Science
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Asymmetric Cooperative Catalysis of Strong Brønsted Acid–Promoted Reactions Using Chiral Ureas

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Science 327, 986, 2010

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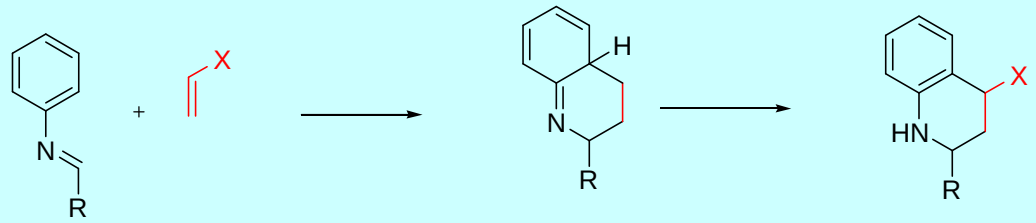
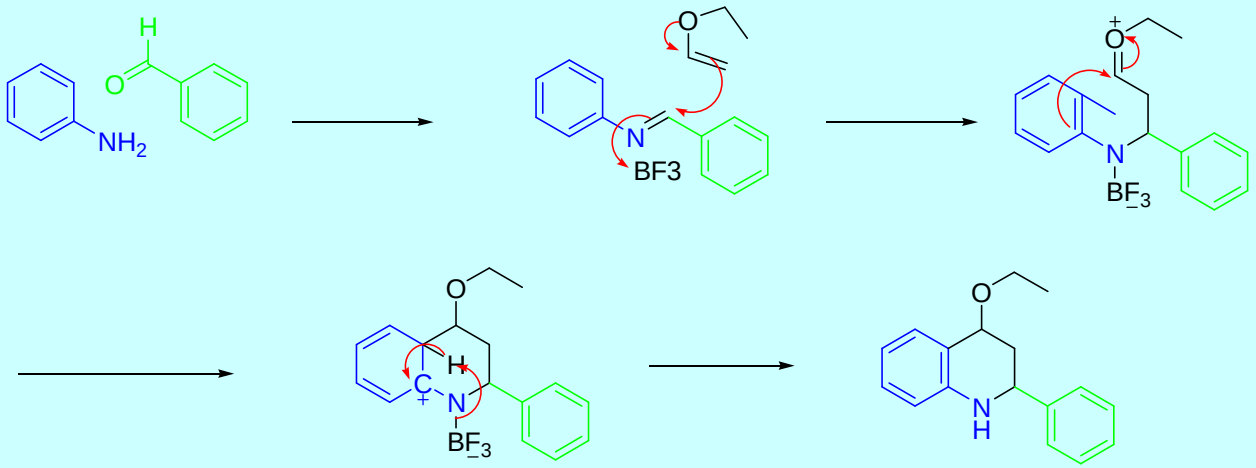
Povarov reaction

Cycloaddition between an aromatic imine and alkene (must be electron rich).



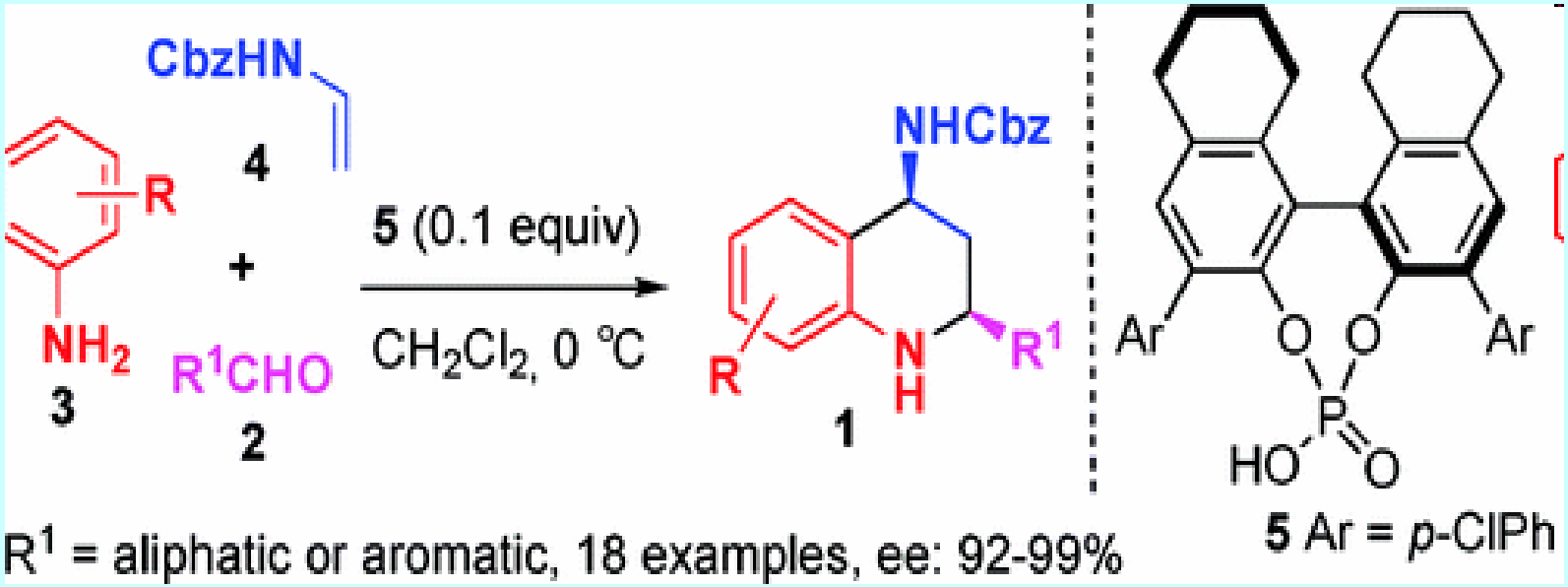
Mechanistic rationale



Vladimir V. Kouznetsov Tetrahedron 65 (2009) 2721–2750*

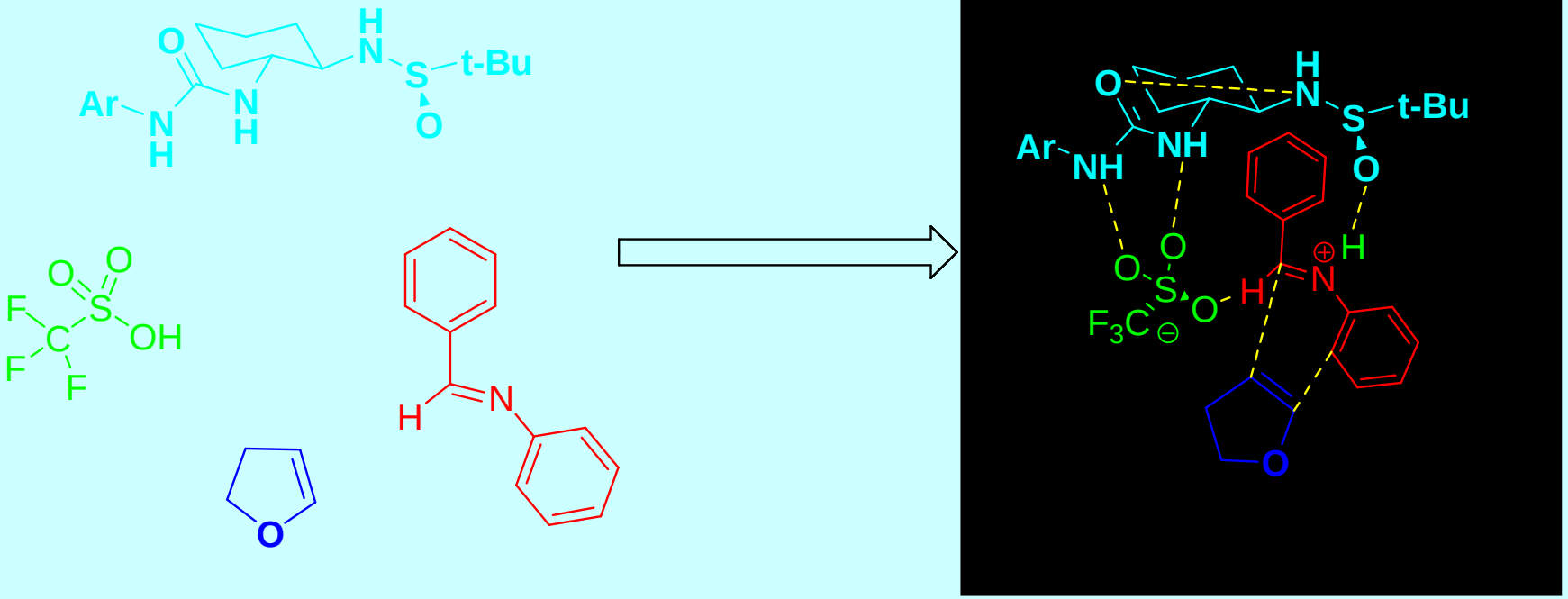
Background……

Chiral Bronsted Acid-Catalysed Enantioselective Three-component Povarov Reaction



Hua Liu, Guillaume Dagousset, Ge´ raldine Masson,* Pascal Retailleau, and Jieping Zhu*
J. AM. CHEM. SOC. 9 VOL. 131, NO. 13, 2009 4598

Present reaction…..



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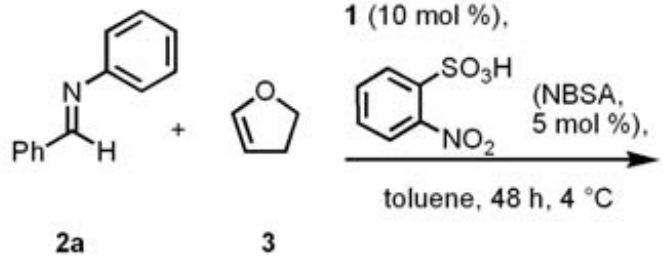
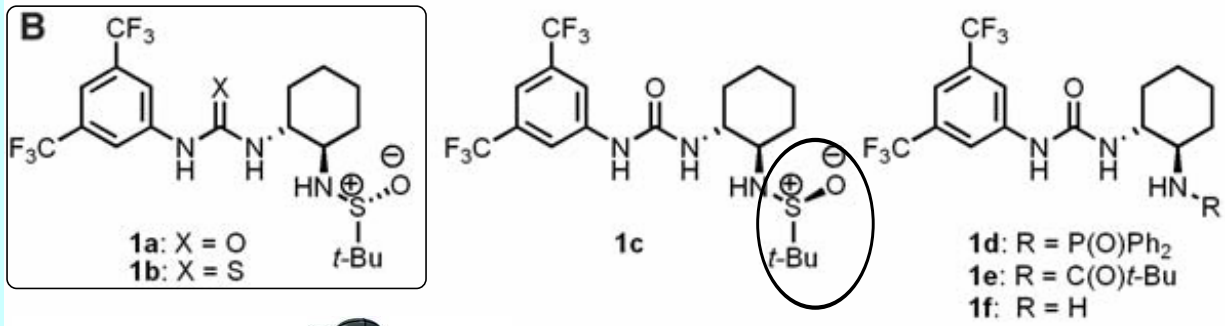
Model Povarov reaction co-catalysed by o-nitrobenzenesulfonic acid and chiral ureas/thioureas…..

A



B



C

entry	catalyst	conversion (%)	dr ($4_{exo}/4_{endo}$)	4_{exo} ee (%)
1	**1a**	92	4.0	91
2	**1b**	95	1.4	83
3	**1c**	52	0.3	2
4	**1d**	20	1.0	50
5	**1e**	8	0.25	<5
6	**1f**	0	ND	ND

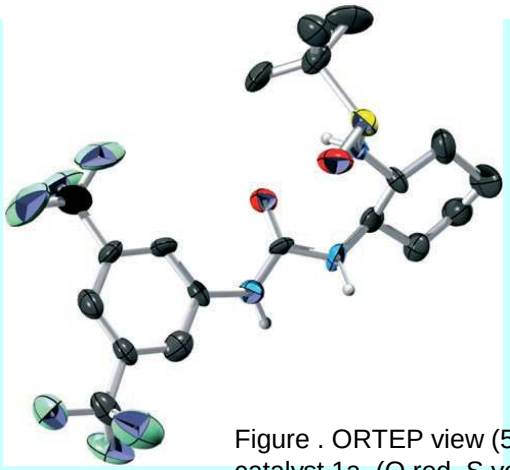


Figure . ORTEP view (50% probability level) of the solid-state structure of catalyst 1a. (O red, S yellow, F green, N blue, C gray).

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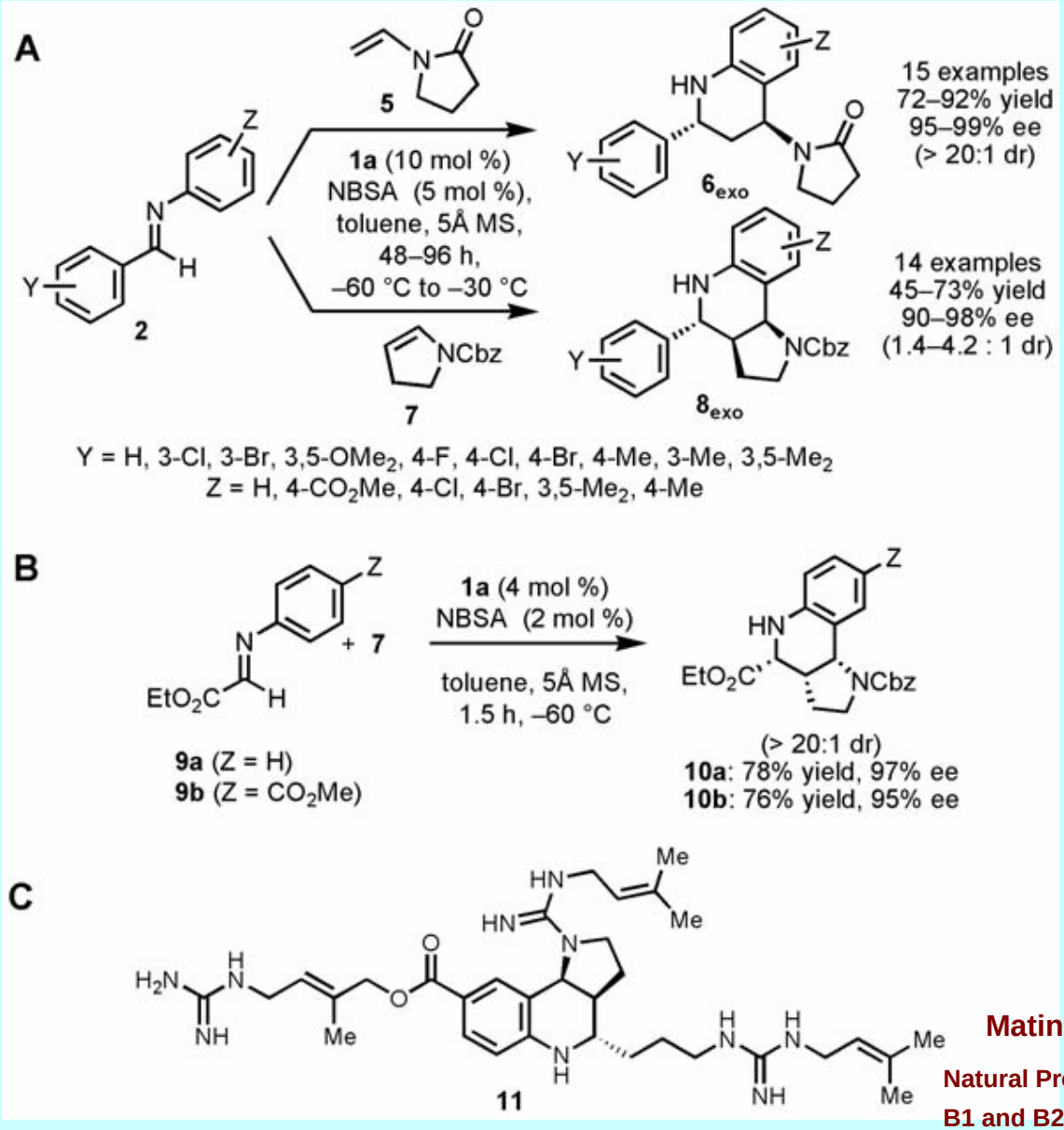
Kian L. Tan and Eric N. Jacobsen* Angew. Chem. Int. Ed. 2007, 46, 1315 –1317

Asymmetric Povarov Reaction catalyzed by 1a/NBSA…..



Matinelline

Natural Product inhibitor of bradykinin B1 and B2 protein-coupled recepter

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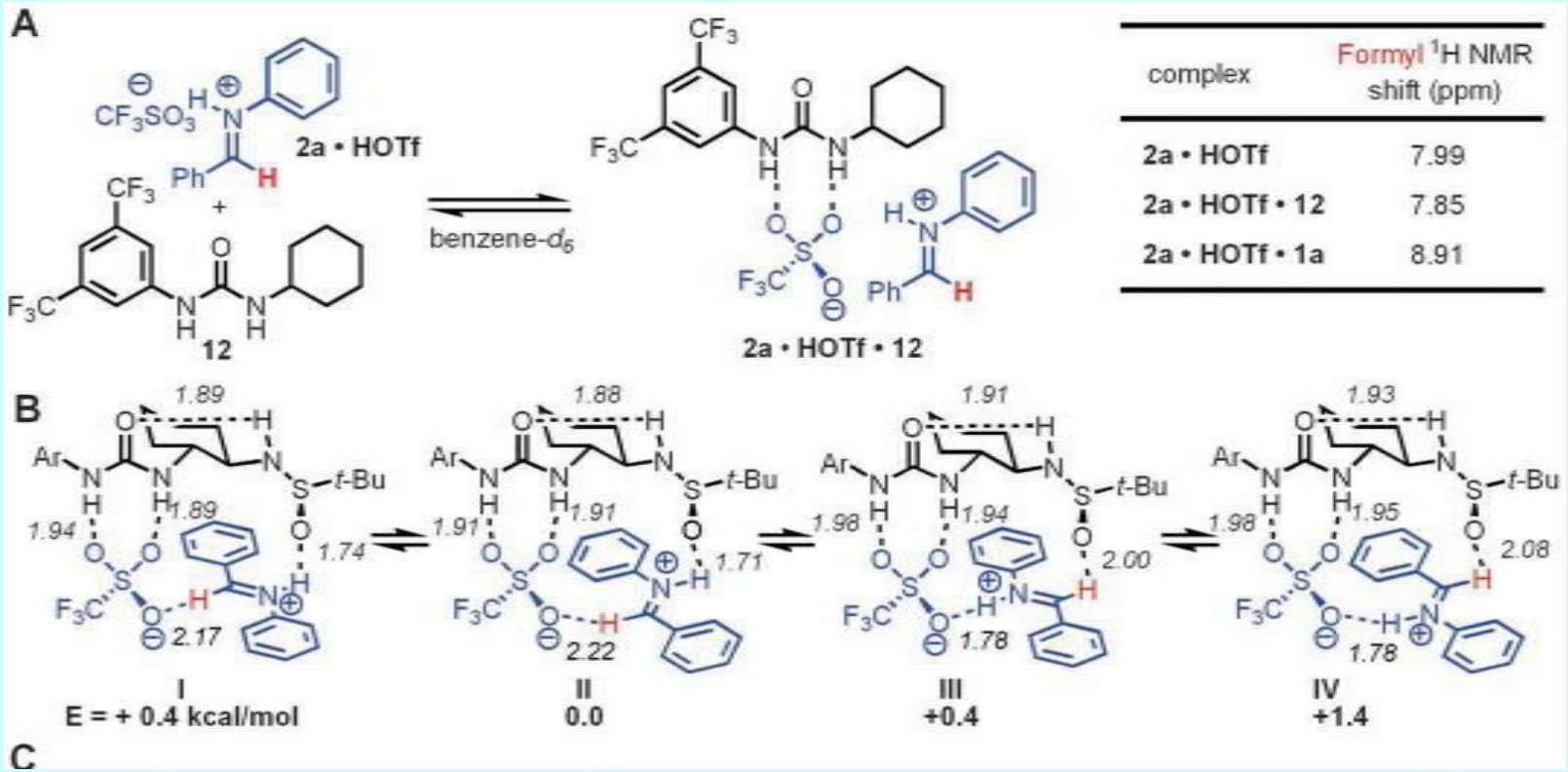
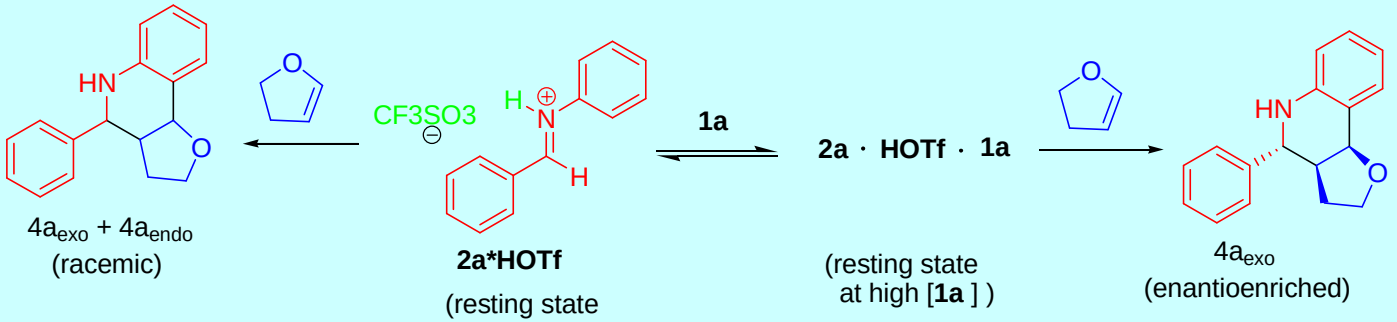


complex	Formyl ^{1}H NMR shift (ppm)
2a • HOTf	7.99
2a • HOTf • 12	7.85
2a • HOTf • 1a	8.91



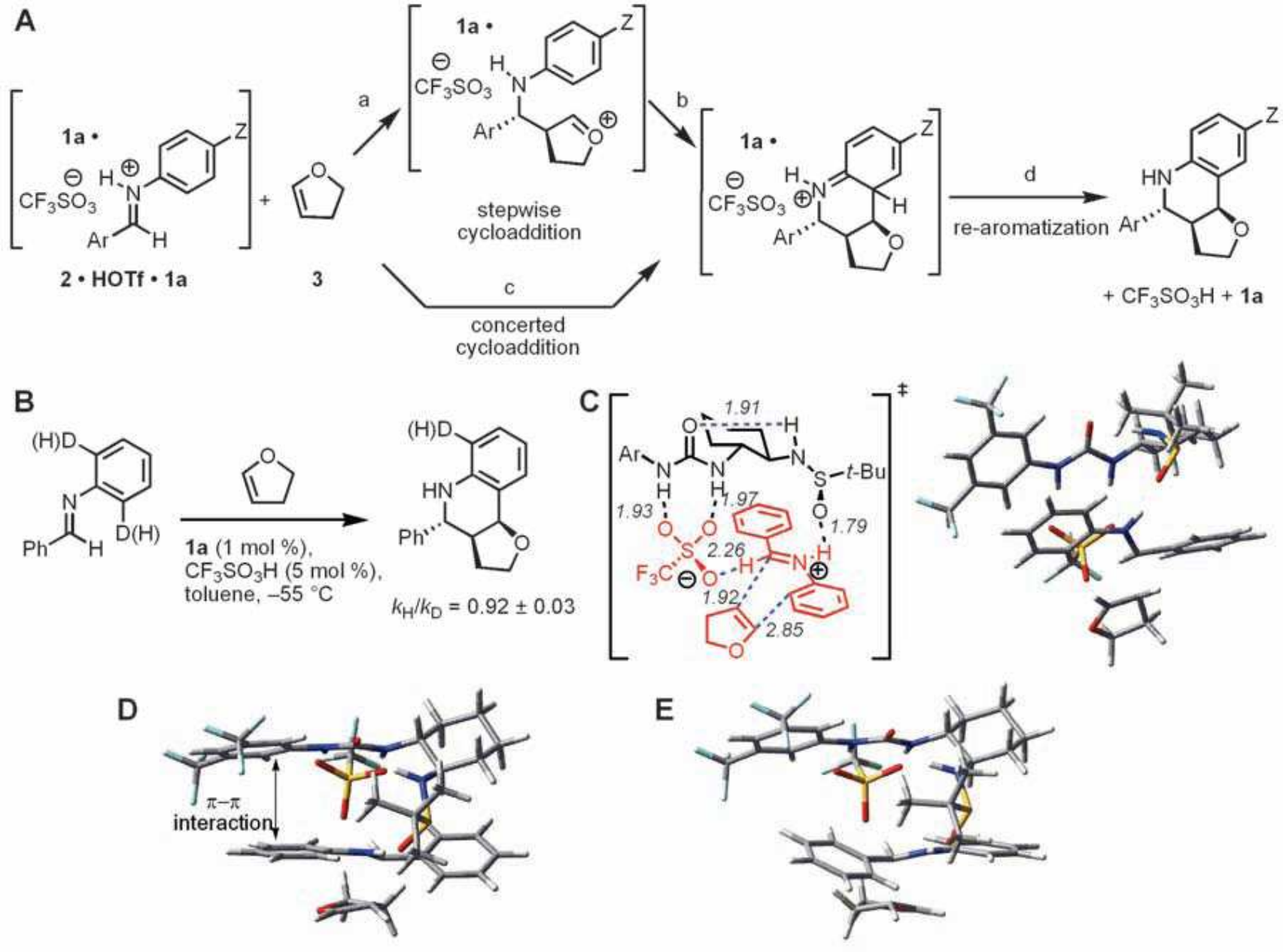
$4a_{exo}$ + $4a_{endo}$
(racemic)

2a*HOTf
(resting state
at low [**1a**])

(resting state
at high [**1a**])

$4a_{exo}$
(enantioenriched)

Possible Mechanism….



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conclusion

- ***Enantioselective catalysis by 1a of a strong Bronsted acid-catalyzed Povarov reaction***

- ***Describes a strategy for inducing entioselectivity in reaction of protio-iminium ions,***

- ***Chiral catalyst interacts with the highly reactive intermediate through a network of noncovalent interaction***

- ***This interaction leads to an attenuation of the reactivity of iminium ion and allows high enantioselectivity in cycloaddition with electron-rich alkenes (the Povarov reaction).***

- ***Illustrating the ability of Bifunctional catalyst 1a to control precisely the outcome of thise reaction through noncovalent interaction alone.***

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Merci

Merci de votre attention

Merci

THANK YOU

UNIVERSITÉ PAUL CÉZANNE
Aix-Marseille III