

Curriculum Vitae

Personal information

Name Sebastian (Seba) Contreras
Current affiliation Max Planck Institute for Dynamics and Self-Organization
Email seba.contreras@ds.mpg.de
Website <https://seba-contreras.github.io>
ORCID <https://orcid.org/0000-0001-8909-774X>
SCOPUS ID 57212808478
Publons/WoS GRJ-7495-2022
Google Scholar <https://scholar.google.com/citations?user=OuloqBIAAAAJ&hl=en>



Career summary

May. 2023 – present **Postdoctoral Researcher**
Max Planck Institute for Dynamics and Self-Organization.

Jul. 2020 – Apr. 2023 **Ph.D. in Physics (Dr. rer. nat.)**
International Max Planck Research School "Physics of Biological and Complex Systems", Georg-August-Universität, Göttingen, Germany: highest honors (*summa cum laude*).

Jul. 2019 – Jul. 2020 **Predocctoral Researcher**
Centre for Biotechnology and Bioengineering, Universidad de Chile, Santiago, Chile.

Jul. 2017 – Jul. 2019 **Master of Science (Process Engineering)**
Universidad de Chile, Santiago, Chile: 7.0/7.0 (highest honors)

Mar. 2012 – Jul. 2017 **Civil Engineering (Diplom)**
Universidad de Chile, Santiago, Chile: 7.0/7.0 (highest honors)

Awards and academic recognition

2020 **Best Graduate (2019)**
Colegio de Ingenieros de Chile (Chile Engineers Association).

2018 **Outstanding student**
Master's Program, Faculty of Physical and Mathematical Sciences (FCFM), Universidad de Chile, Santiago, Chile.

Academic Experience

May. 2023 – Present **Max Planck Institute for Dynamics and Self-Organization – MPRG Priesemann**
Postdoctoral Researcher

Tasks: Research and project lead (Multi-institution subproject in a BMBF-Funded modelling consortium), supervising and advising students, and dependent and independent research.

Jun. 2020 – April 2023 **Max Planck Institute for Dynamics and Self-Organization – MPRG Priesemann**
PhD Student

Thesis: *Complex Dynamics in the Spread of COVID-19.* Here, I studied the complex interplay between information, risk perception, and disease spread, and its implications for mitigation plans in the context of the COVID-19 pandemic. In detail, I studied two non-pharmaceutical interventions, test-trace-and-isolate (TTI) and genomic surveillance, and quantified their contribution to curbing the spread of a disease or reducing the uncertainty in our estimation for certain spreading parameters.

Other tasks: Supervising students (M.Sc. and B.Sc.), tutoring courses on physics at the University of Göttingen, attending international conferences, and performing collaborative research. I also contributed grant proposal conceptualization, writing, and research.

- Jun. 2016 – Jun. 2020 **Centre for Biotechnology and Bioengineering, CeBiB, Universidad de Chile**
Research Assistant and Predoctoral Researcher (Math. Modeling Group)
- Project:** Modelling the spreading dynamics of COVID-19 in Chile with a multigroup SEIRA model, and developing real-time estimators of the effective reproduction number of COVID-19 R_t .
- Project:** Parametric definition of health in human Glucose-Insulin dynamics. Development of a novel DDE model for the human glucose-insulin dynamics and tailored inverse problem-solving techniques for parameter recognition.
- Project:** DMAKit: A user-friendly web platform and Python library for bringing state-of-the-art data analysis techniques to non-specific users.
- Jul. 2017 – Jul. 2019 **Laboratory for Rheology and Fluid dynamics (LRF) Santiago, Chile** – Researcher
- Project:** Statistical characterization of floc-structures in flocculation of clays, using graphene oxide-doped flocculants, for optimizing water recovery in mineral processing plants.
- Project:** Development of statistically-based methodology for variability assessment of rheological parameters in mineral processing.

Teaching

- Oct. 2022 – present **Georg-August-Universität Göttingen Göttingen, Germany** – Teaching Assistant, Lecturer
- Rechenmethoden der Physik, (B.Sc. course).
 - Current Topics in Theoretical Physics, (M.Sc. course).
 - Introduction to Physics of Complex Systems, (M.Sc. course).
- Jul. 2013 – Jul. 2019 **Universidad de Chile Santiago, Chile** – Teaching Assistant, Lecturer
- Ordinary Differential Equations, undergraduate course with ~ 100 students per semester.
 - Mathematical Methods in Engineering, mandatory course for the Ph.D. in Mechanical Engineering program.
 - Dynamics of Hyper-Concentrated Suspensions (non-Newtonian fluid dynamics), optional course for the Ph.D. in Fluid Dynamics program.

Languages

Programming

Julia, Python, MATLAB.

Speaking

Spanish (*Native*), English (*Fluent*), German (*Intermediate, B1*).

Hobbies (I can bring much more than science!)

- Hiking-Trekking** I love outdoors and exploring in Chile (Tierra del Fuego, Torres del Paine, Patagonia, Atacama Desert, Easter Island), or around the world.
- Sports** Running, swimming, diving, climbing, basically anything outdoors.
- Music** I play the piano and sing, and before dedicating my life to science, I played the Cello professionally.
- Cooking** I know many Chilean, Peruvian, and German recipes that might be worth trying!

Publications

Selected publications (full list at the end)

- 2023 Dehning, J., Mohr, S. B., Contreras, S., Dönges, P., Iftekhar, E., Schulz, O., Bechtle, P., & Priesemann, V. "Impact of the Euro 2020 championship on the spread of COVID-19". **Nature Communications** 14(1), 122. doi:-10.1038/s41467-022-35512-x
- 2023 Contreras, S., Oróstica, K. Y., Daza-Sanchez, A., Wagner, J., Dönges, P., Medina-Ortiz, D., Jara, M., Verdugo, R., Conca, C., Priesemann, V., & Olivera-Nappa, Á. "Model-based assessment of sampling protocols for infectious disease genomic surveillance". **Chaos, Solitons & Fractals** 167, 113093. doi: 10.1016/j.chaos.2022.113093
- 2022 Dönges, P.*, Wagner, J.*, Contreras, S.*, Iftekhar, EN.*, Bauer, S., Mohr, SB., Dehning, J., Calero Valdéz, A., Kretzschmar, M., Mäs, M., Nagel, K., & Priesemann, V. "Interplay between risk perception, behaviour, and COVID-19 spread". **Frontiers in Physics** 10:842180. doi: 10.3389/fphy.2022.842180
- 2021 Contreras, S., Dehning, J., Mohr, SB., Spitzner, FP., Bauer, S. & Priesemann, V. "Low case numbers enable long-term stable pandemic control without lockdowns". **Science Advances** 7(41): eabg2243. doi: 10.1126/sciadv.abg2243
- 2021 Contreras, S., Dehning, J., Loidolt, M., Spitzner, FP., Urrea-Quintero, J., Mohr, SB., Wilczek, M., Zierenberg, J., Wibrál, M., & Priesemann, V. "The challenges of containing SARS-CoV-2 via test-trace-and-isolate". **Nature Communications** 12(2021) 371. doi: 10.1038/s41467-020-20699-8

Editorial work

Editor *Frontiers in Public Health* (Review Editor and Guest Associate Editor).

Reviewer Journal referee for *Nature Communications* (1), *The Lancet Infectious Diseases* (1), *IEEE Communications Magazine* (2), *The Lancet Regional Health - Europe* (2), *PLoS Computational Biology* (2), *PLoS ONE* (2), *Mathematical Medicine and Biology* (2) *Chaos, Solitons & Fractals* (8), *Communications Physics* (3), *Communications Medicine* (1), *Scientific Reports* (8), *Heliyon* (8), *Computers in Biology and Medicine* (8), *Frontiers in Medicine* (1), *BMC Bioinformatics* (2) and *Frontiers in Public Health* (8).

Conference attendances

Selected conferences

- 2023 Speaker at the CASUS workshop *Data science and the COVID-19 pandemic – What have we learned so far?*, 5–7 June 2023, Görlitz, Germany. *Mechanics of Pandemics*
- 2023 Speaker at the II Madeira COVID-19 Modellers Encounter. 27 – 31 March 2023, Madeira, Portugal (virtual). *Complex Dynamics in the Spread of COVID-19*
- 2023 Speaker at the 14th Conference on Dynamical Systems Applied to Biology and Natural Sciences, DSABNS 2023, 5–8 February 2023, Bilbao, Spain. *Metastability and tipping points in disease spread: applications to pandemic mitigation and control*
- 2022 Speaker at the Third Infinity Conference. 21 – 23 September 2022, Göttingen, Germany. *Understanding (and fighting) the COVID-19 pandemic with models*
- 2021 Speaker at the I Madeira COVID-19 Modellers Encounter. 27 September - 2 October 2021, Madeira, Portugal. *Spreading dynamics of COVID-19: Compartmental models and beyond*
- 2018 Speaker at the 29th International Mineral Processing Congress, 17-21 September 2018, Moscow, Russia.

Indexed publications

- 2023 Contreras, S., Iftekhhar, & Priesemann, V. "From emergency response to long-term management: the many faces of the endemic state of COVID-19". *In press in **The Lancet Regional Health Europe***. doi:-10.1016/j.lanepe.2023.100664
- 2023 Dehning, J., Mohr, S. B., Contreras, S., Dönges, P., Iftekhhar, E., Schulz, O., Bechtle, P., & Priesemann, V. "Impact of the Euro 2020 championship on the spread of COVID-19". ***Nature Communications*** 14(1), 122. doi:-10.1038/s41467-022-35512-x
- 2023 Contreras, S., Oróstica, K. Y., Daza-Sanchez, A., Wagner, J., Dönges, P., Medina-Ortiz, D., Jara, M., Verdugo, R., Conca, C., Priesemann, V., & Olivera-Nappa, Á. "Model-based assessment of sampling protocols for infectious disease genomic surveillance". ***Chaos, Solitons & Fractals*** 167, 113093. doi: 10.1016/j.chaos.2022.113093
- 2022 Oróstica, K. Y., Saez-Hidalgo, J., de Santiago, P. R., Rivas, S., Contreras, S., Navarro, G., Asenjo, J., Olivera-Nappa, A., & Armisen, R. "Total mutational load and clinical features as predictors of the metastatic status in lung adenocarcinoma and squamous cell carcinoma patients". ***Journal of Translational Medicine*** 20, 373. doi: 10.1186/s12967-022-03572-8
- 2022 Medina-Ortiz, D., Contreras, S., Amado-Hinojosa, J., Almonacid-Torres, J., Navarrete, M., Asenjo, J. & Olivera-Nappa, A. "Combination of digital signal processing and assembled predictive models facilitates the rational design of proteins". ***Frontiers in Molecular Biosciences*** 9:898627. doi: 10.3389/fmolb.2022.898627
- 2022 Contreras, S., Dehning, J., & Priesemann, V. "Describing a landscape we are yet discovering". *In press in **AStA Advances in Statistical Analysis***. doi: 10.1007/s10182-022-00449-5
- 2022 Olivera-Nappa, A.*, Contreras, S.*, Tevy, MF., Medina-Ortiz, D., Leschot, A., Vigil, P., & Conca, C. "Patient-wise methodology to assess glycemic health status: applications to quantify the efficacy and physiological targets of polyphenols on glycemic control". ***Frontiers in Nutrition*** 9:831696. doi: 10.3389/fnut.2022.831696
- 2022 Dönges, P.*, Wagner, J.*, Contreras, S.*, Iftekhhar, EN.*, Bauer, S., Mohr, SB., Dehning, J., Calero Valdéz, A., Kretzschmar, M., Mäs, M., Nagel, K., & Priesemann, V. "Interplay between risk perception, behaviour, and COVID-19 spread". ***Frontiers in Physics*** 10:842180. doi: 10.3389/fphy.2022.842180
- 2022 Oróstica, KY., Contreras, S.*, Sánchez-Daza, A., Fernandez, J., Priesemann, V., & Olivera-Nappa, A. "New year, new SARS-CoV-2 variant: resolutions on genomic surveillance protocols to face Omicron". ***The Lancet Regional Health – Americas*** 7, 100203. doi: 10.1016/j.lana.2021.100203
- 2022 Contreras, S., Olivera-Nappa, Á., & Viola Priesemann "Rethinking COVID-19 vaccine allocation: it is time to care about our neighbours.". ***The Lancet Regional Health–Europe*** 12, 100277. doi: 10.1016/j.lanepe.2021.100277
- 2022 Sanchez-Daza, A., Medina-Ortiz, D., Olivera-Nappa, Á., & Contreras, S. "COVID-19 modeling under uncertainty: Statistical data analysis for unveiling true spreading dynamics and guiding correct epidemiological management". Book chapter in Springer Series ***Studies in Systems, Decision and Control***. doi: 10.1007/978-3-030-72834-2_9
- 2021 Contreras, S.*, Dehning, J.*, Mohr, SB.*, Spitzner, FP.*, Bauer, S.* & Priesemann, V.* "Low case numbers enable long-term stable pandemic control without lockdowns". ***Science Advances*** 7(41): eabg2243. doi: 10.1126/sciadv.abg2243
- 2021 Bauer, S.*, Contreras, S.*, Dehning, J., Linden, M., Iftekar, E. Mohr, SB., Olivera-Nappa, Á., & Priesemann, V. "Relaxing restrictions at the pace of vaccination increases freedom and guards against further COVID-19 waves in Europe". ***PLoS Computational Biology***17(9): e1009288. doi: 10.1371/journal.pcbi.1009288

- 2021 Contreras, S. & Priesemann, V. "Risking further COVID-19 waves despite vaccination". ***The Lancet Infectious Diseases*** 21(6), 745-746 (2021) doi: 10.1016/S1473-3099(21)00167-5
- 2021 Contreras, S.*, Dehning, J.*, Loidolt, M.*, Spitzner, FP., Urrea-Quintero, J., Mohr, SB., Wilczek, M., Zierenberg, J., Wibral, M., & Priesemann, V. "The challenges of containing SARS-CoV-2 via test-trace-and-isolate". ***Nature Communications*** 12(2021) 371. doi: 10.1038/s41467-020-20699-8
- 2020 Contreras, S., Biron-Lattes, J. P., Villavicencio, H. A., Medina-Ortiz, D., Llanovarced-Kawles, N., & Olivera-Nappa, A. "Statistically-based methodology for correcting delay-induced errors on the evaluation of COVID-19 pandemic". ***Chaos, Solitons & Fractals*** 139(2020), 110087. doi: 10.1016/j.chaos.2020.110087
- 2020 Contreras, S., Villavicencio, H. A., Medina-Ortiz, D., Biron-Lattes, J. P., & Olivera-Nappa, A. "A multi-group SEIRA model for the spread of COVID-19 among heterogeneous populations". ***Chaos, Solitons & Fractals*** 136(2020), 109925. doi: 10.1016/j.chaos.2020.109925
- 2020 Medina-Ortiz, D., Contreras, S., Quiroz, C., & Olivera-Nappa, A. "DMAKit: A user-friendly web platform for bringing state-of-the-art data analysis techniques to non-specific users". ***Information Systems*** 93(2020), 101557. doi: 10.1016/j.is.2020.101557
- 2020 Contreras, S., Castillo, C., Olivera-Nappa, A., & Ihle, C.F. "A new statistically-based methodology for variability assessment of rheological parameters in mineral processing". ***Minerals Engineering*** 156(2020), 106494. doi: 10.1016/j.mineng.2020.106494
- 2020 Contreras, S., Villavicencio, H. A., Medina-Ortiz, D., Saavedra, C. P., & Olivera-Nappa, A. "Real-time estimation of Rt for supporting public-health policies against COVID-19". ***Frontiers in Public Health*** 8, 556689. doi: 10.3389/fpubh.2020.556689
- 2020 Medina-Ortiz, D., Contreras, S., Barrera-Saavedra, Y., Cabas-Mora, G., & Olivera-Nappa, A. "Country-Wise Forecast Model for the Effective Reproduction Number Rt of Coronavirus Disease". ***Frontiers in Physics*** 8, 304. doi: 10.3389/fphy.2020.00304
- 2020 Contreras, S., Medina-Ortiz, D., Conca, C., & Olivera-Nappa, A. "A novel synthetic model of the glucose-insulin system for a patient-wise inference of parameters from small size OGTT data". ***Frontiers in Bioengineering and Biotechnology*** 8, 195. doi: 10.3389/fbioe.2020.00195
- 2020 Medina-Ortiz, D., Contreras, S., Quiroz, C., & Olivera-Nappa, A. "Development of supervised learning predictive models for highly non-linear biological, biomedical and general datasets". ***Frontiers in Molecular Biosciences*** 7, 13. doi: 10.3389/fmolb.2020.00013
- 2019 Contreras, S., Ihle, C., & Palza, H. "FBRM measurements of fine solid flocculation performance using graphene oxide-doped industrial flocculants in high-clay tailings". ***In Proceedings of the 29th Int. Mineral Processing Congress.***

Submitted Manuscripts

- 2023 Wagner, J., Bauer, S., Contreras, S., Fleddermann, L., Parlitz, U., & Priesemann, V. "Societal feedback induces complex and chaotic dynamics in endemic infectious diseases". <https://arxiv.org/abs/2305.15427>.
- 2023 Oróstica, KY.*, Contreras, S.*, Mohr, SB.*, Dehning, J.*, Medina-Ortiz, D., Bauer, S. , ..., & Priesemann, V. "Mutational signatures and transmissibility of SARS-CoV-2 Gamma and Lambda variants: A retrospective, observational study". <https://arxiv.org/abs/2108.10018>.