

approach, which may motivate research programs in the field of coupled integro-differential equations as a new avenue in mathematical biology, thereby overcoming limitations of the currently overwhelmingly popular SIR-models in state-of-the-art epidemiology (Fanelli & Piazza 2020; Kermack & McKendrick 1927). As a first step in this direction, aging pandemic modeling can be expanded from Austria to a global scale – similar to our hereditary epidemiology investigations reported in (Ukaj et al. 2021) for the non-aging case. Furthermore, nature and format of the fatality rate function deserves further scrutiny. Such activities are currently going on (Ukaj et al, 2023).

In conclusion, this study shows that old engineering fields, such as geomechanics or concrete engineering, and their proven theoretical concepts, such as the superposition principle or aging, may provide unexpected blueprints for new modeling endeavors driven by comparably young fields, such as computational epidemiology. Hence, in order to frame the insights gained by the present study in the most general way, reinventing the wheel may not be necessary to address the pending questions of our time, and maintaining an inter- and multidisciplinary perspective indeed promises routes to smart and swift solutions of intricate problems, which otherwise would not be accessible.

REFERENCES

- Boltzmann, L. 1874. Zur Theorie der elastischen Nachwirkung (Concerning the theory of the elastic aftereffect). *Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften* 70 (2), 275-306. In German. DOI: 10.1002/andp.18782411107.
- Fanelli, D. & Piazza, F. 2020. Analysis and forecast of COVID-10 spreading in China, Italy and France. *Chaos, Solitons and Fractals* 134, 109761. DOI: 10.1016/j.chaos.2020.109761.
- Irfan-Ul-Hassan, M., Pichler, B., Reihnsner, R. & Hellmich, Ch. 2016. Elastic and creep properties of young cement paste, as determined from hourly repeated minute-long quasi-static tests. *Cement and Concrete Research* 82, 36-49. DOI: 10.1016/j.cemconres.2015.11.007.
- Kermack, W. & McKendrick, A. 1927. A contribution to the mathematical theory of epidemics. *Proceedings of the Royal Society of London A* 115 (772), pp. 700-721. DOI: 10.1098/rspa.1927.0118.
- Rabcewicz, L. 1965. The New Austrian Tunneling Method, *Water Power* 16 (11), 19-24.
- Scharf, R., Pichler, B., Heissenberger, R., Moritz, B. & Hellmich, Ch. 2022. Data-driven analytical mechanics of aging viscoelastic shotcrete tunnel shells. *Acta Mechanica* 233, 2989–3019. DOI: 10.1007/s00707-022-03235-1 (2022)
- Scheiner, S. & Hellmich, C. 2009. Continuum Microviscoelasticity Model for Aging Basic Creep of Early-Age Concrete. *Journal of Engineering Mechanics* 135 (4), pp. 307-323. DOI: 10.1061/(ASCE)0733-9399(2009)135:4(307).
- Scheiner, S., Ukaj, N. & Hellmich, C. 2020. Mathematical modeling of COVID-19 fatality trends: Death kinetics law versus infection-to-death delay rule. *Chaos, Solitons and Fractals* 136, 109891. DOI: 10.1016/j.chaos.2020.109891.
- Ukaj, N., Scheiner, S. & Hellmich, C. 2021. Toward „hereditary epidemiology“: A temporal Boltzmann approach to COVID-19 fatality trends. *Applied Physics Reviews* 8, 041417. DOI: 10.1063/5.0062867.
- Ukaj, N., Scheiner, S. & Hellmich, C. 2023. Aging pandemics: a mechanics-inspired rate-type Boltzmann approach to fatality prediction. *Journal of Engineering Mechanics*, in preparation, 2023.
- Ullah, S., Pichler, B., Scheiner, S. & Hellmich, C. 2010. Shell-specific interpolation of measured 3D displacements, for micromechanics-based rapid safety assessment of shotcrete tunnels. *CMES Computer Modeling in Engineering and Sciences* 57 (3), pp. 279-316. DOI: 10.3970/cmesc.2010.057.279.
- Ullah, S., Pichler, B., Scheiner, S. & Hellmich, C. 2012. Influence of shotcrete composition on load-level estimation in NATM-tunnel shells: Micromechanics-based sensitivity analyses. *International Journal for Numerical and Analytical Methods in Geomechanics* 36 (9), pp. 1151-1180. DOI: 10.1002/nag.1043.
- Wang, X., Bin, H., Tang, H. Hu, X., Wang, J., Huang, L. 2016. A Constitutive Model of Granite Shear Creep under Moisture. *Journal of Earth Science* 27(4), pp. 677–685. DOI: 10.1007/s12583-016-0709-1.
- Worldometer 2023. COVID-19 pandemic, www.worldometers.info/coronavirus. Last accessed: February 14, 2023.