String Phenomenology 2019

Report of Contributions

https://indico.cern.ch/e/sp2019

Contribution ID: **2** Type: **not specified**

Branes and the Swampland

Monday, 24 June 2019 09:00 (30 minutes)

Completeness of the spectrum of charged branes in a quantum theory of gravity naturally motivates the question of whether consistency of what lives on the branes can be used to explain some of the Swampland conditions. In this paper we focus on consistency of what lives on string probes, to show some of the theories with ⊠N=(1,0) supersymmetry in 10d and 6d, which are otherwise consistent looking, belong to the Swampland. Gravitational and gauge group anomaly inflow on these probes can be used to compute the gravitational central charges (c_L,c_R) as well as the level of the group's current algebra k_L. The fact that the left-moving central charge on the string probes should be large enough to allow unitary representations of the current algebra with a given level, can be used to rule out some theories. This in particular explains why it has not been possible to construct the corresponding theories from string theory.

Presenter: SHIU, Gary (University of Wisconsin & HKUST)

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

Swampland conjectures at the limits in field space

Monday, 24 June 2019 09:30 (30 minutes)

String compactifications are often performed in some asymptotic regime in field space, such as at weak string coupling or at large volume. I introduce the theory allowing to systematically analyze all such large field limits in geometric moduli spaces. I argue that along each of such limits a universal structure emerges that can enlighten and test proposed swampland conjectures. I will exemplify this by briefly discussing evidence for the distance conjecture, the axion weak gravity conjecture, and the de Sitter conjecture.

Presenter: GRIMM, Thomas

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

A Strong WGC from the Modular Bootstrap

Monday, 24 June 2019 10:00 (30 minutes)

In its mildest version, the Weak Gravity Conjecture postulates the existence of superextremal particles of any charge Q. This is not really a constraint on the low-energy EFT, since this charge could a priori be arbitrarily large, resulting in a very massive WGC particle. This applies to (quasi-)sublattice versions of the conjecture too, where the role of Q is played by the index of the WGC sublattice. In this talk we will see how, in the context of worldsheet string theory, it is possible to obtain a universal upper bound on Q in the bosonic sector from the modular bootstrap, thus obtaining a strong form of the WGC in the closed string sector.

Presenter: MONTERO, Miguel (KU Leuven)

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

Instantons and Infinite Distances

Monday, 24 June 2019 11:00 (30 minutes)

Presenter: MARCHESANO BUZNEGO, Fernando Gabriel (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

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

The Two Faces of T-branes

Monday, 24 June 2019 11:30 (30 minutes)

T-branes are intrinsically non-Abelian brane configurations whose exotic features are not fully captured by geometry alone. The purpose of this talk is to give evidence for the existence of a brane-brane duality connecting T-branes to collections of ordinary Abelian branes, which encode the T-brane data in their non-trivial worldvolume curvature. The dual picture is argued to be reliable when the traditional description of T-branes in terms of Hitchin systems breaks down due to large field variations.

Presenter: SAVELLI, Raffaele

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

Chern-Simons and Heterotic Superpotentials

Monday, 24 June 2019 12:00 (30 minutes)

Compactifications of Heterotic theories on Calabi-Yau manifolds have a Chern-Simons like contribution to their four dimensional superpotential. In this talk I will discuss some aspects of computations and general theory behind understanding this often ignored contribution to the effective theory of such constructions.

Presenter: GRAY, James (Virginia Tech)

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

Constraining the early universe with gravitational waves

Monday, 24 June 2019 14:30 (30 minutes)

Gravitational waves can be a powerful probe of cosmology, both for what concerns the late-time and the very early universe. I will present the main reasons why and provide some examples, in particular in the context of the space-based interferometer LISA.

Presenter: CAPRINI, Chiara (APC Paris)

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

Dark Energy in String Theory

Monday, 24 June 2019 15:00 (30 minutes)

I will discuss recent attempts to describe dark energy, including quintessence, using string theory.

Presenter: PARAMESWARAN, Susha Louise (University of Liverpool)

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

de Sitter Vacua from Ten Dimensions

Monday, 24 June 2019 15:30 (30 minutes)

I will critically analyze the de Sitter construction of KKLT using ten-dimensional supergravity.

Presenter: MCALLISTER, Liam

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

R-Parity Violating Decays of Chargino and Neutralino LSPs in the B-L MSSM

Monday, 24 June 2019 16:30 (30 minutes)

The R-parity violating decays of Wino Chargino and Bino Neutralino LSPs are analyzed within the context of the B-L MSSM. These LSPs correspond to statistically determined soft supersymmetry breaking parameters which, when renormalization group evolved to lower energy, lead to an effective theory satisfying all phenomenological requirements. The explicit RPV decay channels of these LSPs to standard model particles, the analytic and numerical decay rates and the associated branching ratios are presented.

Presenter: OVRUT, Burt (University of Pennsylvania)

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

Line Bundles in String Model Building

Monday, 24 June 2019 17:00 (30 minutes)

I discuss a recent count of heterotic line bundle models which suggests that the number of string standard models is exponentially large. In the second half of the talk, I focus on the underlying methods to compute line bundle cohomology. New analytic results for line bundle cohomology on complex manifolds point to an underlying mathematical structure which I discuss. Machine learning techniques may be helpful to uncover this structure.

Presenter: LUKAS, Andre (U)

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

A new approach to heterotic moduli and dualities

Monday, 24 June 2019 17:30 (30 minutes)

In this talk I will review the way that the moduli of heterotic theories arise from a coupling of the geometry of Calabi-Yau manifolds and holomorphic, stable bundles over them. I will demonstrate that the complete geometry (manifold + bundle) of a heterotic theory can be described via a higher dimensional, toric complete intersection manifold and explain how this formulation may shed new light on heterotic string dualities.

Presenter: ANDERSON, Lara

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

A Swampland Update

Tuesday, 25 June 2019 09:00 (30 minutes)

I present some recent progress in formulating new swampland criteria.

Presenter: VAFA, Cumrun (Harvard University)

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

Asymptotic flux vacua and the Swampland

Tuesday, 25 June 2019 09:30 (30 minutes)

The Swampland constraints can be often understood as a quantum gravity obstruction to restore global symmetries at infinite field distance. This constrains the physics near the large field limits by requiring the presence of new light states but also constraining the form of the kinetic terms, gauge couplings and the scalar potential of the effective theory. In this talk, I will focus on the scalar potential and the structure of flux vacua at the asymptotic regions of the complex structure moduli space of M-theory compactified on a Calabi-Yau fourfold. Interestingly, we can use powerful mathematical theorems to derive the asymptotic form of the flux induced scalar potential near any large field limit and check the Swampland conjectures. We classify all possible two large field limits in Calabi-Yau fourfolds and check that the potential never admits deSitter vacua at parametric control.

Presenter: VALENZUELA, Irene

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

The Weak Gravity Conjecture and Repulsive Forces

Tuesday, 25 June 2019 10:00 (30 minutes)

The Weak Gravity Conjecture (WGC) has a variant based on repulsive long-range forces. I discuss this "Repulsive Force Conjecture" (RFC) in detail, describing its relation to the WGC and to black holes, and what evidence supports the conjecture. I also discuss strong forms of the conjecture, such as the "sublattice RFC", how these are realized in perturbative string theory, and how all of these conjectures relate to BPS states.

Presenter: HEIDENREICH, Ben

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

de Sitter vacua in string theory: the landscape or the swampland?

Tuesday, 25 June 2019 11:00 (30 minutes)

While string theory was believed to have a landscape of de Sitter vacua, the recent swampland conjectures postulate that metastable de Sitter vacua are in the swampland. In this talk I will focus on what seems to be the most solid and generic construction of de Sitter vacua in string theory, that of KKLT, and show the multiple reasons why it might be in the swampland.

Presenter: GRANA, Mariana (Unknown)

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

Three Swampland Variations

Tuesday, 25 June 2019 11:30 (30 minutes)

Three different issues will be discussed and explicitly exemplified that are related to the dS swampland conjecture and are motivated by the questions: Does it hold away from the perturbative regime? What are the logical consequences if it is true? Can one broaden the perspective to circumvent the dS no-go consequences?

Presenter: BLUMENHAGEN, Ralph

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

Dualities in and from Machine Learning

Thursday, 27 June 2019 12:00 (30 minutes)

Dualities play a key role in our understanding of dynamical systems appearing in effective field theories from string theory and in general in fundamental physics. Dualities in field theory and string theory are a tool to obtain models describing data at a precision beyond a level standard effective field theory techniques allow. At this stage these techniques are not used explicitly in machine learning.

Based on examples, we identify data questions which are easily answerable in one duality frame but not in the other. Simple neural networks confronted with data in this favoured duality frame can answer data questions, in the other frame they cannot identify the correct answer.

We then discuss the question whether a deeper neural network can learn this favourable dual data representation? We present how, based on feature separation, a dual representation, in this example a Fourier-like transformation, can be learned without knowing about its existence. We then discuss how this framework can be extended to apply to physical systems, in particular the 2D Ising model. We comment on potential uses for effective field theories from string theory.

Presenter: KRIPPENDORF, Sven (University of Oxford)

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

Distance Conjecture and Potentials

Wednesday, 26 June 2019 09:00 (30 minutes)

I will discuss relations between the Swampland distance conjecture, and its generalisations, and potentials in string theory.

Presenter: PALTI, Eran

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

A discrete life in the swampland

Wednesday, 26 June 2019 09:30 (30 minutes)

I will discuss instances in which discrete identifications in field space (discrete symmetries, dualities and monodromies) interplay with the swampland conjectures.

Presenter: URANGA, Angel (IFT, Madrid)

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

Generic matter and global gauge group structure in 6D and 4D supergravity and F-theory models

Wednesday, 26 June 2019 10:00 (30 minutes)

6D supergravity and F-theory geometry provide compatible frameworks for a well-defined notion of genericity for matter representations. Generic matter types depend on global gauge group structure, giving insight in particular into the distinction between theories with gauge group SU(3) x SU(2) x U(1) and those with SU(3) x SU(2) x U(1)/Z_6.

Presenter: TAYLOR, Washington

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

Inflation as an Information Bottleneck

Wednesday, 26 June 2019 11:00 (30 minutes)

We discuss how tools from information theory combined with machine learning a direct map from the microscopic parameters of a string inflation mechanism to the CMB observables allows us to systematically estimate the observable footprint of the theory uncertainty. We demonstrate this using the example mechanism of single-field axion monodromy inflation. We find that inflation acts as an information bottleneck, with a surprising number of microscopic parameters decoupling from the CMB observables.

Presenter: WESTPHAL, Alexander (DESY Hamburg)

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

Polarisation everywhere

Wednesday, 26 June 2019 11:30 (30 minutes)

I discuss recent criticism related to controlled SUSY-breaking and the link with the Swampland program: I explain how anti-brane singularities have been a red herring and that supergravity by itself is sufficient to understand why. In particular this was not yet understood for anti-D6 branes. The role of brane polarisation is crucial in this regard. Loss of control over anti-branes potentially arises when there is a non-trivial interplay with moduli stabilisation and the literature on this problem is polarised as well. Finally I discuss the seemingly loosely related concept of weak gravity and cosmic censorship for which an analogy between scalar field polarisation with brane polarisation seems to suggest a potential analytic derivation of how cosmic censorship implies weak gravity.

Presenter: VAN RIET, Thomas

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

The Flatness of Axionic Potentials and a 10d Approach to KKLT

Wednesday, 26 June 2019 12:00 (30 minutes)

After a brief summary of some recent work on flat axionic potentials in the regime of subplanckian decay constants, I will turn to the controversial topic of a 10d description of the KKLT scenario. In particular, I will outline a proposal for completing the coupling of D7-brane gauginos to bulk fields. Building on this, I will then argue that the analysis of 10d Einstein equations appears to be consistent with the original 4d method of KKLT, including both the AdS vacuum and its uplift to metastable de Sitter.

Presenter: HEBECKER, Arthur (Heidelberg University)

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

The String Landscape, the Swampland, and the Observed Universe

Wednesday, 26 June 2019 15:00 (1 hour)

I review ideas related to the landscape of string vacua and restrictions it suggests on the existence of consistent quantum gravitational theories known as swampland conditions. Some implications for particle physics and cosmology are discussed.

Presenter: VAFA, Cumrun (Harvard University)

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

On Towers and Scalars

Thursday, 27 June 2019 09:00 (30 minutes)

We study three topics concerning the role of scalars and the distance conjecture in the Swampland program. First we discuss a Scalar Weak Gravity Conjecture (SSWGC). Solutions for the corresponding extremal equation are compatible with towers of winding and momenta states becoming massless for large fields. We show that this SSWGC implies the refined dS conjecture under certain particular conditions. Second, we show how in CY compactifications in Type II string theory towers of particles, strings and domain walls become massless(tensionlesss) for large values of the Kahler and complex structure moduli. Third, we propose to use modular symmetries in the scalar moduli space of string compactifications in trying to test the validity of swampland ideas in theories with N=0,1 SUSY. Modular invariance requires potentials to be divergent for large values of the moduli, forbidding global symmetries to arise.

Presenter: IBANEZ , Luis (Universidad Autonoma de Madrid (ES))

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

Moduli Stars and False Vacuum Bubbles

Friday, 28 June 2019 11:00 (30 minutes)

Presenter: QUEVEDO, Fernando (The Abdus Salam International Centre for Theoretical Physics)

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

String theory compactifications with sources

Thursday, 27 June 2019 09:30 (30 minutes)

There has been progress in recent years on how to include backreacted O-planes in flux compactifications. After a quick review of such solutions in AdS, I will discuss the current situation for de Sitter.

Presenter: TOMASIELLO, Alessandro (University of Milano-Bicocca)

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

Deep Reinforcement Learning and the Type IIA Landscape

Thursday, 27 June 2019 11:30 (30 minutes)

An artificial intelligence agent known as an asynchronous advantage actor-critic is utilized to explore type IIA compactifications with intersecting D6-branes. By reinforcement learning, the agent's performance in satisfying string consistency conditions, and finding Standard Model like configurations, is significantly improved. In one case, we demonstrate that the agent learns a human-derived strategy for finding consistent string models. In another case, where no human-derived strategy exists, the agent learns a genuinely new strategy that achieves the same goal twice as efficiently per unit time.

Presenter: NELSON, Brent (Northeastern University)

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

Non-supersymmetric D-branes

Tuesday, 25 June 2019 12:00 (30 minutes)

I will argue that D-branes provide an interesting ingredient for constructing and understanding non-supersymmetric string theory compactifications. D-branes break supersymmetry spontaneously. This can lead to setups with non-linearly realized supersymmetry. This non-linear symmetry is still constraining the action, can be sufficient to derive renormalization theorems and therefore gives substantial control over the string compactification. I will correct a misconception in the literature about SUSY breaking intersecting D-branes. Then I discuss flux compactifications with non-supersymmetric D-branes that provide an interesting testing ground for the recent dS swampland conjecture.

Presenter: WRASE, Timm Michael (Vienna University of Technology)

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

Hope or No Hope for a String Landscape?

Thursday, 27 June 2019 10:00 (30 minutes)

Whether string theory admits a multiverse of de Sitter solutions that look approximately like our universe is a hotly debated current topic. I will overview the basics of landscape constructions and explain my view on this question. I will also outline a possible construction of de Sitter solutions.

Presenter: SETHI, Savdeep (University of Chicago)

Contribution ID: **37** Type: **not specified**

What's new with G2?

Friday, 28 June 2019 09:00 (30 minutes)

Presenter: SCHAFER-NAMEKI, Sakura

Contribution ID: **38** Type: **not specified**

A 3-form exploration of the landscape

Friday, 28 June 2019 09:30 (30 minutes)

I will discuss four-dimensional N=1 supergravity models including 3-form potentials and membranes. These provide a general framework to describe the EFTs of string/M-theory compactifications to four dimensions, in which (part of) the internal flux quanta arise as expectation values of the 4-form field-strengths and large portions of the landscape can be explored within a single EFT. The application to concrete string models unveils some interesting universal patterns.

Presenter: MARTUCCI, Luca (University of Padova)

Contribution ID: **39** Type: **not specified**

Anomalies in various dimensions

Friday, 28 June 2019 10:00 (30 minutes)

Anomalies are a powerful probe of the dynamics of field theories. In this talk I will discuss how to connect different anomalies in various dimensions, and describe some applications of these ideas in string model building.

Presenter: GARCIA-ETXEBARRIA, Iñaki

Contribution ID: **40** Type: **not specified**

Higher Spin Theories, AdS Distances and the Swampland

Friday, 28 June 2019 16:30 (30 minutes)

In this talk I discuss various aspects of higher spin theories in the context of the swampland.

Presenter: LUEST, Dieter (Munich-University)

Contribution ID: **41** Type: **not specified**

Landscape of F-theory Standard Models

Friday, 28 June 2019 11:30 (30 minutes)

We present key steps in explicit construction of a globally consistent F-theory compactifications with the exact chiral spectrum of the Standard Model with gauge coupling unification. All global consistency conditions can be reduced to a single geometric criterion on the base of the underlying elliptically fibered Calabi Yau fourfolds. For toric bases, this criterion only depends on an associated polytope and is satisfied for at least O(10^15) distinct bases. Further particle physics implications of these models are addressed.

Presenter: CVETIC, Mirjam (University of Pennsylvania)

Contribution ID: **42** Type: **not specified**

F-theory and Dark Energy

Friday, 28 June 2019 15:30 (30 minutes)

Presenter: HECKMAN, Jonathan

Contribution ID: **43** Type: **not specified**

Flavour as probe of New Physics

Friday, 28 June 2019 14:30 (30 minutes)

Presenter: NARDECCHIA, Marco (CERN)

Contribution ID: **44** Type: **not specified**

String axiverse and gamma-ray spectral modulation of galactic pulsars

Friday, 28 June 2019 15:00 (30 minutes)

I discuss first the possible range of axion scales and couplings in string axiverse, and then the possibility to explain the recently noticed spectral modulation of gamma-rays from some galactic pulsars by the axion-photon-dark photon mixing realized in axiverse scenario.

Presenter: CHOI, Kiwoon

Contribution ID: **45** Type: **not specified**

String Phenomenology From a Worldsheet Perspective

Friday, 28 June 2019 12:00 (30 minutes)

I argue that the ten dimensional non–supersymmetric tachyonic superstrings may serve as good starting points for the construction of viable phenomenological vacua. Thus, enlarging the space of possible solutions that may address some of the outstanding problems in string phenomenology. A tachyon free six generation Standard–like Model is presented, which can be regarded as an orbifold of the $SO(16) \times E_8$ heterotic–string in ten dimensions. I conjecture that any $(2,0)$ heterotic–string in four dimensions can be connected to a $(2,2)$ one via an orbifold or by interpolations and provide some evidence for this conjecture. It implies that any Effective Field Theory (EFT) model that cannot be connected to a $(2,2)$ theory is necessarily in the swampland, and will simplifies the analysis of the moduli spaces of $(2,0)$. I argue that at present level of understanding of string theory construction of vacua in which all the moduli are stable, including the cosmological constant, is futile. An example of a quasi-realistic model in which all moduli are fixed, aside from the dilaton is presented.

Presenter: FARAGGI, Alon (University of Liverpool)

Contribution ID: **46** Type: **not specified**

Unified Flavor- and CP-Symmetries from String Theory

Friday, 28 June 2019 17:30 (30 minutes)

We develop a new method to determine flavor symmetries within compactified string theory. A picture emerges where traditional (discrete) flavor symmetries, CP-like symmetries and modular symmetries combine to a unified flavor group. We observe the phenomenon of "local" flavor symmetries (with non-universality for various sectors of the theory) that opens up a new arena for flavor model building.

Presenter: NILLES, Hans Peter (Univ. Bonn)

Contribution ID: **47** Type: **not specified**

Sypersymmetry breaking and the swampland

Friday, 28 June 2019 17:00 (30 minutes)

We investigate string models with broken supersymmetry from the viewpoint of swampland conjectures.

Presenter: DUDAS, Emilian (Ecole Polytechnique)

Contribution ID: **48** Type: **not specified**

Complexity and Random Matrix Approximations

Thursday, 27 June 2019 11:00 (30 minutes)

Efforts to better understand the landscape and swampland can be stifled by computational complexity. I will discuss ways in which complexity could be overcome by learning random matrix approximations to string data, including both opportunities and caveats. As a concrete example, generative adversarial networks will be used to learn random matrix approximations to certain Calabi-Yau data, and physical implications will be discussed.

Presenter: HALVERSON, James

Contribution ID: **52** Type: **not specified**

Moduli stabilisation and inflation in a Type IIB/F-theory framework

Tuesday, 25 June 2019 14:30 (15 minutes)

The problem of moduli stabilisation and inflation are discussed in type IIB/F-theory. Considering a configuration of three intersecting D7 branes with fluxes, it is shown that higher loop effects induce logarithmic corrections to the Kaehler potential which can stabilise the Kaehler moduli. When a new Fayet-Iliopoulos term is included, it is also possible to generate the required number of e-foldings and satisfy the conditions for slow-roll inflation.

Presenter: LEONTARIS, Georgios (University of Ioannina (GR))

Session Classification: Parallel Session

Contribution ID: **53** Type: **not specified**

Non-Minimal M-flation

Tuesday, 25 June 2019 14:45 (15 minutes)

We show how in a matrix inflationary model, in which there is a non-minimal coupling between the matrix inflatons and gravity and we call non-$\mathbb{M}$-flation for brevity, some of the disadvantages of the minimal model, $\mathbb{M}$-flation, can be avoided. In particular, the number of D3 branes can be reduced to $\leq \mathcal{O}(10^2)$ which can alleviate the "potential" backreaction problem of large number of D3 branes on the background geometry in the minimal model. This is achieved by values of non-minimal coupling of order few hundred, which is much smaller than what is required in Higgs Inflation. The prediction of the model in the symmetry breaking part of the potential $\phi > \mu$, which is a local attractor and can support eternal inflation, consequently becomes compatible with the latest PLANCK result. Contrary to minimal model, in which the spectator fields failed to deplete the energy of the inflation at the end of inflation around the symmetry-breaking vacuum, in non-MM-flation, they can successfully reheat the universe. We also comment on how this non-minimal coupling can arise in the string theory setup.

Presenter: Dr ASHOORIOON, Amjad (Institute for Research in Fundamental Sciences (IPM))

Session Classification: Parallel Session

Contribution ID: **54** Type: **not specified**

Two-field Cosmological alpha-attractors with Noether Symmetry

Tuesday, 25 June 2019 15:00 (15 minutes)

We study Noether symmetries in two-field cosmological alpha-attractors, investigating the case when the scalar manifold is an elementary hyperbolic surface. This encompasses and generalizes the case of the Poincare disk. We solve the conditions for the existence of a 'separated' Noether symmetry and find the form of the scalar potential compatible with such, for any elementary hyperbolic surface. For this class of symmetries, we find that the alpha-parameter must have a fixed value. Using those Noether symmetries, we also obtain many exact solutions of the equations of motion of these models, which were studied previously with numerical methods.

Presenter: ANGUELOVA, Lilia (Utrecht University)

Session Classification: Parallel Session

Contribution ID: **55** Type: **not specified**

O(D,D) completion of the Friedmann equations

Tuesday, 25 June 2019 15:15 (15 minutes)

String theory suggests a unique and unambiguous augmentation of General Relativity, in which the entire closed-string massless NS-NS sector is promoted to stringy graviton fields. O(D,D) T-duality then uniquely fixes the coupling of this 'Stringy Gravity' to other matter, leading to a generalization of Einstein's equations with an enhanced energy-momentum tensor. In this talk I will explore the resulting cosmological implications and show that this yields an enriched framework beyond typical string cosmology, with solutions characterized by two equation-of-state parameters (w,\lambda) rather than one (w). This includes a line in parameter space where GR-like solutions with constant dilaton are admitted for any w. However, while apparently present on the GR line, there is no de Sitter solution arising from an O(D,D)-symmetric cosmological constant or scalar field with positive energy density, suggesting that de Sitter may simply be an artefact of GR and belong to the swampland.

Presenter: ANGUS, Stephen (IBS Center for Theoretical Physics of the Universe)

Session Classification: Parallel Session

Contribution ID: **56** Type: **not specified**

Axion RG flows and a bound on axion excursions

Tuesday, 25 June 2019 15:30 (15 minutes)

I will discuss axionic holographic RG flow solutions in the context of general Einstein-Axion-Dilaton theories, where a non-trivial axion profile is dual to the (non-perturbative) running of the theta-term for the corresponding instanton density operator. I will show that a non-trivial axion solution is incompatible with a non-trivial (holographic) IR conformal fixed point. Imposing a suitable axion regularity condition allows to select the IR geometry in a unique way. Interestingly, the regularity condition always implies a finite allowed range for the axion source parameter in the UV. This translates into the existence of a finite (but large) number of saddle-points in the large N limit. This ties in well with axion-swampland conjectures.

Presenter: WITKOWSKI, Lukas (Laboratoire APC)

Session Classification: Parallel Session

Contribution ID: **57** Type: **not specified**

Transplanckian axion monodromy!?

Tuesday, 25 June 2019 15:45 (15 minutes)

We show that warped throats of the Klebanov-Strassler kind describe fully backreacted solutions of transplanckian axion monodromy. We show that the asymptotic Klebanov-Tseytlin solution features a 5d axion physically rolling through its dependence on an spatial coordinate, and traversing arbitrarily large geodesic distances in field space. We establish the description of the system in terms of an effective 5d theory for the axion, and verify its validity in transplanckian regimes.

Presenter: CALDERÓN INFANTE, José (Instituto de Física Teórica (UAM/CSIC))

Session Classification: Parallel Session

Contribution ID: **58** Type: **not specified**

U(1)R inspired inflation model in no-scale supergravity

Tuesday, 25 June 2019 16:30 (15 minutes)

We consider a cosmological inflation scenario based on a no-scale supergravity sector with U(1)R symmetry. It is shown that a tree level U(1)R symmetric superpotential alone does not lead to a slowly rolling scalar potential. A deformation of this tree level superpotential by including an explicit R symmetry breaking term beyond the renormalizable level is proposed. The resulting potential is found to be similar (but not exactly the same) to the one in the Starobinsky inflation model. We emphasize that for successful inflation, with the scalar spectral index ns~0.96and the tensor-to-scalar ratio r<0.08, a correlation between the mass parameters in the superpotential and the vacuum expectation value of the modulus field T in the Kähler potential must be adopted.

Presenter: Prof. KHALIL IBRAHIM, Shaaban (ENHEP Egyptian Network of High Energy Physics (EG))

Session Classification: Parallel Session

Contribution ID: **59** Type: **not specified**

Holography, relaxions and the self-tuning of the cosmological constant

Tuesday, 25 June 2019 16:45 (15 minutes)

Holography allows a mechanism for the self-tuning of the cosmological constant by considering a universe brane embedded in a bulk dual to a holographic QFT. This mechanism was shown recently to work bypassing earlier problems with bad bulk singularities. By including also a bulk axion (dual to an instanton density of the holographic QFT), we consider the interplay of the self-tuning mechanism and the Electroweak symmetry breaking on the universe brane. Holography provides a large number of saddle point selftuning solutions. Such an approach links relaxion ideas for the hierarchy problem to the self-tuning mechanism of the cosmological constant.

Presenter: HAMADA, Yuta (University of Crete)

Session Classification: Parallel Session

Contribution ID: **61** Type: **not specified**

The supersymmetric anti-D3-brane action in KKLT

Tuesday, 25 June 2019 17:00 (15 minutes)

An anti-D3-brane plays a crucial role in the construction of semi-realistic cosmological models in string theory. Part of its action provides an uplift term that has been used to lift AdS solutions to phenomenological viable dS vacua in the KKLT and LVS setups. This uplift breaks supersymmetry spontaneously and it can be described in the 4d N=1 supergravity language by using non-linear supersymmetry. I will present and discuss the necessary ingredients to write down the complete 4d N=1 supergravity action for an anti-D3-brane coupled to all closed string background fields.

Presenter: CRIBIORI, Niccolo (Vienna University of Technology)

Session Classification: Parallel Session

Contribution ID: **62** Type: **not specified**

On the stability of SUSY breaking Warped Throats.

Tuesday, 25 June 2019 17:15 (15 minutes)

I will discuss the results in hep.th/1810.07673. A local version of the no non-SUSY-AdS conjecture is proposed for warped throats. This essentially bans warped throats with a gravitational dual that locally looks AdS. Several examples are given.

Presenter: GARCIA-VALDECASAS TENREIRO, Eduardo (IFT UAM-CSIC)

Session Classification: Parallel Session

Contribution ID: **63** Type: **not specified**

Geometrical destabilisation of light fields in String Inflation

Tuesday, 25 June 2019 17:30 (15 minutes)

A typical feature of 4D string models is the presence, at tree-level, of a plethora of massless fields called moduli. Some of them are axion-like fields which become massive only via tiny non-perturbative effects which tend to make them naturally very light. When these fields live on a curved manifold a geometrical destabilisation of the inflationary trajectory can be induced since the growth of the isocurvature perturbations quickly brings the system in the non-perturbative regime.

Presenter: GUIDETTI, Veronica (University of Bologna)

Session Classification: Parallel Session

Contribution ID: **64** Type: **not specified**

A Tower Weak Gravity Conjecture from Infrared Consistency

Thursday, 27 June 2019 14:30 (15 minutes)

We analyze infrared consistency conditions of 3D and 4D effective field theories with massive scalars or fermions charged under multiple U(1) gauge fields. At low energies, one can integrate out the massive particles and thus obtain a one-loop effective action for the gauge fields. In the regime where charge-independent contributions to higher-derivative terms in the action are sufficiently small, it is then possible to derive constraints on the charge-to-mass ratios of the massive particles from requiring that photons propagate causally and have an analytic S-matrix. We thus find that the theories need to contain bifundamentals other than satisfying the convex-hull condition. Demanding self-consistency of the constraints under Kaluza-Klein compactification, we show that, for scalars, they imply a stronger version of the weak gravity conjecture in which the charge-to-mass ratios of an infinite tower of particles are bounded from below. We find that the tower must again include bifundamentals but does not necessarily have to occupy a charge (sub-)lattice.

Presenter: ANDRIOLO, Stefano (Hong Kong university of science and technology)

Session Classification: Parallel Session

Contribution ID: **65** Type: **not specified**

Testing the weak gravity conjecture in type I strings with broken supersymmetry

Tuesday, 25 June 2019 14:45 (15 minutes)

I will discuss tests of the weak gravity conjecture in the presence of supersymmetry breaking, using type I string theory with supersymmetry broken by compactification (à la Scherk-Schwarz). Such a (perturbative) setting allows for the presence of runaway potentials (here for the compactification radius), which is the only possibility if one accepts the non-existence of de Sitter vacua, thus enabling one to test the mutual consistency of the weak gravity and the de Sitter conjectures. Although the weak gravity conjecture is valid in the decompactification limit, for fixed values of the radius there are short-ranged attractive D1-branes interactions, which would naively imply a violation of the weak gravity conjecture for the associated R-R 2-form. I will argue however that at one-loop level the effective tension of the branes decreases such that there is a long-ranged repulsive force, which should come from higher-loops. The conclusion is that the weak gravity conjecture should be respected provided that the string coupling is not extremely small.

Presenter: BONNEFOY, Quentin

Session Classification: Parallel Session

Contribution ID: **66** Type: **not specified**

The Swampland Distance Conjecture for Kähler moduli and emergence

Tuesday, 25 June 2019 15:00 (15 minutes)

The Swampland Distance Conjecture (SDC) states that an infinite tower of modes becomes exponentially light when approaching a point at infinite distance in moduli space. At the large volume singularities of the Kähler moduli spaces of Calabi-Yau threefold compactifications, we use the monodromy matrices to explicitly construct the towers of states satisfying the SDC, which consist of charge orbits of D2-D0 bound states. We further focus on the case where the CY is elliptically fibered, in which case the modular symmetry of the moduli space allows to transfer the orbits to the small fiber regime. In M-theory compactifications, which are dual to F-theory compactifications including an extra circle, some orbits always correspond to Kaluza-Klein towers along that circle. Integrating them out yields an infinite distance in the moduli space, adding support to the emergence proposal. More generally, we show that the exponential mass behavior and the infinite field distance are automatic consequences of integrating out any tower of states up to the species scale, as long as the tower gets compressed as we move in the moduli space.

Presenter: CORVILAIN, Pierre (Utrecht U)

Session Classification: Parallel Session

Contribution ID: **67** Type: **not specified**

A Strong Scalar Weak Gravity Conjecture and Some Implications

Tuesday, 25 June 2019 15:15 (15 minutes)

We propose a new version of the scalar Weak Gravity Conjecture (WGC) which would apply to any scalar field coupled to quantum gravity. For a single scalar it is given by the differential constraint $(V'')^2 \leq (2V'''^2 - V''V'''')M_{\rm p}^2$, where V is the scalar potential. It corresponds to the statement that self-interactions of a scalar must be stronger than gravity for any value of the scalar field. We find that the solutions which saturate the bound correspond to towers of extremal states with mass $m^2(\phi) = m_0^2/((R/m)^2 + 1/(nR)^2)$, with $R^2 = e^{\phi}$, consistent with the emergence of an extra dimension at large or small R and the existence of extended objects (strings). These states act as WGC states for the scalar ϕ. It is also consistent with the distance swampland conjecture with a built-in duality symmetry. All of this is remarkable since neither extra dimensions nor string theory are put in the theory from the beginning, but they emerge. This is quite analogous to how the 11-th dimension appears in M-theory from towers of Type IIA solitonic $D0$-branes. From this constraint one can derive several swampland conjectures from a single principle. In particular one finds that an axion potential is only consistent if $f \leq M_{\rm p}$, recovering a result already conjectured from other arguments. The conjecture has far reaching consequences and applies to several interesting physical systems: i) Among chaotic inflation potentials only those asymptotically linear may survive. ii) If applied to the radion of the circle compactification of the Standard Model to 3D with Dirac neutrinos, the constraint implies that the 4D cosmological constant scale must be larger than the mass of the lightest neutrino, which must be in normal hierarchy. It also puts a constraint on the EW scale, potentially explaining the hierarchy problem. This recovers and improves results already obtained by applying the AdS swampland conjecture, but in a way which is independent from UV physics. iii) It also constraints simplest moduli fixing string models. The simplest KKLT model is compatible with the constraints but the latter may be relevant for some choices of parameters.

Presenter: GONZALO, Eduardo

Session Classification: Parallel Session

Contribution ID: **68** Type: **not specified**

The Swampland Distance Conjecture and Towers of Tensionless Branes

Tuesday, 25 June 2019 15:30 (15 minutes)

The Swampland Distance Conjecture states that at infinite distance in the scalar moduli space an infinite tower of particles becomes exponentially massless. In the context of 4d Calabi-Yau compactifications we find that not only towers of particles, but also towers of strings and domain walls generally become tensionless at different infinite distance points. For $\mathcal{N} = 1$ Calabi-Yau orientifolds in type IIA we present the monodromy orbits of domain walls. Finally, we show the structure of energy scales of these towers at different infinite distance points in simple toroidal compactifications, finding that they may occur at the KK or the fundamental string scales. We end with some comments on possible implications of the presence of these towers of extended objects (emergence, non-geometric fluxes, 4d vacua…).

Presenter: HERRAEZ, Alvaro (Universidad Autónoma de Madrid/ Instituto de Física Teórica UAM)

Session Classification: Parallel Session

Contribution ID: **69** Type: **not specified**

Swampland Distance Conjecture for One-Parameter Calabi-Yau Threefolds

Tuesday, 25 June 2019 15:45 (15 minutes)

We investigate the swampland distance conjecture (SDC) in the complex moduli space of type II compactifications on one-parameter Calabi-Yau threefolds. This class of manifolds contains hundreds of examples and, in particular, a subset of 14 geometries with hypergeometric differential Picard-Fuchs operators. Of the four principal types of singularities that can occur — specified by their limiting mixed Hodge structure — only the K-points and the large radius points (or more generally the M-points) are at infinite distance and therefore of interest to the SDC. We argue that the conjecture is fulfilled at the K- and the M-points, including models with several M-points, using explicit calculations in hypergeometric models which contain typical examples of all these degenerations. Together with previous work on the large radius points, this suggests that the SDC is indeed fulfilled for one-parameter Calabi-Yau spaces.

Presenter: JOSHI, Abhinav (University of Bonn)

Session Classification: Parallel Session

Contribution ID: **70** Type: **not specified**

Carving out the Swampland of 6D SCFTs

Tuesday, 25 June 2019 16:30 (15 minutes)

Demanding unitarity of correlators can put severe constraints on the allowed spectra of SCFTs. We discuss such constraints in the context of half-BPS operators in six dimensions using the conformal bootstrap and possible lower bounds on central charges one gets for theories with flavour. In particular we relate these bounds with results from F-theory and the size of its swampland.

Presenter: BAUME, Florent (IFT Madrid)

Session Classification: Parallel Session

Contribution ID: **71** Type: **not specified**

A CICY scan for orientifolds

Tuesday, 25 June 2019 16:45 (15 minutes)

A orientifold involution on a Calabi-Yau manifold will induce a splitting of the cohomology in even and odd parts. Furthermore, in many IIB models it proves useful that the orientifold action gives non-vanishing odd h11. Motivated by these facts, we report here the result of a scan in the database of complete intersection Calabi-Yau threefolds. Out of the 7890 CICYs we single out which ones admit a Z2 involution swapping same-topology divisors, therefore allowing for the introduction of an O7- plane. We then compute the values of the odd part of h11. Our conclusion is that at least in this database the odd h11 will be (almost) always zero or one, so CICYs are generically not good if one insists in having models with large odd h11. We compare this result with an analog one in the the Kreuzer-Skarke database.

Presenter: CARTA, Federico (DESY)

Session Classification: Parallel Session

Contribution ID: **72** Type: **not specified**

Fibers and 5d SCFTs

Tuesday, 25 June 2019 17:00 (15 minutes)

We will consider the construction of 5d superconformal field theories by studying M-theory compactified on a non-compact Calabi–Yau threefold, which is related to the elliptically fibered Calabi–Yau threefold that, in F-theory, constructs the 6d SCFT that circle reduces to said 5d SCFT. We explain how many interesting features of 5d SCFTs, like flavour symmetry enhancement, arise from the elliptic fibration.

Presenter: LAWRIE, Craig (University of Pennsylvania)

Session Classification: Parallel Session

Contribution ID: **73** Type: **not specified**

Yukawa Hierarchies in Global F-theory Models

Tuesday, 25 June 2019 17:15 (15 minutes)

I will argue that global 4d F-theory models generically exhibit holomorphic Yukawa matrices of higher rank. In a toy model, where one can explicitly compute all contributions to one type of couplings, the eigenvalues are shown to develop large hierarchies for generic complex structure moduli.

Presenter: LIN, Ling (University of Pennsylvania)

Session Classification: Parallel Session

Contribution ID: **74** Type: **not specified**

F-theory on quotient elliptic threefolds

Tuesday, 25 June 2019 17:30 (15 minutes)

We present a systematic study of F-theory on smooth elliptic quotient threefolds. We show that general anomaly cancellation in the 6d SUGRA theory is satisfied upon the addition of additional discrete charged superconformal matter. The quotient generically also breaks the gauge symmetry to a discrete one. We use this method to study an order 6 example explicitly constructed via a quotient of a Schoen manifold.

Presenter: OEHLMANN, Paul-Konstantin (Virginia Tech)

Session Classification: Parallel Session

Contribution ID: **75** Type: **not specified**

T-branes in G2 backgrounds

Tuesday, 25 June 2019 17:45 (15 minutes)

We consider compactifications of M-theory on 7-dimensional manifolds with G2 holonomy and focus on gauge theory sectors that are built as 3-manifolds of ADE singularities. We build novel gauge theory configurations that involve non-commuting normal deformations as well as gauge theory magnetic fluxes and provide methods to detect the presence of localised zero modes that can descend to chiral multiplets in 4d. Some solutions seem to suggest that even co-dimension 6 singularities in a G2 manifold can host chiral matter, an observation that might be fruitful in the construction of particle physics models from M-theory.

Presenter: ZOCCARATO, Gianluca (University of Pennsylvania)

Session Classification: Parallel Session

Contribution ID: **76** Type: **not specified**

No-Go theorems for ekpyrosis from ten-dimensional supergravity

Tuesday, 25 June 2019 14:30 (15 minutes)

In this talk, we present whether the new ekpyrotic scenario can be embedded into ten-dimensional supergravity. We use that the scalar potential obtained from flux compactifications of type II supergravity with sources has a universal scaling with respect to the dilaton and the volume mode. Similar to the investigation of inflationary models, we find very strong constraints ruling out ekpyrosis from analyzing the fast-roll conditions. We conclude that flux compactifications tend to provide potentials that are neither too flat and positive (inflation) nor too steep and negative (ekpyrosis).

Presenter: UZAWA, Kunihito (Kwansei Gakuin University)

Session Classification: Parallel Session

Contribution ID: **77** Type: **not specified**

Black Hole Superradiance Constraints on the KS Axiverse

Tuesday, 25 June 2019 14:45 (15 minutes)

We discuss imposing physical constraints on the recently generated Kreuzer-Skarke Axiverse, namely the application of mass limits coming from black hole superradiance. We briefly touch on how our approach can also be applied to other physical limits on axion masses and decay constants to rule out previously viable string backgrounds.

Presenter: MEHTA, Viraf (University of Goettingen)

Session Classification: Parallel Session

Contribution ID: **78** Type: **not specified**

Moduli Stars

Tuesday, 25 June 2019 15:00 (15 minutes)

The recent direct detection of gravitational waves (GWs) has opened a new window of observation for physical phenomena in which gravity is the dominant interaction. Collisions of black holes and neutron stars have been observed and a plethora of new events, even involving new physics, are expected to be detected in the next few years. It is natural to explore alternative physical objects that may exist which are different from the standard stars and black holes and that could lead to particular imprints on the GW spectrum. In this talk I will explore the possibility that moduli (gravitationally coupled scalar fields arising in all string compactifications) can compose compact objects (moduli stars) whose dynamics gives rise to GW production. I will illustrate their formation in the early universe, that was studied through lattice techniques. After their formation moduli stars can have very different behaviours, e.g. they could rapidly collapse to black holes or disperse into scalar radiation. I will describe the fate of moduli stars, that was investigated through numerical relativity techniques.

Presenter: Dr MUIA, Francesco

Session Classification: Parallel Session

Contribution ID: **79** Type: **not specified**

Moduli Portal between visible and hidden sectors

Tuesday, 25 June 2019 15:15 (15 minutes)

We investigate the possibility of Moduli mediators between the visible and hidden sector in the context of the LVS.

Presenter: BROECKEL, Igor (University of Bologna)

Session Classification: Parallel Session

Contribution ID: **80** Type: **not specified**

Spontaneous dark-matter mass generation along cosmological attractors in string theory

Tuesday, 25 June 2019 15:30 (15 minutes)

I will talk about a new scenario for generating a relic density of non-relativistic dark matter in the framework of heterotic string theory with spontaneously broken supersymmetry and at finite temperature. In this scenario, contrary to the standard thermal freeze-out process, dark-matter particles are produced while they are still relativistic and then decouple from the thermal bath because of a sudden increase of their mass above the universe temperature. The mass increase is sourced by the destabilization of a modulus triggered when the temperature of the universe drops below the supersymmetry breaking scale. This phase transition is enforced to take place in certain models thanks to a cosmological attractor mechanism.

Presenter: COUDARCHET, Thibaut (Ecole Polytechnique)

Session Classification: Parallel Session

Contribution ID: **81** Type: **not specified**

Shift Symmetric Orbital Inflation

Tuesday, 25 June 2019 15:45 (15 minutes)

Recent swampland conjectures highlight again the importance of finding viable scenarios for inflation that are not strictly single-field. In particular, one may wonder whether there are multi-field inflationary scenarios that have a similar phenomenology to single field inflation. We present a family of exact models of inflation - dubbed Orbital Inflation - in which the multi-field effects are significant, but the phenomenology remains similar to single field inflation. This simple predictions have a dynamic origin, and are non-trivial, as the isocurvature perturbations are exactly massless. The effective action of perturbations inherits a symmetry from an equivalence between background solutions. We comment on how our results could be connected to symmetries of the UV theory.

Presenter: WELLING, Yvette (Deutsches Elektronen-Synchrotron DESY)

Session Classification: Parallel Session

Contribution ID: **82** Type: **not specified**

Gravitational waves from axion clumps

Tuesday, 25 June 2019 16:30 (15 minutes)

Axionic objects such as axion miniclusters and axion clouds around spinning black holes induce parametric resonances of electromagnetic waves through the axion-photon interaction. Here we discuss various difference gravitational sources from such objects through similar mechanisms.

Presenter: SUN, Sichun (Sapienza University of Rome)

Session Classification: Parallel Session

Contribution ID: **83** Type: **not specified**

Observing axion potentials through gravitational waves

Tuesday, 25 June 2019 16:45 (15 minutes)

I will discuss the the production of gravitational waves which are sourced by the tensor perturbation of SU(2) gauge fields coupled to a spectator axion field. Even though string theory constructions provide a variety of potentials, they can be categorized based on the number of non-stationary inflection points. I will present the resulting GW templates arising from each potential type. I will focus on the case of a modulated (axion monodromy) potential and show how future observations of CMB B-modes can probe the oscillatory behavior of an axion potential, thus shedding light into the underlying string theory construction.

Presenter: SFAKIANAKIS, Evangelos (University of Illinois at Urbana-Champaign)

Session Classification: Parallel Session

Contribution ID: **84** Type: **not specified**

Wavefunctions and their implications on S^2 with flux and branes

Tuesday, 25 June 2019 17:00 (15 minutes)

We formulate a six dimensional U(1) gauge theory compactified on a (two dimensional) sphere S^2 with flux and localized brane sources. Profiles of the lowest Kaluza-Klein (KK) wavefunctions and their masses are derived analytically. In contrast to ordinary sphere compactifications, the above setup can lead to the degeneracy of and the sharp localizations of the linearly independent lowest KK modes, depending on the number of branes and their tensions. Moreover, it can naturally accommodate CP violation in Yukawa interactions.

Presenter: TATSUTA, Yoshiyuki (Waseda Univ.)

Session Classification: Parallel Session

Contribution ID: **85** Type: **not specified**

Matrix model and Yukawa couplings on the magnetized noncommutative torus

Tuesday, 25 June 2019 17:15 (15 minutes)

The IKKT model is proposed as a non-perturbative formulation of superstring theory. I consider the magnetized toroidal compactifications of the IKKT model. I find that the chirality and the generation structure are almost same with the magnetized toroidal compactifications of the super Yang-Mills theory. In addition, I compute the Yukawa couplings including a noncommutative parameter. In comparison with the magnetized toroidal compactifications of the super Yang-Mills theory, I find that the effect of the noncommutative parameter appears the overall factor of the Yukawa couplings.

Presenter: MASAKI, Honda (Waseda University)

Session Classification: Parallel Session

Contribution ID: **86** Type: **not specified**

Discrete Flavor Symmetries from Orbifold GUTs

Tuesday, 25 June 2019 17:30 (15 minutes)

In this talk, we show that in orbifold GUT models discrete symmetries can be understood as remnants of gauge symmetries that are broken by orbifold boundary conditions. We present a systematic way to determine the discrete symmetries that survive the orbifolding. In particular, we derive universal conditions that need to be fulfilled in order to preserve any discrete symmetry. Finally, some implications for flavor model building are discussed.

Presenter: MUETTER, Andreas (Technical University of Munich)

Session Classification: Parallel Session

Contribution ID: **87** Type: **not specified**

Classification of Left-Right Symmetric Heterotic String vacua

Tuesday, 25 June 2019 17:45 (15 minutes)

I will briefly describe the classification approach within the free fermionic formalism, then discuss techniques beyond the random generation classification. In particular, explorations of 'fertile regions' within left-right symmetric models that are pre-selected at the SO(10) level for phenomenological favourability. Finally, we will discuss the application of machine learning techniques within this space of free fermionic string vacua.

Presenter: PERCIVAL, Benjamin (liverpool)

Session Classification: Parallel Session

Contribution ID: **88** Type: **not specified**

Uplifting Runaways

Thursday, 27 June 2019 14:30 (15 minutes)

I will discuss a mechanism which can lead to a possible instability of the KKLT construction for de Sitter vacua. The sphere at the tip of a warped deformed conifold throat can be destabilized by antibranes placed in the throat. Consequently, the stabilization of moduli should not be treated independently from the antibrane uplift in KKLT-like scenarios. This conifold destabilization mechanism can be avoided by turning on a large amount of flux on the sphere, but tadpole cancelation constraints the hierarchy of scales in a type IIB flux compactification. This indicates that antibrane uplift cannot be used to construct stable de Sitter vacua with a small cosmological constant in perturbative string theory.

Presenter: LUEST, Severin (IPhT, CEA Saclay)

Session Classification: Parallel Session

Contribution ID: **89** Type: **not specified**

On non-perturbative effects and moduli stabilization from 10D

Thursday, 27 June 2019 14:45 (15 minutes)

Non-perturbative effects were long ago proposed to be useful for supersymmetric moduli stabilization in Type II string theory compactifications. Their use has been widely studied from the 4D perspective but from the 10D perspective this mechanism is not completely understood. By performing a 10D analysis I will show some features of the mechanism, confirming some old 4D results as well as providing some new properties of the compactification.

Presenter: Dr RETOLAZA, Ander (IPhT CEA Saclay)

Session Classification: Parallel Session

Contribution ID: **90** Type: **not specified**

Thraxions: Ultralight Throat Axions

Thursday, 27 June 2019 17:00 (15 minutes)

We argue that a new type of extremely light axion is generically present in the type IIB part of the string theory landscape. Its mass is suppressed by the third power of the warp factor of a strongly warped region (Klebanov-Strassler throat), suggesting the name thraxion. Our observation is based on the generic presence of several throats sharing the same 2-cycle. This cycle shrinks to zero volume at the end of each throat. It is hence trivial in homology and the corresponding C2 axion is massive. However, the mass is warping-suppressed since, if one were to cut off the strongly warped regions, a proper 2-cycle would re-emerge. Since the kinetic term of the axion is dominated in the UV, an even stronger, quadratic mass suppression results. Moreover, if the axion is excited, the angular modes of the throats backreact. This gives our effective C2 axion a finite monodromy and flattens its potential even further. Eventually, the mass turns out to scale as the third power of the warp factor.

Presenter: LEONHARDT, Sasha (Heidelberg University)

Session Classification: Parallel Session

Contribution ID: **91** Type: **not specified**

Gaugino condensation and small uplifts in KKLT

Thursday, 27 June 2019 15:15 (15 minutes)

We argue that ten-dimensional consistency requirements in the form of a certain tadpole cancellation condition can be satisfied by KKLT type vacua of type IIB string theory. The stress caused by the restoring force that the stabilization mechanism exerts on the volume modulus once supersymmetry gets broken can be seen to ensure this dynamically. However, we also explain that it is surprisingly difficult to engineer sufficiently long warped throats to prevent decompactification which are also small enough in size to fit into the bulk Calabi-Yau (CY). We give arguments that achieving this with reasonable amount of control may not be possible in generic CY compactifications while CYs with very non-generic geometrical properties might evade this conclusion.

Presenter: MORITZ, Jakob (Deutsches Elektronen-Synchrotron DESY)

Session Classification: Parallel Session

Contribution ID: **92** Type: **not specified**

Scaling limits of dS vacua and the swampland

Thursday, 27 June 2019 15:30 (15 minutes)

I discuss the properties of massive type IIA flux compactifications. In particular, I will talk about in which cases one can obtain dS vacua at large volume and small coupling. The scaling symmetries will also be discussed in a concrete example. The conclusion of the talk will be that the large volume and weak coupling limit requires a large number of O6-planes. Since these are bound for any given compactification space one cannot get arbitrarily good control over α 0 and string loop corrections.

Presenter: ROUPEC, Christoph (TU Vienna)

Session Classification: Parallel Session

Contribution ID: **93** Type: **not specified**

Consistent truncation and de Sitter space from gravitational instantons

Thursday, 27 June 2019 15:45 (15 minutes)

I will present a four-dimensional consistent truncation of type IIA supergravity in the presence of fermionic condensates generated by gravitational instantons. The condensates are controlled by the ratio of the characteristic length of the internal Calabi-Yau to the string length, and can be fine-tuned to be dominant in a region of large volume and small string coupling. The consistent truncation admits de Sitter solutions supported by the condensates, subject to certain validity conditions.

Presenter: TERRISSE, Robin (Institut de Physique Nucléaire de Lyon)

Session Classification: Parallel Session

Contribution ID: **94** Type: **not specified**

Walls of Marginal Stability and the Swampland Distance Conjecture

Tuesday, 25 June 2019 14:30 (15 minutes)

In this talk we will investigate the Swampland Distance Conjecture in type IIB string theory compactified on K3 x T2. As conjectured one indeed finds a tower of exponentially light states using the Hodge-Deligne splitting of the middle homology in the degeneration limit. This tower, however, consists of quarter-BPS states, which can potentially decay into a pair of half-BPS states at walls of marginal stability. We investigate the presence of these walls in the context of the degenerations.

Presenter: DIERIGL, Markus (Utrecht University)

Session Classification: Parallel Session

Contribution ID: **95** Type: **not specified**

Supersymmetry Breaking Warped Throats and the Weak Gravity Conjecture

Thursday, 27 June 2019 14:45 (15 minutes)

The proposal for a new Swampland conjecture forbidding stable non-supersymmetric "locally AdS" warped throats, which generalizes the Swampland criterion forbidding stable non-supersymmetric AdS vacua, is discussed. The conjecture is motivated by the properties of systems of fractional D3-branes at singularities, and can be used to rule out large classes of warped throats with supersymmetry breaking ingredients, and their possible application to de Sitter uplift. In particular, this allows to reinterpret the runaway instabilities of the gravity dual of fractional branes in the dP1 theory, and to rule out warped throats with Dynamical Supersymmetry Breaking D-brane sectors at their bottom. Another example are warped throats with supersymmetry broken by the introduction of anti-orientifold planes. These examples lead to novel decay mechanisms in explicit non-supersymmetric examples of locally AdS warped throats, and also of pure AdS backgrounds. Based on arXiv:1810.07673

Presenter: BURATTI, Ginevra (Instituto de Fisica Teorica (IFT) UAM-CSIC)

Session Classification: Parallel Session

Contribution ID: **96** Type: **not specified**

Swampland Variations on a Theme by KKLT

Thursday, 27 June 2019 15:00 (15 minutes)

The KKLT scenario in a warped throat, if consistent, provides a concrete counterexample to both the AdS scale separation and the dS swampland conjectures. In this talk I will analyze the relevant effective field theory for the conifold modulus and the overall Kahler modulus that both have exponentially small masses. In particular, I will focus on KK modes that have masses below the mass scale set by the conifold modulus. We find that integrating out the KK modes leads to one-loop corrections to the moduli kinetic terms which are of the same functional form as their tree level values. Implications for the consistency of the KKLT scenario are discussed. Finally I will comment on the role of KK modes for the emergence of kinetic terms in quantum gravity.

Presenter: KLAEWER, Daniel (Max-Planck-Institut für Physik)

Session Classification: Parallel Session

Contribution ID: **97** Type: **not specified**

(Mis-)aligned Winding in and applying Genetic Algorithms to Type IIB String Theory

Thursday, 27 June 2019 15:15 (15 minutes)

This talk will be divided into two parts. In the first part, I focus on the attempt to construct effective axions with parametrically large decay constants in type IIB string models summarising work with A. Hebecker and D. Junghans (arXiv: 1812.05626). I argue that such axions can be realised as long winding trajectories in complex-structure moduli space by an appropriate flux choice. The simplest models with aligned winding in a 2-axion field space fail due to a general no-go theorem. However, equally simple models with misaligned winding appear to have large decay constants but no large monotonic regions in the potential. I also show that the no-go theorem can be avoided by aligning three or more axions which in principle allows large decay constants and large monotonic regions in the potential. These results may be used to argue against the refined Swampland Distance Conjecture and strong forms of the axionic Weak Gravity Conjecture. The second part of this talk concerns the applications of genetic algorithms to the landscape of type IIB flux vacua based on work with A. Cole and G. Shiu. I argue that genetic algorithms are an efficient method to scan the landscape for viable solutions. More specifically, I consider a symmetric T^6 as well as the conifold region of a Calabi-Yau hypersurface to prove that genetic algorithms are powerful tools to find flux vacua with interesting phenomenological properties. I discuss different applications such as the minimisation of the cosmological constant or the search for appropriate mass scales.

Presenter: SCHACHNER, Andreas (Heidelberg University)

Session Classification: Parallel Session

Contribution ID: **98** Type: **not specified**

Infinite Distances and the Axion Weak Gravity Conjecture

Thursday, 27 June 2019 15:30 (15 minutes)

The axion Weak Gravity Conjecture implies that when parametrically increasing axion decay constants, instantons corrections become increasingly important. In this talk I will discuss evidence for this statement, obtained by studying the couplings of axions that arise in Type IIA Calabi-Yau compactifications. To be more precise, I will discuss the asymptotic behavior of these couplings as one moves towards infinite distance loci in the complex structure moduli space of the Calabi-Yau. Then the growth of the tower of states predicted by the Swampland Distance Conjecture will play a crucial role in satisfying the convex hull condition of the Weak Gravity Conjecture.

Presenter: VAN DE HEISTEEG, Damian (Utrecht University)

Session Classification: Parallel Session

Contribution ID: **99** Type: **not specified**

Instantons and Infinite Distances

Thursday, 27 June 2019 15:45 (15 minutes)

We consider geodesics of infinite length in the (classical) hypermultiplet moduli spaceof type II Calabi-Yau compactifications. When approaching such infinite distance points, a large amount of D-instantons develop an exponentially suppressed action ,substantially modifying the moduli space metric. In the corrected metric the path length becomes finite, although the metric at its endpoint remains singular. The instanton effects also modify the 4d Planck mass such that, in order to keep it finite, the string scale has to be lowered. Our results can be translated, via the c-map, to the physics around points of infinite distance in the vector multiplet moduli space where the Swampland Distance Conjecture and the Emergence Proposal have been discussed, and provide further evidence for them.

Presenter: WIESNER, Max (IFT UAM-CSIC)

Session Classification: Parallel Session

Contribution ID: **100** Type: **not specified**

M5 branes and Theta Functions

Thursday, 27 June 2019 14:30 (15 minutes)

We propose quantum states for Little String Theories arising from M5 branes probing A- and D-type singularities. This extends Witten's picture of M5 brane partition functions as theta functions to this more general setup. Compactifying the world-volume of the five-branes on a two-torus, we find that the corresponding theta functions are sections of line bundles over complex 4-tori. This formalism allows us to derive Seiberg-Witten curves for the resulting four-dimensional theories.

Presenter: SUN, Rui (Yau mathematical science center, Tsinghua University)

Session Classification: Parallel Session

Contribution ID: **102** Type: **not specified**

Cosmological constant at finite string coupling in F-theory flux compactification

Thursday, 27 June 2019 14:45 (15 minutes)

We examine vacuum structures of effective theories of moduli fields in the frameworks of Type IIB and F-theory flux compactifications. For two explicit examples, we numerically investigate the distributions of a huge number of local minima of the effective potential in the complex structure and dilaton directions in moduli fields. Interestingly, our results for the distributions of non-supersymmetric minima exhibit that larger string coupling generically leads to smaller vacuum energy/cosmological constant.

Presenter: OTSUKA, Hajime (KEK)

Session Classification: Parallel Session

Contribution ID: **103** Type: **not specified**

Branes, quiver gauge theories and discrete symmetries

Thursday, 27 June 2019 15:00 (15 minutes)

The spaces of zero-energy configurations (moduli spaces of vacua) of supersymmetric QFTs are richly geometrically structured. Realizing quiver gauge theories as the IR descriptions of brane configurations has allowed the recent development of numerous techniques to examine this geometry. I will discuss some of these techniques and how they can be used to investigate the local geometry of moduli spaces of vacua, even if a global description is unavailable. I will also remark on how studying the manner in which these techniques change for theories with discrete symmetries can give us clues as to the phenomenology of such theories.

Presenter: ROGERS, Jamie (Liverpool University)

Session Classification: Parallel Session

Contribution ID: **104** Type: **not specified**

Multi-field Inflation in High-Slope Potentials

Thursday, 27 June 2019 15:15 (15 minutes)

The recent swampland conjectures have ruled out some of the simplest models of single-field inflation. Inspired by the distance conjecture and the high-slope conjecture, I will present two families of multi-field inflationary potentials compatible with the conjectures along the trajectory. One family is a helix-type potential that satisfies the conjectures only locally. This family inflates with $\epsilon_V \gg \epsilon_H$ and produces Planck-compatible scalar perturbations, but a too-high tensor power. Our other family of potentials globally satisfies the swampland conjectures and is in negatively-curved field space. It balances the potential gradient against the geometry to generate high turning rates. Due to the form of the potential, this model has exactly massless entropic perturbations and a light adiabatic mode. In the superhorizon limit, the entropic mode freezes out, which sources linear growth of the adiabatic mode. In contrast to hyperinflation, both families remain under perturbative control.

Presenter: ROSATI, Robert (University of Texas at Austin)

Session Classification: Parallel Session

Contribution ID: **105** Type: **not specified**

Triangulating the Landscape

Thursday, 27 June 2019 15:30 (15 minutes)

One of the main contributors to the vastness of the string landscape is the immense number of Calabi-Yau (CY) manifolds on which the theory can be compactified. Currently, one of the largest sets of CYs is obtained from hypersurfaces in toric varieties, which result from fine, regular, star triangulations (FRSTs) of reflexive polytopes. In this talk I will present new developments in the study of FRSTs. I will describe how the space of FRSTs is connected and a derivation for a new upper bound for the total number of FRSTs, and hence for the number of hypersurface CYs. I will also discuss prospects for determining what a "typical" triangulation (and CY) looks like and the counting-measure predictions that could be made from that.

Presenter: RIOS, Andres (Cornell University)

Session Classification: Parallel Session

Contribution ID: **107** Type: **not specified**

Inflation and the Swampland Distance Conjecture

Thursday, 27 June 2019 16:45 (15 minutes)

In this talk, we discuss the significance for inflation of the Swampland Distance Conjecture, a proposal for a quantum gravity constraint acting at infinite distances.

Presenter: Dr SCALISI, Marco (KU Leuven)

Session Classification: Parallel Session

Contribution ID: **108** Type: **not specified**

On gaugino condensation in ten dimensions

Thursday, 27 June 2019 15:00 (15 minutes)

Gaugino condensation plays a prominent role in many approaches to constructing dS vacua in string theory. While its analysis is generally performed in the low energy 4d EFT, a 10d perspective can be useful to understand possible constraints on dS uplifts. I will discuss aspects of gaugino interactions localized to D7 branes in type IIB theories, and some insights these provide for KKLT constructions.

Presenter: SOLER, Pablo (ITP Heidelberg)

Session Classification: Parallel Session

Contribution ID: **109** Type: **not specified**

Instantons Away From Equilibrium

Thursday, 27 June 2019 17:15 (15 minutes)

Non-perturbatively generated effective potentials play an extremely useful, often critical, role in string and inflationary model building. These potentials are typically computed by Euclidean methods (i.e. instantons) which assume the system is in equilibrium. For systems out of equilibrium—for instance, an inflaton rolling down its potential—we expect there are corrections to the semi-classical evolution due to transient phenomena. How do we determine these corrections, and when do they become large? I will introduce a picture of non-perturbative effects that does not rely on the Euclidean path integral and answer these questions for a wide class of toy quantum mechanical models.

Presenter: STOUT, John (University of Amsterdam)

Session Classification: Parallel Session

Contribution ID: **110** Type: **not specified**

Effective multi-axion cosmology and constraints from black hole superradiance

Thursday, 27 June 2019 17:30 (15 minutes)

Consistent string theory frameworks of quantum gravity often predict the existence of a plethora of ultralight pseudoscalar degrees of freedom forming the phenomenological landscape of the string axiverse. The complexity of the extra-dimensional compactification manifold and vacua in these models indicate these fields may well possess parameters spanning many decades, covering cosmologically significant scales. If the fields phenomenologically defining parameters, the axion mass, m_a, and (effective) decay constant, f_a, fall in specific ranges, then they may contribute to the cosmological dark sector as either dark matter or an effective cosmological constant. It is important therefore, to quantify the statistical properties for such fields under the assumption of a multifarious scalar component in the low energy spectrum and the viability these ubiquitous elements of string models provide correct theoretic solutions to cosmological paradigms. The powerful asymptotic nature of the limiting spectral distributions of large random matrices has incorporated itself into various areas associated to multi-field axion cosmology. These include models of inflation, quintessence, dark sector cosmology and explicit forms of the superpotential Hessian. The complexities of dealing with the complete UV theory space is often reduced by considering a series of simple yet very powerful nomothetic principles. These considerations see the theoretic conjecture of the string axiverse modelled as an effective field theory which encodes the theoretical uncertainty from the UV limit in the high-dimensional matrices present in the effective Lagrangian, greatly reducing the potential dimensionality of the model parameter space. In order to realise these objectives we will introduce a series of random matrix theory (RMT) inspired models based on axion field alignment and multivariate analysis considerations. We will also present an overview of an effective approach to the spectrum arising from the superpotential in explicit realisations of the string axiverse in G_2 compactified M-theory, which take universal forms at the level of an effective description using stochastic model parameters. Such models can be used to test the viability of axion contributions to the cosmic history using hierarchical Bayesian inference models on the simplified parameter space, along with possessing a susceptibility to machine learning techniques to draw conclusions on the validity of the existence of a string axiverse in the ultralight sector of cosmology. We will also demonstrate how these models can be used to draw inferences on the axion parameter space, using astrophysical spin measurements of stellar binary and supermassive black hole systems, which can exclude the existence of fields spanning a large portion of the ultralight bosonic mass parameter space, via the superradiance phenomenon. We will explore how these measurements are used to constrain properties of the universal statistical distributions in effective axiverse models, specifically the mass ranges and allowed numbers of fields present in the spectrum. Such a methodology generally excludes $N \geq 30$ axion-like fields with a range of mass distribution widths and central values spanning many orders of magnitude, covering axion phenomenologies important to the dark sector of cosmology and grand unified theories.

Presenter: STOTT, Matthew (King's College London)

Session Classification: Parallel Session

Contribution ID: **111** Type: **not specified**

A Landscape of AdS Flux Vacua

Tuesday, 25 June 2019 17:45 (15 minutes)

We analyse type IIA Calabi-Yau orientifolds with background fluxes and D6-branes. Rewriting the F-term scalar potential as a bilinear in flux-axion polynomials yields a more efficient description of the Landscape of flux vacua, allowing for a systematic search of vacua. We classify families of N= 0 Minkowski, N = 1 AdS and N = 0 AdS flux vacua, extending previous findings in the literature to the Calabi-Yau context. We compute the spectrum of flux-induced masses and show that all these vacua are perturbatively stable. Finally, we extend this Landscape to the open string sector by including D6-branes.

Presenter: QUIRANT, Joan (IFT (UAM/CSIC))

Session Classification: Parallel Session

Contribution ID: **112** Type: **not specified**

Local Heterotic Reductions

Thursday, 27 June 2019 16:30 (15 minutes)

Hitchin systems and Higgs bundles have recently been used to understand local aspects of M-theory compactifications on G2 manifolds. I will consider a similar approach from the heterotic point of view, using the heterotic/M-theory duality. Specifically, I will study alpha' corrections to the reduced heterotic system using the Hull-Strominger system. I will present some explicit solutions and also make some observations on the reduced moduli problem, which couples gauge and gravitational degrees of freedom once alpha'-corrections are included.

Presenter: SVANES, Eirik Eik (University of Oxford)

Session Classification: Parallel Session

Contribution ID: **113** Type: **not specified**

SCFT sectors in F-theory landscape

Thursday, 27 June 2019 16:45 (15 minutes)

It was shown that the majority of Weierstrass models in the 6D/4D F-theory landscape are non-minimal. Physically, these 6D/4D supergravity models are coupled to strongly coupled matter sectors, such as 6D (1,0) SCFTs and their compactifications. In this talk, I will focus on the particle spectrum of these sectors and their physical consequence.

Presenter: Dr WANG, Yinan (Mathematics, University of Oxford)

Session Classification: Parallel Session

Contribution ID: **114** Type: **not specified**

Topological formulae for line bundle cohomology

Thursday, 27 June 2019 17:00 (15 minutes)

My talk is a brief account of the increasing body of evidence that line bundle cohomology can be computed in terms of analytic formulae. Our experimental results include spaces such as complete intersections in products of projective spaces (in particular Calabi-Yau threefolds), toric varieties, hypersurfaces in toric varieties and del Pezzo surfaces. Machine learning plays an important role in finding and generalising the analytic formulae. For certain surfaces, including all toric surfaces, we have obtained and proved the existence of topological formulae for all line bundle cohomologies. Time allowing, I will discuss the relevance of these formulae for string model building and other applications, such as the quantum Hall effect.

Presenter: CONSTANTIN, Andrei (University of Oxford)

Session Classification: Parallel Session

Contribution ID: **115** Type: **not specified**

Index Formulae for Line Bundle Cohomology on Complex Surfaces

Thursday, 27 June 2019 17:15 (15 minutes)

In many string theory applications, line bundle cohomologies are required input, for example in model-building with heterotic string theory, Type II string theories, or F-theory. There exist various case-by-case methods to compute individual cohomologies, but it would be beneficial to have further understanding of and formulae for cohomologies. Recently there have been signs that closed-form expressions may exist. I will report recent progress on this: we have found general formulae that describe all line bundle cohomologies on a large class of surfaces. In particular, any cohomology on these spaces can be computed as a topological index.

Presenter: BRODIE, Callum

Session Classification: Parallel Session

Contribution ID: **116** Type: **not specified**

The Calabi-Yau Hypersurface Landscape

Thursday, 27 June 2019 17:30 (15 minutes)

I will describe a large scale study of Calabi-Yau hypersurfaces in toric varieties. We construct large ensembles of O(10^7) Calabi Yau hypersurfaces and study key topological properties such as intersection numbers, cones of effective curves and divisors, and fibration structures. I will describe how the properties of a generic hypersurface scale with the Hodge numbers and discuss some of the phenomenological consequences. Finally, I will show that machine learning can be used to classify geometries, predict topological properties given polytope and triangulation data, and construct geometries with extraordinary properties.

Presenter: DEMIRTAS, Mehmet (Cornell University)

Session Classification: Parallel Session

Contribution ID: **124** Type: **not specified**

The dS Swampland Conjecture, Non-BPS branes and K-theory

Thursday, 27 June 2019 16:30 (15 minutes)

The de Sitter swampland conjecture would be falsified if classical fluxed Type IIA orientifold vacua with a single non-BPS D7-brane were indeed part of the string theory landscape. In other words, the dS swampland conjecture implies the cancellation of K-theory charges on a compact space.

Presenter: BRINKMANN, Max (MPI Munich)

Session Classification: Parallel Session

Contribution ID: **125** Type: **not specified**

What does Inflation say about Dark Energy given the Swampland Conjectures?

Thursday, 27 June 2019 15:45 (15 minutes)

I will discuss the relations between swampland conjectures and observational constraints on both inflation and dark energy. Using the fact that the constant c appearing in the de Sitter conjecture is a universal constant whose value can be determined from inflation, there may be no observable distinction between constant and non-constant models of dark energy. However, the latest modification of the above conjecture, which utilizes the second derivative of the potential, opens up the opportunity for observations to determine if the dark energy equation of state deviates from that of a cosmological constant.

Presenter: LEEDOM, Jacob (University of California, Berkeley)

Session Classification: Parallel Session