Valdo Tatitscheff

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I am a researcher in mathematical physics. I am particularly interested in cluster varieties, representation theory, higher Teichmüller theory, (topological) quantum field theories, dynamical supersymmetry breaking, (topological) string theory, brane tilings, integrable systems and exceptional objects appearing for example in the moonshine correspondences.

Education and Research Experiences

2018 - 2022   **PhD in Mathematics**, *IRMA, Strasbourg*, under the supervision of Prof. V. Fock.
Cluster structures in Mathematics and in Physics.

Spring 2018   **Research internship**, *City, UoL, London*, under the supervision of Prof. Y.H. He.
Dessins d'enfants, Monstrous Moonshine and cusps of Hecke congruence groups.

Oct.-Dec. 2017   **Solvay doctoral school in theoretical physics**, *Paris (nov.) and Amsterdam (dec.)*.
Supersymmetry (Paris session) and AdS/CFT correspondence (Amsterdam session).

Sept.2017   **Master degree in Fundamental Mathematics**, *UPMC, Paris*, *with honours*.
Master thesis on super-Teichmüller spaces under the supervision of Prof. *V. Fock (IRMA)*.

2015 - 2017   **(Part of the) Master degree in Theoretical Physics**, *ICFP, Paris*.
Quantum Field Theories, *Quantum Chromodynamics* and *Introduction to the bosonic string*.
$1/N$ in *Aspects of symmetry* (S. Coleman), *Phases of $\mathcal{N} = 2$ theories in two dimensions* (E. Witten) under the kind supervision of Prof. A.K. Kashani-Poor.

Sept.2015   **Bachelor's degrees in Mathematics and Physics**, *Paris XIII, Paris*, *with honours*.
In which sense do Maxwell equations contain hints of QFTs ? *T. Lévy (UPMC)*.
BSM Physics through effective approaches of the di-Higgs coupling at CMS, LHC. *R. Salerno (LLR)*.

2014 - 2018   **Studies in mathematics and physics**, *Ecole Normale Supérieure de la rue d'Ulm*.

Research publications

Nov. 2021   **Inverse algorithm and triple point diagrams**, arXiv:2105.09622[hep-th].
Proceedings of the Nankai symposium on Mathematical Dialogues, 2-13 Aug. 2021

May 2021   **Topological quantum field theories from Hecke algebras**, arXiv:2105.09622[math.QA].
with V. Fock and A. Thomas.

Jan. 2021   **Dimers in a Bottle**, *Journal of High Energy Physics, 2021(4), 274*, arXiv:2101.02670[hep-th].
with E. García-Valdecasas, S. Meynet and A. Pasternak.

Sept. 2020   **Dimers, Orientifolds and Anomalies**, *Journal of High Energy Physics, 2021(2), 153*, arXiv:2009.11291[hep-th].
with R. Argurio, M. Bertolini, S. Franco, E. García-Valdecasas, S. Meynet and A. Pasternak.

July 2020   **Dimers, orientifolds and stability of supersymmetry breaking vacua.**, *Journal of High Energy Physics, 2021(1), 61*, arXiv:2007.13762[hep-th].
with R. Argurio, M. Bertolini, S. Franco, E. García-Valdecasas, S. Meynet and A. Pasternak.

May 2020   **The Octagon and the non-supersymmetric string landscape**, *Physics Letters B, 815, 136153*, arXiv:2005.09671[hep-th].
with R. Argurio, M. Bertolini, S. Franco, E. García-Valdecasas, S. Meynet and A. Pasternak.

Dec. 2018   **Cusps, Congruence Groups and Monstrous Dessins**, *Indagationnes Mathematicae, (31)6, 1015-1065*, arXiv:1812.11752[math.NT].
with Y.H. He and J. McKay.

Reading groups, workshops, seminars

2 - 13 Aug. 2021   **Nankai symposium on mathematical dialogues**.
I took part to the symposium and gave a gong show on Monday, the 9th. The title was *On the octagon dimer model*. We have been asked to write a short contribution on our talks for a Proceedings of the conference.

Oct. 2020 - present   **Cluster higher Teichmüller theory and spectral networks**.
Together with Clarence Kineider, Georgios Kydonakis, Eugen Rogozinnikov and Alexander Thomas we have read *Moduli spaces of local systems and higher Teichmüller theory* by Fock and Goncharov. I have presented $\mathcal{X}$-coordinates in the case of the groups PGL_n, cluster algebras, and laminations of type $\mathcal{A}$ and $\mathcal{X}$ for the groups SL_2 and PGL_2. We are nowadays working on spectral networks.

Jan. 2020 - present   **Brussels Journal Club**.
We meet weekly to discuss either recent research articles in string theory and related topics, or important topics in field theory and string theory: supersymmetric quantum field theories in $3d$ and $5d$, brane configurations, S-folds, higher-form symmetries, swampland, holography. In June 2020 I presented with Eduardo García-Valdecasas the article *Webs of (p, q) 5-branes, Five Dimensional Field Theories and Grid Diagrams* by Aharony, Hanany and Kol. We are currently reading Tachikawa's review $\mathcal{N} = 2$ *supersymmetric dynamics for pedestrians*, of which I have presented together with Antoine Pasternak the description of the quantum moduli space of the $\mathcal{N} = 2$, $\mathrm{SU}(2)$ SYM with $\mathrm{N_f} = 1$ via its Seiberg-Witten curve, and the construction of Seiberg-Witten curves from brane setups.

Mar. 2021 - present   **SEGAS Seminar**, Strasbourg.
In the *Séminaire des étudiants de géométrie algébrique de Strasbourg* we discuss various topics in algebraic geometry. I gave a lecture on cluster varieties in March 2021.

Fall of 2020   **Hodge theory reading group**, Strasbourg.
I gave a lecture on Hodge structures, polarizations and the Kodaira embedding theorem.

Fall of 2019   **Margulis arithmeticity theorem reading group**, Strasbourg.
I gave a lecture on real Lie algebras and the Cartan and Iwasawa decompositions.

Nov.-Dec. 2019   **Holomorphic differentials in mathematics and in physics**, *MSRI*, Berkeley, California.

24 & 25 Oct. 2019   **Mathématique Physique Astrophysique**, Vautouraude, Bretagne, France.
The goal of this informal workshop with three friends from Classes Préparatoires (Samuel Daudin, Raphaël Duque and Gauthier Mukerjee) – also preparing a PhD – was to present ourselves our respective research topics. I gave an introduction to cluster objects and an introduction to dimer integrable systems.

15 - 17 Jul. 2019   **Mirror symmetry and cluster algebras**, Cambridge, UK.

9 - 13 Jul. 2019   **Strings 2019**, Brussels.

Fall 2018   **Representation theory of $\mathrm{GL}_n(\mathbb{F}_q)$ reading group**, Strasbourg.
I gave a lecture on the characters of $\mathrm{GL}_n(\mathbb{F}_q)$ in terms of symmetric functions.

April 2016   **School on the mathematics of String Theory**, CIRM, France.

Outreach and reviews

2018 - present   **Séminaire des doctorants**.
I have given three review talks at the *séminaire des doctorants de mathématiques de Strasbourg*: *Quantum Computing* (2021), *Tropical geometry* (2020), *Monstrous Moonshine correspondence* (2019).

Feb. 2019   **A short introduction to Monstrous Moonshine**, *arXiv:1902.03118[math.NT]*.
This article is an introduction to the Monstrous Moonshine correspondence aiming to be as accessible as possible. I consider writing such reviews very meaningful as an outreach and a way to demystify some fields in physics and mathematics to non-specialists.

Teaching

Fall term of 2021   **Géométrie S4A**, *Université de Strasbourg*, Strasbourg.
I am the full instructor of the class 'Géométrie affine et euclidienne' to second-year students of the mathematics department (20h).

Fall term of 2021   **Algèbre S2A**, *Université de Strasbourg*, Strasbourg.
I am the full instructor (26h) and also give one of the three exercise sessions (26h) for this class 'Algèbre 2' (which is a standard first course on linear algebra and finite dimensional linear algebra) intended to first-year students of the mathematics department in Strasbourg.

Fall term of 2020	**Algèbre S1A**, *Université de Strasbourg*, Strasbourg. This class is intended to first-year students of the mathematics department. I filled in for the first two hours (and the basics of matrices) of three different classes (2×3 hours). Lectures and exercise sessions and fused.
Fall term of 2020	**Maths pour la Science, 1.**, *Université de Strasbourg*, Strasbourg. This class was intended to first-year students of the chemistry department. The main topics were complex numbers, continuity, derivability and Taylor series (42 hours). Lectures and exercise sessions and fused.
Spring term of 2020	**Maths pour la Science, 2.**, *Université de Strasbourg*, Strasbourg. This class was intended to first-year students of the physics department. It is an introduction to linear algebra in a very hands-on way (32 hours). Lectures and exercise sessions and fused.
Mar. 2018	**Teaching replacements of Prof. Yang-Hui He**, *City, UoL*, London. ○ Introduction to Mathematical Physics, 3rd year of Bachelor (2h). ○ Applied Mathematics, 2nd year of Bachelor (6h).
Mar. 2015	**Exam marking**, *Lycée Stanislas*, Paris. Marking of the mathematics mock exam of second-year students (approx. 180 examination scripts).

2014 - 2017	**Khôlles**, *Lycée Stanislas*, Paris.
	The goal of *khôlles* in *Classes Préparatoires* is to provide students a regular and specific training for the competition at the end of the two years of *Classes Préparatoires* called *Concours pour les grandes écoles*. As during the real oral exams, each student has to solve on the blackboard exercises chosen by the examiner. The duration of a generic *khôlle* is one hour, during which three students are given different exercises at the same time.
	○ *2016 - 2017:* Mathematics in first-year PCSI (one hour a week)
	○ *2015 - 2016:*
	  – Mathematics in first-year PCSI (one hour a week)
	  – Mathematics in first-year MPSI (one hour a week)
	  – Physics and Chemistry in second-year PSI^* (one hour a week)
	○ *2014 - 2015:* Chemistry in second-year PSI^* (one hour a week)

Awards and Prices

01 - 30 Oct. 2019	**GEAR Network Award**, *Graduate Internship*, MSRI, Berkeley, CA. *Holomorphic differentials in mathematics and in physics.*
15 - 24 Jul. 2013	**45th International Chemistry Olympiads**, *Moscow*, Russia. Silver medal.

Miscellanous

	Sport and outdoor activities. I like hiking, trekking and camping. I love discovering new places, exploring landscapes and hitchhiking with my backpack in foreign countries. I began climbing compulsively in the Fall 2017, and now enjoy bouldering or rope climbing indoors as well as outdoors. I also like swimming.
	Music. I have been taught music theory and the trumpet (in the class of L. Rousselle) in Paris between 2005 and 2016. I still practice and enjoy music a lot, in particular playing (and jamming) with people. Not that the trumpet cannot produce interesting monophonic music on its own, but I particularly like the human connections music creates. I have a broad interest music-wise and appreciate music even more when there is a glimpse of experimentation spirit.
2013 - 2018	**Youth monitoring**, *Eclaireuses et éclaireurs unionistes de France*. I have been monitoring 8 to 12 year-old children between September 2013 and August 2015, then 12 to 16 year-old children between September 2015 and August 2018. This activity consisted of approximately one week-end leadership each month (during the academic year), and of three weeks of summer camp every July. I got the national youth monitoring qualification BAFA in 2016 and the first half of the camp-director qualification BAFD in 2017.

Languages

French	Motherthongue
English	Bilingual
German	Good working knowledge