Abstracts

Gabriel Bartolini

The connected components of the branch loci of moduli spaces. Preliminary report

Abstract Bartolini et al showed that the branch locus of moduli spaces of Riemann surfaces is disconnected with a few exceptions. They found isolated equisymmetric strata. calculations in low genera suggest that an equisymmetric stratum either cuts another stratum given by an action of order two or three or it is isolated

Allen Broughton

Exceptional Automorphisms of (generalized) Super-elliptic Curves. Preliminary report

Abstract A super-elliptic curve S is a curve with a conformal automorphism g of prime order p such that $S/\langle g\rangle$ has genus zero. This generalizes the hyper-elliptic case $p = 2$. More generally, a cyclic n-gonal surface S has an automorphism g of order n such that $S/\langle g\rangle$ has genus zero. All cyclic n-gonal surfaces have tractable defining equations. Let $A = Aut(S)$ and N be the normalizer of $C = \langle g\rangle$ in A. The structure of N can in principal be determined by the action of N/C on the sphere S/C which in turn can be determined from the defining equation. If the genus of S is sufficiently large in comparison to n, then $A = N$. For small genus A/N may not be empty and, in this case, any automorphism h in A/N is called exceptional. The exceptional automorphisms of super-elliptic curves are known whereas the determination of exceptional automorphisms of all general cyclic n-gonal surfaces seems to be hard. In this talk we focus on generalized super-elliptic curves in which the projection of S onto S/C is fully ramified. Generalized super-elliptic curves are easily identified by their defining equations. In this talk we determine large classes of (generalized) super-elliptic curves with exceptional automorphisms.
This is joint work with Aaron Wootton.

Peter Buser

Jacobians of limit Riemann surfaces

Abstract This is joint work with Eran Makover, Björn Mützel, Mika Seppälä and Robert Silhol. Consider a family of compact Riemann surfaces given by Fenchel-Nielsen parameters, where k of the length parameters go to zero and all other parameters are kept fixed. The Jacobians then tend to the Jacobian of the limit surface. In the lecture we show that this gives rise to a concept of Jacobians for finite graphs which should allow one to investigate certain phenomena in a simple computational setting. The Jacobians proposed here have twice the expected dimension and obey the Kirchhoff rules of electric circuits.

Mariela Carvacho

Towers of Riemann Surfaces and Fields of Moduli

Abstract We construct a tower of explicit examples of curves which cannot be defined over their field of moduli. We start with non-hyperelliptic curves given by Hidalgo and the lowest is the hyperelliptic curves isomorphic to the obtain by Earle.

This is joint work with Michela Artebani, Ruben Hidalgo and Saúl Quispe.

Javier Cirre

Double covers of Klein surfaces with an automorphism group of type $(2, 2, 2, n)$

Abstract We say that a group G of automorphisms of a compact Klein surface X is of type $(2, 2, 2, n)$ if the universal covering transformation group of G is an NEC group with quadrangle signature $(2, 2, 2, n)$. Alternatively, the orbit space X/G is a hyperbolic quadrilateral with angles $\pi/2$, $\pi/2$, $\pi/2$ and π/n. Let X^+ be the Riemann double cover of X. It is well known that the full group $Aut(X^+)$ of conformal and anticonformal automorphisms of X^+ contains a subgroup iso-morphic to $Aut(X) \times C_2$, where $Aut(X)$ is the full group of automorphisms of X. Then a natural question arises: is $Aut(X^+)$ equal to $Aut(X) \times C_2$, or does X^+ admit other automorphisms?
This question has been considered for bordered Klein surfaces X of algebraic genus g with $12(g-1)$ automorphisms by May, and with $8(g-1)$ automorphisms by Bujalance, Costa, Gromadzki and Singerman. In both cases, $Aut(X)$ is of type $(2, 2, 2, n)$, with $n = 3$ in the first case and $n = 4$ in the second. Later, Costa and Porto studied the more general case where n is an odd prime p. They proved that $Aut(X^+) = Aut(X) \times C_2$ almost always occurs for such actions, and that in fact there is just one single exception for each value of p.
In this talk we will show that the same holds for group actions of type $(2, 2, 2, n)$ for all $n \geq 6$, again with one single exception for each value of n. This is joint work (in progress) with Emilio Bujalance and Marston Conder.

Marston Conder

Extendability of group actions on surfaces

Abstract Suppose the finite group G acts faithfully on some closed surface S. Under what conditions does this action extend to a faithful action of some larger group on the same surface? And how can the action be defined so that G is the full automorphism group of S? In this talk I will describe some joint work with Emilio Bujalance and Javier Cirre on the above questions, over the last two decades. The work began with the case of Riemann surfaces (in 1995), first for cyclic G and later for arbitrary G, and more recently has concentrated on Klein surfaces, both unbordered (and non-orientable) and bordered (and orientable or non-orientable). Of critical importance are the classifications of finitely-maximal Fuchsian groups (by David Singerman (1972)) and NEC-groups (by Emilio Bujalance (1982) and José Luis Estévez and Milagros Izquierdo (2006)).

Antonio F. Costa

On the connectedness of the branch locus and p-gonal locus in the moduli space and its compactification

Abstract Consider the moduli space $\mathcal{M}_g$ of Riemann surfaces of genus $g \geq 2$ and its Deligne-Munford compactification $\overline{\mathcal{M}_g}$. We are interested in the branch locus $\mathcal{B}_g$ for $g > 2$, i.e., the subset of $\mathcal{M}_g$ consisting of surfaces with automorphisms. It is well-known that the set of hyperelliptic surfaces (the hyperelliptic locus) is connected in $\mathcal{M}_g$ but the set of (cyclic) trigonal surfaces is not. By contrast, we show that for $g \geq 5$ the set of (cyclic) trigonal surfaces is connected in $\overline{\mathcal{M}_g}$. To do so we exhibit an explicit nodal surface that lies in the completion of every equisymmetric set of 3-gonal Riemann surfaces. For $p > 3$ the connectivity of the p-gonal loci becomes more involved. We show that for $p \geq 11$ prime and genus $g = p - 1$ there are one-dimensional strata of cyclic p-gonal surfaces that are completely isolated in the completion $\overline{\mathcal{B}_g}$ of the branch locus in $\overline{\mathcal{M}_g}$.
Results in collaboration with G. Bartolini, M. Izquierdo, H. Parlier, A. M. Porto

Javier Etayo & Ernesto Martínez

On the minimum genus problem on bordered Klein surfaces for automorphisms of even order

Abstract The minimum genus problem consists on determining the minimum algebraic genus of a surface on which a given group G acts. For cyclic groups G this problem on bordered Klein surfaces was solved in 1989. The next step is to fix the number of boundary components of the surface and to obtain the minimum algebraic genus, and so the minimum topological genus. It was achieved for cyclic groups of prime and prime-power order in the nineties.
In this work the corresponding results for cyclic groups of order $N = 2q$, where q is an odd prime, are obtained. There appear different results depending on the orientability of the surface.

Arturo Fernández

Algebroid Functions with Essential Singularities

Abstract In this lecture, it is considered the question of analyzing the behaviour of an algebroid function near a singularity. This is an old question, going back to Puiseux, Cramer and others. Here consider the problem of estimating the length of the algebraic cycles of the branches of an algebroid function at an algebraic singularity in terms of the data relative to the coefficients $A_k(z)$ of the equation defining the algebroid function. A further question considered is the value distribution of an algebroid function near an essential singularity, we prove in this direction the corresponding result to the Casoratti-Weierstrass Theorem. The final aim should be the Great Picard Theorem for algebroid functions.

Jane Gilman

Conformal Automorphism Groups, Adapted Bases and Generating Vectors

Abstract I will review the original work on adapted homology bases and will discuss the proper way to extend it to arbitrary finite groups. In particular, I will talk about the original method using curve lifting and the less ad hoc method using Schreier- Reidemeister.

Gabino González-Diez

Action of the absolute Galois group on dessins d'enfants and Beauville surfaces

Abstract A foundational result in Grothendieck's theory of dessins d'enfants is that there is an action of the absolute Galois group on the set of all dessins.
In this talk, based on joint work with Andrei Jaikin-Zapirain, I shall attempt to describe this action and show that it is faithful already on the subset of the (more accessible) regular dessins. If time permits I will indicate how this fact can be also used to prove some conjectures of F. Catanese about Beauville surfaces.

Grzegorz Gromadzki

Free degree of periodic self-homeomorphisms of compact surfaces

Abstract The free degree $\mathfrak{fr}(X)$ of a topological space X is the minimum positive integer n with the property that for any self-homeomorphism φ of X, at least one of the iterates $\varphi^i, i \leq n$ has a fixed point or ∞ if such minimum does not exists. It is known that for compact surfaces $\mathfrak{fr}(X)$ is finite and upper bounds for it for closed surfaces are known since Nielsen [4]; later the precise values have been contributed by Dics and Llibre [3] and Wqang [5]. In a more recent paper Wu and Zhao [6] have showed that for compact orientable surface $F_{g,b}$, of topological genus $g \geq 2$ having b boundary components, $\mathfrak{fr}^+(F_{g,b}) \leq 12g - 24$ while for non-orientable surface $N_{g,b}$, $\mathfrak{fr}(N_{g,b}) = 24g + 24$, where, the super index + in the orientable case means that only orientation-preserving self-homeomorphisms are considered. Here we show that, for periodic self-homeomorphisms, these bounds can be essentially improved. We prove that $\mathfrak{fr}_{\text{per}}(F_{g,b})$ is periodic with respect to b, finding in addition some period. We find explicit values of $\mathfrak{fr}^+_{\text{per}}(F_{g,b})$ for $g = 2, 3$ and all b, we calculate $\mathfrak{fr}^+_{\text{per}}(F_{g,b})$ for some explicitly listed values of g, b and we prove that for the remaining values of g, b, either $\mathfrak{fr}^+_{\text{per}}(F_{g,b}) \leq 2(g-1)$ or $\mathfrak{fr}^+_{\text{per}}(F_{g,b}) = -\chi(F_{g,b})$ and $\mathfrak{fr}^+_{\text{per}}(F_{g,b'}) = \mathfrak{fr}^+_{\text{per}}(F_{g,b})$ for arbitrary b' congruent to b modulo $\mathfrak{fr}^+_{\text{per}}(F_{g,b})$, where $\chi(F_{g,b})$ stands for the Euler characteristic. We give similar results for $\mathfrak{fr}^{\pm}_{\text{per}}(F_{g,b})$ which is defined by allowing also orientation-reversing self-homeomorphisms and for $\mathfrak{fr}_{\text{per}}(N_{g,b})$ for non-orientable surfaces. We use mainly combinatorial approach, in study of periodic self-homeomorphisms of compact bordered surfaces, developed by Bujalance in early eighties of the last century [1, 2].

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Björn Gustafsson

On multisheeted algebraic domains

Abstract If the boundary of a domain in the complex is an algebraic curve, then it is possible to associate two, in general different, compact Riemann surfaces to the domain. One is the Schottky double of the domain, the other is the Riemann surface classically associated to the algebraic curve constituting the boundary. These two Riemann surfaces can be canonically identified with each other if, and only if, the domain is a classical quadrature domain (in the sense of H. S. Shapiro, M. Sakai and others) or, in a different terminology (due to A. N. Varchenko and P. I. Etingof), an algebraic domain.

In the talk I will discuss a generalization of the above concept, which was first discussed by M. Sakai (in the 1980:s) under the name quadrature Riemann surface, and more recently studied by V. Tkachev and myself under the name multisheeted algebraic domain.

William Harvey

Automorphisms of surface bundles

Abstract The recent landmark results of Kahn and Markovic have completed an epic voyage through low dimensional geometric topology, and we now know in principle everything about the structure of compact hyperbolic 3-manifolds: they are virtual surface bundles. This talk will survey some of the background and try to answer the obvious question: what finite automorphism groups can occur?

Frank Herrlich

p-adic Origamis

Abstract As a combinatorial object, an origami can be defined by gluing plane squares. Equivalently, an origami is a finite covering of a torus which is ramified over at most one point. Thinking of a torus as an algebraic curve of genus 1, this definition works over any field. Over the field of p-adic numbers such a covering can arise from an inclusion $\Gamma \leq G$ of two carefully chosen finitely generated discontinuous subgroups of $PGL(2)$. In the talk we present, following the thesis of Karsten Kremer, examples of p-adic origamis obtained this way. In the case that the covering is defined over a number field, we also address the question of identifying the corresponding complex origami defined by squares.

Ruben Hidalgo

Field of Moduli of Rational Maps

Abstract If $\mathbb{K}$ is any subfield of $\mathbb{C}$, then we denote by $\mathrm{Rat}_d(\mathbb{K})$ the space of rational maps of degree d whose coefficients belong to $\mathbb{K}$. We set $\mathrm{Rat}_d = \mathrm{Rat}_d(\mathbb{C})$.

A complex rational map can be written in the form $R(z) = P(z)/Q(z)$, where $P(z), Q(z) \in \mathbb{C}[z]$ are relatively prime polynomials; in which case the degree of R is given by the maximum between the degrees of P and Q. If $P(z) = a_0 + a_1 z + \cdots + a_d z^d$ and $Q(z) = b_0 + b_1 z + \cdots + b_d z^d$, then the condition for R to have degree d is that either $a_d \neq 0$ or $b_d \neq 0$. So there is a natural injective map $\phi : \mathrm{Rat}_d \hookrightarrow \mathbb{P}^{2d+1}_{\mathbb{C}}$ defined as $\phi(R) = [a_0 : \cdots : a_d : b_0 : \cdots : b_d]$. In this case, as the condition for P and Q to be relatively prime is equivalent to have the resultant $\mathrm{Res}(P, Q) \neq 0$, the space Rat_d can be identified via ϕ with the Zariski open set $\mathbb{P}^{2d+1}_{\mathbb{C}} - X$, where X is the hypersurface defined by $\mathrm{Res}(P, Q) = 0$. In particular, Rat_d is a complex manifold of dimension $2d + 1$. Notice that $\mathrm{Rat}_1 = \mathbb{M} = \mathrm{PGL}_2(\mathbb{C})$ is the group of Möbius transformations; a complex Lie group of dimension 3.

If $T \in \mathbb{M}$, and $R \in \mathrm{Rat}_d$, then $T \circ R \circ T^{-1} \in \mathrm{Rat}_d$. We say that R and S are equivalent rational maps (denoted this by the symbol $R \sim S$) if they belong to the same orbit under this action of $\mathbb{M}$. The quotient space $\mathrm{M}_d = \mathrm{Rat}_d/\mathbb{M}$ is the moduli space of rational maps of degree d. The space M_1 can be identified with the Riemann sphere with two cone points of order two, they correspond to the classes of $R(z) = z$ and $R(z) = -z$, respectively, and another special point corresponding to class of $R(z) = z + 1$. If $d \geq 2$, then M_d has a natural structure of an affine geometric quotient [4] and the structure of a complex orbifold of dimension $2d - 2$ (Milnor proved that $\mathrm{M}_2 \cong \mathbb{C}^2$ [2]). Explicit models for M_d seems not to be known for $d \geq 3$.

Let us denote by $\Gamma = \mathrm{Gal}(\mathbb{C})$ the group of field automorphisms of $\mathbb{C}$. If $R \in \mathrm{Rat}_d$ and $\sigma \in \Gamma$, then σ acts on R, by applying σ to the coefficients of R; we get in this way a rational map $R^\sigma \in \mathrm{Rat}_d$ [5]. In general, it may be that R^σ is not equivalent to R. Notice that if $R \sim S$ and $\sigma \in \Gamma$, then $R^\sigma \sim S^\sigma$, in particular, Γ induces an action on the moduli space M_d. The Γ-stabilizer of the class $[R] \in \mathrm{M}_d$ is given by the group $\Gamma_R := \{\sigma \in \Gamma : R^\sigma \sim R\}$; its fixed field $\mathcal{M}_R = \mathrm{Fix}(\Gamma_R) < \mathbb{C}$ is called the (absolute) field of moduli of R. Notice from the definition that if $R \sim S$, then $\Gamma_R = \Gamma_S$ and $\mathcal{M}_R = \mathcal{M}_S$. For instance, the quadratic polynomial $R_c(z) = z^2 + c$, where $c \in \mathbb{C}$, has field of moduli $\mathbb{Q}(c)$; which in this case is a field of definition. This comes from the fact that $R_c \sim R_d$ if and only if $c = d$.

A field of definition of $R \in \mathrm{Rat}_d$ is a subfield $\mathbb{K}$ of $\mathbb{C}$ so that there is some $S \in \mathrm{Rat}_d(\mathbb{K})$ with $S \sim R$. Every field of definition of R contains $\mathcal{M}_R$. In fact, if $\mathbb{K}$ is a field of definition of R, then (up to equivalence) we may assume that R is already defined over it. If $\sigma \in \mathrm{Gal}(\mathbb{C}/\mathbb{K})$, then $R^\sigma = R$; in particular $\sigma \in \Gamma_R$.

If $d \geq 2$ is even, then Silverman [3] proved that the field of moduli is a field of definition. He also proves that for polynomials maps this is true. In the same paper, if $d \geq 3$ is odd, then Silverman considered polynomials

$$R(z) = i\left(\frac{z-1}{z+1}\right)^d$$

and proved that they have field of moduli equal to $\mathbb{Q}$, but that they cannot be definable over it (they even cannot be definable over $\mathbb{R}$ since there is not a circle on the Riemann sphere $\widehat{\mathbb{C}}$ invariant under R). In these examples, the rational map is definable over a degree two extension over its field of moduli.

In this talk I present the following general fact.
Theorem. *Every rational map is definable over an extension of degree at most two of its field of moduli.*

We will also present necessary and sufficient conditions for a rational map to have a real field of moduli and also to be defined over the reals. Moreover, we provide a simple condition for a rational map to be definable over $\overline{\mathbb{Q}}$.

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Gareth A Jones

Umbrellas, and a dessin of genus 274211883004723200000000000000001

Abstract Abstract: Dessins d'enfants are combinatorial structures on compact Riemann surfaces defined over algebraic number fields. If G is a finite group, then there are just finitely many regular dessins with automorphism group G. I shall explain how to enumerate these dessins, and how to represent them all as quotients of a single regular dessin, the umbrella U(G) of G. For example, if G is a cyclic group of order n then U(G) is a map on the Fermat curve of degree n and genus (n-1)(n-2)/2. On the other hand, if G is the alternating group of degree 5, then U(G) has genus 274211883004723200000000000000001. For other nonabelian finite simple groups G, the genus is somewhat larger.

Jonas Karlsson

From pointed curves to computational linguistics

Abstract The Deligne-Grothendieck-Knudsen-Mumford moduli spaces $M_{g,n}$ of stable pointed curves of fixed genus are deep objects of central importance in geometry and physics. The case of genus zero, in particular, arises in the study of Mac Lane's coherence theorem, the Knizhnik-Zamolodchikov equations, and spaces of trees. I will describe these connections and report on ongoing work on applications to computational linguistics.

Santiago López de Medrano

Actions of groups on surfaces which are complete intersections of quadrics

Abstract We shall present some examples of compact surfaces given by the complete intersection of several affine homogeneous real quadrics and the unit sphere. Such intersections, and their projectivizations, have interesting $\mathbb{Z}_2^r$ actions. We will compare these with the case of complete intersections of complex projective quadrics (Humbert curves).

Adnan Melekoglu

Mirrors on Platonic Riemann Surfaces

Abstract Let X be a Riemann surface of genus $g > 1$ and let $\mathcal{M}$ be a regular map on X. A reflection σ of $\mathcal{M}$ fixes some simple closed geodesics on X, which are called the mirrors of σ. Let M be a mirror on X. Then there exist two particular conformal automorphisms of $\mathcal{M}$ that fix M setwise and rotate it in opposite directions. These automorphisms are called the rotary automorphisms of $\mathcal{M}$. In this talk we present a formula for the number of mirrors on X fixed by the reflections of $\mathcal{M}$ in terms of the orders of the rotary automorphisms and the group of automorphisms of M. We also give some applications of this formula to some well known Riemann surfaces.

Klaus-Dieter Semmler

Algorithms for hyperbolic polygons and Fuchsian groups

Abstract Minkowski introduced an algorithm replacing generating sets of euclidean lattices, or parallelograms, by others to get a canonical form, using geometric criteria like quotients of side lengths and angles of the parallelogram. This algorithm defines a set of outcoming standard generating pairs, the well known fundamental domain of $SL_2(\mathbb{Z})$ representing the space of conformal structures on tori. J. Gilman and L. Keen applied these ideas to 2-generator groups acting on the hyperbolic plane, generated by hyperbolics, producing a final set representing hyperbolic structures of pair of pants ((0,3)-surfaces) or one-holed tori ((1,1)-surfaces). The latter case can be interpreted as transforming a triangle. But at any step of the algorithm **three** outcomes are possible: a pair to pass to the next step, a final standard pair (i. e. an acute or right angled large triangle as canonical form), or a triangle, which is too small violating Margulis- or the Collar-Lemma. This last case will bring about accidental elliptics, which show that either the generated group is not discrete, or a NEC group with unexpected signature. Unfortunately we are rarely capable of telling in beforehand, if a set of generators of a subgroup of $SL_2(\mathbb{Z})$ yields a discrete or Fuchsian group and what signature to expect. We propose algorithms to lead into this trichotomy: good group, bad group, or keep going. This we do for more general sets of generators for hyperelliptic surfaces and describe the state of the art as far as we know.

Mika Seppälä

Learning Analytics, Riemann Surfaces, and Quadratic Differentials

Abstract Massive Open Online Courses (MOOCs) offer, at best, students a wealth of resources supporting several different learning styles. Students have different cognitive profiles, and different learning styles. Some students like to read, some others start by trying to solve problems, some students view videos, etc. Different ways to use the resources of a MOOC determine different study paths.

World Education Portals (WEPS) develops technologies that automatically support students to reach their educational goals in an optimal way. This is based on a mathematical model of learning and studying using MOOCs. In this model, a MOOC is a Riemann surface, an instructor is a quadratic differential on the Riemann surface, and the vertical foliation of the quadratic differential in question defines the study paths for students to follow.

WEPS is working to realize the extraordinary vision of Iisac Asimov from 1988. See http://www.youtube.com/watchv=Zib6OC_yJxk&feature=youtu.be.

Tony Shaska

On Superelliptic Curves and their Jacobians

Abstract For a fixed genus $g > 1$ we discuss the stratification of the moduli space $\mathcal{M}_g$ based on the automorphism groups of the curves. Then for each superelliptic locus of $\mathcal{M}_g$ we define the corresponding dihedral invariants and give a stratification of the corresponding moduli in terms of these invariants. Decomposition of the superelliptic Jacobians will be determined for all $1 < g < 10$ and an algorithm is provided for all g.

David Singerman

Doubles of Klein Surfaces

Abstract A Klein surface X of genus g and k boundary components will have a $2\epsilon g+k-1$ double covers ($\epsilon = 2$ if X is orientable and $\epsilon = 1$ if X is non-orientable.) Some of these, such as the complex double, the Schottky double and the orienting double are more important than others and were discussed in the first serious study of Klein surfaces by Alling and Greenleaf. However, there the definitions are difficult to follow. Our approach is just to study these doubles by considering index 2 subgroups of NEC groups. We can now easily identify these special doubles. This is joint work with Antonio Costa and Wendy Hall, my very first Ph.D student back in 1978.

Klara Stokes

Linear, non-homogeneous patterns in numerical semigroups associated to combinatorial configurations

Abstract A numerical semigroup is a subset $S \subset \mathbb{N} \cup \{0\}$, such that S is closed under addition, $0 \in S$ and the complement of S in $(\mathbb{N} \cup \{0\})$ is finite. A linear pattern of length n admitted by a numerical semigroup S is a linear polynomial $p(X1, ..., Xn)$ with non-zero integer coefficients, such that, for every ordered sequence of n elements $s_1 \geq \cdots \geq s_n$ from S, we have $p(s_1, ..., s_n) \in S$. A combinatorial (d, r, k)-configuration, with $d = vgcd(r, k)/k = bgcd(r, k)/r$, is an incidence geometry with v points and b lines, such that there are k points on every line, r lines through every point and two distinct points are on at most one line. Then d is always a natural number. Fixing r and k, the set of natural numbers d such that there exists at least one (d, r, k) configuration has the structure of a numerical semigroup, denoted $S(r, k)$. In this talk we show that the numerical semigroups $S(r, k)$ admit a family of linear, non-homogeneous patterns. This gives an upper bound of the conductor of such numerical semigroups. This is joint work with Maria Bras-Amorós.

Vladimir Tkatjev

The Meromorphic Resultant on Compact Riemann Surfaces

Abstract We shall discuss some applications of resultant of two meromorphic functions on a compact Riemann surface introduced earlier by B. Gustafsson and V.T. For example, we explain how to relate the meromorphic resultant to the exponential transform of a quadrature domain in the complex plane

David Torres

Uniform dessins, arithmetical triangle groups, and Bruhat-Tits trees

Abstract A compact Riemann surface of genus $g > 1$ has different uniform dessins d'enfants of the same type if and only if its surface group K is contained in different conjugate Fuchsian triangle groups Δ and $\alpha\Delta\alpha^{-1}$.
In the case when Δ is not arithmetic the possible conjugators are rare and easy to classify. In the arithmetic case the problem is much more complicated, but can be understood through the study of quaternion algebras. Among the tools which are used, the localisation of algebras and the representation of $p-$adic maximal orders as vertices of Bruhat-Tits (or Serre) trees turn out to be crucial.
We will explain briefly the general approach and focus on some examples in low genera, which arise from the uniformization of some classical curves like Klein's quartic and other Macbeath-Hurwitz curves. We will also present some open questions regarding these dessins on which we are currently working.
This talk is based on joint work with Ernesto Girondo and Jürgen Wolfart.

Peter Turbek

Explicit equations and automorphisms of cyclic trigonal Riemann surfaces

Abstract A cyclic trigonal surface X is a Riemann surface that possesses an automorphism σ of order three such that $X/\langle\sigma\rangle = \mathbb{C}$. It is known that if the genus of X is greater than four, then $\langle\sigma\rangle$ is unique and normal in the full automorphism group G of X. We determine explicit defining equations for each cyclic trigonal surface of genus greater than four. In addition, we explicitly determine generators for the automorphism group of each surface. Where possible, we try to associate the surfaces found with those that appear (without defining equations) in the literature.

Ewa Tyszkowska

On triangular (D_n)-actions on p-gonal Riemann surfaces

Abstract A compact Riemann surface X of genus $g > 1$ which has a conformal automorphism ρ of prime order p such that the orbit space $X/\langle\rho\rangle$ is the Riemann sphere is called *cyclic p-gonal*. The group generated by ρ is unique in the group G of conformal automorphisms of X if $g > (p-1)^2$. We say that the action of G on X is a *triangular (D_n)-action* if G acts with a triangular signature and the quotient $G/\langle\rho\rangle$ is a dihedral group D_n for some $n \geq 2$. In this case we denote X by $X_{p,n,g}$. If n is the number of fixed points of a p-gonal automorphism ρ, then $X_{p,n,g}$ is a p-sheeted cover of the sphere ramified over the vertices of a regular n-gon and we say that $X_{p,n,g}$ is a *(p,n)-Accola-Maclachlan surface*. In particular, $X_{2,2g+2,g}$ is the original Accola-Maclachlan surface whose automorphism group has the minimum size $8(g+1)$. A symmetry of a Riemann surface X of genus g is an antiholomorphic involution and the set of fixed points of X consists of k disjoint Jordan curves called *ovals*, where $0 \leq k \leq g+1$. We determine, up to topological conjugacy, the full group of conformal and anticorformal automorphisms of $X_{p,n,g}$. We prove that $X_{p,n,g}$ is symmetric and any of its symmetries with fixed points has 1 or p ovals. We find these $X_{p,n,g}$ whose group of automorphisms has the minimum size and these $X_{p,n,g}$ which admit a symmetry with the maximal number of ovals. Finally, we prove that for any prime p there exists a symmetric Riemann surface whose every symmetry has p ovals, and there exists a Riemann surface with arbitrary even number of symmetries.