

TOME 1

THE RIVER AND THE CANAL

*Data Literacy
Tried by the Flow*

SECOND EDITION

David Bories

Tried by the Flow — A Processual Ontology of the Datum, Tome 1
The River and the Canal — Data Literacy Tried by the Flow

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Directed and written by generative artificial intelligence.

Translation produced by generative artificial intelligence, under the supervision of the author.

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The full text of the three tomes, in the second as in the first edition, is freely available at <https://artisanat-de-la-donnee.fr>

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Note on the translation — This translation re-fixes the source text without displacing its substance. A few terms of the corpus have no obvious equivalent in English; the choices made, and how they are to be read, are set out in the section “Translation choices” at the end of the volume. This translation is not frozen: it will evolve with readers’ feedback and with the improvement of the means of translation. The French version is authoritative.

Preface to the Edition

Substance, Form and the Status of This Second Edition

“Not all opinions are equal, but all deserve to be weighed.”

— maxim with no identified author

I. The Status of This Edition

The first edition of this trilogy was an essay, in the full sense of the word: it set out an idea and unfolded it, layer by layer, at the pace at which the essay discovered itself. That edition remains what it was — archived as it stands, with its strengths and its acknowledged limits. The second edition establishes the text. It demolishes nothing: it tightens.

What changes fits in one sentence: the essay carried several of its safeguards scattered about; the edition brings them back to their loci and credits them. The precautions that lived at the turn of a chapter — the exact status of legibility, the precaution of the flow, the dated finding, the moderate thesis of exchange, the stable sources, the intention delegated to the instrument — are brought back to the place where each is demonstrated, and flagged for what they are: established results, not additions. The second edition gives each strong formula its scope; it abandons none of them.

Its composition: the three tomes, revised, which keep the narrative, the dramaturgy — the spring, the torrent, the reader — and the language of the canal; and an Architecture Volume, new, which assembles the systematic register of the whole. The threshold of that volume states its status. Each volume now carries, at its head, its edition statement, distinct from its version.

A word, finally, on how it was made. This trilogy was conceived and supervised by David Bories, and directed and written using generative artificial intelligence: a large language model is not a direct reader of the flow of

the real; it is trained on a frozen corpus and produces verisimilitudes calculated from that corpus. AI is here a powerful instrument — a sophisticated canal — set in motion by a human intention: it was a human who saw the urgency of the subject, chose the angle, arbitrated the sentences, retained and rejected.

II. The Thesis

The title announces a processual ontology of the datum. The second edition specifies what this expression commits to — and what it does not. The datum is not dissolved in it into pure flowing: it is an entity **processually constituted, historically individualized, relationally maintained**. The process has explanatory priority over identity, persistence and value; it does not erase the entity, it explains it.

Two ontologies share the ground. Object ontology treats the datum as an available thing, picked in an already constituted field, stored, then consumed. Processual ontology treats it as the result of acts — drawing, inscribing, maintaining, resuming — whose conditions never cease to count. The demonstration lives in Tome 1, “The Two Ontologies”; the systematic statement, in the Architecture Volume.

III. The Discipline of Admission

This edition proceeds from a work of consolidation that submitted each outside contribution to a test bench; the discipline deserves to be stated, because it still holds.

Every contribution receives one of four statuses: **constitutive**, when the mechanism described is necessary to the process of the datum; **corrective**, when it reveals an ambiguity or a contradiction and calls for an explicit revision; **extension**, when it extends the diagram towards a scale or a problem still little treated; **boundary case**, when it tests the diagram in an extreme situation — useful for delimiting, insufficient for founding.

Five criteria govern admission: structural correspondence — comparable roles, not similar names; independence — the mechanism was developed for another problem; transferable consequence — the borrowing makes it possible to deduce what the corpus did not yet say; explicit limit — the point where the transposition ceases to hold is formulated; net gain — the contribution reduces an ambiguity or increases testability without weighing down the vocabulary. An analogy that has yielded its established result can then disappear without the argument losing its force.

IV. The Reading Contract

Three registers make up this edition, and readers gain from knowing at once where each one lives.

Substance: what is true of the datum independently of the techniques that produce it at a given moment. Let us imagine 1950: the motor car is becoming widespread. From that date, facts can be established that will not be contradicted — a car rolls, so a road surface will be needed; it consumes fuel, so refuelling points; it is driven, so training. But one cannot fix the width of the lanes, the fuels, the highway code: that depends on an unforeseeable evolution. The concept is a lamp: it lights up the area where one must look and warns that there are shoals there; the detailed chart of the reefs falls to the reader, in their situation.

Form: the examples and the images. Meteorology, the temperature entry, the rings of the tree, the river and the canal, the wave and the ocean, the torrent — all of this is dated, revisable, and does not constitute sourced empirical claims. Illustrations make a concept intuitive; they do not demonstrate it; guiding images make it memorable. An image that ceases to shed light, or that a reader from another culture could formulate differently, can be replaced without loss: only the substance it serves commits the edition.

The formal machinery: the formalisms — states, times, queues and throughputs put into symbols. They live in the Architecture Volume, and nowhere else; the tomes presuppose nothing of them.

Two precautions complete the contract. The first: the edition constantly calls upon the “flow of the real”, without deciding between a processual realism — the real is flowing — and a more modest epistemic position — our relation to the real takes this form for beings situated as we are; for the reach of the argument, the two come to the same. The second: when the text seems to lend an activity to data — “the datum goes stale”, “the trace says” —, these are shortcuts of writing; what acts are humans, institutions, apparatuses. The shortcut is convenient; it must not be taken literally.

One principle, finally, governs circulation: **one contribution, one locus**. Each concept has a single place of demonstration; everywhere else, its consequences circulate, preceded by at most one sentence of reminder and a cross-reference. The Landmarks, at the end of each document, carry the reminders and the credits. Once this preface has been read, each document can be approached without reminder; the rule holds everywhere, unless otherwise stated.

V. Originality

There remains the question that every synthesis must face: what is new here? This edition’s answer is cautious, and fits in one sentence:

To our knowledge, no identified work brings together exactly this architecture; several traditions have independently established major components of it.

The claim therefore does not concern unprecedented components; it con-

cerns **composition and deduction**: the assembling, in a single chain, of constitution, persistence, circulation, resumption and feedback — and what this assembling makes it possible to deduce, a theory of the torrent and a responsibility of the reader. The annotated bibliographies, at the end of each tome, carry the detail of the overlaps and differences, tradition by tradition. The scoping review that will put this sentence to the test will come after publication; until then, caution is the rule.

The Rule of This Edition in One Sentence

This edition says what it is true to say of the datum for a long time. It leaves to others, and to the reader, the task of determining what to do with it for today.

Note on the Re-edition

What the Second Edition Takes Up, Transforms and Adds

I. What It Takes Up

The trilogy and its dramaturgy — spring → torrent → reader. The plan is the originality claimed; the strongest asset has not been retouched, it has been tightened.

All the founding images — the two deaths, the torrent, the canal, the window, the wave, copying without division, the threat of the trace. None has been withdrawn; each has received, at its locus, its scope.

The established results the essay already possessed, scattered about — the exact status of legibility, the precaution of the flow, the dated finding, the moderate thesis of exchange, the stable sources, the intention delegated to the instrument. The second edition brings them back to their loci and credits them.

The voice — the language of the canal in the tomes; the lexicon as the single definitional source; images that are expressed through images.

II. What It Transforms

The decisive repair. The scale of the datum — constituted → accessible → intelligible → actualized → operative — replaces falling back into trace everywhere, except in the limit case of the dead datum. A datum that no one reads remains constituted: it is not actualized, and mute for this particular reader. Its locus is *The Trace or the Datum*, in the tome of the reader.

The sixteen scoped historical formulations, and three related motifs. Lapse becomes *validity for a use*; the forced symmetry of media gives

way to the *conditions of interpretive resumption*; exchange no longer accomplishes the datum, it *extends availability and the possibility of use*; the threat of the trace takes on the status of a *horizon of neglect*; the meta-physical thesis on meaning gives way to the *imputability thesis* — what cannot be delegated without remainder is the imputability of arbitration, the machine occupying a situated position of handling or processing without being, by that alone, an actual reader.

The synthesis promoted to Architecture Volume. Twelve theses, consolidated looped diagram, three families of constitution, layers of the datum, minimal ontology, formal machinery, map of neighbours. The formalisms live there, and nowhere else.

The pruning. One concept, one locus; reminders fit in one sentence followed by a cross-reference; the hedging of the argument is removed; the method preface becomes single at the level of the edition — it is the Preface to the Edition, and each tome opens on a one-page Threshold; the Landmarks carry the reminders and the credits.

Versioning. An edition field distinct from the version; major bumps on the three tomes and on the Architecture Volume.

III. What It Adds

Twenty-one canonical terms — the foundation of identity: *datum of origin, occurrence, filiation, provenance*; the scale and its five states; *the three intentions and differential traceability*; *the three families of constitution*, the *institutional datum*, the *derived datum* as genus; *validity for a use* and the *conditions of interpretive resumption*; the *responsibility of the chain* and *decomposed probity*; the *situated position of handling or processing* and the *actual reader*.

Three terms of formal machinery, confined to the Architecture Volume, where the formalisms live: the tomes presuppose nothing of them.

The Architecture Volume itself, and the **annotated bibliographies** of each tome, which now carry the mechanisms used in the background, the sources of the epigraphs and the detail of the neighbours.

The cautious formula of originality, carried by the Preface to the Edition, and the deferred scoping review, scheduled after publication.

IV. The Story of This Edition

Not “the essay was fragile”. The essay carried its repairs scattered about; the edition brings them to their locus. The second edition scopes; it does not abandon.

The first edition remains what it was, archived as it stands. The authoritative version is now this one.

Threshold

For a Processual Approach to the Datum

Tome 1 — The River and the Canal

We do not live surrounded by data.

We live surrounded by a real that flows — and we believe we see data where there is, as long as we have inscribed nothing, only the world passing by. It is from this shift of outlook that this first tome starts. It defends a simple and perhaps unsettling idea: the datum is not an object that one picks in an already constituted field. It is the result of an operation that constitutes it — in its observational route, a drawing made on the flow of the real: a snapshot which, as soon as it is taken, begins to move away from the world it claims to describe. This flow always exceeds the cuts made in it; its continuity and its inexhaustibility describe important cases, not axioms.

From this shift, all the rest follows: a datum goes stale in the observational route, and its validity is judged for a use; its value depends on the corpus that surrounds it and on the fidelity of the act that produced it; humans, far from simply “having” data, dig canals in the river of the real to capture from it what they need.

The seven documents that make up this tome unfold this idea, from the first prehistoric notches to the contemporary digital deluge.

From the Notch to the Algorithm

A History of the Datum in Humanity

Tome 1 — Document 1

“What is not measured cannot be governed.”

— Administrative adage

The Gesture

At one moment in their history, humans performed the gesture this document takes as its starting point: they chose not to let the world pass without leaving a trace. Not an involuntary trace — the footprint in the mud, the bark scratched by something passing — but an *intended* trace. A sign set down deliberately to represent something other than itself, to force remembrance, so that tomorrow would know what today had seen.

When did this happen for the first time? The question is perhaps badly put. The traces we have found are not the first traces that existed: they are the first that have come through time. Hard rock preserves what wood, bark and skin do not. What we know of prehistoric humans is an involuntary selection made by materials and millennia, not a faithful inventory.

Among the gestures that have survived, some resist any confident interpretation. Cave walls bear representations of animals, negative hands, repeated geometric forms. Were these annotations of the real — a survey of hunts, a count of seasons, a map of the territory — or the expression of an inner life we will never be able to decipher? The distinction between *annotating* and *expressing* seems clear from our present; it was perhaps less so for the one who painted by the glow of a torch. What these representations tell us with certainty is that the capacity to fix the world in the form of signs is very old, much older than writing, perhaps as old as conscious humanity itself.

Other gestures are more legible. Bones bearing series of regular notches have come through tens of millennia in protective sediments. The number of notches, their organization, their regularity suggest counting: days, moons, animals, members of a group. What matters here is not the exact reason — it is still debated — but the act itself: observing a phenomenon, deciding that it is worth retaining, associating a material sign with it, maintaining the correspondence over time. This gesture is the prototype of everything that will follow. There is nothing spectacular about it. It is, in silence, founding.

The dissociation had just taken place. For the first time, a fragment of the real existed separately from the real. The event could go on flowing; its trace remained. From that moment on, humans would produce, with extraordinary ingenuity and constancy, ever more effective media to fix what time would otherwise carry away.

These traces, once fixed in matter, do not remain facing the real — they become part of it. The painting on the cave wall long ago lost what it meant for the person who put it there: its inscription, the freshness of its meaning, is stale for ever. But its fixation remains. The real has absorbed it. It has become one of the traces the real keeps of itself.

From Object to Sign

Counting on one's fingers has an obvious limit: one cannot keep them raised indefinitely. Counting with pebbles has another: beyond a certain number, handling pebbles becomes as unmanageable as what one was trying to count. Humans solved this problem in a way that looks obvious in hindsight, but which represents a considerable cognitive leap: they made, themselves, the objects they would use for counting.

No longer pebbles picked up at random, but shapes fashioned by hand, standardized, each of which represented a precise category of what was being counted. One object for a measure of grain. Another for a sheep. A third for a jar of oil. Then, past a new threshold, one object stands for several — quantity condenses, the number of objects decreases without the reality they represent being reduced. Abstraction is under way.

The next step is more discreet, but perhaps more decisive still. These objects are enclosed in clay envelopes to protect them, to transport them, to certify a transaction. Then the imprint of what the envelope contains is engraved on its surface — to avoid breaking it at each check. And soon, the imprint is enough. The object inside is no longer necessary. The outer sign says everything the object said. This is the moment when the representation detaches itself from the thing represented. The sign no longer

imitates the object — it *designates* it. This discreet shift is the birth certificate of writing.

Writing in the Service of Storehouses

We readily imagine writing as an invention of poets or philosophers — a tool born of the desire to pass on a thought, to put an epic into narrative. The ancient traces we have deciphered tell another story.

The first tablets carry lists. Rations distributed, head of cattle, quantities of grain received and dispatched. Writing, in the forms we can read, was born in storehouses, not in temples. It was designed to manage data before being used to pass on ideas. The scribes who developed it were administrative agents, not men of letters in the sense we would give the word.

Painted walls attest to a symbolic expression well before writing. The first system rigorous enough, shared enough, stable enough to come through the centuries and remain legible was a management system. Abstract thought, narration and poetry then found in this system a vehicle they had not invented.

This reversal deserves to be retained: the datum is not a derived use of writing. In the traces we have found, it is writing that is a response to a need for data. It served the real before serving the imagination.

The Institution Inherits the Gesture

The individual gesture — noting for oneself, counting for oneself — remained individual only for a time. As societies grew more complex, structures took charge of annotating the world on a scale that no individual could reach alone.

The administration takes a census of people, lands, herds — in order to tax, to mobilize, to plan. Religious institutions keep the registers of births, marriages and deaths, ensuring the memory of individuals where the State did not yet have the means to do so. The merchant invents accounting records capable of following the flows of a trade that crosses continents. Each, in its own way, organizes the same founding gesture: observing the real, fixing a representation of it, keeping this representation so as to be able to refer to it.

In this movement, libraries occupy a singular place. They are not only a place of conservation: they are the first organized infrastructure for storing *and* making available the data accumulated by humanity. At first reserved for a narrow elite — the centres of power, worship and knowledge

of the civilizations that had the means for them —, they gradually opened up, until they became, with the modern public library, a facility open to all. In this, they embody one of the slow but continuous movements of the history of the datum: what was privilege becomes, with time, common.

Today, the whole of the knowledge accumulated in the world's libraries — built up over millennia, stored on shelves that would stretch over hundreds of kilometres — can be contained in a digital infrastructure whose footprint is only a fraction of that of the physical buildings. This is not only a change of volume: it is a change in the nature of access. Libraries have not disappeared, however. They endure, sometimes reinvented, sometimes in difficulty — like a certain print press that holds out. Not out of inertia, but because they answer to something the data centre does not entirely replace: human mediation, the physical relation to the document, the curation of knowledge by people who have made it their profession. The digital has not erased paper. It has moved it.

The datum has ceased to be an individual memory aid. It has become an instrument of collective government, instruction and trade. Whoever organizes the annotations — and access to these annotations — controls a part of the common reality.

The Series Reveals the Law

An isolated observation tells little. It says what happened once, in one place, under particular conditions. Repeated, compared, organized over time, the same observation begins to say something else: what happens *regularly*, what follows a rhythm, what obeys a law.

The patient accumulation of comparable observations — the positions of the stars night after night over decades, births and deaths in a city over several generations, the prices of a market over years, volcanic eruptions and tides on inhabited coasts, variations in climate and seasons on cultivated lands — ends up revealing regularities that no one-off observation could have suspected. And a regularity, once identified, makes it possible to do something that mere annotation did not allow: *to foresee*.

To foresee does not mean to see everything. The human who observes the real only ever perceives a portion of it — limited by their instruments, by their angles of observation, by what they chose or managed to measure. Their prediction is partial, uncertain, revisable. But it suffices to produce a decision: to act on a portion of the real, to modify what, without intervention, would follow its course. This action on the real transforms it. And the transformation produces new observations, which call for new annotations, which feed new predictions. One cycle closes — and another opens.

The datum has changed temporality. It looked backwards so as not to

forget; it now looks forwards in order to anticipate. And the human who predicts in order to act no longer merely observes the world: through their decisions, they begin to modify it in return. Annotation enters the loop of the real.

The Machine Takes Over

Counting, classifying, sorting, comparing: these operations have in common that they are repetitive. They do not require judgement — they require method and constancy. The whole history of techniques shows the mark of a constant movement: entrusting to the tool what is systematic, so as to free attention for what calls for a decision.

The first mechanical aids to calculation appeared well before the industrial era. Then mechanization took on a new scale: machines capable not only of calculating, but of storing instructions, executing operations in sequence, keeping results. The passage from the calculating machine to the information-processing machine is a qualitative leap as significant as the passage from the clay token to writing.

This leap obeyed the same logic: entrusting to the tool what is systematic, keeping for oneself what is not. Machines first took charge of raw calculation, then of managing data in growing volumes, then — gradually — of forms of recognition, classification and decision that were thought to be reserved for human intelligence. At each stage, the boundary between what the machine does and what humans keep for themselves has shifted.

The Deluge

The deluge: a point where figures no longer speak. To say that humanity produces every day a quantity of digital data representing millions of times the content of a large library says nothing that one can really grasp. What does say something is what this requires in order to exist.

Storing, processing and distributing this continuous flow of annotations requires a physical infrastructure that can be measured in concrete terms: buildings whose cumulative surface area on a global scale is equivalent to several large conurbations; electricity consumption comparable to that of entire countries; water needs for cooling the equipment that are counted like the annual consumption of metropolises. And this infrastructure keeps growing — in a few recent years, humanity has produced as much digital data as it had accumulated over the entire preceding decades.

This volume is not homogeneous. Some of these data are meant to be kept, archived, analysed in due course. Others are ephemeral by nature: the sensors embedded in machines, vehicles, industrial networks — and

more broadly digital uses such as videoconferencing or telephony — continuously produce observations that have value only at the instant they are produced — for a decision that must be taken within the second — and that will be erased the instant after. The question of what to keep and what to let pass has become a decision in its own right, a new form of the founding gesture.

Humans have not stopped annotating the world. But they now largely annotate it through digital systems of considerable power and speed. This mediation gives them a new capacity: to observe, as a whole and in near real time, the annotations they produce about the world. They no longer observe only the world directly — they also observe the image that their own annotations draw of it. And these two gazes do not always coincide.

Metacognition

For a long time, humans observed the real world around them in order to annotate it. They now observe, more and more, the replica of the world that their annotations have built.

This replica is not the world. It is a partial projection of it, filtered by the criteria according to which the annotations were produced — the phenomena chosen to be observed, the instruments used, the measurement thresholds applied, the decisions taken on what deserves to be captured. It says what one has decided to look at, in the forms in which one has decided to look at it. What it does not say is at least as vast as what it says.

But this replica has a property the real world does not have: it is navigable, comparable with itself over time, open to questioning at will. One can look in it for regularities, test hypotheses in it, take decisions in it. And at the speed at which digital systems update it, it gives the impression of synchronicity with the real world — an impression that is largely an illusion. The real keeps flowing, and the replica runs after it.

To keep this replica as close as possible to the real, humans have delegated to the machine the direct observation of the world — sensors, processing algorithms, automatic annotation systems. They keep for themselves, more and more, the observation of this observation: deciding what the figures mean, what the trends imply, what must be done. The act is no longer simply cognitive — it has become meta-cognitive. Humans no longer observe only the world: they observe what their observation of the world produces.

It is in this space — between the flow of the real and the replica they build of it — that most of what is called mastery of the datum is played out today. Not owning data, but understanding what one has chosen to observe, why

one chose to observe it in this way, and what this observation does not show. That is the subject of the documents that follow.

Landmarks

For all the references used in this document — datings of artefacts, archaeological sources, historical works —, see the *Annotated Bibliography* at the end of the tome, in particular the sections “Archaeological and Historical Sources Cited in the Essay” and “History and Anthropology of the Datum”.

The examples in this document belong to form — dated, revisable — and only the movement of substance they illuminate commits the edition: the datum as an ancient human gesture, its first administrative function, its institutionalization, its industrialization, its digitization (reading contract, Preface to the Edition).

Reading, Writing, Understanding the World through Data

Data Literacy: What It Is, Where It Comes From, Where It Is Going

Tome 1 — Document 2

“Literacy, following the model of popular education proposed by Paulo Freire, requires not only the acquisition of technical skills but also the emancipation achieved through the literacy process.”

— Catherine D’Ignazio, “Creative data literacy”, *Information Design Journal*, vol. 23, no. 1, 2017, abstract of the article

This Document and Its Time

This document situates the trilogy in the field that welcomes it. It gives the essentials of that field — the genealogy, the established results, the tensions, and the blind spot from which the following documents start. The detailed state of the field — institutional frameworks, ecosystem of actors, figures, criticisms — lives in a complementary note, *Data Literacy — State of the Field*, which takes it on as a dated reference point, revisable at its own pace. Here remains only what does not go stale.

A Long Genealogy

The word *literacy* — which French has calqued as *littératie* — derives from the Latin *littera*, the letter. In its strictest sense, it designates the ability to read and write; for most of human history, this ability was the privilege of an elite, which drew from it — Jack Goody showed this — an essential part of its power, before it became, within two centuries, a common good:

one person in ten could read and write in the world in 1820; more than eight adults in ten can today. This movement recalls what the previous document showed: what was the preserve of a few becomes, with time, a common good.

Three transformations have since renewed the concept. *Functional literacy* first (Gray, 1956; UNESCO, 1978): no longer a technique but a social competence — *context, autonomy, participation* —, marked by Paulo Freire, for whom learning to read the world precedes learning to read the word. *Fragmentation* next: as societies grow more complex, a constellation of specialized literacies appears — media, information (1974), statistical, digital (1997). *Consolidation* finally (UNESCO, 2003): identifying, understanding, interpreting, creating, communicating and computing, in varied contexts, in order to participate fully in social life.

It is from this soil that **data literacy** emerged in the early 2000s — with a precursor that the field's literature has erased from its own genealogy: Peter Naur's *datalogy* (1966), a science of the nature and use of data, which already carried its whole programme — dispelling the technical myth, training in critical understanding — thirty years before the word.

What the Field Has Established

The most cited birth certificate is Milo Schield's article (2004), which fixes the founding tripartition: information literacy concerns *sources*; statistical literacy, *reasoning*; data literacy, between the two, the *raw material* itself — its selection, its transformation, its presentation. The value of a statistic, Schield writes, depends heavily on the way the underlying data were selected, converted and manipulated.

The concept then takes root in pedagogy — Mandinach and Gummer define it as the ability to transform information into actionable knowledge; Ridsdale and her team give it the most widely used academic framework (collection, management, evaluation, application) — and is doubled by a critical current, at MIT, around Catherine D'Ignazio and Rahul Bhargava: an *empowering* literacy, heir to Freire, summed up in four verbs — to *read* data, to *work with* it, to *analyse* it, to *argue with* it — and crowned by a civic definition: the desire and ability to constructively engage in society *through or about* data. The formula matters: the datum is not only a tool in it; it is a social object to reflect upon.

Beneath these frameworks lie two theoretical foundations. The DIKW pyramid first (Ackoff): the datum, a raw sign; information, the datum put into context; knowledge, integrated information; wisdom, its judicious application. The tool, despite its critics, keeps its pedagogical virtue: not confusing the levels, knowing how to move between them. Let us go further still: the datum itself is not a *given* fact but a *captured* fact. The philosopher of science Kaplan noted this as early as the middle of the twentieth century: it is not nature that supplies the datum to the researcher, it is the

researcher who captures it in nature according to their aims and frameworks. To speak of raw data is an oxymoron; every datum carries the choices of those who produced it — the phenomena retained, the instruments, the thresholds. Understanding this is the first act of literacy.

Three traditions, finally, cross in the field without any of them exhausting it: the *statistical* (probabilistic reasoning, critical reading of figures), the *documentary* (sources, metadata, the chain of information), the *critical* (power relations and the biases that nest in data). The most accomplished frameworks articulate all three.

What the Field Has Not Settled

Data literacy is a *boundary object*: a data officer, a school librarian and a community activist do not understand the same thing by the same word — and yet they speak of the same object. Hence the plural that research tends to validate: *data literacies*, which coexist without converging. Hence, also, three purposes in tension — professional (literacy as productive capital), educational (as formative competence), civic (as a condition of democracy) — between which every training policy arbitrates, whether it says so or not. And hence the criticisms that run through the field: managerial co-optation that depoliticizes the issue, technique favoured over ethics, power asymmetries made invisible, the risk of a two-tier literacy, the inflation of a word which, by designating everything, would no longer mean anything.

The field, finally, reconfigures itself with each transformation of the datum itself — and the most recent wave, that of generative models capable of reading, writing and reasoning with data, makes it necessary to distinguish data literacy, which concerns *materials*, from AI literacy, which concerns the *systems* trained on these materials. To the question that follows — what is the point of training humans in what machines do better? — two propositions stand the test of time: using these machines intelligently requires precisely a data literacy, without which the user is the prisoner of the tool; and collective decisions on the use of data remain human decisions — a society that had entirely delegated its understanding of data could no longer, strictly speaking, govern itself.

The Blind Spot

In the age of printing, knowing how to read ceased to be a privilege and became a condition of civic participation. The parallel with the datum has its limits, but it points in a direction: the datum makes each of us a recorded object; literacy is what can make us a subject who reads and questions — the critical reader of their own world, rather than its statistical extra.

The frameworks examined here — Schield, Mandinach-Gummer, Ridsdale, and the institutional frameworks that descend from them — have a con-

siderable merit: they have formalized competencies that did not exist as such. But they share a limit. **None of them thematizes the *processual nature of the datum*.** All treat it as an object to be handled — to be collected, managed, evaluated, applied — without questioning what it is, for a datum, to exist. The documents that follow examine what this blind spot changes, and what new competencies it calls for.

Landmarks

The detailed state of the field — complete genealogy, frameworks, actors, figures, criticisms — is in the complementary note *Data Literacy — State of the Field* (dated reference point, revised at its own pace). For the references — Schield, Mandinach and Gummer, Ridsdale, D’Ignazio, Naur, Ackoff, as well as the institutional frameworks —, see the *Annotated Bibliography* at the end of the tome, in particular the sections “Data Literacy — Founding Texts” and “What Evolves and How to Follow It”.

The Flow and the Annotation

For a Processual Ontology of the Datum

Tome 1 — Document 3

“Everything flows.”

— *panta rhei*, formula attributed to Heraclitus by Simplicius (6th century)

“A datum is what is given — for a later occasion.”

— Alfred North Whitehead, *Process and Reality* (1929)

Preamble — What This Document Adds

The two preceding documents laid two foundations: the long trajectory of the datum as a human gesture, then literacy and its blind spot — none of the literacy frameworks examined in the previous document thematizes the *processual* nature of the datum; all treat it as an object to be handled.

This document builds the framework this blind spot calls for: a processual ontology of the datum — in which the process has explanatory priority without dissolving the entity — and derives from it its temporal, epistemic and political consequences. This framework will lead to a notion that the document *Digging the Canal* will develop: the flow of observation, a link that processual theory makes necessary and that practical use demands.

Part I — The Two Ontologies of the Datum

Two ontologies share the ground. The Preface to the Edition sets out the thesis; its systematic statement lives in the Architecture Volume; the demonstration is made here.

Object Ontology: Four Tacit Presuppositions

The dominant ontology of the datum rests on four presuppositions that are rarely examined, but omnipresent in everyday language, in law and in technical practice.

First presupposition: the datum pre-exists its collection. When one says “collecting data”, one assumes that they already exist, somewhere, and that one moves them to a new location. The verb *collect* implies objects waiting to be picked up. This image is misleading: there are not, in the real, data that wait. There are phenomena that become data only by being annotated.

Second presupposition: the datum is stable. Once inscribed, it is supposed to remain identical to itself. The permanence of the medium is extended to the content. This stability is more apparent than real: the datum does not change, but the real from which it is extracted continues to change. Very soon, it represents a state of the real that no longer exists.

Third presupposition: the datum has an intrinsic value. Hence the fortune of the metaphor of the “new oil”, hence *data lakes*, hence the idea that it is worth storing massively because we will know later what to do with it. This belief masks the fact that the value of a datum always depends on a context of use and on a freshness that no storage guarantees.

Fourth presupposition: the datum can be owned. “My data”, “the company’s data”, “sovereign data”: so many expressions that assume that a datum is a good, liable to belong, and hence to be sold, bought, stolen. This is the presumption these expressions carry; personal data law, for its part, does not institute it: it protects rights and freedoms, among them the right to data protection.

These four presuppositions are not false. They are *true within a narrow framework*: one in which the temporality of the real has been suspended or ignored. As soon as time is reintroduced — Bergsonian duration, Heraclitean becoming, Whiteheadian process — object ontology reveals its limits.

This position has its credentials: contemporary philosophy of information — Floridi foremost — defines the datum as a *difference*, a lack of uniformity in the fabric of the real. This is the strongest version of the objectal: in it, the datum is no longer a massive thing, but it remains a given — something the world would contain before any gesture. The present essay takes one more step: the difference is indeed in the flow; but as long as no one has drawn and inscribed it, it is not a datum — it is some of the real, which differs.

Processual Ontology: Four Reversals

Processual ontology reverses each of these presuppositions — not to dissolve the datum in flowing, but to say how a stable entity is constituted.

The four reversals, properly read, are four aspects of this constitution.

First reversal: the datum does not exist before its annotation. What exists is the flow — a physical event, a behaviour, a transaction, a heartbeat. This event, taken in itself, is neither a datum nor a non-datum: it is. The datum is born of the gesture that detaches it from the flow to assign it a symbolic representation. This gesture is constitutive. Without it, there is a river, but no fish pulled from the current. First aspect: the datum is a *constituted* entity — not found, but made, by an act whose conditions count.

Second reversal: the datum goes stale. From the instant it is inscribed, the flow it comes from continues its course while the datum, engraved in its medium, does not change. The datum ages not because it changes, but because the world has carried on without it. This wear is not a uniform law — the document *The Two Times of the Datum* will decompose it into validity for a use. Second aspect: the entity is *historically individualized* — dated by the act that produced it, inscribed in a history that the flow pursues without it.

Third reversal: the value of the datum is not intrinsic. It depends on three joint variables: the proximity of its inscription to the present of the flow (its *freshness*), the density of the corpus to which it can be attached (its *referential neighbourhood*), and the quality of the annotation operation that produced it (its *probity*). A fresh datum of today can be more precious than a considerable volume stored ten years ago, because the one is still close to its flow, and the other has definitively detached itself from it. Third aspect: the entity is *relationally maintained* — its value lives in the relations that take it up, not in its grain.

Fourth reversal: the datum does not belong as a thing does. One can own the medium, the occurrence, the database — but one does not own the flow from which it was drawn and which continues, indifferent. Non-rivalry is here ontological — one person's drawing takes nothing from another's — and says nothing, by itself, about legal regimes, which are discussed in their own order. This distinction between the ownership of the *drawing* and the inappropriability of the *flow* is central; the end of this document returns to it briefly. Fourth aspect: what can be owned is the entity and its media, never the source.

Four reversals, a single thesis. The datum is an entity **processually constituted** — the first —, **historically individualized** — the second —, **relationally maintained** — the third; and what can be owned of it are its occurrences and its media, not its source — the fourth. The process has explanatory priority over identity, persistence and value; it does not erase the entity, it explains it.

Why Object Ontology Triumphed

If processual ontology is philosophically more accurate, how is it that object ontology structures thinking about the datum today, as well as law,

economics and even literacy? Four reasons converge.

A philosophical reason. Western metaphysics, since Aristotle, has privileged substance over process. A thing first *is*; it *changes* afterwards. This precedence of being over becoming has been contested — by Heraclitus before Parmenides, then episodically by Leibniz, Bergson, James, Whitehead, Deleuze, Simondon — but it has remained dominant.

A technical reason. Foundational computing, from the Turing machine to Edgar Codd's relational model (1970), thinks in terms of registers, memories, tables: static structures in which the datum occupies a *place*. *Stream processing* architectures remain a minority against the dominant model of batch processing — in which flows of running water are received continuously but processed in frozen blocks, as if brooks were turned into ice cubes in order to be counted. And yet systematic flows of observation precede computing by several millennia: the Babylonian astronomical diaries (8th century BCE) already constituted cadenced drawings over decades.

An economic reason. The object-datum can be sold and, when it meets the criteria for recognition as an intangible asset, appear on the asset side of a balance sheet (see the note on law and the accounting of data, *Annotated Bibliography of Tome 1*). The flow-datum is much harder to monetize, because it goes stale. The business models of the large digital platforms rest on the illusion that the data accumulated yesterday will still hold their value tomorrow.

A political reason. Object ontology allows ownership; ownership allows control; control allows power. If one admitted that the datum is born of a dated drawing, and that its validity is played out against a flow that continues, the political question would shift: it would no longer be *who owns the data*, but *who has access to the flow*, *who decides what is drawn*. This question is disturbing; it is comfortable not to ask it.

Part II — The Flow as Ontological Primacy

The Flow: A Condition, Not a Metaphor

The flow is not a metaphor. It is the condition under which every datum is produced: whatever one draws, and however fine the drawing, what one draws from does not stop at the drawing.

The flow has a few structuring properties. Two of them describe important cases, not axioms. It is most often *continuous*: between two measurements, the reality measured has not ceased to exist; between two clicks of the user, behaviour has not been suspended. It is most often *dense*: between two instants, however close, what happens exceeds what is retained of it. Whether the real is, in the last instance, continuous and dense, the essay does not have to decide. What suffices for the whole argument is

more sober and more certain: **the real relevant to an observation always exceeds the cuts it produces.** No annotation exhausts its source. *Irreversibility*, for its part, admits no exception. The instant *t*, once past, is past for ever. Any drawing not made at *t* is definitively lost — it can be reconstituted by inference; it cannot be resurrected. *Independence*, on the other hand, has a family limit: it is said of the pre-existing referent of the observational family, whereas the institutional family, under a rule that says what counts as what, makes the inscription take part in the existence of what it registers (“Three Ways of Being Born”). Where there is a pre-existing referent, the flow is indifferent to annotation: whether one looks or not, whether one measures or not, it continues. The datum owes much to the annotator; the flow owes it nothing.

This last point implies that the volume of data produced by humanity — however considerable, however fast it grows — represents not the production of *the flow* but the production of *drawings on the flow*. The flow itself is not measurable; it is, by definition, what measurements are drawn from. Contemporary civilization does not produce more and more real: it documents certain portions of this real ever more finely, leaving the rest to flow away in darkness.

A precaution governs all this — it was written from the first edition onwards, and the present section has just aligned itself with it. When this essay speaks of the “flow of the real”, it does not commit itself to a metaphysical thesis on the ultimate nature of the real. Whether the flowing belongs to the real itself or to our condition of perceiving it, the argument holds in both cases. The Preface to the Edition takes it up in the reading contract; it holds for everything that follows.

Whitehead and the *Datum*

The British philosopher Alfred North Whitehead, in his major work *Process and Reality* (1929), builds a metaphysics in which, against the whole Aristotelian tradition, becoming is more fundamental than being. Whitehead names the elementary unit of the real not *substance* but *actual occasion* — a punctual event of becoming, which actualizes itself and then becomes a resource for the following occasions.

And here is the remarkable find for our purpose: to designate what an actual occasion *transmits* to the following occasions, Whitehead gives the word *datum* a philosophical precision. In his terminology, the *datum* is “what is given” to a later occasion by the occasions that precede it. This term does not designate a thing; it designates a *residue of process* — what remains of an occasion that has happened and can be taken up in the following occasion. The *datum* is therefore, in essence, *retrospective*: it is what *has been given*, not what *is*. And it is *relational*: it has meaning only for the occasion that takes it up.

This intuition — formulated nearly a century before the era of *Big Data* — is probably more accurate than all contemporary managerial definitions

of the datum. It says explicitly what the standard literature conceals: the datum is what the past bequeaths to the present, in the form of an isolated fragment that will have to be recontextualized in order to regain meaning.

Bergson and Duration: What Measurement Loses

Henri Bergson, in the *Essai sur les données immédiates de la conscience* (1889), rigorously distinguishes two modes of time. *Spatialized time* is that of the clock, of measurement, of inscription: cut into discrete instants, juxtaposed like points on a line. It is the time of data. *Pure duration* is that of lived experience, of consciousness, of process: continuous, qualitative, indivisible. It is the time of the flow.

Bergson maintains that scientific measurement proceeds by reducing duration to spatialized time. To measure, one must freeze; to freeze, one must interrupt continuity. The datum is what remains of duration once it has been spatialized. It keeps the magnitude; it loses the movement.

This loss is not a criticism of science. Bergson simply reminds us that *measurement does not contain everything it measures*. This intuition should be at the foundation of any serious data literacy. It means that no database, even an exhaustive one, *contains* the real it claims to describe. It contains sections of it, snapshots. The rest — duration itself — has remained in the flow, where it has continued without us.

Part III — The Backup Metaphor

The most illuminating analogy for grasping the processual nature of the datum comes to us from a familiar object of computing: the file backup.

Let there be a file F on a disk, and a backup S of this file made at instant t_0 on an external disk. At instant t_0 , F and S are identical. At instant $t_1 > t_0$, file F has been modified, but S has not changed: they have begun to diverge. At instant $t_2 \gg t_0$, the modifications have accumulated; S , which was the copy of F , is now no more than an archive of an earlier state. To have an up-to-date backup, a *new* drawing must be made.

This analogy transposes directly to the datum. File F is the flow of the real: it evolves constantly, without stopping. Backup S is the datum: frozen at the moment of its drawing. From the instant it is inscribed, it begins to diverge from the flow. The divergence grows over time — slowly for slow flows (geology, demography), rapidly for fast flows (financial markets, online behaviour).

The analogy names precisely what happens in contemporary algorithmic systems. A large language model, trained on a corpus frozen at a given date, is literally a backup of a state of the world's textual flow. With every passing instant, this corpus moves away from the flow, which continues.

The technique of plugging these models into real-time online searches is an attempt to *re-draw* from the flow to make up for this lag — implicitly acknowledging, by its very existence, that the model without it would be a stale backup.

One does not ask a backup to be beautiful, complete or intelligent. One asks it to be *faithful to the moment of its creation* and *fresh for the use one makes of it*. A backup from yesterday is precious if the original file was damaged today. A backup from five years ago is useless for restoring a file one has been working on since — it represents a bygone state. The value of a datum is therefore not in the datum: it is in the relation between the datum, the flow from which it was drawn, and the use one wants to make of it. Every datum is a point; the real is always a line.

Part IV — The Act of Annotation

To Annotate Is to Choose

If the datum is born of the gesture that draws, then this gesture calls for examination. To annotate is always to choose: to choose *what* to observe in the flow (the object), *how* to observe it (the method), *when* to observe it (the frequency), *with which instruments* (technical mediation), *according to which categories* (the grid).

Each of these choices performs a reduction. The object chosen excludes all other possible objects; the method retained excludes all other methods; the frequency leaves out of the frame everything that happens between two observations; the classificatory grid imposes its distinctions on a flow that had none.

Each drawing is a *composite act*: the choice of the object, the choice of the moment, the choice of the instrument, the choice of the category. Remove any one of these choices, and you remove the datum itself. The datum is constituted by an act; it is not a pure fact.

This act can be broken down, and its breakdown is anything but a technical detail. Those whose job is to measure — the laboratory technician, the land surveyor, the field investigator — have long known it: taking a measurement is never a simple gesture. One must *aim* — decide what, in the flow, deserves to be retained. One must *define what one measures* — for “temperature” is not measured: what is measured is the temperature of such a body, at such a point, under such a convention, and the definition is part of the result. One must *measure with a regulated instrument* — one whose behaviour is known, which has been compared with a better-regulated one, and whose regulation is lost if no one tends it. One must finally *inscribe the result with its uncertainty and its origin* — not “37.2”, but: so much, to within so much, obtained in this way, by such an instrument, at such a moment. A result without its uncertainty or its origin is

not more precise: it is only harder to contest.

The result therefore carries its operation — object aimed at, definition, instrument, uncertainty. What this carrying commits for the time of the datum — an irreversible documentary fact, an assertion that remains revisable — will be established in the next document, *The Two Times of the Datum*.

That is why the idea of “raw data” is an oxymoron, as the collection of historical studies brought together by Lisa Gitelman has shown. Every datum has been worked by someone, somewhere, with instruments and categories that carry their own choices. This was true of the cuneiform tablets of Uruk, which classified sheep according to precise administrative categories. It is true of the sensors of a smartphone, which measure certain frequencies of acceleration and not others. There are no innocent data — there are data whose author has been forgotten.

The Undrawn

Everything one chooses to annotate excludes an infinity of other possible choices. The undrawn is, by definition, invisible in the database; it is not part of the analysis; it is not counted in the statistics. It remains in the flow, indistinct.

This shadow zone — what researchers in *data studies* call *missing data* or *uncollected data* — is constitutive of every database. A database is defined as much by what it contains as by what does not appear in it. A census that asks no question about the language spoken at home makes the linguistic diversity of a population invisible. An urban sensor placed in wealthy neighbourhoods and absent from poor ones produces a biased “statistical city”. A training corpus made up mainly of English-language texts produces a model that “speaks” certain languages better than others.

These three examples say more than an absence. The undrawn does not merely lack: it *weighs on what the drawn say*. A database in which only the equipped neighbourhoods appear is wrong about none of its points — and wrong about the city. What has survived also speaks on behalf of what has disappeared; what one chose to count also answers for what one left unsaid. The first document showed this for traces, which materials and millennia select before any reader; the same weighing holds for drawing, which selects within what has left a mark. Bias is not an accident of measurement: it is the cast shadow of the gesture that cuts. The undrawn is part of the gesture.

The undrawn is not the opposite of data: it is their invisible lining. Every datum stands out against a background of non-data. Data literacy should include a *literacy of the undrawn* — the capacity to ask, in front of any dataset: what was chosen not to be measured? what was chosen not to be seen? who decided it, and in what context?

This weighing is specific to birth by drawing — the rest of this part will show that drawing is not the only way for a datum to be born.

Who Annotates?

The flow is indifferent; annotation never is. It has a subject — hence a point of view, hence interests.

Four major classes of annotators structure the contemporary landscape. *Expert human annotators* — scribes, accountants, doctors, statisticians, scientists, journalists — are slow and costly, but reflexive and capable of self-correction: they know, in principle, that they are annotating and why. *Involuntary human annotators* — each of us, when we fill in a form, click on a website, geolocate an application — produce annotations without necessarily knowing it and most often without grasping their later use. *Automatic sensors* — thermometers, cameras, satellites, GPS — are fast and cheap, but blind to their own frame: a sensor placed in the wrong place produces impeccably precise and completely false data. *Annotation algorithms* — image recognition, audio transcription, text classification — are powerful but reproduce and amplify the biases of their training corpora.

Each class of annotator produces data with different characteristics: granularity, freshness, reliability, bias. A complete data literacy should include the capacity to identify, in front of any datum, *what type of annotator produced it*, and to anticipate the biases specific to that type.

Three Ways of Being Born

Everything above has assumed a tacit model: drawing — a piece of the world, an instrument, a result. This model is the right one for a large share of data, and this document will continue to rely on it. But it is not the only one. Looking at real chains, a datum can be born in three ways, and the measurement drawing ceases to be the implicit prototype of every datum.

The first family is *observational*. It is the one just described: an interaction leaves a trace, and the act constitutes it as a result under criteria — physical measurement, observation, testimony, photography, survey. It is to this family, properly, that the undrawn and its weighing belong: where one draws, one cuts.

The second family is *institutional*. The inscribed marriage, the counted vote, the registered title, the closed balance are not drawings on a phenomenon that would exist without them. When the registrar pronounces and the register inscribes, the inscription does not report a fact that happened elsewhere: under a rule that says what counts as what, it takes part in making it exist. So its truth is not checked against the world — it is contested before the rule and the authority that instituted it; and it does not wear out against the flow — it is amended, revoked or repealed, before

the same rule. Its provenance does not name an instrument: it names the act, the rule, the institution.

The third family is *derived* — and it is a genus more than a species. A datum is born in it from other data, by a regulated operation: parent data, a model or a transformation, a new result, a new provenance. This document will soon meet a first species of it, the *consolidated* — the synthetic grain extracted from a flow. The next document will establish a second, the *verisimilar* — the extension guaranteed by a model, not by the real —, and a third, *recounting* in the technical sense — the re-inscription, with acknowledged loss, of a reread datum. The family extends far beyond: correction, annotation, classification, estimation, prediction, synthetic data — and translation according to the declared invariants: altered, it engenders a descendant; preserved, a new occurrence of the same datum, the operation and the source text being inscribed in the provenance in both cases. Every derived datum opens a filiation, and its provenance includes the model and the parent data — the mechanics of this filiation is the business of the tome of movement.

Real chains braid the three families together. An observational entry goes into a derived consolidation; the consolidation grounds an act that institutes; the recording of this act will feed other derived data. What distinguishes the families is not the medium or the format: it is what, in each, the act constitutes — and before what its result is contested.

Part V — The Corpus as a Condition of Intelligibility

A Datum Alone Says Nothing

Processual ontology radicalizes an intuition already present in the DIKW pyramid. It goes further: the datum is not only meaningless out of context; it is *strictly empty* outside a corpus.

A temperature measurement — “37.2 °C” — is not a piece of information that lacks context. It is a symbol without reference, waiting to be connected to other temperature measurements (the time series of the same subject), norms (the normal range in the adult human), classifications (the thresholds of fever), other concomitant data, an identified subject, a timestamp. These elements form the *corpus* of the datum: the set of other drawings that give it meaning. The datum alone is a word without a sentence; the corpus is the grammar that makes it legible.

It follows that the value of an individual datum depends very largely on the density of the corpus in which it is inscribed. The same temperature measurement in a hospital that has millions of historical measurements and established clinical norms, and in an isolated context with no possible comparison, does not have the same value — even if it is identical as a

signal. It is not the datum that changes; it is the corpus that lights it up or puts it out.

One then sees an effect of increasing returns appear: the denser the corpus, the more precious each new datum. This is one of the economic engines of *Big Data*. And these returns are self-sustaining: a rich corpus attracts better-quality data, which enrich the corpus, which increases its value further. Conversely, organizations with a weak corpus suffer a vicious circle in which their isolated data are worth little. This dynamic shows why the worldwide concentration of data in the hands of a few large platforms and a few States is not only a phenomenon of volume — it is a self-sustaining phenomenon of value gaps.

Measurement as a Constellation of Drawings

It is important to distinguish the *drawn signal* from the *interpreted measurement* — the datum related to a frame of reference. We have said that no datum is raw; here is why, seen from the corpus. The thermometer shows “37.2”. This is a signal. For it to become a measurement, there must be a unit, a physical reference, a calibration of the instrument, a subject. Each of these elements is itself *another drawing*, made on *another fragment of the flow*, which frames the main drawing. A measurement is not a pure datum: it is a constellation of articulated drawings.

This means that a datum is only ever half given. To function, it always requires other data. A backup should therefore preserve not *one* file, but the *file system* in which it is inscribed — which is precisely what librarians call metadata and archivists the *context of production*.

Part VI — Temporal Lapse

The Half-Life of the Datum

Industry itself has ended up recognizing lapse — under the name of *data freshness* or *data decay*. Several authors have proposed giving each type of datum a rate of decay, on the model of radioactive half-life: the datum, like an unstable atom, would disintegrate. The image is telling, provided it is read correctly. Decay is not an intrinsic attribute of the grain, which would come apart on its own in its medium: it is a relation between the datum and the use asked of it. The datum does not disappear physically — it remains, engraved in its medium; what decays is its capacity to represent the flow from which it was extracted, *for the question one asks of it*. The next document will establish this decomposition under its name: validity for a use.

Decay rates vary considerably with the type of flow. Very slow for geological or structural demographic data. Slow for stable asset data. Medium for

socio-professional data. Fast for behavioural data. Very fast for financial, meteorological, acute medical or network traffic data. The inscription, for its part, persists; it is its hold on the present that is perishable — like a fruit, like a fish out of water.

Three Ages of the Datum

From this property, one can distinguish three ages in the life of a datum, corresponding to three different uses.

First age — the fresh datum. As long as the gap between the datum and the flow it comes from remains small enough, the datum can be used as a representation of the current real. This is operational use: taking a decision, formulating a recommendation, triggering an action. A temperature sensor whose last measurement dates from two minutes ago can ground an immediate medical decision.

Second age — the ripening datum. As the datum moves away from its flow, it loses its representational capacity for the present, but keeps a statistical usefulness: aggregated with other data of the same type, it feeds models, reveals trends, supports predictions. It no longer represents current reality, but a past behaviour whose trace can inform a projection.

Third age — the archival datum. Once too far from the flow to have even a statistical usefulness for the present, the datum becomes a pure trace of the past. It no longer represents; it *commemorates*. Its value is no longer operational or predictive, but historical.

This distinction has a practical consequence: many contemporary problems of data governance come from confusing these three ages. What is no longer anything but archive is taken for operational; what could still be of use is relegated to the archive. The dangerousness of an individual is assessed on the basis of a ten-year-old file. A customer's creditworthiness is assessed on the basis of a history that no longer reflects their situation. A question about the present is answered with a model trained on a corpus frozen two years earlier. And, under cover of innovation, old practices are rediscovered — tried and tested responses to climatic, food, land-use or well-being constraints — that had been relegated to the archive and had lost nothing of their operational value.

The Paradox of Preservation

There remains a paradox: why keep a stale datum? Three good reasons coexist. Statistical interest: even stale for operational use, the datum enriches the historical corpus that illuminates present data. Memorial interest: keeping is a cultural function in itself; societies archive so as to be able to think of themselves in time. Comparative interest: confronting the initial state and the current state makes it possible to measure a change.

These legitimate reasons must not mask a problematic use: keeping a stale datum *while acting as if it were still operational*. This is the confusion of the ages, and it is one of the major risks of contemporary data governance.

Part VII — On the Flow of Observation: The Missing Link

The Limit of the Isolated Datum

Processual ontology reconstitutes well what a datum is: an entity constituted by an act — first and foremost the drawing on the flow, dated, biased, carrying the marks of its author. But something is missing. A datum alone, even well understood, does not account for what happens when drawings become systematic. Between the sporadic notch on a prehistoric bone and the IoT sensors that continuously produce millions of points per second, there is a qualitative change, not merely a quantitative one. At a certain threshold of density and cadence, one does not merely change the quantity of data: one changes nature.

This something else has a name: the **flow of observation**.

The Complete Triptych

Where the initial processual ontology set out two planes — the flow of the real and the datum as a drawing on this flow — the complete ontology requires three.

The **flow of the real** is what happens, independently of any human annotation. Continuous, immense, indifferent: this characterization describes important cases, not axioms; the relevant real always exceeds the cuts made in it, and indifference is said of the pre-existing referent of observation (“The Flow: A Condition, Not a Metaphor”). The real as it flows, as Heraclitus thought it, as Bergson named it duration.

The **flow of observation** is a flow built by a human entity — or by an organization, a technical apparatus under human control — through the accumulation of cadenced drawings made on the flow of the real according to intentional criteria. The flow of observation is not the flow of the real: it is a partial derivation, faithful to the criteria that defined it, and manipulable. It can be stored, replayed, consolidated, transmitted, interrupted. It lasts as long as it is tended.

The **consolidated datum** is the synthetic informational grain extracted from the flow of observation by processing — average, indicator, status, equation — of high use value and reusable in other contexts. It is, as announced above, the first species of the derived family: born of other data by a regulated operation, it opens a filiation — its provenance includes the processing and the parent drawings.

The triptych *flow of the real* → *flow of observation* → *consolidated datum* constitutes the complete chain of production of the datum according to processual ontology.

What the Flow of Observation Illuminates

Introducing this missing link has several important consequences.

It makes the ontology *operationally practicable*. If every datum goes stale, one might fear that drawing is futile. The answer is: one draws continuously, in order to reconstitute a flow. Individual lapse is offset by collective cadence. The ontology moves from a philosophy of loss (the flow escapes us) to a philosophy of partial reconstruction (we build canals that capture from it what is useful to us).

It *reconciles the ontology with technical practice*. The stream processing industry already builds flows of observation, without theorizing them in this way — as did, before it, the parish registers of the 16th century, and before them the Babylonian astronomical diaries from the 8th century BCE onwards.

It *shifts the question of ownership*. Humans are not central because they own the datum, but because they *build the canals* through their intention. They do not have the real; they have intentions, and their intentions structure what they capture of it. This formulation — humans as builders of canals, not as owners of the waters — opens a political economy radically different from that of the object-datum.

The definition that this document set itself the task of building can now be stated:

The datum is the elementary grain of a flow of observation that humans build through their intention, from the flow of the real. This flow of observation is faithful to the real relative to the criteria that defined it, without ever being a replica of it. From it are extracted consolidated data, of high use value, which feed decisions and knowledge — and which circulate, in turn engendering new derived flows of observation.

The properties of the flow of observation — its criteria of construction, its analogies, its inter-entity dynamics, the competencies it implies — are the subject of the document *Digging the Canal*.

Part VIII — Broader Consequences

For Algorithmic Systems

Processual ontology sheds light on the great contemporary tensions around artificial intelligence systems. A large language model is, archi-

tecturally, a backup: its training corpus is dated, its knowledge stops at a certain date, and any question concerning later events reveals the structural lag between the frozen datum and the flow that has continued. The techniques that consist in plugging it in real time into outside sources are attempts to plug it back into the flow. They bear witness, by their existence, to what processual ontology makes it possible to name: the model without them is a backup that diverges.

The open philosophical question — can one imagine an intelligent system that would learn from the flow of the real continuously, without a frozen corpus? — calls for an answer that the concept of the flow of observation will make it possible to specify: such a system could not learn directly from the flow of the real, because this flow is not directly observable. It would learn from the flows of observation that humans keep active. The intelligence of the system would then depend on the quality of the canals — and therefore, in the last instance, on the intention of those who dig them.

For Data Law

Personal data law — illustrated by the European GDPR and its equivalents worldwide — rests on the protection of the rights and freedoms of the data subject, including the right to the protection of their data — not on an ownership of the datum by that person. This person can consent to its processing, access their data, rectify them, erase them. All these operations assume a stable entity — and on this point, processual ontology does not contradict them: the datum is indeed a stable entity, because it is constituted. Where the framework assumes too much lies elsewhere: in taking the entity to stand in for its source.

Processual ontology sheds light on this framework more than it overturns it. If the datum is a drawing on the flow of my behaviour, rectifying it changes nothing in the flow — which has already continued. The “right to be forgotten” is, strictly speaking, a right over drawings, not a right to stop the flow. This distinction does not disqualify existing law; it shifts its questions, upstream and downstream of the object it knows. Upstream of the act: what is consent worth when given on what follows from the drawing, if the gesture that draws — who, how, according to which criteria — remains out of sight? Downstream: what becomes of a protection designed for a durable object, when the validity of what is protected is played out use by use, against a flow that continues? Asking these questions is the business of an ontology; answering them — by which rules, which institutions — belongs to the debate, in each situation.

For the Ethics of Storage and the Politics of the Commons

The doctrine “store everything, we will know what to do with it later” assumes that the data kept retain their value for the use that justified their drawing. Processual ontology suggests more discernment: store for a use

one can name — operational, statistical, memorial —, let the rest go. Part of massive storage is illusory, not because keeping would be futile, but because what is kept there for the present are backups that diverge from the file the longer they are kept. The environmental cost of this accumulation — in surface area, energy, water — is real and growing; it is justified only where the value of a stock, for a named use, endures.

More fundamentally, processual ontology reformulates the question of appropriation — and it is here that the distinction set out in the fourth reversal bears fruit, briefly. The flow cannot be owned; drawings can. Non-rivalry is ontological: that one person draws takes nothing from what another can draw — the flow continues, indifferent to the nets. It does not, by itself, decide any legal regime: the medium is owned, the database is protected, the secret is kept, the person is defended, access is regulated, control is contested — each in its own order, before its own rules. But it sheds light on what the large platforms claim: “their” data are not their creation — they are their drawings on a flow which, for its part, calls to mind the goods that no one living along the river exhausts, air, running water. This comparison does not ground a right; it shifts the question.

As long as one thinks of the datum as an object, one is condemned to a political economy of ownership — in which oligopolistic positions appear legitimate. If one thinks of the datum as a drawing on a source that no one exhausts, the political economy becomes one of use rights — in which democratic debate regains its rights over the question: who builds the canals, according to which rules, in the service of which interests?

Conclusion — The Net and the River

The real is a river. The datum is what a net pulls from it. Our civilization has spent two centuries refining its nets, multiplying them, automating them. It has forgotten to look at the river.

This forgetting is philosophically understandable: Western metaphysics privileged substance against process, being against becoming, the object against the flow. But reintroducing the river into our thinking about the datum is not a gesture of philosophical nostalgia. It is a practical condition: understanding what one really holds in one’s hands when one works with data, what one can infer from them and what one cannot, what one owns and what one does not.

Let us restate the essentials in summary.

What is a datum? Not a pre-existing object that one collects, but an entity constituted by an act — first and foremost the drawing that an annotation makes on the flow of the real and fixes in a symbolic representation — the elementary grain of a flow of observation that humans build through their intention.

What is its value? Not an intrinsic and lasting value, but a value determined jointly by its freshness, by the density of the corpus that makes it interpretable, and by the quality of the gesture of annotation that produced it.

What is its fate? Not indefinite preservation, but a trajectory in three ages — operational when it is fresh, statistical when it ripens, memorial when it has moved too far from the flow to represent it any longer.

From here, two questions open, which the essay treats each in its own document. That of time: how can a frozen thing age? (*The Two Times of the Datum.*) And that of the canal: if systematic drawings constitute flows of observation, how is one built? According to which criteria? With which properties? And with which effects on what it makes it possible to see — and on what it hides? Digging this canal with discernment is the subject of the exploration that follows.

Everything flows, nothing abides. — Heraclitus

Our data, for their part, abide. It is the flow that does not wait for them: as time passes, the gap widens between what they fix and what they still claim to represent.

Landmarks

For the references used in this document — the processual tradition and its heirs, the critique of raw data and of classification infrastructures, the political economy of platforms and the governance of shared resources, the stream/batch duality in industry, the half-life applied to the datum —, see the *Annotated Bibliography of Tome 1*. The methodological status is set out in the Preface to the Edition; the backup, the net, the fruit and the fish belong to the status of illustrations; the precaution on the “flow of the real” — no thesis on the ultimate nature of the real — belongs to the reading contract. Two mechanisms are used in the background without being developed: the constitutive rule, by which a recording takes part in the fact it inscribes, and the weight of the undrawn on what the drawn say — selection, censoring, survivorship; both come from independent traditions, whose detail is left to the annotated bibliographies.

This document carries four loci for the trilogy. The thesis of the two ontologies is demonstrated here — four reversals read as four aspects of an entity processually constituted, historically individualized, relationally maintained; the Preface to the Edition carries it, the Architecture Volume states it as a system. The precaution of the flow has its locus here: the real relevant to an observation always exceeds the cuts it produces — continuity and density are important cases, not axioms; this precaution is not added from outside: the first edition had written it, the edition aligns the body of the text with it and credits it. The act of annotation receives its

breakdown here — aiming, defining what one measures, measuring with a regulated instrument, inscribing the result with its uncertainty and its origin —, whose consequence *The Two Times of the Datum* will establish: the divide between documentary fact and revisable assertion, and validity for a use. The three families of constitution — observational, institutional, derived — are established here, in the definitions of the lexicon; the mechanics of filiation of derived data lives in the tome of movement, the flow of observation in the document *Digging the Canal*. Belonging, finally, has here only its scope: non-rivalry is ontological; legal regimes are discussed in their own order; the text says so briefly, and nothing demonstrates it again elsewhere. The three ages of the datum, the archival datum and the old practices returned to operational use are established results of the first edition, kept in their place.

The Two Times of the Datum

The Act, the Medium, and the Current That Ages What Does Not Move

Tome 1 — Document 4

"Time is invention or it is nothing at all."

— Henri Bergson, *Creative Evolution* (1907)

Preamble — A Paradox to Resolve

The preceding documents have, on several occasions, stated two assertions that seem to contradict each other.

On the one hand, the datum is **frozen, inert, arrested**. Once drawn and inscribed, it no longer changes. "The temperature measured is 38.2 °C": an engraved, definitive finding, which no flowing will come to erase. It is even this fixity that makes the datum useful — it can be consulted, transmitted, replayed, because it does not move.

On the other hand, these same documents have said that the datum **goes stale**, that it **withers**, that its **freshness varies**. Over time, it represents less and less faithfully the real from which it was extracted. It ages.

How can a frozen thing age? As long as this apparent paradox is not resolved, it weakens the whole edifice of processual ontology. If the datum is frozen, it cannot go stale. If it goes stale, it is not really frozen. One must choose — or else dissolve the contradiction.

The purpose of this document is to dissolve it. Its thesis fits in one sentence: **the datum does not have one time, it has two**. In the one, it is eternal. In the other, it ages. And these two times do not contradict each other, because they do not measure the same thing.

Establishing this thesis requires going back to the very making of the datum — to the two operations from which it results. For if the datum has two times, it is because it is born of two gestures: an **act** that brings it into being, a **medium** that makes it last. The first anchors it in the time of the real; the second sets it in the time of inscription. The datum is the tension between these two anchorings — and its lapse, as we shall see, is nothing other than the moving-away of the first, as the flow that carried the act continues to flow. It remains to give this moving-away its exact measure — which is a relation, not a law.

Part I — The Two Operations That Make a Datum

A Datum Is Not Born of a Single Gesture

Common intuition pictures the production of a datum as a single gesture: one “takes” a measurement, one “collects” a piece of information, one “records” a fact. A single verb, a single movement.

This picture is too summary. To produce a datum is to perform **two operations of different natures**, which the speed of modern devices has merged to the point of making them indistinct, but which remain logically separate.

The first consists in **arresting a value**. In the flow of the real, the temperature of a body varies constantly, without ever settling on any value. To arrest a value is to decide that, at this precise instant, this continuous magnitude *is worth* 38.2 — it is to make a cut in a flowing that, of itself, contains no break. We shall call this first operation the **act of inscription**.

The second consists in **durably fixing** the arrested value. Arresting a value is not enough: this arrest must also persist, and not be immediately taken back by the flowing. The value must be entrusted to something that will maintain it — a notch in a bone, a sign on a tablet, a mark on a disk. We shall call this second operation **fixation on a medium**.

These two operations are distinct. The first is a gesture of **cutting**: it separates an instant from the continuous. The second is a gesture of **preservation**: it tears the instant that has been cut out away from the wear of time. One can conceive of the one without the other — mental arithmetic arrests a value without fixing it; a blank magnetic tape is a medium that has not yet arrested anything. But a datum, in order to exist fully, needs both.

The Act of Inscription: The Cut in What Exceeds

The act of inscription is the instant when a value ceases to be a moment of the flow of the real and becomes a datum. It is an act of **cutting**, and the reach of this cutting deserves to be measured.

The flow of the real **always exceeds the cuts** made in it — continuity is an important case of it, not an axiom, and this is such a case. The temperature of a body does not proceed in steps; it varies indivisibly, without ever settling. Between 38.1 and 38.3, it has passed through an infinity of values, none of which lasted the slightest assignable instant. The real, in itself, **contains no 38.2 °C**: it contains a thermal becoming that stops on nothing.

The act of inscription imposes an arrest where the real knows none. It says: *here, now, it is 38.2*. It extracts from becoming a stable value, a clear magnitude, a number. In doing so, it accomplishes what Bergson called the **spatialization of time**: it transforms duration — continuous, qualitative, indivisible — into a series of fixed points, comparable, manipulable. The datum is born exactly there, at the point where pure duration is converted into spatialized time.

This conversion has a price. It gains manageability — a number can be compared, calculated, transmitted — and it loses movement. The datum keeps the magnitude; it abandons the becoming of which this magnitude was an instant. Every inscription is poorer than the becoming it arrests, as the footprint is poorer than the step.

Two properties of the act of inscription must be retained, for they will govern everything that follows.

The act is dated. It takes place at a precise instant of the flow of the real. It draws *that* moment, and no other. The datum therefore carries within it, indelibly, the mark of the instant at which the act took place. It is in relation to that instant that all ageing will then be measured.

The act is unique and unrepeatable. The gesture that fixed “38.2” at instant *t* is itself an event of the flow of the real — it belongs to the flow, it happened in it once, it will never happen in it again identically, since the flow has continued. One cannot perform the same act of inscription again: one can only perform a new one, at a new instant, on a real that has changed. This property, abstract in appearance, has a major practical consequence that we shall meet again: lost freshness cannot be recovered, because the act that could have captured it is past.

Fixation: The Tearing Away from the Flowing

Fixation on a medium is the operation by which the arrested value is entrusted to a matter that will maintain it.

To fix a datum is to **tear it away from the flowing**. As long as the value is only arrested — held in a volatile memory, in a mind, in a fleeting signal — it remains under threat: the slightest incident dissolves it. Fixation shelters it. It inscribes the value in something that resists time: the hardness of a bone, the firing of a clay tablet, the magnetic stability of a disk. From that instant, the datum is **withdrawn from the flow**. It no longer flows with it. It abides.

It is fixation that gives the datum its most precious properties: the fixed datum can be **consulted** at will, **replayed**, **transmitted**, **duplicated**. All these operations assume that a medium maintains it. Without fixation, no consultation is possible, no memory, no accumulation, no flow of observation. Fixation is the material condition of every deferred use of the datum.

Fixation has properties of its own, to be stated clearly.

Fixation is never absolute: it is relative to the resistance of the medium. No datum is frozen “for eternity” in the absolute. It is frozen *as long as its medium holds*. An inscription written in the sand of a beach holds for a few instants; a notch engraved in a bone has held for nearly forty millennia; a mark on a magnetic medium holds for a few years before degrading. The “frozen” therefore has a lifespan of its own. There are in reality **two possible deaths** of the datum, and the failure of the medium is one of them — we shall come back to this.

Fixation is indifferent to meaning. The medium does not know what it carries. The engraved rock does not know that it carries a temperature; the disk does not know that it carries a medical entry. All the intention, all the meaning, all the arbitrariness of the datum come from the act, never from the medium. The medium merely holds.

Fixation is duplicable. The fixed value can be copied from one medium to another. The copy is strictly identical to the original. This point, trivial in appearance, opens a paradox that we shall examine further on.

Part II — The Two Times

Why Two Operations Engender Two Times

Each of the two operations attaches the datum to a different time.

The **act of inscription** attaches the datum to the **time of the real**. For the act takes place in the flow of the real, at a dated instant of this flow. It draws the state of the real at *that* instant. The datum, through its act of origin, is therefore indissolubly linked to a moment of the flow of the real — the moment when the cut was made. And this flow continues to flow after the act. The datum therefore keeps one foot in a current that does not stop.

Fixation on a medium attaches the datum to the **time of inscription**. For fixation withdraws the datum from the flowing and sets it in a medium that maintains it identical to itself. In that time — the medium’s own time, the time of the inscribed thing — the datum no longer moves. It is what it is, indefinitely, for as long as the medium holds.

Here is the resolution of the paradox of the preamble. The datum is frozen *and* perishable because it has one foot in each of these two times. Frozen

in the time of inscription, where the medium keeps it motionless. Perishable in the time of the real, where the flow keeps moving away from the point the act had marked. The two statements are true at the same time, because they speak of two different times.

Two regimes, not a bookkeeping: real infrastructures deploy them into a plurality of **operational times** — from the event that occurs to the action that follows —, whose clocks do not always coincide; their detail belongs to the Architecture Volume. The substance lies entirely in the two regimes.

The Time of Inscription: The Eternity of What Is Engraved

In the time of inscription, the datum is **eternal**. This eternity is not a figure of speech; it is exact, to within a precision that the following section provides.

“The temperature measured at instant t is 38.2 °C.” This statement, once the act has been correctly performed and the value correctly fixed, is true. It was true yesterday, it is true today, it will be true in a thousand years. No passing of time will make it false. The real may well continue, the body may well warm up or cool down: *that the temperature measured at instant t was 38.2 °C* remains an acquired, definitive fact.

It is this eternity that makes it possible to **rely** on a datum, to **cite** it, to **replay** it, to build on it. If the datum changed in the time of inscription, no memory, no accounting, no science would be possible. The whole civilization of the datum rests on that eternity.

It remains to understand clearly what is eternal. It is not the value *insofar as it describes the current real*. It is the value *insofar as it was measured at a given instant*. The eternity of the datum is the eternity of a **dated finding**, not the eternity of a description valid for ever. The datum does not say “the body is at 38.2 °C”; it says “the body was measured at 38.2 °C at instant t ”. The first statement goes stale; the second, never.

The Eternity Decomposed: The Five Planes

The eternity of the dated finding calls for a precision, which the very making of the act imposes. The previous document broke annotation down: aiming, defining what one measures, measuring with a regulated instrument, inscribing the result with its uncertainty and its origin. A finding produced in this way is not a block. It can be assessed on five planes, which must not be confused: the **occurrence** of the recording — this act did take place: such an apparatus, according to such a procedure, produced and inscribed such a result at such an instant; the **authenticity** of the document — this inscription is indeed the one it claims to be, neither substituted nor altered since; the **quality** of the result — what the instrument, the procedure, the declared uncertainty were worth; the **truth** of the assertion about the phenomenon — was the body at 38.2 °C; the **validity** for a use — can this finding ground such a decision, now.

The divide between the times runs between these planes, and it is clear-cut. What the time of inscription guarantees is the first: the **documentary fact** — such an apparatus produced such a result at such an instant — is irreversible. No later discovery will make this recording not have taken place. But the truth of the assertion remains **revisable** without anything moving on the medium: should one discover afterwards a calibration defect, a mix-up of patients, an uncontrolled influence, and “the body was at 38.2 °C” falls — while “the instrument displayed 38.2 °C at instant *t*” remains. Revision does not strike out the inscription: it is a new inscription, which corrects its reach. The eternity of the engraved is the eternity of the documentary fact — not that of the truth about the phenomenon, which belongs to the ordinary work of knowledge.

Authenticity and quality, the act fixes; what one knows of them can change, through the same work. There remains the fifth plane, validity for a use — the only one that the time of the real works on in its own right, and the subject of the rest of this document.

The Time of the Real: The Withering of What Does Not Move

In the time of the real, the datum **withers**. And here one must be very precise, for this is the subtlest point of the whole reasoning.

The datum, in the time of the real, does not move either. *It does not move*. The value 38.2 inscribed on the medium remains 38.2. What moves is not the datum — it is the real. The body goes on living, its temperature goes on varying, the flow pursues its course. And as the flow moves away from the instant *t* where the act had dropped its anchor, the gap widens between what the datum asserts and what the real has become.

The withering of the datum is therefore **not a movement of the datum**. It is a movement *of the real*, which moves away from it. The datum is a fixed point; the real is a current; and what we call “lapse” or “loss of freshness” is nothing other than **the measure of the growing separation between the fixed point and the current**. Withering is not a property of the datum; it is a **relation** between a motionless datum and a mobile real.

The Inversion: What the Datum Does to the Classical Scientific Framework

This situation brings into play something the usual conceptual framework does not describe.

In the classical scientific method, one has a **fixed frame** and one measures in it the **movement of an object**. The road is the fixed frame, the car is the moving object: one measures the changing position of the car in relation to the road. The sky of the distant stars is the fixed frame, the planet is the moving object. Always the same schema: stable frame, moving object, and it is the movement of the object that one wants to grasp.

The datum inverts exactly this schema. Here, **the object is fixed and the frame is mobile**. The datum — the inscribed drawing — is the motionless point. The flow of the real — what should play the role of frame — is in perpetual movement. One no longer has an object moving in a stable frame; one has a frozen object whose frame moves away.

Where classical science measures the movement of an object in a fixed frame, the datum presents for observation the moving-away of a mobile frame around a fixed object.

The ageing of a datum is not its own movement; it is the effect of the displacement of its frame. This inversion explains a difficulty often felt by a mind trained in the scientific method: it is used to the frame of reference serving to *capture* movement, and it finds itself here before a case in which the movement of the frame itself is what must be taken into account. The discomfort is real; it is not the sign of an error, but that of a genuinely unusual situation.

Lapse as Separation

Let us bring the preceding sections together in a single image.

The datum has two anchorings. One, set by the act of inscription, attaches it to a precise instant of the flow of the real — the instant t when the cut was made. The other, set by fixation on a medium, attaches it to the time of inscription, where it remains eternally identical to itself.

These two anchorings are *motionless*. The datum moves in neither of the two times. But the flow of the real does not stop: it flows around the point that the act marked, as a river flows around a stake planted in its bed. The stake does not go downstream; the current passes before it. As the water moves away, the gap widens between the instant the stake was planted and the present state of the river.

As long as this gap remains small — that is, as long as the instant of the act is recent —, the datum faithfully represents the real. The datum is *fresh*. But the flow never stops: the gap grows, not because the datum moves, but because the time of the real carries everything away, except the datum.

The lapse of a datum is exactly this separation. It is neither a degradation of the datum nor a degradation of the medium: the datum remains legible, the medium holds firm. It is the growing gap between the point that the act marked in the flow and the present state of that flow. The datum does not go stale from within; it goes stale because the world moves away from it.

This image also says what is certain and what is variable in the separation. Certain: the flow of the real never stops, and the gap, for every datum drawn, keeps growing. Variable: everything depends on the speed of the current: a flow of the real that changes slowly — the composition of a soil,

the age pyramid of a population — moves away slowly from the instant at which the act was performed; a flow that changes fast — a stock price, a heart rate during exertion — moves away from it in a few instants. The speed of separation is not a property of the datum: it is the speed of the fragment of the real from which it was extracted.

But separation is the mechanism, not the measure. What it does to the datum — when it ceases to be valid, and for what — does not fall uniformly on everything inscribed: it is a relation, which the next part decomposes.

Part III — What the Distinction Illuminates

Lapse Decomposed: Validity for a Use

Separation is a fact; “stale” is a verdict. And the verdict cannot be read in the gap alone. The same inscription — “38.2 °C measured at instant t ” — is stale for someone who wants to know whether the fever is rising tonight, and perfectly accurate for someone who reconstructs, ten years later, the history of the illness. Nothing has moved on the medium between these two judgements; it is the use that has changed. Lapse is therefore not a uniform law of ageing, which would fall on everything inscribed in the same way: it is a **relation** between a motionless datum and a situated use.

This relation has four terms, and naming them is enough for the false law to dissolve. The **object** aimed at: from which fragment of the real the datum was extracted, and at what speed this fragment changes — a soil, a market price, a feverish body do not carry their data away at the same pace. The **question** asked: is the inscription asked to tell the present, or to attest the past? The **instant** of use: the same entry, three hours or three days after the act, does not support the same decision. The **tolerance** admitted: how much gap the use can absorb without the decision tipping over — the fourth part will meet this tolerance again, in connection with risk. A datum is valid *for*: validity does not inhabit the inscription; it arises from the fit between the inscription and what is asked of it.

The case of the statement concerning the past completes the dissolution of the law. Let us return to the stake planted in the river. For someone who wants to know the level of the water this morning, last year’s mark is worth nothing any more; for someone who reconstructs where the river ran that year, it is worth exactly what it says. The stake has not changed; the question has. When the question concerns the past — what happened, what the apparatus measured —, the gap between the instant of the act and the present is no longer a defect: it is the very object of the question. The statement concerning the past does not age like the one that claims to tell the present — and that is why the archive, far from being the scrap heap of the operational, is a holding of intact validity for the questions that are its own.

The corpus already possessed the pieces of this relation; the edition lodges them here and credits them. The **stable sources** — those fragments of the real whose separation slows down to the imperceptible — are its remarkable case: the following section establishes them. The **three ages** of the datum — fresh, ripening, archival — are its graduation of use, on the side of undergone ageing: the previous document set them out, with the archival datum that commemorates without representing any more. And **recounting** — the new inscription, with acknowledged loss, of a datum reread once it has gone stale for its original use — lives in the tome of the reader: it is possible only because “stale for the alert” never meant “lost for history”. Here is the exact measure promised at the outset of this document: a relation, not a law.

The Illusion of Repeatability, or the Sources

A natural objection may arise here. If the act of inscription is unique and unrepeatable, how is it that, in practice, one can draw “the same datum twice”? I count the rings of a tree trunk: I get 87. I count them again the next day: I get 87. If I measure the temperature of a body twice a few seconds apart, the instrument shows 38.2 °C twice. Repeatability seems to be a fact of experience.

This objection deserves to be faced, for its answer reveals something important.

First, rigour requires saying that these are not “the same datum twice”: they are **two distinct data carrying the same value**. Each proceeds from a separate act of inscription, dated differently, performed by a different gesture. What is repeated is the arrested value, never the act. The distinction between the two times easily allows this precision: two acts can coincide in the time of the real on the same value — because the flow of the real has not had time to move significantly between them.

But it is precisely this *because* that must be examined, for it reveals the true nature of the illusion. When I count the rings of the trunk again, I get the same value not because the flow of the real has stopped, but because its speed of transformation, for the object observed, is so slow on the human scale that the gap between the two acts remains imperceptible. On the scale of the trunk, a day is nothing. On the scale of a century, the trunk will have disintegrated and the “repeatability” will have vanished. Lapse was indeed at work — simply at a rhythm that human perception does not capture.

It is the same structure of illusion that Aristotle was subject to, without knowing it, regarding falling bodies. Aristotle always saw the heavy object fall faster than the light one, and he concluded that this was a law of the real. But what he saw was not pure falling: it was falling *in air*, and the air biased his whole observation without his having access to an environment of comparison. It took Galileo and the vacuum for the illusion to dissipate. Likewise, the human who observes the repeatability of a drawing does not

perceive an absence of lapse: they perceive a lapse slowed down *beyond what their temporal window can grasp*.

From this analysis follows a useful notion: that of the **stable source**. A stable source is a fragment of the real whose lapse is so slow that it can be treated, on the scale of human use, as negligible. Not because it is absent — the flow never stops — but because it is imperceptible. The grammar of a language, mathematical theorems, the great physical regularities, well-established historical facts, certain geological properties: so many sources whose drawings can be held to be valid for a long time, provided one keeps in mind that this validity is a *duration* and not an *eternity*.

This notion has a reach that the essay must name. Stable sources are, for a society, what foundation ground is for a building: firm enough, on the scale of use, for durable edifices to be built on them — even though one knows, in the last analysis, that the ground itself will eventually move. A civilization is built in part on its capacity to identify these sources, to protect them, to pass them on. Other sources, with rapid lapse, can also be exploited — an oil pocket, a fashion, a competitive advantage — but they call for another posture: knowing that they will run dry, planning their replacement, not asking of them the stability they cannot offer. What is costly is not drawing from an unstable source; it is confusing it with a stable source and building on it as if it were one.

The essay's water metaphor is naturally enriched here. Humans are not the owners of the waters that flow in the river. Nor are they the owners of the canals they have dug in it — in the strong sense, these canals are artefacts that they maintain but that depend on the river. But the **springs** that feed their canals — the fragments of the real whose lapse slows down until it becomes negligible —, those they can recognize, name, pass on. The spring is what soothes in the metaphorical network: neither the torrent that carries away, nor the canal that must be tended, but the identified point of origin to which one can always return.

This idea calls, at the level of literacy, for a competency of the family that the document *Digging the Canal* brings together. It is added to the list: knowing how to identify stable sources, and not confusing the slowness of their lapse with its absence.

The Two Deaths of the Datum

The datum can **die in two distinct ways**, which must not be confused.

The first death is **lapse**: the datum becomes false for describing the present. It is death in the time of the real. The datum remains perfectly legible, perfectly intact on its medium — but it no longer tells the current real. The “38.2 °C” entry from three days ago is still there, accurate as a dated finding, but it no longer informs about the present fever. This death does not strike the existence of the datum; it strikes its **representative validity** — and we have known since the opening of this part that this

verdict is relative: dead for the use that asked for the present, the same inscription remains alive for the questions that concern the past.

The second death is **disappearance**: the medium degrades, and the datum purely and simply ceases to exist. It is death in the time of inscription. The rock erodes, the clay breaks, the magnetic medium loses its magnetization, the format becomes illegible for want of a machine to read it. The datum is no longer false: it no longer *is* at all. This death strikes **existence**.

These two deaths are independent. A datum can be perfectly alive as to its medium and perfectly dead for telling the present: this is the case of every ancient archive. Conversely, a datum could still be fresh as to the real but already lost through failure of the medium.

Keeping a datum and keeping it valid are two different tasks, which call for different means. Fighting disappearance is a matter of the quality and redundancy of media — it is a matter of archiving. Fighting lapse is a matter of re-drawing — it is a matter of freshness, and no medium, however durable, can do anything about it. One can engrave a datum in the most resistant material: that protects it from disappearance; it does not protect it from a single second of lapse.

These two deaths are images, and they must be given their exact status: teaching images. They name the two typical collapses — that of validity, that of existence — of a state which, described completely, has more than two dimensions: existing, being intact, being authentic, being reachable, being intelligible, being valid for a use — so many components that can give way separately, and whose regulated decomposition belongs to the Architecture Volume. The tomes keep the images; it is enough to know that they summarize. As for total collapse — the universal loss, for every reader, of the very conditions of interpretation —, it remains a limit-ideal: the tome of the reader will place it on the last rung of its scale, on the side of the second death.

A Variant: The Inaccessible Datum

A third situation deserves to be named, which is neither lapse nor disappearance in the strict sense, but another form of extinction. Let us imagine a datum fixed on an electromagnetic wave that has propagated through space beyond the field of human drawing. The inscription is still there: the wave keeps travelling, transporting the signal entrusted to it. Its medium has not disappeared — it is even, on the human scale, of almost infinite durability. And the datum is not stale in the sense of the time of the real: what it says remains accurate relative to the instant at which the act of inscription was performed.

But it has become **inaccessible**. The reader has no means, from their position, of reaching it — the wave moves away faster than they could catch up with it, or has dispersed out of reach of the instruments. For

them, everything happens as if the datum no longer existed, even though neither the medium nor freshness is in question.

This third situation — inaccessibility — does not contradict the two deaths; it confirms that the images summarize. A single component of the state has given way — reachability for this reader, from their position —, all the others holding firm: the medium carries, the finding remains, the gap with the real plays no part. A datum can be perfectly alive in itself, and nevertheless lost *for a situated reader*. It is, in mirror image, a consequence of the fact that the next document will establish: every reader is partial, bounded by what they can reach. The datum, like the trace, exists fully only in the encounter with a reader capable of reading it — and this encounter is sometimes made impossible by the mere geometry of space.

The Paradox of Duplication

The datum can be **uplicated**, and the copy is identical to the original — a fact that has no equivalent in the world of material objects. If one duplicates an apple, one gets two apples — two distinct objects. But if one duplicates the datum “38.2 °C measured at instant *t*” from one medium to another, one does not get “two data” in the sense in which one would have two apples. One gets **the same datum, carried by two media**.

The distinction between the two times explains why. Duplication is an operation that bears on **fixation** — it copies the inscription from one medium to another. It does not touch the **act**. Now the act is unique, dated, un-repeatable. Duplicating the medium does not create a second act; it only multiplies the carriers of a single act.

One conclusion follows: **the datum is not in the medium; it is carried by it**. The medium is multiple, material, perishable, duplicable. What it carries — the dated finding that issues from the act — is unique, invariant, indifferent to the number of media that carry it. The datum is therefore an entity of a singular kind: it needs a material medium in order to exist and last, but it is identified with no particular medium. It is, in a precise sense, *the individuated result of an act made persistent* — and an act is not duplicated; it is preserved. The tome of movement will give this structure its names — the **datum of origin**, one, which every copy instantiates; the **occurrences**, which are counted — and will establish its mechanics, up to the filiation by which a transformation, for its part, opens a line of descent; here, it is enough that the rule holds.

This analysis sheds light on the circulation of the datum. What circulates is not an object passing from hand to hand; it is a finding that becomes present in several places at once — the movement of a carrier medium, letter or tablet, transmitting the same occurrence without multiplying it; the tome of movement establishes this division between the two modes. The datum is not ceded like a thing; it is *shared* like a fact.

The rule can therefore be fixed in four verbs, which the whole rest of the

essay will observe. The **act** is preserved: unique and dated, it is neither duplicated nor multiplied. The **inscription** is duplicated — or moves with its medium: duplication, which copies the fixation from one medium to another, is the elementary operation of the duplicative mode; the movement of a carrier medium transmits the same inscription without duplicating it. The **carriers** multiply: multiplication is the aggregate effect of duplications, as propagation will be the aggregate of transports. The **datum** is shared: one and one only, present in several places, without anyone being dispossessed of it.

Why Freshness Can Never Be Recovered

The distinction between the two times finally establishes with rigour a principle stated intuitively: **freshness cannot be obtained after the fact.**

Freshness is the proximity between the instant of the act and the present of the real. Now the act is unique and unrepeatable: it took place at instant *t*; it will never take place at another instant. To have a fresh datum, there is only one way: to perform a **new act of inscription**, now, on the present real. This new act produces a new datum — dated now, fresh by construction. But it does not *refresh* the old one: it creates another one, alongside.

Freshness, in other words, is not an attribute that could be restored; it is the signature of a recent act. One cannot make an old act recent. One can only perform a new act.

This principle has an important consequence. All the techniques that seem to “produce freshness” without a new drawing — regression, time-series forecasting, the analysis of trends and seasonality — never in reality produce freshness. They produce something else, which calls for a precise name — and that is the subject of the next part.

Part IV — Freshness, Verisimilitude and Prediction

Freshness and Verisimilitude: Two Things Not to Be Confused

There is a vast set of techniques — linear regression, time-series forecasting, statistical process control, seasonality analysis, the study of trends — that make it possible, from a set of old data, to estimate what a datum would be worth if it were drawn now.

These techniques are precious, legitimate, often remarkably effective. But let us be very rigorous about what they produce. They do **not produce freshness**. They produce what must be named by another word: **verisimilitude**.

Freshness is the fruit of a **real contact** with the present of the flow of the real. It is obtained by a recent act of inscription — a new drawing. A fresh datum is guaranteed by the real itself: it says what the real is, because it has just been extracted from it.

Verisimilitude is the fruit of a **calculation on a model**. It is obtained without contact with the present of the real, from a set of old data and from hypotheses about the way the real behaves. A verisimilar datum is not guaranteed by the real: it is guaranteed by a model, that is, by the hypothesis that the real has continued to behave as the model supposes.

A verisimilar datum is therefore a **datum of another nature**: no longer a drawing on the flow of the real, but a drawing on a model of the flow of the real. It has not touched the present real; it has touched a calculated representation of what the present real *should* be. The previous document named its family: the **verisimilar** is the second species of the derived genus — where the consolidated tightens what has been drawn into a grain of synthesis, the verisimilar extends beyond: the extension guaranteed by a model, not by the real. Its provenance says so plainly: it includes the model and the parent data — drawings which, for their part, had touched the real, along flows of observation built upon it.

This in no way disqualifies verisimilitude. In an immense number of situations, a new drawing is impossible, too costly, too slow, and verisimilitude is then the best substitute available. But conceptual honesty — and data literacy — require never confusing the two. To present a verisimilar datum as a fresh datum is to attribute to a calculation the guarantee that belongs only to contact with the real. It is passing off a hypothesis as a finding.

Risk, or the Price of Verisimilitude

Since the verisimilar datum rests on the hypothesis that the real has continued to behave as the model supposes, it carries within it a **risk**: that this hypothesis is false — that the real has, precisely, ceased to resemble the model.

This risk cannot be eliminated. It can only be **controlled**: estimated, bounded, and set against what the use tolerates.

The acceptable margin of uncertainty is not the same in every field, because the **cost of an error** is not the same. Two illustrations show this.

First illustration — managing a shop department. Forecasting the restocking of a shelf of dry goods and that of a shelf of fresh produce are two exercises in verisimilitude of the same nature, but they do not tolerate the same margin of uncertainty. Dry goods keep for a long time: if the forecast is too generous, the surplus will remain saleable, and the next order can be adjusted. The error is *recoverable*, so an ample margin of uncertainty is acceptable. Fresh produce keeps for a short time: a surplus will have to be thrown away; an error cannot be recovered. Same technique, same

nature of verisimilitude — but a requirement of precision dictated by the flexibility of the use.

Second illustration — calculating a trajectory. Laying out the curve of a road bend and calculating the trajectory of a space probe are two forecasting exercises of the same nature, with incomparable requirements. For the bend, an approximate value of the number π to two decimal places is enough: the vehicle has a margin — it can slow down, correct; the trajectory is flexible. For the probe that must use a gravity assist, a value of π to many decimal places is needed: the trajectory has no flexibility; a tiny deviation at departure becomes an immense deviation on arrival.

These illustrations say something of substance: **the quality required of a verisimilar datum is not defined in the absolute, but relative to the use and to the risk that this use can tolerate.** It is the tolerance of the previous part, met again on the side of calculation — and a direct variant of the observational optimum that the document *Digging the Canal* will establish: precise enough for the risk to be acceptable, no more precise than the use requires.

What One Predicts Is Not the Datum

One last point remains to be clarified, the subtlest, and perhaps the most important for the conceptual accuracy of the whole series.

When one uses a forecasting technique, everyday language says that one “predicts a datum”. This expression is misleading, and the distinction between the two times makes it possible to say why.

A datum is a frozen drawing — a dated finding, arrested by an act, fixed on a medium. As such, it has no future: it is going nowhere; it will never become anything other than what it is. A past datum will eternally remain that past datum. **One therefore cannot predict a datum:** there is nothing, in a datum, that could be predicted, since it will never be transformed.

What one predicts, in reality, is not the datum: it is **the future state of the fragment of the flow of the real** that the criteria of drawing had cut out. One does not predict a number; one anticipates a state of the world. And the result of this anticipation — the calculated value — is not a fresh datum: it is a verisimilar datum, a drawing made not on the real but on a model.

Let us set a safeguard here. What one anticipates is never “the flow of the real” in general. The flow of the real as a whole is immense, polymorphous, and remains beyond any grasp. What one anticipates is solely **the future state of the fragment of the real that the criteria of the flow of observation had framed.** Forecasting inherits the framing of the drawing in full. If the criteria did not capture a certain parameter, the forecast is blind to that parameter — and therefore blind to any future event that would depend on it.

One does not predict a datum — a frozen drawing has no future. One anticipates the probable future state of the fragment of the real that the criteria of drawing had cut out. The result of this anticipation is not a fresh datum, but a verisimilar datum: a drawing made on a model, and not on the real. Freshness is obtained only through a new contact with the real; all the rest is inference, and inference is paid for in risk.

Conclusion — The Fixed Point and the Current

At the end of this journey, the paradox of the preamble is dissolved. The datum is frozen *and* perishable, without contradiction, because it lives in two times at once.

It is frozen in the **time of inscription**, because a medium keeps it identical to itself: that such an apparatus measured 38.2 °C at instant *t* is an irreversible documentary fact — what can be revised is the reach of the assertion, never the having-taken-place of the act. It is the foundation of all memory.

It is perishable in the **time of the real**, because the flow from which the act had extracted it never stops: the real continues, moves away from the point the act had marked, and the growing gap between this fixed point and this current is what we call lapse. The datum does not move; it is the world that leaves it behind.

This double life comes from the very making of the datum. It is born of two operations: an **act of inscription**, which makes a cut in the continuous of the real and dates it irrevocably; a **fixation on a medium**, which tears the arrested value away from the flowing and sets it in the eternity of the inscribed. The act anchors the datum to an instant of the flow; the medium anchors it in the time of inscription. The datum is the tension between these two anchorings — and its ageing, the moving-away of the first, as the flow that carried it continues to flow; what this moving-away costs it is measured use by use.

From this distinction several clarifications follow. Lapse is not a law but a relation — a datum is valid *for a use*, and the statement concerning the past does not age like the one that claims to tell the present. The datum can die in two ways — going stale in the time of the real, disappearing in the time of inscription — and fighting the one never protects against the other. The datum can be duplicated without being multiplied, because it is not in its medium but carried by it. Freshness can never be recovered, because it is the signature of a recent act. And what is called “predicting a datum” is in reality anticipating the future state of a fragment of the real framed by criteria: the result is not a fresh datum but a verisimilar datum, guaranteed by a model and not by the world.

From this double lesson — separation slowing down until it seems zero, as with stable sources; separation racing until it exceeds any grasp, as with the price that varies in a few instants — a still broader truth emerges. **Lapse exists at every scale of the flow of the real. Humans perceive only a band of it — the one in which the rhythm of the real is commensurate with their own. Short of it, the real seems immutable; beyond it, it seems instantaneous. It is between these two thresholds that they lay their canals, plant their springs, build their civilization.**

The lesson, at bottom, is simple. A datum is a fixed point planted in a current. Its strength is to be a fixed point: that is what allows us to build on it. Its limit is to be planted in a current: that is what makes it escape us as the current moves on. To understand the datum is to hold these two truths together — and to know, each time one leans on a datum, how long ago the current left the point where it was planted.

“Time is invention or it is nothing at all.” The datum, for its part, is inscribed in two times at once: the one that keeps it intact, and the one that, without ever touching it, moves it away from the world.

These two times of the datum are, at bottom, also two times of the reader. When someone encounters a trace — an inscription, a datum, a document — they encounter an act performed by someone else, in another present, for reasons they may no longer know. The gap between the instant of the act and the instant of reading is what the next document explores: what the reader can do with a trace they did not witness.

Landmarks

For the references used in this document — Bergson (pure duration / spatialized time), processual ontology, Gitelman, and the archaeological artefacts mentioned (a bone notched across several tens of millennia) —, see the *Annotated Bibliography of Tome 1*. The methodological status is set out in the Preface to the Edition; the thermometer and its 38.2 °C, the stake in the river, the wave emitted out of reach, the shop department and the probe belong to the status of illustrations; the analogy of Aristotle holds for the structure of the illusion, not as history of science.

This document carries four loci for the trilogy. The two regimes of time have their locus here — the time of the real, the time of inscription — and the operational times receive here only their mention: the deployment, clock by clock, belongs to the Architecture Volume. The five planes of the finding are established here — occurrence, authenticity, quality, truth, validity — and with them the divide promised by the previous document: the documentary fact is irreversible; the assertion about the phenomenon remains revisable; the dated finding, which the first edition had written,

gains here its precision and its credit. Validity for a use receives its demonstration here — object, question, instant, tolerance, and the case of the statement concerning the past; the established results of the corpus are lodged here without remainder: the stable sources, established here; the three ages and the archival datum, set out in the previous document; recounting, in the tome of the reader. The two deaths remain — teaching images of the typical collapses of a state with several dimensions, whose regulated decomposition lives in the Architecture Volume; the universal loss of the conditions of interpretation is the limit-ideal, which the tome of the reader places on the last rung of its scale. Duplication, finally, keeps here its four verbs and its image — copying without division; the datum of origin and the occurrence are only named here, their mechanics, up to filiation, being the business of the tome of movement. The verisimilar is established here, the second species of the derived genus; the consolidated was established in the previous document, recounting is established in the tome of the reader.

The Trace and the Reader

What Makes the Datum Possible — At the Foundations of the Essay

Tome 1 — Document 5

“Nature does nothing in vain, and nothing superfluous.”

— Aristotle, *De Caelo*

“The world is made to end up in a book.”

— Stéphane Mallarmé

Preamble — A Question Never Asked

This document occupies a singular position in the essay. It was written later; it could nevertheless be placed first. The documents that precede it have all presupposed, without ever questioning it, that a drawing was possible. They have described how humans draw, annotate, build flows of observation, but they have not asked: *what, in the world and in humans, makes this drawing possible in the first place?*

This document asks that question. It is to the others what foundations are to a building: invisible once the edifice has been raised, but that without which the edifice would not stand. Readers who approach the essay from its chronological beginning can therefore discover it where it presents itself, without harm; those who later want to understand why all the rest holds will gain from coming back to it, and rereading it as one rereads an introduction after finishing a book.

The whole essay rests on a thesis: the datum is not a pre-existing object that one would collect, but the result of an operation that constitutes it — here, in its observational route, the drawing made on the flow of the real by an act of annotation. This thesis, if one examines it, contains an

assumption it has never justified. It assumes that there is, in the real, something that *can* be drawn; and it assumes that there exists a being that *can* draw. These two assumptions have been treated as self-evident. They are not.

If the flow of the real were a pure flowing without thickness — a perpetual present that kept no mark of what it has been —, what could one draw from it? Nothing, or almost nothing: a snapshot without depth, immediately dissolved. For a drawing to have meaning, the real must *carry something* — it must be, in one way or another, already marked, already structured by its own past. The real must be *legible*.

And if nothing in the universe were capable of aiming, cutting out, annotating, inscribing — if there were only matter and forces —, who would draw? No one. The real could be as legible as one likes: without a reader, its legibility would remain a dead letter. There must exist a being capable of reading.

The datum, then, does not hold up by itself. It rests on two pillars, and this document's sole purpose is to bring them to light:

- **First pillar — the legibility of the real.** The flow of the real keeps traces of itself. As it flows, it leaves marks. This property is what makes the real *drawable*.
- **Second pillar — the existence of a reader.** The flow of the real has produced, through its own flowing, a being capable of reading these marks. This being is what makes legibility *effective*.

The datum is born at the exact meeting point of these two pillars: a real that carries traces, and a being that the real has engendered to read them. From their meeting, an act makes the datum — the drawing of a trace under criteria, and its inscription as a result. The whole essay rests there. This document goes down to that foundation.

Part I — The Legibility of the Real

The Real Keeps Traces of Itself

Let us begin with the first pillar, and with a fact that goes unnoticed because it is so common.

The flow of the real, as it flows, does not entirely erase itself behind it. It leaves **marks**. The passage of water hollows out the stone, and the stone keeps the shape of the passage. The growth of the tree deposits layers of wood, and the trunk keeps the stacking of the layers. The lava flow cools, and the rock keeps the memory of the flow. The deposit of sediments forms strata, and the cliff keeps the order of the deposits. The step in the mud leaves a footprint, and the dried mud keeps the footprint.

This fact is so general that it takes an effort to see it as a fact, and not as a self-evident necessity. One can imagine — in the mind — a world in which it would not be so: a world in which each instant would be erased entirely, in which matter would keep no imprint of what it has undergone. Such a world could be conceived. It would not be knowable.

Our world is not like that. Our world is a world in which **the past leaves marks in the material present**. We shall call this property the *legibility of the real*. The present state of matter is not a pure snapshot without depth; it is charged with the memory of what produced it — unequally, as we shall see, but really. The eroded stone is not only a stone: it is a stone *that carries the inscription of the rain*. The felled trunk is not only wood: it is wood *that carries the inscription of the seasons*.

It is this property — and it alone — that makes the real drawable. One does not draw a pure instant; one could do nothing with it. One draws a state of the real *insofar as it carries the marks of its past*. Drawing has meaning because the real has thickness.

What Is a Trace?

The right word for these marks is **trace**. Three characteristics define it.

The trace is caused. It is not made *on purpose*. No intention presides over its formation. The rain does not erode the stone to leave a message; it erodes it because that is the physical consequence of running water. The tree does not form its rings so that they may be counted; it forms them because growth alternates with the seasons. The trace is the blind product of a causal process. This is its first characteristic, and the most important: the trace is intended by no one.

The trace is physically linked to what it marks. There is, between the trace and what produced it, a real, material, non-arbitrary link. The footprint was *really* hollowed out by the foot; the ring was *really* deposited by a year of growth. This is what distinguishes the trace from the arbitrary sign: the word “tree” has no physical link with a tree, it is a convention of language; the ring, for its part, is physically the product of the year it signals.

The trace is legible, but it is not read. The trace contains, in a sense, information — the age of the tree is *in* the arrangement of the rings. But this information is only *potential*. It is available; it is not actualized. As long as no one comes to read the rings, the tree carries its age without this age being *known* to anyone. The trace offers legibility; it does not accomplish a reading.

Reading the rings means here interpreting marks under criteria. It is not yet the act of reading of an arrived datum: the datum will be constituted only by the inscription of a result.

This third characteristic is decisive for what follows: **a trace is legible real; it is not yet a datum.**

The Trace, Condition of All Knowledge

The legibility of the real is not one fact among others: it is the condition of possibility of **all knowledge**, without exception.

All knowledge that concerns the past rests on traces. Geology reads strata to reconstruct the history of the Earth. Dendrochronology reads rings to date wood. Palaeontology reads fossils. Astronomy reads the light of distant stars, which is a trace of a state of the cosmos millions or billions of years old. Archaeology reads remains. Medicine reads symptoms, which are the traces of the illness in the body. Forensic science reads clues.

None of these forms of knowledge would be possible in a world without traces. And the observation goes further: even knowledge of the present rests on traces, for every perception is already the reading of a trace. When the eye sees an object, it does not touch the object: it receives the light the object has reflected — a luminous trace, already separated from its source by the time, however tiny, of the journey. To perceive is always to read a mark that the real has left.

The legibility of the real is therefore the ground of everything. Without it, no science, no memory, no perception, no datum. It is the first pillar, and it is so fundamental that one never sees it — as one does not see the ground one walks on.

Differential Traceability

This ground, however, is not uniform. Before going on to the second pillar, the first must be stated exactly, for the statement, left without measure, would promise too much. That the real keeps traces of itself does not mean that everything in it can be read, nor that what can be read can be read equally. Legibility is distributed by degrees, and each degree can be lacking. We shall call this characteristic the **differential traceability** of the real.

Four degrees are distinguished.

The first is **causal marking**. A process passes through matter and marks it: rain erodes, growth deposits, the step leaves its imprint. This is the fact we have just established. But it must be held to its right measure: the mark never exhausts the process that causes it. The eroded stone carries the inscription of the rain; it does not carry every drop, nor the sky of every shower. Marking is real; it is never complete.

The second is the **preserved trace**. Marking is not enough; the mark must also persist beyond the process. Now many marks die with the instant that makes them: the wake closes, the warmth of a hand leaves the stone, the

scent dissipates. The real marks itself constantly, and constantly too it takes its marks back. What is preserved is a part — not the whole.

The third is the **accessible trace**. Preserved, the trace may remain out of reach: the buried stratum that no drilling will reach, the wreck in depths that nothing visits, the ring at the heart of a living tree that no one will fell. The trace is there, whole, and no reader can get to it.

The fourth is the **interpretable trace**. Accessible, the trace may remain mute for want of a reader who has the means to read it — a criterion, a rule, a competence. Tree rings were preserved and on offer for millennia before dendrochronology made them into witnesses; symptoms long preceded the medicine that knows how to read them; the light of the stars was already arriving when no one knew how to see anything in it but a glimmer. Each time, the trace was there; it was reading that was lacking.

And even at the top of these degrees, a reservation remains: the mark may **underdetermine its cause**. Different processes leave similar marks. The flint may have been broken by frost or knapped by a hand, and the archaeologist must decide; fever signals a hundred illnesses, and the doctor must tell them apart; the polished stone was polished by water or by the sand the wind carries. The physical link is real — the trace was indeed caused —, but it cannot always be followed back along a single route: reading will often mean choosing between possible pasts, and sometimes remaining in equivocation.

Here is the exact status of the first pillar. What stands, whole: **no knowledge has any route other than the trace** — nothing we know of the world has been known otherwise. What falls: the idea that everything would be legible, everywhere — a real entirely archived in its own matter, whose inventory would merely take a long time to draw up. Between the two lies the truth of the pillar: a world that marks itself enough to be knowable, never enough to be known in its entirety. Nothing guarantees that a mark is formed, preserved, reached and read; yet it is through such marks, and through them alone, that everything we know passes.

It is this differential character that makes drawing an art, not a gathering: since no total traceability is guaranteed, one must aim, choose, equip oneself. The essay has shown this work; it gives here its reason.

The Times of the Trace: Beyond the Instantaneous and the Eternal

One last remark on this first pillar, which prepares Part III.

The traces that the real leaves of itself are deposited at every scale of time. Some form and fade in a fraction of a second — the ripple on the surface of the water, the echo of a sound. Others take seasons — the rings of a tree. Others centuries — the erosion of a cliff. Others millions of years — geological strata. Others still billions of years — the fossil light of the cosmos.

Humans directly perceive only a **window** of these scales. What forms and fades too quickly escapes them; so does what forms too slowly. Humans have a *threshold of the instantaneous* and a *threshold of the eternal*. These two thresholds are not properties of the real. They are properties of humans. Just as humans perceive only a band of the light spectrum and a band of the sound spectrum, they perceive only a band of the *spectrum of times*.

This point will be essential when we speak of the second pillar. It means that **the reader of the real is a situated reader**: they do not read all traces; they read those that fall within their window. The reading that a given being can make of the real is always partial, bounded by what that being is.

Part II — The Trace Is Not the Datum

The Threshold That Nothing Crosses on Its Own

We come to the most delicate point of this document, and the most important for the solidity of the whole essay.

It is tempting — and the intuition is beautiful — to say that traces *are* data. Are the tree's rings not the inscription of the years? Are the strata not the annotation of the deposits? Does the volcanic stone not carry, engraved in it, the information of the eruption? Does the felled trunk not bring together, it seems, the two operations that *The Two Times of the Datum* identified as constitutive of the datum: an act of inscription (one pair of rings per year) and a fixation on a medium (the wood itself)?

This temptation must be named and set aside. If traces were data, then the datum would pre-exist humans, it would lie about everywhere in the real, and one would fall straight back into the object ontology that the preceding documents have worked to undo. The sentence “we live surrounded by data” would become true again — and with it, the idea that the datum is an object one picks up, and not a drawing one makes.

The distinction must therefore be held firmly. **The trace is not the datum.** Between them there is a threshold, and this threshold nothing crosses on its own. An act is needed.

Caused versus Intended

The difference between the trace and the datum fits in two words: the trace is **caused**, the datum is **intended**.

This shortcut is accurate, and the essay will use it. But the second word must be weighed here and now — for, misunderstood, it would make the

thesis promise more than it says, and the first objection to come along would carry it away.

The act of inscription, as *The Two Times of the Datum* established it, is not just any mark left in matter. It is an act that **decides**: it arrests a value, it makes an intentional cut in the continuous, it aims.

Now the tree decides nothing. The tree aims at nothing. The tree makes no intentional cut in the real: it *undergoes* the real, and in undergoing it, it keeps its mark. The formation of rings is a blind causal process. There is, in the tree, no intention to record the years, no project of memory, no intended addressee. The tree does not inscribe itself: it is inscribed, passively, by the alternation of the seasons.

That is why the rings, despite appearances, do not bring together the two operations constitutive of the datum. They do have something that *resembles* a fixation on a medium — the wood retains the layers. But they have no act of inscription, because there has been no act at all: there has been a process. And a process is not an act. A process unfolds; an act is decided. The trace is the residue of a process; the datum is the product of an act.

But let *intended* be understood exactly, for an objection lies in wait. The sensor that measures a temperature every hour intends nothing — no more than the tree. The log that a system keeps of its own operation is written without any hand being involved and without any mind thinking of it. If *intended* required a conscious will at each inscription, almost everything the present calls data would fall back on the wrong side of the threshold — and the distinction, barely set out, would empty itself.

It holds, because *intended* does not designate a state of mind. The constitution of a datum is **regulated and imputable** — a regulated and imputable act, which aims, cuts out, inscribes — and the will that carries it does not have a single address. It is distributed into **three intentions**, which inhabit neither the same place nor the same moment.

The intention of the apparatus answers for the design: why this capture system exists — what to measure, where, at what cadence, under which criteria. It is the intention deposited in the instrument, the protocol, the institution. The sensor intends nothing, but someone intended the sensor, and everything it measures is measured under that intention: **intention is delegated to the instrument without dissolving into it**. The automaton is not the author of the drawing; it is its workman — as the measurer of the previous document already delegated to the thermometer the task of sensing in their place. The tome of the reader will meet this delegation again before the machine that reads; it begins here, before the machine that inscribes.

The intention of the occurrence answers for the singular recording: does an agent decide to produce *this particular* recording? The doctor who enters the temperature in the file, the land surveyor who takes aim, the dendrochronologist who counts: each intends the occurrence they pro-

duce. This is the case the essay has most often described — and it is only one case. Where the apparatus carries the intention, the occurrence may be intended by no one: no one intends the three a.m. entry, and it is nevertheless fully a datum.

The intention of use, finally, answers for the present status: why this mark is treated as a datum *now*, by whom, for what question. For the first two intentions can be lacking together, and the status can come about all the same — this is the limit case that tests the structure: the **recruitment of a residue**. A system deposits, on the margins of what is asked of it, by-products that no one aimed at or intended to answer for anything. One day a question arises, and someone picks out from this deposit something to answer it with: they aim, they apply a criterion, they enter the residue into the file with its provenance. This recruitment is an act — late, but whole — and it is the recruitment, not the deposit, that makes the threshold be crossed. The will can therefore come *after* the mark: what was caused yesterday can be constituted tomorrow, provided an act answers for it.

Three intentions, carried by different actors, at different moments. A datum can be intentionally structured without being intended occurrence by occurrence; it can be intended at the occurrence without an apparatus preceding it; it can have been intended only at the point of use, long after its cause. *Intended* means: covered by at least one of the three, and such that someone — designer, operator or recruiter — answers for the act. The pure trace is covered by none: no apparatus aimed at it, no agent decided it, no use has yet recruited it.

The trace, then, possesses the *materiality* of the datum — it is in matter, it lasts — but not its *origin*. It lacks what makes a datum a datum: the regulated and imputable act that aims, cuts out and inscribes. The shortcut of the threshold can now be used unguarded — the trace is caused, the datum is intended —, *intended* having received its measure here.

The Three Storeys: Flow, Trace, Datum

Let us now set out the complete architecture clearly. Between the flow of the real and the datum, there are not two storeys; there are three.

First storey — the flow of the real. The tree that grows, the stone the rain strikes, the sediments being deposited. Pure flowing. No trace yet distinguished, no datum. The real in the making.

Second storey — the trace. The rings formed, the stone eroded, the strata stacked. The flow of the real has left on matter the mark of its passage. The real is now *legible* — it carries potential information. But this information is read by no one. There is still no datum: there is real that has become legible, and nothing more. The trace is an in-between: more than pure flow, less than the datum.

Third storey — the datum. An observer comes along. They look at the felled trunk. They apply a criterion — “a pair of rings, one light and one

dark, counts as one year". They count. They inscribe a result: "this tree is eighty-seven years old". *There*, and only there, a datum exists. And it was nowhere in the tree before the observer produced it.

This last point must be weighed. The tree did not "contain" its age. The tree contained rings — a trace. The age is the product of an act: the act of someone who knew that the rings were legible, who chose to read them, who applied a rule of reading, and who arrested a result. The datum "eighty-seven years" belongs to the observer and to their act; it does not belong to the tree. The tree supplied the trace. The observer produced the datum.

The leap between the second and the third storey — between the trace and the datum — is the leap that nothing makes on its own. It is the leap of the act: a reader surveys the trace under criteria and inscribes a result. The trace is *legible*; the datum is *inscribed*.

The word "reader" here designates the observer who interprets the trace and inscribes a result, not the canonical act of reading of an already constituted datum, studied in the tome of the reader.

And between legible and inscribed lies the whole gap that separates a possibility from its seizing — the gap that an act, and only an act, can bridge.

The "Book of Nature": A Metaphor Summoned, Then Surpassed

The intuition that the real is, in a way, already written — that it is a text bearing meaning — is ancient and venerable. Medieval thought conceived of the world as a second book, to be read alongside Scripture. Galileo, on the threshold of modern science, wrote that the great book of the universe is written in the language of mathematics. The idea runs through the centuries: the real would be legible because it would already be a form of writing.

This metaphor has a share of truth — that is the whole of the first pillar: yes, the real is legible. But taken literally, it leads to an error. A book is *written by someone, to be read, with an intention*. To say that nature is a book is to suggest that it was inscribed intentionally, that it is a message, that it contains data waiting for their reader. Now this is not the case. The real is not written: it flows, and its flowing leaves traces. Traces are not sentences; they are causal residues.

The right formulation is therefore not "the real is a book that one reads", but: **the real is not a book — it is what a reader can make books from**. Nature does not contain data; it contains traces, and data are what the reader produces by surveying traces under criteria. The metaphor of the book confuses legibility — which is in the real — with reading — which is in the reader. It is this confusion that the whole essay has the function of dispelling.

Part III — The Reader the Flow Has Produced

Without a Reader, Legibility Remains a Dead Letter

We have established the first pillar — the legibility of the real — and its limit — the trace is not the datum, because an act is needed that surveys it under criteria and inscribes it. This limit points, by what it lacks, to the second pillar. There must be a being capable of performing this act: there must be a **reader**.

Let us imagine a perfectly legible world — more legible than ours: a world in which each thing would carry, engraved, preserved and offered, the memory of its whole past — but in which no being capable of reading existed. A world of marked stones, ringed trunks, ordered strata, and no one. What would the legibility of this world be worth? Nothing. It would remain a pure possibility, never actualized. The traces would be there, perfect, exhaustive — and mute.

The datum therefore requires, in addition to a real that carries traces, the existence of a being capable of reading them. This being must possess precise faculties: to **perceive** traces, to **distinguish** them, to **interpret** them, to **aim** at an intention, and to **inscribe** a result. These faculties brought together are what we call a reader.

The question then becomes: where does this reader come from?

The Reader, Product of the Flow

The reader did not come from elsewhere. The reader was not set down in the world from outside the world. The reader — the human — is itself a **product of the flow of the real**.

Humans are living beings. Life appeared within the flow of the real, through a process that belongs entirely to this flow: evolution. Evolution is nothing other than a long flowing of the flow of the real — generations, variations, selections, spread over billions of years. And this process has shaped beings endowed with senses: eyes that capture light, ears that capture vibrations, nervous systems that distinguish, compare, memorize. Then, in one of these lineages, a cognition capable of abstraction, of intention, of language — capable of aiming, cutting out, inscribing.

The very faculties that make humans readers were produced by the flow of the real. The eye that reads the trace is the result of a long work of the flow. The cognition that interprets the trace is the result of a long work of the flow. Humans do not observe the flow of the real from an outer bank; they are a portion of the flow, which the flow has shaped in such a way that it has become capable of reading the other portions.

Why did the flow produce such a being? Precisely because of the first pillar. Because the real is legible — because it carries traces —, it was *advantageous* for a living being to know how to read them. The animal that knows how to read the trace of the predator survives; the one that knows how to read the trace of the prey feeds itself; the one that knows how to read the trace of the season anticipates. The legibility of the real, in a way, *called for* the appearance of readers. The first pillar made the second not only possible, but favoured.

The Real Turns Back on Itself

From the foregoing follows a consequence of great reach, which must be stated clearly while staying within the bounds of substance.

If the reader comes from the flow, and if they read the traces the flow leaves of itself, then something remarkable happens: **the flow of the real, through the reader it has produced, reads itself.**

Before the appearance of readers, the flow of the real flowed and left traces, but these traces were read by no one — the real unfolded without knowing itself. With the appearance of a being capable of reading, a portion of the flow became capable of taking cognizance of the other portions, and, in time, of itself. The real produced, in humans, a point where it turns back on its own flowing and deciphers it.

The datum is the elementary unit of this turning back. Each time a human draws a datum, the flow of the real, through the being it has shaped, takes note of a fragment of itself. Knowledge, science, memory, the essay you are reading at this moment — all this is the flow of the real reading itself through one of its products.

This document will stop there as regards substance. The reach of this turning back — what it means for the human condition — goes beyond the framework of a foundational document. It will be taken up in the document that closes the essay. Here, it is enough to have established the fact, and it alone: the second pillar is not external to the first. The reader is not a visitor come from outside to read a foreign world. The reader is the real become, at one point, capable of reading itself.

A Situated Reader, Hence a Partial Reading

Since the reader is shaped by evolution under particular conditions, they are a **situated reader**. Their faculties are not unlimited: they perceive a certain band of the light spectrum, of the sound spectrum, of the spectrum of times — and not the rest.

The human reading of the real is therefore, by construction, **partial**. Not through lack of care, not through insufficient method, but by nature: a situated reader reads only the traces that fall within their window. Traces

that are too fast, too slow, too faint, of a nature their senses do not capture, remain illegible *for them* — though perfectly real.

This fact grounds, at the root, everything the essay has said about the partiality of the datum. If every flow of observation is partial, if every drawing leaves an undrawn, if no datum exhausts the real — it is, in the last analysis, because **the reader is partial**. The partiality of the datum is not a correctable accident; it is the inheritance of the reader's condition. Humans do not read the whole of the real because humans are only a portion of the real, and a portion cannot embrace everything.

Instruments — the telescope, the microscope, the sensor, the thermometer — extend the reader's window. But they do not abolish the condition of the situated reader: they move it. Every instrument has, in its turn, its own window, its own limits. The extension of reading is endless; its completion is impossible.

Part IV — What This Foundation Legitimizes

The Two Pillars beneath Each Document of the Essay

Let us go back over the whole essay, and show that each of its documents rests, without having said so, on the two pillars that this one has just established.

From the Notch to the Algorithm told several tens of millennia of the history of the datum. This history could only begin because the real was legible and because a reader had appeared, capable of engraving a notch. A notched bone is an act of reading: it presupposes the two pillars.

Reading, Writing, Understanding the World through Data examined literacy. Now literacy is nothing other than the cultivation of the second pillar: the art of being a better reader. Training in data literacy means refining the faculties of the reader that the flow has produced.

The Flow and the Annotation set out processual ontology: the datum is constituted by a regulated operation, of which drawing on the flow is the observational route. This document provides its underpinning: drawing is possible because the flow is legible (first pillar) and because there exists someone who draws (second pillar).

Digging the Canal, which will be read next, will develop the flow of observation. This construction will presuppose a builder capable of aiming, of choosing criteria, of inscribing — that is, a reader. And the partiality of the flow of observation, which it will acknowledge, finds here its deep cause: the reader is situated.

The Two Times of the Datum distinguished the act of inscription from fixation on a medium. This document shows where the act comes from: it

comes from a reader, itself a product of the flow. And it shows what precedes the act: the trace, without which the act would have nothing to inscribe.

Each document of the essay, therefore, silently presupposed the legibility of the real and the existence of the reader. None had said so. This document has said so. It was the foundations; it now joins the edifice.

Why Processual Ontology Requires This Foundation

A question might remain: why wait so long to lay the foundation? Why not lay it from the start?

Because foundations, in the order of construction, are poured first, but, in the order of understanding, one grasps their necessity only once the edifice has been raised. As long as one has not seen the building, one does not measure what it takes to bear it.

Processual ontology asserts that the datum does not exist before the operation that constitutes it — that it is born of an act. This assertion is strong, and it lays itself open to a formidable objection: *if the datum does not exist before the act, then knowledge would be a pure creation of the mind, without anchorage in the real; humans would not read the world, they would invent it*. This is the objection of radical constructivism, and if it cannot be answered, processual ontology collapses into arbitrariness.

The two pillars are the answer. Yes, the datum is born of an act — but this act, in the observational route this document deals with, is a **drawing**, not an invention. It surveys a *real* trace, physically deposited by the flow of the real itself, and inscribes it as a result. The datum is not arbitrary: it is held, by the trace, to a material anchorage in the real. And the reader who performs the act is not a mind floating above the world: they are a product of the world, shaped by it to read it. The datum is therefore at once *constructed* — by the act of the reader — and *grounded in the real* — by the trace the reader surveys and by their nature as a reader-born-of-the-real.

An example clarifies the distinction. Let us imagine someone who asserts, without having examined anything, by pure decision: “this tree is 87 years old”. This is pure invention. No trace holds this datum; anyone can assert the opposite with the same authority — that is, none. This is what the datum would look like if radical constructivism were true: a number suspended in a void, with nothing in the world to arbitrate it.

The dendrochronologist sometimes obtains the same figure — 87 years — but by an entirely different path. They have seen the rings, applied the rule *one ring per year*, counted. Their datum is constructed: by their act, their rule, their decision to count this and not that. But it is also *held* — by the rings, which are there, in the wood, deposited by the process of growth, verifiable by anyone who repeats the same operation. If their result is contested, one can count again; the trace is there to arbitrate.

Construction without invention: this is the exact position that the two pillars make possible. The datum is the individuated result of a reader's act — constructivism was right on this point — but this act surveys a real trace under criteria and inscribes it as a result, and the reader is real, shaped by the flow to read it — constructivism was wrong to suggest otherwise.

And that is why the two pillars were indispensable. They hold processual ontology at an equal distance from two abysses. On one side, object ontology, which believes that the datum pre-exists in the real: the pillars refute it by showing that the real contains only traces, never data. On the other, arbitrary constructivism, which believes that the datum is a free invention of the mind: the pillars refute it by showing that every drawing is held by a real trace and performed by a reader who is real. Between these two abysses, there is a narrow and firm ground: the datum is the result that an act constitutes and inscribes — here, in the observational route, what a reader, born of the flow, draws from the traces the flow leaves of itself, under criteria. The whole essay stands on this ground.

Conclusion — The Wave and the Ocean

This document was the foundations. It remains, to finish, to look at what they bear.

We have established two pillars. The real keeps traces of itself: this is the legibility of the real, and it is what makes it drawable. The flow of the real has produced a being capable of reading these traces: this is the reader, and it is what makes legibility effective. The datum is born at the exact meeting point of the two — the drawing, by a being born of the flow, of a trace deposited by the flow, and the inscription of this trace as a result under criteria. Neither the real alone nor humans alone produce the datum: their meeting is needed.

We have also held a distinction without which the whole essay would collapse: the trace is not the datum. The real is full of traces; it is empty of data. Where the datum is born of a drawing, it appears only with the reader, only with the act by which they survey a trace under criteria and inscribe it, only with their intention. It is therefore false to say that we live surrounded by data. We live surrounded by a real that flows and that, as it flows, marks itself. Data are what we make — in the observational route, by drawing these marks. The world does not hold out data to us; it holds out a legible matter, and it has made of us, in addition, the beings capable of reading it.

One last thing remains to be said, and it opens onto the document that closes the essay. The reader that the flow has produced occupies a strange position. It is a portion of the flow of the real — made of the same matter, subject to the same flowing, perishable like everything the flow carries

away. And yet, because it knows how to read, it experiences itself as distinct from the flow: it observes it, measures it, cuts it up into data, builds canals, and ends up aspiring to master it. A being born of the flow that claims to govern the flow. A portion of the real that turns back on the whole from which it comes.

It is the image of a wave that would like to own the ocean. The wave is made of the ocean's water; it exists only as carried by it; it will return to it. And yet, while it rises, it distinguishes itself from it, it takes shape, it seems, for an instant, to tower above it. The datum is the foam of this movement: not the point where the wave, fleetingly raised above the ocean it is made of, takes cognizance of the ocean, but what it shapes and leaves behind it — neither the ocean nor the wave.

Understanding what this commits us to — for humans, for the place they grant the datum in their collective life — is the business of the document that closes the essay. This one will have done its work if it has shown the ground on which all the rest rests: there is no datum except through the act that constitutes it — and, in the observational route, this act is possible only because the real lets itself be read, and because the real has produced, in humans, its reader — the being that draws its traces and inscribes them as data.

"The world is made to end up in a book." No: the world ends up in no book. But it has produced a being who, reading the traces the world leaves of itself, writes books — and this is one of them.

Landmarks

For the references used in this document — Peirce's semiotics (the trace as index), the Galilean metaphor of the book of nature, Jakob von Uexküll's *Umwelt*, Whitehead's processual ontology, the epigraphs from Aristotle and Mallarmé, the archaeological artefacts (the notched bone, Part IV) —, see the *Annotated Bibliography of Tome 1*. The methodological status is set out in the Preface to the Edition; the eighty-seven-year-old tree and its dendrochronologist, the flint broken by frost or knapped by a hand, the hourly sensor and the log a system keeps of its own operation belong to the status of illustrations.

This document carries two loci for the trilogy. **Differential traceability** is established here — causal marking, preserved trace, accessible trace, interpretable trace — with the possible underdetermination of the cause: different processes leave similar marks. The exact status of legibility — no knowledge has any route other than the trace — is not a contribution of the edition: the first edition had written it; the edition lodges it at its locus, credits it, and drops what promised too much — everything would be legible, everywhere. The **three intentions** — of the apparatus, of the occurrence, of use — demonstrate here that constitution is regulated and im-

putable without requiring a conscious will at each inscription, down to the residue captured without design that use recruits; the intention delegated to the instrument is no newer: the tome of the reader had established it faced with the machine that reads; the edition brings it back to where delegation begins — faced with the machine that inscribes — and credits it. After this locus, the shortcut of the threshold — the trace is caused, the datum is intended — and its twin — a process is not an act — are used unguarded: *intended* has received its measure here. The document establishes in addition, for the whole trilogy, the three characteristics of the trace, the threshold that nothing crosses on its own, the reader's window as a band of the spectrum of times, and the partiality of every reader — the previous document leans on it. The threshold it holds is the entry threshold — from the trace to the constituted datum, through the act of inscription; the exit threshold — from the constituted to the actualized — and the scale that measures its states belong to the tome of the reader, which is their locus. The image of the wave, opened in the conclusion, finds its full development in the document that closes the essay.

Digging the Canal

The Flow of Observation: How Humans Reconstruct the Real through the Datum

Tome 1 — Document 6

“You cannot step twice into the same river.”

— Heraclitus, fragment 91

“Give me a place to stand, and I will move the world.”

— Attributed to Archimedes

Preamble — The Missing Link

The preceding documents have built, step by step, a processual understanding of the datum. The third, *The Flow and the Annotation*, set out processual ontology and introduced the notion that is the subject of the present document, stating it in this form:

The datum is the elementary grain of a flow of observation that humans build through their intention, from the flow of the real. This flow of observation is faithful to the real relative to the criteria that defined it, without ever being a replica of it. From it are extracted consolidated data, of high use value, which feed decisions and knowledge — and which circulate, in turn engendering new derived flows of observation.

The present document takes this definition as its starting point and deepens it. The aim is to understand in detail what a flow of observation is: how it is born, what distinguishes it from the flow of the real, how it reproduces movement, how it is manipulated, under what conditions it is of good quality, how it can transform the real it observes, and what it implies for data literacy.

The flow of observation is the **missing link** of processual ontology. Without it, the theory remained contemplative: it said that the datum goes stale, that the flow escapes us, but it did not say how humans actually go about making fruitful use of the datum. With it, the theory becomes practicable. It describes not only the condition of the datum, but the **art** of the datum — the art of digging canals in the river of the real.

Part I — What Is a Flow of Observation?

Definition and Ontological Position

A flow of observation is a *built* flow. This construction radically distinguishes it from the flow of the real, which is built by no one.

Let us return to the three planes that *The Flow and the Annotation* set out.

The **flow of the real** is what happens, independently of any observation: immense, irreversible, indifferent to humans. No one dug it; no one can stop it.

The **flow of observation** is a flow that humans build from the flow of the real. It is constituted by the cadenced accumulation of drawings made according to intentional criteria. It is partial, faithful relative to its criteria, and manipulable.

The **consolidated datum** is the synthetic grain extracted from a flow of observation by processing — average, trend, status, indicator —, of high use value, and capable in its turn of feeding a new flow of observation.

The flow of observation occupies an intermediate, pivotal position. It is neither the raw real nor the final information: it is the **workspace** that humans set up for themselves between the two. It is in this space that the whole art of the datum is played out.

The Birth of a Flow of Observation: Intention and Criteria

A flow of observation is not born spontaneously. It is born of an **intention**: an entity — an individual, a company, an administration, a laboratory — identifies a need, a question, a subject it wants to follow. Without intention, there is no flow of observation, only scattered drawings.

This intention received its measure in the previous document: it is the **intention of the apparatus** — the one that regulates the canal before any occurrence — which *The Trace and the Reader* distinguishes from the intention of the occurrence and the intention of use. And the builder it presupposes is the reader that the same document founded: situated, hence partial — the partiality of every flow of observation finds its deep cause there.

From the intention follow the **criteria**. Defining the criteria of a flow of observation means answering a series of questions: *What?* Which observable raw facts of the flow of the real does one want to draw? *At what cadence?* How frequently are the drawings made? *With what fidelity?* What precision is required of each drawing, which instruments, which calibration, what acceptable margin of error? *With what corpus?* Which context data accompany each drawing to make it interpretable? *Over what scope?* Which portion of the flow of the real is observed, and which is left aside?

These criteria are not neutral. They are the direct expression of the intention. A flow of observation built to monitor a patient's health will not have the same criteria as a flow built to optimize a logistics chain. **Criteria are the signature of intention in the flow of observation.**

This is an essential point for literacy: in front of any flow of observation, the first question is not “what does it say?” but “what intention gave birth to it, and what criteria follow from it?”. A flow of observation never lies about the real; but it shows only what its criteria allow it to show.

Relative Fidelity to Criteria

A decisive conceptual precision is needed here. One would be tempted to say that a flow of observation is “a partial true copy” of the flow of the real. This is inaccurate. No flow of observation conforms to the flow of the real *in general* — it cannot, since it is infinitely poorer than it. The right formulation is the following:

A flow of observation is faithful to the flow of the real relative to the criteria that made it possible to build it.

A photographic analogy clarifies this point. A photographer who captures a moving object with a slow shutter speed will obtain an image in which the object appears as a streak. This photo is not “unfaithful”: it is a perfectly faithful replica of the real *relative to the chosen criterion*. The streak is not an error; it is the exact consequence of the criterion. Another photographer, with a fast shutter, would freeze the object sharply — another criterion, another fidelity, another image, of the same real.

The same holds for every flow of observation. Its limits are not defects: they are the *imprints of its criteria*. A flow of observation that draws the temperature once a day does not “miss” hourly variations through negligence; it leaves them out of frame by construction.

The consequence for literacy is clear: criticizing a flow of observation does not mean reproaching it for not showing everything — none can. It means asking whether **the criteria that defined it are suited to the use one wants to make of it**. Relevant criticism does not concern fidelity — which is always relative and always real — but the relevance of the criteria.

The Properties of the Flow of Observation

The flow of observation has a set of properties that distinguish it point by point from the flow of the real.

The flow of the real exceeds every cut; the flow of observation is discrete. The real never presents itself pre-cut to observation — the precaution of *The Flow and the Annotation* holds here without reservation. The flow of observation, for its part, is made of one-off drawings separated by intervals: between two drawings, it contains nothing — a dotted line laid over what offered no break.

The flow of the real is immense; the flow of observation is restricted. The real comprises an infinity of observable raw facts. The flow of observation retains only a deliberate selection of them. This is precisely what makes it *useful*: it is legible because it is poor. A map that represented the whole territory at a scale of 1:1 would be unusable.

The flow of the real is indifferent; the flow of observation is intentional. The real pursues no aim. The flow of observation is entirely the expression of an aim. It carries the mark of the intention that dug it.

The flow of the real is irreversible; the flow of observation is replayable. The real never goes back. The flow of observation, once recorded, can be rewound, reread, replayed as many times as one wishes.

The flow of the real is uncontrollable; the flow of observation is manipulable. One can neither stop the real, nor speed it up, nor pause it. The flow of observation can be activated, suspended, accelerated, slowed down, filtered, enriched, merged, deleted. It obeys its builder.

The flow of the real belongs to no one; the flow of observation belongs to its builder. The real is an absolute commons. The flow of observation, as a built artefact, can be appropriated, kept, transmitted, exchanged. What is appropriated is never the real — only the canal that has been dug in it.

This series of oppositions can be summed up in a formula: **the flow of the real is given; the flow of observation is made.** Humans are the builders of canals, not the owners of the waters.

Part II — Setting in Motion

The Paradox of the Inert and of Movement

A datum is a *frozen, inert* drawing: once inscribed, it no longer changes. How, then, can a flow of observation — which is only a collection of frozen data — restore the *movement* of the flow of the real?

The answer fits in two words: **chained reading**. An isolated datum is inert. Two consecutive data, read one after the other, bring out a difference — hence a change, hence an embryo of movement. A long series of data, read in order and at a sufficient rhythm, recreates the movement of the flow of the real as it was flowing at the time of the drawings.

The flow of observation is therefore not in movement *in itself* — it is, at rest, a collection of frozen points. It is *set in motion* when it is read. The movement is not in the data; it is in the act of running through them. A reel of film, laid on a table, is only a strip of motionless photos; it becomes movement only when it runs through the projector.

This is a remarkable property: the flow of observation contains movement **potentially**, in folded form, and unfolds it at each reading. It can be unfolded as many times as one likes, forwards or backwards, fast or slowly. The movement of the real, which was irreversible and unique, becomes — in the flow of observation — reproducible and manageable.

The Cinema Analogy and the Threshold

The most illuminating analogy for understanding this setting in motion is the cinema.

Cinema is born of a threshold. A succession of still images projected slowly is only a slide show: the eye perceives separate images. But when the cadence crosses a certain threshold — for classical film cinema, historically set at around twenty-four frames per second —, something tips over: the eye no longer perceives images; it perceives movement. The nature of what is perceived has changed.

It is exactly the same for the flow of observation. Drawings spaced too far apart give only a succession of snapshots with no perceived connection. But when the cadence crosses a threshold appropriate to the subject observed, the flow of observation, when read, restores the movement of the flow of the real. One tips over from the one-off entry to the true flow.

The analogy goes further. Cinema did not stop at this first threshold. Its history is that of an accumulation of improvements: synchronized sound, colour, increased definition, larger formats. Each of these improvements extended the corpus and improved probity — and at the end of this accumulation, one no longer speaks of a slide show that has become fluid; one speaks of an art in its own right. The improvement of the criteria of a flow of observation is not only quantitative: beyond a certain accumulation, it produces a **qualitative leap**. The flow of observation changes nature, becomes capable of things it could not do before. We shall return to this phenomenon in Part VII.

The analogy also has its limits. Cinema creates movement through a property of the human brain: the eye interpolates between images. The movement perceived in the cinema is a perceptual reconstruction; it is not in the film. Now, in the case of a flow of observation used by an automatic

decision system, there is no brain to interpolate. The system takes the succession of drawings for a continuity, without the implicit caution of the spectator who knows they are watching a film. Between two consecutive drawings, anything may have happened in the flow of the real — a brief event that left no trace, because it slipped between two points.

The analogy must therefore be held with its limit: **the flow of observation produces a functional illusion of continuity, never a real continuity.** Learning never to confuse the film with the world, even when the film is perfect, is one of the objects of the literacy of the flow of observation.

The Image Compression Analogy

A second analogy sheds light on another aspect: **image compression.**

When one photographs a scene and saves the image in a compressed format, one obtains a file that faithfully reproduces the scene for everyday use. But if one zooms in, one eventually reaches a limit: flat patches, blocks, artefacts appear. Compression has kept what was perceptible at the intended scale, and sacrificed the rest.

This is exactly how the flow of observation works. It is a **compression of the flow of the real.** It faithfully reproduces what its criteria have retained of it, at the intended scale of use. But if one tries to exploit it at a finer grain than the one for which it was built, one extracts only artefacts.

Where the cinema analogy sheds light on the *temporal* dimension (cadence, movement), compression sheds light on the dimension of *resolution*. A flow of observation has a **temporal resolution** (given by its cadence) and a **descriptive resolution** (given by the richness of its corpus and the precision of its drawings). Beyond either one, one leaves the flow's domain of validity.

The Minimal Threshold: Not Losing the Signal

From these analogies follows a rule of substance. There is a **minimal threshold** of cadence below which the flow of observation ceases to represent faithfully the movement of the flow of the real. Signal theory knows this principle under the name of the Nyquist-Shannon criterion: a band-limited signal, sampled uniformly at a rate higher than twice its highest frequency, is entirely determined by its samples (see the note in the *Annotated Bibliography of Tome 1*). Below that, misleading artefacts are produced — the phenomenon in which the wheels of a car seem to turn backwards in a film, because the cadence is badly matched to the speed of rotation.

Transposed to the flow of observation, by structural analogy and without any quantitative result: **the cadence of drawing must be matched to the speed of change of the flow of the real observed.** A flow of the real that changes fast requires a fast cadence; a flow that changes slowly

tolerates a slow cadence. If the cadence is below the threshold, the flow of observation lies — not by saying something false at each point, but by suggesting a continuity it has not captured.

This minimal threshold is, for the flow of observation, a principle of substance, transposed by analogy and without a figure. But respecting the minimal threshold is not enough. Being above the floor is not being in the right place.

Part III — The Observational Optimum

More Is Not Better

In the discourse that surrounds *Big Data*, a conviction has spread widely: drawing more would always be preferable. It is this conviction that the concept of observational optimum contradicts.

Let us consider a meteorological flow of observation. The move from infrequent manual entries to more precise sensor entries has probably improved the quality of forecasts. But should one densify indefinitely? Going from one entry every ten minutes to one entry every second would, in all likelihood, bring almost nothing — the weather does not change significantly from one second to the next. One would have multiplied the volume of data, the computing power, the cost of storage, for an almost zero gain.

This over-drawing has a name: **over-engineering**. It is the error symmetrical to under-drawing. Under-drawing takes one below the minimal threshold: one loses the signal. Over-engineering takes one far above what is necessary: one gains nothing in signal; one loses in cost.

Definition of the Observational Optimum

Between the floor of under-drawing and the waste of over-engineering, there is a zone in which the flow of observation is built *as well as possible*. The central point of this zone is the **observational optimum**.

The observational optimum is the point at which the arbitration between benefit (the quality of the result obtained) and cost (the quantity of means used: drawing, transport, storage, computation, time) is most satisfactory for the intended use.

The optimum is not the state in which one draws the most. It is the state in which one draws *what is needed*: enough for the flow of observation to be faithful and useful for its use, no more than this use requires. Being at the optimum means being in an **optimal situation of observation**: neither blind nor drowned.

At least three variables enter into this arbitration: **cadence** (the frequency of drawings), **corpus** (the richness of the parameters captured and of the context data), and **probity** (the precision and reliability of each drawing). Each has a cost, and each, beyond a certain point, ceases to bring a proportionate benefit. The optimum is the joint setting of these three variables that maximizes the favourable margin between benefit and cost.

The Optimum Depends on the Context of the Observed Subject

There is no universal observational optimum. The optimum depends entirely on the context: on the speed at which the observed fragment of the flow of the real changes, and on the fineness that the use requires.

The question that determines the optimum is always the same: *can the observed flow of the real change significantly between two drawings?* If so, the cadence is too slow. If not, the cadence is needlessly fast.

A flow of observation on the seismic activity of a fault, a flow on the attendance of a museum, a flow on the evolution of a glacier, a flow on the traffic of a computer network: each has its own optimum. The observational optimum is not a value; it is a *question* that must be asked afresh each time.

The concept sets out — and this is substance — an existence statement, open to refutation: an observational optimum exists for every flow of observation, and locating it is necessary in order to make fully satisfactory use of the datum. It does not determine — and this is form — *where* the optimum lies in a given concrete case. That point depends on the subject, on the use, on the costs of the moment, on the constraints of the entity. It depends, in the last instance, on the judgement of the human who builds the flow of observation.

Part IV — The Manipulation of the Flow of Observation

A Flow One Masters

The flow of observation, because it is a built and recorded artefact, lends itself to a set of operations. Let us list them briefly, for each is a capacity that humans gain over the real.

Store. Keep the flow of observation, whereas the flow of the real is lost at every instant.

Replay. Reread a recorded flow as many times as one wishes. The movement of the real, unique and irreversible, becomes reproducible: slow motion, fast forward, freeze-frame.

Activate and deactivate. Suspend, then resume. Observe intermittently, according to needs and means.

Consolidate. Extract from a flow consolidated data — averages, trends, statuses — which sum up, with high use value, what the flow contained in dispersed form.

Purge. Remove redundant drawings, discard parameters that have become useless, reduce the cadence. The operation that makes it possible to move closer to the optimum when one realizes one has over-drawn.

Enrich and merge. Add context data, or combine two flows to form a third, richer one.

Transmit. Direct a flow towards another entity, which will exploit it according to its own criteria. This point opens up inter-entity dynamics (next part).

Delete. Destroy a flow. A capacity that is also a responsibility: what is deleted can never be re-drawn identically, since the flow of the real has continued.

Replaying or Forecasting: The Two Uses of the Mastered Flow of Observation

Among these operations, two uses deserve particular development.

Replaying — the hold on the past. A recorded flow of observation makes it possible to go back to a bygone moment and examine it at leisure. It is through this capacity that humans transform the irreversible into the analysable.

Forecasting — the hold on the future. A sufficiently dense and faithful flow of observation, observed over a sufficient duration, brings out regularities, trends, cycles. From them, forecasts can be formulated: anticipating the probable state of the flow of the real at a future instant. This is not a direct hold on the future, but a reduction of uncertainty.

These two uses rest on the same property of substance: a flow of observation, unlike the flow of the real, is an object *manageable in time*.

An important point about freshness. The freshness of a flow of observation conditions its relation to the *current* real; it does not condition its capacity to be *replayed*. This is validity for a use, established in *The Two Times of the Datum*, met again on the side of the canal: stale for telling the present, an old flow remains fully valid for replaying its era. A film from 1920 restores movement as well as a film of today; it simply no longer restores the present.

The Consolidated Datum: Extracting the Substance

When an entity processes and analyses its flow of observation, it does not keep the entirety of the raw drawings as its result. It extracts from it a **synthesis**: average, trend curve, equation, status, indicator, diagnosis. This is the consolidated datum.

The consolidated datum has three characteristics of its own. It is of **high use value**: it answers directly the question that the intention had asked. It is **contextualized**: it carries with it the ancillary data that make it possible to interpret it — the period the average covers, the conditions of measurement, the margin of uncertainty. It is **reusable**: because it is synthetic and contextualized, it can serve as the starting point for other reasoning, and in particular feed a new flow of observation.

Part V — The Dynamics: Flows That Engender Flows

The Flow of Observation Is Not an End in Itself

A flow of observation is a **point of passage** in a dynamic that can extend further, in two forms.

Internal derivation. From a flow of observation, consolidated data are extracted. But these consolidated data, accumulated in their turn in a cadenced way, themselves form a new flow — a second-rank flow of observation, which no longer observes the flow of the real directly but the first flow of observation. Each level is a compression of the previous one, poorer in detail, richer in meaning.

Inter-entity transmission. A flow of observation built by one entity can be directed towards another entity. The latter receives it and processes it according to its own criteria, which are not those of the entity of origin. It therefore builds from it a new derived flow of observation, carrying its own intention.

The Substance Is Not Exhaustible

This dynamic of transmission rests on a singular property of the datum. When one extracts the substance of a physical material, the material is consumed. The datum does not work like that. When an entity has extracted from a flow of observation the consolidated datum that interested it, it has extracted *its* substance — the one its intention was looking for. But the flow is not emptied. Another entity, carrying another intention, can extract from it an entirely different substance.

A flow of observation on the movements of a fleet of vehicles has delivered its logistical substance to the carrier company. The same flow can deliver to an urban planner a substance on the use of roads, to a researcher a

substance on mobility behaviours, to an insurer a substance on exposure to risk. Inter-entity dynamics are not the recycling of waste; they are the putting into circulation of an unexhausted resource.

A Distributed Intelligence

This dynamic outlines, on a large scale, something that goes beyond each entity taken in isolation. If numerous entities each build their flows of observation, and if these flows can circulate and fertilize one another, then a **distributed representation of the flow of the real** is constituted — fragmentary, made of heterogeneous pieces, but collectively richer than what any entity could build alone.

This distributed representation is not a centralized stock. It is a living fabric of flows of observation tended in parallel by a multitude of entities, each of which remains responsible for its own canals. Its richness lies in the diversity of intentions and in the possibility of relating them to one another.

But this distributed intelligence has a condition: it is constituted only if the intentions that dig the canals are *plural and independent*. A fabric of flows concentrated in a few hands — a few platforms, a few States — is not a distributed intelligence: it is a distributed surveillance. The difference is not technical; it is political. It turns on the question of who decides the criteria, in the service of which intentions, with what possibility of contestation.

A Distributed Architecture of Models

This inter-entity dynamic makes it possible to take up the question that *The Flow and the Annotation* bequeathed to this document, already sketching its answer: can one conceive of an artificial intelligence that would learn from the flow of the real continuously, rather than from a frozen corpus? As it stands, the question contains an error — the flow of the real is not observable as such; it is observable only through the flows of observation that human entities maintain. A “continuous intelligence” is therefore never plugged into the real: it is plugged into canals tended by others. It remains to unfold what this answer outlines.

This precision set out, the concept of the flow of observation outlines the architecture the question called for. **Every training corpus is an assembly of frozen flows of observation**: one does not present “the world” to a model; one presents to it what human canals, at a given date, have deposited. Now flows differ in their rate of lapse — some observe a real with slow lapse (the grammar of a language, theorems, the great regularities), others a real with rapid lapse (current events, markets, the state of a project). From this difference follows an arbitration: **training and giving access do not answer the same question**. A slow flow justifies training, whose cost is amortized by the duration of validity of the model. A fast

flow calls rather for access — the model is plugged into the canal kept up to date, rather than being made to absorb what that canal deposited yesterday.

This logic outlines, on a large scale, not a universal model but a constellation of specialized models, differentiated along two axes: **theme** — one model per field, trained on the flows relevant to its terrain — and **duration of freshness** — some models, anchored in slow corpora, remain valid for a long time; others are refreshed frequently, or replaced by simple connectors to the tended flow. This is the algorithmic embodiment of the distributed intelligence described above. The dividing line set out above holds here unchanged: concentrated around a few very large all-purpose models, trained on enormous undifferentiated corpora, the architecture keeps the form of distributed intelligence and loses its condition — the plurality of intentions. What precedes is substance — the differentiated lapse of corpora, the training/access arbitration, the superiority of a plural architecture for the plurality of intentions — and what remains is form, which the essay does not decide: which thematic divisions, which connection protocols, under which regulations. The precise map remains to be drawn up.

AI is therefore neither the summit of a cognitive pyramid nor a single instrument. It is a family of differentiated instruments, articulated with a human fabric that maintains the flows from which it derives and to which it connects. Its future is not played out in the autonomization of a model that would do without humans. It is played out in the quality, plurality and independence of the canals these humans tend.

Part VI — The Loop: When Observation Transforms the Real

Observing to Decide, Deciding to Act

So far, we have described the flow of observation as a canal that draws from the flow of the real without affecting it. This description is incomplete. The flow of observation, most often, is not built for contemplation alone. It is built to **decide**. And the decision, put into effect, becomes **action**. And action, exercised on the world, **modifies the flow of the real** itself.

The complete schema is therefore not an arrow, but a **loop**:

Flow of the real → drawings → flow of observation → consolidated data → decision → action → modification of the flow of the real → new drawings...

When a flow of observation is used to decide and act on the fragment of the real it observes, it forms a **closed circuit**.

An Illustration: Arid Soil

An entity wants to know which species of tree to plant on an area of arid soil. It builds a flow of observation: nature of the soil, meteorological parameters, humidity, sunshine. From this flow, it extracts a consolidated datum: such a species of tree is suitable. This is a decision. The entity plants.

The trees grow. And, as they grow, they modify the fragment of the real that had been observed: they retain moisture, shade the soil, reduce the aridity. The flow of the real of this area is no longer what it was. If the entity then builds a new flow of observation with the same criteria, the drawings will reveal a transformed real. The gap between the first drawings and the new ones is not a measurement defect: it is the **effect of the action**.

One point deserves to be noted. The first drawings — those of the initial arid soil — tip over immediately, because of the action, into the third age of the datum: the memorial age. They no longer represent the present of the real, since this present has been deliberately modified. The feedback loop accelerates the ageing of the datum: it is no longer only the passive flowing of time that makes the drawings go stale; it is the action itself, issuing from their use, that relegates them to the archive.

Observation Is Not Neutral

When a flow of observation is inserted into a closed circuit, **observation ceases to be neutral**. To observe in order to act is to commit oneself to transforming what one observes. The flow of observation is no longer a mirror held up to the real; it is the first link of a process that will modify this real.

This in no way disqualifies observation — the loop, in the example of the arid soil, is perfectly virtuous. But it requires lucidity. Whoever builds a flow of observation intended for decision is not an outside spectator. The criteria they choose do not only determine what they will see: they determine, through the relay of decision and action, what the real will become. To observe, when it is in order to decide, is already to begin to act.

The loop is set out here, not demonstrated. Its own amplification — more data making more automation possible, which multiplies captures and decisions, which engender new traces — is the business of the tome of movement; and what it does to ontology — the responsibility of the chain, the bridge between observation, inference and intervention — is demonstrated at the closing of the tome of the reader, which is its locus.

Part VII — The Systemic Leap

We have seen, with the cinema analogy, that the accumulation of improvements to a flow of observation can produce, beyond a certain threshold, a qualitative leap.

The fact of substance is the following: **the improvement of the means by which a flow of observation is built can produce a systemic change** — a change that cannot be reduced to a gradual improvement, but transforms the nature of what the flow of observation makes it possible to do, and sometimes the nature of the whole activity that relies on it.

Cinema is the paradigmatic example. But the phenomenon is general. The move from infrequent manual entries to precise and dense sensor entries did not merely “improve a little” this or that flow of observation — it made possible things that did not exist before. Beyond a certain accumulation, one no longer says “the entries are a little better”; one says that a given activity has changed regime.

Closer to us, two examples that many have lived through illustrate leaps of the same order, on different parameters.

The first concerns the **storage of and access to the datum**. A large language model — today designated by the acronym *LLM* — condenses into a single entity three functions that, throughout human history, had been held separately: the **library** where information is shelved, the **librarian** who knows how to find it, the **storyteller** who knows how to render it in comprehensible language. At first sight, what changes is efficiency: what required three places, three professions, three acts now fits into a single interaction. But the systemic leap is elsewhere. Each of the three roles, integrated with the other two, *changes nature*. The library no longer shelves books: it compresses a corpus into the weights of a network, from which an intact copy can no longer be extracted. The librarian no longer consults a catalogue: it generates a probable answer by computation. The storyteller no longer reads a text: it synthesizes text that *resembles* what the corpus could have produced. And with the fusion of the three roles disappears their separation — which until then made possible traceability (knowing where a piece of information comes from), criticism (contesting a classification), the return to the source (rereading the original text), and counter-power (one role could correct the other).

The second example concerns the **speed of circulation of signals**. When a user validates an action online — confirming an appointment, for example —, the confirmation notification can arrive on their phone *even before* the web page that triggered the action has finished reloading. Yet the signal has travelled a longer route: application server, notification server, operator, phone. The cause of this apparent inversion is simple: at the speed at which the signal travels today, the transit time has become so short that it falls below the threshold of human perception. The subjective experience is no longer that of *sending then receiving*; it is that of

simultaneity. Two portions of the flow of the real — the computer screen, the phone screen — are modified by a single gesture, apparently at the same time.

Each of these two crossings of a threshold — in its own way — makes possible an **automation** that humans have, until now, had to carry out themselves.

The leap in speed and synchrony automates the **circulation of data** between devices. When transmission becomes imperceptible, entire classes of repetitive tasks — booking a seat, tracking an order, making an appointment, filling in an administrative form, cross-checking two registers, triggering a reminder, sending a supporting document — can be entrusted to machines articulated with one another, which pass data to each other in a time that humans no longer have to worry about. The pre-filled tax return is exemplary in this respect: what the taxpayer once had to copy out by hand — income, withholdings, family situation — now circulates between the employer, the bank, the administration, and reaches them already inscribed. Their task, which was to *produce* the return, is reduced to *validating* it.

The leap in storage and access automates, for its part, **cognitive operations** that the separation of the three roles had always left to a human agent. Reading an email and formulating its reply, qualifying a text, formatting a badly written document, converting the format of a datum, summarizing a voluminous file, extracting the relevant part from a whole, translating from one language to another — so many operations that until then required a dedicated process, that is, someone who read, judged, reformulated. They can now be delegated to a device that condenses in itself the functions of the library, the librarian and the storyteller.

In both cases, it is the same gesture that becomes general: *“I confirm, I accept”*.

These automations extend, in the digital terrain, an older movement. The loom had, in its time, automated a repetitive operation that until then had been human — and this automation had transformed not only textiles, but the organization of work and the way a society dressed. The assembly line, the printing press, the telephone had each, in their time, triggered comparable leaps. The digital triggers a new one, which this time concerns **tasks of annotation, coordination and administrative circulation** — those tasks that the first document of the essay designated as *“having in common that they are repetitive”*. The terrain changes; the structure of the phenomenon is the same.

The repercussions cut both ways; let us name both sides. On one side, a real benefit: the mental load is lightened, the time freed can be put towards what matters, and a self-employed worker can, by integrating these devices into their organization, delegate what does not engage them — reminders, follow-up, accounting — in order to concentrate on the heart of the craft. Administrative automation is, in a way, the contemporary an-

swer to the over-administration that the same society had engendered. On the other side, a dispossession: the user who validates no longer knows what circulates, who sees what, which data fed which pre-filling, or according to which criteria. Their mental load shifts, their agenda is set elsewhere, their attention is freed — or lets itself be captured by those who maintain the canals in their place.

This example is, in accordance with the reading contract, an illustration of form — dated, revisable, possibly obsolete in ten years, when use and technique will have changed. What remains of substance does not change: a leap in cadence or speed, beyond a certain threshold, cannot be reduced to a gradual improvement — it transforms the nature of what a flow of observation makes possible, the way humans articulate themselves with it, and with it the organization of the society that relies on it.

What the concept asserts — and this is substance — fits in few words: certain flows of observation can, through the improvement of their means of construction, lead to a systemic change. This was true for cinema; it will be true for flows of observation that we do not yet know how to name. What the concept does not say — because it is form — is *which* flows will undergo such a leap, *when*, *to what extent*, and *with what consequences*.

The concept thus points to shoals — over-engineering, under-drawing, the illusion of continuity, the loop that is not neutral, the systemic leap with unforeseen effects — without charting them: this is the lamp of the Preface to the Edition, and the chart of the reefs falls to the reader, in their situation. Making that chart possible is precisely what the literacy of the flow of observation must enable the reader to do.

Part VIII — What the Flow of Observation Brings to Literacy

From Stock to Flow: A Change of Outlook

Introducing the flow of observation into data literacy means carrying out a fundamental change of outlook.

Standard literacy teaches one to handle the datum as a *stock*: one identifies it, collects it, cleans it, analyses it, communicates it. The governing verb is *to have*.

Literacy enriched by the concept of the flow of observation teaches one to think of the datum as a *flow*: it comes from a flowing (the flow of the real), it is captured in a built canal (the flow of observation), it is set in motion when it is read, it goes stale relative to a use, it can be replayed, transmitted, derived. The governing verb is no longer *to have* but *to make flow*.

This change does not make standard literacy obsolete: one still needs to know how to clean a datum or read a graph. But it wraps it in a more accurate understanding. The learner trained in the flow of observation no longer asks only “is this datum accurate?” but “which canal does it come from? with what intention was it dug? is it at the observational optimum? what does it leave out of frame?”

The Extended Chain

Reading, Writing, Understanding presented the DIKW pyramid (*Data* → *Information* → *Knowledge* → *Wisdom*), its pedagogical virtue and its limits. The concept of the flow of observation makes it possible to propose a more complete chain:

Flow of the real → *Flow of observation* → *Elementary data (drawings)* → *Consolidated data* → *Information* → *Knowledge* → *Wisdom*

The higher levels remain identical. But literacy must go back **two storeys lower** than the classical pyramid did: not only understanding the datum and its context, but understanding the flow of observation that produces it — its intention, its criteria, its cadence, what it leaves out of frame — and the flow of the real of which this flow of observation is a partial derivation.

The Competencies of Processual Literacy

We now have the material to set out in full force the competencies that this processual literacy adds to existing frameworks. They form a coherent body that no standard framework of *data literacy* covers.

Reading the flow of the real behind the datum. In front of any dataset, identifying the process of the real that has been annotated. Which phenomenon was observed? At what scale? With what frequency? This preliminary competency conditions any correct interpretation.

Recognizing a flow of observation. Knowing how to distinguish an isolated drawing from a tended flow of observation, and, in front of a flow of observation, understanding that it is a construction and not a transparent window onto the real.

Going back to the intention and the criteria. In front of any flow of observation, reconstructing the intention that gave birth to it and the criteria that follow from it — what, at what cadence, with what fidelity, what corpus, what scope.

Judging relative fidelity. Understanding that a flow of observation is faithful relative to its criteria, never absolutely; not reproaching it for its limits, but assessing whether its criteria suit the intended use.

Criticizing the relevance of the criteria. The fidelity of a flow of observation to its criteria is not the assurance of its relevance for a given use.

Knowing how to ask: *are the criteria that defined this flow suited to the question I am asking?* — a different question, and often a harder one.

Identifying the undrawn. In front of any database, asking the symmetrical question: what was chosen not to be measured? Which flows were not observed? Who set aside what, according to which criteria?

Reconstituting the necessary corpus. Identifying the set of other data that give meaning to an isolated datum — units, norms, references, meta-data. Understanding that the datum alone is incomplete, and that its value depends on the density of the corpus available.

Assessing freshness, distinguishing the three ages. Estimating the temporal gap between the datum and the flow it comes from, and judging whether this gap is compatible with the use envisaged. Knowing whether a datum is usable operationally, statistically or only memorially.

Identifying stable sources. Recognizing, among flows of observation, those whose lapse is so slow that it can be held, on the scale of use, to be negligible — the grammar of a language, theorems, the great physical regularities. These sources provide the foundation ground on which a body of knowledge or an edifice can rely over time. Confusing them with sources with rapid lapse, or the reverse, is the error to avoid: each type calls for a distinct posture.

Locating the observational optimum. Knowing how to ask, for a given flow of observation, the question of the balance between benefit and cost; recognizing under-drawing and over-engineering; seeking the point at which one is in an optimal situation of observation.

Thinking the gesture of annotation. In front of any datum, knowing who annotated it, with which instrument, according to which grid, with which intention, with which biases specific to that class of annotator.

Distinguishing setting in motion from the relation to the present. Understanding that freshness conditions the relation of a flow of observation to the current real, but not its capacity to be faithfully replayed as a representation of its era.

Recognizing the illusion of continuity. Knowing that the flow of observation produces a functionally continuous representation of the real, but not a real continuity. Not confusing the film with the world, even when the film is of high quality.

Thinking the loop. Knowing how to recognize when a flow of observation is inserted into a closed circuit, and appreciating that, in that case, the choice of criteria commits the future of the real.

Anticipating the systemic leap. Keeping in mind the possibility that an improvement of the means produces a change of nature, and not a mere gradual improvement.

Understanding inter-flow dynamics. Knowing that a flow of observation can be derived, transmitted, reprocessed by other entities according to their own criteria; that the quality of a derived flow depends on the complete chain of upstream drawings; that from this circulation arises a distributed intelligence whose richness depends on the plurality of the intentions that feed the canals.

Recognizing the nature and age of the corpora that feed an AI model. In front of any result produced by an AI system, knowing how to ask the questions: on which flows of observation was this model trained? what is the freshness of the corpus? which intentions dug the canals this corpus comes from? does the question asked concern a field with slow lapse, where the model's memory remains valid, or a field with rapid lapse, where direct access to the tended flow would be needed? This competency is the contemporary version, applied to AI systems, of the critical reading of flows of observation.

The Purpose: An Individual in a Situation of Observing

The purpose of this whole journey joins the one that *Reading, Writing, Understanding* assigned to data literacy. But the concept of the flow of observation makes it more precise: being *data-literate*, in the full sense, is not only knowing how to handle data. It is knowing how to put oneself in a **situation of observing**: understanding that every drawn datum comes from a canal that an intention has dug, knowing how to dig one's own canals, regulate them to the optimum, replay them to understand the past and extrapolate them to glimpse the future, read the canals others have dug without confusing them with the real, knowing that one's observations, when they guide action, transform the world they observe.

It is a technical competency. It is also a civic competency: a citizen who knows this does not let a flow of observation be imposed on them as "reality". In front of any observation figure presented as a fact, they know how to ask the questions of substance: *which flow of observation feeds this figure? who defined its criteria? what does it not show? how often is it refreshed?* These questions are political as much as technical. They are the heart of an informed democracy.

And it is, perhaps, an existential competency. Humans do not own the real and never will — the real flows, immense and indifferent. But humans can, through their intention, dig canals in it: partial replicas, faithful to what they have chosen to see in it, which they can replay, share, put at the service of their decisions. Humans will never be the owners of the waters. They can be the builders, lucid and responsible, of their canals.

Conclusion — The Art of the Canal

The flow of the real is an immense river, which flows without us, without end, without return. The previous documents had taught us to look at it, and to understand that our data are only drawings from it — buckets of water drawn from the current, which go stale as soon as they are set down on the bank.

This document has shown something else. Humans are not content to scoop buckets. They **dig canals**. Through their intention, they divert a share of water from the river; they give it a width, a throughput, a course. The canal is infinitely poorer than the river; it contains only what the course has admitted. But the canal is something humans master. They can follow it, go back up it, replay it, connect it to other canals, entrust it to a neighbour, fill it in when they no longer have any use for it. The canal is the human work par excellence: a portion of the real made manageable.

The whole art of the datum lies in the quality of this digging. A badly laid-out canal — too narrow, and one misses the signal; too wide, and one drowns in useless water — does its builder a disservice. A well laid-out canal, regulated to the optimum, is the most powerful instrument humans have for understanding the past, glimpsing the future, and deciding — knowing that their decisions, in return, will modify the river.

There will always remain, beyond all the canals, the river itself: immeasurable, continuous, indifferent, inappropriable. It is a lesson in modesty. But it is also a lesson in freedom: since the river cannot be owned, no one can claim to own it. There are only canals, dug by intentions, which anyone can learn to lay out, to read and to share.

There remains what this knowledge commits the one who digs to — the being that the flow has produced, and that, canal after canal, claims to read the whole of which it is a part. That is the subject of the document that closes the essay.

“You cannot step twice into the same river.” But one can learn to dig canals in it.

Landmarks

For the references used in this document — the Nyquist-Shannon criterion, *dataism* (van Dijk), the *N=All* argument (Mayer-Schönberger & Cukier) —, see the *Annotated Bibliography of Tome 1*. The methodological status is set out in the Preface to the Edition; meteorology, cinema, photography, image compression, the arid soil, the pre-filled return and the large language model belong to the status of illustrations.

This document carries four loci for the trilogy. The **flow of observation** receives here the development that *The Flow and the Annotation* referred

to it — birth through intention and criteria, relative fidelity to criteria, properties, setting in motion through chained reading and the functional illusion of continuity, operations of mastery, dynamics of flows that engender flows. The **observational optimum** is established here — the arbitration between benefit and cost, regulated jointly on cadence, corpus and probity — whose variant on the side of calculation *The Two Times of the Datum* has given. The **systemic leap** is set out here: the improvement of the means of a flow which, beyond a threshold, changes the nature of what it makes possible. The **extended chain** and the competencies of processual literacy are brought together here — it is here that the tome's established results pay in their share, from stable sources to the three ages. The **loop**, for its part, has here only its support: set out — observing to decide, deciding to act, acting that modifies what is observed —, never demonstrated; its own amplification is the business of the tome of movement; the responsibility of the chain and the bridge between observation, inference and intervention are demonstrated at the closing of the tome of the reader, which is their locus. The intention that digs is the intention of the apparatus, and the builder the situated reader: *The Trace and the Reader* founded both — the partiality of every flow of observation follows from them.

The Wave and the Ocean

Humans in the Flow — Conclusion of the Essay

Tome 1 — Document 7

“We are such stuff as dreams are made on.”

— William Shakespeare, *The Tempest*

Preamble — Closing the Arch

This essay began with a notch in a bone, several tens of millennia ago, and it ends here. In between, it will have tried to understand what a datum is.

The document *The Trace and the Reader* ended on an image: a wave that would like to own the ocean it is made of. And on a promise — that the last document would say what this image commits us to, for humans and for the place they grant the datum in their collective life. This document keeps that promise. It occupies a particular position: it is the only one in the essay that fully takes on a share of meditation. The six previous ones built a concept; this one draws its consequences for the human condition.

In accordance with the reading contract set out in the Preface to the Edition, this document keeps to substance. It will not tell readers what to do. It will strive to make clearly *thinkable* the situation in which they find themselves, so that, seeing better, they become thereby better able to decide. The only proactivity this essay can legitimately aim at is not obedience to recommendations: it is the lucidity that makes one capable of choosing.

Part I — The Wave

A Being Born of the Flow

Let us return to the image, and look at it closely, for this whole document follows from it.

The document *The Trace and the Reader* established a fact that nothing contradicts: humans are a product of the flow of the real. They were not set down in the world from outside the world. Their senses, their cognition, their very capacity to read traces and to inscribe data — all this was shaped, over billions of years, by evolution, which is a long flowing of the flow of the real. Humans are made of the matter of the world, subject to its laws, carried along by its current.

A wave is exactly that. A wave is not an object set on the ocean. A wave is the ocean's water, momentarily raised. It has no matter of its own: what composes it is the ocean itself, at one point, caught in a movement. It forms, it holds for an instant, it falls back. And the water that formed it never ceased to be the ocean.

Humans are to the ocean of the real what the wave is to the ocean of water: a portion that rises. This image is not an ornament. It states a literal truth, established by *The Trace and the Reader*: there is no exteriority of humans to the flow of the real. When humans draw a datum, it is not a subject seizing an object; it is the flow of the real which, at one of its points, takes note of itself.

The Rising Wave: Detachment

And yet something, in the human wave, distinguishes it from all the others.

A wave of water does not know that it is a wave. It rises and falls back knowing nothing of the ocean, knowing nothing of itself. The human wave *knows*. It rises — and, as it rises, it turns back on the ocean it is made of, and it reads it.

This turning back has a dizzying consequence. In turning back on the ocean, the wave distinguishes itself from it. Not that it leaves it — it cannot leave it; it is made of its water — but it *experiences* itself as distinct from it. It lives itself as a point of view on the ocean, hence as other than the expanse it contemplates. This is **detachment**: not a real separation, but a lived separation. Humans remain a portion of the flow; but because they read the flow, they experience themselves as facing it.

From this lived detachment arises everything that makes for human grandeur — and everything that makes for human vertigo. Because they experience themselves as distinct from the flow, humans can take it as an object: observe it, measure it, cut it up into data, build flows of observation from it. Science, technology, this very essay are the fruits of detachment.

But detachment has a slope. Whoever experiences themselves as distinct from the flow comes, almost imperceptibly, to believe they are its master. From “I read the flow”, one slides to “I dominate the flow”; from “I draw data from it”, to “these data are mine”; from “I build canals in it”, to “I govern the waters”. The wave, by dint of rising, ends up forgetting that it is the ocean. It is detachment turning into illusion — and it is the heart of the vertigo this document must name.

The Pretension: Owning, Recreating, Canalizing, Destroying, Rebuilding

The Trace and the Reader had named this pretension in a single stroke: a being born of the flow that claims to govern the flow. Let us unfold it here in five verbs — owning, recreating, canalizing, destroying, rebuilding.

Owning. Humans want to make the flow, or what they draw from it, into property. But one never owns the flow of the real. One owns, at most, canals one has dug in it — flows of observation, inscribed drawings. The river belongs to no one.

Recreating. Humans want to reproduce the flow, to manufacture manageable doubles of it — which is exactly what flows of observation are. This recreation is legitimate and fruitful, on one condition: remembering that the double is never the original.

Canalizing. Humans want to orient the flow, constrain it, direct it. This is a real art — the very one that *Digging the Canal* celebrated. But canalizing a portion is not mastering the whole.

Destroying. Humans have acquired the power to modify the flow of the real itself. This loop can repair; it can also devastate. Humans have become a force of the flow, capable of bending it — an immense power, and a blind one if it is not lucid.

Rebuilding. Having undone, humans want to redo. A noble ambition, but one that must know its limit: the flow of the real is irreversible. One never rebuilds the state that came before; one builds a new state, which will carry the marks of the destruction and of the repair.

These five verbs outline the condition of contemporary humans facing the flow: an immense power, and a possible mistake about the nature of this power. Humans can do much. But they can do much only on *canals*. The flow of the real exceeds them, carries them, and will carry them away. The wave can shape the foam; it does not command the tide.

Grandeur and Vertigo

To say that humans are a wave that takes itself for the master of the ocean is not to belittle them. It is to describe exactly what makes for both their grandeur and their vertigo — and the two are inseparable.

Grandeur: that the flow of the real should have produced a being capable of turning back on it and reading it is a prodigious fact. For billions of years, the flow flowed. Then, at one point, it produced the human wave — beings capable of reading its traces and, in their turn, of inscribing intended traces — and this wave began to decipher it.

Vertigo: this same wave, because it rises, can forget that it is the ocean. It can take its lived detachment for a real separation. It can believe that it owns what it is made of, that it commands what carries it, that it will survive what will carry it away.

Lucidity, which this document will make its central issue, is nothing other than this: holding grandeur and vertigo together. Knowing that one is a wave capable of reading the ocean — that is the grandeur, and it must not be denied out of false modesty. And knowing that one is only a wave — that is the measure, and it must not be forgotten out of pride.

Part II — The Torrent

A Singular Moment

The human wave has always read the flow. But it is living today through a singular moment of this reading.

Compared with the tens of millennia travelled since the first notches, the rhythm of annotation is undergoing a considerable acceleration today. What the essay has called the digital — a combination of cadence in drawings, of extent of the flows covered, of precision of each measurement, and of speed of circulation and processing, which makes it possible, for a vast class of flows of the real, to keep canals up to date even as the real is transformed — has moved the wave from one regime to another. It no longer engraves notches; it permanently tends hundreds of millions of flows of observation.

We shall call this moment the **torrent**. The word is not neutral. A torrent is running water — a wealth, a force. But a torrent is also what can carry away, drown, escape. The torrent of data is both at once: a power of reading the real multiplied many times over, and a throughput that can submerge the wave that set it off.

As to substance, only one thing is said: the torrent is a moment in which the question of lucidity, put to the human wave since always, arises with a new acuteness. The faster and the more the wave reads, the more it matters that it should know *what it is doing in reading*.

The Shoals, Pointed Out and Not Described

The essay, throughout its course, has brought up a number of shoals. Here they are gathered together, named, and left to the reader's vigilance: the concept points; the chart of the reefs falls to the reader.

The shoal of confusing the datum with the real. The whole essay has worked to distinguish the canal from the river, the drawing from the flow, the trace from the datum. The shoal is to forget this — to take a flow of observation for the real itself. The torrent, by its richness, makes this confusion more tempting.

The shoal of the stale datum treated as fresh. A datum ages in the time of the real without moving in the time of inscription. The torrent, which keeps without measure, puts within reach data about which nothing, on their surface, says how long ago the real left them.

The shoal of over-engineering. Drawing far beyond the observational optimum, accumulating data whose cost far exceeds the meaning one gets from them. The torrent is exposed to this by nature: technical ease encourages drawing without measure.

The shoal of the forgotten undrawn. The torrent, by its abundance, gives the illusion of exhaustiveness — and that is how it makes the undrawn even more invisible. Believing that what is not measured does not count.

The shoal of observation that believes itself neutral. Observing in order to decide means engaging a transformation of the real. The torrent, because it feeds countless automatic decisions, multiplies loops — and therefore multiplies the transformations of the real carried out without anyone having fully intended them.

The shoal of the dispossessed reader. The essay has placed the reader at the centre. The shoal is that the reader should relinquish their hold: that they should delegate reading to the point of no longer knowing how to read. Delegation, which is legitimate, becomes a shoal when it becomes renunciation.

These six shoals are not a list of faults to be corrected. They are points of vigilance, valid whatever the era and the techniques. The essay points them out. What readers make of them, in their time and with their means, belongs to them.

Part III — Lucidity

What the Essay Gives Back to the Reader

What remains, at the end of this journey, in the reader's hands?

Not a method: the essay has prescribed no procedures. Not instructions: it has forbidden itself the register of exhortation. Not solutions: form, it has left to others and to other times.

What it gives back to the reader is something else, and it is more precious than a method — because it does not go stale. It gives them back an **outlook**. A way of seeing the datum, the flow, the torrent, which depends on no technique and will age with none.

This lucidity fits in a few propositions, which must be gathered here one last time, not as a summary, but as what the reader takes away:

There are no data in the world — there is real that flows, and acts that constitute data: every datum has been produced by someone, with an intention, according to criteria, and none is neutral, or raw, or the real (see *The Flow and the Annotation* and *The Trace and the Reader*).

Every datum comes from a flow and remains suspended in it: it is born dated, its value depends on the corpus that surrounds it and on the probity of the act that produced it, and the datum drawn from the flow ages as the real moves away from it, its value also depending on its freshness (see *The Flow and the Annotation* and *The Two Times of the Datum*).

Humans do not own the flow of the real — they dig canals in it: what they master are flows of observation, partial replicas, faithful to their criteria alone, manageable, perishable (see *The Flow and the Annotation* and *Digging the Canal*).

Observing is never innocent: choosing criteria means choosing what one will see and what one will not see, and, when observation guides decision, it is already choosing what the real will become (see *The Flow and the Annotation* and *Digging the Canal*).

The reader is at the centre, and is born of the flow: the datum exists only through the act that constitutes it — here, in the observational route, drawing a trace under criteria and inscribing it as a result, by a being that the flow of the real produced to read it, a partial, situated, mortal being, in whom nevertheless, and nowhere else, the real is deciphered (see *The Trace and the Reader*).

That is lucidity. It does not say what to do. It says how to see.

Lucidity as the Condition of Freedom

Why does this outlook matter? Why lucidity, and not happy ignorance?

Because lucidity is the condition of freedom. This is the last thesis of substance in this essay, and it needs to be stated clearly.

A wave that does not know it is a wave is not free: it is entirely carried by the movement that lifts it, without any hold on it. A wave that knows it is a wave does not thereby escape the ocean — it cannot; it is made of it — but

something in it has changed: it can take note of its condition and, within this condition, choose.

The same holds for humans facing the torrent. Humans will not get out of the torrent: they are made of it, they live from it, they are caught in it. Lucidity offers them no escape. But it offers them, within the torrent, the difference between being carried away and navigating. Whoever knows that the datum is constituted by a dated act no longer obeys it blindly. Whoever knows that every flow of observation is partial looks for what is not being shown to them. Whoever knows that observation transforms the real measures the reach of what they set off. Whoever knows that they are the reader does not relinquish reading.

It is in this sense, and in this sense only, that this essay has sought to make the reader **proactive**. Not by dictating acts to them, but by giving them back the outlook that allows an act to be chosen rather than undergone. Data literacy, whose right definition *Reading, Writing, Understanding* was looking for, perhaps finds here its simplest formula: *to be data-literate is to have regained enough lucidity about the datum to remain free in a world made of it.*

The Reader's Responsibility

Lucidity does not come without something that it necessarily brings with it: responsibility.

As long as humans believed the datum to be neutral, objective, simply found in the world, they could feel not responsible for what it said: the datum spoke; they merely listened to it. The essay has undone this belief. If the datum is, in its observational route, a drawing made by an intentional act, then someone has chosen: chosen to draw this and not that, at this cadence, according to these criteria, for this use. And whoever chooses answers for their choice.

This responsibility cannot be delegated entirely, even when reading is delegated. The reader of the contemporary torrent cannot read everything themselves — they must rely on devices, on instruments, on other readers. This delegation is inevitable and legitimate. But there remains to them the responsibility of knowing *that they are delegating*, of not confusing what is presented to them with the real, of keeping the question alive — where does this datum come from? which canal produced it? what does it not show me? how long ago did the real leave it?

And everyone, in the torrent, is also a producer of data. Everyone, by their mere digital existence, feeds flows of observation they did not dig. The essay has not said what should be done about this — that would have been form. But it has made one thing clear, which is substance: these data did not fall from the sky; they were drawn, and every drawing proceeds from an intention that is not necessarily that of the person it concerns.

Knowing this is already no longer being quite an object of the torrent. It is beginning to be a subject of it.

Why Substance, and Not Form

One last thing deserves to be said. The Preface to the Edition set out a rule from the outset: this essay states what is true of the datum independently of the techniques that produce it, and forbids itself to prescribe the concrete form things take in the reader's present time. The reason fits in one sentence — the condition of a text that does not go stale with the technical generation that saw it born. Now that the essay is ending, this sentence can be unfolded. For this reason is not an author's preference. It is an internal necessity of the subject.

Let us look at data literacy as it is taught today, in the institutional frameworks and the manuals that make up its literature. *Reading, Writing, Understanding* showed that it presents itself, essentially, as a discipline of **form**: it describes tools, platforms, competency frameworks, certifications, technical architectures, good practices tied to dated technologies. This is not a reproach — it is a description. Applied literacy has its necessity; it equips the reader with concrete means for today.

But this literature is exposed, on the institutional scale, to what the essay has thematized on the scale of the datum: lapse. It is enough that tools evolve faster than the manuals that teach them — that a platform changes version faster than an institutional framework integrates these changes — for the technical competencies learned in a training course to be, in part, already in need of updating at the moment the learner leaves it. Knowledge about the datum is then exposed to the lapse it does not know how to think.

The loop is striking. The literature that describes data literacy ages in the time of the real without moving in the time of inscription — exactly like the datum of *The Two Times of the Datum*. It remains accurate as a dated finding ("here is how data literacy was taught in such and such a year"), but it loses its representative capacity as the tools it describes are replaced by others. And this ageing is all the faster because the matter it deals with — digital technologies — evolves fast compared with the cycles of writing, revision, publication and distribution.

An essay on the datum that was likewise wired to form would inevitably reproduce this ageing. It would describe, in a few chapters, the state of an art that will be outdated before the end of its first public reading. It would make, on lapse, a perishable book. This would be a performative contradiction — saying that the datum goes stale with a text that goes stale.

That is why the substance/form rule was not an aesthetic choice. It was the **only way** in which an essay on the lapse of the datum could avoid going stale itself. To deal with this subject in particular, one had to inscribe

oneself in the time of what does not go stale with the tools: the time of concepts, the time of structures, the time of substance.

This does not devalue applied literacy. The two registers are complementary, in the way the three ages of the datum are complementary. Applied literacy is in the **first age**: it equips for the present, it is operational, it goes stale as tools change — that is its function. This essay has tried to stand in a register that would be, at bottom, what the **second and third ages** are to the datum: a knowledge that ripens slowly, that informs long-range decisions, that is passed on beyond the technical generation that saw it born. Both are necessary; they simply do not have the same duration of validity.

Form always ends up going stale. Substance ages much more slowly — at the rhythm at which the condition of humans as readers of the traces that the real leaves of itself changes. That is, at a rhythm measured not in years, but in anthropological transformations. As long as humans remain beings who draw, who annotate, who dig canals in the river of the real, what the essay has stated about the datum will remain true. The day humans cease to be that, the essay will have aged too — but then other questions, and other essays, will take its place.

This essay is therefore not only *about* the lapse of the datum. It is, down to its method, *consistent with* what it says of the datum. The form it takes is a direct consequence of the thesis it defends. That is the only merit it claims — and the only one it could claim without contradicting itself.

General Conclusion of the Essay — What the Wave Knows

This essay will have held, from one end to the other, a single thesis, unfolded in seven moments. The datum is not an object that the world holds out to us. It is the result of an act: the drawing, by a reader that the flow of the real has produced, of a trace that the flow of the real has left of itself. All the rest — lapse, the corpus, the flow of observation, the optimum, the two times, the two pillars — follows from this single thesis, like the branches of a single trunk.

From this thesis, the essay has drawn an image; let us look at it, to finish, one last time. Humans are a wave of the ocean of the real. They are made of it; they will return to it; they will never leave it. But it is a wave that, in rising, turned back on the ocean and learned to read it. This reading is its grandeur. Forgetting its condition as a wave is its vertigo. And between grandeur and vertigo there is a narrow thread, which is lucidity: knowing, at the same time, that one reads the ocean and that one is only a wave.

Humans are not the owners of the waters. Nor are they, strictly speaking, the owners of the canals they dig — these canals depend on the river that

feeds them. But they are, more modestly and more durably, the **keepers of the springs**: those points where the real, through the slowness of its transformation, offers them foundation ground. Identifying the springs, protecting them, passing them on: this is, in the long term, the humblest and most precious part of their responsibility as readers.

At the hour of the torrent, this thread is narrower than ever, and more necessary. Humans can, in the torrent, let themselves be carried away — take their canals for the river, their stale data for the present, their abundance for exhaustiveness, their observation for innocence. Or they can, in this same torrent, remain lucid — and lucidity will not take them out of the torrent, but it will make of them, within the torrent, beings who navigate instead of being swept along.

This essay will have prescribed nothing. It will have tried to give the reader back their outlook. To make the datum, the flow, the torrent *thinkable* for them — and so that, seeing better, they become freer, and more responsible for the part of the world that passes through their hands.

A wave that knows it is a wave is already, by this knowledge alone, something other than a wave: it is the point where the ocean, for an instant, looks at itself.

What the wave knows does not save it from the ocean. But it is this knowledge, and it alone, that makes of it something other than water that rises and falls back. It is this knowledge that this essay will have sought, modestly, to rekindle.

“We are such stuff as dreams are made on.” And such stuff as the real is made of. The wave is the ocean that, for an instant, rises and looks at itself. This essay will have been a drop of that gaze.

Conceptual Landmarks

For the references used throughout the journey — down to the epigraph from *The Tempest* —, see the *Annotated Bibliography of Tome 1*. The notions called upon in this document — processual ontology, the flow of observation, the observational optimum, the two times of the datum, the trace and the reader — are developed in the six previous documents. The methodological status and that of the images are set out in the Preface to the Edition; one precision falls to them here: the description of the “moment of the torrent” holds as a general characterization of an era, not as a dated analysis — what is substance is that the acceleration of annotation raises the question of lucidity with increased acuteness; the concrete forms belong to the reader’s time.

This document closes the essay; it gathers without demonstrating again. The image of the **wave**, opened at the end of *The Trace and the Reader*,

finds its full development here — detachment as a lived and not a real separation, grandeur and vertigo, the five verbs of pretension. **Lucidity as the condition of freedom** is the last thesis of substance here, with the responsibility it brings — delegating without relinquishing — and the figure of the **keeper of the springs**. The reason for the substance/form rule, set out in the Preface to the Edition, is unfolded here: an essay on lapse that was wired to form would go stale itself. The **torrent** has here only its name and its moment: its theory — throughputs, the queue, the over-plus — is the business of the tome of movement and the tome of the reader. The six shoals each refer back to their locus; the loop is only mentioned — it is demonstrated at the closing of the tome of the reader.

The network of images in brief — To fix in a few strokes the essay's metaphorical network:

- the **flow of the real** is the river — what flows without us, immense, indifferent, inappropriable;
- **drawings** are buckets of water drawn from the current — frozen as soon as they are set down on the bank;
- **flows of observation** are canals dug in the river — portions of diverted water, manageable, tended by an intention;
- **stable sources** are the points where the river flows so slowly that durable edifices can be built there;
- the **wave** is the place of humans in the whole — made of the ocean's water, it rises, deciphers it, and returns to it;
- the **torrent** is the contemporary moment — an outsized throughput, which can carry away whoever does not know how to navigate.

Thus ends the essay **The River and the Canal — Data Literacy Tried by the Flow**, in seven documents.

Annotated Bibliography of Tome 1

Apparatus of References of Tome 1

This bibliography brings together the references called upon by the seven documents of the essay. It is organized to remain useful over time: first the works of substance, whose relevance will not go stale; then the mechanisms used in the background without being developed, the sources of the figures called upon and the neighbours of the thesis; next the leads for following the evolution of the field on one's own; finally durable search terms, usable whatever the portals and tools of tomorrow.

The concepts are not redefined here: their reference definition is in the *Canonical Lexicon*, and each is demonstrated at its locus, indicated along the way. Cross-references from one document to another are made by title.

What Will Not Change

These works constitute a stable foundation of reference across the seven documents of the essay.

At the Philosophical Foundations

Bergson, Henri — *Essai sur les données immédiates de la conscience*, Félix Alcan, 1889; *Matière et mémoire*, 1896; *L'Évolution créatrice*, 1907. Of all the philosophers of process, Bergson is the one whose thought applies most directly to the status of the datum — his very title of 1889 contains the word. The distinction between pure duration and spatialized time is the direct underpinning of the thesis of the two times of the datum (*The Two Times of the Datum*).

Whitehead, Alfred North — *Process and Reality: An Essay in Cosmology*, The Macmillan Company, 1929 (Gifford Lectures 1927-1928; corrected edition by D. Griffin and D. Sherburne, The Free Press, 1978). The most

accomplished metaphysics of process. The philosophical precision of the word *datum* is central to it: what is given to a later occasion by the occasions that precede it. For an accessible introduction: *Process Philosophy*, *Stanford Encyclopedia of Philosophy*.

Peirce, Charles Sanders — Peirce's semiotics, and in particular his distinction between the caused sign (the index) and the conventional sign, is the underpinning of the trace/datum distinction developed in *The Trace and the Reader*. Smoke with regard to fire, the footprint with regard to the step: the index is a sign physically linked to its object, not by convention.

Cassin, Barbara (ed.) — *Vocabulaire européen des philosophies* — *Dictionnaire des intraduisibles*, Seuil/Le Robert, 2004. The entry ES GIBT ("there is") follows, in its first part, the passage from the Latin "datur" to the German "es gibt", and relates the *datum* to the philosophical vocabulary of givenness. A tool of substance.

Deleuze, Gilles — *Différence et répétition*, PUF, 1968. For the thought of becoming against representation.

Simondon, Gilbert — *L'Individuation à la lumière des notions de forme et d'information*, Jérôme Millon, 2005. For the thought of individuation as process, and the conception of information as differential rather than object.

Jullien, François — *Du temps. Éléments d'une philosophie du vivre*, Grasset, 2001. The difference between the Western thought of time as object and the Chinese thought of time as propensity — a useful philosophical counterpoint to the processual thesis.

Floridi, Luciano — *The Philosophy of Information*, Oxford University Press, 2011. The most accomplished definition of the position this essay reverses: the datum is grounded there as *diaphora*, a difference, a lack of uniformity in the real — that is, in the last analysis, as something that *is there*, even relationally, before any gesture. The essay maintains the opposite: the difference is in the flow, but the datum is born only with the operation that inscribes it — with drawing, for the observational route. Reading Floridi means measuring what is most solid in object ontology — and exactly where the dividing line runs.

The lineage of becoming — Heraclitus against Parmenidean being (fragments; reference edition Diels-Kranz); Leibniz; James, William, *A Pluralistic Universe*, Longmans, Green & Co., 1909. The tome does not discuss this lineage: it names it in order to situate the contestation, minority but continuous, of the precedence of substance over process.

History and Anthropology of the Datum

Schmandt-Besserat, Denise — *La Genèse de l'écriture*, translated by Nathalie Ferron, Les Belles Lettres, 2022 (original title *How Writing Came*

About). For the origin of counting systems and their link with the birth of writing. A work accessible to a non-specialist readership.

Goody, Jack — *La Raison graphique*, Minuit, 1979; *The Logic of Writing and the Organization of Society*, Cambridge University Press, 1986. For understanding the cognitive and social effects of writing, the foundation of any reflection on literacy.

Roser, Max & Ortiz-Ospina, Esteban — *Literacy, Our World in Data*, revision of March 2024 (online). For the orders of magnitude of world literacy recalled by *Reading, Writing, Understanding the World through Data*: one person in ten able to read and write in 1820, more than eight adults in ten today.

Hacking, Ian — *The Taming of Chance*, Cambridge University Press, 1990. For understanding how, in the 19th century, statistics moved from administrative tool to dominant mode of thought.

Desrosières, Alain — *La Politique des grands nombres. Histoire de la raison statistique*, La Découverte, 1993. For the links between data production, administration and power. A rigorous and readable historical sociology.

Epistemological Critique of the Datum

Gitelman, Lisa (ed.) — *“Raw Data” Is an Oxymoron*, MIT Press, 2013. Nine historical case studies showing that every datum carries the mark of its context of production, of its instruments and of its classificatory categories. The title sums up the orientation of the book.

Bowker, Geoffrey C. & Star, Susan Leigh — *Sorting Things Out: Classification and Its Consequences*, MIT Press, 1999. A study of the way classification systems shape the phenomena they claim to describe. Sheds light on the gesture of annotation as a structuring act (*The Flow and the Annotation*) and on the trace as a situated deposit (*The Trace and the Reader*). Bowker also contributed to the anthology *“Raw Data” Is an Oxymoron* edited by Gitelman.

Bowker, Geoffrey C. — *Memory Practices in the Sciences*, MIT Press, 2005. On the infrastructures of scientific memory — databases, archives, standards — and their retroactive effect on what can be known. Echoing the two times of the datum (*The Two Times of the Datum*) and the status of media (*The Two Times of the Datum*, Part I).

Leonelli, Sabina — *Data-Centric Biology: A Philosophical Study*, University of Chicago Press, 2016. A relational approach to the datum, presented as an alternative to the DIKW pyramid.

Berry, Gérard — *L’Hyperpuissance de l’informatique*, Odile Jacob, 2017. For understanding the technical foundations of contemporary computing and the ontological presuppositions they carry.

Contemporary and Political Issues

Zuboff, Shoshana — *The Age of Surveillance Capitalism*, PublicAffairs, 2019 (French translation *L'Âge du capitalisme de surveillance*, Zulma, 2020). A synthesis published in 2019 on the contemporary issues of the massive capture of data as a business model.

D'Ignazio, Catherine & Klein, Lauren F. — *Data Feminism*, MIT Press, 2020 (open access online). For the critique of *raw data*, attention to *missing data* and the inscription of power structures in data.

O'Neil, Cathy — *Weapons of Math Destruction*, Crown, 2016; French translation *Algorithmes : la bombe à retardement*, Les Arènes, 2018. For the concrete damage that misunderstood or deliberately biased data can produce.

Cardon, Dominique — *Culture numérique*, Presses de Sciences Po, 2019; *À quoi rêvent les algorithmes*, Seuil, 2015. A dense but accessible panorama of the transformations that the Internet and digital data have produced in societies.

Mayer-Schönberger, Viktor & Cukier, Kenneth — *Big Data: A Revolution That Will Transform How We Live, Work, and Think*, Houghton Mifflin Harcourt, 2013. For an introduction to the turn towards massive data, and the explicit formulation of the idea that quantity makes up for quality (the so-called *N=All* argument), which the essay opposes.

Ostrom, Elinor — *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, 1990; French translation *Gouvernance des biens communs*, De Boeck, 2010. Nobel Prize in Economics 2009. The theory of the commons, developed for natural resources, can be transposed to flows as commons (*The Flow and the Annotation*).

Data Literacy — Founding Texts

Schield, Milo — *Information Literacy, Statistical Literacy, Data Literacy*, IASSIST Quarterly, vol. 28, no. 2-3, summer-autumn 2004. Formulation of the concept of *data literacy*.

Mandinach, Ellen B. & Gummer, Edith S. — *Data Literacy for Educators: Making It Count in Teacher Preparation and Practice*, Teachers College Press, 2016. The anchoring of the concept in pedagogy.

Ridsdale, Chantel et al. — *Strategies and Best Practices for Data Literacy Education*, Dalhousie University, 2015. A systematic review of the literature on the subject, and a conceptual framework with four domains (collection, management, evaluation, application).

D'Ignazio, Catherine & Bhargava, Rahul — *Approaches to Building Big Data Literacy*, MIT Center for Civic Media, 2015. The grid of four verbs — *read, work with, analyse, argue with* — for an empowering literacy.

Naur, Peter — *Datalogy, the Science of Data and Data Processes*, IFIP Congress 1968; *Computing, a Human Activity*, Addison-Wesley, 1992. Naur proposed a discipline aimed at training individuals in the nature and use of data.

Verdi, Ugo — *À la recherche d'une maîtrise des données : une étude des discours scientifiques et professionnels sur la data literacy*, doctoral thesis in information and communication sciences, Université Bordeaux Montaigne, 2024. A state of the art in French published in 2024. Available via HAL.

Morrow, Jordan — *Be Data Literate*, Kogan Page, 2021. An entry through the professional dimension.

Star, Susan Leigh & Griesemer, James R. — *Institutional Ecology, "Translations" and Boundary Objects, Social Studies of Science*, vol. 19, no. 3, 1989. The concept of the *boundary object*, applied to *data literacy* by Verdi (2024).

Ackoff, Russell L. — *From Data to Wisdom, Journal of Applied Systems Analysis*, vol. 16, 1989. The formalization of the DIKW pyramid.

The detailed state of the field — complete genealogy, frameworks, actors, figures, criticisms — lives in the complementary note *Data Literacy — State of the Field*: a dated reference point, revised at its own pace, distinct from this tome.

Mechanisms Used in the Background

Three traditions are called upon in the body of the tome without being developed there; their detail belongs here. The tome takes mechanisms from them, not theses.

The constitutive rule and institutional facts — Austin, John L., *How to Do Things with Words*, Oxford University Press, 1962 (French translation *Quand dire, c'est faire*, Seuil, 1970); Searle, John R., *Speech Acts*, Cambridge University Press, 1969, and *The Construction of Social Reality*, The Free Press, 1995 (French translation *La Construction de la réalité sociale*, Gallimard, 1998). The division between regulative rules and constitutive rules gives the institutional family its mechanism: under a constitutive rule, the recording does not describe an independent fact — it takes part in bringing into existence the fact it records. Locus of the family: *The Flow and the Annotation*.

Sampling, selection bias and the undrawn — Wald, Abraham, *A Method of Estimating Plane Vulnerability Based on Damage of Survivors*, Statistical Research Group, Columbia University, 1943; Heckman, James J., *Sample Selection Bias as a Specification Error, Econometrica*, vol. 47, no. 1, 1979; Efremov, Ivan A., *Taphonomy: A New Branch of Paleontology, Pan-American Geologist*, vol. 74, 1940, and, for the contemporary

state, Behrensmeyer, Anna K., Kidwell, Susan M. & Gastaldo, Robert A., *Taphonomy and Paleobiology, Paleobiology*, vol. 26, no. 4, 2000. Three independent disciplines — applied statistics, econometrics, palaeontology — have established the same fact: what has not been drawn, or has not survived, weighs on what the drawn say. Taphonomy is, on the side of the trace, the exact counterpart of what the tome calls the undrawn. Locus: *The Flow and the Annotation*.

Stream processing and batch processing — Stonebraker, Michael, Çetintemel, Uğur & Zdonik, Stan, *The 8 Requirements of Real-Time Stream Processing, ACM SIGMOD Record*, vol. 34, no. 4, 2005; Kleppmann, Martin, *Designing Data-Intensive Applications*, O'Reilly, 2017. The stream/batch duality, as industry has formulated it for itself. The tome retains from it only the observation — the dominant model receives continuously and processes in frozen blocks — without adopting its vocabulary.

Sources of the Epigraphs and of the Figures Called Upon

Aristotle — *On the Heavens (De Caelo)*, for the epigraph of *The Trace and the Reader*. The fall of bodies serves, in *The Two Times of the Datum*, as an analogy: it holds for the structure of the illusion — a constant observation, a false inference —, not as history of science.

Mallarmé, Stéphane — the formula comes from his reply to Jules Huret's survey on literary evolution, 1891; it circulates in two states, with and without the epithet.

Shakespeare, William — *The Tempest*, Act IV, Scene 1, for the epigraph of *The Wave and the Ocean*.

Galileo — *The Assayer (Il Saggiatore)*, 1623, for the great book of the universe written in the language of mathematics: a metaphor summoned, then surpassed, in *The Trace and the Reader*.

Uexküll, Jakob von — *Streifzüge durch die Umwelten von Tieren und Menschen*, 1934 (French translation *Milieu animal et milieu humain*, Rivages, 2010). The *Umwelt* — the world proper to an organism, cut out by its organs of perception — is the biological precedent of what the trilogy calls the reader's window; the tome of the reader takes it up.

Neighbours of the Thesis — Overlaps and Differences

Absence found is not proof of absence: a search can miss a vocabulary, a language, a neighbouring discipline, an unindexed chapter. This is what the cautious formula of the Preface to the Edition takes into account. The Architecture Volume carries the map — six neighbouring families, with their overlap and their difference, and the five registers of originality that

make it possible to judge them (§7). The detail of the references is here, and in the apparatuses of the two other tomes for what concerns their subject.

The datum as constructed, not raw — Gitelman (above); Markham, Annette N., *Undermining 'data': A critical examination of a core term in scientific inquiry*, *First Monday*, vol. 18, no. 10, 2013. Overlap: the datum does not pre-exist; it is constructed. Difference: the trilogy derives from it an ontological architecture that also covers persistence, circulation and reading.

From traces to data — Rheinberger, Hans-Jörg, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*, Stanford University Press, 1997; *Split and Splice: A Phenomenology of Experimentation*, University of Chicago Press, 2023 (German edition *Spalt und Fuge*, 2021). Overlap: the mediation that leads from the trace to the datum, and the change of medium it requires — the order of the graphematic distinguished from the order of representation. Difference: the trilogy generalizes this chain beyond the experimental sciences and links it to circulation, reading and the torrent.

Process philosophy — Whitehead, Bergson, Simondon (above). The metaphysical foundation: priority of becoming, individuation, duration, relations. It forbids presenting the reversal of substance by process as unprecedented in itself; what the trilogy claims is the composition, not the thesis.

The three other families — the relational datum (Leonelli), the datum as process in organization theory (Jones), trajectories and materiality (the *data journeys*): their neighbourhood concerns movement and resumption. References in the *Annotated Bibliographies* of Tomes 2 and 3; analysis in the *Architecture Volume*, §7.

What Evolves and How to Follow It

Certain elements cited in the essay are by nature in permanent movement. The portals below offer stable entry points for following their evolutions.

Institutional literacy frameworks: the European Commission's Joint Research Centre for DigComp (successive versions 2.0, 2.1, 2.2, 3.0...); the PIX portal and Éduscol for the French Cadre de référence des compétences numériques (CRCN); UNESCO *Media and Information Literacy* for frameworks in media literacy and AI literacy; the CNIL portal for the training framework on data protection.

International measurements of skills: OECD for PIAAC (adult skills) and PISA (15-year-old pupils); Statistics Canada for *Data Literacy: What It Is and How to Measure It in the Public Service*.

French-language research on data literacy: the HAL portal for open archives; GTnum DEFI (Données pour l'Éducation, la Formation, l'Innovation), led since 2022 by Anne Lehmans and Camille Capelle at the University of Bordeaux; the journals *InterCDI*, *Hermès*, *Information and Learning Sciences* (Emerald), *Journal of Documentation*, *Journal of Community Informatics*.

Durable civic actors of the voluntary sector: Open Knowledge Foundation (stable entry portal, hosting in particular *School of Data*); *DataKind*; *The Engine Room*; *Our World in Data* (Oxford); *Open Data France*.

Studies of the data skills gap: annual reports by analytics vendors (notably the *Data Literacy Project* co-founded by Qlik); research firms such as Accenture or Gartner.

Environmental footprint of digital infrastructures: International Energy Agency (IEA) for the annual reports on the energy consumption of data centres; *International Data Corporation* (IDC) for worldwide volumes.

Primary archives of the history of the datum: *The National Archives* (United Kingdom, for the *Domesday Book*); *National Archives and Records Administration* (United States); *Archives nationales de France*; *British Museum*, *Pergamonmuseum*, *Metropolitan Museum of Art* for cuneiform tablets; *IBM History*, *Library of Congress* (Hollerith collection), *ACM* (Turing Award collection).

To Go Further on Your Own: Durable Search Terms

Links age, the names of institutions change, platforms are renewed. These search terms remain valid for querying the academic and library databases available on the date one reads.

Prehistory of symbolic cognition: *cognitive archaeology*, *Upper Paleolithic symbolic behavior*, *cave art dating*, *prehistoric symbolic representation*.

History of writing and of annotation systems: *origin of writing*, *proto-cuneiform*, *Mesopotamian calculi*, *history of numeral systems*.

History of statistics and of measurement: *history of statistics*, *political arithmetic*, *statistical reason*, *epistemology of measurement*.

History and theory of data literacy: *data literacy definition*, *data literacy history*, *datalogy* Peter Naur, *boundary object literacy*, *DIKW model criticism*.

Institutional frameworks and literacy policies: *DigComp competence framework*, *data literacy policy*, *CRCN digital competences*, *AI literacy framework*.

Critical approaches: *data feminism, datafication critique, data activism, algorithmic accountability, surveillance capitalism data.*

Contemporary issues of the datum: *epistemology of data, processual ontology, data studies, science and technology studies (STS), data freshness, data decay, raw data myth.*

Teaching practices: *data literacy education, data storytelling pedagogy, arts-based data literacy, serious games data.*

Digital infrastructures and footprint: *data centre environmental footprint, digital sobriety, green IT, data center energy consumption.*

Archaeological and Historical Sources Cited in the Essay

Ancient symbolic representations — The cave paintings with the oldest minimum age constraints, according to the published state of knowledge as of 21 January 2026, are in Island Southeast Asia. Work published in 2021 (Brumm et al.) established, for an animal figure at Leang Tedongnge (Sulawesi, Indonesia), a minimum age constraint of 45.5 ka; work published in 2024 and then in 2026 (Oktaviana et al.) established minimum age constraints of 51.2 ka at Leang Karampuang (Sulawesi) and of 67.8 ka for a stencil at Liang Metanduno (Muna Island) — conservative lower bounds, which do not establish an order among the dates of execution. References: Brumm et al., *Oldest cave art found in Sulawesi*, *Science Advances*, 7, eabd4648, 2021; Oktaviana et al., *Narrative cave art in Indonesia by 51,200 years ago*, *Nature*, 631, 814-818, 2024; Oktaviana et al., *Rock art from at least 67,800 years ago in Sulawesi*, *Nature*, 650, 652-656, 2026.

Prehistoric notched bones — Two artefacts: the **Lebombo bone** (between 42,000 and 43,000 years old, Lebombo Mountains, southern Africa), a baboon fibula bearing 29 deliberate notches, interpreted as a tally stick or a record of lunar cycles (work of Peter Beaumont); the **Ishango bone** (between 20,000 and 25,000 years old, Congo basin), bearing three columns of notches organized according to a complex internal structure whose interpretation is still debated (work of Jean de Heinzelin de Braucourt, taken up and discussed by Alexander Marshack).

Clay tokens and the birth of writing — The system of *calculi* (clay tokens) has been found over a territory stretching from Anatolia to present-day Iran, with examples going back 9,000 years. The clay envelopes sealing these tokens are called *bullae*. Schmandt-Besserat's work demonstrated the direct link between this system and the invention of cuneiform writing.

Administrative writing at Uruk — Proto-cuneiform appears around

3300 BCE at Uruk (Mesopotamia). More than 5,000 tablets from the corresponding archaeological layers have been excavated; their content is almost exclusively administrative and accounting. The historian Eleanor Robson (University College London) has produced reference analyses of this corpus.

Great ancient censuses — The Roman *census* (a census of citizens and their property, practised from the 6th century BCE); the English *Domesday Book* (1086, an exhaustive inventory of the lands and resources of the kingdom of England, commissioned by William the Conqueror).

Double-entry bookkeeping — Formalized by the Franciscan friar Luca Pacioli in his *Summa de arithmetica* (1494), it is an intellectual tool of modern commerce.

Great institutional libraries — Alexandria (Egypt, 3rd century BCE); Pergamon (Anatolia); the libraries of Egyptian temples (Tehtunis, Oxyrhynchus); Buddhist monastic libraries (Nalanda, in India, founded in the 5th century, welcomed up to ten thousand students); the libraries of the medieval Islamic world (the *Bayt al-Hikma* of Baghdad, 9th century); Aztec *amoxcalli* in Mesoamerica. The modern public library — open to all without condition — developed from the 19th century onwards, notably in Great Britain (*Public Libraries Act*, 1850).

Early statistical analyses — The Babylonian astronomical diaries (8th century BCE to the Common Era), a series of celestial and commercial entries covering several centuries, which enabled Hipparchus and then Ptolemy to calculate fine planetary regularities; John Graunt's *Natural and Political Observations upon the Bills of Mortality* (1662), a statistical analysis of London demographic data, based on the bills of mortality.

History of the mechanization of calculation — Mechanical calculating machines (Pascal, Leibniz, 17th century); Charles Babbage's work on the analytical engine (1830-1840), the concept of a general-purpose programmable machine, commented on by Ada Lovelace; punched-card tabulation (Herman Hollerith, United States census of 1890); electronic computers (ENIAC, 1945); Edgar Codd's relational model (1970), which structured database management for decades. For the theoretical perspective: David Landes, *The Unbound Prometheus*, 1969; Lewis Mumford, *Technics and Civilization*, 1934.

Note on “Freshness” and “Data Decay”

Professional literature has ended up naming the lapse of data. A few milestones: *Data Assets: Information Decay*, *Analytics Magazine* (INFORMS), 2014, for the half-life metaphor; Wang, R. Y. & Strong, D. M., *Beyond Accuracy: What Data Quality Means to Data Consumers*, *Journal of Management Information Systems*, vol. 12, no. 4, 1996, an article that dis-

tinguishes several dimensions of quality, including *timeliness*. On algorithmic biases produced by old histories: Angwin, J. et al., *Machine Bias*, ProPublica, 2016 (analysis of the COMPAS recidivism prediction system in the United States). On the professional notion of *perishable data*, information whose business value is transient and degrades over time: Cognizant, glossary, “Perishable data” (online; page dated 6 January 2023 by its publication metadata, a date not displayed in the text of the page; consulted on 29 September 2026).

Note on Law and the Accounting of Data

Regulation (EU) 2016/679 has as its subject matter the protection of the fundamental rights and freedoms of natural persons, and in particular their right to the protection of personal data (Article 1(2); recital 1, which links it to Article 8(1) of the Charter and Article 16 TFEU; recital 4, which recalls that it is not an absolute right). It institutes no ownership by the person of their data. The accounting standard IAS 38 makes the recognition of an intangible asset subject to four cumulative criteria — identifiability (§ 12), control (§ 13), probable future economic benefits (§ 17), reliable measurement of cost (§ 21); the probability criterion is deemed satisfied for a separately acquired asset (§ 25); research is expensed (§ 54) and the capitalization of internal development is allowed only under six cumulative conditions (§ 57); the standard expressly excludes internally generated goodwill (§ 48) as well as internally generated brands, mastheads, publishing titles and customer lists (§ 63). The body of *The Flow and the Annotation* retains from it only the scoping: a datum can appear on the asset side of a balance sheet when it satisfies these criteria, not by nature.

Note on the Nyquist-Shannon Criterion

The sampling theorem establishes that a band-limited signal, with no component above a frequency W , sampled uniformly at instants spaced $1/2W$ apart and observed over the whole axis, is entirely determined by its samples and is reconstructed by cardinal sine (sinc) interpolation (Shannon, *Communication in the Presence of Noise*, *Proc. IRE*, 37(1), 1949, theorem 1). Two distinct limits: aliasing, when the signal carries components above half the sampling frequency; the effect of a finite observation window — truncation error and spectral leakage —, which is not aliasing. The essay transposes to the flow of observation, by structural analogy, only the existence of a cadence threshold; it derives no quantitative result from it.

Note on Van Dijck and the Critique of *Dataism*

The critique of the discourse that presents the datum as intrinsically valuable through its mass alone was formalized under the name of *dataism* by José van Dijck: *Datafication, dataism and dataveillance: Big Data between scientific paradigm and ideology, Surveillance & Society*, vol. 12, no. 2, 2014.

Translation choices

These notes say how to read the English words that render the terms of the corpus; they are fixed for the whole English translation by the *Translation Charter of the Corpus*.

- **datum / data.** The corpus treats the datum as an individual: constituted by an act, dated, carried by media. The translation therefore says *datum* in the singular — unusual but exact, the Latin for “what is given”, which keeps the French play on *donnée* and *donné* (“a datum is only ever half given”) — and *data* as its plural, construed as a plural. Whitehead’s *datum*, in italics, is the philosopher’s term, distinct from the datum of the corpus.
- **drawing / to draw** (*prélèvement, prélever*): the gesture of drawing from the flow, as one draws water; *sampling* is avoided, except in the Nyquist-Shannon theorem and the statistical works of the bibliography, where it is the technical term. *To scoop* renders the bucket’s *puiser*. *To measure, entry and survey* render *relever* and *relevé*: *entry* for the inscribed value, *survey* for a way of observing; *reading* is kept for the act of reading.
- **lapse; stale; to go stale** (*péremption; périmée; se périmer*): a relation, not a decay — the gap that grows between a datum that stays still and a world that carries on. A datum goes stale *for a use*. *Expiry* is kept for regulatory contexts.
- **to arrest a value** (*arrêter une valeur*): to stop the value and to settle it, both at once, as the French verb does. **Frozen** renders *figée* (the motionless content), **fixed** and **fixation** the act that gives the datum a medium.
- **canal; to dig; course** (*canal, creuser, tracé*): the canal dug in the river, for irrigation; never a *channel*. *Canaliser* is rendered *canalize*, to keep the image.
- **spring / stable source** (*source*). French has one word where English has two: the **stable sources** are the fragments of the real that lapse so slowly that one can build on them; the tome also calls them the **springs** that feed the canals, of which humans are the **keepers**. *Source* keeps its ordinary sense elsewhere (“the return to the source”).
- **river** renders *fleuve*, and also *rivière* in the stake planted in its bed: English has one word for both.
- **substance** renders *fond*, the register of what is true of the datum

independently of techniques, against **form**. The same English word also renders the French *substance* in its two other senses: the substance of metaphysics, against process (*The Flow and the Annotation*), and what an intention extracts from a flow (*Digging the Canal*, “The Substance Is Not Exhaustible”). The context distinguishes them; *background* renders the ordinary *fond*.

- **medium** (*support*, plural *media*) carries the inscription; **carrier** (*porteur*) holds an occurrence of the datum.
- **caused / intended** (*causée / voulue*): *intended* means covered by at least one of **the three intentions** — of the apparatus, of the occurrence, of use —, never a conscious will at each inscription.
- **verisimilar datum; verisimilitude**: guaranteed by a model, not by the real; *plausible* would weaken it.
- **actualized** (*actualisée*): the act by which a reading produces a meaning, never the updating of a file. Where the French *actualiser* means updating (a web page reloading, skills to be brought up to date), the English says so.
- **recounting** (*récit*, technical sense) is the re-inscription of a lapsed datum; the *récit* of the edition is its ordinary **narrative** or **story**.
- **Tome** names each of the three tomes; **volume**, any other book of the corpus. “The tome of movement” and “the tome of the reader” are Tomes 2 and 3.
- **Threshold** (*Seuil*) is the opening text of a tome, and the passage an act makes one cross; **Landmarks** (*Repères*) is the closing section of each document; **locus** (plural *loci*) renders *foyer*, the single place where a contribution is demonstrated.
- **planes, storeys, levels, degrees** keep apart the French *plans, étages, niveaux, degrés*; **inversion** (fixed object, mobile frame) is kept distinct from the **reversals** of object ontology.
- In *The Trace and the Reader*, the **reader** is the observer who interprets a trace and inscribes a result, as the text itself says.
- **Quotations**. The epigraphs from Heraclitus and Archimedes are given in their received English renderings; Shakespeare in the original (“We are such stuff as dreams are made on”); Catherine D’Ignazio in the original English of her abstract, as is the definition of data literacy by D’Ignazio and Bhargava (“through or about data”, where the French text says “through and about”). Bergson’s sentence follows the received English translation of *Creative Evolution*. The sentences of Aristotle and Mallarmé are translated from the French. The epigraph attributed to Whitehead condenses his use of the word *datum*; no sentence of *Process and Reality* matches it word for word, and it is translated from the French.
- **Titles**. *Tried by the Flow* renders *À l’épreuve du flux*: the datum put to the test of the flow. This tome is *The River and the Canal — Data Literacy Tried by the Flow*.

We do not live surrounded by data.

One day in May 2026, I asked the AI:

“Produce a documentary that is well supported, complete, reasoned, clean and sourced, on the origins of data in humanity, from the most ancient origins that have been identified:

How did the first data collected by humans appear, in what form?

For what uses? For what purposes?

Then detail the major developments that led contemporary civilization to depend on the uses of data through digital technology and its incessant stream of data.

How did humans become aware of data, of its potential?

How did they collect, produce and exploit it over the millennia?”

The AI complied.

And the essay began.

To say that the author, when producing this essay, did not have it in mind is to overlook nearly 20 years of observing what goes on underneath: at first, cables, a screen, a keyboard. Then, quickly, laptops, a network, touch screens, mobile devices. And now applications, users, codes and an omnipresent digital life whose stream of data carries as much interest for the present as questions about what is to come.

In substance, this essay paints the portrait of the world in motion.

In form, it freezes from it the image of a contemporary society.

Second edition, October 2026. The text has been reworked to make its distinctions more precise: the datum is distinguished in it from the act that constitutes it, the observational drawing ceases to be the model of every datum, and lapse becomes a validity judged for a use. The first edition remains available at artisanat-de-la-donnee.fr.