ROUTE SCOUTING

(aka RETROSYNTHETIC ANALYSIS)

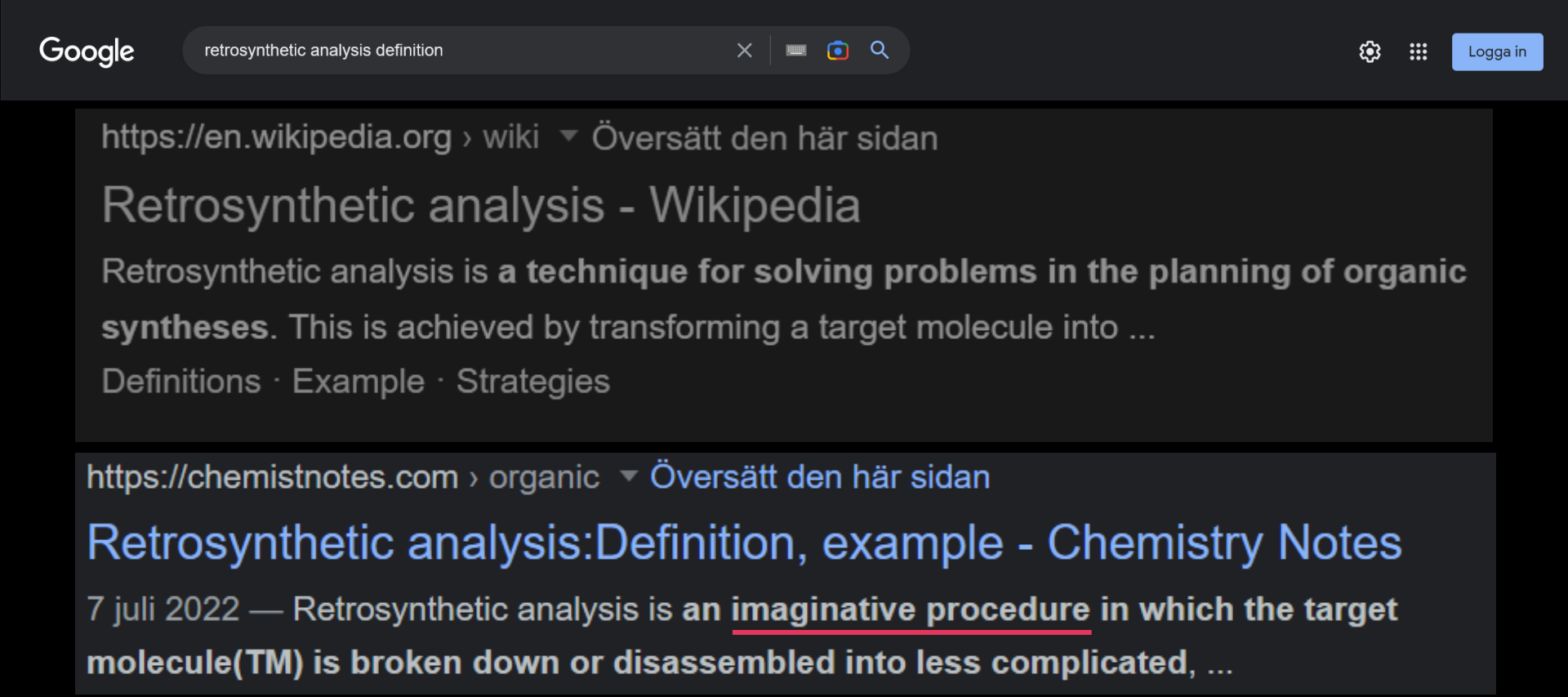
Google retrosynthetic analysis definition Logga in

https://en.wikipedia.org › wiki Översätt den här sidan

Retrosynthetic analysis - Wikipedia

Retrosynthetic analysis is **a technique for solving problems in the planning of organic syntheses**. This is achieved by transforming a target molecule into ...

Definitions · Example · Strategies


Google
retrosynthetic analysis definition
Logga in
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Retrosynthetic analysis - Wikipedia
Retrosynthetic analysis is a technique for solving problems in the planning of organic syntheses. This is achieved by transforming a target molecule into ...
Definitions · Example · Strategies
https://chemistnotes.com › organic Översätt den här sidan
Retrosynthetic analysis:Definition, example - Chemistry Notes
7 juli 2022 — Retrosynthetic analysis is an imaginative procedure in which the target molecule(TM) is broken down or disassembled into less complicated, ...

ROUTE SCOUTING

(aka RETROSYNTHETIC ANALYSIS)

ROUTE SCOUTING

REVOLUTION

revolution

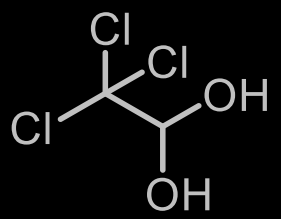
https://dictionary.cambridge.org/dictionary/english/revolution

revolution

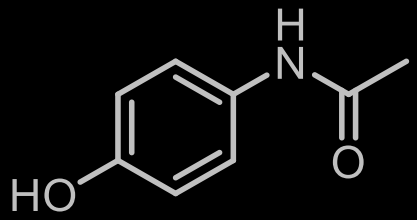
“…a sudden and great change…”

https://dictionary.cambridge.org/dictionary/english/revolution

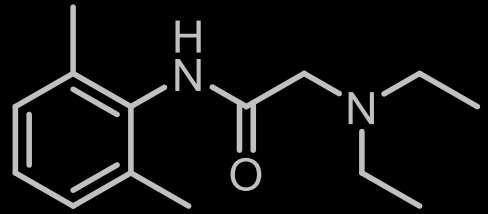
drug structures: evolution



CHLORAL HYDRATE
(1832)

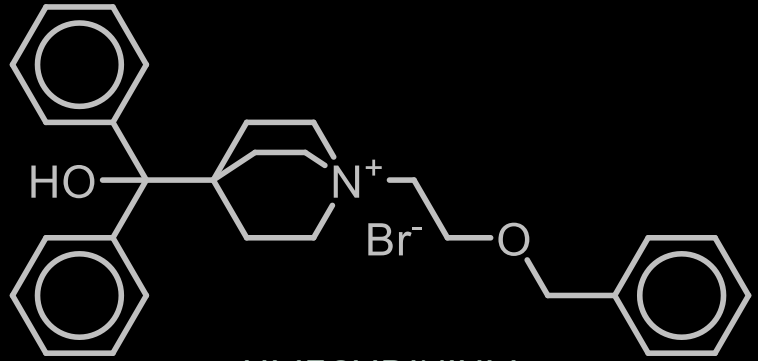


PARACETAMOL
(1877)



LIDOCAINE
(1943)

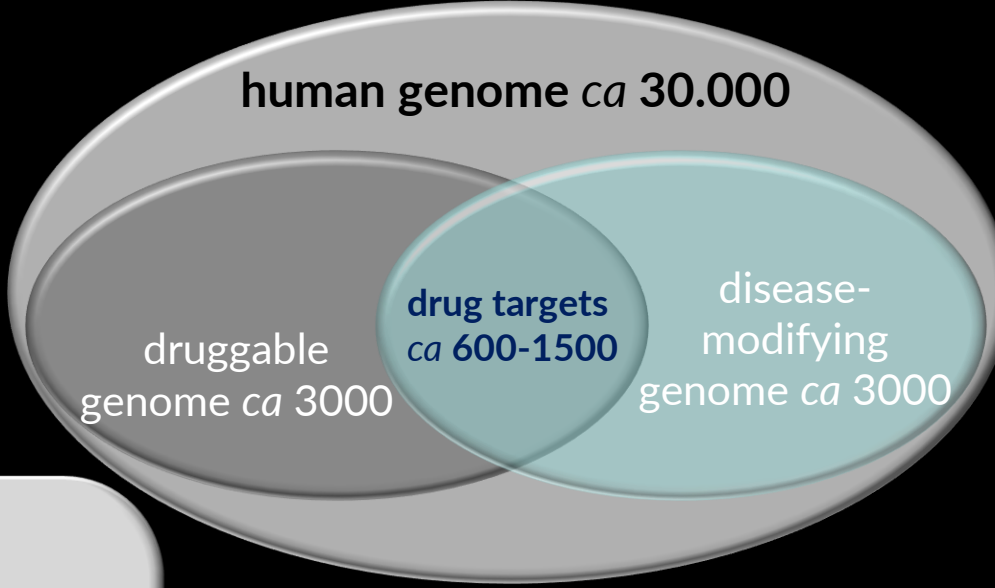
LINAGLIPTIN
(2006)

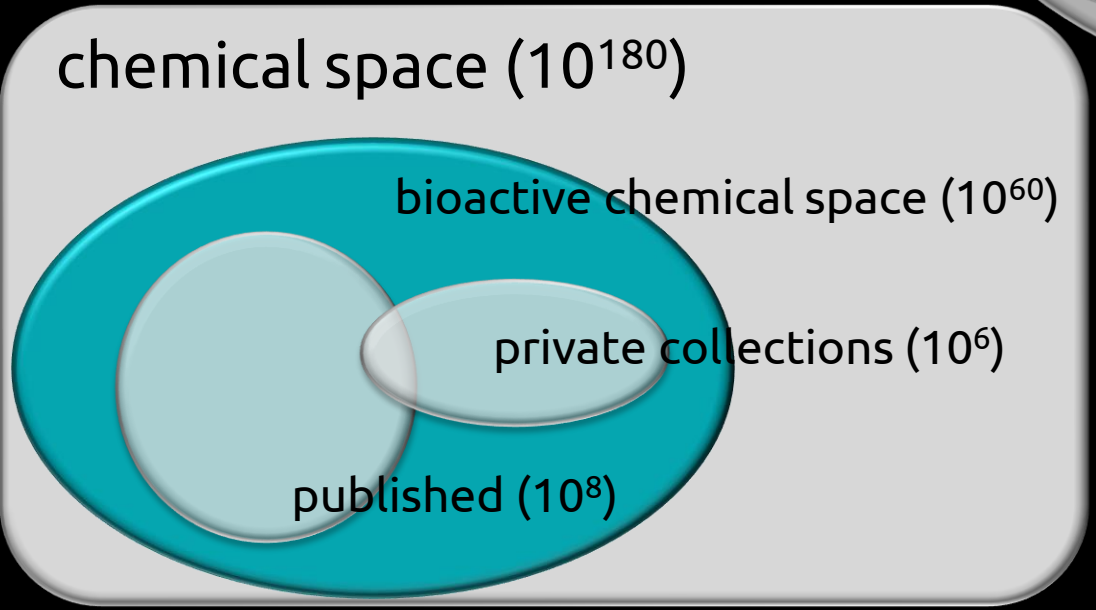


UMECLIDINIUM
(2014)

https://en.wikipedia.org/wiki/List_of_drugs_by_year_of_discovery

drug structures: evolution





the easy ones already exist

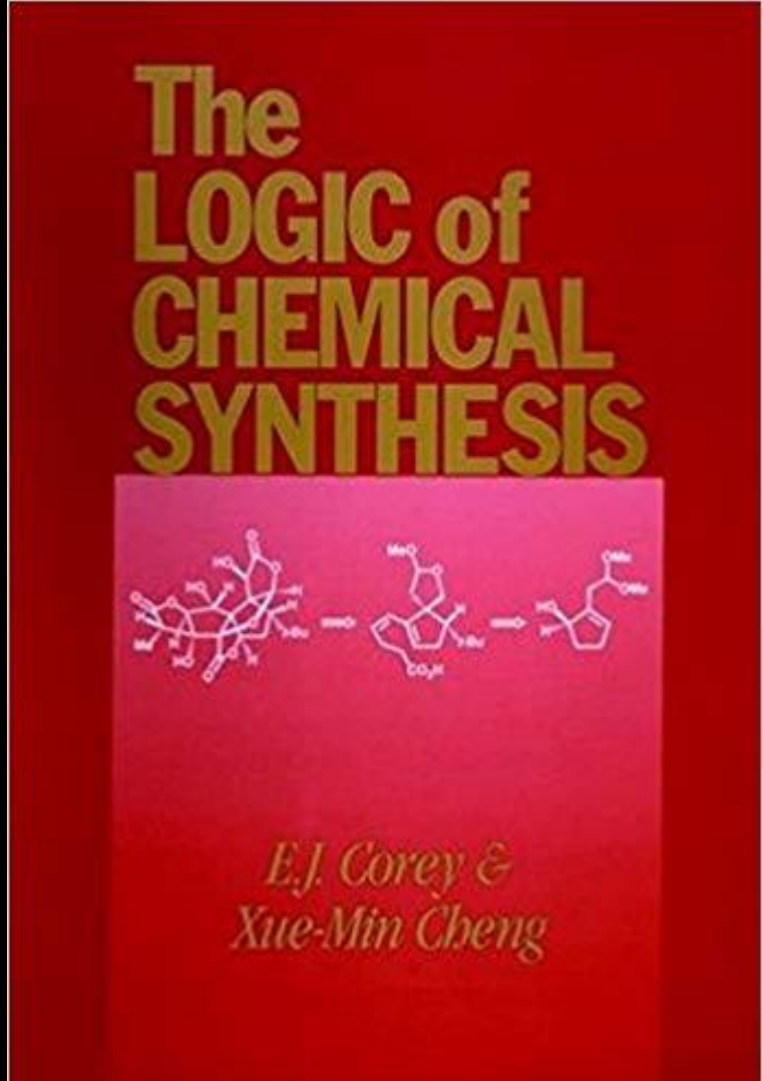
retrosynthetic analysis tools

Robert B. Woodward
(1917-1979)
(Nobel prize 1965)

Alexander R. Todd
(1907-1997)
(Nobel prize 1957)

retrosynthetic analysis is art

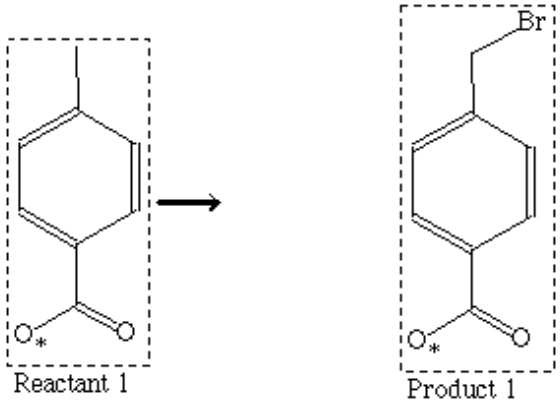
Elias J. Corey
(b. 1928)
(Nobel Prize 1990)



ROUTE SCOUTING

FIRST REVOLUTION

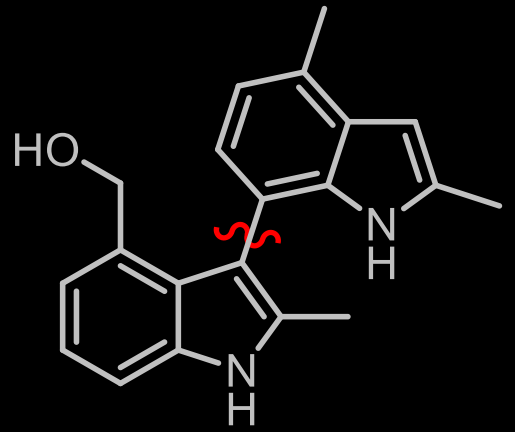
File Edit Task View Options Editmode Query Window Help



CrossFire Beilstein (**1994**)

how is it done today?

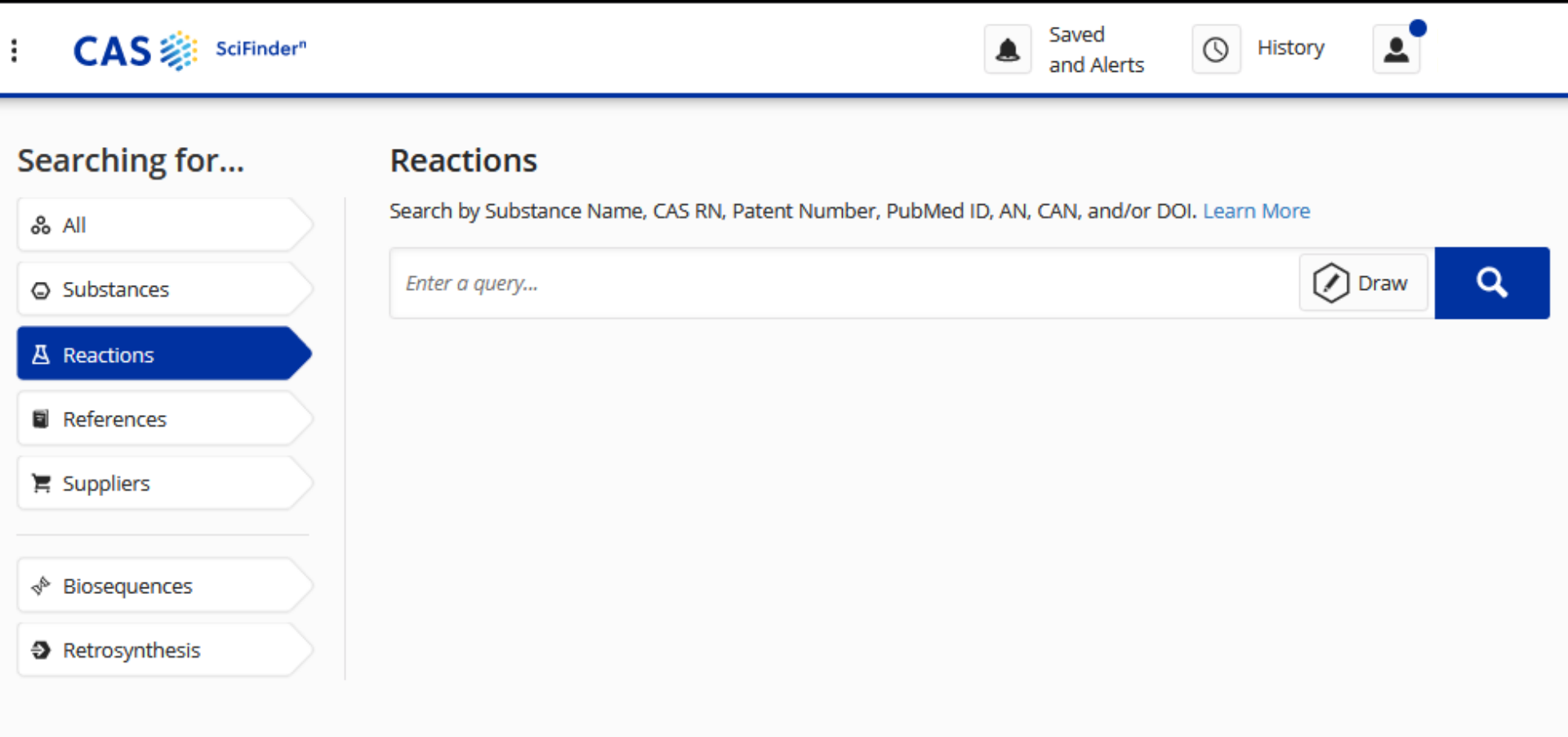
target molecule



(2,2',4'-trimethyl-1H,1'H-[3,7'-biindol]-4-yl)methanol

ROUTE SCOUTING TOOLS

i&OS


CAS SciFinder
Saved and Alerts
History
Searching for...
All
Substances
Reactions
References
Suppliers
Biosequences
Retrosynthesis
Reactions
Search by Substance Name, CAS RN, Patent Number, PubMed ID, AN, CAN, and/or DOI. Learn More
Enter a query...
Draw

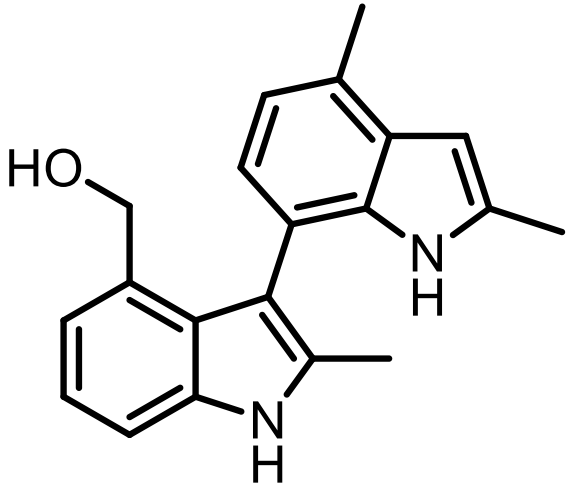
CAS

Account

CAS Draw

Enter a CAS Registry Number, SMILES, or InChI...

Draw or change atoms or bonds.



Molecular Formula:

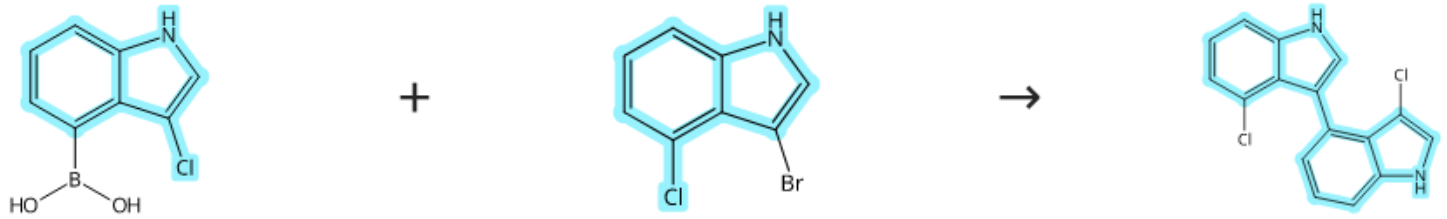
C

Zoom: 100%

OK

Cancel

Scheme 1 (1 Reaction) Steps: **1** Yield: **55%**



Suppliers (34)

Reaction Summary Steps: **1** Yield: **55%**

1.1 Reagents: Potassium carbonate
Catalysts: Tetrakis(triphenylphosphine)palladium
Solvents: Tetrahydrofuran, Water; 5 h, 70 °C

View Reaction Detail

Preparation of fused indole derivatives as organic electronic device materials

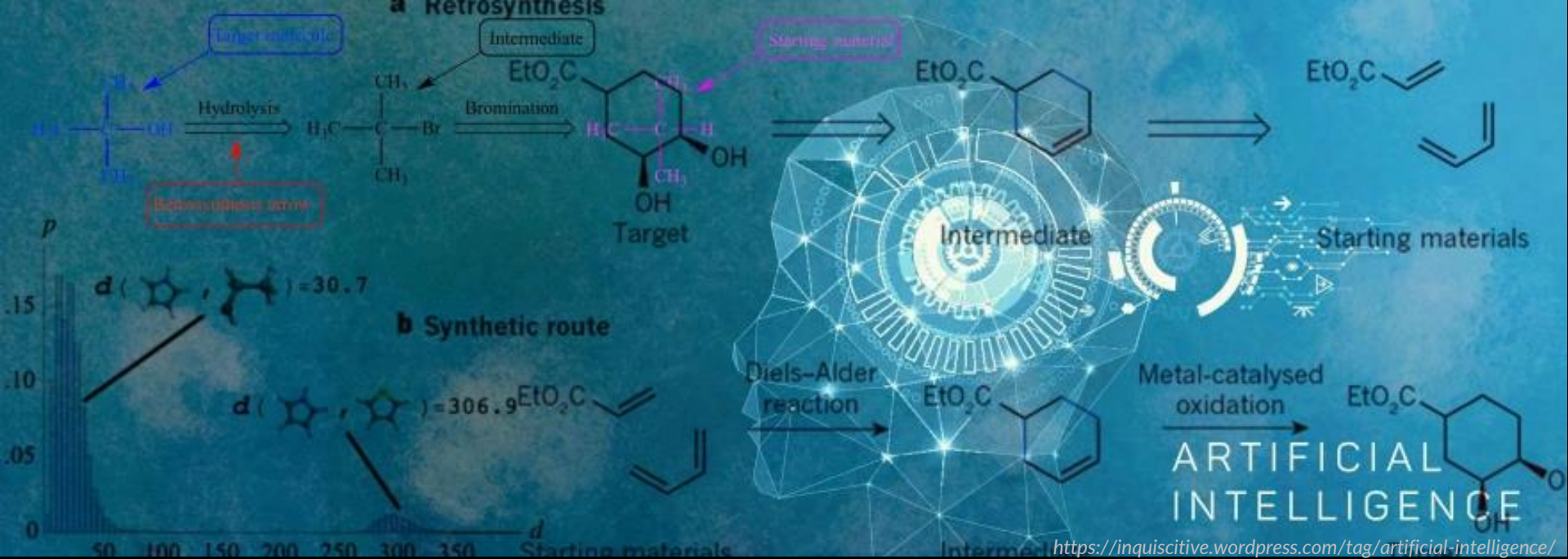
By: Choi, Don Su
Korea, Republic of, KR2175379 B1 2020-11-09

PATENTPAK Full Text

ROUTE SCOUTING

REVOLUTION

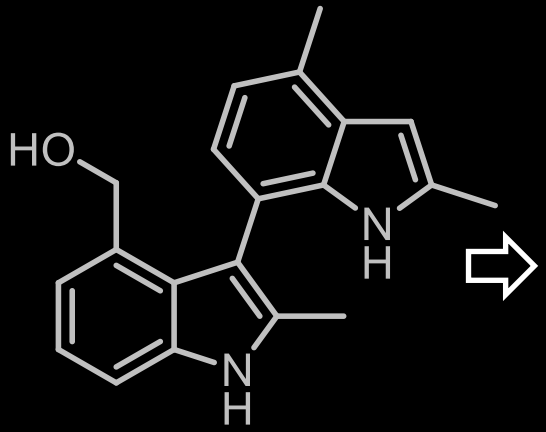
“a sudden and great change”

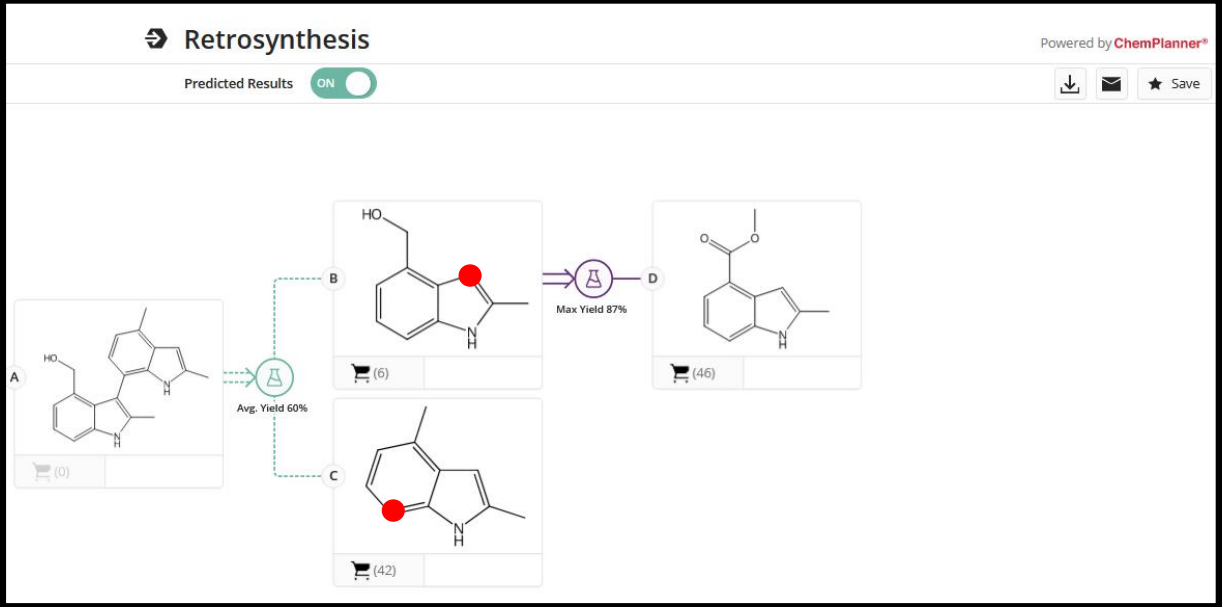


https://inquiscitive.wordpress.com/tag/artificial-intelligence/

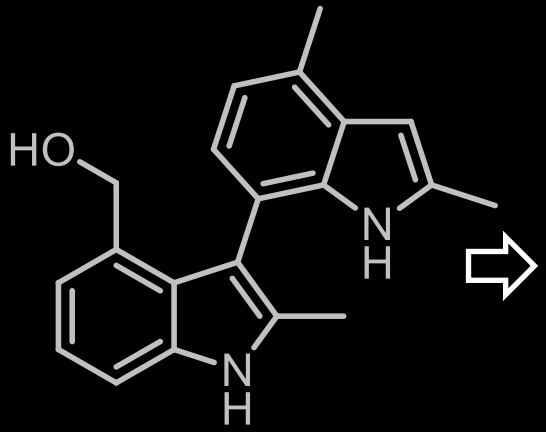
computer aided synthesis design (CASD)

- LHASA
- SYNCHEM
- COMPASS
- WODCA
- SST
- KOSP
- HORACE
- AIZynthfinder
- SECS
- FLAMINGOES
- EROS
- SYNGEN
- CHIRON
- ARChem / ChemPlanner
- IC*SYNTH*
- ASKCOS





ROUTE SCOUTING TOOLS



Retrosynthesis

Powered by ChemPlanner®

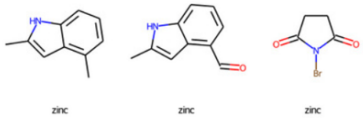
Predicted Results ON

Save

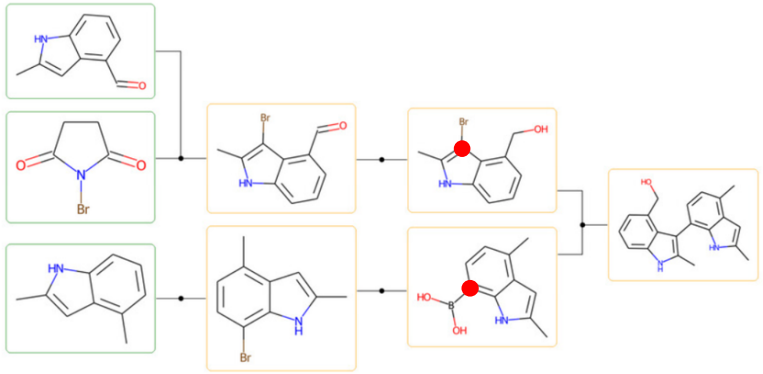
AIZynthfinder

(test version; limited “policies” and resource databases (e.g.: s/ms only ZincDB)). Time taken: < 5 mins

Compounds to Procure

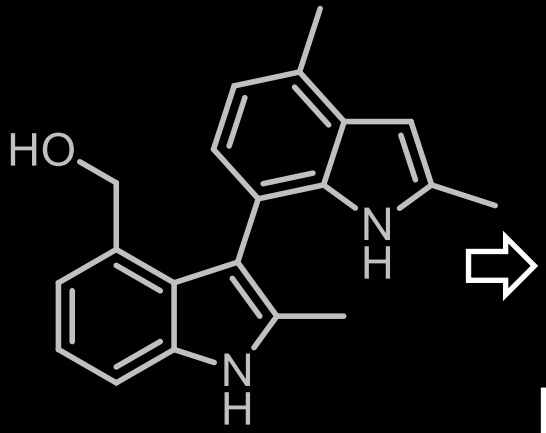


Steps



ROUTE SCOUTING TOOLS

i&OS



Retrosynthesis

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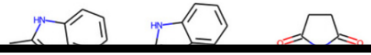
Compounds to Procure

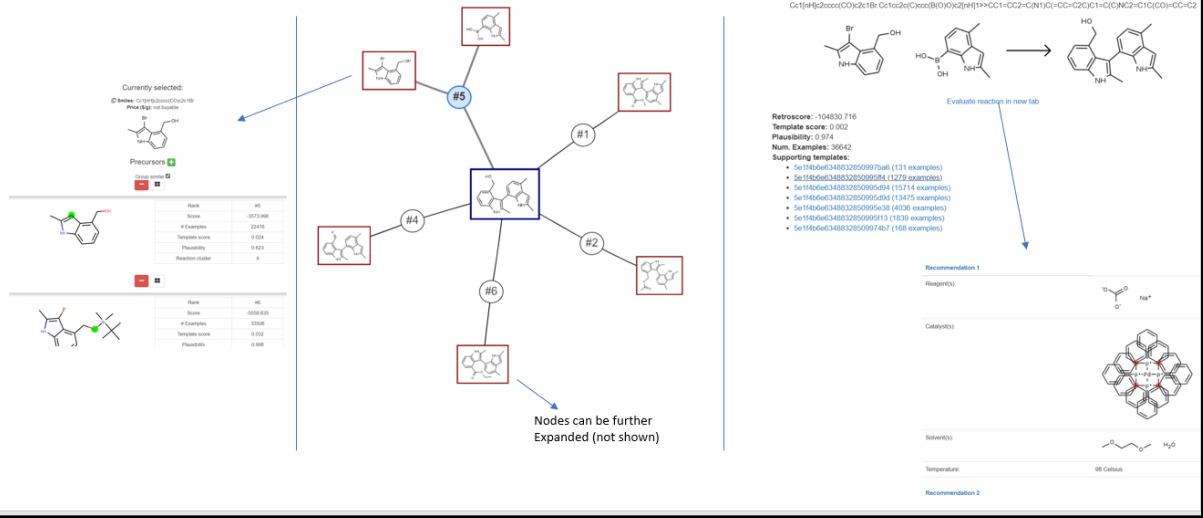


ASKCOS

Open source software tools for organic synthesis

Site by MIT offering some of their published analysis approaches (based on Reaxys)

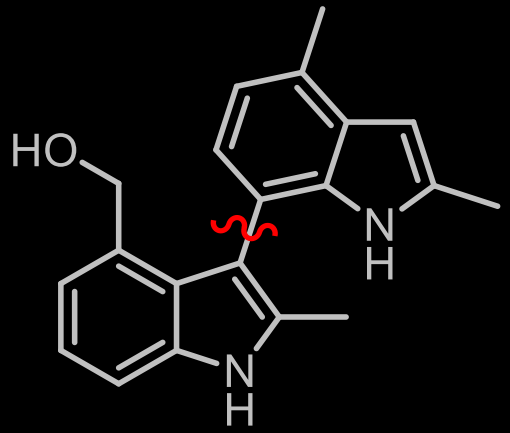
Interactive Path Planning:



Synthetic Experts

SciFinder

ChemPlanner

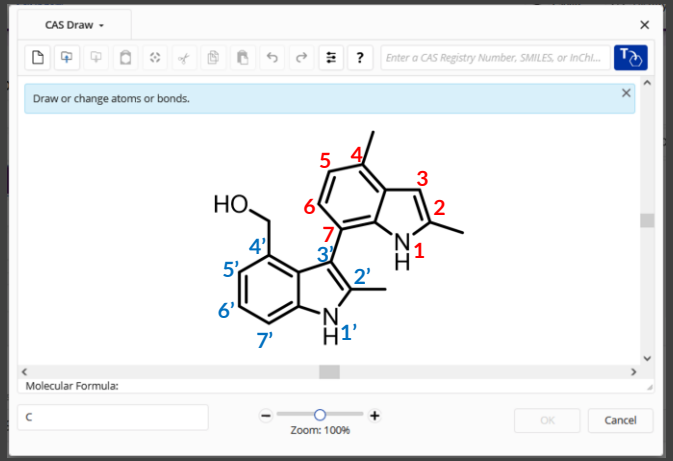


AIZynthfinder

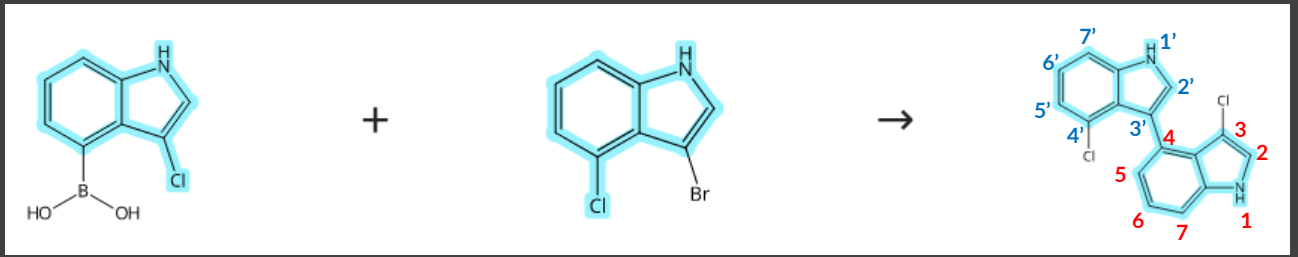
ASKCOS

ROUTE SCOUTING TOOLS

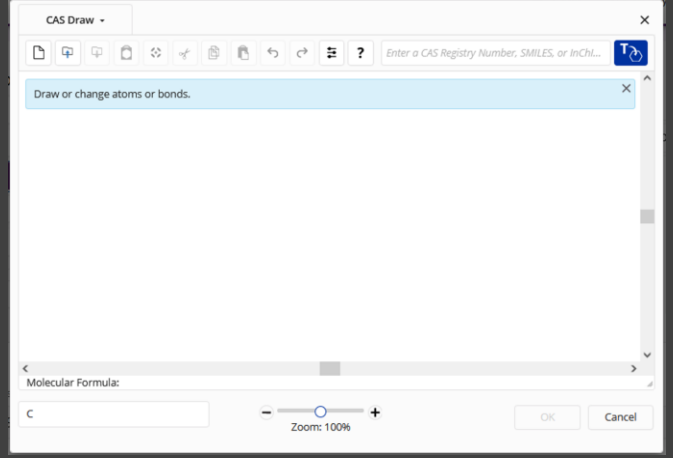
I&OS



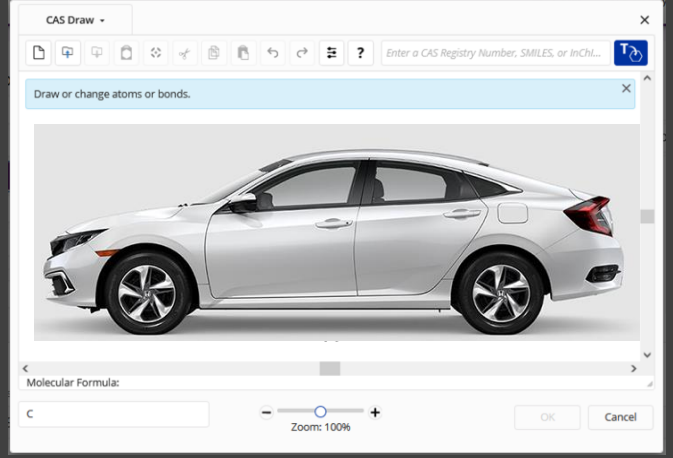
similarity based



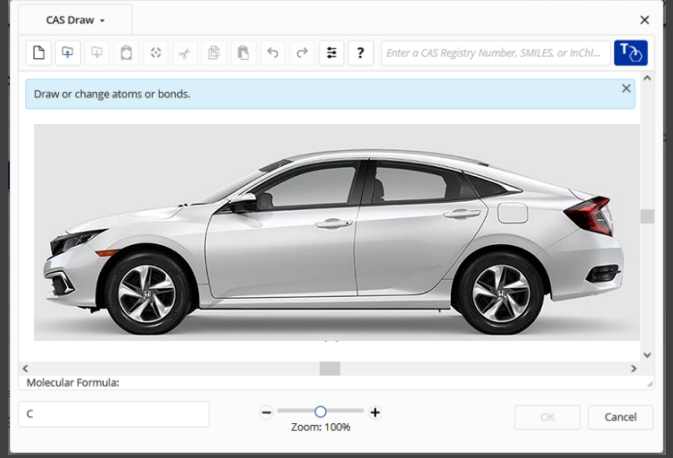
there's something about
similarity



there's something about
similarity

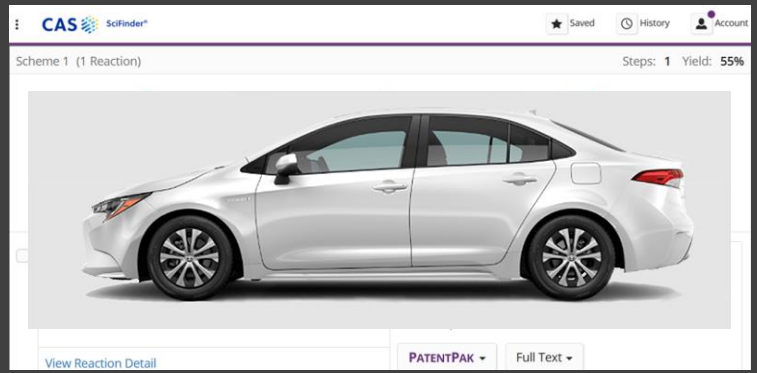


there's something about ***similarity***



Similarity based on:

- SAME SHAPE (IMAGE)
- SAME FUNCTIONALITY



there's something about
similarity

Similarity ”only” based on:

- SAME SHAPE (IMAGE)

they look the same, but one of them cannot sing

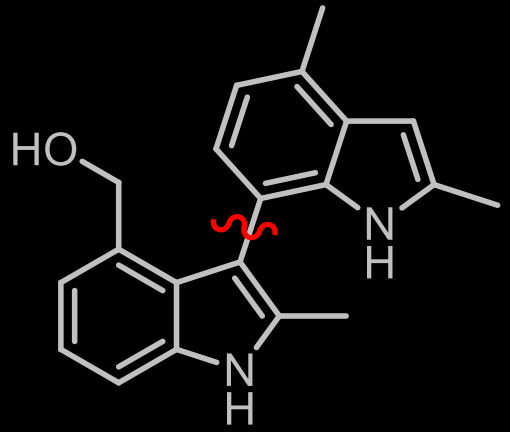
SIMILARITY IS NOT ALL

(in organic synthesis)

Synthetic Experts

SciFinder

ChemPlanner



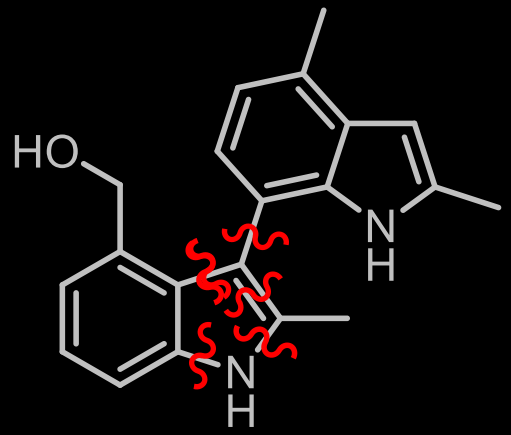
AIZynthfinder

ASKCOS

is that it?

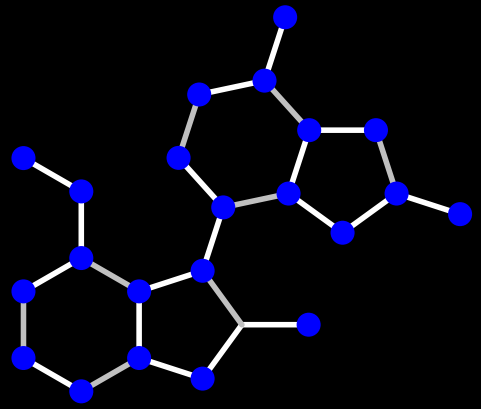
ROUTE SCOUTING

finding transformations



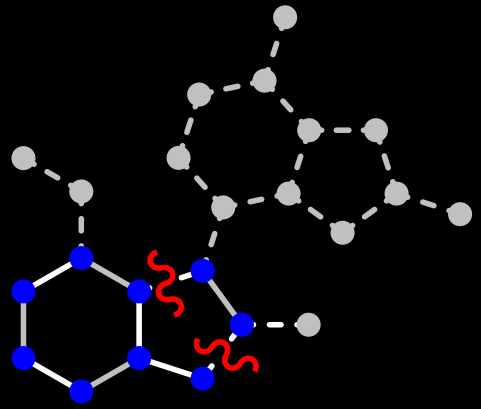
ROUTE SCOUTING – i&o s ROUTINE

molecular (sub)graph

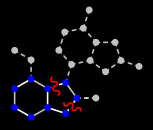


ROUTE SCOUTING – i&o s ROUTINE

molecular (sub)graph



ROUTE SCOUTING – i&o s ROUTINE



for each disconnection

SUGGESTED

$A + B \rightarrow P$

fragment score

R-group score

similarity

transform descriptors

reaction descriptors

REPORTED

$A_1 + B_1 \rightarrow P_1$

$A_2 + B_2 \rightarrow P_2$

$A_3 + B_3 \rightarrow P_3$

.....

$A_j + B_j \rightarrow P_j$

ROUTE SCOUTING – i&o s ROUTINE

semi automatic process

```
SMILES in column one or two. Any additional columns are dropped.

:param file_name: (incl path)
:param delimiter:  optional
:param header: None, False, True (enforces): row 0. False auto detects line 0 vs 1 if header or not
:return: pandas table w smiles in first column & whatever identifier named as 'ID'
"""
if header is None:
    header = False  # due to later analysis

if not header:
    # a form of header auto detection, but only for first line.
    with open(file_name) as file_in:
        first_line = file_in.readline().split()
    first_col = first_line[0]
    # check if more than just one column
    if len(first_line) > 1:
        second_col = first_line[1]
    else:
        second_col = "dummy"
    # finally auto set header true/false
    if is_smiles(first_col) or is_smiles(second_col):
        header = False
    else:
        header = True

if not header:
    df = pd.read_csv(file_name, sep=delimiter, header=None, dtype=None)
else:
    df = pd.read_csv(file_name, sep=delimiter, header=0, dtype=None)
    header = True  # revert value for later analysis

# determine smiles or text for cells 0,0 and 0,1
_loc00 = is_smiles(df.iloc[0][0])  # smiles or text
if len(df.columns) >= 2:
    # we don't want here other columns. becomes too much.
    df.drop(df.columns[2:], axis=1, inplace=True)
    _loc01 = is_smiles(df.iloc[0][1])  # smiles or text

# create artificial name
if len(df.columns) == 1:
    df[1] = "Mol" + df.index.astype(str)
    _loc01 = False
    if not _loc00:
        # loc00 is not a string, but contains the header name of the smiles
        # N.B.: we don't have headers yet; they will be moved up later, thus overwrite cell 0,1
        df.iloc[0, 1] = "ID"
    if header:
```

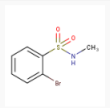
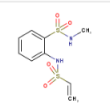
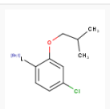
- KNIME
- Python

Show 10 entries Search:

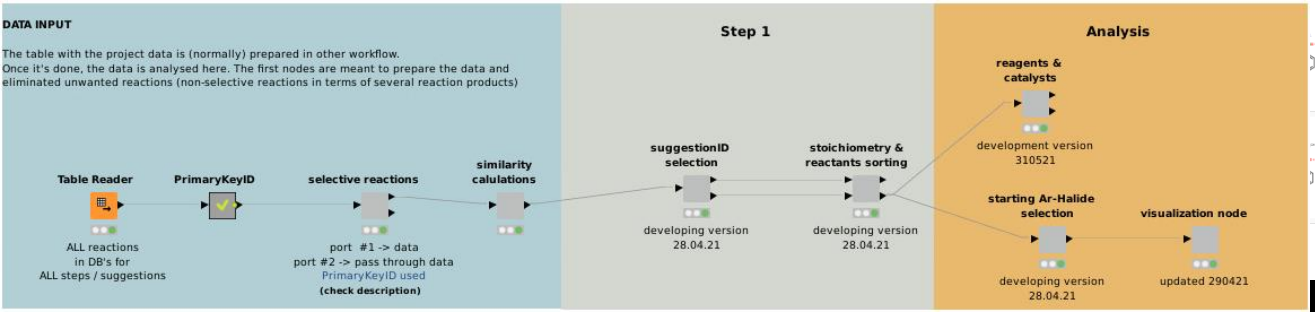
	# examples w desired similarity	Max*(similarity)	similarity cut-off	Mean(yield)	Unique count*(yield)	suggestionID
☐	123	0.7735849022865295	0.4	63.94949494949498	58	2.1
☐	1179	0.6515151262283325	0.4	75.4689655172414	57	2.2
☐	55	0.7909091114997864	0.4	53.99999999999998	28	2.3
☐	9	0.4447761178016662 6	0.4	30	1	2.4
☐	20	1	0.4	51.5	18	2.5

Showing 1 to 5 of 5 entries Previous 1 Next

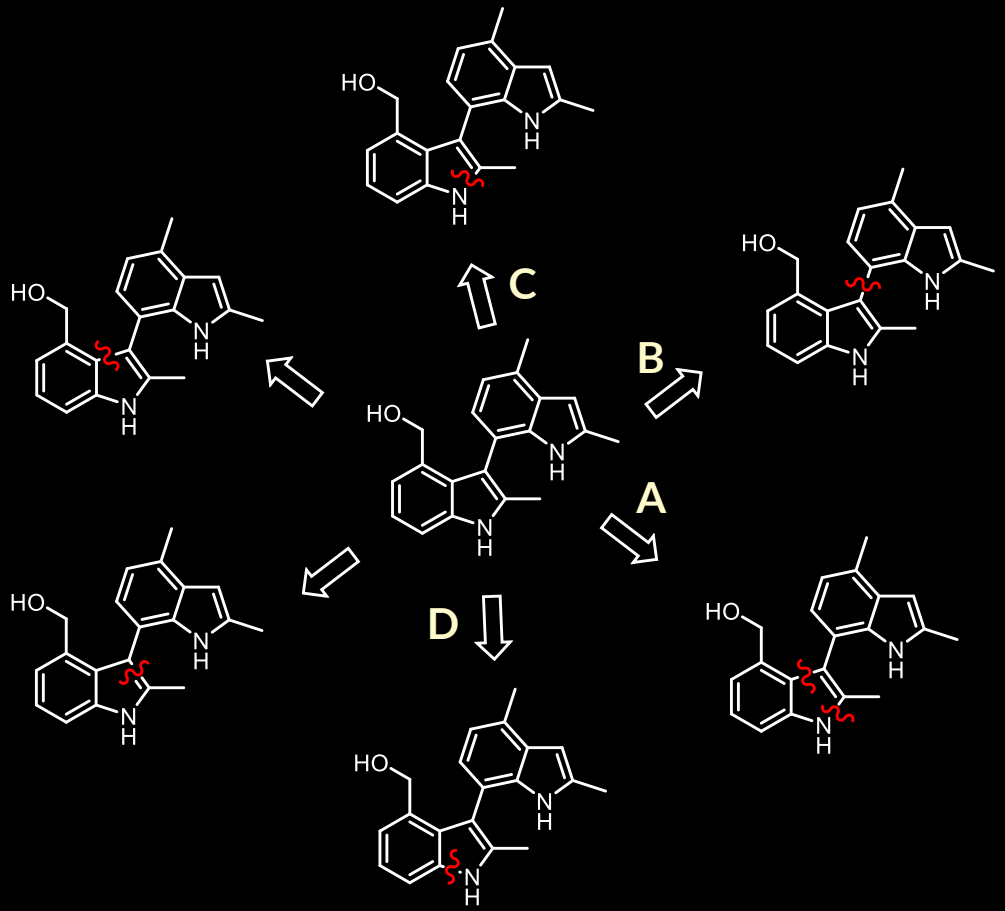
Show 10 entries Search:

	comments	desired_product_struc	wrong substitution pattern (P)	# examples w right subst. pattern	Mean(yield)	suggestionID
☐	key structural motifs present in the suggestion step		1	547	64.88617886178862	2.1
☐	key structural motifs present in the suggestion step		33	1856	67.87227414330219	2.2
☐	key structural motifs present in the suggestion step		0	363	54.412500000000016	2.3
			0	33	43.5	2.4
			0	20	51.5	2.5

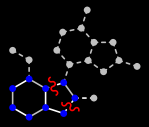
Previous 1 Next



(*almost*) all synthetic alternatives



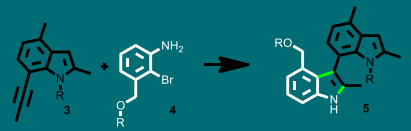
from computer *to* lab bench

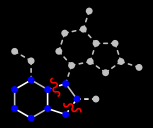


reported reactions

suitable reaction conditions

suggested reaction





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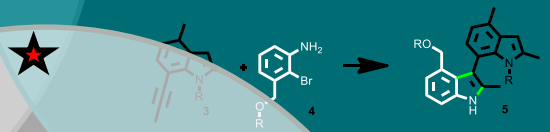


molecular descriptors

mining

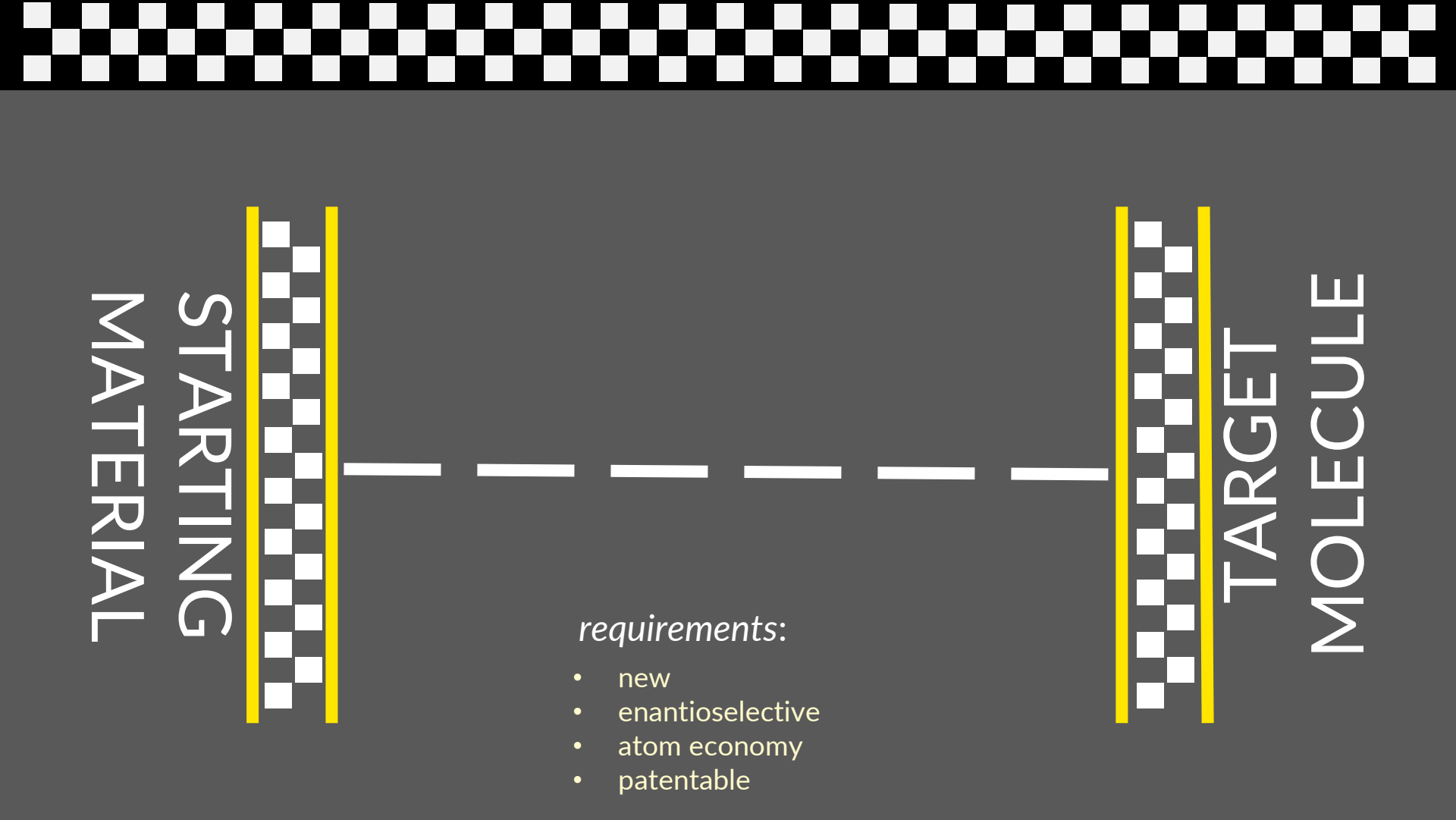
- cost efficient
- less waste
- increased successful outcome

WHY?

STARTING MATERIAL → → → → → TARGET MOLECULE

requirements:

- new
- enantioselective
- atom economy
- patentable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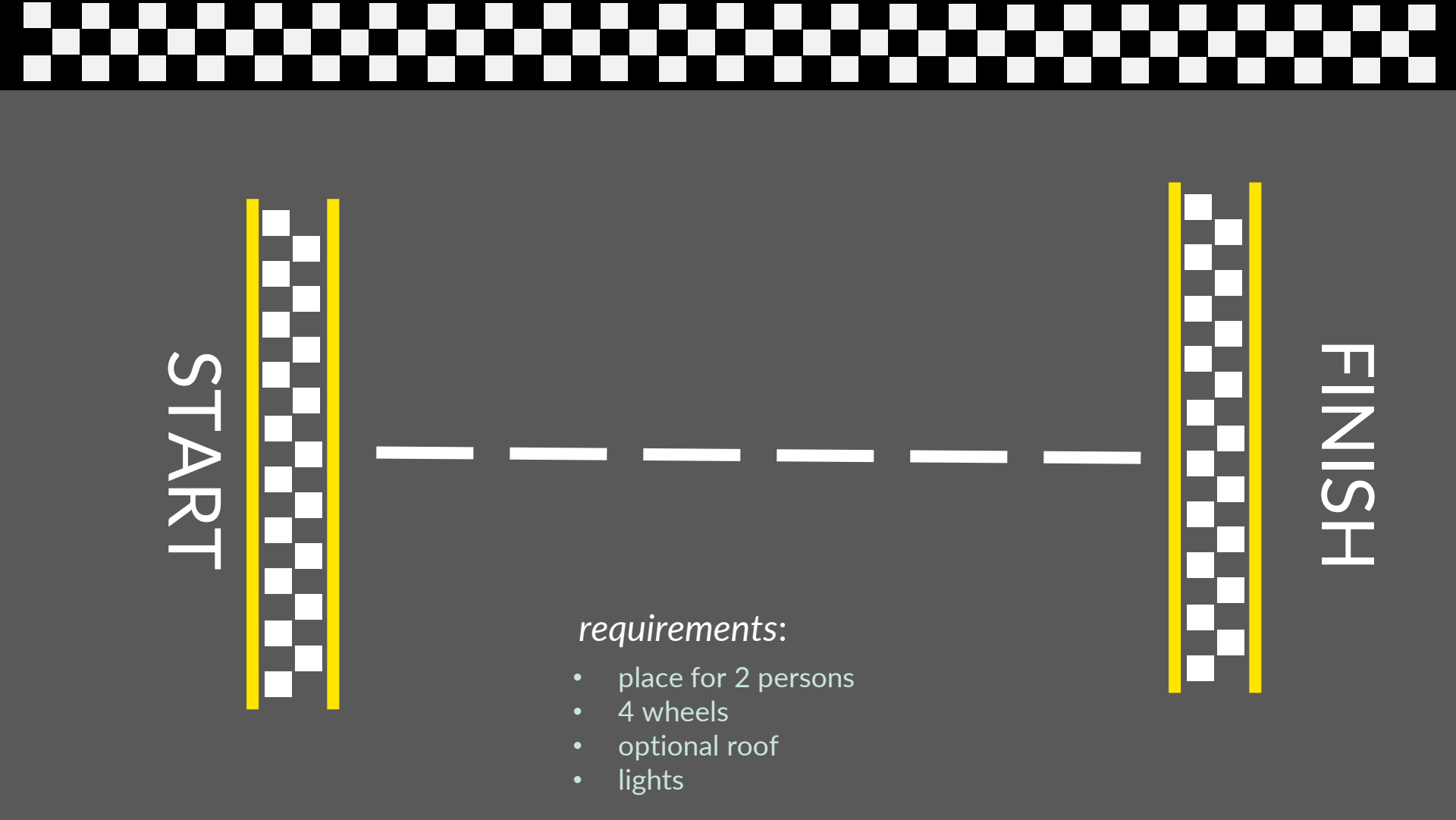
START
FINISH
requirements:
- place for 2 persons
- 4 wheels
- optional roof
- lights

START

FINISH

requirements:

- place for 2 persons
- 4 wheels
- optional roof
- lights

START

FINISH

requirements:

- place for 2 persons
- 4 wheels
- optional roof
- lights


THANK YOU
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