PROGRAMME FOR
104TH PERIPATETIC SEMINAR ON SHEAVES AND LOGIC
6 AND 7 OCTOBER 2018
AMSTERDAM, THE NETHERLANDS

Saturday 6 October

9:30	Zawadowski	*Positive Opetopes with Contractions form a Test Category*
10:15	Weinberger	*Simplicial Sets inside Cubical Sets*
11:00	Coffee	
11:30	Pasquali	*From triposes to quasi-toposes*
12:15	Terwijn	*Computability theory and partial combinatory algebra*
13:00	Lunch	
14:30	Faber	*Homogeneous structures, names and types*
15:15	Uemura	*Cubical Assemblies and the Independence of the Propositional Resizing Axiom*
16:00	Coffee	
16:30	Blechschmidt	*How not to constructivize cohomology*
17:15	Moerdijk	Closed dendroidal sets and unital operads

Marek Zawadowski, *Positive Opetopes with Contractions form a Test Category*

Abstract: The category of opetopic sets was introduces by J. Baez and J. Dolan to serve as the basis of their attempt to define ∞-dimensional (opetopic) categories. It is a presheaf category with the exponent being the category of opetopes (and face maps) **Ope**. The final version of the notion of opetopic ∞-category is yet to come, and the main obstacle to is the challenging/intricate combinatorics of its building blocks, the opetopes. In this talk I will report some progress in understanding it.

The category of positive opetopic sets **pOpeSet** can be defined as a full subcategory of the category of polygraphs **Poly**. An object of **pOpeSet** has generators whose codomains are again generators and whose domains are non-identity cells (i.e. non-empty composition of generators). The category **pOpeSet** is a presheaf category with the exponent being called the category of positive opetopes **pOpe**. The category **pOpe** has several descriptions. Its objects are called positive opetopes and morphisms are face maps only. Since **Poly** has a full-on-isomorphisms embedding into the category of ω-categories **oCat**, we can think of morphisms in **pOpe** as ω-functors that send generators to generators. The category of positive opetopes with contractions $\mathbf{pOpe}_\iota$ has the same objects and face maps as **pOpe**, but in addition it has some degeneracy maps. A morphisms in $\mathbf{pOpe}_\iota$ is an ω-functor that sends generators to either generators or to identities on generators. I will show that the category $\mathbf{pOpe}_\iota$ is a test category. This imply that there is a Cisinski (proper) model structure on the presheaf category $\widehat{\mathbf{pOpe}_\iota}$ and hence it provides yet another model of intensional Martin-Löf Type Theory.

The proof is combinatorial, it uses my description of the category $\mathbf{pOpe}_\iota$, as well as the other combinatorial description of **pOpe** due to T. Palm. If time permits, I will say something about further properties and prospects concerning both $\mathbf{pOpe}_\iota$ and $\mathbf{Ope}_\iota$.

Jonathan Weinberger, *Simplicial Sets inside Cubical Sets*

Abstract: We give a description of simplicial sets as an essential subtopos of cubical sets (seen as presheaves on the category of finite lattices). This is used to discuss inter-relations between universes classifying small fibrations (w.r.t. the

type-theoretic model structures), or small families of sheaves, resp. Joint work with Thomas Streicher.

Fabio Pasquali, *From triposes to quasi-toposes*

ABSTRACT: The Tripos-to-topos completion is a construction introduced by Hyland Johnstone and Pitts that gives an elementary topos out of any given tripos [1]. We describe how Maietti-Rosolinis elementary quotient completion [2] provides a tripos-to-quasi topos completion when applied to a suitable class of triposes. Properties of these triposes can also be proved to be necessary to get an arithmetic quasi-topos in such a way, giving a characterization of those arithmetic quasi- toposes that arise in this way. Finally we characterize those triposes whose tripos-to-quasi-topos completion coincides with the tripos-to-topos completion. Notable examples of our constructions are the category of assemblies in Hylands Effective topos, the category of equilogical spaces and toposes arising as exact completions.

This is a joint work with M.E. Maietti and G. Rosolini.

[1] J. M. E. Hyland, P. T. Johnstone, and A. M. Pitts. Tripos theory. Math. Proc. Camb. Phil. Soc., 88:205-232, 1980.
[2] M. E. Maietti and G. Rosolini. Elementary quotient completion. Theory Appl. Categ. , 27:445-463, 2013.

Sebastiaan Terwijn, *Computability theory and partial combinatory algebra*

ABSTRACT: In the context of his theory of numberings, Ershov showed that Kleene's recursion theorem holds for any precomplete numbering. We discuss various generalizations of this result. Among other things, we show that Arslanov's completeness criterion also holds for every precomplete numbering, and we discuss the relation with Visser's ADN theorem. We then generalize the notion of numbering to the setting of partial combinatory algebra, and prove a generalization of Ershov's theorem in this context.

Eric Faber, *Homogeneous structures, names and types*

ABSTRACT: In this talk I will outline the project of my doctoral thesis that starts with a renewed understanding of homogeneous logical structures through topos theory. This is motivated by recent ideas of A.M. Pitts that suggest to use a generalization of nominal sets to describe models of (homotopy) type theory. I will aim to describe how far homogeneous structures get you towards that goal and how this theory may be used to understand different models of type theory and their interrelation.

Taichi Uemura, *Cubical Assemblies and the Independence of the Propositional Resizing Axiom*

ABSTRACT: Cubical type theory gives a constructive justification of the univalence axiom. A model of this type theory in cubical sets is build, informally, in constructive metatheory, so this construction should work internally in suitable

categories other than Set. Orton and Pitts have given a sufficient condition for modeling cubical type theory in an elementary topos. Based on their work, I build the cubical set model internally in the category of assemblies. A feature of this new model is that it has a universe which is impredicative as well as univalent, but this model does not satisfy the propositional resizing axiom.

Ingo Blechschmidt, *How not to constructivize cohomology*

ABSTRACT: This talk reports on the ongoing quest of finding a general framework for cohomology which works in constructive mathematics and in particular on a negative result concerning flabby sheaves obtained using the effective topos.

Ieke Moerdijk, Closed dendroidal sets and unital operads

ABSTRACT: –

9:30	Menni	*The Unity and Idenity of Decidable objects and double negation sheaves*
10:15	Henry	*The étale and localic isotropy groups of toposes*
11:00	Coffee	
11:30	Espindola	*Omitting types theorem, conceptual completeness and definability for infinitary logic*
12:15	Simpson	*Synthetic probability theory*

Matias Menni, *The Unity and Idenity of Decidable objects and double negation sheaves*

Abstract: We give sufficient conditions on a topos for the existence of a Unity and Identity for the subcategories of decidable objects and of double negation sheaves, making them adjointly opposite. Typical examples of such a topos include many gros toposes in Algebraic Geometry, simplicial sets and other toposes of combinatorial spaces in Algebraic Topology, and certain models of Synthetic Differential Geometry.

Simon Henry, *The étale and localic isotropy groups of toposes*

Abstract: B.Funk, P.Hofstra and B.Steinberg have shown that every Grothendieck topos have a completely canonical group object, called its isotropy group which acts on every object of the topos, making every morphisms equivariant. The origin of this group was quite mysterious (at least to me) and this work arise as my personal attempt to understand it.

I'll show that every topos T have a canonical "localic group object" which also acts on every objects of T (and in fact on every topos over T). This localic groups arise from a very natural categorical construction, the "free loops object". The ordinary isotropy group appears as the group of points of this localic group. The localic isotropy group have better functoriality property than the ordinary one and this allows to obtain some nice new results in the isotropy theory of toposes, which I will present if I have enough time left.

Christian Espindola, *Omitting types theorem, conceptual completeness and definability for infinitary logic*

Abstract: We will start by presenting a sheaf-theoretic version of the classical omitting types theorem that generalizes to infinitary logic as a corollary of an infinitary version of Deligne's completeness theorem. This allows to transfer to the infinitary case the classical theorems about atomic and prime models, and also an infinitary version of the Ryll-Nardewski theorem characterizing categorical theories. We will then analyze a reconstruction result for infinitary theories through a semantic presentation of the classifying topos. This latter presentation entails both conceptual completeness and definability theorems which generalize those of Makkai and Reyes.

Alex Simpson, *Synthetic probability theory*

Abstract: –