

CARE-TOGRAPHIES: FINDING FAILURE IN NAVIGATIONAL SETTINGS

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Introduction

In this chapter I offer a methodological framework for how to think about navigational failure, considering navigation as instituting networks of care or ‘care-tographies’. In order to do so, I first lay out the feminist understanding of care as a practical activity, dependent upon specific ‘phases’ of care. Then, I consider how failure has routinely been studied by scholars, in respect to events like train crashes and nuclear accidents. In light of these efforts, some have considered how theories of care might be applied to such failures, offering an analysis of how ‘matters of care’ might crystallize,¹ helping to prevent or alleviate the effects of technological or organizational, failure. Building upon these insights, I consider how navigation might be similarly understood through a care-tographic framework, and how navigational devices, interfaces, and infrastructures mediate caring relations between people and worlds. In the final two vignettes, I briefly evidence how care is practiced in navigational settings, with reference to protest events and autonomous vehicle tests.

Care and Failure

Feminist political scholars Berenice Fisher and Joan Tronto identify four phases of care,² neither temporal in form, nor ‘orderly stages’³ culminating in ‘some completion of the caring activity’.⁴ Each phase might be carried out by a single individual or ‘divided among different individuals or groups,’⁵ with each ordinarily ‘intertwined in chaotic and contradictory styles’,⁶ in which care might co-exist with carelessness, or caregiver might become care-receiver. Thus, locating care is tricky. For instance, ‘care giving may proceed where no one any longer cares about the original situation’,⁷ say when housing support is provided to an evicted family. In such a case, ‘the original situation’ of the eviction (arguably a situation where care is noticeably absent) may or may not be a factor in the

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- 1 María Puig de la Bellacasa, *Matters of Care: Speculative Ethics in More Than Human Worlds*, Minneapolis, MN: University of Minnesota Press, 2017.
 - 2 Berenice Fisher and Joan Tronto, ‘Toward a Feminist Theory of Caring,’ in Emily K. Abel and Margaret K. Nelson (eds), *Circles of Care: Work and Identity in Women’s Lives*, Albany, NY: SUNY Press, 1990, pp. 36-54.
 - 3 Fisher and Tronto, ‘Toward a Feminist Theory of Caring’, 41.
 - 4 Fisher and Tronto, ‘Toward a Feminist Theory of Caring’.
 - 5 Fisher and Tronto, ‘Toward a Feminist Theory of Caring’.
 - 6 Fisher and Tronto, ‘Toward a Feminist Theory of Caring’.
 - 7 Fisher and Tronto, ‘Toward a Feminist Theory of Caring’.

resulting decision to provide housing support (merely that the family now require housing). In any case, searching for care involves analytical skill, and attunement to the conditions that make care possible.

Firstly, care involves *being attentive*. In this phase of the caring process, one must decide to 'care about' something,⁸ with the judgement being more an 'orientation rather than a motivation',⁹ driven by finite resources, time, knowledge, or ability. Secondly, care requires taking *responsibility*. In this phase, care becomes an action, requiring 'more continuous time spent and more explicit knowledge of the situation than does caring about'.¹⁰ Thirdly, care requires *maintenance*, with care understood as a continual, iterative, activity rather than a single, declarative act. Here caregiving involves being responsive to changing 'moment-by-moment or day-by-day conditions'¹¹ that might demand the revision of any 'caregiving strategy' devised.¹² Then lastly, care involves *feedback*, constitutive of any *caregiving*, in which one must be aware of, and responsive to, the *receiving* of care. Here the needs and desires of the people receiving care must be understood, such that the provision of care be tailored accordingly, and that care itself can achieve its stated or implicit aims.

Taken together, these phases constitute care as a set of inter-connected practices, rather than simply a moral ethic or principle. Through their asynchronous interweaving, these phases of care form what I have called 'care-tographies', networks of care relations drawn between people by the things they do.¹³

Technological failures have commonly been studied by science and technology studies (STS) scholars, sociologists, and geographers, whether in the context of nuclear accidents, train crashes, or electricity blackouts.¹⁴ Whilst much of this work has offered sociological or socio-technical analyses of why particular technologies or systems 'fail' through reference to ideas around complexity, multiplicity, relationality, and materiality, few provide a methodological framework for finding failure. By incorporating feminist theories of care, some STS scholars have shifted discussion from how failure might be understood through addressing 'concerns' (a broken part, a forged safety certificate)¹⁵ to how it might be understood as a failure to offer

8 Fisher and Tronto, 'Toward a Feminist Theory of Caring'.

9 Fisher and Tronto, 'Toward a Feminist Theory of Caring', 42.

10 Fisher and Tronto, 'Toward a Feminist Theory of Caring', 42.

11 Fisher and Tronto, 'Toward a Feminist Theory of Caring', 43.

12 Fisher and Tronto, 'Toward a Feminist Theory of Caring'.

13 Sam Hind, 'Cartographic Care, or, Caretographies,' *LivingMaps Review* 3 (2017): 1-14, <http://livingmaps.review/journal/index.php/LMR/article/view/67/136>.

14 Charles Perrow, *Normal Accidents: Living with High-Risk Technologies*, New York: Basic Books, 1987; John Law, *After Method: Mess in Social Science Research*, London: Routledge, 2004; Stephen Graham and Nigel Thrift, 'Out of Order: Understanding Repair and Maintenance,' *Theory, Culture & Society* 24.3 (2007): 1-25, <https://doi.org/10.1177/0263276407075954>.

15 Bruno Latour, *Aramis or the Love of Technology*, Cambridge, MA: Harvard University Press, 1996; Bruno Latour, 'Why Has Critique Run Out of Steam? From Matters of Fact to Matters of Concern,' *Critical Inquiry* 30.2 (2004): 225-48, <https://doi.org/10.1086/421123>.

and maintain curiosity, attention, affect, responsibility, responsiveness, and thus care itself.¹⁶ Fisher and Tronto provide the necessary methodological foundations with which to locate, and analyze failure itself: through the lens of care, care work, and the practice of taking care.

Navigational Failure and Care

Building on Fisher and Tronto's feminist work, and extending existing scholarship on failure, I understand navigational failure as conditional on care, and the activation, maintenance, or suspension of a caring process. In this, navigational failure might broadly be attributed to a lack of care at any one moment, whether a lack of attention by a hiker who misses a path, an overworked driver who misses a turn, a mapping company who depreciates a cartographic product, or a development company who renames a neighborhood. In each case we might argue that a navigational 'failure' (a missed turn, an out-of-date map) has occurred or has an increased chance of occurring, and that a lack of care might be attributed to the failure.

Thinking about maps and navigation as matters of care is nothing new. Monica Stephens, for instance, has examined how childcare facilities are often left off digital mapping platforms like OpenStreetMap (OSM), whilst Valentina Carraro has considered how social navigation apps like Waze warn ('white, middle-class') users of dangerous areas in Israel/Palestine.¹⁷ Significant examples of navigational failure that invite a care-ful analysis include the 2012 Apple Maps failure evidenced by misplaced labels and 'melting' satellite imagery¹⁸ or the 2022 Russian invasion of Ukraine, when Google Maps disabled their live traffic feature to protect local users.¹⁹ Both of these cases might be framed as particular kinds of technological 'failures', either in reference to database issues (as with Apple Maps) or location-tracking (Google Maps). However, both examples can also be considered as failing to offer and maintain care. In the Apple Maps case, the launch of a new product suddenly rendered routine navigation hazardous. In the Google Maps case continuing to offer the same live traffic feature potentially exposed local users to Russian attack.

In the following two navigational vignettes I expand on this prior work, considering how each case can be evaluated using a 'care-tographic' framework, as well as examining how navigational situations elicit specific aspects of care itself. Whilst the first vignette highlights

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- 16 Maria Puig de la Bellacasa, 'Matters of Care in Technoscience: Assembling Neglected Things,' *Social Studies of Science* 41.1 (2011): 85-106, <https://doi.org/10.1177/0306312710380301>; Aryn Martin, Natasha Myers, and Ana Viseu, 'The Politics of Care in Technoscience,' *Social Studies of Science* 45.5 (2015): 625-41, <https://doi.org/10.1177/0306312715602073>.
- 17 Monica Stephens, 'Gender and the GeoWeb: Divisions in the Production of User-Generated Cartographic Information,' *GeoJournal* 78.2 (2013): 981-96, <https://doi.org/10.1007/s10708-013-9492-z>; Valentina Carraro, *Jerusalem Online: Critical Cartography for the Digital Age*, London: Palgrave Macmillan, 2021.
- 18 Nilay Patel, 'Wrong Turn: Apple's Buggy iOS6 Maps Lead to Widespread Complaints,' *The Verge*, 20 September 2012, <https://www.theverge.com/2012/9/20/3363914/wrong-turn-apple-ios-6-maps-phone-5-buggy-complaints>.
- 19 James Vincent, 'Google Disables Maps Traffic Data in Ukraine to Protect Citizens,' *The Verge*, 28 February 2022, <https://www.theverge.com/2022/2/28/22954426/google-disables-maps-traffic-data-in-ukraine-to-protect-citizens>.

how care is iterative and requires ongoing evaluation, the second vignette shows how the accumulated burden of responsibilities can easily lead to tragedy.

Vignette 1: Protest Mapping

At 11pm on 30 June 2020, a new national security law was imposed in Hong Kong, severely restricting freedom of speech and free assembly in the territory.²⁰ A year before, citizens had taken to the streets to protest a controversial extradition bill, the first mass protests since the 2014 ‘Umbrella Revolution’.²¹ In doing so, several protest mapping projects sprung up, including HKmap.live and 103.hk.²² Following the protests in 2019, HKmap.live had been removed from the Apple App Store citing public safety concerns, continuing as a dynamic, web-accessible map only.²³ In contrast, 103.hk published regular static, digital image-based maps. Both used Telegram channels to push cartographic updates to subscribers.²⁴ I have previously written about how both projects cultivated forms of care towards protesters, helping them navigate dangerous situations and encounters with the police.²⁵ But here I want to emphasize three aspects.

Firstly, that protest mapping requires *self-care*, in which not only map users are cared for, but map makers too. As the 103.hk team emphasized to its cartographic volunteers, ‘the map is not as important as you are’,²⁶ echoing Tronto’s later addition of a fifth phase of care, ‘solidarity’.²⁷ Secondly, that protest mapping requires *resilient care infrastructures* in order to offer a sustainable, effective, and robust navigational service. As the 103.hk team acknowledged, reporting protocols, including a standardized system for communicating incidents, was integral to their project. Thirdly, that protest mapping needs an understanding of when care needs *expire*. While the 103.hk team had largely perfected the art of representing incidents on the map, they struggled to deal with incidents that *no longer needed to be*

- 20 Lily Kuo, ‘Controversial Hong Kong National Security Law Comes into Effect,’ *The Guardian*, 30 June 2020, <https://www.theguardian.com/world/2020/jun/30/controversial-hong-kong-national-security-law-comes-into-effect>.
- 21 Lily Kuo and Oliver Holmes, ‘Police Use Rubber Bullets as Hong Kong Protesters Vow ‘No Retreat’’, *The Guardian*, 12 June 2019, <https://www.theguardian.com/world/2019/jun/11/hong-kong-extradition-law-protesters-rally-outside-government-offices>.
- 22 At the time of writing (17 August 2022), neither map is still directly accessible, except via archival links: <https://web.archive.org/web/20220501132639/https://hkmap.live/> and <https://web.archive.org/web/20191212145044/https://103.hk/en/map/>.
- 23 Sam Byford, ‘Apple Removes App Used in Hong Kong Protests After Pressure from China,’ *The Verge*, 10 October 2019, <https://www.theverge.com/2019/10/10/20907596/apple-hong-kong-protests-app-removed-china>.
- 24 At the time of writing (17 August 2022), both Telegram channels are still accessible via <https://t.me/hkmaplive> and <https://t.me/RealTimeMapHK>.
- 25 Sam Hind, ‘Cartographic Care, or Care-tographies: From London to Hong Kong,’ in Phil Cohen and Mike Duggan (eds), *New Directions in Radical Cartography: Why the Map is Never the Territory*, Lanham, MD: Rowman & Littlefield, 2022, pp. 257-282.
- 26 ‘Team Info,’ 103.hk, <https://web.archive.org/web/20191212145044/https://103.hk/en/map/obs/#status>.
- 27 Joan C. Tronto, *Caring Democracy: Markets, Equality, and Justice*, New York: New York University Press, 2013, 35.

represented. In a time-critical and resource-intensive environment, knowing when care was no longer required was vital.

Vignette 2: Autonomous Driving

At 9:58pm on 18 March 2018, an Uber ATG autonomous vehicle killed a pedestrian, Elaine Herzberg, in Tempe, Arizona (USA).²⁸ As a crash investigation by the US National Transportation Safety Board (NTSB) later confirmed, Herzberg had been hit whilst walking her bicycle across northbound North Mill Avenue, a four-lane arterial route in the north of the city.²⁹ At the time of impact, the vehicle had been undertaking a second loop of an established test route routinely driven since 2017 by the fleet of modified Volvo XC90s operated by Uber ATG in Tempe.³⁰ The ‘vehicle operator’ behind the wheel was Rafaela Vasquez, an employee with the company since June 2017, responsible for a range of tasks whilst the vehicle was in autonomous mode.³¹ Here I want to emphasize three aspects of the tragic event.

Firstly, according to the NTSB report, the Uber ATG vehicle failed to *account* for Herzberg. 5.6 seconds before she was hit, the vehicle’s on-board developmental automated driving system (ADS) detected and classified Herzberg as a vehicle. After a further eight new classifications in which she was also categorized as stationary and as an ‘unknown object’, 0.2 seconds before impact Herzberg was classified for a final time as a bicycle.³² At no point was Herzberg correctly identified or classified as a pedestrian walking with a bicycle.

Secondly, Vasquez herself failed to *maintain attention*. Between 9:16pm and 9:59pm (one minute after impact), Vasquez’s personal mobile phone was alleged to have been streaming a TV show.³³ Using eye-tracking analysis, NTSB investigators determined that Vasquez had glanced down towards the center console of the vehicle (where they believed her personal mobile phone to be) 23 separate times in the three minutes before crash.³⁴ One of the principle tasks of the vehicle operator was to monitor the driving environment, ready to take control of the wheel in an emergency, something Vasquez had failed to do to avoid a crash.³⁵

28 Sam Levin and Julia Carrie Wong, ‘Self-Driving Uber Kills Arizona Woman in First Fatal Crash Involving Pedestrian,’ *The Guardian*, 19 March 2018, <https://www.theguardian.com/technology/2018/mar/19/uber-self-driving-car-kills-woman-arizona-tempe>.

29 ‘Highway Accident Report: Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian, Tempe, Arizona, 18 March 2018,’ National Transportation Safety Board, <https://www.nts.gov/investigations/accidentreports/reports/har1903.pdf>.

30 ‘Highway Accident Report,’ National Transportation Safety Board.

31 Lauren Smiley, ‘‘I’m the Operator’: The Aftermath of a Self-Driving Tragedy,’ *WIRED*, 8 March 2022, <https://www.wired.com/story/uber-self-driving-car-fatal-crash>.

32 ‘Highway Accident Report,’ National Transportation Safety Board’, 15-16.

33 ‘Highway Accident Report,’ National Transportation Safety Board’, 24.

34 ‘Highway Accident Report,’ National Transportation Safety Board’, 18.

35 ‘Highway Accident Report,’ National Transportation Safety Board’, 42.

Thirdly, Uber ATG failed to sufficiently *take care of* their vehicle operators. Five months prior to the crash, the company had reduced the number of vehicle operators in the vehicle during each test from two to one. This ‘consolidation of responsibilities’³⁶ meant a single individual was responsible for a suite of ongoing tasks, from monitoring the road, to flagging driving infractions on a dashboard-mounted device.³⁷ The extra burden placed on Vasquez was a significant factor in Herzberg’s death.

These are not the only aspects of the event that can be evaluated with reference to care but the aspects that help to make sense of the various intersecting ‘failures’ that created the conditions for the fatal crash.³⁸ By approaching them as matters of care, or more appropriately, as matters of a *lack of care*, the tragic circumstances of the navigational situation can be better understood.

Conclusion

In this chapter I have offered a methodological framework for how to examine navigational failures, considering navigation as instituting networks of care or ‘care-tographies’. In this, navigational failures can be seen as being precipitated through the relative presence, or absence, of caring practices and strategies. More specifically, such failures can be considered through a feminist lens of care, in which possible ‘phases’ of care may be identified as part of the provision of navigational assistance in a range of navigational settings.

In the two short vignettes, I have considered how a care-tographic approach might help to draw out specific navigational relations in the mapping of protest events and the testing of autonomous vehicles. In both cases, to understand how mapping requires diligent, patient work in often dangerous and either physically exhausting or mentally numbing conditions. A care-tographic approach offers the possibility of locating moments at which the normal state of things breaks down and of drawing attention to the routine manual work behind digital platforms and nominally ‘autonomous’ machines,³⁹ where the experience of performing such work is situated somewhere between intolerable burden and boredom.

For scholars of navigation, feminist theories of care also provide a significant, but often overlooked, approach to understanding how navigational settings are constructed, how navigational technologies nominally ‘fail’, who suffers when they fail, and why. For

36 ‘Highway Accident Report,’ National Transportation Safety Board’, 45.

37 Sam Hind, ‘Machinic Sensemaking in the Streets: More-than-Lidar in Autonomous Vehicles,’ in Gillian Rose (ed), *Seeing the City Digitally: Processing Urban Space and Time*, Amsterdam: Amsterdam University Press, 2022, 57-80.

38 One could also analyze how the median strip on North Mill Avenue, used by Herzberg, was landscaped to have the ‘appearance of a pathway’, despite not being a designated pedestrian crossing; Hind, ‘Machinic Sensemaking in the Streets’.

39 Paola Tubaro, Antonio A Casilli, and Marion Coville, ‘The Trainer, the Verifier, the Imitator: Three Ways in Which Human Platform Workers Support Artificial Intelligence,’ *Big Data & Society* 7.1 (2020): 1-12, <https://doi.org/10.1177/2053951720919776>.

mapmakers, designers, and software engineers, a care-tographic framework might serve as an evaluative tool for critical, egalitarian map design and implementation, catering to the situated needs of those who require navigational assistance the most.

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