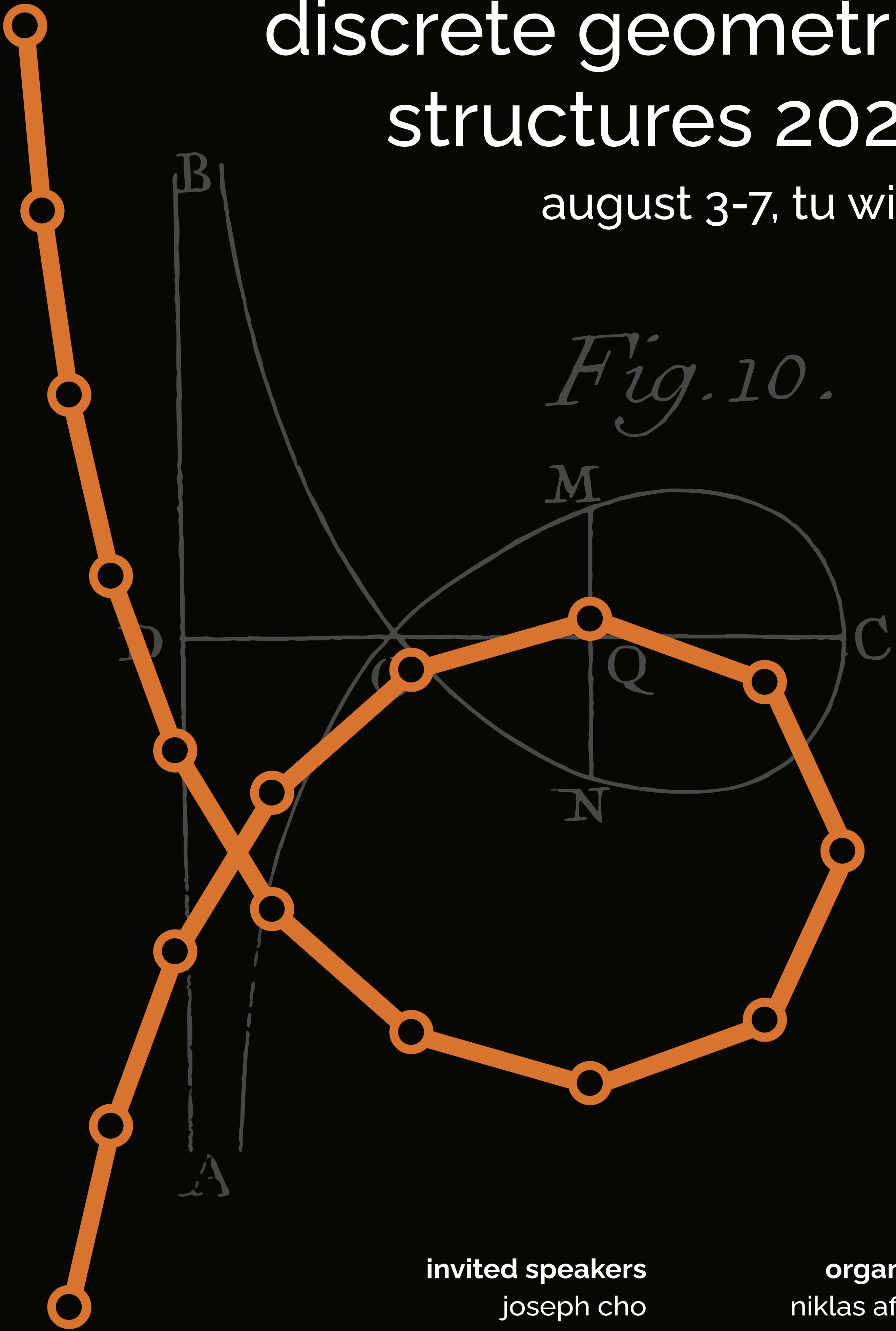
discrete geometric structures 2026

august 3-7, tu wien



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Poster by

Joseph Cho

Locations

Building:

TU Wien
Freihaus (green area)
Wiedner Hauptstraße 8-10
1040 Vienna

Registration:

H in front of *FH Hörsaal 6* (2nd floor)

Talks:

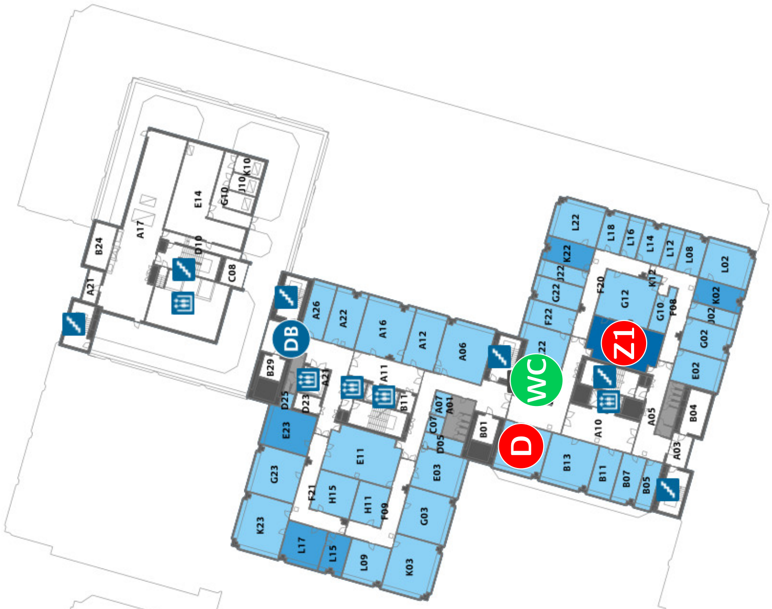
H *FH Hörsaal 6* (2nd floor)

Coffee breaks:

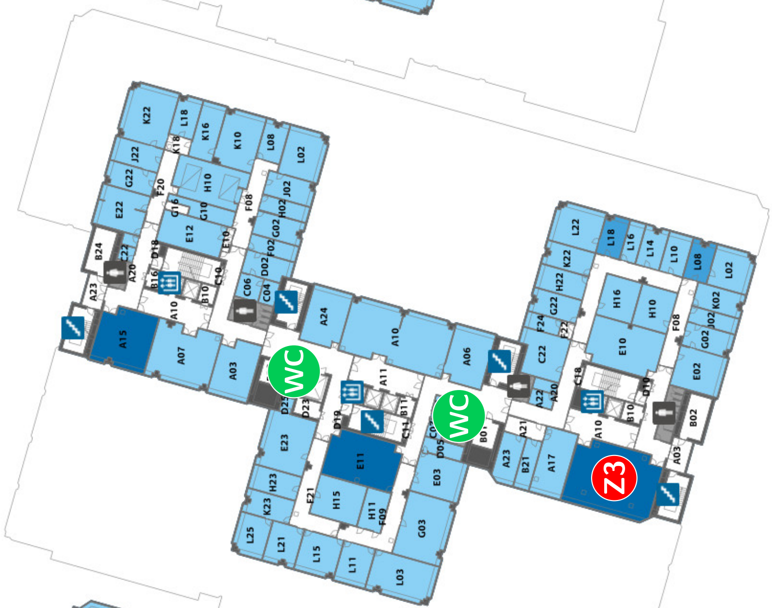
H short coffee break: in front of *FH Hörsaal 6* (2nd floor)
Z3 long coffee break: *Zeichensaal 3* (7th floor)

Rooms for discussions:

D *Dissertantenzimmer* (8th floor)
Z1 *Zeichensaal 1* (8th floor)



8th floor



7th floor

2nd floor

Participants

Niklas Affolter (TU Wien)
Sara Bentrifa (TU Wien)
Alexander Bobenko (TU Berlin)
Livia Campo (University of Vienna)
Albert Chern (UCSD)
Joseph Cho (Handong Global University)
Felix Dellinger (TU Wien)
Hamide Feyza Aykut (Yildiz TU)
Mark Gillespie (University of Utah)
Oliver Gross (UCSD)
Felix Günther (Leibniz Universität Hannover)
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Lorca Heeney-Brockett (TU Wien)
Udo Hertrich-Jeromin (TU Wien)
Tim Hoffmann (TU München)
Kaibo Hu (University of Edinburgh)
Sadashige Ishida (ISTA)
Ivan Izmestiev (TU Wien)
Aditya Kapilavai (University of Nantes)
Oleg Karpenkov (University of Liverpool)
Martin Kilian (TU Wien)
Maximilian Kohlbrenner (TU Berlin)
Rimvydas Krasauskas (Vilnius University)
Katrin Leschke (University of Leicester)
Lishan Li (Beihang University)
Marcin Lis (TU Wien)
Niels Lubbes (JKU Linz)
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Paul Melotti (Université Paris-Saclay)
Fatemeh Mohammadi (KU Leuven)
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Andres Naranjo (University of Leicester)
Georg Nawratil (TU Wien)
Lorenzo Nicolodi (Università di Parma)
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Philipp Schiller (Tampere University)
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Martin Winter (TU Berlin)
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Puchun Zhou (University of Oxford)
Darja Zierau (TU Wien)

Abstracts

Monday

Gudrun Szewieczek (Uni Innsbruck) Monday 10:00

From integrable discrete surfaces to bistable kinematic mechanisms

Bistable, or "snapping," structures have the ability to hold two stable states without continuous energy input. This talk introduces a novel class of such systems: snapping four-bar nets. These are multi-looped kinematic chains that possess exactly two distinct assembly configurations and zero degrees of freedom. A transition between these states is not a rigid-body motion but a "snap-through" enabled by material flexibility. In this talk we shall demonstrate how these bistable structures can be systematically designed using discrete Koenigs nets—a broad class of integrable discrete surfaces that includes, among others, discrete minimal surfaces. This approach allows for good control over snapping angles and further topological constraints such as a snapping cube. This is joint work with Daniel Huczala, Martin Pfurner and Hans-Peter Schröcker.

Ivan Izmestiev (TU Wien) Monday 10:30

Smooth, discrete, and semi-discrete Voss surfaces

Voss surfaces are those that carry a conjugate net of geodesics. Their Gauss images are Chebyshev nets on the sphere, they can be isometrically deformed so that the net remains conjugate, and they are closely related to surfaces of Gaussian curvature -1. Discrete Voss surfaces are made of planar quadrilaterals, and semidiscrete ones of developable strips. In both cases, the rich properties of smooth Voss surfaces are preserved. The talk is based on a joint work with Matteo Raffaelli and Arvin Rasoulzadeh.

Oleg Karpenkov (University of Liverpool) Monday 11:30

Klein-Arnold tensegrities

In this talk, we introduce new classes of infinite and combinatorially periodic tensegrities, derived from algebraic multidimensional continued fractions in the sense of F. Klein. We describe the stress coefficients on edges through integer invariants of these continued fractions, as initiated by V.I. Arnold, thereby creating a novel connection between geometric rigidity theory and the geometry of continued fractions. Remarkably, the new classes of tensegrities possess rational self-stress coefficients. This is a joint paper of Fatemeh Mohammadi, Christian Müller, Bernd Schulze and Oleg Karpenkov.

Kiumars Sharifmoghaddam (TU Wien) Monday 11:50

Snapping Flat-foldable Tori and Boxes

In the talk, we begin with a one-degree-of-freedom family of rigidly foldable tubes and construct a toroidal polyhedron by closing the trajectory of such tubes. During this process, the one-DOF motion is lost, but the existence of two distinct configurations—(1) fully developed and (2) fully flat-folded—can be proven. Any intermediate configuration must store energy within the faces and edges, resulting in a snapping behavior. We then reveal an interesting connection to the well-known "fold-and-one-cut" problem and by using this connection we adapt the construction to flat-foldable boxes.

Georg Nawratil (TU Wien) Monday 12:10

From axial C-hedra to general P-hedra and their construction & deformation using control polylines

We give a full classification of continuous flexible discrete axial cone-nets, which are called axial C-hedra. The obtained result can also be used to construct their semi-discrete analogs. Moreover, we identify a novel subclass within the determined class of (semi-)discrete axial cone-nets, whose members are named axial P-hedra as they fulfill the proportion (P) of the intercept theorem. Known special cases of these axial P-hedra are conic crease patterns with reflecting rule lines. By using a parallelism operation one can even generalize axial P-hedra. The resulting general P-hedra constitute a rich novel class of continuous flexible (semi-)discrete surfaces, which allow direct access to their spatial shapes by three control polylines. This intuitive method makes them suitable for transformable design tasks using interactive tools. The construction of P-hedra from the control polylines can also be used for an efficient algorithmic computation of their isometric deformations.

Mark Gillespie (Ecole Polytechnique) Monday 14:30

Implicit Minimal Surfaces for Bijective Correspondences

This talk will introduce a new algorithm for computing bijective correspondences between triangle meshes using a new implicit representation of continuous, bijective, orientation-preserving maps between genus zero surfaces with or without boundary. The distortion of these maps can easily be minimized by optimizing the Ginzburg-Landau functional—a ubiquitous model in physics and differential geometry—leading to a simple algorithm for computing bijective correspondences using only standard tools of the tangent vector field toolbox. The method avoids combinatorial mesh modifications and does not require barrier functions to enforce bijectivity making it more robust to noise and simpler to implement. Moreover, the algorithm does not assume a bijective initialization and can untangle non-bijective correspondences generated by computationally cheaper methods such as functional maps. It supports the use of both landmark points and landmark curves to guide the correspondence.

The key idea is that a bijection between surfaces defines a two-dimensional mapping surface sitting inside the four-dimensional product space of the two inputs, and this mapping surface can be stored implicitly as the zero set of a complex section—essentially a complex function defined on the product space. Now the distortion of the map can be optimized by minimizing the area of this mapping surface, which amounts to minimizing the Ginzburg-Landau functional of the complex section. This implicit map representation offers improved stability and naturally supports constraints that are difficult to enforce with explicit map representations, and has practical benefits when compared to state-of-the-art correspondence algorithms.

Oliver Gross (UCSD) Monday 16:30

Elastic Curves via Geometric Mechanics

Elastic curves are the mathematical shapes of thin elastic rods in equilibrium, with deep connections to mechanics, geometry, and computer graphics. Traditionally described as stationary points of bending energy under length and torsion constraints, their rich theory admits many equivalent characterizations. This talk develops a new one from the viewpoint of geometric mechanics. The starting point is a lesser known isoperimetric characterization: a curve is elastic if and only if it is a critical point of the length functional under fixed area and volume vectors. These constraints transform naturally under orientation-preserving rigid body motions, identifying them as momentum variables for these symmetries. This structure suggests a new discrete theory. The low-order integral quantities length, area, and volume vectors are all naturally defined for polygonal curves, leaving the same transformation laws exactly satisfied. The resulting definition of discrete elastic curves in terms of the isoperimetric characterization restricted to polygonal curves is variational, structure-preserving, and requires no auxiliary discretizations of curvature, Lagrangian, or material frames. The same structure carries the Marsden–Weinstein form, a canonical symplectic structure on the space of curves, to polygonal curves. This yields novel approaches to Hamiltonian dynamics on discrete space curves, including reparametrization, vortex-filament, and modified Korteweg–de Vries flows.

Eleni Pachyli (TU Wien) Monday 16:50

Lichnerowicz–Obata Theorem for the discrete spherical Laplacian in dimension two.

The classical Lichnerowicz—Obata Theorem states that for an n-dimensional Riemannian manifold (M, g) with $Ric \geq (n-1)g$, the first eigenvalue of the Laplacian is greater or equal than n. We prove a discrete analogue of this theorem in dimension 2, for a spherical cone metric with curvature $\kappa_i := 2\pi - \omega_i > 0$ for the discrete spherical Laplacian defined by I. Izmestiev and W. Lam. Our proof draws on ideas from the theory of mixed volumes, in particular from Y. Shenfeld and R. van Handel's proof of the Alexandrov—Fenchel inequality. In the process, we also derive a discrete analogue for the Bochner method. This is joint work with Ivan Izmestiev.

Carl Lutz (University of Luxembourgh) Monday 17:10

The Moduli Space of Ideal Circle Patterns on Complex Projective Tori

A classical problem posed by Hermann Weyl in 1915 and solved by Lévy, Alexandrov, and Pogorelov asks which metrics arise on the boundary of strictly convex bodies. Its polyhedral counterparts originate in the rigidity theory of Legendre and Cauchy. The case of ideal hyperbolic polyhedra and the associated circle patterns on the conformal boundary of hyperbolic 3-space culminates in the Koebe–Andreev–Thurston circle packing theorem and Rivin's realization theorem for complete cusped hyperbolic metrics on the sphere. I will discuss conjectural extensions of these results to higher-genus surfaces and a framework for proving them. For tori, this framework yields a proof of the conjecture.

Tuesday

Alexander Bobenko (TU Berlin) Tuesday 10:00

Convex variational principles for dimer models and discrete differential geometry from Riemann surfaces

Convex variational principle are of crucial importance in the theories of dimer models and discrete conformality. They are essential for proving existence and uniqueness. We derive them in their most general form using the theory of Riemann surfaces.

Mikhail Skopenkov (KAUST) Tuesday 10:30

Quantum walks and conformal mappings

Quantum walks, introduced by Feynman, are archetypal in the study of quantum algorithms. Their wave functions oscillate within an interval, decay exponentially outside it, and the transition is described by the Airy function. For the first time, we prove a uniform asymptotic formula in the whole plane and discover a second universal transition phenomenon that occurs in a broad class of discrete models. We prove a general theorem producing uniform asymptotic formulae of this kind from conformal mappings associated with the underlying oscillatory integral.

The key ingredient is new conformal-geometric interpretations of known physical relations, such as Einstein's relation among energy, mass, and momentum. This is joint work with M. Drmota, F. Kuyanov, and A. Ustinov

Niels Lubbes (JKU Linz) Tuesday 11:30

Webs on pointwise sums of two rational curves

Let A+B be the pointwise sum of two rational curves A and B in real affine space. We assume that A+B is a non-planar surface and that A is not a translate of B. A mira curve on an embedded real algebraic surface is a rational curve that is of lowest possible degree while still moving in a pencil. Let MiraWeb(A+B) denote the set all mira curves on the A+B. The translates of A and B determine two distinguished pencils of rational curves on A+B. Now suppose that there exists a mira curve on A+B that is neither a translate of A nor a translate of B. Our main result is that in this case MiraWeb(A+B) belongs, up to birational equivalence, to one of ten webs. If no translate of A or B is a mira curve, then each of A and B admits a polynomial parametrization. We conclude with a topological characterization of MiraWeb(A+B) in terms of closure conditions of certain discrete subwebs. In particular, if MiraWeb(A+B) is not an infinity web, then all its 3-subwebs are hexagonal. A preprint will be available at nielslubbes.com/pp soon.

Sobhan Samareh Rad (TU Wien) Tuesday 11:50

Rigid quad-surfaces with flexible 3×3*-subnets*

A frequently cited statement in discrete differential geometry and origami literature asserts that a non-degenerate discrete conjugate net (quad-surface) is flexible if all of its 3×3 subnets are flexible. This talk disproves the statement by presenting several counterexamples: rigid 3×4 nets built from flexible 3×3 subnets. We will explore the geometry of these counterexamples, introduce a corrected globalization theorem requiring the absence of coplanar adjacent faces, and draw parallels to overconstrained mechanisms in planar kinematics. This talk is based on joint work with Ivan Izmestiev, Georg Nawratil, and Kiumars Sharifmoghaddam, arXiv:2606.15907.

Jean-Baptiste Stiegler (Université Paris-Saclay) Tuesday 12:10

Collapsing in pentagram-like dynamics

Polygonal dynamics is a family of dynamical systems acting on points in projective spaces. The most famous example is the pentagram map, defined by Schwartz in 1992. He proved that convex polygons collapse towards a point, whose coordinates where determined by Glick in 2020. However, this collapsing phenomena seem to occur in every polygonal dynamics, for instance the ones coming from discrete holomorphic functions. We prove it under some mild assumption, and derive a formula for the limit point. We do so by generalizing the approach of Aboud & Izosimov based on the concept of infinitesimal monodromy.

Fatemeh Mohammadi (KU Leuven) Tuesday 14:30

Identifiability of points and rigidity of graphs in applied algebraic geometry

Identifiability shows up everywhere, from rigidity questions in discrete geometry to tensor completion problems and secant varieties in algebraic geometry. At its core lies a simple question: when do a collection of algebraic relations determine the underlying points uniquely? I will present a new framework that tackles this question for systems where algebraic constraints interact with combinatorial structure. The key idea is to understand how the combinatorics of a graph or hypergraph control local and global identifiability. Starting from the classical

setting of graph rigidity, where relations come from Euclidean distances, we extend the theory to hypergraphs equipped with general algebraic measurements. This perspective allows us to obtain several necessary or sufficient conditions for identifiability, using tools from both rigidity theory and the geometry of secant varieties.
The results come from several joint works: (a) with James Cruickshank, Anthony Nixon, and Shin-ichi Tanigawa and (b) with Sean Dewar, Georg Grasegger, Kaie Kubjas, and Anthony Nixon.

Sara Bentrifa (TU Wien) Tuesday 16:30

Analytic continuation of rotational linear Weingarten surfaces in hyperbolic space.

We are interested in the analytic continuation of linear Weingarten surfaces across the ideal boundary of hyperbolic space. The main focus of this talk is on rotational surfaces, where we show that the analytic continuation is given by the 180-degree rotation of the profile curve around the boundary curve.

Naoya Suda (Kobe University) Tuesday 16:50

Discrete K-surfaces in Minkowski 3-space

Bobenko and Pinkall showed that discretizations of asymptotic coordinates for surfaces with constant negative Gaussian curvature in Euclidean space can be computed via discrete linear systems with a spectral parameter. On the other hand, Gu, Hu, and Zhou described Bäcklund transformations for spacelike surfaces with constant positive Gaussian curvature in Minkowski space via linear systems and gauge transformations. In this talk, we first consider Bäcklund transformations and the permutability formula in Minkowski space. We then construct a discrete linear system and introduce a discretization of spacelike surfaces with constant positive Gaussian curvature.

Roman Prosanov (University of Barcelona) Tuesday 17:10

Polyhedral surfaces in (2+1)-spacetimes

(2+1)-dimensional spacetimes provide an important test ground for quantum gravity theories. On the other hand, they have deep connections with the classical Teichmüller theory. In dimension (2+1), the Einstein equations require the spacetimes to have constant sectional curvature, which makes them particularly tractable, however they still remain diverse enough to be geometrically interesting. GHMC spacetimes constitute a physically relevant class of spacetimes from the viewpoint of causality. One of the threads of the current research is to understand the geometry of a GHMC (2+1)-spacetime from the intrinsic geometry of its spacelike slices, possibly with some additional data. While this is usually investigated in the smooth category, it is also meaningful to examine the data that comes from polyhedral slices. In my talk, I will tell about the current state of art of this topic.

Yousuf Soliman (SideFX) Wednesday 10:00

The Affine Heat Method

Riemannian logarithmic maps encode, for every point on a surface, both the direction and the distance along the shortest geodesics to a given source point. This map and its inverse, the exponential map, arise in many geometry processing tasks. In this talk, I will present our work on the Affine Heat Method for evaluating the logarithmic map. The key insight is to define a connection Laplacian with a homogeneous coordinate accounting for the translation between tangent coordinate frames. Parallel sections along a geodesic then describe a straight line parameterization of the curve; the action of short-time heat flow under this Laplacian produces a smoothed global approximation of the logarithmic map. The resulting numerical method is straightforward to implement, fast, and improves accuracy compared to past approaches. The method can be applied in any dimension and to any spatial discretization, including polygonal meshes and point clouds, due to its formulation in terms of the Laplacian.

Amir Vaxman (University of Edinburgh) Wednesday 10:30

High-order representations

I will discuss higher-order discretizations for several geometry-processing methods, that alleviate some of the artifacts and the limitations of traditional low-order (e.g., piecewise-linear) methods. This pertains to structure-preserving directional fields, geodesic distances, and animation generation.

Helmut Pottmann (TU Wien) Wednesday 11:30

Laguerre sphere meshes

We consider meshes all whose elements are defined within Laguerre sphere geometry. They are C1 continuous surfaces that are composed of planar, spherical and conical patches and can model any positively curved surface. After presenting some basic concepts for their study and computation, we briefly address approximation with Laguerre quad meshes and thereby encounter a novel generalization of conjugate nets.

Denis Polly (TU Wien) Wednesday 11:50

Discrete minimal surfaces and spinors

In this talk, we will give an account of a class of discrete spinors on a planar graph and how they can be lifted to orthogonal frames in Euclidean space. We will further discuss, how these frames can be integrated to create a class of discrete minimal surfaces, thereby discretising a spinoral Weierstrass-type representation.

Mason Pember (FSU London) Wednesday 12:10

Discrete Weierstrass-type representations

The Weierstrass-Enneper representation has been used extensively to create interesting examples of minimal surfaces in Euclidean 3-space from holomorphic functions. It is well known that this mechanism can be interpreted as the Christoffel transform of a map into the unit sphere. Bobenko and Pinkall (1996) used this interpretation to obtain a Weierstrass representation for discrete minimal nets in Euclidean 3-space. There are many other Weierstrass-type representations for surfaces (smooth and discrete) with certain curvature in 3-dimensional space forms. In this talk we shall see how these can be unified using the theory of Omega surfaces.

Thursday

Wayne Rossman (Kobe University) Thursday 10:00

Constant curvature rotational nets and periodic Bäcklund transformations

After giving explicit parametrizations of discrete constant negative Gaussian curvature surfaces (i.e. discrete pseudospherical surfaces) of revolution, we construct Baecklund transformations that again will have explicit parametrizations and are new examples of non-rotational discrete pseudospherical surfaces. In the process of doing this, for discrete CGC circular nets, we can provide rotationally invariant families of flat connections and give conditions on them so that the Baecklund transformations preserve periodicity, that is, have annular topology. This is joint work with T. Raujouan and N. Suda.

Katrin Leschke (University of Leicester) Thursday 10:30

New isothermic tori: Darboux transforms of the Wente torus

In this talk we present how a Darboux transformation on polarised curves can be used to construct Darboux transformations of isothermic surfaces. This way we can control the closing conditions of the transformation and construct new isothermic tori from given ones. This is joint work with Joseph Cho and Yuta Ogata.

Lorenzo Nicolodi (Università di Parma) Thursday 11:30

Conformal geometry of quasi-umbilical timelike surfaces

We study the conformal Lorentz geometry of quasi-umbilical surfaces in the conformal compactification of Minkowski 3-space, the Einstein universe. By a quasi-umbilical surface is meant a timelike immersion of a surface X in the Einstein universe whose shape operator at any point of X is non-diagonalizable over $\mathbb{C}$. We show that quasi-umbilical surfaces are isothermic, that their conformal Gauss map is harmonic, and that their conformal deformations depend on one arbitrary function in one variable. We then prove that quasi-umbilical surfaces arise from suitable null curves in the neutral space form $S^{2,2} = \{x \in \mathbb{R}^{2,3} \mid \langle x, x \rangle = 1\}$. This is joint work with E. Musso and M. Pember.

Albert Chern (UCSD) Thursday 11:50

New Discrete Theories for Fluids and Shells

Fluids and elasticity are known to have elegant geometric formulations and have been the main targets for structure-preserving discretization. Surprisingly, there is still large landscape of discrete geometric structures yet to be explored.

Geometrically, incompressible fluid flows follow least action paths on the Lie group of volume-preserving diffeomorphisms. A standard discretization approach employs the Koopman representation that identifies diffeomorphisms as linear maps on functions, with discretization amounts to truncating the function space into a finite dimensional vector space, and the diffeomorphism group into a finite dimensional Lie group. The truncation inevitably yields a non-holonomic variational problem. In particular, previous discrete Euler equations are Hamiltonian systems with respect to an almost Poisson bracket that violates the Jacobi identity. We show that by taking the variation problem differently using the so-called vakonomic principle, we obtain a new discrete Euler equation that restores the Jacobi identity for the first time. This leads to additional conservation laws mimicking those in the continuous theory.

In elasticity, the geometric theory of Maxwell–Cremona reciprocal diagram and Airy stress representation only exists in the plane rather than for arbitrary surfaces. Likewise, there has not been elasticity complex generalized beyond Euclidean spaces or space forms. We propose a new way of organizing the elasticity complex. This reveals a powerful principle that every geometric integrability condition comes with an Airy representation for the corresponding stress. In particular, we obtain new Airy potential for stresses on general non-planar thin shells, which is a vast variable reduction for thin shell models. The principle survives in the discrete setup, leading to a Maxwell–Cremona theory for general triangle meshes.

Kosuke Naokawa (Hiroshima IoT) Thursday 12:10

Singularities of discrete developable surfaces

A ruled surface with zero Gaussian curvature in Euclidean 3-space is called a developable surface. A developable surface is a surface that is locally isometric to the Euclidean plane with the standard metric. It provides a mathematical model of paper surfaces formed by bending or joining sheets, such as cylinders and cones. When the rulings of a developable surface are extended, singularities such as cuspidal edges and swallowtails frequently appear. In this talk, I will discuss a formulation of discrete analogues of singularities appearing on developable surfaces, together with criteria for discrete singularities and concrete examples. This talk is based on joint work with Christian Müller.

Joseph Cho (Handong Global University) Thursday 14:30

Integrable discretizations and reductions

From the rise of solitonic approach to modern differential geometry was the field of discrete differential geometry born, with the ethos of structure-preserving discretization at its heart. A key ingredient in this process is the zero-curvature formulation of integrability: among many ways to represent this, we will focus on the approach of using a one-parameter family of flat connections on vector bundles, as this method has been shown to be amenable to recovering the discrete theory in various settings. In this talk, we will highlight the strengths of using the flat connections approach to recovering the discrete theory, with a particular focus on the integrable reductions obtained using polynomial conserved quantities.

Sadashige Ishida (ISTA) Thursday 16:30

A discrete sandbox for geometric hydrodynamics

Arnold interpreted the motion of ideal fluids as geodesics on the infinite-dimensional space of volume-preserving diffeomorphisms. Zeitlin "discretized" them as geodesics on the finite-dimensional matrix Lie group SU(N). In this talk, I use Zeitlin's framework to introduce discrete notions of curvatures on the space of volume-preserving diffeomorphisms. Moreover, this suggests an interplay between values of the Ricci curvature and the (in)stability of fluid states, as well as the stabilizing effect of the Coriolis force. Based on joint work with Alex Suri.

Maximilian Kohlbrenner (TU Berlin) Thursday 16:50

A Polyhedral Construction of Empty Spheres in Discrete Distance Fields

We present a geometric algorithm based on Lie sphere geometry, that constructs the set of largest spheres that lie completely outside a given set of spheres, a subset of the vertices of the d-dimensional Apollonius diagram.
Lie sphere geometry provides a unified representation of points, oriented spheres and hyperplanes in Euclidean d-space as the subset of lines in d+3 dimensional space that are contained in a certain quadric. The natural scalar product in this construction is zero if two elements are in oriented contact. We show how the sign of this product can be used to decide if spheres are disjoint. This allows us to model the space of spheres that are not intersecting a given union of spheres as the intersection of half-spaces (and the quadric).
The maximal spheres are on the boundary of this set and can be computed by first constructing the intersection of half-spaces, which is a convex hull problem, and then intersecting edges of the hull against the quadric, which are the roots of a univariate quadratic.

Philipp Schiller (Tampere University) Thursday 17:10

Fitting geometric primitives with prior information

Fitting geometric primitives to point clouds can be challenging when the available data are sparse, incomplete, and noisy; for example, real-world scans are often acquired from a single viewpoint and may exhibit spatially varying measurement noise. In such ill-posed settings, minimizing point-to-primitive distances alone is often insufficient to obtain reliable estimates. One way to address this challenge is to incorporate prior information into the fitting procedure rather than relying solely on the observed point cloud. Examples of such prior information include object visibility, as constrained by the scanner position, and models of measurement uncertainty. In this talk, we adopt a probabilistic (Bayesian) perspective on primitive fitting and demonstrate how prior knowledge can be incorporated into the fitting procedure in a principled manner.

Friday

Felix Dellinger (TU Wien) Friday 10:00

Koenigs Binets

Koenigs nets are an element of projective differential geometry. Their discretizations appeared in the theory of integrable systems, in rigidity theory, or in the construction of discrete minimal surfaces.
We introduce a new version of discrete Koenigs nets called Koenigs binets. A Koenigs binet is a pair of two combinatorially dual conjugate nets where the dual edges have equal Laplace invariants. We give a generalization to higher dimensions and show that Koenigs binets are multi-dimensionally consistent. Koenigs binets have several interesting properties and include the most prominent discretizations of Koenigs nets as special cases.

Yuri Suris (TU Berlin) Friday 10:30

Projective geometry of discrete integrable systems associated with affine Weyl groups $W(E_8^{(1)})$ *and* $W(E_7^{(1)})$

We decompose integrable systems $P^2, P^1 \times P^1$, and P^3 into products of geometrically defined birational involutions. Each such involution is based on a divisor class with a one-dimensional linear system with a generic element of genus zero. Classical Manin involutions of P^2 along straight lines represent the simplest particular case. Novel, more sophisticated cases include birational involutions of P^2 along conics and along nodal cubic curves, as well as birational involutions of P^3 along quadratic cones and along Cayley nodal cubic surfaces.

Peter Schröder (Universität Bonn) Friday 11:30

Constant Mean Curvature Surfaces from Discrete Harmonic Maps

Constant mean curvature surfaces are aesthetically appealing geometric objects with applications in physics, differential geometry, and architecture. We present a straightforward discretization of constant mean curvature surfaces based on the classical observation that their Gauss maps are harmonic. Our construction is elementary—requiring only discrete Dirichlet energy minimization and a Poisson solve—yet it exactly mirrors this aspect of the smooth theory. A discrete analog of conjugation produces discrete constant Gauss curvature surfaces. Their unit offsets are discrete CMC surfaces with a conformal parameterization. Additionally, we introduce a novel Möbius-invariant discretization of the Dirichlet energy for sphere-valued maps on dual meshes that is derived from the discrete Willmore energy. It is more robust than standard formulations based on inverse cotangent weights. Our approach to the construction of constant mean curvature surfaces provides direct control over tangent planes along a boundary, if present, and naturally handles closed and periodic examples. We demonstrate the approach on a range of free-boundary, symmetric, and periodic CMC surfaces. Joint work with Ulrich Pinkall and Yousuf Soliman.

Martin Winter (TU Berlin) Friday 11:50

Being Non-afraid of Non-convexity – Valuations and Polarity on Polyhedral Complexes

Motivated by research in discrete and convex geometry, we present a new minimalistic frameworks for geometrically realizing abstract polytopes: to each k-dimensional face of the abstract polytope we assign a k-dimensional affine subspace, respecting inclusions. This definition avoids any mention of convexity, flat polyhedral boundary, interior/exterior or manifold conditions. Still, it suffices to define notions of volume and polarity. In fact, we explain how a wide range of valuations and valuative identities extend to this setting, including Minkowski balancing, (generalized) Schläfli formulas, canonical forms and Wachspress geometry.

Felix Günther (Leibniz Universität Hannover) Friday 12:10

The Discrete Theorema Egregium

The Discrete Theorema Egregium is a foundational statement in discrete differential geometry. Drawing a direct parallel to Gauss's classical theorem, it establishes that the extrinsic curvature of a polyhedral vertex – represented by the algebraic area of its spherical Gauss image – is exactly equal to its intrinsic curvature, measured by the angle defect.

Despite its fundamental nature, a rigorous proof remained open for a remarkably long time. The primary obstacle was the complexity of determining the area of self-intersecting spherical polygons that arise as Gauss images. While a proof was eventually established in joint work with Thomas Banchoff utilizing the critical point index, this presentation introduces a novel, more accessible approach based on simple induction.

Excursion and Dinner

Excursion

Option 1: Walk from Cobenzl to Dinner (Weinhof Zimmermann)

Meeting point is the main entrance hall of the Freihaus **at 3:00pm**

Public transport to starting point of excursion:
U4 Karlsplatz (direction Heiligenstadt) → Heiligenstadt
Bus 38A (direction Kahlenberg) → Cobenzl Parkplatz

Walk to Dinner (see map on the next page)

Option 2: Public transport directly to dinner

Public transport to dinner (*without excursion*):
U4 Karlsplatz (direction Heiligenstadt) → Spittelau
Bus 35A (direction Salmannsdorf) → Neustift, Agnesgasse

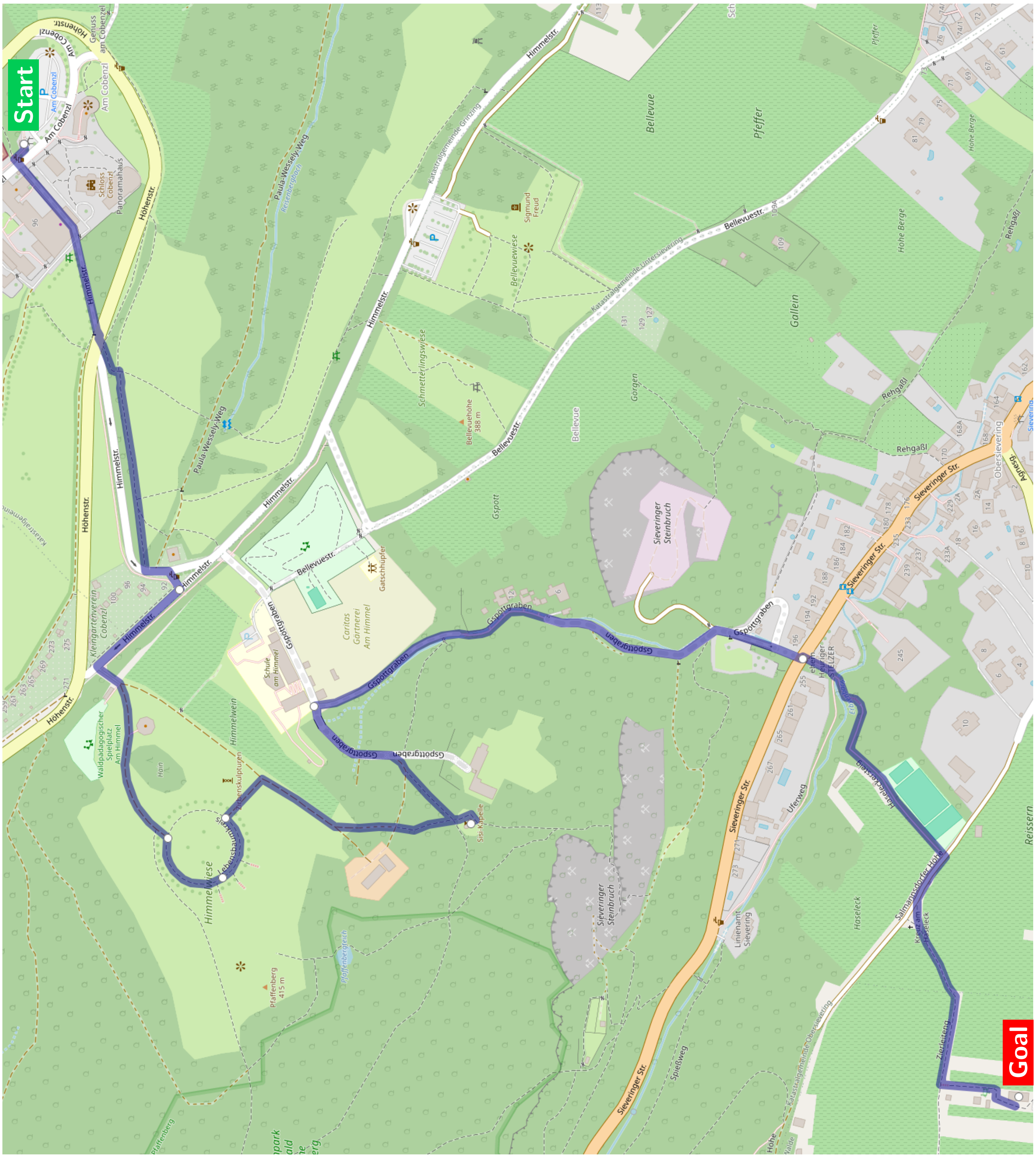
Dinner at 5pm

Weinhof Zimmermann
Mitterwurzergasse 20, 1190 Wien
https://www.weinhof-zimmermann.at/

Public transport back to Karlsplatz:
Bus 35A (direction Spittelau) → Spittelau
U4 Spittelau (direction Hütteldorf) → Karlsplatz

Walk from Cobenzl to Dinner (Weinhof Zimmermann)

Important Information
Distance: ≈ 3km   Time: ≈ 60 min
Ascend: ≈ 90m   Descend: ≈ 190m (partially steep descend on paved road)



Lunch and Dinner Recommendations

Lunch recommendations close to the university:

1. **Fat Monk (Bowls)**
Operngasse 24, 1040 Wien

2. **BÁNH MÌ VIENNA (Vietnamese)**
Faulmanngasse 1, 1040 Wien
banh-mi4.eatbu.com

3. **SHU Restaurant Vienna (Sichuan)**
Operngasse 28, 1040 Wien

4. **Kebab-Haus (Turkish)**
Operngasse 26, 1040 Wien

5. **El Burro (Mexican)**
Margaretenstraße 9, 1040 Wien
elburro.at

6. **Kojiro 2 (Japanese)**
Kühnplatz 4, 1040 Wien

7. **Yong Streetfood (Asian)**
Rechte Wienzeile 9A, 1040 Wien
yongstreetfood.at

8. **Yalla (Lebanese)**
Operngasse 23, 1040 Wien
yalla-falafel.at

9. **Tofu und Chili (Chinese)**
Linke Wienzeile 18, 1060 Wien

10. **Papas am Naschmarkt (Greek)**
Naschmarkt 509, 1060 Wien

11. **Bep Viet (Vietnamese)**
Favoritenstraße 2, 1040 Wien
bep-viet.at

12. **RIVA Favorita (Pizzeria)**
Favoritenstraße 4/6, 1040 Wien
riva.pizza

13. **Santos Wieden (Mexican)**
Favoritenstraße 4-6/2, 1040 Wien
santos-bar.com

14. **BOK Restaurant (Pan-Asian)**
Favoritenstraße 8, 1040 Wien
bok.co.at

15. **Wieden Bräu (Austrian)**
Waaggasse 5, 1040 Wien

16. **Chang (Asian)**
Waaggasse 1, 1040 Wien
chang.at

17. **Bánh Mì Hôi An (Vietnamese)**
Wiedner Hauptstraße 31, 1040 Wien
banmihoian.at

18. **Gorilla Kitchen (Burritos)**
Gußhausstraße 19, 1040 Wien
gorillakitchen.at

19. **Kenny's Karlsplatz (Bowls)**
Paniglgasse 15, 1040 Wien
kennys.at

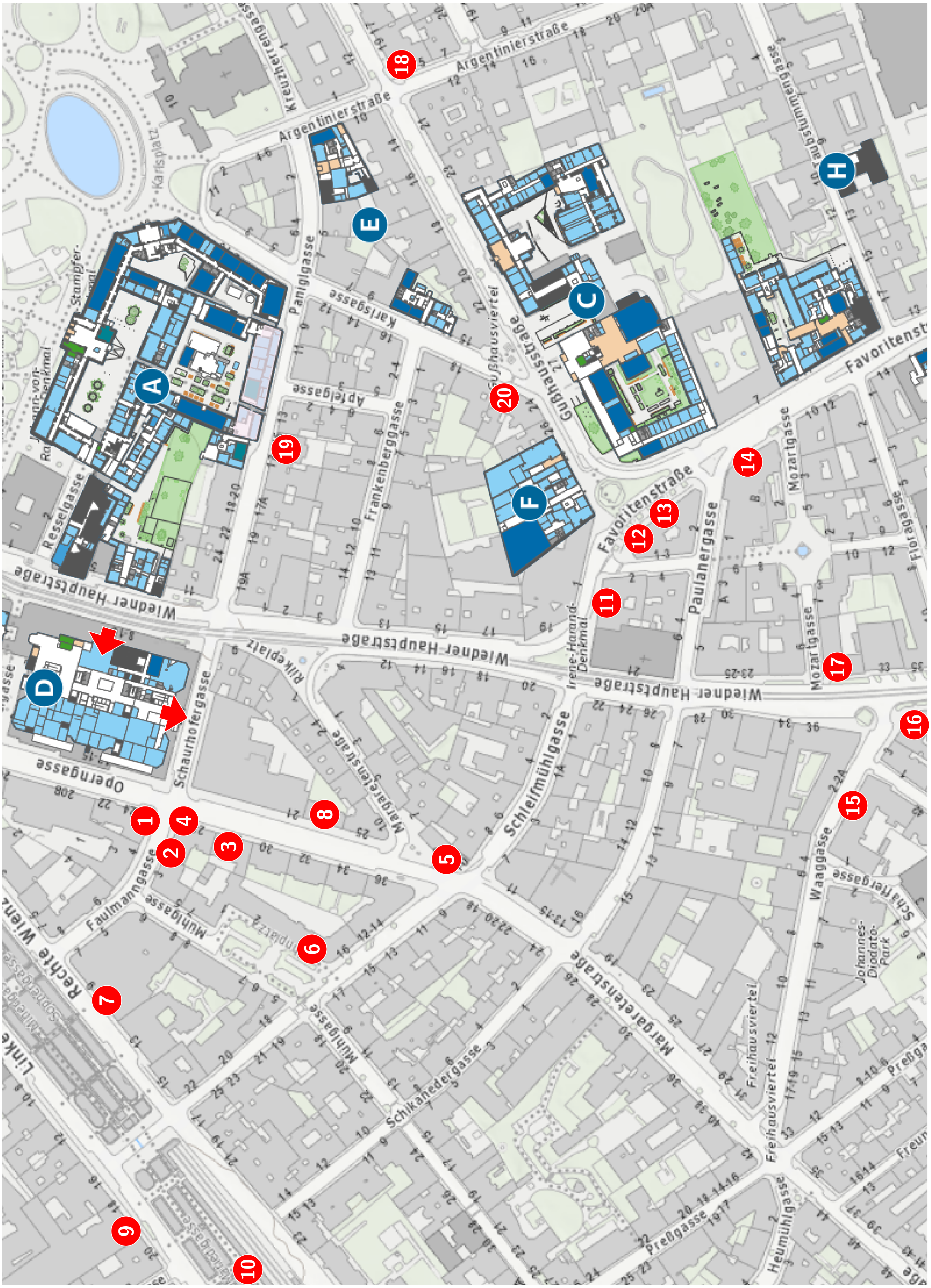
20. **SALON WICHT!G (Curry)**
Karlsgasse 22, 1040 Wien
salonwichtig.at

Dinner recommendations (reservations may be necessary):

Waldviertlerhof (Austrian)
Schönbrunner Str. 20, 1050 Wien
waldviertlerhof.at

Zum alten Fassl (Austrian)
Ziegelofengasse 37, 1050 Wien
zum-alten-fassl.at

die freunderlwirtschaft (vegetarian)
Grünentorgasse 21, 1090 Wien
freunderlwirtschaft.at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Argentinierstraße
Karlsplatz
Kreuzherrengasse
Paniglgasse
Karlsgasse
Apfelgasse
Frankenberggasse
Gußhausstraße
Favoritenstraße
Mozartgasse
Floragasse
Paulanergasse
Wiedner Hauptstraße
Resselgasse
Schaurhofergasse
Operngasse
Rilkeplatz
Margaretenstraße
Schleifmühlgasse
Mühlgasse
Faulmanngasse
Rechte Wienzeile
Linke Wienzeile
Schikanedergasse
Waaggasse
Schaffergasse
Johannes-Diodato-Park
Freihausviertel
Preßgasse
Heumühlgasse
Irene-Harand-Denkmal