▸ HSING-CHIEN TSAI, ZE-YUAN DUAN, *On the Complexity of First-order Axiomatizable Mereological Theories*.
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In this talk, we are only concerned with first-order mereological theories which can be axiomatized by using the following list of axioms that can be found in the literature.

(P1: reflexivity) $\forall x Pxx$
(P2: anti-symmetry) $\forall x \forall y((Pxy \wedge Pyx) \to x = y)$
(P3: transitivity) $\forall x \forall y \forall z((Pxy \wedge Pyz) \to Pxz)$
(EP: extensionality) $\forall x \forall y(\exists z PPzx \to (\forall z(PPzx \leftrightarrow PPzy) \to x = y))$
(WSP: weak supplementation) $\forall x \forall y(PPxy \to \exists z(PPzy \wedge \neg Ozx))$
(SSP: strong supplementation) $\forall x \forall y(\neg Pyx \to \exists z(Pzy \wedge \neg Ozx))$
(FS: finite sum) $\forall x \forall y(Uxy \to (\exists z \forall w(Owz \leftrightarrow (Owx \vee Owy)))$
(FP: finite product) $\forall x \forall y(Oxy \to \exists z \forall w(Pwz \leftrightarrow (Pwx \wedge Pwy)))$
(A: atomicity) $\forall x \exists y(Pyx \wedge \neg \exists z PPzy)$, where y is an "atom", for it has no proper part.
(AL: atomlessness) $\forall x \exists y PPyx$
(G: existence of the greatest member) $\exists x \forall y Pyx$
(C: complementation) $\forall x(\neg \forall z Pzx \to \exists z \forall w(Pwz \leftrightarrow \neg Owx))$
(UF: unrestricted fusion axiom schema) $\exists x \alpha \to \exists z \forall y(Oyz \leftrightarrow \exists x(\alpha \wedge Oyx))$, for any formula α where z and y do not occur free.

Previously, we have shown the following facts, where **CEM** is the theory axiomatized by (P1), (P2), (P3), (SSP), (FS) and (FP).

(1) Any theory strictly weaker than **CEM**+(C) is finitely inseparable and hence undecidable. (2) Any theory weaker than **CEM**+(G) is undecidable, but **CEM**+(G) is not finitely inseparable. (3) Any theory stronger than **CEM**+(C) is decidable.

In this talk, we will see that the undecidable theories mentioned in (1) or (2) are 1-complete and the decidable theories mentioned in (3) are NP-hard. Moreover, we did not deal with the atomless theories previously. Now we will show that any theory weaker than **CEM**+(G)+(AL) is 1-complete (note that an atomless theory cannot be finitely inseparable).