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We Have Always Been Geohackers

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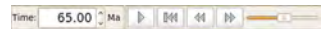
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sedimented canon of critique. Unworking (resonating with Spivak's unlearning) implies a *staying with* critique's troubled legacy. Yet, it does so in a way that also enables us to re-turn (to) it differently.

Possible Bodies (Helen Pritchard, Jara Rocha, Femke Snelting) We Have Always Been Geohackers

The Anthropocene should go in a bug report, in the mother of all bug reports. It is hardly an uncontroversial concept.¹



Detail of Gplates main interface (timeslider)

Possible Bodies is a collaborative inquiry into the concrete and at the same time fictional entities of so-called bodies. The research collective asks what material-cultural conditions of possibility render “bodies” *volumetrically* present, specifically in the context of technologies and techniques of 3-D-tracking, modeling, rendering, and scanning.² Although different volumetric technologies are situated in specific domains and regimes, their knowledge practices persistently affect and confirm each other. Possible Bodies has grown convinced that this circulated unfolding contributes to the crystallization of *standard operations* that are primarily informed by a hegemonic interest in efficiency, control, probability, and optimization. In response to this we propose that these *standard operations* call for there to be an affirmative form of responsibility-taking, one that might generate other figures and operations.

Triggered by a lack of trans*feminist experiments with volumetric geocomputation techniques and the necessity to engage with a counterhistory of geologic relations, the *Underground Division* of Possible Bodies recently took a leap of both scale and time, which implicated a jump from inquiries into the field of body politics to considerations of geopolitics. Together with a group of companions participating in “Depths and Densities,” a workshop in the context of transmediale festival 2019, we moved from individual somatic corporealities (or zoologically-recognized organisms) towards the so-called

1 Rocha, Jara, “Depths and Densities: A Bugged Report,” in *Transmediale journal*, 2019, <https://transmediale.de/content/depths-and-densities-a-bugged-report> (last access: October 2019).

2 Possible Bodies, “The Possible Bodies Inventory,” <https://possiblebodies.constantvzw.org> (last access: July 2019).

*body of the earth.*³ Our trans*feminist vector was sharpened by queer and antiracist sensibilities, and oriented towards (but not limited to) trans*generational, trans*media, trans*disciplinary, trans*geopolitical, trans*expertise, and trans*genealogical concerns.⁴ Collectively we explored the volumetric renderings of the so-called earth and how they are made operative by geocomputation, where geocomputation refers to the computational processes that measure, quantify, historicize, visualize, predict, classify, model, and tell stories of spatial and temporal geologic processes. We invited participants to collectively report bugs found through/on Gplates, a free software tool and web portal for tectonic plate modeling.⁵ What emerged in the bug reporting was the urgent need to generate figures and operations that are not dependent on the expertise of technocrats, experts, or technoscience. As a way into this, in this chapter we mobilize the methodological figures of *disobedient bug reporting* and *disobedient action research* to ask – what affirmative forms of responsibility-taking might be possible through taking up these figures within the processes and practices of volumetric geocomputation? The “Depths and Densities” workshop triangulated Gplates’ visions of the earth with critical software and interface analysis, poetics, and theoretical text materials. Working through Gplates is a consideration of volumetric regimes as world building practices. For us, it was in part a response to Kathryn Yusoff’s call for “a need to examine the epistemological framings and categorizations that produce the material and discursive world building through geology in both its historical and present forms.”⁶ In this way, we attended to the material-discursive amalgam of Gplates: the different regimes of truth, histories, representation, language, and political ideology that operate upon it.⁷ While staying close to an approach that holds that the underground is no longer (or never was) the exclusive realm of technocrats or geophysics experts, this chapter is based on discussions and reflections that flowed from the workshop.⁸

3 “Depth and Densities: A Possible Bodies Workshop,” <https://2019.pastwebsites.transmediale.de/content/depths-and-densities-a-possible-bodies-workshop> (last access: July 2019).

4 We use the formula trans*feminist in order to convoke all necessary intersectional and intrasectional aspects around that star (*).

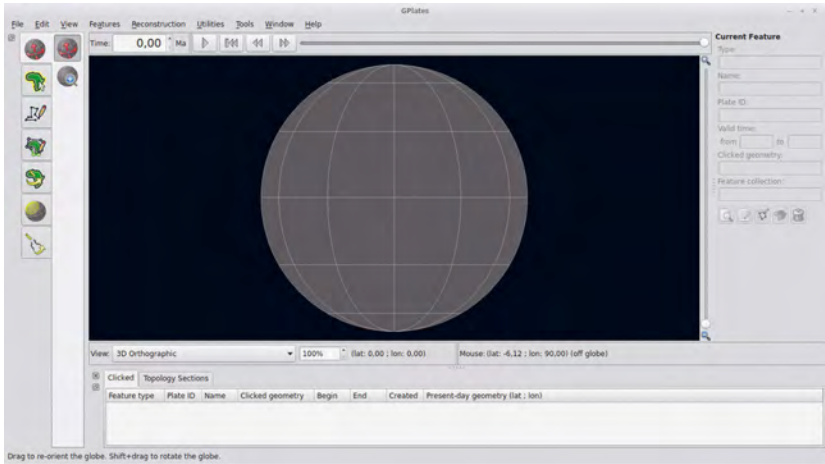
5 “Gplates, desktop software for the interactive visualisation of plate-tectonics,” <https://www.gplates.org/> (last access: July 2019).

6 Kathryn Yusoff, *A Billion Black Anthropocenes or None*, Minneapolis 2018, p. 7.

7 “Depths and Densities” workshop materials can be found at <https://pad.constantvzw.org/p/possiblebodies.depthsanddensities> (last access: July 2019).

8 See earlier work on these figures: Rocha, Jara, and Snelting, Femke, “MakeHuman,” in Braidotti, Rosi, and Hlavajova, Maria (eds.), *The Posthuman Glossary*, Bloomsbury Academic, 2018; and Rocha, Jara, and Snelting, Femke, “La imaginación invasiva y sus cortes agenciales,” in *Utopía: Revista de crítica cultural*, Mexico City, April 2019.

Volumetric Regimes



Gplates interface before loading geodata (grey earth)

Geomodelling software contributes to technocolonial subsurface exploration and extraction by enlisting, among other things, geophysics stratigraphy, diagenesis, paleoclimatology, structural geology, and sedimentology combined with computational techniques and paradigms for acquiring and rendering volumetric data. Following the *industrial continuum* of 3-D, the same techniques and manners that power subsurface exploration are operationalized within other domains, such as, for example biomedical imaging, entertainment industries, and border policing.⁹ In that sense, jumps in scale from individual somatic corporealities to the so-called body of the earth is daily business for the industries of volumetrics.

We chose to work with Gplates because it is a software platform that emerges from a complex web of academic, corporate, and software interests that allows communities of geophysicists to reconstruct, visualize, and manipulate complex plate-tectonic data-sets. For users with other types of expertise, Gplates provides a web portal with the possibility of on-the-fly rendering of selected data sets, such as LiDAR Data, Paleomagnetic Data, and Gravity Anomalies.¹⁰ The software is published under a general public license which means its code is legally available for inspection, distribution, and collaboration.

9 Possible Bodies, "Item 074: The Continuum," <https://possiblebodies.constantvzw.org/inventory/?074> (last access: July 2019).

10 "Gplates 2.0 software and data sets," <https://www.earthbyte.org/gplates-2-0-software-and-data-sets> (last access: July 2019).

According to its own description, Gplates

offers a novel combination of interactive plate-tectonic reconstructions, geographic information system (GIS) functionality and raster data visualisation. GPlates enables both the visualisation and the manipulation of plate-tectonic reconstructions and associated data through geological time.¹¹

The application is developed by a global consortium of academic research institutions situated in geological and planetary sciences. EarthByte, the consortium's leading partner, is an "international center of excellence and industry partners" whose large team is formed by students, researchers in oceanography and geology, and employees assigned to the project by companies, such as Shell, Chevron, and Statoil.¹² Gplates implements its own native file format, the Gplates Markup Language (GPML), in order to combine and visualize public data-sets from various resources, and to render them onto the basic shape of a gray globe.¹³ A horizontal timeline invites users to animate tectonic plate movement seamlessly forwards and backwards over geological time.

As software was downloaded during the workshop, knowledge and relations comingled, and soon, fifteen laptops were displaying the Gplates portal. Together we imagined resistant vocabularies, creative misuses and/or plausible f(r)ictions that could somehow affect the extractivist bias embedded in the computation of earth's depths and densities, and the ways in which this organizes life.

As the so-called earth spun before us, the universalist geologic commons emerged.¹⁴ A particular regime embedded within the software that imbues *the histories of colonial earth-writing* and a *geologies* in which "[e]xtractable matter must be both passive (awaiting extraction and possessing of properties) and able to be activated through the mastery of white men."¹⁵ In these scenes of turbocapitalism, the making present of fossil fuels and metals as waiting for extraction heavily depend on software tools, such as Gplates, for handling, interpreting, and 3-D visualization of geological data. These entangled softwares form an infrastructural complex of mining and measuring. Such tools belong to what we refer to as "the contemporary regime of volumetrics," meaning the enviro-socio-technical politics – a computational aesthetics – that emerge with the measurement of volumes and generation of 3-D objects. A regime full of bugs.

11 "Gplates, desktop software for the interactive visualisation of plate-tectonics," <https://www.gplates.org/> and <https://sourceforge.net/projects/gplates/> (last access: July 2019).

12 "EarthByte: People," <https://www.earthbyte.org/people/> (last access: July 2019).

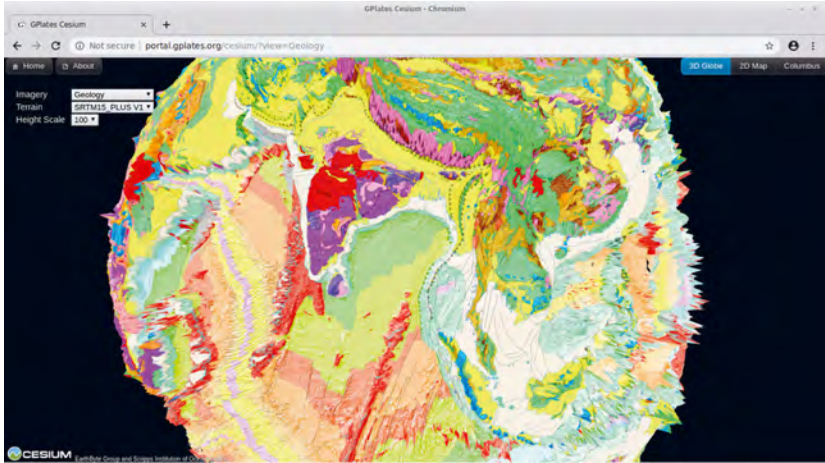
13 "grey means there is nothing such as a body of earth / it is almost a void / whole parts of grey earth / like you are making a cake / you can put toppings on." In Rocha 2019.

14 Yusoff 2018, p. 2.

15 Yusoff 2018, pp. 2 and 14.

Reporting a Bug, Bugging a Report

Somewhere there is a fault. Sometime the fault will be activated. Now or next year, sooner or later, by design, by hack, or by onslaught of complexity. It doesn't matter. One day someone will install ten new lines of assembler code, and it will all come down.¹⁶



Gplates web portal: Geology view, Earthbyte Group and Scripps Institution of Oceanography (last access: June 2019)

Bug reporting, the practice of submitting an account of errors, flaws, and failures in software, proposes ways to be involved with technological development that not only tolerates, but necessarily requires other types of expertise than writing code. Bug reporting is a lively technocultural practice that has come to flourish within free software communities, where Linus' law "with many eyeballs, all bugs are shallow" still rules.¹⁷ The practice is based on the idea that by distributing the testing and reporting of errors over as many eyes (hands, screens, and machines) as possible, complex software problems can be fragmented into ever smaller ones. By asking users to communicate their experiences of software breakdowns effectively, bug reporting forces "the making of problems" through a process of questions and fragmentation.¹⁸ It exposes so-called bugs to a step-by-step temporality, to make even

16 Ulman, Ellen, *Close to the Machine: Technophilia and Its Discontents*, San Francisco 2012 [originally 1999].

17 Raymond, Eric Steven, "The Cathedral and the Bazaar," <http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/index.html> (last access: July 2019).

18 As Simondon notes, "living is itself the generation of and engagement with problems." Simondon, Gilbert, *L'Individuation à la lumière des notions de forme et d'information*, Grenoble 2013.

the hardest problems small enough to be squeezable,¹⁹ as they eventually are reduced to nothing more than *tiny* bugs.

In order to streamline the process of such squeezing, many software platforms have been developed to optimize the cycle of bug reporting and bug fixing.²⁰ “Issue trackers” help developers first of all to separate bug reports from feature requests. A “bug” is a fault or an error that responds to what is already there; a “feature request,” on the other hand, is a proposal that adds to the project-as-is; it extends an existing feature or ultimately necessitates the rethinking of a software’s orientation. It is obvious that in such a techno-solutionist framework, reports will attract attention first, while requests have a lower priority. Once identified as such, a bug can then be tagged as “critical” (or not), assigned to a specific piece of code, a software release, a milestone, a timeline, or a developer who then will need to decide whether it is a syntax, run-time or semantic error. From then on, the bugs’ evolution from “reported” to “resolved” will be minutely tracked.

The issue with issue trackers and with bug reporting in general is that these are by definition coercive systems. Issues can only be reported in response to already existing structures and processes, when “something is not working as it was designed to be.”²¹ But what if something (for example, in this particular case, a geocomputation toolkit) is not designed as it should be? Or even more importantly, what if geocomputation should not be designed, or it should be actively undesigned and not exist at all? Or what if there were no way to decide or define, in advance, how something should be without making an authoritative gesture of prejudgment and imposition?

Bug reporting tightly ties users’ practices to the practice of development, making present the *relations* of software – it is a mode of practicing-with. Like Haraway’s situated practice of writing, figured by Maria Puig de la Bellacasa as a *thinking-with* and *dissenting-within*, bug reporting makes apparent that software does not come without its world.²² *Dissenting-within* figures as both an embedded mode of practice, or speaking from within open-source software, problematizing an idea of a critical distance; but also has an “openness to the effects we might produce with critiques to worlds we would rather not endorse.”²³

Maybe it is time to file a bug report on bug reporting. Both writing and reading bugs implies a huge amount of empathy, but this is in fact a technically

19 In the context of technical bug reporting, squeezing refers to fixing.

20 Issue trackers are increasingly being integrated into software versioning tools such as git, following the increasingly agile understanding of software development.

21 “Bug: Definition – What Does Bug Mean?” <https://www.techopedia.com/definition/3758/bug> (last access: July 2019).

22 See Puig de la Bellacasa, Maria, “‘Nothing Comes without Its World’: Thinking with Care,” in *The Sociological Review* 60, no. 2 (2012): pp. 197–216; Haraway, Donna J., *Staying with the Trouble: Making Kin in the Chthulucene*, Durham, NC / London 2016; and Kathrin Thiele’s chapter in this publication.

23 Puig de la Bellacasa 2012, pp. 205–206.

constrained sort of empathy: through steps, summaries, evidences, and indexing the reporter needs to manage her urgency and sync it with that of the wider apparatus of the software's techno-ecology and its concrete manipulator or interlocutor. What if we would use these processes for collectively imagining software otherwise, beyond the boundaries that are drawn by limiting the imagination of what counts as a bug, such as the productivist hierarchization between "features" and "bugs"?²⁴ Bug reports could allow space for other narratives and imaginations of what is the matter with software, *remediating* it with and through its troubles, turning it inside-out, affecting it and becoming affected by it in different ways.²⁵ "GPLates 2.1 was released today! Many bugs have been fixed, including the computation of crustal thinning factors."²⁶

In our attempt to imagine a bug report on Gplates, many questions started to emerge, not only in relation to how to report, but also because we were wondering *whom* to report to. In other words: a repoliticization of the practice of bug reporting implies thinking about the constellation of interlocutions that this culture of filing inserts its sensibilities in. If we consider software to be part of an industrial continuum, subjected to a set of values that link optimization, efficiency, and development to proficiency, affordability, and productive resilience, then where should we report the bug of such an amalgam of turbocapitalist forces? To whom should we submit reports on patriarcocolonialism? It also became clearer that making issues smaller, and shallow enough to be squeezed, was the opposite of the movement we needed to make; the trust in the essential modularity of issues was keeping problems in place.

Gplates for example, confirms users' understanding of the earth as a surveyable object that can be spun, rendered, grabbed, and animated; an object to be manipulated and *used*. There is, as Yusoff notes, no separation between technoscientific disciplines and the stories they produce, but rather an axis of power that organizes them.²⁷ Gplates is very much part of this axis, by coercing certain representational options of earth itself. But it also

24 "Experiments in virtuality – explorations of possible trans*formations – are integral to each and every (ongoing) be(coming)." Barad, Karen, "Transmaterialities: Trans*/Matter/Realities and Queer Political Imaginings," in *GLQ: A Journal of Lesbian and Gay Studies*, vol. 21, no. 2–3, 2015, pp. 387–422.

25 "I find bug reports interesting because if they're good, they mix observation and narration, which asks a lot from the imagination of both the writer and the reader of the report." Snelting, Femke and Haag, Christoph, "Just Ask and That Will Be That (Interview with Asheesh Laroia)," in *I Think that Conversations Are the Best, Biggest Thing that Free Software Has to Offer*, Brussels 2014, pp. 201–208.

26 "GPLates 2.1 released (and pyGPLates revision 18)," <https://www.earthbyte.org/gplates-2-1-released-and-pyGPLates-revision-18/> (last access: July 2019).

27 "There is not geology on one hand and stories about geology on the other; rather, there is an axis of power and performance that meets within these geologic objects and the narratives they tell about the human story. Traveling back and forth through materiality and narrative, the origins of the Anthropocene are intensely political in how they draw the world of the present into being and give shape and race to its world-making subjects." Yusoff 2018, p. 34.

does so through computational choices on the level of programming and infrastructure, through interface decisions and through the way it implements the language of control on multiple levels. These choices are not surprising, they align with other geocomputation tools, other volumetric rendering tools, and with normative understandings of the agency and representations of the earth in general.

Could we imagine filing a bug report on Gplates' timeline implementation, insisting on the obscenely anthropocentric faultiness of the smooth slider that is moving across mega-annums of geological time? How would we isolate this issue, and say exactly what is wrong? And since reproducibility is requested in a bug report, how would we ask a developers' collective to reproduce the issue one more time in order to rigorously study options for nonreproducibility in the future, and what do we expect the collective to do about it? We need a cross-platform, intersoftware, intracommunity, transgenealogical way of reporting that, instead of making bugs smaller, scales them up in time and space and that can merge untested displacements and intersections into its versioning ladder.

The practices of bug reporting could be considered as ways to develop trans*feminist commitments to the notion of thinking-with.²⁸ This is a mode of engagement with technological objects that is potentially porous to non-technical contributions; that is: to those by queers, women, people of color, nonadult and other less-entitled contributors. This also means that what seems (and is felt) to be the problem with technosciences has the potential to be arranged in other ways at the site of the bug report. Such porosity for *calibration-otherwise* and in differing domains opens up through the intense squeezing, fragmentation, and proliferation of problems.²⁹ This exterminating, almost necropolitical motion of squeezing operates on bugs that are small enough to be killed.³⁰ Squeezing to kill has as a rough consequence that those who are involved in the killing need to assume the responsibility for considering how and why to force through different conditions for the possible, but not others. Such considerations might generate semiotic and material circumstances for making interventions into the damages that are caused by the practices of geocomputation and software like GPlates.³¹ It might be a way to do what we call *queering the damage*, and to extend queer theories concerned with personal injury into geocomputational ensembles in

28 Puig de la Bellacasa 2012, p. 199.

29 For a discussion on recalibrating relations, see Pritchard, Helen, Gabrys, Jennifer, and Houston, Lara, "Re-calibrating DIY: Testing Digital Participation across Dust Sensors, Fry Pans and Environmental Pollution," in *new media & society*, vol. 20, no. 12, 2018, pp. 4533–4552.

30 Mbembe, Achille, "Necropolitics," trans. Libby Meintjes, in *Public Culture*, vol. 15, no. 1, 2003, pp. 11–40.

31 Although there is not enough room to expand on the damages here, they include pain, suffering, injury, uselessness, homophobia, racism, ageism, ableisms, specism, classism, exclusions, and inclusions.

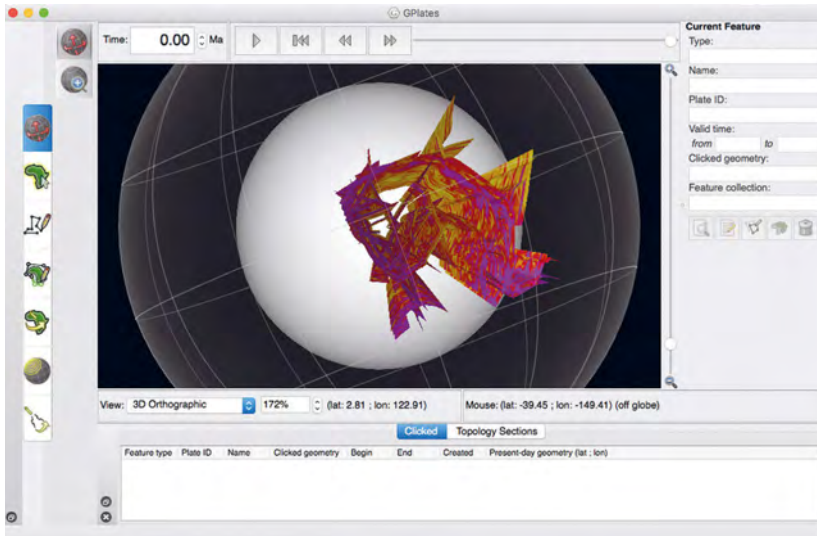
order to consider the effects of damages shared by humans and nonhumans. By practicing *queering damage* in relation to geocomputation, we engage with the injuries caused by these volumetric practices. This is a kind of trans*-feminist practice that does not seek to erase histories of injury and harm, but which recognizes that there is a generative force within injury.³² A force that might take the form of partial reparations, response-ability, (techno)composting and reflourishing.

While we would like to consider bug reporting as a form of *response-ability* taking, there is also another option.³³ Instead of staying with the established manners dependent on the existing and hegemonically universalizing logic repertoire for technical processing, we might refuse to fix many tiny bugs under the guise of agile patching and instead consider opening a “BUT” gate.³⁴ This is a political operation: instead of trying to “fix” the Gplates timeline, we could decide to creatively use it by for example setting the software’s default for “present” to a noncorresponding year, or by mentally adding a 0 to each of the displayed numbers. Another way to *stay with the trouble* of software might be to use things *as they are*, and to invent different modes by the very practice of persistent use.³⁵

Disobedient Action-Research as a Form of Bug Reporting on Research Itself

They look over at the group of well-known companions and just-known participants, and ask: ‘if multiple timescales are sedimented in contemporary software environments used by geophysics, can fossil fuel extractivist practices be understood as time-traveling practices?’ They observe that this will need to be a question for the bug report. Running the mouse across the screen turning the software of geophysics, they ponder how, through visualizing plates in particular ways on a timeline, Gplates renders a terra nullius, an emptied world.³⁶

- 32 For more context on queering damage and extending queer theories of injury see “Queering Damage,” <https://queeringdamage.hangar.org> (last access: July 2019); and Pritchard, Helen, *The Animal Hacker*, PhD Diss., Queen Mary University of London 2018, p. 244.
- 33 “Blaming Capitalism, Imperialism, Neoliberalism, Modernization, or some other ‘not us’ for ongoing destruction webbed with human numbers will not work either. These issues demand difficult, unrelenting work; but they also demand joy, play, and response-ability to engage with unexpected others.” Haraway, Donna J., “Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin,” in *Environmental Humanities* vol. 6, no. 1, 2015, pp. 159–165.
- 34 A “BUT” gate is a proposed addition to the logic operators at the basis of electronics and computation, a gate that would halt the process and make time to discuss concerns on other levels of complexity. More about this proposal by ginger coons and Relearn: “Item nr. 013: BUT: an additional logical gate,” <https://possiblebodies.constantvzw.org/inventory/?013> (last access: July 2019).
- 35 Haraway, Donna J., *Staying with the Trouble: Making Kin in the Chthulucene*, Durham, NC / London, 2016, p. 2



Gplates main interface with data loaded

This essay started as collective bug report on Gplates software, but in order to file such a report, it needed to disobey the axiom of problem reduction, and zoom out to *report on bug reporting* as a practice. Let's now bug the way research engages itself with the world, and specifically how it affects and is affected by computational processes.

Orthodox modes of producing knowledge are ethically, ontologically, and epistemologically dependent on their path from and towards universalist enlightenment; the process is to answer questions, separate them from each other, and eventually fix the world, technically. This violent and homogenizing attitude stands in the way of a practice that, first of all, needs to attend to the re-articulation and relocation of what must be accounted for, perhaps just by proliferating issues, demands, requests, complaints, entanglements, and/or questions.³⁷

Take vocabularies as a vector, for example: in order to report on the bug of using the term “grabbing” in Gplates – of which a participant in the “Depth

36 A recounted scene from the “Depths and Densities” workshop. On terra nullius, see de la Cadena, Marisol, and Mario Blaser (eds.), *A World of Many Worlds*, Durham, NC / London 2018: “The practice of terra nullius: it actively creates space for the tangible expansion of the one world by rendering empty the places it occupies and making absent the worlds that make those places.”

37 “Without separability, sequentiality (Hegel’s ontoepistemological pillar) can no longer account for the many ways in which humans exist in the world, because self-determination has a very limited region (spacetime) for its operation. When nonlocality guides our imaging of the universe, difference is not a manifestation of an unresolvable estrangement, but the expression of an elementary entanglement.” Ferreira da Silva, Denise, “On difference without separability” in *32a São Paulo Art Biennial catalogue: Incerteza viva/Living Uncertainty*, São Paulo 2016, pp. 57–65.

and Densities” workshop astutely observed that “if all the semantic network of Gplates is based on handling and grabbing as key gestures in relation to the body of earth, a loss of agency and extractivist assumption slips in too smoothly, and too fast” – we are in need of research methods that involve direct action and immediate affection into/by the objects of study.³⁸ She continued: “Also, the use of the verb ‘to grab’ brings with it the history and practice of ‘land grabbing,’ land abuse, and arbitrary actions of ownership and appropriation, which has been correlated both with dispossession by the taking of land, and environmental damage.” In other words: if orthodox research methods deal with either hypothesis based on observations that are then articulated with the help of deduction or induction, we are in need of methods that affect and are affected by their very materialities, including their own semantics.³⁹

It is appealing to consider the practices of bug reporting as a way to inhabit research. As a research method, it can be understood as a repoliticization and cross-pollination of one of the key traditional pillars of scientific knowledge production: the publishing of findings. In this sense, bug reporting is, like scientific research, concerned with a double-sense of “making public”: first, it makes errors, malfunctions, lacks, or knots legible; second, it reproduces a culture of a public interest in actively taking-part in contemporary technosciences. Possible Bodies considers bug reporting as a way to engage in disobedient action research. By practicing bug reporting, we might anchor our discussions in encounters with the world and the world that composes them – and this is closely related to the practice of *queering damage*.⁴⁰ In this way, bug reporting becomes inseparable from the relations it composes with volumetrics, both with the technical and through its relations with queer and feminist theory. Disobedient action research “invokes and invites further remediations that can go from the academic paper to the bug report, from the narrative to the diagrammatic and from tool mis-use to interface redesign to the dance-floor. It provides us with inscriptions, descriptions, prescriptions and reinterpretations of a vocabulary that is developing all along.”⁴¹

Action research as an established method is by definition hands-on, site-specific and directly interpellating to systems, and in that sense, it is already close to the potential of bug reporting as a form of response-able research.

38 Rocha 2019.

39 Puig de la Bellacasa 2012, p. 199.

40 Strathern, Marilyn, “Opening Up Relations,” in de la Cadena, Marisol, and Mario Blaser (eds.), *A World of Many Worlds*, Durham, NC / London 2018.

41 Rocha, Jara and Snelting, Femke, “The Possible Bodies Inventory: Dis-orientation and Its Aftermath” in *Cuerpos Polidricos, Immaterial Journal*, vol. 2, no. 3, Barcelona, 2017.

In a way, action research is always already disobedient, because it refuses to stand back or to understand itself as separate from the world it is researching; with Karen Barad we could say that action research assumes it is “always-already entangled.”⁴²

The “disobedient” in disobedient action research means it refuses to follow the imagined looped cycle of the evolving timeline of theory and practice. It does not fit the neatly posed questions of a technical bug report neither. It instead works diffractively across the *deep implicancies* of collective research with software, cutting between various lines of inquiry.⁴³

The specific disobedience that Possible Bodies brings to Gplates is the refusal to scope according to the probable axis of universalism, productivism, and determinism. It is a disobedience that instead moves across vectors, coordinates, and intersectional scales and – why not? – emerges from within those very vectors and their circumstances. It proposes a calibration-otherwise for volumetrics that can be understood as a form of disciplinary disobedience, a gesture that does not reject scale and the expertise of geocomputation but that problematizes its aftermath while experimenting with other applications and implications.

This disobedient bug report on Gplates therefore needed to ask about temporalities and their material and semiotic conditions, but at the same time concretely wonder how the software imagines the end of time(s), in a modelling sense.⁴⁴ Within such diffractive cycles, the disobedient bug report attunes to all types of bugginess within a process: “[the underground] is no longer (or never was) the exclusive realm of technocrats or geophysics experts.”⁴⁵

Tuning in to these various lines, disobedient action research has its own liveliness, searching out the bugginess in all tools, forcing a debugging of more than just software, and asking users and developers to consider a commitment to the deep implicancies of earth sciences, extractivism, software development, and coercive naming, to name only a few possible agential cuts. The point of disobedient action research is that the feminist commitment to stay with the trouble is made operational within the work itself.

These ongoing buggy moments of research and reporting then need to include the bugs within eurocentric, identitarian white feminist theoretical frameworks and practices that we are uncomfortably infused by. The worlds which they are rendering visible worry us, and the ones excluded from this rendering urge us to try harder. As object and subject co/mingle in the bug report, worlds become recast, “where poetic renderings start to (re)generate (just) social imaginations.”⁴⁶ In taking up the software tools of geophysics

42 Barad, Karen, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Durham, NC / London 2007.

43 Ferreira da Silva, Denise and Neuman, Arjuna, *4 Waters: Deep Implicancy*, 2018.

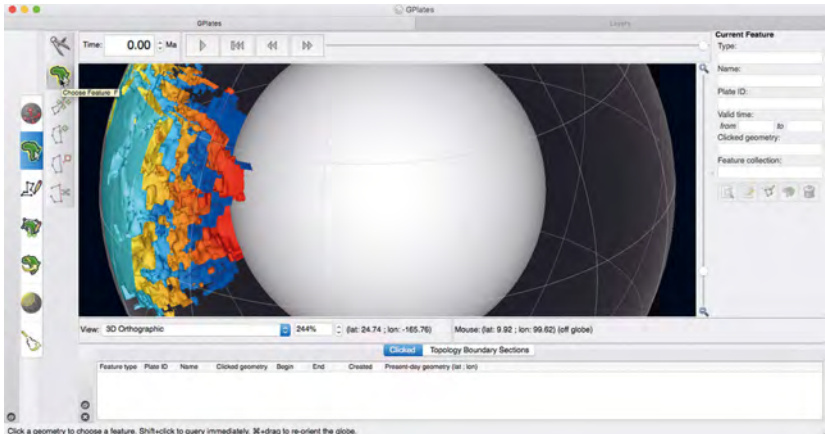
44 Rocha 2019.

45 Rocha 2019.

46 Possible Bodies, “Ultrasonic Dreams of Aclinical Renderings” in *Ada: A Journal of Gender, New Media, and Technology*, no. 13, 2018.

research and industry, we are reminded collectively that technical knowledge is not the only knowledge suitable for addressing the situations we find ourselves in.⁴⁷ As we anchor our disobedience in trans*feminist figurations, bugs obviously appear in how “we make it otherwise.”⁴⁸ Rendering through figures, some of our anchors become lost and others become necessarily unstable, as they make certain worlds tangible, and render others absent.

Nonfixing as Experimental De/Rebugging @ Gplates



Gplates main interface (detail): grabbing the earth

What if the earth grabs back?⁴⁹

The attempt to write a bug report on Gplates forces us to reconsider the implications of a fix and its variations such as the technofix or the reparation. As necessary as it seems to report the damaging concoction of representations, computations, vocabularies, and renderings, it seems important to not assume these issues to be addressed in order to (just) fix them in the sense of putting them back in circulation. Or to say it differently: to change it all so nothing really changes.

In the *turbocapitalist momentum*, are there other options besides abrupt deceleration and hyperlubricated acceleration? A way of working without guarantees or attempting to resist ever-new reparative fantasies of technoscience? However, we are not calling for an anti-affirmative stance; but instead by making the leap in scale, together with queer and antiracist ontologies in

47 Suchman, Lucy, *Human-Machine Reconfigurations: Plans and Situated Actions*, second edition, Cambridge, UK 2006, pp. 188–190.

48 Povinelli, Elizabeth A., “After the Last Man: Images and Ethics of Becoming Otherwise,” in *E-flux* 35, 2012.

49 Rocha 2019.

our software critique we place an emphasis on damages across the industrial continuum of volumetrics. As Heather Love notes, queer practice “exists in a state of tension with a related and contrary tendency – the need to resist damage and to affirm queer existence.”⁵⁰ In a mode of queering-damage-as-queer-existence, we extend the possibility of intervention from body politics to geopolitics.

Engaging together in disobedient bug reporting might be a queer way to learn more sophisticated ways of identifying how regimes of truth, ideology, or representation affect our most immediate and mundane naturecultures. The hegemonic acceleration of contemporary technologies imposes a series of conditions that lead to the persistence of cultural forms of *totalitarian innovation* which must be resisted and contested. Yet those same conditions also constitute a complex of latencies and absences with which we have to inventively coexist, driven by the need for attentive, politicized presences. In a way, the persistent practice of finding “bugs” as another possible mode to conduct research tracks the potential to stay with the trouble of software in a responsible, creative way. The bug reporting on GPlates is an affirmative mode of software critique that refuses to organize along the vectors of reparation or resilience, but to grab back.

In other words, writing disobedient, collective, situated bug reports might be a method of pushing the limits of the probable and expanding the spectrum of the possible. Discussing technological sovereignty and infrastructural self-defense initiatives are good places to start, but those gestures are certainly not enough.⁵¹ The first step is to methodologically identify and affirmatively publish the damages that coercive turbocapitalism inflicts through volumetrics and geocomputation. We need to join forces and write bug reports on these systems in order to technically equip ourselves with partial and localized repair possibilities, while resisting the production of ever-new and naïve reparative fantasies.

As a future work, we started to think about what noncoercive computing would involve, as it becomes increasingly clear that the hubris of, let’s say, the Gplates timeline is rooted in the colonial *computationalism* of such a project.⁵² It won’t all happen tomorrow, but we can start with a rough outline together. *We have always been geohackers.*

50 Love, Heather, *Feeling Backward*, Cambridge, MA 2009, pp. 3; and Love 2009, 3 in Pritchard 2018, pp. 244.

51 Haché, A. et al. (eds.), *Soberanía Tecnológica: Ritimo*, 2014, <https://www.plataforme-echange.org/IMG/pdf/dossier-st-cast-2014-06-30.pdf> (last access: August 2020).

52 Ali, Syed Mustafa. “A Brief Introduction to Decolonial Computing” in *XRDS: Crossroads, The ACM Magazine for Students*, vol. 22, no. 4, 2016, pp. 16–21.



Feuerball des Trinity-Tests nach 16 Millisekunden, 16.07.1945, New Mexiko

Orit Halpern Der planetare Test

1945 wurde in New Mexico die erste Atombombe gezündet. Der Trinity-Test war das Resultat einer der größten wissenschaftlichen Anstrengungen, die je unternommen wurden, und bahnte den Weg für die Entwicklung jener Bombe, die später den Namen „Fat Man“ tragen und über Nagasaki abgeworfen werden würde. Der Test war bald kein Test mehr, sondern Realität.

Angesichts der Explosion zitierte der wissenschaftliche Leiter des Manhattan Projects, J. Robert Oppenheimer, aus der Bhagavad Gita: „Wenn das Licht von tausend Sonnen am Himmel plötzlich bräch' hervor / das wäre gleich dem Glanze dieses Herrlichen.“¹ Und als die große Wolke sich über der Wüste aufbaute, kam eine weitere Zeile aus derselben Schrift über seine Lippen: „[I]ch bin der Tod geworden, der Zerstörer der Welten.“² Unfähig, die Auswirkungen dessen zu ertragen, was er selbst geholfen hatte zu entwerfen, würde er sich bald gegen seine eigene Erfindung wenden – eine Technologie, die die Welt in Trümmer legen würde. Einzig für den Zweck entworfen, zu töten, transformierte die Bombe gerade durch ihre tödliche Wirkung das gesamte Leben auf der Erde.³

Der Trinity-Test markiert einen entscheidenden Moment in der Geschichte der Menschheit, in dem das Überleben der Arten auf eine intime und gefährliche Weise mit Technologie verschränkt wurde. Technologie bzw. Design

1 *Bhagavadgita. Das Lied der Gottheit*, übers. v. Robert Boxberger, neu bearb. und hg. v. Helmuth von Glasenapp, Stuttgart 2003 [zuerst Berlin 1870], S. 28.

2 Ebd.

3 „J. Robert Oppenheimer, Atom Bomb Pioneer, Dies“, in: *New York Times*, 19.02.1967, <https://archive.nytimes.com/www.nytimes.com/learning/general/onthisday/bday/0422.html> (07.06.2019).