GLSMs – 2020

Report of Contributions

https://indico.phys.vt.edu/e/glsms2020

Contribution ID: **3** Type: **not specified**

Welcome / orientation

Monday, August 17, 2020 10:50 AM (10 minutes)

Contribution ID: **4** Type: **not specified**

Hans Jockers: Quantum K-Theory and Wilson Loop Algebras

Monday, August 17, 2020 11:00 AM (50 minutes)

Abstract: In this talk we review certain aspects of Wilson line operators in 3d N=2 supersymmetric gauge theories with a Higgs branch that is geometrically described by complex projective varieties. We discuss the relationship between Wilson loop algebras of the gauge theory and the quantum K-theoretic ring of the associated complex projective variety.

Contribution ID: **5** Type: **not specified**

Ilka Brunner: Phases of GLSMs and transition defects

Monday, August 17, 2020 12:00 PM (50 minutes)

Abstract: I will discuss how defects can be used to describe the transition between different phases of 2-dimensional linear sigma models. In particular, I will consider the transport of branes from a phase to the GLSM and between different phases from this point of view.

Contribution ID: **6** Type: **not specified**

Mauricio Romo: B-brane Transport in Anomalous Gauged Linear Sigma Models

Monday, August 17, 2020 7:00 PM (50 minutes)

Abstract: Mapping of B-branes in SCFTs determined by the different phases of a non-anomalous gauged linear sigma model (GLSM) is a well established subject in physics and mathematics. From the point of view of the GLSM, a fundamental tool to determine such functors is the so-called grade restriction rule (GRR). When the axial R-symmetry is anomalous, this picture changes. Some such cases are understood in physics and mathematics as well. In this talk I will present a GLSM approach to understand how the GRR must be modified for the anomalous cases, for abelian models. I will illustrate this in simple cases, mainly Hirzebruch-Jung resolutions of A_n singularities.

Contribution ID: **7** Type: **not specified**

Mykola Dedushenko: Algebras and traces at the boundary of 4d N=4 SYM

Monday, August 17, 2020 8:00 PM (50 minutes)

Abstract: I will describe how the structure of supersymmetric boundary correlators in 4d N=4 SYM can be encoded in a class of associative algebras equipped with twisted traces. In the case of interfaces, this yields a new connection to integrability.

Contribution ID: **8** Type: **not specified**

Sakura Schafer-Nameki: Recent progress on 5d SCFTs

Tuesday, August 18, 2020 4:00 AM (50 minutes)

Contribution ID: **9** Type: **not specified**

Max Hubner: M2-Branes, Local G2 Manifolds and a Colored Quantum Mechanics

Tuesday, August 18, 2020 5:00 AM (25 minutes)

Abstract: We consider local G2 manifolds which are ALE fibered over compact 3-manifolds X. M-theory on such spaces is well approximated by 7d SYM theories whose supersymmetric vacua are determined by a Hitchin system on X. We probe this system with a colored quantum mechanics and reformulate the compactification integrals on X as amplitudes of the QM. Euclidean M2-brane instantons are found to be in one to one correspondence with generalized instantons of the QM. We use this correspondence to study and compute their non-perturbative contributions to the 4d superpotential.

Contribution ID: **10** Type: **not specified**

Matteo Sacchi: New 2d N=(0,2) dualities from four dimensions

Tuesday, August 18, 2020 5:30 AM (25 minutes)

Abstract: Dualities in 4, 3 and 2 dimensions are related by different types of dimensional reduction limits. These can be effectively exploited to find new dualities from already known ones. As a concrete example, I will review the reduction of 4d N=1 dualities to 2d N=(0,2) ones by compactification on a two-sphere with a topological twist. In particular, I will present a new duality for a USp(2N) gauge theory with antisymmetric matter and show how this can be derived by iteration of a more fundamental duality, in analogy with similar derivations for parent dualities in four and three dimensions.

Contribution ID: **11** Type: **not specified**

Ilarion Melnikov: An overview of (0,2) GLSMs

Tuesday, August 18, 2020 11:00 AM (50 minutes)

Abstract: I will give an overview of the physics of (0,2) gauged linear sigma models, mainly focusing on theories that are believed to flow to compact (0,2) superconformal theories. I will outline some of the progress made in the last decade in understanding such RG flows, and I will point out some challenges for the decade ahead.

Contribution ID: **12** Type: **not specified**

Tudor Dimofte: Twists and operators in 3d SUSY gauge theories

Tuesday, August 18, 2020 12:00 PM (50 minutes)

Abstract: I aim to give an overview of the different twists available in 3d QFT: holomorphic-topological for N \geq 2 SUSY, and fully topological A and B twists for N=4 SUSY. I will describe what local and extended operators look like in these twists (both abstract structure and concrete examples), connecting to various modern applications such as boundary chiral algebras, stable envelopes, and quantum K theory; and I'll try to explain how the various twists relate to each other in the case of 3d N=4 SUSY.

Contribution ID: **13** Type: **not specified**

Kentaro Hori: Grade restriction rule and its applications

Tuesday, August 18, 2020 7:00 PM (50 minutes)

Abstract: The grade restriction rule is an important element in B-type boundary conditions in 2d (2,2) supersymmetric gauge theories. In this talk, I will show how to find it and describe some of its applications, including D-brane transport between different phases in gauged linear sigma models, such as McKay, CY/LG, CY/CY correspondences.

Contribution ID: **14** Type: **not specified**

Hao Zou: Gauged Linear Sigma Models for Symplectic Grassmannians

Tuesday, August 18, 2020 8:00 PM (25 minutes)

Abstract: In this talk, I will discuss two-dimensional gauged linear sigma models realizing symplectic Grassmannians. After describing the construction of the GLSMs themselves, I will explain how the Coulomb branch computations in such GLSMs reproduce known ordinary and equivariant quantum cohomology ring relations. For the interests of string theorists, I will also discuss the Calabi-Yau condition inside symplectic Grassmannians. Similar constructions and analysis can also be used for more general isotropic spaces, for example, orthogonal Grassmannians and general isotropic flag
manifolds.

Contribution ID: **15** Type: **not specified**

Zhentao Lu: Quantum sheaf cohomology for toric complete intersections

Tuesday, August 18, 2020 8:30 PM (25 minutes)

Abstract: The quantum sheaf cohomology (QSC) is a deformation of the classical sheaf cohomology ring of a holomorphic vector bundle E and is a generalization of quantum cohomology. We review the version of QSC for toric varieties that corresponds to the description of the geometric phase of A/2 twisted, 2d (0,2) GLSMs. We then present a Sheaf COhomology REstriction (SCORE) formula, which transfers the computation of classical sheaf cohomology (and correlators) for toric complete intersections to the ambient toric variety. After that we discuss some work in progress on quantum corrections.

Contribution ID: **16** Type: **not specified**

Break: nothing scheduled

Wednesday, August 19, 2020 4:00 AM (2 hours)

Contribution ID: **17** Type: **not specified**

Sebastian Franco: 2d (0,2) Gauge Theories, D-branes and Beyond

Wednesday, August 19, 2020 11:00 AM (50 minutes)

Abstract: Engineering quantum field theories in String Theory in terms of branes is a powerful approach for understanding their dynamics. In the first part of my talk I will introduce Brane Brick Models, a novel class of brane configurations that streamline the connection between an infinite class of 2d quiver gauge theories and toric Calabi-Yau (CY) 4-folds. Brane Brick Models can be regarded as 3d generalizations of dimer models. I will also explain how they can be systematically constructed from the underlying CY 4-fold using mirror symmetry.

Finally, I will present a unified mathematical framework based on m-graded quivers with superpotentials that elegantly describes SUSY gauge theories in even dimension, ranging from 6d to 0d, and their dualities. These quivers enjoy new, higher order mutations, which precisely correspond to the order (m+2) dualities of the corresponding gauge theories. This construction also leads to an infinite of tower of graded quivers associated to higher dimensional CYs.

Contribution ID: **18** Type: **not specified**

Azeem Hasan: m-dimers: A unifying perspective on worldvolume gauge theories on D-branes

Wednesday, August 19, 2020 12:00 PM (25 minutes)

Abstract: Wordlvolume gauge theories arising on D-(5-2m) branes probing a toric Calabi-Yau (m+2)-fold can be uniformly encoded in objects called m-dimers. These generalize the well-known construction of 4d, N=1 theories on D-3 branes probing toric Calabi-Yau threefolds to 2d (0,2) theories on D-1 branes probing CY-4folds and 0d N=1 matrix on D-(-1) branes probing CY-5folds. The m-dimers are themselves brane configurations dual to the original setup. We explain how they simplify the passage from gauge theory to geometry and vice versa. Central to this simplification is the combinatorial description of GLSM fields parameterizing the moduli space of these gauge theories. This combinatorial description also reveals interesting relations between such theories in different dimensions, allowing us to construct some of the more complicated theories like 0d, N=1 matrix models using simpler and better understood 4d N=1 theories as the building blocks.

Contribution ID: **19** Type: **not specified**

Nitin Chidambaram: Grassmann flips and semi-orthogonal decompositions

Wednesday, August 19, 2020 12:30 PM (25 minutes)

Abstract: Recently, Ballard, Diemer and Favero proposed a construction of a Fourier-Mukai functor between the derived categories of different GIT quotients under a \mathbb{C}^* action. In this talk, I will talk about a generalization of their notion to the setting of GL(V)-actions in the context of Grassmann flips. Using this generalization, I will also present some semi-orthogonal decompositions arising from these flip functors. This is joint work with Ballard, Favero, McFaddin and Vandermolen.

Contribution ID: **20** Type: **not specified**

Yong-Bin Ruan: Logarithmic GLSM and its applications

Wednesday, August 19, 2020 7:00 PM (50 minutes)

Abstract: In early 2010, a mathematical theory of GLSM was proposed by Fan-Jarvis-Ruan to generalize both Gromov-Witten theory and FJRW-theory. The mathematical GLSM theory produced an open moduli space, in contrast to the traditional moduli theory where the compactness is required. Then, a cosection (constructed out of superpotential) localized the theory to the critical locus. The above theory is theoretically beautiful, but useless in computation. Recently, a delicate compactification of GLSM (logarithmic GLSM) was constructed to remedy the above defect. Its localization formula is proved to be extremely effective to solve many outstanding problems in the subject of Gromov-Witten theory, including BCOV axioms of higher genus Gromov-Witten theory of quintic 3-fold, r-spin conjecture relating r-spin virtual
cycle and locus of holomorphic differential, modularity of Gromov-Witten theory of elliptic fibration and so on. In the talk, we will survey the above developments. These are joint works with Felix Janda and Qile Chen who will give more detail of the program during this conference.

Contribution ID: **21** Type: **not specified**

Johanna Knapp: GLSMs, localisation, and the stringy Kahler moduli space

Wednesday, August 19, 2020 8:00 PM (50 minutes)

Abstract: We provide evidence that the sphere and hemisphere partition functions of Calabi-Yau GLSMs, when evaluated in different phases, always have the same structure. The main ingredients that enter the result are Givental's I/J-functions, the Gamma class, and, in the case of the hemisphere, the Chern character of the D-brane. This is based on joint work with D. Erkinger, M. Romo, and E. Scheidegger.

Contribution ID: **22** Type: **not specified**

Bumsig Kim: General GLSM Invariants and Their Cohomological Field Theories

Thursday, August 20, 2020 4:00 AM (50 minutes)

Abstract: This talk is based on the joint paper arXiv:2006.12182 with David Favero. We will explain how to construct GLSM invariants for a general choice of stability in both the narrow and broad sector cases so that GLSM invariants form a Cohomological Field Theory. This construction is obtained by forming the analogue of a virtual fundamental class which lives in the local cohomology of the twisted Hodge complex. This general construction comes from the use of two new ingredients. First, the use of the Thom-Sullivan and Godement resolutions applied to matrix factorizations are introduced to handle poorly behaved (non-separated) moduli spaces. Second, a localized Chern character map built from the Atiyah class of a matrix factorization is utilized to forgo the use of Hochschild homology.

Contribution ID: **23** Type: **not specified**

David Erkinger: Sphere partition function of Calabi-Yau GLSMs

Thursday, August 20, 2020 5:00 AM (25 minutes)

Abstract: In this talk, we propose a universal expression for the sphere partition function evaluated in hybrid phases of Calabi-Yau GLSMs that are fibrations of Landau-Ginzburg orbifolds over some base manifold. Special cases include Calabi-Yau complete intersections in toric ambient spaces and Landau-Ginzburg orbifolds. We will explain the building blocks entering the expression and test the proposal for
one- and two-parameter Abelian GLSMs, making connections, where possible, to known results from mirror symmetry and FJRW theory. This talk is based on arXiv:2008.03089 with J. Knapp.

Contribution ID: **24** Type: **not specified**

Jirui Guo: Quantum sheaf cohomology and duality of flag manifolds

Thursday, August 20, 2020 5:30 AM (25 minutes)

Abstract: In this talk I will introduce (0,2) deformation of quantum cohomology, namely quantum sheaf cohomology, of flag manifolds based on their GLSM description. In order to study the ring structure, it is necessary to obtain a representation of the ordinary cohomology, that is suitable for (0,2) generalization. Given such a representation, localization and Coulomb vacua can be used to extract the ring relations. I will also talk about how to predict the dual (0,2) deformation under the biholomorphic duality between flag manifolds by making use of the quantum sheaf cohomology. This pair of deformations gives rise to an IR duality between A/2-twisted nonabelian GLSMs.

Contribution ID: **25** Type: **not specified**

Alexander Kuznetsov: Overview of homological projective duality

Thursday, August 20, 2020 11:00 AM (50 minutes)

Abstract: I will try to give a friendly overview of homological projective duality and its applications. If time permits I will also discuss some recent progress such as the construction of categorical joins developed jointly with Alex Perry.

Contribution ID: **26** Type: **not specified**

David Favero: CY components of GLSMs

Thursday, August 20, 2020 12:00 PM (50 minutes)

Abstract: As one varies the stability condition/energy of a GLSM, the associated derived categories can often be embedded in one another. As a consequence many GLSMs have a (sometimes fractional) Calabi-Yau phase. Mathematically, this can be interpreted as a full Calabi-Yau subcategory of the derived category of the GLSM. I will survey this story following joint work with Ballard-Katzarkov and Kelly.

Contribution ID: **27** Type: **not specified**

Qile Chen: Logarithmic GLSM: the theory

Thursday, August 20, 2020 1:00 PM (25 minutes)

Abstract: Following Yongbin's talk, I will discuss more details about logarithmic compactification of the Gauged Linear Sigma Models, and its crucial properties, including its virtual cycles, relations to Gromov-Witten theory, and a natural torus action.

Contribution ID: **28** Type: **not specified**

Seung-Joo Lee: Gromov-Witten Theory on Elliptic 4-folds and Weakness of Gravity in 4 Dimensions

Thursday, August 20, 2020 7:00 PM (50 minutes)

Abstract: In this talk I will report new common features shared by all 4-dimensional theories obtained from supersymmetric compactifications of F-theory with fluxes. I will first discuss the modular behavior of the Gromov-Witten invariants on an elliptic Calabi-Yau 4-fold and clarify in particular their relation to the invariants on certain 3-fold hypersurfaces, to which the elliptic fibration is induced. Based on this modular behavior, I will argue that the Weak Gravity Conjectures must hold for 4-dimensional minimally-supersymmetric effective theories of F-/heterotic theory, in every weak gauge-coupling regime thereof.

Contribution ID: **29** Type: **not specified**

Piljin Yi: Gauged Euler Index, Wall-Crossing, and Holonomy Saddles

Thursday, August 20, 2020 8:00 PM (50 minutes)

Abstract: Recasting of geometric index theorems into path integral of nonlinear sigma models has a long history, dating back to early 1980's. The idea has been revived in the last decade for gauge theories with complex supersymmetries, under the banner of localization, and resulted in several systematic formulae for Hirzebruch genus, Elliptic genus, and other higher-dimensional twisted partition functions.

Here, we turn to gauge theories with two real supercharges, as in d=3 N=1 and d=2 N=(1,1). The holomorphy is no longer
available and chemical potentials drop out universally. Instead, winding numbers of the real superpotential W enter as key quantities, incompleteness of which implies wall-crossing and is prevalent in all spacetime dimensions, unlike the D-term wall-crossing with complex supersymmetries. We introduce the notion of holonomy saddles which allows systematic constructions of d=1,2,3 twisted partition functions from d=0 Gaussian building blocks. d=3 Chern-Simons terms require extra care, but contribute additive pieces computable again from winding numbers. We close with comparisons against Intriligator-Seiberg and checks of several d=3 N=1 dualities.

Contribution ID: **30** Type: **not specified**

Break: nothing scheduled

Friday, August 21, 2020 4:00 AM (2 hours)

Contribution ID: **31** Type: **not specified**

Louise Anderson: Mass-deformed Chern-Simons theories, localisation and beyond

Friday, August 21, 2020 11:00 AM (50 minutes)

Abstract: In this talk, I will give an introduction to mass-deformed Chern-Simons theories, and how one can obtain exact results in these theories using localisation. I will then venture beyond constant masses, into the realm of Lorentz-symmetry breaking mass deformations, and the avenues that opens to understanding QFTs with broken translational symmetries.

Contribution ID: **32** Type: **not specified**

Fabian Ruehle: Worldsheet instantons in Heterotic string theory

Friday, August 21, 2020 12:00 PM (50 minutes)

Abstract: Heterotic worldsheet instanton contributions to the 4D N=1 superpotential depend on Kahler, complex structure, and bundle moduli of the underlying string compactification. Beasley-Witten and Bertolini-Plesser used sigma model arguments to show that these contributions can exhibit a surprising cancelation among different curves within the same curve class. We will analyze this cancelation from an algebraic point of view for monad or extension bundles over complete intersection Calabi-Yau (CICY) manifolds. We give a purely algebraic way of computing the genus zero, single wrapping, Gromov-Witten invariants for a specific type of curve class, illustrate how to compute the Pfaffians and their moduli dependence up to a constant, and study the aforementioned cancelation for these classes of models. We find connections between the polynomials governing the Pfaffians and the mixed GLSM anomalies, and formulate a necessary condition for a non-vanishing instanton superpotential in terms of an affine Hilbert function. Surprisingly, all models found in a scan over monad bundles on CICYs with Picard number 3 have linear dependent Pfaffian contributions (and hence potential cancelations) within a given curve class, even when the instanton moduli space is non-compact and hence the arguments of Beasley-Witten do not enforce such a vanishing.

Contribution ID: **33** Type: **not specified**

Felix Janda: Logarithmic GLSM: Applications

Friday, August 21, 2020 1:00 PM (25 minutes)

Abstract: Following Yongbin's and Qile's talks, I will give more details on how log GLSM and its localization formula can be applied to higher genus computations of hybrid model GLSMs. There will be a special emphasis on the Gromov-Witten theory of quintic threefolds.

Contribution ID: **34** Type: **not specified**

Dmitri Bykov: A new look at integrable sigma-models and their deformations

Friday, August 21, 2020 1:30 PM (25 minutes)

Abstract: I will show that flag manifold sigma-models (including CP^{n−1}, Grassmannian models as special cases) and their trigonometric/elliptic deformations may be cast in the form of gauged bosonic Gross-Neveu-type systems. Quantum mechanically the gauging is violated by chiral anomalies, which may be cancelled by adding fermions. I conjecture that such models are integrable and check that the trigonometrically deformed geometries satisfy the generalized Ricci flow equations.