



Prospects for a New Materialist Informatics: Introduction to a Special Issue

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DOI: <https://doi.org/10.1344/jnmr.v3i1.38955>

In her interview with Lisa Nakamura in 2003, Donna Haraway called for “prospects for a materialist informatics” that is attentive to the kinds of humanness and machineness that are produced in material-semiotic encounters with/in technology, and to the kinds of perspectives that do not fit well the technoscientific norms of such encounters (Nakamura & Haraway, 2003). Building on the work of Donna Haraway, Katherine Hayles (1999), Nakamura (Kolko et al., 2000; Nakamura, 2008), and a plethora of cyberfeminist scholars and activists (Fernandez et al., 2003; Sollfrank, 2018), the racialized, classed, sexed and otherwise variously “normed” (both in a positive and negative sense) materializations of and in informatics have been an important area of research both in new materialist scholarship (Colman, 2015; Colman et al., 2018; Ernst et al., 2017; Lorenz-Meyer et al., 2019; Papenburg et al., 2018), as well as in science and technology studies (STS) and technology critique in general. We can think here, for instance, of the many recent works that investigate the relation between structural inequalities and AI/machine learning technologies (e.g., Benjamin, 2019; Eubanks, 2018; Noble, 2018; O’Neil, 2017). It is noteworthy that most of these discussions were brought to the fore by women of color and Black women.

New materialist perspectives are also slowly taking root in informatics as a discipline. For instance, the 2020 ACM’s Designing Interactive Systems conference¹ had an

¹ ACM stands for “Association for Computing Machinery” and is one of the largest international professional associations of computer scientists. For more about the specific conference, see <https://dis.acm.org/2020/> (accessed on 17.02.2022).

explicit new materialist focus, as did several contributions in the conferences on human-computer interaction (HCI), participatory design (PD), computer-supported cooperative work (CSCW), human-robot interaction (HRI), and interactive systems design in recent years (Draude, 2020; Fischer et al., 2019; Frauenberger, 2020; Freeman et al., 2019; Homewood et al., 2021; Klumbyte et al., 2020; Pihkala & Karasti, 2018; Ståhl et al., 2021; Treusch et al., 2020). Some argue that there is a new “entanglement HCI” perspective emerging that takes up not least concepts from new materialism to introduce a new perspective in HCI and interaction design more generally that is attentive to material-semiotic entanglements and approaches worldmaking with technology as always already more-than-human (Frauenberger, 2020; Homewood et al., 2021; Niemimaa, 2016). This highlights that informatics inherently *is* a material-semiotic discipline, which is constituted by sign/signal processing and tied to hardware, tech infrastructures and embeddedness in material worlds (Nadin, 2007).

This research, spanning humanities, social sciences, arts, and computer science and design, is the context in which the conference on New Materialist Informatics took place in Kassel, Germany, on 22-25 March 2021. Being an 11th international new materialisms conference, it aimed to root and further the research in and of informatics that starts from and enacts new materialist approaches in AI/ML (machine learning), software engineering, robotics, critical algorithm studies and critical digital studies, STS, design, artistic research, HCI, and media studies, among others. The overall hope was to create space to consolidate research that could fit under the umbrella of new materialist informatics (NMI) thus also performatively instituting the field. However, all the aforementioned references notwithstanding, it turned out to be a challenging, and perhaps impossible, task to demarcate NMI as a field in a concise way. This is not least because NMI, as an investigation of (new) material(ist) concerns in, approaches to and enactments of informatics – itself understood as both a research discipline and a field of practice – relies on approaches to materiality that can be traced back to different traditions of scholarship and praxis.

We attribute this most importantly to the fact that materiality figures differently within humanities and social sciences (SSH), and more technical and practice-oriented fields such as informatics. In the former, materiality, as it meets media and technology, is

addressed through materialist media theories, both new (Parikka, 2011, 2015) and more classical theories often originating in the German context (Bollmer, 2019; Kittler, 1992), Marxist and political economy-oriented research (e.g., Gottlieb, 2018; Pötzsch, 2017), while the vitality of matter as well as material-discursive entanglements are taken up more in aforementioned new materialist scholarship. Informatics, on the other hand, includes both imaginaries of disembodiment – as evidenced in, for instance, reliance of metaphors such as clouds, *software*, as well as the general imaginary of abstraction and abstract thought as disembodied (e.g., Haraway, 1997). However, informatics also needs to work with a clear understanding of the material basis of information technologies and thus also the material capacities and constraints – from reliance on minerals and other natural resources to make technology do its work, to material practices of design, to material configurations of hardware and software (Blanchette, 2011; Chien, 2019; Dourish, 2017; Hayles, 1992; Jung & Stolterman, 2012). These differences also show in the different understandings and interpretations of "matter" and "material" in "new materialism" as it meets informatics.

Such plethora of approaches to materiality within and of informatics, we believe, is not necessarily a problem but rather a possibility for the field of NMI to remain open to multiple genealogies. Furthermore, when it comes to specifically *new* materialism and informatics, there are fruitful cross-pollinations to be made. First, the way materiality is addressed in informatics could benefit from new materialist understanding of matter as agentive and relational, and technologies as material-discursive configurations, to use Lucy Suchman's term (Suchman, 2006), that enact specific worldings of humanness and machineness. Secondly, new materialist scholarship could benefit from informatics' attentiveness to what matter (as and in technology) can do, how matter itself is rendered informational, and, methodologically, the pragmatic and design-oriented methodologies.

This polyvocality, in terms of genealogies of materialisms, disciplines of research, and praxes of engagement, is what we aimed at maintaining both throughout the conference in 2021, as well as in this special issue. Apart from the different takes on matter and mattering, the articles in this special issue present different disciplinary crossovers and convergences between arts, HCI, engineering, media and culture

studies, philosophy, political economy, robotics, architecture, and design. Accordingly, they also present different methods, varying from historical genealogies, computational experiments, to theoretical analyses and theory-led interventions. This methodological diversity is, we argue, crucial for NMI as an emerging transdisciplinary field.

The articles by Ziyuan Meng & Jon Burmeister on “Cybersecurity and Simondon’s Concretization Theory: Making Software More Like a Living Organism” and by Petra Gemeinboeck on “Difference-In-Relation: Diffracting Human-Robot Encounters” present the crossovers between software engineering and philosophy, and performance and human-robot interaction, respectively. Addressing these rather established disciplines, these contributions perform a diffractive re-reading of computational practices – human-robot interaction design and cybersecurity software engineering – with new materialist philosophies and concepts, which also has implications for how said practices can be performed.

Meng and Burmeister rely on Simondon’s theory of concretization and individuation to draw parallels between the development and interaction of living organism with its environment, and software. The article introduces Simondon’s terms of concretization, individuation, and associated milieu, among others, and argues that software and its behaviour, particularly in cybersecurity context, can and should be approached more as a living organism, blurring the boundaries between material/immaterial, living/non-living, natural/technical. This further highlights the processual, living, dynamic materiality of software and technology in general, and shows how Simondon’s non-anthropocentric view of technicity can have implications for software engineering approaches.

Gemeinboeck’s contribution bears implication for the understanding and design of human-robot interaction (HRI). She investigates how HRI can be re-imagined not as predicated on achieving sameness or similarity (robots mimicking humans and their ways of inter/action), but rather on establishing interaction while maintaining ontological difference. Drawing on new materialist concepts such as intra-action and diffraction (Barad, 2007), Gemeinboeck questions the normative humanness that often is implied in HRI and develops *bodying-thinging* as a concept that helps

understand the ongoing material attunement between human and non-human bodies, inserting relational ontology at the core of HRI and human-robot experience design.

Relationality and onto-epistemological questions are an important theme also in Selena Savić's contribution "Articulating Nomadic Identities of Radio Signals" and Lisa Müller-Trede's "Discerning Relational Data in Breath Patterns: Gilbert Simondon's Philosophy in the Context of Sequence Transduction." Savić investigates the onto-epistemology of radio signals and ways of knowing them with data observatories and machine learning (ML) algorithms. Proposing that radio signals both are matter and do matter(ing), she argues that their nomadic identity can be articulated with ML processes without essentializing or de-contextualizing them – something that is often done when categorizations are performed with contemporary ML technologies. Bringing together new materialist thought, media theory and experimental research, Savić demonstrates how to think with and work with computation in material, engaged and experimental way.

Müller-Trede also employs computational experimentation to think with and through relationality. Working with breath patterns, ML sequence transduction model, and Simondon's theory of transduction and intensity (2017), she presents an example of computation that deals with relational information and intensities, while retaining the singularity, collectivity, and contextualization of such intense data. Müller-Trede thus shows not only that technical objects are relational, but also that computing, and specifically ML technologies, can address and amplify singularity and relationality without immediate and fixed categorization. This points to the importance of investigating what else computing can do beyond its more conventional uses.

One of such different uses is speculative exploration, which is presented in Yota Passia's and Panagiotis Roupas' work "Manifold Spaces and Patterned Potentialities." Bringing together architectural theory, continental philosophy of Deleuze & Guattari, and experimental design, Passia and Roupas investigate how space can be imagined and configured differently through a manifold. Inventing a speculative "anticipation apparatus," they think through information as a form of matter that is spatially distributed and interactive, allowing to explore intensity, transformation and change in urban environments. This contribution enacts ways of working with abstraction,

materiality, creativity, and potentiality in a generative way, which are important concepts in addressing limits and possibilities of information technologies.

Material settings of contemporary information technologies are also explored in Harald Kümmerle's article "Japanese Data Strategies, Global Surveillance Capitalism, and the 'LINE Problem,'" albeit in a very different sense. Kümmerle brings together political economy and historical analysis and draws a geopolitical cartography of data discourses and politics from the perspective of Japan. He presents a tracing of infrastructure, political actors, experts, nationalist/international/colonial-imperial discourses, and strategies – and weaves this into a detailed narrative that contributes to a better understanding of global data regimes and their interconnections with surveillance capitalism. Less exemplary of the "new" and more of "materialist" scholarship, this is an informative interlude in the more theoretical/conceptual and design perspectives offered by other articles in this issue. It is also significant particularly because power dynamics around data are all too often primarily from US-American or European perspectives.

The two intra-views in this special issue also contribute to thinking about the geo-, techno-, racial and controlling politics of computing and its practices. The intra-view on "Contagious Education" by P. Taylor Webb, Marcelina Piotrowski and Petra Mikulan, explores how contemporary information technologies can loosen the grip of normative education and instead allow for "digital contagion" towards different practices of learning. Speaking to the context of education research, the authors discuss how these technologies can disrupt the way that education is currently governed towards biopolitical, racialized and extractive datafication. Exploring the concepts of contagion, overspill, and life as excess, Webb, Piotrowski and Mikulan suggest that technologies can be used to jam the mechanisms of computational and other forms of control.

"Speculative Materialities, Indigenous Worldings and Decolonial Futures in Computing & Design" invited Indigenous researcher and game designer Outi Laiti, artists and researchers Femke Snelting, Luiza Prado de O. Martins and Caroline Ward to share their practices and explore some of the pressing political questions in computing and computational imagination. What infrastructures and communal spaces do we need for *otherwise* practices in computing? What political strategies help reimagine

computing from less dominant perspectives? This is an intra-view that is also a call to continue to push the limits of computing and question the kinds of subjects that are expected to take part in informatics work.

Finally, the two Almanac entries – “Algorithmic Kinning” by Goda Klumbytė and “Stoniness” by Paul Heinicker and Jonas Parnow – conclude this special issue with terms that exemplify the intermingling and co-constitution of matter and information. The former describes how computational condition affects kin-making practices and kinship as a concept, while the latter addresses the materiality of the digital and the informational, or, in other words, the “stoniness” of post-digital materiality².

To conclude, we want to point out the political stakes of and possible future directions for new materialist informatics research. In the context of new technologies being implicated in both the Fourth Industrial Revolution and the Sixth Extinction, and the long-standing discourses around dis/embodiment in and of information technologies, it is crucial to pay attention to how matter is accounted for or excluded from accounts of computing infrastructures, conditions, and effects. As we mentioned earlier, the material basis of computing is one dimension of this account. Others are the racialized, sexualized, naturalized and other discriminatory dynamics that unfold in the materializations of informatics. Materialities of bodies in general – human and non-human – thus must be inserted back into accounts and practices of computing, without making assumptions that we know what bodies can do or neatly slotting them into the moulds of categories, to actively work against the deeply entrenched power hierarchies. This is particularly salient in the context of information technologies that order, categorize, govern, and classify life at an unprecedented scale, all the while obscuring their workings and infrastructural premises with metaphors of “black boxes”, “clouds”, etc. At the same time data and information are also portrayed as the “new oil”, thus pointing again to recurring colonialism and extraction (Couldry & Mejias, 2019; Ricaurte, 2019; Thatcher et al., 2016)³.

As all articles in this issue demonstrate, informatics is staunchly material in its infrastructure and in its effects, even if that materiality is expressed in different ways.

² For a collection of resources on post-digital materiality, see Heinicker’s and Parnow’s project <https://stones.computer/> (accessed on 18.02.2022).

³ For more on the entanglements between race, colonialism, and technology, see the materials, including video recordings, of the symposium “Recursive Colonialism”, organised The Critical Computation Bureau, on 1-12 December 2020: <https://recursivecolonialism.com/> (accessed on 04.02.2022).

At the same time, it is important for matter to be accounted for in new materialist terms – as a dynamic, agentive, entangled process of mattering. Matter is itself informational and poietic and therefore an active agent in computing. Thus, for the future work in NMI, we argue that it is crucial to generate accounts that demonstrate and further the understanding of material-semiotic, material-informational entanglements and intra-actions that are both actualized and put at stake in computational practices. Furthermore, adequate (re)presentation of positions that are not limited to European, US-American, Western perspectives, such as Indigenous knowledge, are also sorely needed in NMI – the lack that is palpable both in this issue, and in the New Materialist Informatics 2021 conference that it emerges out of⁴. We therefore hope that both in terms of research and in terms of praxis, NMI community will work to create fertile ground for more feminist, post- and de-colonial, trans*feminist, Indigenous and further *otherwise practices*. Last but not least, practice is another keyword for future research. If NMI is to retain its polyvocality and political engagement, we believe that it is important to continue to present ways not only how to engage matter speculatively but also how to speculate materially and think-with informational matters. We hope that the articles presented in this issue provide some inspiring examples of these diverse practices of new materialist informatics.

Acknowledgements

We would like to thank all the peer reviewers for their time and expertise. We are also grateful for the journal's editorial board and team for their support in bringing this special issue to fruition.

The New Materialist Informatics conference at the University of Kassel, Germany, was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft - DFG), and financially and organisationally supported by Research Center for Information System Design (ITeG) at the University of Kassel.

⁴ This has also been critically addressed with respect to new materialism as a field in general – see, for instance, Hinton et al. (2015); Sundberg (2014); Todd (2016).

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