Facets of Irreversibility: Inverse Semigroups, Groupoids, and Operator Algebras

December 4 – 8, 2017
University of Oslo

organized by
T. Omland, A.P.W. Sørensen, and N. Stammeier

sponsored by

The Research Council of Norway

and

UiO Department of Mathematics
University of Oslo

Schedule: Facets of Irreversibility,

	Monday	Tuesday
9-10	Registration	*Lisa O. Clark*
	Opening words by Geir Dahl	
10-11	*Jack Spielberg*	Break
		James Rout
	Break	Break
11-12	*Nadia S. Larsen*	*Toke M. Carlsen*
12-13	Lunch	Lunch
13-14	*Tristan Bice*	*Gilles de Castro*
	Break	Break
14-15	*Charles Starling*	*Ben Steinberg*
15-16	Break	Break
	Bartosz Kwasniewski	*Petter Nyland*
	Break	Break
16-17	*Camila Fabre Sehnem*	*Magnus Norling*
	Break	
	Devarshi Mukherjee	
17-18		

The speakers' names are linked to their abstracts. A click on a title will transport you back to the corresponding part of the schedule.

December 4 – 8, 2017, Oslo

Wednesday	Thursday	Friday
Karen Strung		*Erik Bédos*
Break	*Jacqui Ramagge*	Break
Selçuk Barlak	Break	*Ganna Kudryavtseva*
Break	*Sergey Neshveyev*	*Collecting loose ends & farewell*
Nathan Brownlowe	Lunch	
Free afternoon for discussions and excursions	*Takeishi Takuya*	
	Break	
	Jean Renault	
	Break	
	Ulrik Enstad	
	Break	
	Krzysztof Piszczek	
Conference dinner at Eik		

The speakers' names are linked to their abstracts. A click on a title will transport you back to the corresponding part of the schedule.

Contents

Non-commutative Stone duality

Mark V. Lawson
Heriot-Watt University

Pseudogroups of transformations have never gone out of fashion but, then, they have never really been in fashion, either. Their groupoids of germs, on the other hand, have star quality being a type of topological groupoid known as *étale* which arise in many different parts of mathematics. In the 1950s, pseudogroups became the basis of the (abstract) theory of inverse semigroups as a result of the work of Preston in the UK, of Wagner in the USSR and of Ehresmann in France. Wagner and Ehresmann were differential geometers and their development of inverse semigroup theory stayed close to these geometrical origins whereas mainstream inverse semigroup theory developed along more familiar algebraic lines. But inverse semigroups were not just the preserve of inverse semigroup theorists. Renault [15] was principally interested in constructing C^*-algebras from étale groupoids but inverse semigroups are a major player in his monograph. In Kumjian's paper [7], inverse semigroups received star billing and were no longer understudies to étale groupoids. In his paper, concepts and constructions familiar to inverse semigroup theorists appeared in new, and surprising, surroundings. Henceforward, inverse semigroups appearing in papers on C^*-algebras became a theme which Paterson's book [14] did much to promote. It would be remiss of me at this point not to mention the work of Ruy Exel [1,2] which is particularly well known for its use of inverse semigroups.

My interest in the nature of the role played by inverse semigroups in the theory of C^*-algebras was sparked by the work of Johannes Kellendonk [4,5]. He used what might be regarded as the *inverse semigroup of partial translational symmetries* of aperiodic tilings to construct C^*-algebras as suitable vehicles for computing invariants of the tiling. Kellendonk's ideas found their way into my book [8] where, from my perspective, they lay dormant. The catalyst for the theory we have developed was Daniel Lenz's paper [13] circulated as a preprint in 2002. This reworked Kellendonk's work in purely algebraic terms and, as a result, led to a fully algebraic approach to the construction of the *universal groupoid* of [14].

> At this point, the question of understanding the exact mathematical relationship between inverse semigroups and étale topological groupoids became pressing.

A first step in answering this question was made in [11], where we rephrased Lenz's work in terms of filters. Independently, Pedro Resende [16] had been thinking about étale groupoids and realised that one reason they were sigificant was that their set of open subsets formed a monoid. Thus étale groupoids are precisely the topological groupoids with an algebraic alter ego.

As a result of all of this work, it eventually dawned on me that the classical theory of Stone duality could be generalized to a non-commutative setting by replacing Boolean algebras by Boolean inverse monoids and Boolean spaces by étale groupoids with a Boolean space of identities, which we call *Boolean groupoids* [9]. This has turned out to be a fruitful perspective, not least in that it explained where the *compact-open G-sets* of Renault [15] came from. In a series of papers [10,12,6] this particular result has been placed into a more general setting that generalizes the first two chapters of [3], complements the work of Resende and provides, what we would argue, is the correct framework for understanding the relationship between inverse semigroups and étale groupoids and thence to C^*-algebras. The starting point is an adjunction between the category of (abstract) pseudogroups and the category of étale groupoids which reduces to an actual duality between Boolean inverse monoids and Boolean groupoids. In this talk, I shall focus on this duality alone and explain how it relates to classical commutative Stone duality; I shall describe examples of Boolean inverse monoids that bear striking similarities to well known C^*-algebras; and show that the groups of units of such monoids are exactly the topological full groups.

References

1. R. Exel, Inverse semigroups and combinatorial C^*-algebras, *Bull. Braz. Math. Soc. (N.S.)* **39** (2008), 191–313.
2. R. Exel, Tight representations of semilattices and inverse semigroups, *Semigroup forum* **79** (2009), 159–182.
3. P. T. Johnstone, *Stone spaces*, CUP, 1986.
4. J. Kellendonk, The local structure of tilings and their integer group of coinvariants, *Commun. Math. Phys.* **187** (1997), 115–157.
5. J. Kellendonk, Topological equivalence of tilings, *J. Math. Phys.* **38** (1997), 1823–1842.
6. G. Kudryavtseva, M. V. Lawson, A perspective on non-commutative frame theory, *Adv. Math.* **311** (2017), 378–468.
7. A. Kumjian, On localizations and simple C^*-algebras, *Pacific J. Math.* **112** (1984), 141–192.
8. M. V. Lawson, *Inverse semigroups: the theory of partial symmetries*, World Scientific, 1998.
9. M. V. Lawson, A non-commutative generalization of Stone duality, *J. Aust. Math. Soc.* **88** (2010), 385–404.
10. M. V. Lawson, Non-commutative Stone duality: inverse semigroups, topological groupoids and C^*-algebras, *IJAC* **22**, 1250058 (2012) DOI:10.1142/S0218196712500580.
11. M. V. Lawson, S. Margolis, B. Steinberg, The étale groupoid of an inverse semigroup as a groupoid of filters, *J. Austral. Math. Soc.* **94** (2014), 234–256.
12. M. V. Lawson, D. H. Lenz, Pseudogroups and their étale groupoids, *Adv. Math.* **244** (2013), 117–170.
13. D. H. Lenz, On an order-based construction of a topological groupoid from an inverse semigroup, *Proc. Edinb. Math. Soc.* **51** (2008), 387–406.
14. A. L. T. Paterson, *Groupoids, inverse semigroups, and their operator algebras*, Progress in Mathematcis, vol. 170, Birkhäuser, Boston, 1998.
15. J. Renault, *A groupoid approach to C^*-algebras*, Lecture Notes in Mathematics, **793**, Springer, 1980.
16. P. Resende, Etale groupoids and their quantales, *Adv. Math.* **208** (2007), 147–209.

Invited Talks

Automorphisms of Kirchberg algebras arising from groupoids and inverse semigroups

Wed 10:20-11:20

Selçuk Barlak

University of Southern Denmark

I will present results showing that many finite order $*$-automorphisms on unital Kirchberg algebras that satisfy Rosenberg-Schochet's universal coefficient theorem (UCT) arise from automorphisms of inverse semigroups or groupoids. This in turn leads to a new characterization of the UCT problem for separable, nuclear C^*-algebras. We will then discuss a more specific class of such automorphisms, namely certain quasi-free ones on purely infinite simple Cuntz-Krieger algebras. This talk is based on two joint projects with X. Li and G. Szabó, respectively.

On Exel-Pardo algebras as C^*-algebras of left cancellative small categories

Fri 09:00-10:00

Erik Bédos

University of Oslo

To each Exel-Pardo system (E, G, φ), consisting of a directed graph $E = (E^0, E^1, r, s)$, an action of a discrete group G on E, and a cocycle $\varphi : G \times E^1 \to G$ for the action of G on the edge set E^1, satisfying the compatibilty condition $\varphi(g, e) \cdot s(e) = g \cdot s(e)$ for all $g \in G$ and $e \in E^1$, we will explain how one can produce a singly aligned left cancellative small category $E^* \rtimes^{\varphi} G$ by forming the Zappa-Szép product of the associated category system (E^*, G, φ), where E^* denotes the category of finite paths on E.

Each finitely aligned left cancellative small category $\mathcal{C}$ gives rise to a Toeplitz algebra $\mathcal{T}(\mathcal{C})$ and a Cuntz-Krieger algebra $\mathcal{O}(\mathcal{C})$, characterized by their respective universal properties with regard to certain representations of $\mathcal{C}$ in C^*-algebras. We will show that when (E, G, φ) is an Exel-Pardo system with E row-finite, then $\mathcal{T}(E^* \rtimes^{\varphi} G)$ and $\mathcal{O}(E^* \rtimes^{\varphi} G)$ may be described in terms of generators and relations. In particular, we get that $\mathcal{O}(E^* \rtimes^{\varphi} G)$ is isomorphic to the Exel-Pardo algebra originally associated to (E, G, φ) by Exel and Pardo in the case where E is finite and sourceless, and G is countable.

This talk is based on joint work with S. Kaliszewski, John Quigg and Jack Spielberg.

Wed 11:30-12:30

Associating C^*-algebras to undirected objects

Nathan Brownlowe

University of Sydney

C^*-algebras associated to directed graphs, and their higher-dimensional and topological generalisations, has been a hugely successful theory within the field of Operator Algebra for a number of decades. In this talk we will examine some C^*-algebras associated to undirected objects, including undirected graphs, and graphs of groups. We will include results that are joint work with Alex Mundey, David Pask, Jack Spielberg and Anne Thomas.

Tue 11:00-12:00

Shifts of finite type, Cuntz-Krieger algebras and their algebraic analogues, groupoids, and inverse semigroups

Toke M. Carlsen

University of the Faroe Islands

I will talk about connections between Cuntz-Krieger algebras and their algebraic analogues, shifts of finite type, and inverse semigroups and groupoids constructed from shifts of finite type.

Tue 09:00-10:00

Purely infinite simple groupoid algebras

Lisa O. Clark

Victoria University of Wellington

A simple algebra is algebraically purely infinite simple if every left ideal contains an infinite idempotent. In this talk, we will consider the relationship between this algebraic notion of pure infiniteness and the C^*-algebraic one in the setting of groupoid algebras. In particular, given an ample groupoid, if its Steinberg algebra is algebraically purely infinite simple, then the reduced groupoid C^*algebra is purely infinite simple as well.

A perspective on non-commutative frame theory

Fri 10:20-11:20

Ganna Kudryavtseva

University of Ljubiljana

We discuss an extension of fundamental results of frame theory to a non-commutative setting where the role of locales is taken over by étale localic categories (looked at as non-involutive generalizations of étale localic groupoids). These categories are put in a duality with complete restriction monoids (which can be thought about as non-regular generalizations of pseudogroups). The relationship between monoids and categories is mediated by a class of quantales called restriction quantal frames. This builds on the work of Pedro Resende on the connection between pseudogroups and étale localic groupoids. Projecting down to topological spaces, we extend the classical adjunction between locales and topological spaces to an adjunction between étale localic categories and étale topological categories. We then restrict these adjunctions to spatial-sober and coherent-spectral equivalences. The classical equivalence between coherent frames and distributive lattices is extended to an equivalence between coherent complete restriction monoids and distributive restriction semigroups. Consequently, we deduce several dualities between distributive restriction semigroups and spectral étale topological categories. We also specialize these dualities to the setting where the topological categories are cancellative or are groupoids. The talk is based on a joint work with Mark V. Lawson.

Equilibrium states on right LCM semigroup C^*-algebras revisited

Mon 11:00-12:00

Nadia S. Larsen

University of Oslo

In joint work with Afsar, Brownlowe and Stammeier we have identified a general framework for studying equilibrium states on C^*-algebras associated to right LCM semigroups by means of which earlier case studies were unified and new classes of examples could be included. Even more recently, an intriguing example studied by Spielberg under the name of the Baumslag-Solitar monoid of type (BS3) has gained attention as a class of right LCM monoids where certain of the general properties collapse. The good news is that the insight obtained from dealing with these monoids from the viewpoint of studying KMS states brings about simplifications of the general approach. Moreover, it may be the missing link into understanding KMS states in a much broader context. In the talk I will explain these simplifications. This talk is based on ongoing joint work with N. Brownlowe, J. Ramagge and N. Stammeier.

Thu 11:00-12:00

Ground states, groupoids, and Bost-Connes type systems

Sergey Neshveyev

University of Oslo

It is known that the KMS-states on groupoid C^*-algebras at finite inverse temperatures admit a relatively transparent description in groupoid terms. In the talk I will explain that, under mild assumptions, the ground states also have a simple description. Specifically, they correspond to the states on the C^*-algebra of another groupoid, which we call the “boundary groupoid” and which already appeared in an earlier work of Renault. I will illustrate the general result with some examples, particularly concentrating on Bost-Connes type systems. This talk is based on joint work with Marcelo Laca and Nadia S. Larsen.

Thu 10:00-11:00

Self-similar actions of groupoids, C^*-algebras, and states

Jacqui Ramagge

University of Sydney

We will consider self-similar actions of groupoids on the path space of a directed graph, use them to construct C^*-algebras, and describe the classification of the KMS states on the algebras.

Thu 14:00-15:00

Limits of proper G-spaces

Jean Renault

University of Orléans

Cho-Ho Chu and Xin Li have recently shown that amenable measured groupoids have the Liouville property. Using their construction, it will be shown that every amenable G-space, where G is a locally compact groupoid with Haar system, is in a suitable sense the limit of a sequence of proper G-spaces. The key ingredient is the study of random walks on Bratteli diagrams and on groupoids.

The groupoid approach to C^*-algebras of left cancellative small categories

Mon 09:50-10:50

Jack Spielberg

Arizona State University

Many interesting C^*-algebras seem to originate in some sort of "oriented combinatorial data". The most well-known examples are ordered (discrete) groups, directed graphs, and higher rank graphs. It turns out that the only properties needed in these situations are a set with a (partially defined) law of composition that satisfies left cancellation. The technical name for this kind of structure is "left cancellative small category". Historically, C^*-algebras were constructed from these by choosing (more or less obvious) generators and relations. As the combinatorial data of interest became more complicated, this choice became more difficult to make. There are, however, alternative constructions that are intrinsic, requiring no choice, via inverse semigroups or groupoids. These have the additional virtue of providing a locally compact Hausdorff space (i.e. a place for dynamics and analysis) as the fundamental starting point of the construction. Moreover, one can then give a presentation by generators and relations that covers all examples at once. In this talk I will describe the construction of the groupoid and its C^*-algebras (Toeplitz algebras and boundary quotient), and show some examples. Parts of the talk represent joint work with Eric Bédos, Steve Kaliszewski, and John Quigg.

The tight C^*-algebra of an inverse semigroup

Mon 14:00-15:00

Charles Starling

Carleton University

Many C^*-algebras of current interest (k-graph C^*-algebras, C^*-algebras of right LCM semigroups, Katsura algebras, AF algebras) are generated by a set of partial isometries, and in most cases one can find such a generating set which is closed under product and adjoint – such a set of partial isometries always forms an inverse semigroup. For a C^*-algebra A from the above list (and others) and its generating inverse semigroup S, one can often show that A is universal for some class of representations of S. The universal C^*-algebra for all representations typically ends up being larger than A, but there exists a natural quotient (called the tight C^*-algebra of A) which in most cases ends up being exactly A. We describe this quotient, and discuss how realizing an algebra in this way can help to determine its properties (i.e. simplicity, pure infiniteness). We also discuss connections with some work in progress.

Tue 14:00-15:00

Reconstructing étale groupoids from their algebras

Benjamin Steinberg
City College of New York

Jean Renault showed that for topologically principal étale groupoids, a diagonal preserving isomorphism of reduced C^*-algebras implies an isomorphism of groupoids.

In this talk we discuss the corresponding question for étale groupoid algebras over a ring. Several authors have already considered this question in the algebraic setting. For group rings, the analogous question can be solved nicely for groups whose group rings have no non-trivial units. In this talk we generalize the notion of having no non-trivial units to étale groupoid algebras, prove that the class of étale groupoids having this property for a given ring R is closed under diagonal preserving isomorphism and give some fairly general sufficient conditions for a groupoid to have this property. Our resullts apply to path groupoids associated to Leavitt path algebras, effective groupoids and all groupoids covered by the previous results of Carlsen and Rout. One nice application of our result is that a diagonal preserving isomorphism from a Leavitt path algebra to the algebra of any Hausdorff ample groupoid implies an isomorphism of groupoids. Our proofs are all via inverse semigroup theory.

Wed 09:00-10:00

Dynamical $\mathcal{Z}_0$

Karen Strung
Radboud University

Joint work in progress with Bhishan Jacelon investigates C*-algebraic constructions from minimal dynamics on noncompact spaces. In particular, we are able to construct a simple, separable, nuclear nonunital C*-algebra $\mathcal{Z}_0$ with $K_*(\mathcal{Z}_0) \cong K_*(\mathbb{C})$ as the C*-algebra of a minimal étale groupoid coming from such a dynamical system.

Contributed Talks

General locally compact Stone duality

Mon 13:20-13:50

Tristan Bice

Institute of Mathematics of the Polish Academy of Sciences

There has recently been a surge of interest in non-commutative extensions of the classical Stone duality between zero-dimensional (locally) compact Hausdorff spaces and (generalized) Boolean algebras. Our goal is to outline how to remove the zero-dimensionality restriction and still obtain a duality with a class of lattices that is first order definable (in contrast to e.g. frames/locales which are second order). We also discuss extending this to a duality between certain bases of locally compact Hausdorff étale groupoids and a first order definable class of inverse semigroups. This talk is based on joint work with Charles Starling.

The boundary path space of graphs, labeled spaces and topological graphs

Tue 13:20-13:50

Gilles de Castro

Universidade Federal de Santa Catarina

When describing the C^*-algebra of a graph as a groupoid C^*-algebra, the unit space of this groupoid is the boundary path space of a graph, which consists of all infinite paths and finite paths that end in a sink or an infinite emitter. The algebra of continuous functions of this space is isomorphic to a certain commutative C^*-subalgebra, called the diagonal subalgebra. It can also be shown that the boundary path space can be recovered from an inverse semigroup defined from a graph by the tight spectrum of the idempotents semilattice. In a joint work with G. Boava and F. Mortari, we showed that a similar analysis can be done in the case of labeled spaces (which are labeled graph with some extra structure). In the case of topological graphs, one of the difficulties that arises is that the tight spectrum is totally disconnected, so that even if we can define a suitable semilattice, we would not obtain from this construction the correct topology on the boundary path space of a general topological graph. I would like to discuss that this difficulty can be circumvented by using techniques of pointless topology.

Thu 15:20-15:50

The Balian–Low theorem and vector bundles

Ulrik Enstad

University of Oslo

The Balian-Low theorem is a celebrated result in time-frequency analysis. Roughly, it states that if one requires a Gabor system with window function g to be an orthonormal basis for $L^2(\mathbb{R})$, then g cannot be well-localized, and is therefore not suitable for time-frequency analysis. Much of Gabor theory can be extended to the setting of locally compact abelian groups, but it has proved difficult to find a suitable generalization of the Balian-Low theorem to this setting. In this talk, I will discuss how the Balian-Low theorem is linked to the non-triviality of vector bundles, which again are linked to projective modules over group C^*-algebras.

Mon 16:00-16:30

On C^*-algebras associated to product systems and semi-saturated Fell bundles

Camila Fabre Sehnem

University of Göttingen

Let P be a sub-semigroup of a group G. A Fell bundle over G yields a product system consisting of Hilbert bimodules $\mathcal{E} = (\mathcal{E}_p)_{p\in P}$ if the multiplication maps are isomorphisms when one restricts to the fibres over P. In this talk, we will consider product systems over semigroups arising from quasi-lattice orders. Given a quasi-lattice ordered group (G, P), we apply the construction of relative Cuntz–Pimsner algebras to show that a compactly aligned product system of Hilbert bimodules over P extends to a Fell bundle over the group G. In this setting, we will define a notion of semi-saturated and orthogonal Fell bundle so that its restriction to the positive cone gives rise to a compactly aligned product system of Hilbert bimodules. This correspondence is part of an equivalence between certain bicategories.

Mon 16:40-17:10

C^*-algebras generated by partial product systems

Devarshi Mukherjee

University of Göttingen

The partial product systems over $\mathbb{N}$ introduced here generalise both product systems over $\mathbb{N}$ and Fell bundles over $\mathbb{Z}$. We extend the construction of Toeplitz C^*-algebras and of relative Cuntz–Pimsner algebras to this setting and show that the section C^*-algebra of a Fell bundle over $\mathbb{Z}$ is a relative Cuntz–Pimsner algebra. This talk is based on joint work with Ralf Meyer.

Purely infinite inverse semigroup crossed products and Cartan pairs

Mon 15:20-15:50

Bartosz Kwasniewski
University of Bialystok

We discuss crossed products by actions of inverse semigroups by Hilbert bimodules. This construction generalizes C^*-algebras associated to Fell bundles over etale groupoids. It also models all regular C^*-inclusions. We study criteria under which the ideal structure of reduced crossed products can be described in terms of invariant ideals. We give sufficient conditions for pure infiniteness of such algebras. When applied to the situation where A is a Cartan C^*-subalgebra of B and A has totally disconnected spectrum, these conditions are also necessary provided that the associated type semigroup is almost unperforated. In particular, these results generalize recent work of Bönicke and Li, and Rainone and Sims. This talk is based on joint work with Ralf Meyer (in progress).

On Fell Bundles over inverse semigroups and their left regular representations

Tue 16:00-16:30

Magnus Norling
University of Oslo

Wordingham's Theorem, which says that the left regular representation of an inverse semigroup is faithful, can be extended to left regular representations of Fell bundles over inverse semigroups. We discuss the connection between the C^*-algebra generated by the left regular representation and Exel's previous construction of a reduced cross-sectional C^*-algebra associated to such a Fell bundle. This talk is based on joint work with Erik Bédos.

Topological full groups and graph groupoids

Tue 15:20-15:50

Petter Nyland
Norwegian University of Science and Technology (NTNU)

A recent theorem of Matui states that an effective minimal étale groupoid over a Cantor set can be recovered from its associated topological full group – considered as a discrete countable group. We suggest how to extend the definition of the topological full group to groupoids with locally compact unit spaces. We are then able to extend Matui's Spatial Realization Theorem. If time permits, consequences for graph groupoids and graph C^*-algebras will also be discussed. This talk is based on joint work with Eduard Ortega.

Thu 16:00-16:30

Derivations of Köthe type algebras: Fréchet algebra case and DF-algebra case

Krzysztof Piszczek
Adam Mickiewicz University

Many Fréchet algebras arising in mathematical analysis have a structure of a Köthe type algebra. In this talk we study the behaviour of continuous derivations into bimodules of such algebras. In particular we give a complete characterization of the so-called amenable and contractible Köthe type algebras. We also deal with dual Köthe type algebras. In this dual framework a similar characterization of amenability and contractibility is also available.

Tue 10:20-10:50

Groupoids and higher-rank graphs

James Rout
Technion – Israel Institute of Technology

I will talk about the (multi-dimensional) dynamics of higher-rank graphs. I will explain how groupoid methods have been used to characterise continuous orbit equivalence and conjugacy of higher-rank graphs in terms of isomorphisms of the associated C^*-algebras. This talk is based on joint work with Toke M. Carlsen.

Thu 13:20-13:50

Reconstructing the Bost-Connes semigroup actions from K-theory

Takeishi Takuya
Kyoto University

We present a reconstruction result of groupoids from groupoid C^*-algebras. The Bost–Connes C^*-algebra is a C^*-algebra which is constructed from a semigroup dynamical system attached to a number field. We show that the original dynamical system can be reconstructed from K-theory of composition factors of the Bost-Connes C^*-algebra. Together with the result of Cornelissen–de Smit–Li–Marcolli–Smit, this gives a complete classification of Bost-Connes C^*-algebras. This talk is based on joint work with Yosuke Kubota.

Participants

Selcuk Barlak	University of Southern Denmark
Erik C. Bédos	University of Oslo
Tristan Bice	IMPAN
Nathan Brownlowe	University of Sydney
Toke M. Carlsen	University of the Faroe Islands
Johannes Christensen	University of Aarhus
Lisa O. Clark	Victoria University of Wellington
Gilles de Castro	Universidade Federal de Santa Catarina
Ulrik Enstad	University of Oslo
Luca E. Gazdag	University of Oslo
Michel Hilsum	CNRS
Eun Ji Kang	Seoul National University
Ganna Kudryavtseva	University of Ljubljana
Bartosz Kwasniewski	University of Bialystok
Magnus B. Landstad	NTNU
Nadia S. Larsen	University of Oslo
Karen Linton	Everett College
Sara Malacarne	University of Oslo
Devarshi Mukherjee	Georg August Universitt Göttingen
Sergey Neshveyev	University of Oslo
Magnus Norling	University of Oslo
Petter Nyland	NTNU
Tron A. Omland	University of Oslo
Krzysztof Piszczek	Adam Mickiewicz University
Jacqui Ramagge	University of Sydney
Jean Renault	University of Orléans
James Rout	Technion (Haifa)
Camila F. Sehnem	University of Göttingen
Airat Sitdikov	Kazan State Power Engineering University
Jack Spielberg	Arizona State University
Charles Starling	Carleton University
Nicolai Stammeier	University of Oslo
Ben Steinberg	City College of New York
Karen R. Strung	Radboud University
Adam P.W.Sørensen	University of Oslo
Takuya Takeishi	Kyoto University