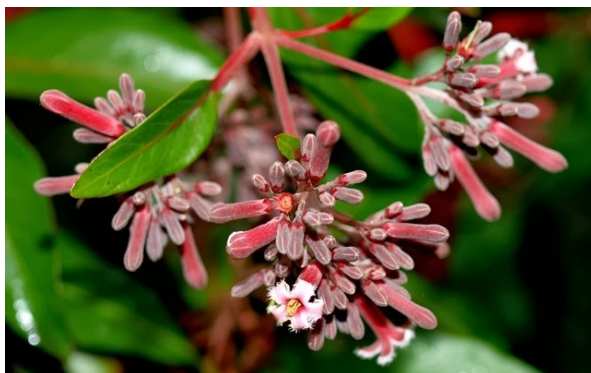
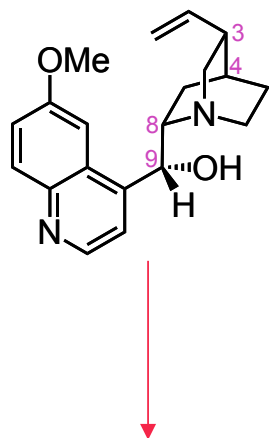
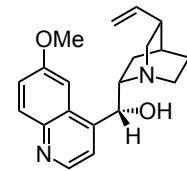


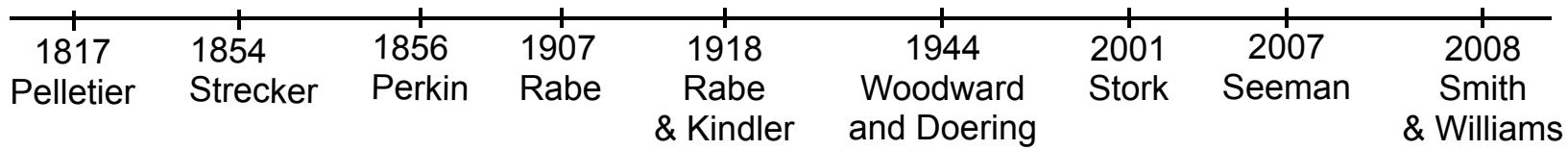
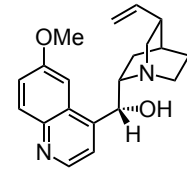
A Molecule That Has Changed The World

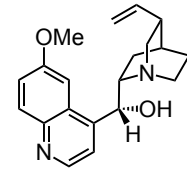
“Quinine”

Buthaina Al Rifaie
Sigman Group
Jun 26th, 2017

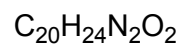
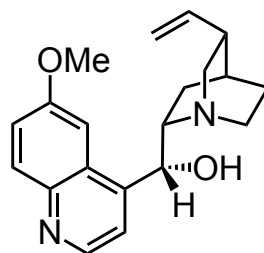
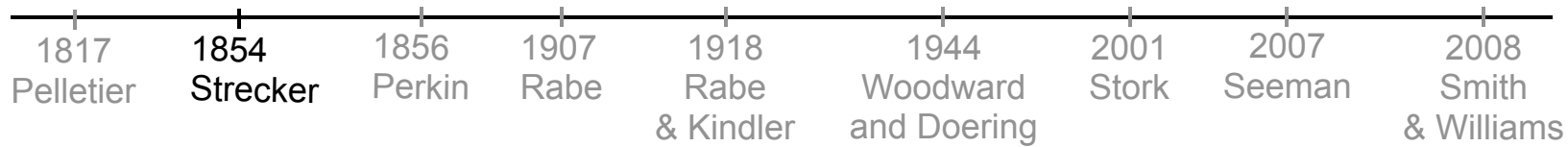
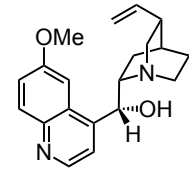


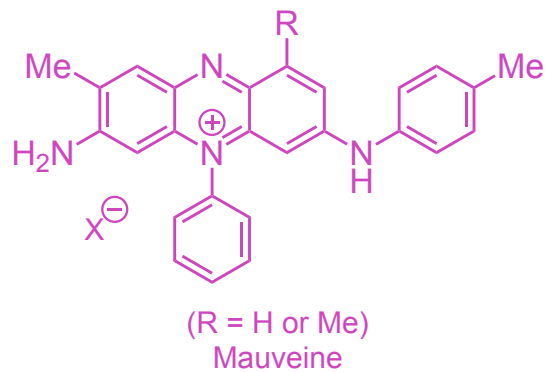
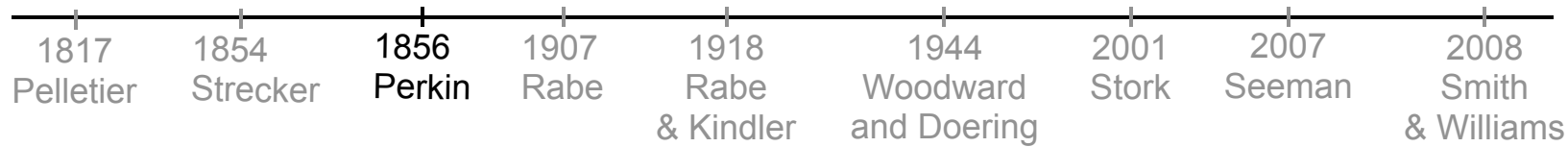
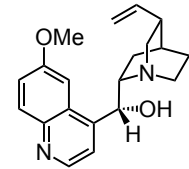
Cinchona Officinalis L.

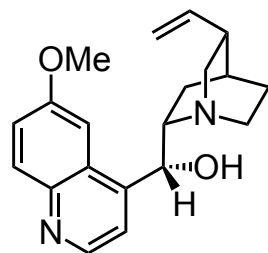
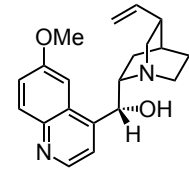


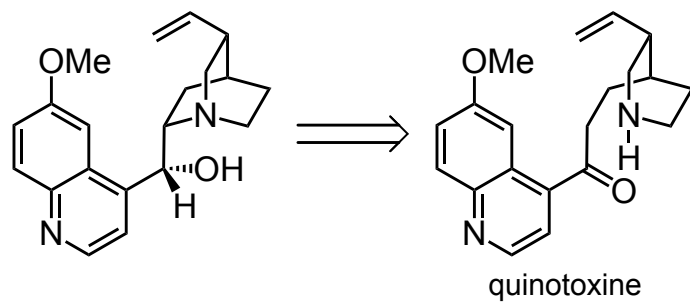
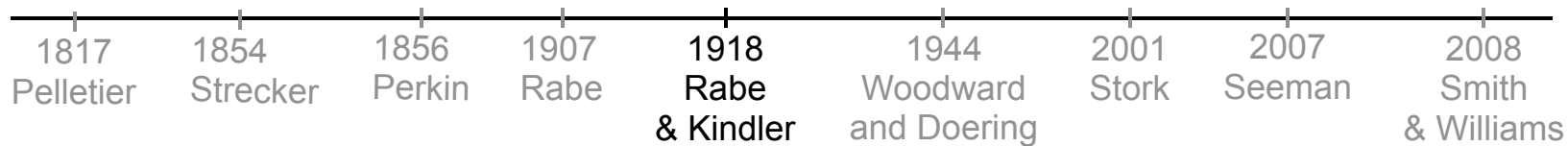
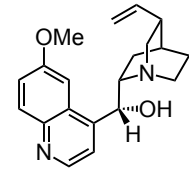


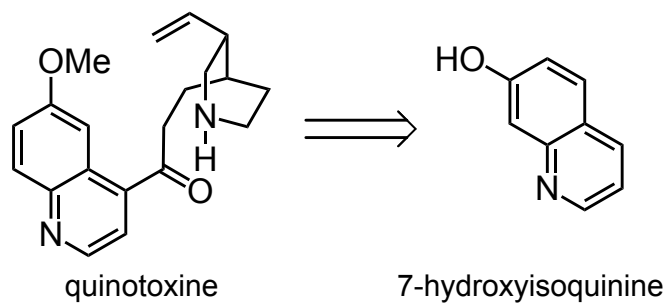
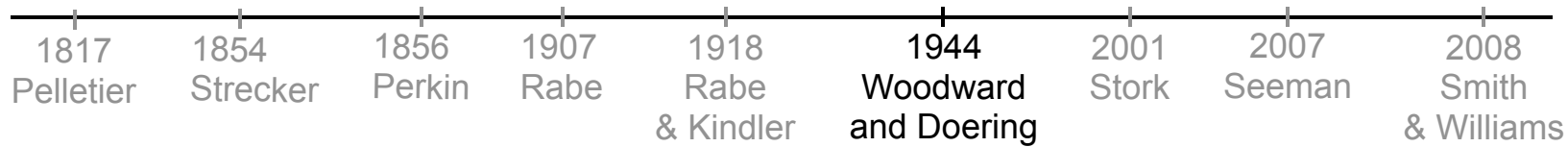
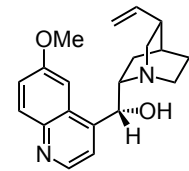
Cinchona Officinalis L.

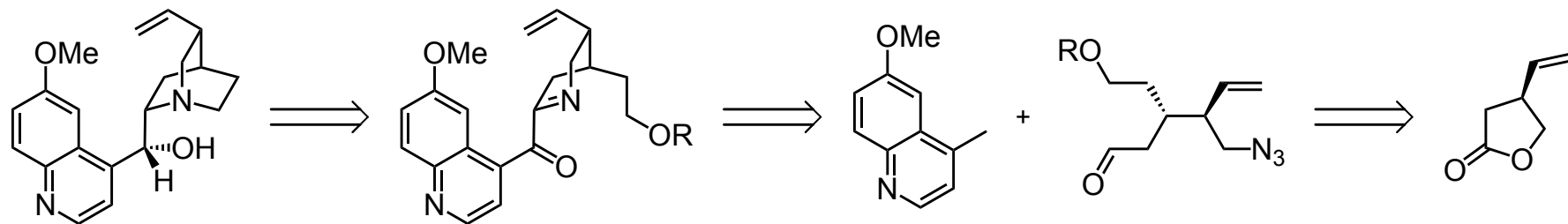
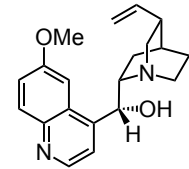


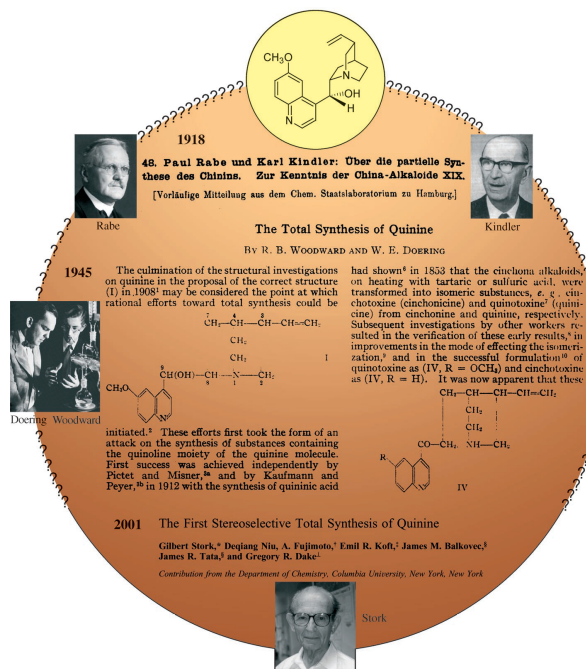
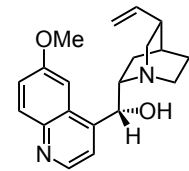


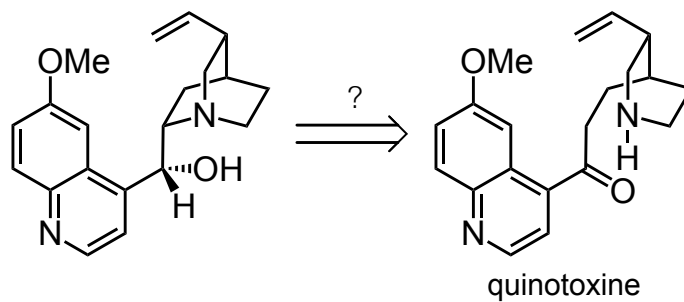
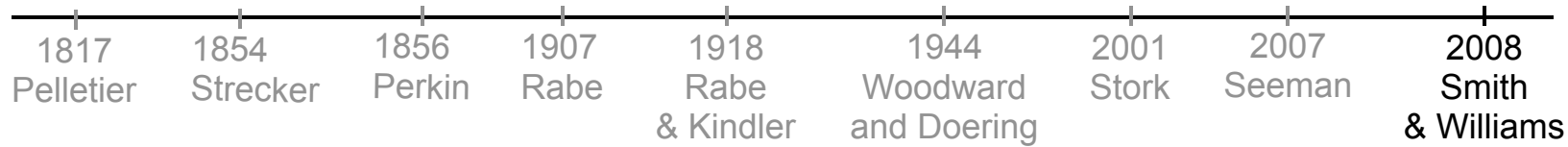
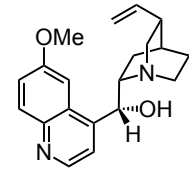


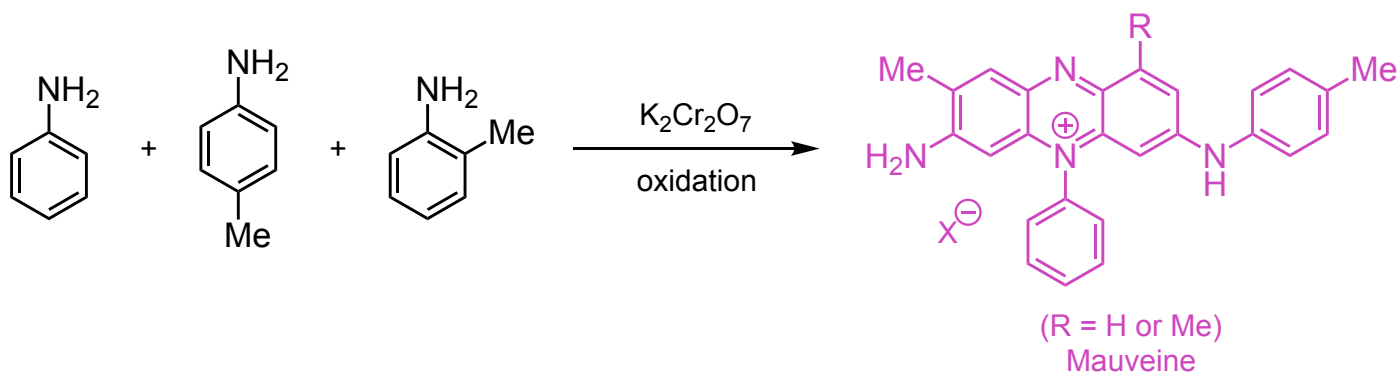
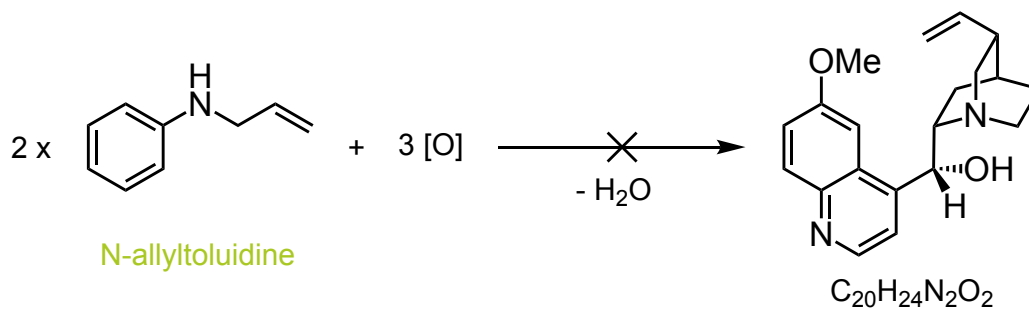
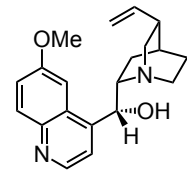
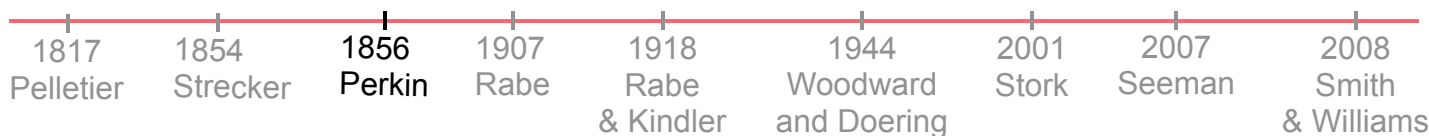


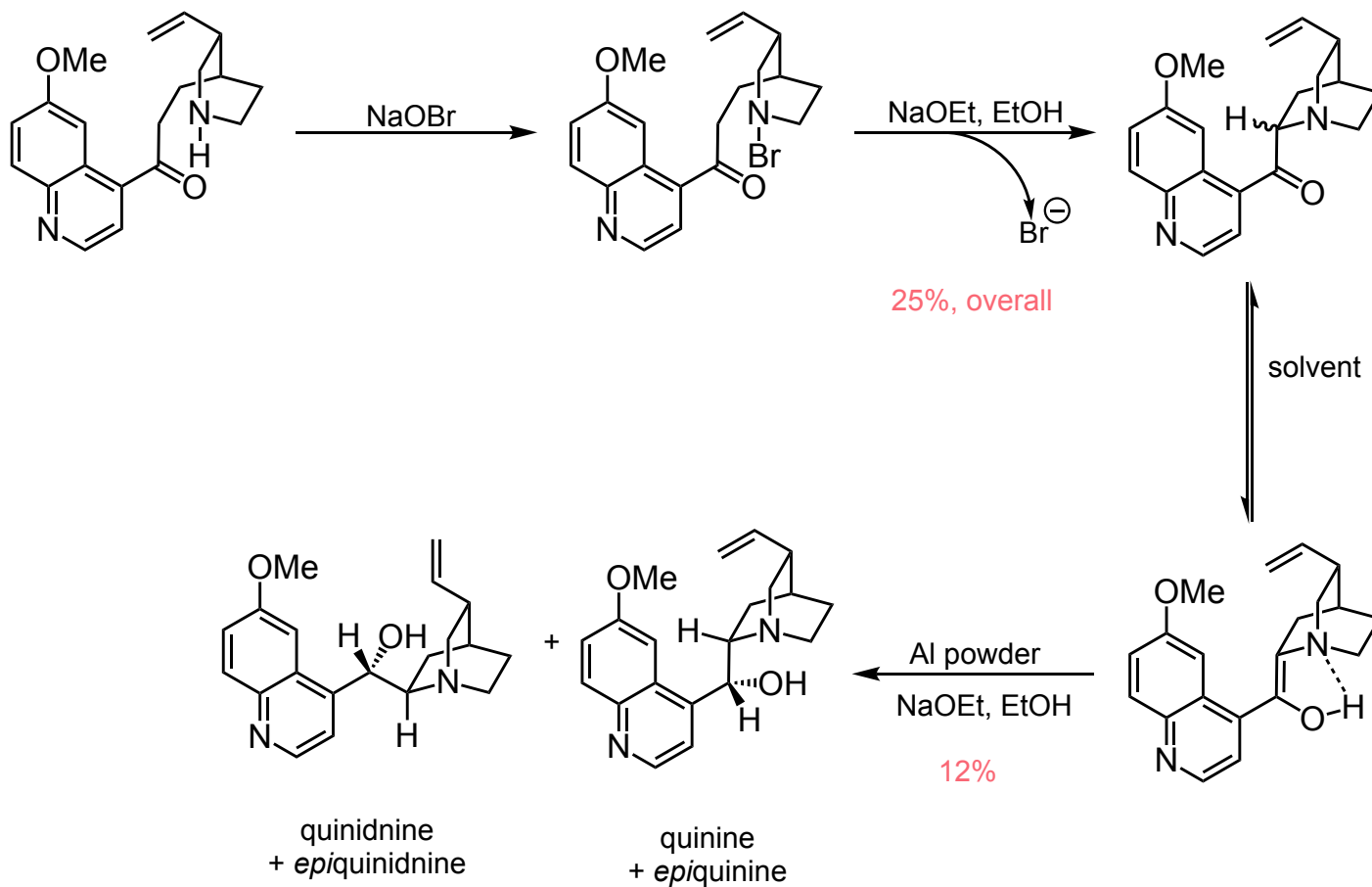
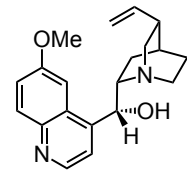
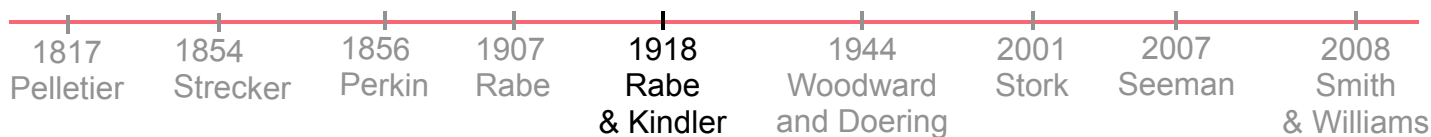


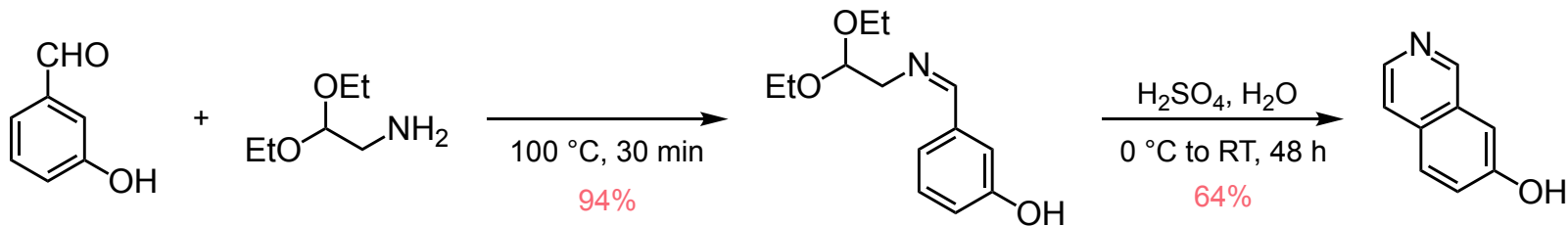
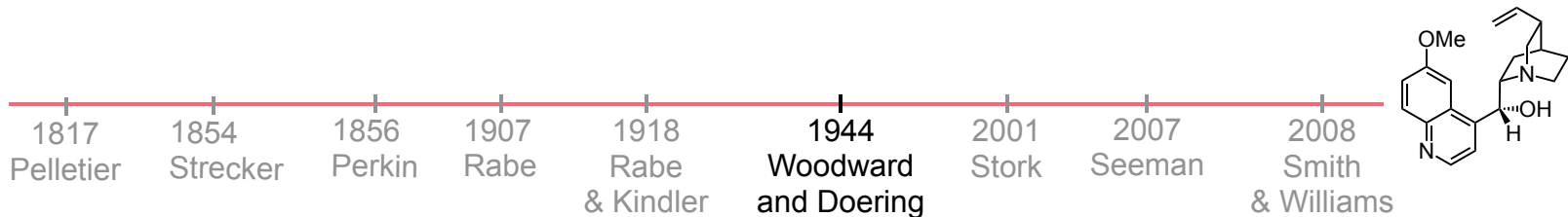






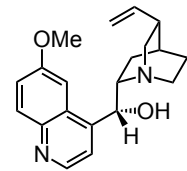






Pomeranz-Fritsch Isoquinoline synthesis

Schotten-Baumann

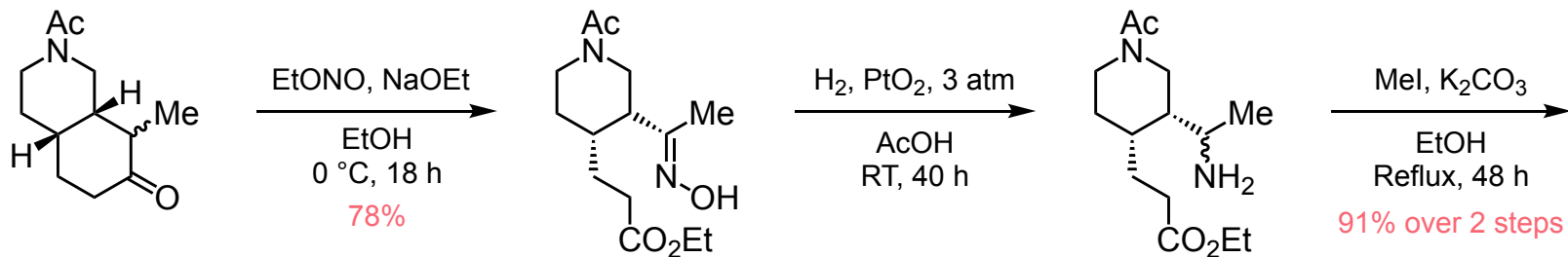
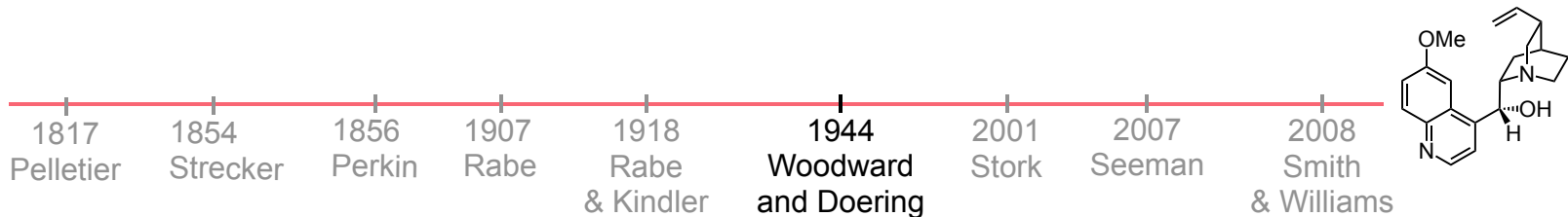


Oc1ccc2c(c1)c(cnc2)CN3CCCCC3
 $\xrightarrow[\text{EtOH, H}_2\text{O, 100 }^\circ\text{C, 6 h}]{\text{Piperidine, CH}_2\text{O}}$
Cc1c(O)ccc2c(c1)cnc2
 $\xrightarrow[\text{MeOH, 220 }^\circ\text{C, 16 h}]{\text{NaOMe}}$
Cc1c(O)ccc2c(c1)ncn2
 $\xrightarrow[\text{AcOH, RT, 18 h}]{\text{H}_2, \text{PtO}_2, 4 \text{ atm}}$
Cc1c(O)ccc2c(c1)ncn2

61% 65%

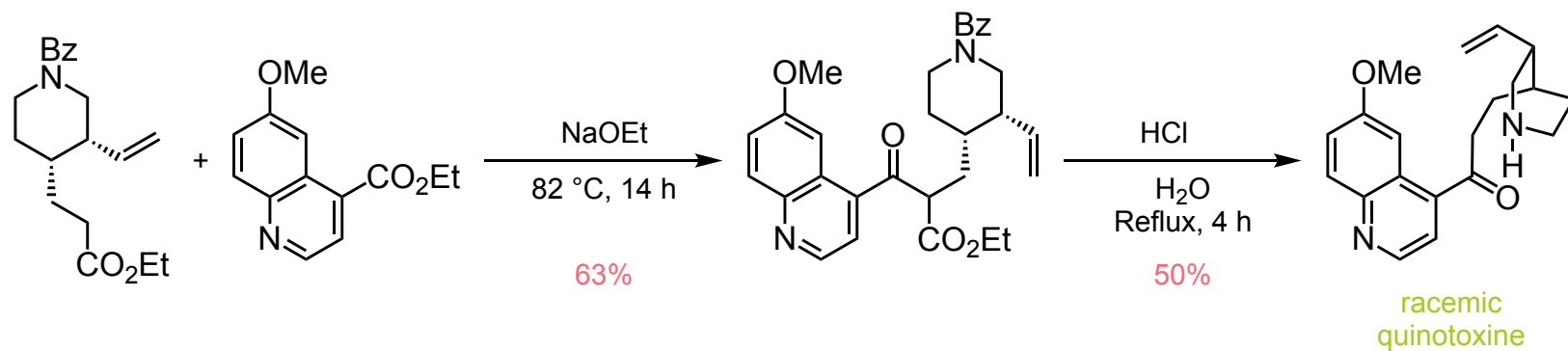
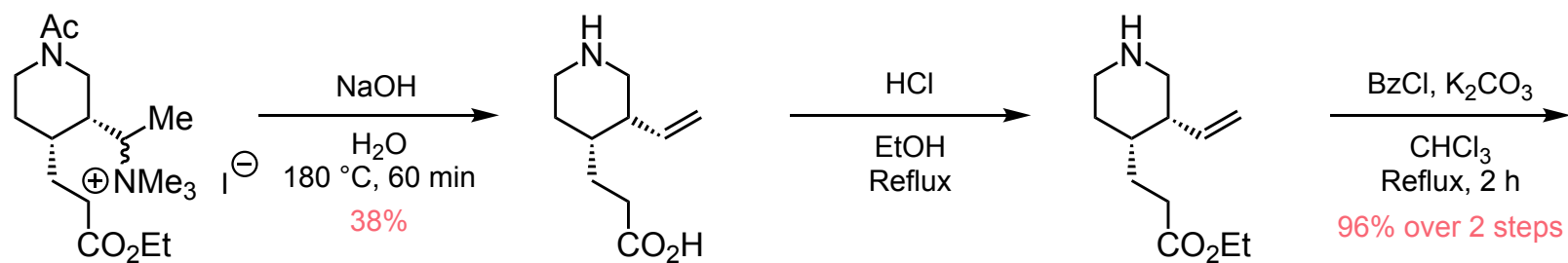
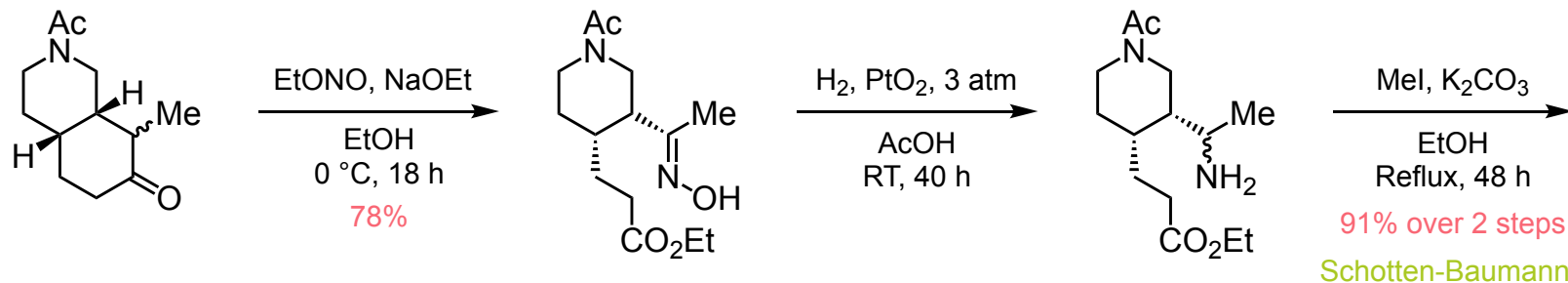
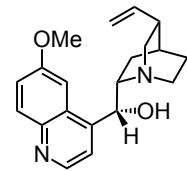
CC1=CC=C2C(=C1)C(=C(C=C2)O)CN3CCCC3C1=CC=C(C=C1)C
 $\xrightarrow[\text{MeOH, 40-50 } ^\circ\text{C}]{\text{Ac}_2\text{O}}$
CC1=CC=C2C(=C1)C(=C(C=C2)O)CN3CCCC3C1=CC=C(C=C1)C
 $\xrightarrow[\text{EtOH, 150 } ^\circ\text{C, 16 h}]{\text{H}_2, \text{Ni (Raney), 200 atm}}$
CC1=CC=C2C(=C1)C(=C(C=C2)O)CN3CCCC3C1=CC=C(C=C1)C
 $\xrightarrow[\text{AcOH, H}_2\text{O, 0-50 } ^\circ\text{C, ON}]{\text{CrO}_3}$
CC1=CC=C2C(=C1)C(=C(C=C2)O)CN3CCCC3C1=CC=C(C=C1)C

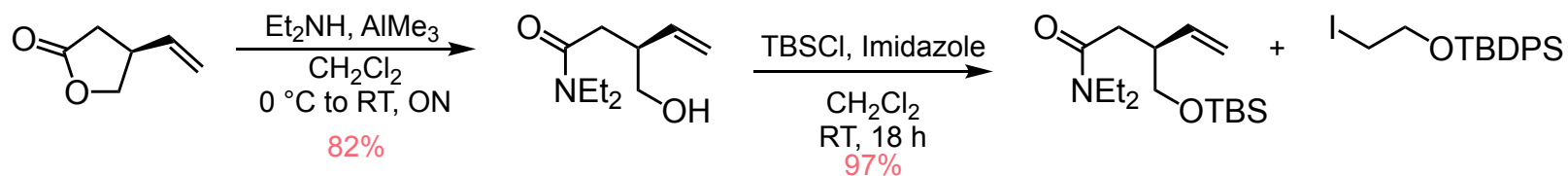
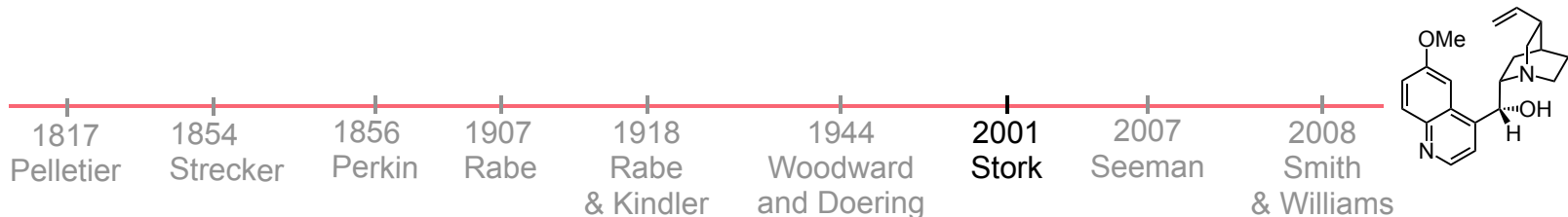
95%, over 2 steps
 65%
30% over 2 steps





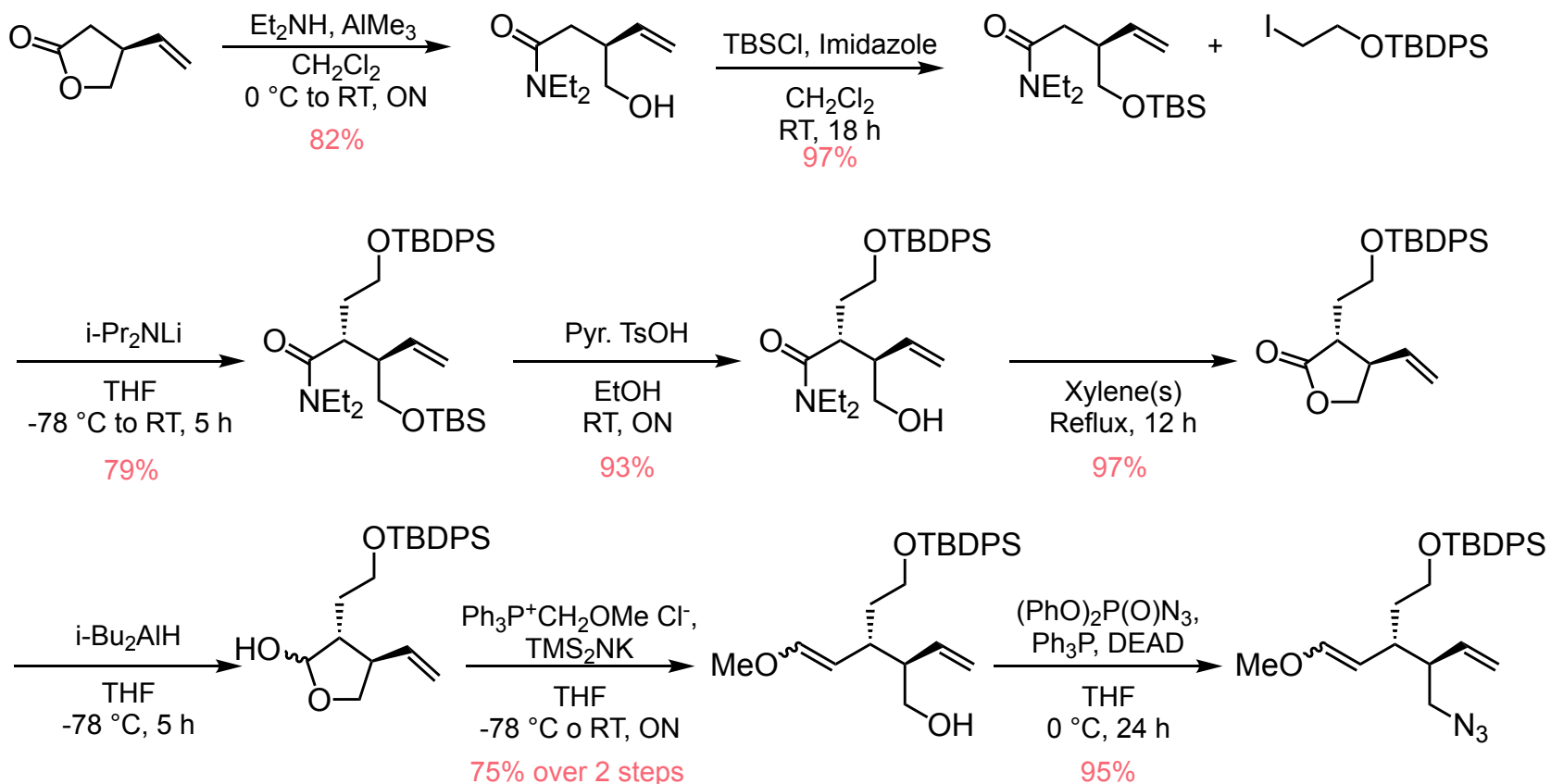
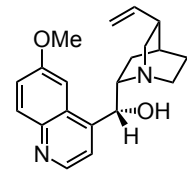
1817 Pelletier 1854 Strecker 1856 Perkin 1907 Rabe 1918 Rabe & Kindler 1944 Woodward and Doering 2001 Stork 2007 Seeman 2008 Smith & Williams

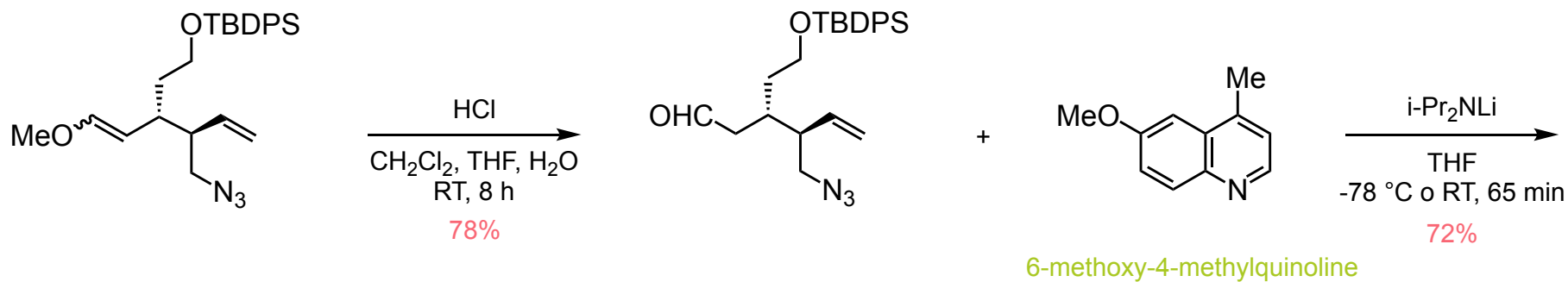
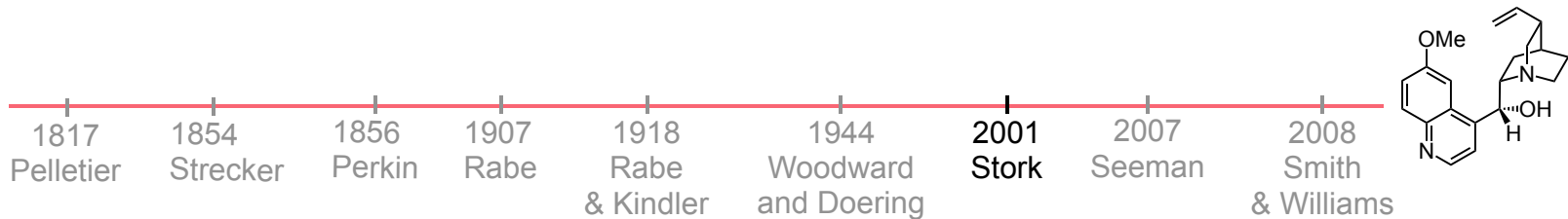






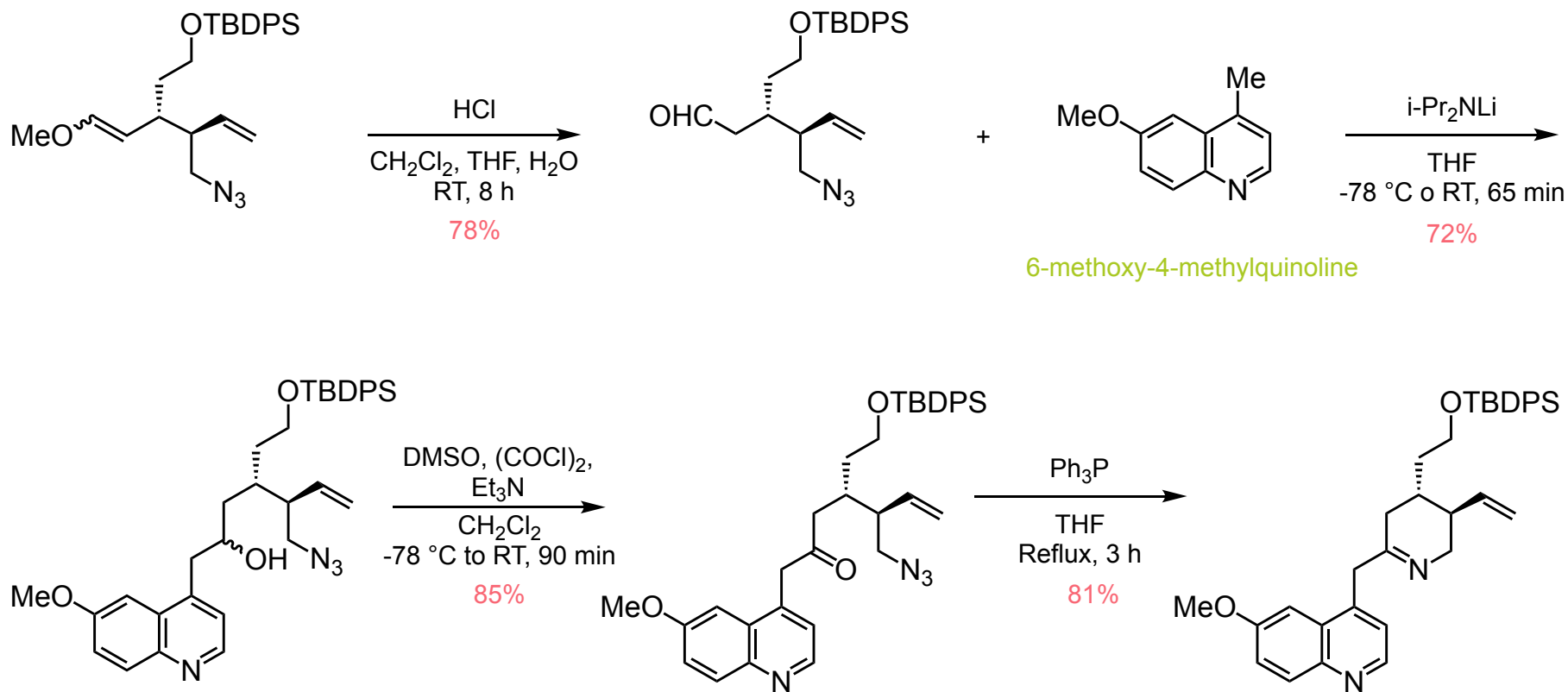
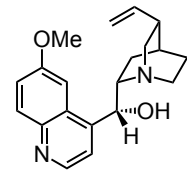
1817 Pelletier 1854 Strecker 1856 Perkin 1907 Rabe 1918 Rabe & Kindler 1944 Woodward and Doering 2001 Stork 2007 Seeman 2008 Smith & Williams

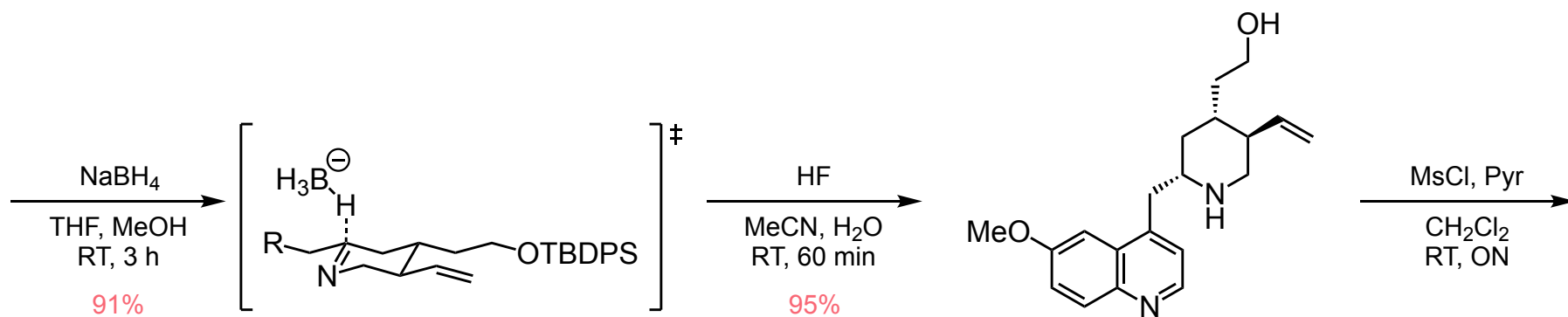
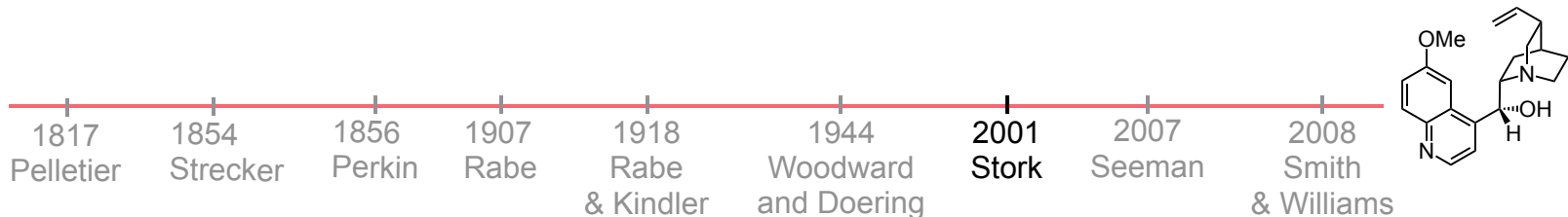






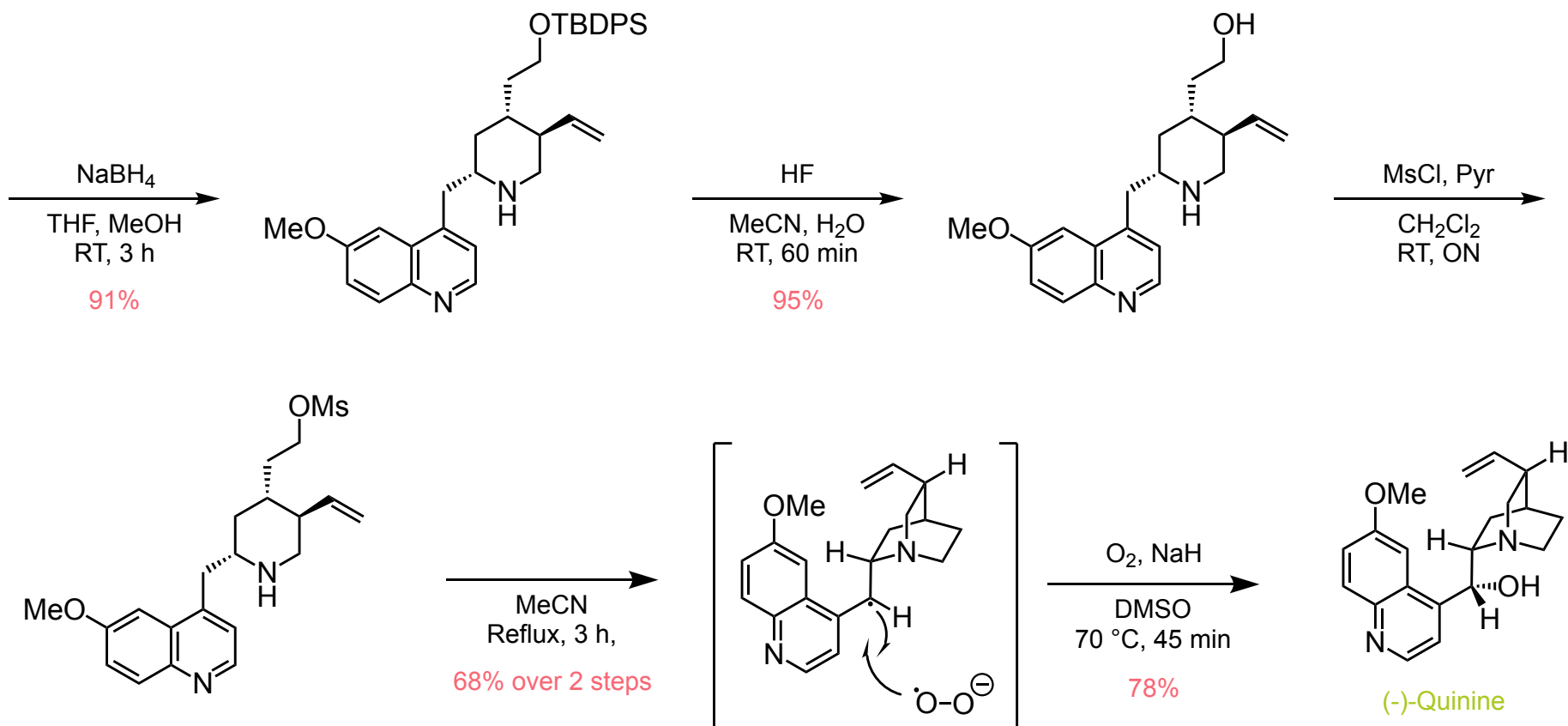
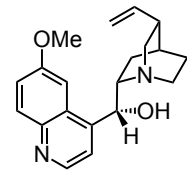
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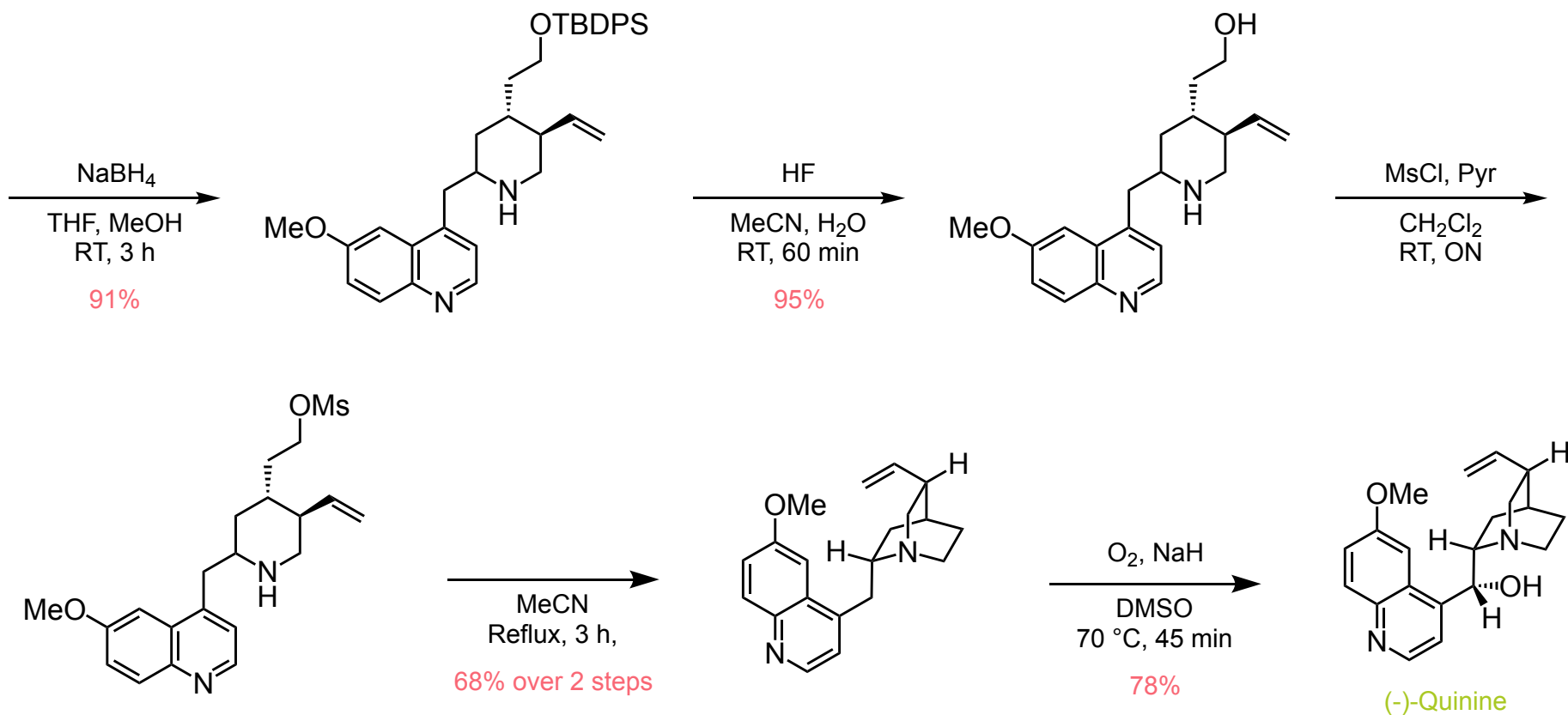
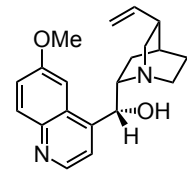
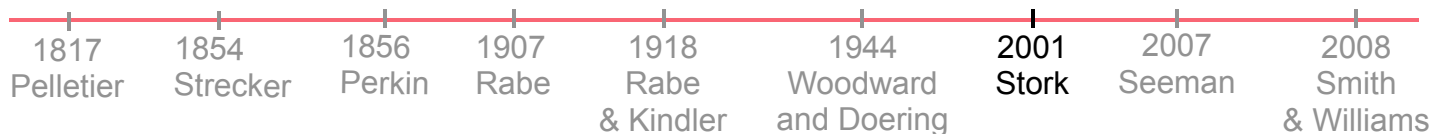


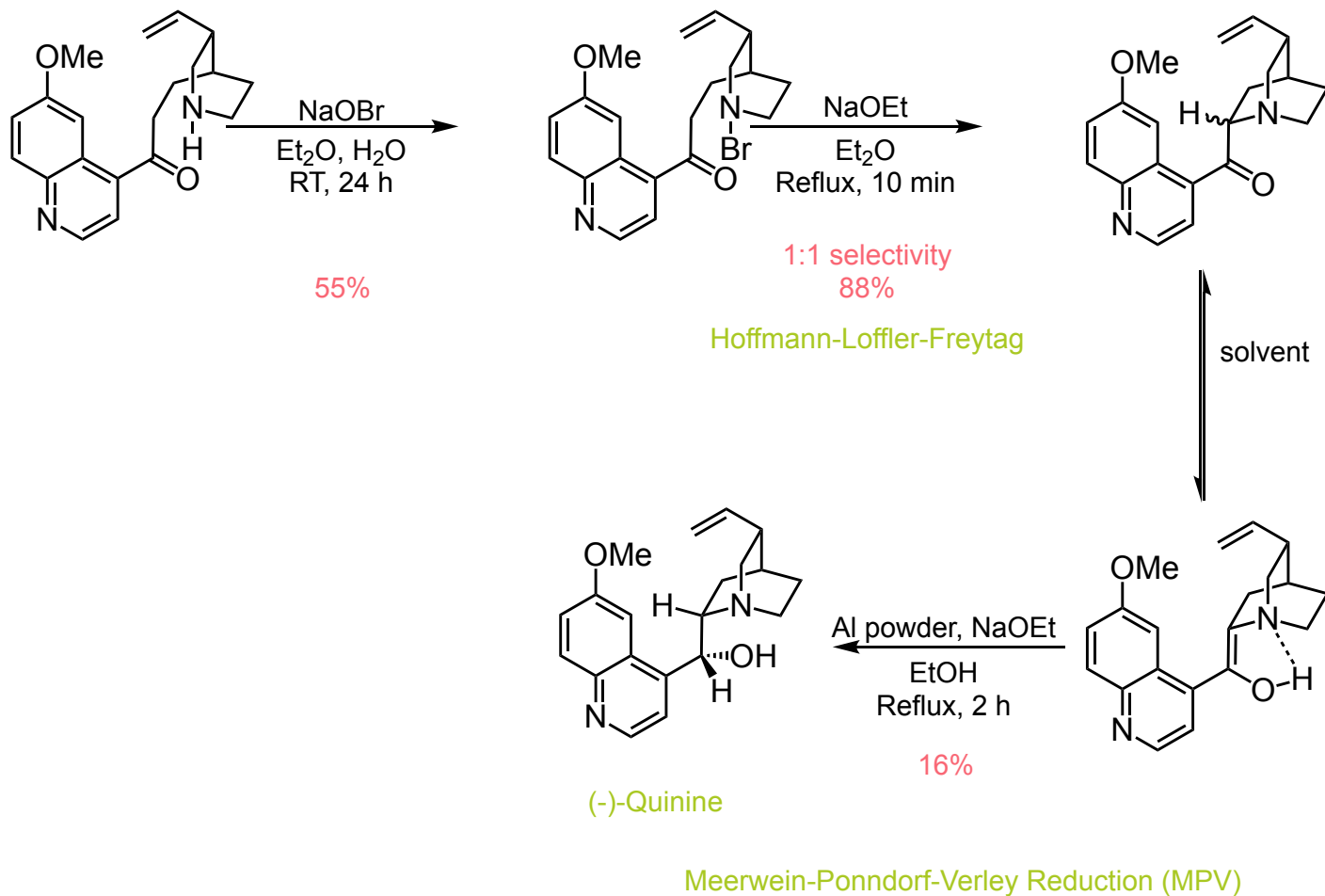
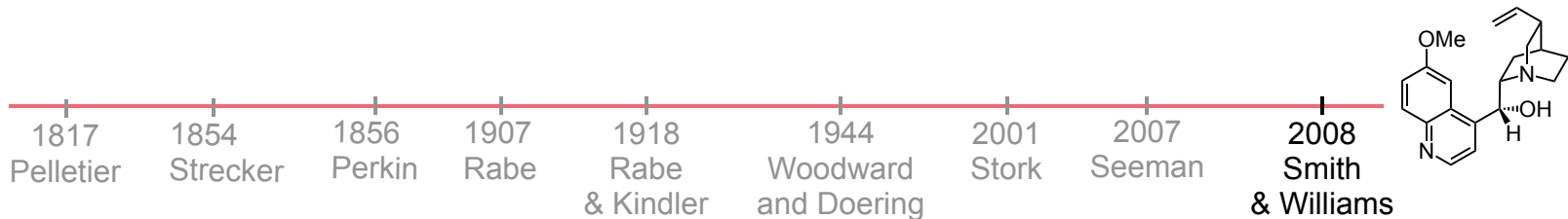


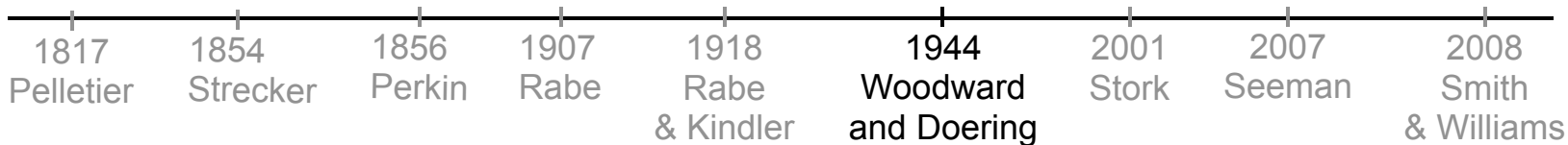
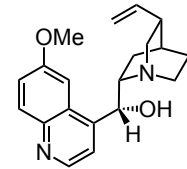


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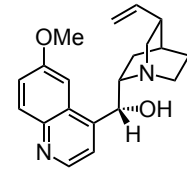
Woodward's Synthesis

18 total steps to quinotoxine

Overall yield : 0.6%

Not stereoselective

Conducted in time with no NMR, column chromatography, or other advanced tools



Woodward's Synthesis

18 total steps to quinotoxine

Overall yield : 0.6%

Not stereoselective

Conducted in time with no NMR, column chromatography, or other advanced tools

Stork's Synthesis

19 total steps to (-) - Quinine

Overall yield : 0.96%

First stereoselective synthesis of Quinine

