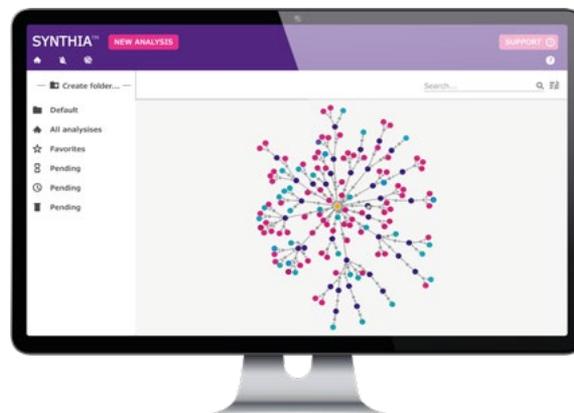


# RetroSynthetIQ

# SYNTHIA™

## Retrosynthesis Software



Newsletter 2023 • Volume 2 • Issue 1

### The Distillate

#### Computational planning of the synthesis of complex natural products

In this Nature paper from 2020, researchers showcased advances in computer-aided synthetic design. Prior to publication, no algorithm had yet been able to design plausible routes to complex natural products, which require multi-step planning.

The authors demonstrated that such computational synthesis planning is possible, provided the program's knowledge of organic chemistry and data-based AI are augmented with causal relationships, allowing it to 'strategize' over multiple synthetic steps. The routes designed, three of which were validated in the lab, were mostly indistinguishable from those designed by human experts in organic synthesis.

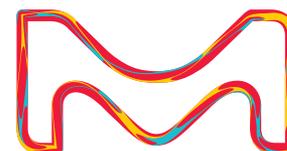
Earlier programs were designed to only 'think' one step at a time and were limited to simple targets which could easily be designed by human chemists without

computer assistance. Until this work, no algorithm had yet been able to design plausible routes to complex natural products.

Over the last decade, the authors have been developing a hybrid expert-AI system, SYNTHIA™ Retrosynthesis Software, due to the fact that purely data-oriented artificial intelligence (AI) approaches are not adequate to plan syntheses of complex targets. SYNTHIA™ now knows more than 100,000 expert-coded rules which include stereoselective and scaffold-directed transformations.

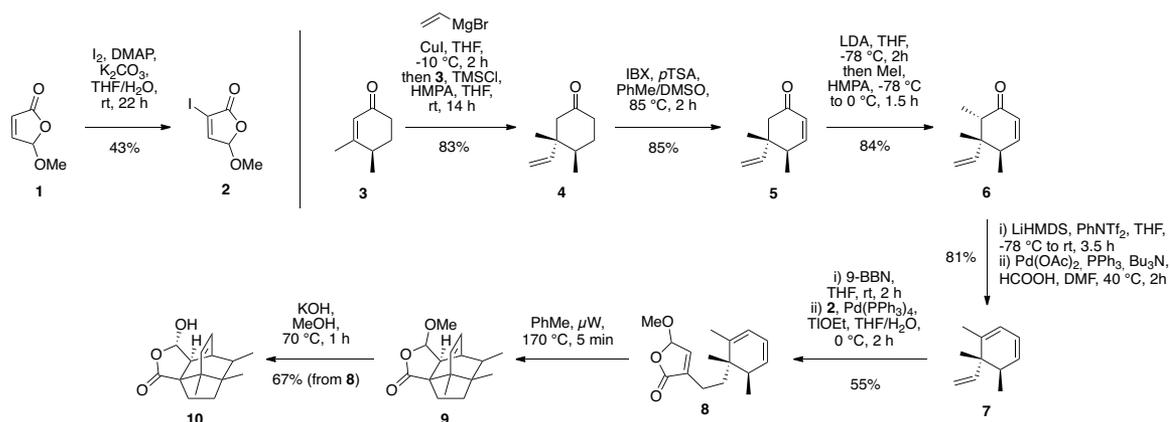
These high-quality rules which generate specific retrons (or synthons) has been refined by the addition of filters which evaluate chemical reaction locations by using either machine-learning or quantum-chemistry methods.

[Read it here](#)



## GET YOUR SYNTHON

### Synthesis of a Bridged Polycycle Sesquiterpene: Lamellodysidine A



The synthesis of natural products in many cases is a challenging task due to the presence of complex 3D carbon scaffolds and a variety of functional groups. Lamellodysidine A is one of the recently reported bridged polycyclic sesquiterpenes with a unique carbon framework. This intriguing molecule was analyzed by *SYNTHIA™ Retrosynthesis Software*, which identified a pathway with an intramolecular Diels-Alder reaction as a key step.

Notably, the software correctly predicted the stereochemistry of the Diels-Alder cycloadduct and the selective formation of the thermodynamically more stable and less hindered stereoisomer in the last step. The route was successfully executed in the laboratory and showed the utility of retrosynthetic software for planning syntheses, even for challenging targets.

[Read it here](#)

## DID YOU KNOW?...

### Natural Product Settings - Power Search

Take advantage of the advanced algorithms described in the Nature paper discussed above by using the *Natural Products* search configuration in SYNTHIA™. Enable the *Power Search* function within SYNTHIA™ to plan routes to complex molecules. This function develops synthetic disconnections simultaneously over multiple reaction steps.

Saved Configurations ⓘ Natural Products ⚙️

**STOP CONDITIONS** **PATH RANKING**

**Options**

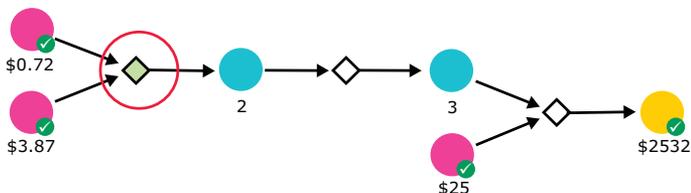
- Plan strategic two-step reaction sequences ⓘ
- Allow multiple identical retrosynthetic disconnections in one step ⓘ
- Build heterocycles from scratch ⓘ
- Exclude diastereoselective reactions ⓘ
- Power Search ⓘ

## DEVELOPER UPDATES – SYNTHIA™ 6.5

### Easily Visualize Published Reactions in Synthetic Pathways

In the next release of SYNTHIA™ Retrosynthesis Software, users will have the option to include published reactions in predicted pathways. Look for the lime-green nodes in your results to easily visualize published reactions. Visit [www.synthiaonline.com](http://www.synthiaonline.com)

[Learn more](#)



Published reactions highlighted with lime-green nodes

### Enhanced User Interface

Get a sneak-peak of the most recent user interface improvements featuring:

- A streamlined New Analysis button
- Tagging & Sharing for more organized molecule management
- A Shopping List to better manage your laboratory supply needs

Learn about these features and more by watching the SYNTHIA™ 6.5 Release Video.

[Click Here](#)

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with us!

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## Organic Process Research and Development

### The 49th Leading Process Chemistry Conference!

Date: 13 March - 15 March 2023

Time : 08.15 - 16.30

Location: Florida, USA

Improve your efficiency and learn how to be more innovative in your synthetic route design, development, and optimization.

The chemical and pharma industries are fast moving and ever changing. The efficient conversion of a chemical process into a process for manufacturing at tonnage scale has always been of importance. However, in the current economic and regulatory climate, it has become increasingly vital and challenging to do so efficiently and sustainably. OPR&D focuses on all these essential aspects of the chemical industry and has a reputation for quality.

# SYNTHIA.EDU - New SYNTHIA™ Tutorials

SYNTHIA™ Academy Tutorials are designed to quickly familiarize users with SYNTHIA™ Retrosynthesis Software.

**Course 1** is an introduction to SYNTHIA™.

**Course 2** demonstrates the use of filters to better navigate your results and reveal more relevant pathways.

Tutorials that highlight new & existing features will be added throughout the year.

The tutorials are accessed by clicking on 

## Contact Us:

Phone Support: 1-800-325-5832

Email Support: [synthia@merckgroup.com](mailto:synthia@merckgroup.com)

Website: [synthiaonline.com](https://synthiaonline.com)

Select one of the SYNTHIA™ Academy courses and follow the prompts.

## Trainings are MONTHLY (Basic Training 60 min, Case Study 30 min)

### Basic training

- Thursday January 12<sup>th</sup> 9:30 AM EST  
[Click here to join the meeting](#)
- Thursday February 2<sup>nd</sup> 9:30 AM EST  
[Click here to join the meeting](#)
- Thursday March 2<sup>nd</sup> 9:30 AM EST  
[Click here to join the meeting](#)

## Office Hours are MONTHLY

### Office Hours

- Thursday January 19<sup>th</sup> 9:00 AM EST  
[Click here to join the meeting](#)
- Thursday January 19<sup>th</sup> 1:00 PM EST  
[Click here to join the meeting](#)
- Thursday February 16<sup>th</sup> 9:00 AM EST  
[Click here to join the meeting](#)
- Thursday February 16<sup>th</sup> 1:00 PM EST  
[Click here to join the meeting](#)
- Thursday March 23<sup>rd</sup> 9:00 AM EDT  
[Click here to join the meeting](#)
- Thursday March 23<sup>rd</sup> 1:00 PM EDT  
[Click here to join the meeting](#)

Merck KGaA  
Frankfurter Strasse 250  
64293 Darmstadt, Germany

## To place an order or receive technical assistance

Order/Customer Service: [SigmaAldrich.com/order](https://SigmaAldrich.com/order)

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Safety-related Information: [SigmaAldrich.com/safetycenter](https://SigmaAldrich.com/safetycenter)

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