

LSDNA: Rhetoric, Consciousness Expansion, and the Emergence of Biotechnology

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I had to struggle to speak intelligibly.

—Albert Hofmann on his self-experiment with LSD-25

Finding a place to start is of utmost importance. Natural DNA is a tractless coil, like an unwound and tangled audio tape on the floor of the car in the dark.

—Kary Mullis on the invention of Polymerase Chain Reaction

1. Undoing life

What happened is this: Once upon a time there was a narrative of vitality. Ok, not a narrative, but an apprehension, a fear, a vision. *It* didn't have a beginning, middle, or end. *It* was. Its contours were no more determinable than those of consciousness. Indeed, our consciousness, as humans, was our sole alleged difference from *it*. From something called "life." We were *more than* life, but were also, tragically, confined to it. You know the story all too well. Some of its major authors were Cuvier, Lamarck, Darwin, Bichat. Even Shelley.

Just because this sudden transformation happened on paper doesn't mean it was easy to endure. Enormous numbers of humans went on tranquilizers just to deal with the effects. Others, elsewhere, knew nothing but rumors. Nonetheless, they became increasingly implicated in its effects, the effects of understanding and experiencing both "life" and "consciousness" as *informatic* events. Suddenly—and it is sudden, a real surprise—both our vitality and our thought were distributed, scattered across a network and nowhere in particular. Timothy Leary and Francis Crick were speaking the same language, the language of information where the organic and the machinic enfold each other helically and, sometimes, the capacity for replication goes through the ceiling. This new language of information would

introduce a novel response and abyss: the pleasures and hells of eternal replication. The distribution of both life and consciousness enabled a dream of immortality from which we have not yet awakened, as the mere specter of infinite clonal replicants provokes entropies of identity even as it preserves the self from onslaughts of decay.¹

In at least one of its characteristics this shift toward an informatic understanding of life is perhaps not really so novel. The seductions of control are hardly, historians of science tell us, foreign to the practices and effects of technoscience. Evelyn Fox Keller makes this point concisely and precisely in her not-quite eponymous essay, "From Secrets of Life to Secrets of Death," itself a self-professed sequel to her 1986 "Making Gender Visible." Here the scientific "impulse" is underwritten by a perennial motif that underlies much of scientific creativity, namely, the urge to fathom the secrets of nature and the collateral hope that, in fathoming the secrets of nature, we will fathom (and hence gain control of) our own mortality (*Secrets*, 29).

Surely Keller is correct that the nascent practices of molecular biology were cryptographic in character, an espionage project unknowingly launched by Erwin Schrodinger during the Second World War. Surely it is crucial to this moment that while Schrodinger's 1943 Dublin lectures were introducing audiences to the concept of the code-script, Alan Turing again brilliantly decrypted a modified U-boat code, giving the Allies code superiority for the remainder of the war.² But in this segment on that strange growth called "biotechnology," I want to focus on what Keller has called the "collateral" of hope in this cryptographic impulse, namely the collateral equation between *inquiry* and control, specifically the control of mortality.

For is "fathoming" a secret identical to the exercise of control? The very cadence and rhetorical encryption of Keller's formulation here, a general parenthetical syllogistic conclusion within and alongside a hyphenated invocation of particularity, suggest that concepts and practices of secrecy are more unstable than Keller implies with her invocation of Feynman's "disease" of lock picking: "One of my diseases, one of my things in life, is that anything that is secret, I try to undo" (40). For Keller, Feynman's confession is emblematic of a desire to control life and death.

Yet the impulses to "undo" secrecy and the exercise of control can operate as extraordinarily divergent vectors. True, the appropriately named Feynman carries out the oh-so-human desire to reveal and expose, the garish and obscene revelation through which control sometimes emerges.

Nietzsche associated this nihilism and its will to truth—undoing falsehood, exposing it in a negative revelation—with the unhappy conscience of a science that killed a god who had never *lived*:

Even if language, here as elsewhere, will not get over its awkwardness, and will continue to talk of opposites where there are only degrees and many subtleties of gradation; even if the inveterate Tartuffery of morals, which now belongs to our unconquerable “flesh and blood,” infects the words of even those of us who know better—here and there we understand it and laugh at the way in which precisely science at its best seeks most to keep us in this simplified, thoroughly artificial, suitably constructed and suitably falsified world—at the way in which, willy-nilly, it loves error, because, being alive, it loves life.³

Nihilism was in part, for Nietzsche, a product or symptom of a will to reveal, the undoing of the secret that Keller writes of. On the other tentacle, Nietzsche cultivates and laughs with a *froliche Wissenschaft* that lives not through the bottomless plumbing of interiority, the revelatory practice of the secret, but in *life*. Here laughter sprouts out of an “understanding” that is not necessarily correlative to knowledge: those of us who should have known better, here and there, here as elsewhere, the gay scientist, *understands*. This “understanding” results less from a will than from a hosting, a sudden encounter or recognition of a differential, “being alive, it loves life.” Less a capacity to steadfastly endure the respective differences of entropy and time than a flexible hospitality to a chaotic difference, this understanding finds itself in love with life, overtaken by it. Here, in catastrophic laughter, we notice that life and death are less opposites than differences, non sequiturs whose only image is the outbreak of laughter. These changes in kind challenge usual identity complexes, hailing vertiginous capacities for differentiation as well as the disciplined stabilities of knowledge.

Willy-nilly, here and there, science is perhaps at its best when as inquiry, its direction cannot be predicted. In its very effort to embed humans in a thoroughly articulated, transcendental vision, technoscience often encrusts or “infects” the living with a mechanical revelation. What Bergson characterized as “the encrustation of the mechanical upon the living,” the sudden folly of the machinic/biological difference, is less an analysis of the uncanny than a reminder that any specifically *biological* difference can never be known in advance. Such sudden revelations of artifice are not a matter of epistemology but of self-experiment: we don’t know what an organism can do! In the context of biotechnology, such open-ended life forms augur, perhaps, changes in kind not just of species but of life *itself*.

This unpredictable character of science and life implies not relativism but an extraordinary capacity for surprise, a sudden difference between knowledge and life that is periodically associated with laughter. Laughter often responds to the specificity of *life* as an evolutionary force, an unfolding or becoming whose logic is not identical to knowledge. Here the undoing of one knot is the creation of another, not a bringing of secrets into the outside of knowledge, but endless and essentially unpredictable wandering from knot to knot, problem to problem.

Laughter, then, becomes for Nietzsche an ecology of human “agency” through which this understanding can emerge. As such, this “agency” is a paradoxical one, as it is fundamentally implicated in an activity that, for the most part, humans can neither instigate nor control.⁴ Bergson, whom most contemporary biologists regard as representative of a teleological vitalism, also notices that it is through laughter that the difference between the mechanical and the living often is expressed, a practice grounded not in telos but in imageless errancy. According to late millenium writers such as Stuart Kauffman, we humans find this erratic understanding of life too desolate and inconsolable to embrace: “we find ourselves on a tiny planet, on the edge of a humdrum galaxy among billions like it scattered across vast megaparsecs, around the curvature of space-time back to the Big Bang. We are but accidents, we are told” (4). And yet, for Nietzsche, gay scientists love error precisely to the extent that they love life. And the love of life *appears to be fundamentally a symptom of being alive*. Both love and laughter, as activities, are not fundamentally human agencies that emerge from consciousness. For both, the involvement of a self is necessary but impossible: for both the self is at play and, indeed, *at stake*, in love and laughter. The love of life, a symptom of being alive, is therefore a symptom not of knowledge or consciousness but of the force of life, a force exterior to, beyond, or quite simply other than consciousness and the self.

Thus there is at least one other valence of this “undoing” that was Feynman’s disease, not revelation and its alleged collateral, control, but a pulling apart or deterritorialization, an undoing of the self that is usually the creation of another. It is perhaps here, ecologically, that rhetoric as a set of practices emerges. Techniques for the constitution and dissolution of audiences and individuals have been the hallmark of rhetorical disciplines for millennia, and it is this emphasis on the generation of states neither foreign to nor defined by cognition that I want to exert on this question of scientific innovation and the communities and identities capable of bearing it. Here, rhetorical practices implicated with technoscientific innova-

tion become zones where the traffic between culture, nature, and knowledge becomes less undecidable than indiscernible.

In the schematic argument that follows, I map the rather willy-nilly itinerary of molecular biology's rhetorical and conceptual evolution and its debts to these forms of agency best exemplified by laughter but available to many extraordinary affects proper to the rhetorical practices of even the scientific will: laughter, terror, ecstasy. Such modes of response, I will argue, were crucial to a conceptual evolution whose feedback loop arrives at cloning and tends toward a nanotechnological threshold: DNA information, at first understood by molecular biology as a fundamentally stable semantic phenomenon or "secret," became a spectacularly mutable technology of replication and differentiation by the early 1980s. This undoing of life, and the concomitant "loss" of integrity in the organism, wrought first by recombinant DNA and then Polymerase Chain Reaction, seems to occur in response to an undoing and doing of identity sculpted by that most tabooed and double entangled scientific enterprise: the self-experiment. In particular, the necessary role of the self-experiment in the scientific study of hallucinogens, an inquiry not into life but into consciousness, provides the ecology for the emergence of these innovative and even ecstatic modes of interaction. I hope to also suggest by implication that it is from the realm of self-experiment that we must troll for analogies for our current ethical and political positions regarding biotechnology.

My discussion will respond to the common self-experiments at play in the seemingly diverse ecologies of the hallucinogenic "expansion" of "consciousness" and the engineering of evolution, biotechnology. These ecologies will be treated as twin or replicated domains where an informatic desire distributes, differentiates, and disperses both consciousness and life into inhuman, inorganic, and extraterrestrial realms.

2. Taking DNA, or tripping over the organism

Thus far I have claimed a shift from an emphasis on the interiority of organisms and the associated revelation of their essence to a harnessing of DNA's capacity to replicate and its subsequent "distribution" of life. No longer simply the attribute of a sovereign organism, life now emerges out of the connections of a network, involving an essential impropriety—it is life's habit of refusing containment that becomes interesting for biotechnology and capital.

These replicants are extraordinarily different models of living systems, both of which take place under the sign of “DNA” and molecular biology. One, the cracking of the code, looked to expose vitality as an attribute of a “periodic crystal,” an orderly rather than mysterious enterprise best apprehended by physics. Another, a model of living systems we associate with biotechnology and its collateral capital and publicity markets, is less interested in what DNA might “mean” than with what it can *do*, and the relation between what it can do—replicate—and its production of value. Indeed, an emphasis on the primordial importance of *copying* reminds us of the impossibility of keeping secrets, as replication allows alleles and ideas to travel to multiple contexts, some intended and some not. Contemporary life science, despite all the chatter of God associated with the recent rough draft of the human genome, is interested less in predictability than in experimentation and mutability, the capacity for deterritorialization that generates value in the economy.⁵

While molecular biology was busy on its eighth day of creation, discovering, decoding, and analyzing the “secret” of life, LSD-25 was also proffered in the labs and then the communes and other crowds of the world as the secret of “consciousness.” Contrary to its usual representation as a seamless technology of unveiling associated with the instant gratification allegedly sought by an entire decade, the 1960s, LSD was continually treated as an enormously powerful but equally unreliable tool for the probing, revelation, and “expansion” of consciousness. Writers, researchers, and experimentalists such as Timothy Leary, Humphrey Osmond, Richard Alpert, and Stanislov Grof all sought to study the function of “set and setting” in the instantiation of hallucinogenic practices and their capacity to transform human consciousness. These writers *took DNA* and used it to frame and articulate hallucinogenic sessions as programmable but not controllable events, experiments with and on the self. As such, theirs was a fundamentally *pragmatic* rather than *semantic* relation to the “information” of DNA, more recipe than message.

How did these writers *take DNA*? In fact, there were many experiments among researchers attempting to ingest DNA and RNA itself as a hallucinogen, sometimes in the hope of developing a “learning lozenge” that would permanently inscribe the experience of LSD onto the brain. But nucleic acids were also crucial *rhetorical* vectors composing hallucinogenic discourse of the 1950s and 1960s: the talk, thought experiments, manuals, and technical papers that resulted from variously intentional and unintentional ingestions.

Hallucinogenic discourse, both of scientific and “recreational” nature, faced a similar rhetorical dilemma as the rest of the ecstatic traditions it responds to: it must report on an event that is *in principle* impossible to communicate. Writers of mystic experience from St. Theresa to William James have treated the unrepresentable character of mystic events as the very hallmark of ecstasis. Hallucinogenic discourse faced a similar struggle in the effort to report on the knowledge beyond what William Blake (and Jim Morrison) described as the “doors of perception.” To deal with this struggle, many researchers had recourse to the rhetoric of nucleic acids; DNA and RNA became privileged characters in the stories and practices of hallucinogenic science. Nucleic acids were more, though, than “content providers” for the channeling of hallucinogenic knowledges into quasi-scientific protocols. As carriers of the news of molecular biology’s informatic vision, rhetorics of nucleic acids were also set and setting for hallucinogenic sessions themselves: more than reporting devices, these rhetorics of nucleic acids helped to suggest that these sessions were themselves, like DNA, programmable.

3. Double-take

Problems of reportage troubled the discourse of LSD almost from its very inception, and certainly from its very first ingestion. In his fundamental ergot studies in 1938, Albert Hofmann first synthesized lysergic acid diethylamide, abbreviated LSD-25 (Lyserg-saure-diethylamid) for laboratory usage. This novel molecule was noted primarily for its strong effects on the uterus, but as Hofmann retroactively reports in his autobiography named for a molecule, *LSD, My Problem Child: Reflections on Sacred Drugs, Mysticism, and Science*:

The research report also noted, in passing, that the experimental animals became restless during the narcosis. The new substance, however, aroused no special interest in our pharmacologists and physicians; testing was therefore discontinued.⁶

Hofmann continued his work in the ergot field, but LSD-25 was thought to have little pharmacological value, so between 1938 and 1943 “nothing more was heard of the substance LSD-25.”

And yet Hofmann still had ears for the crying of LSD-25. According to his own account, LSD wouldn't leave him alone:

And yet I could not forget the relatively uninteresting LSD-25. A peculiar presentiment—the feeling that this substance could possess properties other than those established in the first investigations—induced me, five years after the first synthesis, to produce LSD-25 once again so that a sample could be given to the pharmacological department for further tests. This was quite unusual; experimental substances, as a rule, were definitely stricken from the research program if once found to be lacking in pharmacological interest . . . Nevertheless, in the spring of 1943, I repeated the synthesis of LSD-25. As in the first synthesis, this involved the production of only a few centigrams of the compound.⁷

Although Hofmann's attribution of presentiment must be placed within its context as an autobiographical confession, it nonetheless well names a peculiar agency that often adheres to those self-experiments that are survived: the inability to forget. The memory of LSD and, as we shall see, LSD-25 itself, seems to have little truck with the usual operations of will. Indeed, according to Hofmann, his response to the crying of LSD-25—synthesis—resulted paradoxically in an interruption or a dissolution: "In the final step of the synthesis, during the purification and crystallization of lysergic acid diethylamide in the form of a tartrate (tartaric acid salt), I was interrupted in my work by unusual sensations."⁸ This interruption of the I, rather than ending an experiment, instigates one. In a report to a superior, Hofmann did his best to offer a description of the phenomenon that ensued after the interruption, but he only "surmised" a connection with the LSD-25.

Hofmann's analysis of the cause of the interruption itself was interrupted by the question of ingestion. Given his method of synthesis, Hofmann reasoned that his accidental passage must have been through the skin, and that the substance must therefore be of extraordinary, indeed unprecedented, potency. Thus Hofmann's causal analysis of the unusual sensations seemed to offer two extraordinarily unlikely, i.e., unprecedented, alternatives. On the one hand, the cause could remain unknown, and the tasteless and odorless LSD-25 had merely been associated with the experience rather than causing it. In this instance the strange interruption retained its enigmatic status, a non sequitur of Hofmann's experience. On the other hand, if the minute quantity of LSD-25 were the causal agent of the interruption, then Hofmann was faced with the equally unlikely scenario that he had discovered the most potent compound known to history.⁹ To resolve the situation,

Hofmann had recourse to an extraordinary non sequitur, itself seemingly emerging without cause: “There seemed to be only one way of getting to the bottom of this. I decided on a self-experiment.”¹⁰

In what sense can one “decide” on a self-experiment? What warrants this decision? If it seems obvious that indeed, Hofmann did decide on such a course of action, it must also be noted that such a decision is of necessity itself an experiment, one that emerges not from any deliberative logic but from an incalculable action, a breakage in a chain of reasoning: just do it. Whatever the historical sedimentation concerning self-experiment, and there is plenty, Hofmann’s deliberation on his possible responses to the interruption was itself not subject to anything like a procedure, an algorithm shorter than repetition by which he could arrive at a resolution of the two equally enigmatic if thoroughly differentiated outcomes.¹¹ Thus, this decision to self-experiment is itself a testing of a hypothesis: that repetition is the most high-fidelity and compressed procedure for resolving the matter. The outcome of this experiment—Hofmann’s implication of himself into the research—cannot itself be meaningfully differentiated from the experimental dosing of LSD-25. Only an additional experiment, the synthesis and ingestion of LSD-25, will retroactively provide this experiment in decision making with anything like a result. As if to mark the extreme danger that the implication of a self and body into the experiment entails, Hofmann writes oxymoronically of a self-experiment embarked upon with “caution”:

Exercising extreme caution, I began the planned series of experiments with the smallest quantity that could be expected to produce some effect, considering the activity of the ergot alkaloids known at the time: namely, 0.25 mg (mg = milligram = one thousandth of a gram) of lysergic acid diethylamide tartrate.¹²

The danger here, though, is not only the risk of an unknown compound of apparently extraordinary psychic potency. Rather, the instance or event of danger emerges coincident to the interruption of work itself: how to proceed? For as Hofmann notes after the now deliberate ingestion, LSD-25 is nothing if not the incessant and yet irregular arrival of the question: *How to go on?* This is a question of endurance for the experimental self: usual experimental protocol demands that everything is involved in an experiment *except* the self, and yet here it is precisely only the self and its responses that are the very assay of LSD-25. Only the variable examples of

history provided anything like a protocol for self-experiment, calibration for the assay.¹³

This assay had great difficulty generating any readout:

4/19/43 16:20: 0.5 cc of 1/2 promil aqueous solution of diethylamide tartrate orally = 0.25 mg tartrate. Taken diluted with about 10 cc water.

Tasteless. 17:00: Beginning dizziness, feeling of anxiety, visual distortions, symptoms of paralysis, desire to laugh.¹⁴

LSD-25 did little to present itself for inscription. Without flavor, within forty minutes it produces predominantly anticipatory symptoms, events that were about to make themselves more fully known. The “desire to laugh,” as such an experimental anticipatory symptom, was particularly difficult to assay. For by what means would any desire to laugh be registered by an observing self, except by laughter itself and its subsequent attempted blockage? What agency would interrupt said desire and, interrupted, in what sense did one desire to laugh?

Obviously, anyone can wish for laughter: this is the unlikely hope marked by the sitcom laugh track. But what is named by Hofmann is perhaps less a wish than a tantalizing inclination, a becoming laughter that is neither a cackling or its absence, a meanwhile in which the proximity of the future—I am about to laugh—is unbearable to the self of the present. For Hofmann, this desire indeed becomes unbearable, the doing of the experiment veritably undone:

Supplement of 4/21: Home by bicycle. From 18:00–ca. 20:00 most severe crisis. (See special report.) Here the notes in my laboratory journal cease. I was able to write the last words only with great effort. By now it was already clear to me that LSD had been the cause of the remarkable experience of the previous Friday, for the altered perceptions were of the same type as before, only much more intense. I had to struggle to speak intelligibly.¹⁵

Hofmann’s certainty regarding the causal role of LSD-25 in the visions and disturbances he experienced was equaled by his inability to communicate the character and nature of the certainty. While under the variable influence of LSD-25, Hofmann periodically ceases to be capable of even an *attempt* at communication and, thus, an attempt at experimentation. In place of the usual and (mostly) invisible expectation of communicability that is the rhetorical arena of scientific observation, the struggle suggests Hofmann’s reliance on another mode of knowing altogether: the struggle

of the ordeal, an event in which knowing is not separable from an irreducible participation: “I had to struggle to speak intelligibly.”

This struggle to communicate is not a deficit in the hallucinogenic experience, but a symptom of it. In this sense, the self-experiment is both failure and success: As an experiment *with* the self, the outcome is close to null. No meaningful report can be generated, and therefore the knowledge of the hallucinogenic experience can in no way be gathered or repeated. As an assay, the self is found wanting. If the experiment is an occasion at which, strangely, the self is to be present as the very apparatus through which the inquiry is to be made visible and replicable, then the apparatus has faltered and the experiment is nothing but artifact.

Nonetheless, Hofmann would later prepare a special report to his supervisor, Professor Stoll. Here Hofmann was struck by the *capacity to remember* the experience with great, even machinic precision:

What seemed even more significant was that I could remember the experience of LSD inebriation in every detail. This could only mean that the conscious recording function was not interrupted, even in the climax of the LSD experience, despite the profound breakdown of the normal world view. For the entire duration of the experiment, I had even been aware of participating in an experiment, but despite this recognition of my condition, I could not, with every exertion of my will, shake off the LSD world. Everything was experienced as completely real, as alarming reality; alarming, because the picture of the other, familiar everyday reality was still fully preserved in the memory for comparison.¹⁶

As an experiment *on* the self, the ingestion of LSD-25 was indeed a resounding success: the experimental object was unmistakably transformed, alteration extending even to the agency of Hofmann himself. As a recording, Hofmann could not avoid remembering as, for the purposes of LSD-25, Hofmann became what Merlin Donald describes as an “external symbolic storage” device. Combined with his own memory of LSD’s agency — “*And yet I could not forget the relatively uninteresting LSD-25*” — Hofmann’s transformation by the experiment is subtly but nonetheless inescapably inscribed in the confession: LSD-25 is not easily erased from the experience and memory of the experimental subject, a subject who, like it or not, is recording.¹⁷

Hence, while the conclusions to Hofmann’s exercise of extreme caution remained to be determined, there could be no argument but that the risk had yielded interesting data, namely, the transformation of Hofmann

himself into a being seemingly incapable of forgetting certain aspects of the LSD experience. On this factor alone, Hofmann could determine that he had happened upon a substance of unprecedented potency. Its usefulness and character would, of course, call for further research, but Hofmann's understanding of the causal nature of LSD-25 in his experience was certainly an important result capable of representation to his colleagues.

But if Hofmann had great faith in the splitting capacities of LSD as a molecule that allows for an almost unique position as a retroactive observer and real-time participant, his supervisors, at least at first, did not:

As expected, the first reaction was incredulous astonishment. Instantly a telephone call came from the management; Professor Stoll asked: "Are you certain you made no mistake in the weighing? Is the stated dose really correct?" Professor Rothlin also called, asking the same question. I was certain of this point, for I had executed the weighing and dosage with my own hands. Yet their doubts were justified to some extent, for until then no known substance had displayed even the slightest psychic effect in fraction-of-a-milligram doses. An active compound of such potency seemed almost unbelievable.¹⁸

While the incredulity focused repeatedly on issues of quantitative importance, clearly it was also the qualitative transformations wrought by LSD-25 that inspired disbelief. The missing special report, whatever it says, was evidently unable to carry out its task of translating the delirium of the self-experiment into the allegedly intersubjective space of scientific communication. So little convinced were Hofmann's colleagues of his report that they took the almost unbelievable step of repeating the self-experiment:

Professor Rothlin himself and two of his colleagues were the first to repeat my experiment, with only one third of the dose I had utilized. But even at that level, the effects were still extremely impressive, and quite fantastic. All doubts about the statements in my report were eliminated.¹⁹

That is, LSD-25 was in this instance both the object of scientific inquiry and the medium for the communication of the results of that inquiry, the translation of a solo experiment into the general equivalent of truth. While Hofman's wife returned from Lausanne upon hearing reports that Albert had had some sort of "breakdown," his fellow scientists willingly and immediately ingested LSD in order to eliminate any doubts fostered by Hofmann's report, a psychedelic republic of letters.

It is as an experiment *on* the self that Hofmann's discoveries are replicated by the community. Only by encountering a veritable undoing of

self—a submission to the possible transformation that one is in fact testing for—can interesting data from this novel pharmacological agent be gathered, evaluated, and transmitted.

4. Informatic prayer

The combination of ineffability common to many mystic traditions and the necessity of communication proper to scientific practice continued to pose problems for the study of hallucinogens as they migrated from Sandoz Pharmaceuticals, where Hofmann worked, to places like the pre-1962 psychology department of Harvard University, the working home of Timothy Leary, Ralph Metzner, Richard Alpert, and Michael Horowitz. Among a parade of intellectuals and artists who moved through Leary's burgeoning circle was writer William S. Burroughs, whose cut-up techniques had been used, a few years earlier, to strip a written text of its meaning—what Burroughs called the virus of the Word—and to allow such texts to interrupt normal consciousness. After a visit with Burroughs, Leary hit upon the idea of using Burroughs's cut-up technique as a framework for reporting the hallucinogenic experience. In this framework, both Burroughs's texts and LSD were experiences one less understood than underwent and, in undergoing them, recorded them. These recordings, as with Hofmann's precise recall of his LSD trip, were not, however, communicative in the usual sense: they could be understood only retroactively, after the subject had himself or herself encountered LSD-25. With the cut-up method, Leary hoped to interrupt the grip of the authorial ego, which might interfere with the more direct recording of the LSD experience. In other words, the LSD experience was treated less as an event to be reported on than an experience to be assayed by writing: the cut-up was a symptom and not a description of the encounter of LSD. In this sense, the information gathered about LSD was understood less as a semantic production than a pragmatic one: all data concerned not an *understanding* of LSD but instead consisted of testing LSD for what it could *do*. Writing, in this context, becomes less a struggle for intelligibility than a prolix signature of the LSD experience.

Indeed, LSD appears to have provoked a graphomania of sorts among Leary's crowd. By 1962 they had been removed from their positions at Harvard University and were now leading itinerant seminars from Zihuatanejo, Mexico, several islands in the Caribbean, and then finally the

Hitchcock brothers' mansion in Millbrook, New York. The *Psychedelic Review* regularly published the group's prolific work, and in 1963 Leary, Metzner, and Albert prepared a psychedelic "manual" for use in association with LSD. Published early in 1964, *The Psychedelic Experience: A Manual Based on the Tibetan Book of the Dead* was presented as a source of protocols for the management and study of psychedelic sessions. Much of the writing in this and other such "manuals" was oriented less to "understanding" LSD experience than with dealing with it, enduring it. These texts were intended to be part of the very interface of psychedelia, algorithms for attaining and prolonging particular states: "One may want to pre-record selected passages and simply flick on the recorder when desired. The aim of these instruction texts is always to lead the voyager back to the original First Bardo transcendence and to help maintain that as long as possible."²⁰ These recipes and techniques for ecstasy were repeatedly and explicitly linked by Leary to the writing and execution of a sequence of steps in a computer environment, programming.

A third use would be to construct a "program" for a session using passages from the text. The aim would be to lead the voyager to one of the visions deliberately, or through a sequence of visions: "One can envision a high art of programming psychedelic sessions, in which symbolic manipulations and presentations would lead the voyager through ecstatic visionary Bead Games."²¹ In this framework, hallucinogenic subjects become both authors of and platforms for "symbolic manipulations and presentations," interactive wetware of infinite experiment and transformation. In the preface to a later work, *Psychedelic Prayers and Other Meditations*, Leary would write that "'The Psychedelic Experience' was our first attempt at session programming" (37).

Crucial to this vision was that the function of information here was to "program." Less an activity of understanding or even communication than of repetition and transformation, these programs had to be endured. Indeed, the writings "based" on the *Book of the Dead* were often not understandable or recognizable until, like Hofmann's colleagues, one had oneself undergone the encounter with LSD:

The most important use of this manual is for preparatory reading. Having read the Tibetan Manual, one can immediately recognize symptoms and experiences which might otherwise be terrifying, only because of lack of understanding as to what was happening. Recognition is the key word.²²

Thus the *Tibetan Book of the Dead* was treated as a source book not to be decoded as much as deployed, deterritorialized, and disseminated in divergent contexts, used more than understood.

Leary made this pragmatic understanding of language (which, for Leary, was indistinguishable from information) even clearer in *Psychedelic Prayers*, his 1966 “translation” of the Tao Te Ching, which Leary called a “time tested psychedelic manual”:

like all great biblical texts (sic), the Tao has been rewritten and re-interpreted in every century and this is how it should be. The terms for Tao change in each century. In our times, Einstein rephrases it, quantum theory revises it, the geneticists *translate* it in terms of DNA and RNA, but the message is the same.(37)

Translation, for Leary, is both universally available—“the message is the same”—and utterly variable and reliant upon context, what Leary will refer to as “set and setting” for the LSD experience but that can be extended to his own work of translation as well: “these translations from English to psychedelese were made while sitting under a bamboo tree on a grassy slope of the Kumoan Hills overlooking the snow peaks of the Himalayas” (38). Like the drugs and plants with which they are to be used, psychedelic manuals are catalysts for transcendent experiences, “or can be, given the appropriate preparation, attitude, and context,” the “set and setting” in Leary’s felicitous phrase (10). Crucial to this facility for novel set and settings is not, strictly speaking, its universal message, but rather its capacity to be translated and travel into novel contexts: “The advice given by the smiling philosophers of China to their emperor can be applied to how to run your home, your office, and how to conduct a psychedelic session” (10). Note here that the psychedelic manual is not concerned with the communication or an elucidation of a meaning, although it also does so. Rather, the text is seen as a how-to tool for managing and transforming diverse contexts with the help of exotic and yet thoroughly debugged techniques.²³ Its translation is less the production of an equivalent meaning than the “porting” of code to a different platform: “It became apparent that, in order to run exploratory sessions, manuals and programs were necessary to guide subjects through transcendental experiences with a minimum of fear and confusion” (*Prayers*, 36). This lack of interest in the semantic operation of such manuals is itself pragmatic: reportage continually fails, even while context is itself a powerful constituent of the psychedelic experience. The

incommunicability of the psychedelic experience was taken to be a measure of the complexity of human consciousness as well as the insufficiency of most concepts to it: "No current philosophic or scientific theory was broad enough to handle the potential of a 13 billion-cell computer" (36).

As "prayers," Leary's translations also remind the reader of the active rhetorical register involved in the LSD context: Prayers, above all, demand prayer. For Leary, their effects emerge out of their very utterance, a whispered utterance that needs to be said more than heard: "they should be read *very* slowly and in a serene voice. They should be considered prayers to be whispered" (33). Ideally, then, these rhetorics should approach pure action. Only a trace of the utterance will persist, a whispered scar of language's ecstatic embodiment.

The prayer program was divided by Leary into six parts, and the very center of the sequence is occupied by a twelve-part sutra entitled "Homage to DNA." Here Leary, "translating" and transforming the *Tibetan Book of the Dead* into epideictic praise of the book of life, instructs the reader/tripper to "contact cellular consciousness" (which, according to the Nietzschean rubric above, is not "consciousness" but "life") via the utterance of these meditations. The first, "The Serpent Coil of DNA," invokes the old and now-familiar image of the ouroboros, a figure also used by Waddington in his discussion of feedback: "we meet it everywhere, but we do not see its front . . . When we embrace this ancient serpent coil, we are masters of the moment, and feel no break in the curling back to primeval beginnings. This may be called Unravelling the clue of the life process" (67). Rather than containing a "message," DNA is hailed as a molecule of ceaseless activity whose very embrace leads to an unraveling or, to translate, undoing. But even as a master of the moment, this "undoing" reveals no central wisdom other than this: our implication in an ancient coil of repetition without beginning or end. Thus, rather than triumph, Leary's doggerel suggests an affirmation of primeval complicity, a complicity owed to the very self-replicating ouroboros of DNA and, perhaps, a complicity with LSD and the prayer itself. The universal message alluded to by Leary is none other than repetition itself.

Contrasted with the molecular biology of the same period—the transmitter of the rhetorics of nucleic acids that were the set and setting of hallucinogenic knowledge—research into psychedelics, both in the lab and the commune, were strikingly pragmatic in their understanding of information. Both Hofmann and Leary wrote of the need for endurance, a practice that would enable repetition within and beyond the hallucinogenic

experience even while the very assay of the experience, the self, was becoming variable and even breaking down. Indeed, it was the practice of repetition itself that seemed to emerge as crucial to the acquisition and transmission of hallucinogenic knowledges. For Leary and the programmers of psychedelic practice, sessions were sequences of information to be actualized differentially. No two sessions could be enacted in precisely the same fashion, precisely because of the transformative effects of LSD and its teachings, repetitive teachings of undoing: “Unravelling the clue of the life process.” While molecular biology continued to write and talk of decoding the book of life and practicing a hermeneutics of DNA, hallucinogenic discourse suggested that information was less a phenomenon to be understood than a potent mutagen of human experience, mutagens that could be understood only retroactively.

5. Highway 128, revisited

If I had not taken LSD ever would I have still been in PCR? I don’t know, I doubt it, I seriously doubt it.

—Kary Mullis

In his 1998 autobiography *Dancing Naked in the Mind Field*, Nobel Prize winner Kary Mullis details his invention of Polymerase Chain Reaction or PCR. While both the topic (the invention of a veritable Xerox machine for nucleic acids) and the genre (scientific autobiography with a hint of scandal, the promise of a forbidden, “naked” truth) encourage the telling of a heroic tale of innovation, Mullis’s narrative continually highlights the thoroughly contingent and ungovernable arrival of a concept. Far from simply inflating the role of a lone scientist struggling to know life and the cosmos, *Dancing Naked* offers a testimony to the thoroughly other, even alien, character of a scientific vision.²⁴

By every account, Mullis was himself an unpredictable creature. A biochemist by training, his most important publication in graduate school treated time reversal and its cosmological implications. In love with the craft of producing new compounds in a more and more efficient fashion, Mullis was every bit as much tinkerer as theorist. This tinkering extended to his own consciousness. Like many of his UC Berkeley chemistry colleagues, Mullis considered the potent new hallucinogens to be experimen-

tal objects as real and interesting as any other in their practice. Indeed, after one particularly difficult episode of incorrect dosage, he underwent an entire personality change: overtaken by amnesia, he had the inarticulable sense that indeed he had become someone else as a result of the encounter.

Nor was Berkeley Mullis's sole linkage to hallucinogens. During the period of PCR's emergence as a concept, he visited with Albert Hofmann at the house of his friend Ron Cook. Indeed, Mullis later compares Hofmann's three-lettered discovery with his own:

The famous chemist Albert Hofmann was at Ron's that night. He had invented LSD in 1943. At the time he didn't realize what he had done. It only slowly dawned on him. And then things worked their way over the years as no one would have predicted, or could have controlled by forethought and reason. Kind of like PCR. (11)

This conjunction of LSD and DNA is of course strikingly resonant with Leary's treatment of both above: for Mullis, the main connection between the two was contingency itself, a practice "no one would have predicted, or could have controlled by forethought and reason." Only the unfolding of events allows for a retroactive ascription of narrative and reason. No description of the events could have been compressed into anything shorter than the events themselves. In short, the practice of translating LSD and PCR into respectively technoscientific objects involved nothing less than the transformation of knowledge without precedent, a non sequitur not available to prophecy. There appeared to be no shortcut to either, with only the narrative of accident and coincidence making retroactive sense of the event. Unforeseeable, the effect of both could only be endured, responded to like the surfer Mullis is.

But Mullis himself goes further in his account of the connection between PCR and LSD. Retaining the contingency of the concept, he nonetheless credits his experience with LSD with a certain capacity for the sheer strangeness of the idea of PCR. In a British Broadcasting Corporation interview, he hesitantly ascribed a paradoxical agency to LSD in the invention of PCR:

PCR's another place where I was down there with the molecules when I discovered it and I wasn't stoned on LSD, but my mind by then had learned how to get down there. I could sit on a DNA molecule and watch the go by (sic) and I didn't feel dumb about that, I felt I could, I mean that's just the way I think is I put myself in all different kind of spots and I've learned that partially I would think, and this is again my opinion, through psychedelic drugs.

If you have to think of bizarre things PCR was a bizarre thing. It changed an entire generation of molecular biologists in terms of how they thought about DNA.²⁵

Mullis's idea was a remarkably simple one. Indeed, in his cabin off of Highway 128 in Mendocino County, California, the idea struck him as far too simple to be workable: "If the cyclic reactions that by now were symbolized in various ways all over the cabin really worked, why had I never heard of them being used? . . . Why wouldn't these reactions work?" (8–9). Key to Mullis's understanding was the cyclic or iterative character of DNA itself. Unlike many earlier molecular biologists who had sought the "meaning" of the genetic code, Mullis sought only to replicate enormous quantities of any given sequence. Mullis writes that because of his knowledge of computer programming, "I understood the power of a reiterative mathematical procedure" (8–9).

It is precisely as an iteration machine that Mullis treats DNA. While H. G. Khorana and his team had provided the foundation for PCR as early as 1965, they did so within a cryptographic paradigm of discovering the nature and meaning of the genetic code. Francis Crick, writing the lead article for a volume devoted to the triumph of the newly decrypted code, declared that the "historic occasion" was the understanding of the four-letter alphabet of ATCG and its triplet combinations that produce the twenty amino acids, which in turn fold up into proteins: "From all of this we were able to work out the *meaning* of several of the remaining doubtful triplets" (3–9). An article by Khorana, et al. appears thirty-six pages later in the volume, and it is clear from its frame and content that above all Khorana's group sought understanding and even proof: "It was therefore clearly desirable to try to *prove* the total structure of the genetic code by this method" (39). As Paul Rabinow points out in *Making PCR*, the problem of generating DNA sequences was solved by cloning methods, so Khorana's group left the techniques they had discovered for another decade and perspective.

While Rabinow writes that Mullis's approach was the "opposite" of Khorana's, it is perhaps more helpful to notice that each had a fundamentally different understanding of information. For Khorana, the genetic code was a space of revelation: the production of a gene was in the service of an understanding of the entire genetic code, an understanding attentive to the rhetorical and epistemological genres of a logical proof. By contrast, Mullis sought less to understand DNA—for that, after all, was accomplished—than to transform it. It is through this pragmatic understanding of genetic

information that PCR emerged. Consider, for example, Mullis's account of the PCR process:

If I could arrange for a short synthetic piece of DNA to find a particular sequence and then start a process whereby that sequence would reproduce itself over and over, then I would be close to solving the problem . . . The concept was not out of the question because in fact one of the natural functions of DNA molecules is to reproduce themselves. (6)

This treatment of DNA as an ourborous, not unlike that of Leary's, looked to the pragmatic capacities of nucleic acids: the natural capacity to replicate. And while Rabinow, perhaps in an understandable anxiety to avoid a heroic vision of scientific innovation, distances his own account of PCR from Mullis's, he perhaps overlooks the fact that Mullis was not hero but host, as his instantiation of iterative, pragmatic understanding of information replicated not just DNA but psychedelic culture itself, as the notion of "expansion" and decontextualization that dislocated consciousness in the 1960s now deterritorialized life, allowing it to become just another sample. Where to begin on the effects of such a deterritorialization or "expansion" of life? Perhaps one must begin with replication. And if any molecule was replicated, perhaps that molecule was LSDNA.

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Notes

1. The replicative logic of information, for example, warrants the utopian ideals of uploaders such as physicist Frank Tipler. In *The Physics of Immortality*, uploading becomes an instantiation of nothing less than resurrection itself: eternal life through replicating uploads. Alien abductees encounter this allegedly redemptive necessity of replication with some horror: the capacity to sample and replicate DNA becomes less the hallmark of immortality than the terrifying sign of alien hybridization. For more on the diverse and differentiated responses to becoming-information, see Doyle.

2. For a good summary of this complex historical dynamic, see the short piece by the University of Sheffield Department of Computer Science (<http://www.dcs.shef.ac.uk/~u7ss/enigma1.html>). A longer and more detailed account can be found in Andrew Hodges's remarkable book, *Alan Turing: The Enigma*.

3. <http://www.cwu.edu/~millerj/nietzsche/bge2.html>

4. This contingency associated with laughter can perhaps be best exemplified by the following scenario of Armageddon: Asteroid hits earth, producing enormous quantities of nitrous oxide, or laughing gas: death by laughter. The willy-nilly itinerary of an asteroid is a potent producer of laughter indeed, although it is perhaps not as comic as current schemes for using missiles to defend the Earth from such alien projectiles, what will be henceforth known as "gasteroids."

5. Of course, the "code script" and its subsequent rhetorical transformations of code, program, and network were all elements of a system to *do* something: uncover the mysteries

of life or, as Francois Jacob put it, “to triumph over death.” In this sense, the emphasis on the replication activity of DNA rather than its communicative capacities is the return of the repressed of Schrodinger’s machinic, and ultimately cryptographic, rendering of life.

6. This citation of Hofmann’s text can be found online at http://www.flashback.se/archive/my_problem_child/chapter1.html. I name additional sites below for the sake of redundancy: if one site is down, another copy of the text can be used as a backup.

7. Ibid.

8. <http://www.chamisamesa.net/lsd.html>

9. In his own retroactive testimony on this notion that LSD-25 was itself in some ways “unprecedented” or the “most potent,” particularly when it comes to creating the topological distinction between inside and outside, Hofmann noted: “There was to my knowledge no other known substance that evoked such profound psychic effects in such extremely low doses, that caused such dramatic changes in human consciousness and our experience of the inner and outer world.”

10. <http://www.druglibrary.org/schaffer/lsd/child1.htm>

11. It is not the case, for example, that Hofmann had no options: as his own account details, many more ways of fathoming LSD-25’s effects were available, including the animal testing alluded to earlier.

12. <http://www.chamisamesa.net/lsd.html>

13. The question of caution is an interesting one here, seemingly oxymoronic to any notion of self-experiment, as the very status of the self is at stake. Hofmann writes that during the terrifying peaks of his hallucinogenic panic, he worried over the possibility of ever communicating to his family the fact of LSD-25’s unforeseeable effects. This retroactive recognition of Hofmann’s highlights the true experimental conclusion of his work: that there is no preparation, decided or otherwise, for the encounter with qualitative difference of LSD-25: “Would they ever understand that I had not experimented thoughtlessly, irresponsibly, but rather with the utmost caution, and that such a result was in no way foreseeable? My fear and despair intensified, not only because a young family should lose its father, but also because I dreaded leaving my chemical research work, which meant so much to me, unfinished in the midst of fruitful, promising development. Another reflection took shape, an idea full of bitter irony: if I was forced to leave this world prematurely, it was because of Lysergic acid diethylamide that I myself had brought into the world.”

14. http://www.chm.bris.ac.uk/motm/lsd/lsd1_text.htm

15. http://www.netSPACE.org/~rabyd/lsd/Baden_II.html

16. http://www.acidmagic.com/books/problem_child.html

17. Indeed, in some sense Hofmann is both recorder and recording here, as he must respond exegetically to the demands of memory.

18. http://www.lycaeum.org/books/books/my_problem_child/chapter1.html

19. <http://www.a1b2c3.com/drugs/lsd01.htm>

20. See Leary, Metzner, and Alpert, *The Psychedelic Experience*, on-line.

21. Ibid.

22. Ibid.

23. William Burroughs treats language as the substrate for such a recipe, such as this recipe for becoming contained in Burroughs’s “atrophied preface to *Naked Lunch*: “*Naked Lunch* is a blueprint, a How-to Book” (203).

24. Indeed, Mullis writes explicitly of an encounter with an alien presence in Mendocino County, California.

25. See British Broadcasting Corporation, “‘Psychedelic Science’ Programme Notes,” on-line.

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