# Derived Picard groups and integration of Hochschild cohomology (arXiv:2405.14448)

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## Hochschild cohomology

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$$u \cdot_{\mathsf{BCH}} v \coloneqq u + v - \frac{1}{2}[u, v] + \frac{1}{12}[u, [u, v]] + \cdots$$

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- $G = \mathbb{R}^{\times} \rightsquigarrow L = (\mathbb{R}, 0)$  and  $\exp(t) = e^t = \sum_{i=0}^{\infty} \frac{1}{i!} t^i$  is injective with  $\operatorname{Im} \exp = \mathbb{R}_{>0} \subseteq \mathbb{R}^{\times}$  and  $u \cdot_{\operatorname{BCH}} v = u + v$ .
- In general: exp is not injective!

#### Summary

- L = Lie(G) recovers subgroup of exp(L) ⊆ G<sub>o</sub> ⊆ G through exponential.
- Group structure on exp(L) is locally encoded in BCH product.

#### Aim

Find a similar relationship between  $\mathcal{D}Pic(-)$  and  $HH^{\bullet}(-)$ .

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Sebastian Opper Derived Picard groups and integration of Hochschild cohomology

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## Definition (pre-Lie exponential)

Suppose char k = 0.

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Sebastian Opper Derived Picard groups and integration of Hochschild cohomology

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 F : A  $\xrightarrow{\sim}$  B ⇒ canonical commutative diagram

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Proof relies on work by many people.

Sebastian Opper

Derived Picard groups and integration of Hochschild cohomology

## Injectivity of exponential

Sebastian Opper Derived Picard groups and integration of Hochschild cohomology

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One can prove a general sufficient criterion for the injectivity of  $exp_A$ .

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# Injectivity of exponential

One can prove a general sufficient criterion for the injectivity of  $exp_A$ . An application is the following.

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The exponential  $\exp_A : HH^1_+(A, A) \to DPic(A)$  is injective in any of the following cases:

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Viewing  $\mathcal{D}Pic(A)$  as a "Lie group" G,

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Let A be a fin.-dim. graded gentle algebra and  $(\Sigma_A, \eta_A)$  its surface. If char  $\Bbbk = 0$  or under mild conditions on  $(\Sigma_A, \eta_A)$ , there exists an isomorphism

$$DPic(A) \cong Aut^{\infty}_{\circ}(A) \rtimes \mathcal{MCG}(\Sigma_A, \eta_A).$$
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$$\mathcal{MCG}(\Sigma_A, \eta_A) = \{f : \Sigma_A \to \Sigma_A \mid f \text{ preserves structure} \}_{\sim}$$

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### Teasers

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- Necessary condition for uniqueness of lifts of triangulated functors to enhancements and the related uniqueness problem for Fourier-Mukai kernels.
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### Thank you for your attention!

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