INFORMATICS

Algorithms	Proficient in the employment of advanced data structures (stacks, queues, priority queues, trees, binary trees, search trees, range trees, graphs, hash tables) and in the development of complex algorithms (dynamic programming, recursive techniques, merging, sorting, graph traversal, shortest path, minimum spanning tree, geometric algorithms, tree rebalancing) to solve computationally intensive tasks.
Blockchain/Ethereum	Advanced understanding of blockchain technology principles. Knowledge of Ethereum/Solidity, Web3.js, Ganache, Truffle, MetaMask, JS ES8/9 integration.
Languages	Proficient in: SQL, C, C++/STL, Java, MATLAB, Assembly. Learning: Python, C#.
C/C++	Development and implementation ex novo of a new advanced bioinformatics algorithm targeting protein structure comparison, inspired to the Hough transform technique of computer vision, as final internship project at the Institute for Advanced Study of Pavia (Italy), from 2008 to 2010. Reduction of the computational complexity of the most computationally intensive fundamental tasks from polynomial to logarithmic, achieving efficiency and runtimes in the order of minutes, compared to hours for the naive implementation, on an identical sample set of interest. Dynamic memory allocation/deallocation procedures and redundancy optimization for the complex data structures implemented, e.g., three-layered range trees. Implementation of fast range search algorithms in three dimensions and recursive binary tree rebalancing methods.
C/Assembly	Mixed C/Assembly project: data transfer on serial COM ports, with low-level functions (port listening, data transmission) in Assembly and high-level ones (cryptography, validation) in C.
SQL	Extensive knowledge of database theory and of the SQL language, expertise in complex database querying, knowledge in administering a distributed database and competences on the Java JDBC/ODBC interface. Oracle SQL and PL/SQL, MySQL. Interfacing with JSP and Node.js. Performance and execution plans. Graph/tree queries, connect by and pivot.
Java	Experience with multiple educational and production-level projects with focus on an object-oriented approach to a modelling relation. Exposure to programming user interfaces in J2ME.
MATLAB	Differential (ODE) modelling of various complex chemical reaction networks over time, stability analysis and multidimensional parameter space evaluation, during coursework at the Institute for Advanced Study of Pavia (Italy), in 2006, and as a part of computational modelling projects during Ph.D. research at the University of Groningen (the Netherlands), from 2010 to 2014.
Web frontend	In-depth knowledge of: JavaScript ES8/9, React with Redux, HTTP(S) protocols, HTML/CSS. Exposure to: Angular, jQuery, Bootstrap.
Web backend	Expertise in server-side architectures and programming using: Node.js, Express.js, Java JSP. Development of secure REST API frameworks over HTTPS with bcrypt and Passport.js authentication and JST authorization. Exposure to PHP, ASP.NET.
GIT	Expert in the version control system Git and in the SmartGit GUI. Manager in charge of complex projects on in-house servers and on GitHub.
CD/CI	Familiarity with the deployment tool Jenkins.
OOP	Expert in the principles of Object-Oriented Programming and their implementation.
UML	Knowledge of the Unified Modeling Language for software design and engineering.
Design Patterns	Basic knowledge of the Design Patterns for software design and engineering.
Graphic Design	Adobe Creative Cloud: Photoshop, Premiere Pro, Bridge, Illustrator, Dreamweaver, Fireworks, Flash, After Effects.
3D Modelling	Basic expertise using game engines (buildings, interiors), 3D Studio Max (interiors, objects), AutoCAD (objects), POV-Ray (molecules), Chem3D (molecules), MATLAB (functions in parameter spaces).
Computer Networks	Knowledge and competences in creating and administering a computer network.

ECONOMICS AND FINANCE

Econophysics	Familiar with the principles of econophysics and major macroeconomics results.
Investment	Expert in investment performance attribution and appraisal techniques and standards.
PEARL	Proficient in the investment performance framework PEARL. Knowledge and expertise derived from being a full-stack developer of the software itself.

CHEMISTRY

DCC	Expert in the principles and laboratory practice of Dynamic Combinatorial Chemistry and complex chemical reaction networks.
Chromatography	Techniques mastered: UPLC, HPLC, GC. In-depth knowledge of direct and reverse stationary phases. Expert in the ex novo development of new chromatographic methods and in the adaptation of existing ones. Familiarity with field-related computer software for the efficient processing and reporting of high-throughput analysis jobs.
Mass Spectrometry	Proficient in MS, UPLC-MS, HPLC-MS and GC-MS techniques using EI, ESI and APCI sources and Q, TQ, Ion Trap, Orbitrap, TOF, Q-TOF and MALDI analyzers. Familiarity with the instrumentation and extensive expertise in the development of relevant instrument tuning parameters (temperatures, pressures, voltages, currents, gas flows) for different chemistries and according to the individual experimental conditions.
Synthesis	Multi-step organic synthesis skills. Expertise in methodology development for an organic catalytic reaction. Compound identification via NMR, UV, IR, CD, chromatography, mass spectrometry.
Peptide Synthesis	Experience in solid-phase peptide synthesis.
Modelling	Advanced expertise in the differential (ODE) and stochastic (Gillespie) kinetic modelling of complex reaction networks.
Theory	Familiarity with the theory of (M,R)-systems.
Software	ChemBioDraw, Chem3D, MestReNova.
Molecular Dynamics	Basic MD practice with Gromacs/Gromos and VMD.
Certification	GRE Chemistry: 940/940 (99^{th} percentile).

LANGUAGES

Italian	Mother Tongue
English	Fluent
Spanish	Fluent
Dutch	Fluent
French	Fluent
Portuguese	Basic

BROADER INTERESTS

Travelling, sailing, scuba diving (PADI Advanced Open Water Diver), windsurfing, surfing, swimming, ice skating, hiking, photography, videography, gaming, 3D design, computer graphics, full-stack website/app development, blockchain architectures, income inequality, theories of life, AI/ML, ontological and epistemological paradigms of science.