

# GASPER TKAČIK

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DATE OF BIRTH 1979-05-24 (Ljubljana, Slovenija)  
NATIONALITY Slovenia, European Union  
LANGUAGES Slovene (native), English (fluent), German (intermediate)

## POSITIONS

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2022– Deputy to the Dean, ISTA Graduate School  
2019 Visiting Faculty (May–August), Princeton, CUNY, Rockefeller U.  
2017– Professor, Institute of Science and Technology Austria (ISTA)  
2011–2016 Asst. Prof., Institute of Science and Technology Austria (ISTA)

## ACADEMIC EDUCATION

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2008–2010 **Postdoctoral Research Associate, University of Pennsylvania**  
Advisors: Vijay Balasubramanian, Phil Nelson  
2007 **Postdoctoral Research Associate, Princeton University**  
2002–2007 **Ph.D. in Physics, Princeton University**  
Advisors: William Bialek, Curtis G. Callan Jr.  
2001–2002 **Graduate Research Fellow**  
Faculty of Mathematics and Physics, University of Ljubljana  
1997–2001 **BSc. Mathematical Physics, University of Ljubljana**

## PROFESSIONAL

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- **Main areas of research:** biophysics, computational neuroscience, neural coding, information theory, natural scene statistics, collective behavior, evolution, gene regulation
- **Selected awards:** Lieben Prize of the Austrian Academy of Sciences (2019)
- **Selected grants:** *FWF Austrian Science Fund* P34015 (PI, 2020–2023, €345,200); *HFSP Program Grant* RGP0034/2018 (co-PI, 2018–2021, \$350,000); *FWF Austrian Science Fund* P28844 (PI, 2016–2019, €340,547); *FWF Austrian Science Fund* P25651 (PI, 2013–2017, €351,362); *HFSP Program Grant* RGP0065/2012 (co-PI, 2012–2016, \$350,000);

PUBLICATIONS (PREPRINTS IN GREY, REFEREED PUBLICATIONS IN BLACK)

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- [1] Reinhardt M, Tkačik G, ten Wolde PR, **Path Weight Sampling: Exact Monte Carlo computation of the mutual information between stochastic trajectories.** *arxiv.org*: 2203.03461 (2022).
- [2] Kavčič B, Tkačik G, **Token-driven totally asymmetric simple exclusion process.** *arxiv.org*: 2112.13559 (2021).
- [3] Iglér C, Fourcade C, Waldminghaus T, Pauler FM, Santhanam B, Tkačik G, Guet CC, **Limited specificity of molecular interactions incurs an environment-dependent fitness cost in bacteria.** *bioRxiv.org*: 465141 (2021).
- [4] Bialek W, Gregor T, Tkačik G, **Action at a distance in transcriptional regulation.** *arxiv.org*: 1912.08579 (2019).
- [5] Nardin M, Csicsvari J, Tkačik G, Savin C, **The structure of hippocampal CA1 interactions optimizes spatial coding across experience.** *bioRxiv.org*: 460602 (2021).
- [6] Lombardi F, Pepic S, Shriki O, Tkačik G, de Martino D, **Statistical modeling of adaptive neural networks explains coexistence of avalanches and oscillations in resting human brain.** *Nat Comput Sci*, in press (2022).
- [7] Hledik M, Barton NH\*, Tkačik G\*, **Accumulation and maintainance of information in evolution.** *Proc Nat'l Acad Sci USA* **119**: e2123152119 (2022).
- [8] Zoller B, Gregor T, Tkačik G, **Eukaryotic gene regulation at equilibrium, or non?** *Curr Opin Syst Biol* **31**: 100435 (2022).
- [9] Młynarski W, Tkačik G, **Efficient coding theory of dynamic attentional modulation.** *PLOS Biol* **20**: e3001889 (2022).
- [10] Lagator M<sup>=</sup>, Sarikas S<sup>=</sup>, Steinrück M, Toledo-Aparicio D, Bollback JP, Guet CC\*, Tkačik G\*, **Predicting bacterial promoter function and evolution from random sequences.** *eLife* **11**: e64543 (2022).
- [11] Tkačik G, Gregor T, **The many bits of positional information.** *Development* **148**: dev176065 (2021).
- [12] Kačič B, Tkačik G, Bollenbach T, **A minimal biophysical model of combined antibiotic action.** *PLOS Comput Biol* **17**: e1008529 (2021).
- [13] Chalk M, Tkačik G, Marre O, **Inferring the function performed by a recurrent neural network.** *PLOS One* **16**: e0248940 (2021).
- [14] Młynarski W<sup>=</sup>, Hledik M<sup>=</sup>, Sokolowski TR, Tkačik G, **Statistical analysis and optimality of neural systems.** *Neuron* **109**: 1–15 (2021).
- [15] Grah R, Zoller B, Tkačik G, **Nonequilibrium models of optimal enhancer function.** *Proc Nat'l Acad Sci USA* **117**: 31614–31622 (2020).
- [16] Maoz O, Esteki MS, Tkačik G, Kiani R, Schneidman E, **Learning probabilistic representations with randomly connected neural circuits** *Proc Nat'l Acad Sci USA* **117**: 25066 (2020).
- [17] Kačič B, Tkačik G, Bollenbach T, **Mechanisms of drug interactions between translation-inhibiting antibiotics.** *Nat Comms* **11**: 4013 (2020).
- [18] Berry MJ 2nd, Tkačik G, **Clustering of neural activity: a design principle for population codes.** *Frontiers Comput Neurosci* **14**: 20 (2020).
- [19] Tomanek I<sup>=</sup>, Grah R<sup>=</sup>, Lagator M, Andersson AMC, Bollback JP, Tkačik G, Guet CC, **Gene amplification as a form of population-level gene expression regulation.** *Nat Ecol Evol*, **4**: 612–625 (2020).
- [20] Cepeda-Humerez SA, Ruess J, Tkačik G, **Estimating information in time-varying signals.** *PLOS Comput Biol* **15**: e1007290 (2019).
- [21] Hledik M, Sokolowski TR, Tkačik G, **A tight upper bound on mutual information.** *arxiv.org*: 1812.01475 (2018), *IEEE ITW* (2019).
- [22] Ruess J, Pleska M, Guet CC, Tkačik G, **Molecular noise shapes bacteria-phage ecologies.** *PLOS Comput Biol*, **15**: e1007168 (2019).

- [23] Petkova M\*, Tkačik G\*, Bialek W, Wieschaus EF, Gregor T, **Optimal decoding of cellular identities in a genetic network.** *Cell* **176**: 844–855 (2019).
- [24] Iglér C, Lagator M, Tkačik G, Bollback JP, Guet CC, **Evolutionary potential of transcription factors for gene regulatory rewiring.** *Nat Ecol Evol* **2**: 1633–1643 (2018).
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- [26] Ferrari U, Deny S, Chalk M, Tkačik G, Marre O, Mora T, **Population model learned on different stimulus ensembles predicts network responses in the retina.** *Phys Rev E* **98**: 042410 (2018).
- [27] Granados AA, Pietsch JM, Cepeda-Humerez SA, Farquhar IL, Tkačik G, Swain PS, **Distributed and dynamic intracellular organization of extracellular information.** *Proc Nat'l Acad Sci USA* **115**: 6088–6093 (2018).
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- [29] Botella-Soler V, Deny S, Martius G, Marre O, Tkačik G, **Nonlinear decoding of a complex movie from the mammalian retina.** *PLOS Comput Biol* **14**: e1006057 (2018).
- [30] Savin C, Tkačik G, **Maximum entropy models as a tool for building precise neural controls.** *Curr Opin Neurosci* **46**: 120–126 (2017).
- [31] Chait R\*, Ruess J\*, Bergmiller T, Tkačik G, Guet CC, **Shaping bacterial population behavior through computer-interfaced control of individual cells.** *Nature Comms* **8**: 1535 (2017).
- [32] Harpaz R, Tkačik G, Schneidman E, **Discrete modes of social information processing predict individual behavior of fish in a group.** *Proc Nat'l Acad Sci USA* **114**: 10149–10154 (2017).
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- [35] Friedlander T\*, Prizak R\*, Barton NH, Tkačik G, **Evolution of new regulatory functions on biophysically realistic fitness landscapes.** *Nature Comms* **8**: 216 (2017).
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