Matthew Fuller

ANALYSIS, EXPOSURE AND ADDITION: THE AESTHETIC AND ECOLOGICAL LOGICS OF JOANA MOLL'S *CARBOLYTICS*

PostScript^{UM}

Matthew Fuller

ANALYSIS, EXPOSURE AND ADDITION: THE AESTHETIC AND ECOLOGICAL LOGICS OF JOANA MOLL'S *CARBOLYTICS*

Understanding meaning, in the sense historically understood by the arts and humanities, is to do with relays of interpretation. An idea or a disposition may travel from person to person, from a painting to a dance, from a concept to a gesture, and onwards in intersecting ripples of association and reworking. The formation of perception and of the formulation of values have, in the present world, also become increasingly understood to have significance in an ecological sense: one to do with the transfer of nutrients, energies and the shaping of possibilities in the interplay of lifeforms. In parallel to this growth of understanding, computing becomes a crucial site for the staging and calculation of relays of interpretation. The cultures of computing weave into and affect many other aspects of life with their own kind of relays. As they gain power, questions arise. Computing technology is scrutinised not only for its effects on societal values and processes, it is also beginning to be understood in terms of its costs in ecological terms.

In this sense, meaning becomes not only about interpretation but also about a sensual and ethical relationship to power, what we plug into, what we detach from, which codes we can avoid and those we cannot, and how much

resources are allocated to what kinds of information, which kinds of visions and knowledge. In turn, who and what is edged towards death or extinction by inert things that seem uncannily lively, or at least busy, very busy indeed.

It is in all these ways that *Carbolytics* has meaning; additionally, this remarkable project by Joana Moll is also a way of seeing what kind of meaning is made from cookies, those strange traces of other relays of interpretation left in the ongoing transformation of the internet.

Cookies and Networks

Cookies are text files. They are placed on your device by many of the websites you use. They contain a string of code to identify the device, as a stand-in for a user, and an encoded record of the actions that the user has made. This amounts to "state" information, for instance, what items are in a shopping basket, or which articles you have read or opened on a website, or the services used on a cloud computing platform.

Many sites issue cookies that are short and functional. The cookies set by others can be surprisingly large. The music aggregator Spotify for instance generates cookies of megabytes in length, and indeed there is an illicit trade online for the cookies that allow the appearance of being a "premium" user for this platform.

Cookies also allow for tracking of users, what they look at, what actions they perform. Here, the cookie raises concerns for those who aim to defend ideas of privacy on the internet. Regularly updated software, such as the Electronic Frontier Foundation's *Privacy Badger*, can be downloaded to easily counter-act some of these concerns, and aspects of basic data hygiene such as using VPNs, setting your browser preferences to "Do Not Track" can all help, but defining and defending privacy, and other notions of personhood online is also an open-ended project.[1]

1   *Privacy Badger*. Retrieved January 24, 2022, from https://privacybadger.org/

Privacy, however, is a difficult notion, since it implies a structure of explanation of the world in which the private is foundational. Other formulations, such as poet and philosopher Édouard Glissant's conception of opacity, as a necessary part of all relations, even, or especially, to oneself, suggest a different quality of interconnection.[2] Glissant argues that opacity is a precondition of life and understanding; difference and variation do not arise against a pre-determining grid of primary transparency into which features such as privacy can be plugged. Rather, opacity is a necessary part of connection emphasising the interplay of interpretations.

Some residues of interpretation make the private tantalising and worth sustaining, even if only as a tactical fallacy. Part of this is to do with the way in which the idea of the private meshes with wider grammars of economics and the idea of the individual as it stands at this point in history. Of key interest to the advertising businesses that run the major platforms, such as Google or Facebook, is less the existential dimension to this question, but rather the challenge of finding the "hot" moment that registers as someone making a decision to buy something. If you check several sites to ascertain the best price of something, those moves from site to site are often visible through "third-party" cookies. These are produced neither by the website or by the user, but by an intermediary. Alongside the major platforms there are tens of companies managing such cookies worldwide. They allow for the behaviour of users to be mapped across multiple sites, windows, devices and other factors. Since these cookies act to shape pricing, one could say that the myth of the invisible hand of the market is replaced by the reality of the partially visible cookie. Curiously, the first technical specification for cookies, developed by Netscape, specifically anticipated this use and advised against it.[3]

2   Glissant, É. (2010). For Opacity. *Poetics of Relation* (B. Wing, Trans.). Ann Arbour: University of Michigan Press.
3   Kristol, D., & Montulli, L. (1997, February). *HTTP State Management Mechanism, Network Working Group RFC 2109*. Datatracker. Retrieved January 24, 2022, from https://datatracker.ietf.org/doc/html/rfc2109

Free Computing

Because computers or phones are often used very intimately across all aspects of a person's life, they have uniquely thorough access, of a skewed sort, to peoples' interests and behaviours. It is skewed because it is both very descriptive—what device is being used, using which browser, carrying out which actions, in which location, having looked recently at what else—and very banal. Inferences must be drawn from such data, and these require multiple layers of data standing-in-for one or another kind of meaning. This "meaning" of course is not self-evident but has to be produced through the work of numerous analytic devices such as machine learning tools and long records of the online actions of millions of users.

The value of such data and the work done in storing and generating it has meant that there is competition between companies over the nature and means of its gathering. Recently, both Apple and Google have introduced measures in different ways to take more control of the data of their users. These operations have usually been represented to the general public as enhancing a liberal notion of privacy. Conveniently, however, they also tend to concentrate informational power, and place the locus of interpretation, in the hands of the platform owners.

Cookies are not the only ways of storing data on users' machines. Many websites use "pixels": a single unit of ostensibly visual data that can also be used to store and update information. Using images as a text is a nice trick, confounding the usual distinction between images and text found in culture. But the key function is not to rework our conceptual notions of media, but rather to have the user's computer do work for the platforms.

It has long been observed that users of platforms carry out what Tizianna Terranova called "Free Labour".[4] Users add text, images, links, ratings, likes,

---

4   Terranova, T. (2004). *Network Culture*. London: Pluto Press.

virality and liveliness of all kinds. Until the interventions of Joana Moll, what was less discussed was the amount of "free computing" also being carried out.

Writing a cookie, sending it, updating the information it carries, storing that data, backing it up and moving it across a network all requires energy. The amount of energy used per cookie will depend upon the nature of the transaction, how many times the cookie is called upon or refreshed and other factors. The energy characteristics of the computer the cookie is stored on and the network the data moves across, the qualities of the energy grids that the devices are attached to will also play their parts. The energy politics of such systems are occluded because they are distributed, with little bits of work parcelled out here and there. It is partly for this reason that companies claim to run effectively "net zero" operations, because they only count the actions of the devices they themselves run. The truth is, though, that the systems such businesses rely upon are fractioned up and outsourced in billions of tiny parts. These are loosely and intermittently joined, but they are still there, and very active.

According to journalist Guillame Pitron, who has analysed much of the scientific and technical work in this area, data servers alone account for 1–3% of global electricity usage. Assuming that there is parity of data held and worked between the central servers and the local devices, it seems likely that an equivalent amount of work is being done by all the computers feeding their small amounts of local data into "the cloud".[5] This suggests that approximately 2–6% of global electricity usage resolves to computing. The Shift Project, a think tank working on the shift towards post-carbon economics, suggests that digital technologies as a whole emit 4% of greenhouse gasses.[6]

5   Pitron G. (2021). *L'Enfer Numérique: Voyage au bout d'un Like*. Paris: Les Liens qui Libèrent.
6   The Shift Project (2019). *Lean ICT, towards digital sobriety*. The Shift Project. Retrieved January 24, 2022, from https://theshiftproject.org/en/article/lean-ict-our-new-report/

Carbolytics

Joana Moll's *Carbolytics* project, developed in collaboration with researchers from the Barcelona Supercomputing Centre, is a way of understanding the collective existence of cookies and what they mean in terms of their outsourced generation of carbon dioxide.

The project takes the following steps. First, a script visits each of the top one million most-visited websites. To receive the full range of cookies available, a computer based in the USA is used. The computer running the program receives the cookies pushed by each website and counts the number of cookies from each host, organisation, domain name and category of website.

The program then calculates how much energy is being used to send, store and retrieve each cookie. From this, it can make an approximate calculation of how much CO_2 is being generated by each cookie, each "average user", each company, each domain and each category of use.

Once the calculation is carried out, the results are made available as a database viewable through the *Carbolytics* interface. In total, the project suggests, there are just under two trillion visits per month to the top one million websites (in the month concerned, exactly 1,295,345,405,057 visits and 197,359,398,267,217 cookies activated).[7] This triggers approximately 150 cookies *per visit*. The project shows that 39,400 cookies per month are served from the sites in the top one million websites to the average user. This enormous population of cookies breaks down to 23,133,620 distinct sorts. Taken together, this means that approximately 11,558 tonnes of CO_2 is generated by browser-based cookies every month. What are these cookies doing? Their primary uses are "targeting" advertising or maintaining payment compliance for companies streaming audio and video content or selling cloud-based computing services.

7   The list of the one million most used sites is from https://tranco-list.eu/.

What are the limits to these calculations? Firstly, since the script runs on a powerful but standard computer, it is able to garner information only on cookies addressed to computers and mobile device in browsers, not those being circulated in apps. If these were added, the sum would likely be far larger. Secondly, the dataset used is valid for the period when the program ran (Oct 2021 to Jan 2022) – things could have changed by now. Thirdly, the problem has many more statistical "dimensions" that further research can open up. Fourthly, a more global understanding of cookie use would help.

These limits aside – those characteristic of digital methods projects in which access to information is grossly asymmetrical due to the power of platforms – *Carbolytics* reveals the vast but extremely finely apportioned and massively distributed mechanisms by which a certain kind of business is carried out nowadays. The artwork shows us not only what is happening, but also makes evident that individualising the problem, parcelling it out into minuscule units across billions of users, is part of the thinking that underlies the condition it creates. As societies, we urgently need to gain the means to start thinking, and sensing, in different ways about this problem.

Aesthetics of the Expository and of Addition

Artworks create sensoriums. They rework and extend our capacities to see and perceive. They may train and refine or soften, slow down and disaggregate what it is that we think we understand about the world. They may also enable capacities to see other acts of seeing. To start to see other processes of sensing and interpretation, to empathise with them, or to critically assess them, to rethink them, is a crucial power of art, but also one that is more widely spread. Humans, as a socially evolved species, rely on culture to understand and navigate the world. An aspect of this is our "theory of mind", an understanding of what it is that we think other people sense or think. This is crucial to culture.

But culture also implies the myriad techniques and technologies through which it takes place and that also enculture minds and sensoriums. In the case of many technologies, they do not simply extend the mind, they create its environment and can also become relatively autonomous of any mind per se. Cookies, and the wider mechanisms of monitoring and identification of which they are a part, belong to this category, but an understanding of them requires an enhanced theory of mentalities that can include the non-conscious "cognitions" – the term is debatable – of computers. A challenge for contemporary culture is to develop adequate ways to deepen our understanding of technology so that the capacity for sophisticated and supple recursions of the understanding of understanding that humans have evolved can grapple effectively with, and rework, what are too often dubiously presented as the unavoidable givens of computing.

There are two key things that Joana Moll's *Carbolytics* project works with in this regard. Firstly, an aesthetics of the expository. Secondly, an aesthetics of addition.
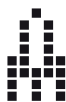
The expository way of working aims to bring to light something that is little understood or is designed to be perceptible only in certain very narrow ways to particular people and devices. The apparatus of cookies is such a thing to be exposed. To expose a hidden layer of meaning or of social and ecological formations is an essential function of critical enquiry. It points to something often outside the artwork and brings it into a certain kind of perceivability.

Carbolytics exposes a working approximation of the hidden and outsourced pollution of digital capitalism. It does so in a way that not only reveals something of what is happening; by working through data generated in these processes, it also makes a public addition to them. The structure of the world wide web seems to invite such an approach with its basic function of linking, citing and embedding. This aspect of the project adds something to an existing system, even when it is unwanted, rerouting it in some way, opening it up to different capacities of interpretation. An *addition* of this kind is by no means

capable of fully righting a situation, or of acting as some kind of cybernetic "governor" to moderate it and make it acceptable. The differences in power between the currently hegemonic platforms and an artwork make such a condition inaccessible. Rather, it can hope to be an irritant and an awkward supplement as the artwork is added to the working of the enormous power of the platforms.

Matthew Fuller
ANALYSIS, EXPOSURE AND ADDITION: THE AESTHETIC AND
ECOLOGICAL LOGICS OF JOANA MOLL'S *CARBOLYTICS*

Published on the occasion of the exhibition:

Joana Moll
Carbolytics
aksioma.org/carbolytics

Aksioma | Project Space
Komenskega 18, Ljubljana, Slovenija
16 February–11 March 2022

Part of *Tactics & Practice #12: New Extractivism*
aksioma.org/new.extractivism

Carbolytics is an Aksioma commission realised within the framework of
kon*S* – Platform for Contemporary Investigative Art | kons-platforma.org