

# Colloquium

## Carbohydrate-Based Material Science

Prof. Peter Seeberger, Max Planck Institute for Colloids and Interfaces

Rapid preparation of polysaccharides is by automated glycan assembly (AGA) [1] using a synthesizer [2] provides access to diverse glycans as large as 151-mers [3]. Accelerated synthesis methods [4] now used to synthesize complex glycans including challenging *cis*-linked polysaccharides [5] are enabling fundamental investigations into the structure and function of polysaccharides. Synthetic glycans are key in combination with single molecule imaging, [6] molecular modelling and other physical methods to characterize carbohydrate structure [7-9]. We use synthetic polysaccharides to address fundamental questions of carbohydrate structure and folding and material science [10-12]. Synthetic glycans can now be used to construct 3-D shapes from first principles [13] and open a new field for engineering materials from scratch.

1. Guberman, M.; Seeberger, P.H.; *J. Am. Chem. Soc.*, **2019**, *141*, 5581.
2. Hahm, H.S.; Schlegel, M.K.; Hurevich, M.; Eller, S.; Schuhmacher, F.; Hofmann, J.; Pagel, K.; Seeberger, P.H.; *Proc Nat Acad Sci USA*, **2017**, *114*, E3385.
3. Joseph, A.; Pardo-Vargas, A.; Seeberger, P.H.; *J. Am. Chem. Soc.*, **2020**, *142*, 8561.
4. Danglad-Flores, J.; Leichnitz, S.; Sletten, E.T.; Joseph, A.A.; Bienert, K.; Le Mai Hoang, K.; Seeberger, P.H.; *J. Am. Chem. Soc.*, **2021**, *143*, 8893.
5. Zhu, Y.; Delbianco, M.; Seeberger, P.H.; *J. Am. Chem. Soc.*, **2021**, *143*, 9758.
6. Wu, X. Delbianco, M.; Anggara, K.; Michnowicz, T.; Pardo-Vargas, A.; Bharate, P.; Sen, S.; Pristl, M.; Rauschenbach, S.; Schlickum, U.; Abb, S.; Seeberger, P.H.; Kern, K.; *Nature* **2020**, *582*, 375
7. Delbianco, M.; ... Seeberger; *J. Am. Chem. Soc.* **2018**, *140*, 5421.
8. Yu, Y.; ... Seeberger, P.H.; Delbianco, M.; *J. Am. Chem. Soc.* **2019**, *141*, 4833.
9. Yu, Y.; Tyrikos-Ergas, T.; Zhu, Y.; Fittolani, G.; Bordoni, V.; Singhal, A.; Fair, R.J.; Grafmüller, A.; Seeberger, P.H.; Delbianco, M.; *Angew. Chem. Int. Ed.* **2019**, *58*, 13127.
10. Anggara, A.; Zhu, Y.; Delbianco, M.; Rauschenbach, S.; Abb, S.; Seeberger, P.H.; Kern, K.; *J. Am. Chem. Soc.*, **2020**, *142*, 21420.
11. Anggara, K.; Zhu, Y.; ... Seeberger, P.H.; Kern, K.; *Proc Nat Acad Sci USA*, **2021**, *118*, e2102168118.
12. Fittolani, G.; Vargová, D.; Seeberger, P.H.; Ogawa, Y.; Delbianco, M.; *J. Am. Chem. Soc.*, **2022**, *144*, 12469-12475.
13. Fittolani, G.; Tyrikos-Ergas, T.; Poveda, A.; Yu, Y.; Seeberger, P.H.; Jiménez-Barbero, J.; Delbianco, M.; *Nature Chem.* **2023**, doi: 10.1038/s41557-023-01255-5.

### Bioblurb

Peter H. Seeberger, a chemist, was a tenured professor at MIT and ETH Zurich before becoming director at the Max-Planck Institute in Potsdam in 2009. Since 2021, he is a Vice President of the German Research Foundation (DFG). His research spanning topics from engineering to immunology has been documented in >660 journal articles and >60 patents was recognized with >40 international awards. Peter Seeberger supports open access publishing as the Editor-in-Chief of the *Beilstein Journal of Organic Chemistry*. He is a co-founder of the *Tesfa-Ilg Foundation* that works in Ethiopia and nine successful companies.

17 January, 2024, 16:00-17:15 p.m. | FIT