Encoding an Infinite Message:

Richard Powers's The Gold Bug Variations

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Bronowski has defined science as "nothing else than the search to discover unity in the wild variety of nature...."[1] This is perhaps the culmination of a belief whose origin G. S. Rousseau locates in the seventeenth century:[2]

> Nature herself was finite....not an infinite body of knowledge that man could never hope to understand....rather codified in a vast but nevertheless finite set of laws and relationships that would gradually be revealed to man if he persisted.

According to this view the diversity and complexity of the world are to be mastered, confined, and simplified, certainly not emphasized or celebrated.

The central message of Richard Powers' third novel, The Gold Bug Variations, is that this conception looks from exactly the wrong direction. The wondrous thing about the world is not that "the wild variety of nature" may be encompassed by a finite set of laws, but rather that such a

limited basis set can generate infinite variety. The message is eventually understood by Stuart Ressler, a young biological researcher caught up in the race to break the genetic code in the 1950's, and is misread, in various ways, by most of the other characters; these comprise the main themes of the text's narrative. More strikingly, though, the message is not only presented by the text but structurally embedded within it, as Powers has constructed out of his limited basis set an echo of systems that can generate infinite possibility. The crucial structural element in this construction, as foreshadowed by the title, is code.[3]

In order to see how a message portraying infinity may be encoded, it is essential to distinguish two different functions of code. The more familiar is the simpler: substitution. This function is well represented in Poe's story The Gold Bug, where a cipher has the sole function of concealing a set of instructions, which are usable only after reconversion to clear text. A good description of this aspect of code is provided by Hofstadter: "...decoding mechanisms...do not add any meaning to the signs or objects which they take as input; they merely reveal the intrinsic meaning of those signs or objects."[4] Code in this sense has no productive power: there is a one-to-one correspondence between the coded message and its deciphered meaning.

A second and more important function of code may be seen in three of the novel's major motifs. Two of these are the genetic code, the set of rules whereby genetic information stored in DNA is translated into protein synthesis in the cell; and computer programming, where code refers to the set of instructions that the programmer actually writes. In programming, the aspect of substitution is still present in some sense: the code, in whatever programming language used, must be converted into machine language. However, the main function of code is not substitution but rather generation: the code is a set of instructions that brings about actions. It does not merely produce another version of itself; rather it produces the intended output of the computer program.

The distinction is even more obvious with respect to the genetic code. One can distinguish between the set of rules of correspondence between a specific triplet of bases and a specific amino acid (translation) and the synthesis of an enzyme from information coded in a sequence of DNA (expression).[5] In the substitutional sense, the coded message — a list of the nucleotide bases that make up a gene — yields upon decoding just another list, that of amino acids that make up a protein. In the generative sense, though, the result of decoding the genetic message is the living organism! There is thus a multiplicative

aspect of code and decoding that takes us far beyond any one-to-one correspondence: the near-infinite complexity and infinite variability of life is generated from the relatively simple set of molecules and rules that comprise the genetic code.

The third coding motif is Bach's Goldberg Variations. Although the connection with code is not at first obvious, Powers presents it as another manifestation of code as generator. The Goldberg Variations are based upon a simple bass line, only 32 notes long, that functions as the "[thematic germ] on which the entire piece is built."[6] The variations "are all obedient, first-filial offspring of the same parent; while different phenotypes, they carry the same underwriting code." (582). Most significantly, the work illustrates how such a generating code can imply, if not actually produce, infinity:

> The canons proceed beyond the octave, start all over again at the ninth, as if to suggest, "We could do this for eons." The Goldbergs threaten to expand the modest four-note germ of the thirty-two note Base to the scale of infinite invention, a perpetual calendar. (583)

Since we are dealing here with a literary, not a scientific work, we need to consider yet another possible

coding motif: the function of language as code. Is language a code? Two authorities appear to be in explicit disagreement on this question. A character in a rather different sort of novel proclaims: "To understand a message is to decode it. Language is a code. But every decoding is another encoding."[7] Lacan, on the other hand, argues: "[Le langage] n'est pas un code, il est essentiellement ambigu....[les codes] en principe évitent les ambiguïtés...."[8] In fact this disagreement is not about the nature of language. Lacan's statement: "la signification ne renvoie jamais qu'à elle-même, c'est-à-dire à une autre signification."[9] is in perfect agreement with Morris Zapp's italicized conclusion above.

Instead, Lacan's belief that language is not a code stems from implicitly restricting code to its simplest level. Discussing computer programming, he claims "rien ne sort de la machine que ce que nous en attendons....Elle s'arrête au point où nous avons fixé qu'elle s'arrêterait...."[10] As we see in The Gold Bug Variations (and as anyone who has dabbled in programming knows well), once a program reaches even a modest level of complexity it is all too easy to get something unexpected. The same is true for the other coding motifs in Powers's book: "the music is about how variation might ultimately free itself from the instruction that underwrites, but nowhere

anticipates what might come from experience's trial run." (585); and: "The young scientist left in this gaunt body was himself a product of the code he'd been after, the code that couldn't keep itself hidden from itself." (113). In the generative sense that Powers emphasizes, code exhibits the same ambiguity and potential to produce unexpected meaning that Lacan attributes to language.

To clarify further the connections between language and code, we may consider Black's "substitution view of metaphor" according to which "Understanding a metaphor is like deciphering a code or unraveling a riddle."[11] This view appears analogous to Hofstadter's description of code cited earlier: a one-to-one mapping, a static device with no power to expand the scope of meaning. Black rejects this in favor of an "interaction view of metaphor" and quotes Samuel Johnson: "As to metaphorical expression, that is a great excellence in style, when it is used with propriety, for it gives you two ideas for one."[12] Here language is a many-to-one mapping which has operational aspects: it produces new meaning rather than simply substituting one meaning for another, in parallel with the generative functions of code discussed above. Lacan agrees: "Toute espèce d'emploi, en un certain sens, l'est toujours, métaphorique....La compairaison n'est qu'un développement secondaire de la première émergence à l'être du rapport

métaphorique, qui est infiniment [my emphasis] plus riche que tout ce que je peux sur l'instant élucider."[13]

This is clearly a key point: if one wants to represent the generation of infinite variability within the limits of a necessarily finite book, one should take all possible advantage of the multiplicative power of language-as-code. Powers explicitly addresses this issue in each of his two earlier works. The passage: "A map of one inch to the inch, which cannot be spread without covering the countryside, shows nothing that the place itself does not show as well"[14] emphasizes the one-to-one vs. many-to-one mapping metaphor. In Prisoner's Dilemma, we have the image of a time capsule that is intended to show the future everything about the current world: "fitting all America into the tube would take a tube the size of all America. But thanks to the recent invention of microfilm, we can fit into this space the blueprint for something far larger."[15] Both of these images reappear in The Gold Bug Variations; the first is discussed at some length (88), while the second is merely mentioned (168).

Two aspects of Powers's use of language in this sense — to expand the scope of his text far beyond its physical confines — merit more detailed consideration. The first is the pervasive use of puns. One reviewer has complained

that the punning is excessive and serves merely as a display of virtuosity.[16] Unquestionably there is more than a trace of showmanship in examples such as "Anyone can have tea for two, but it takes phage to make T4 tumor" (256) or the Marxist[17] exchange: "I can at least conceive of an oncogene." "I had an Onco Gene, once." "I remember him! Your Onco Gene and your Anti Body" (451). However, this misses a key point: what is a pun, after all, but a one-to-two (or more) mapping of words onto things signified? A pun such as "Cracking the code is just the tip of the Goldberg" (369) summons up the image, applicable to icebergs and the Goldberg Variations as well as the coding problem, of vast depths only hinted at by the obvious, visible portion.

Allusion is an even more efficient method of generating multiple meaning. One example is both allusion and pun: "a man's speech should exceed his lapse, else what's a meta for?" (517). The pun, the original quotation on which it is based ("Ah, but a man's reach should exceed his grasp/or what's a heaven for?"), and perhaps even the poem from which it is taken (Browning's Andrea del Sarto; another early 16th century painter is a recurring figure in The Gold Bug Variations) all offer commentary on the text. To borrow from the computer programming motif, allusion is equivalent to calling a subroutine: the author/programmer

has only to name (or quote part of) a work to bring the whole into his text.

Powers utilizes this device extensively. There is a key relationship between Ressler and Margaret, the seven-year-old daughter of a research colleague; at each of their two encounters the child recites a poem. In neither case is the entire poem printed, nor are title or author identified — but it is just the left-out parts that are the most crucial. The first ("Margaret, are you grieving/Over Goldengrove unleaving?") (176) is "Spring and Fall" by Gerard Manley Hopkins; the title refers to the important role of the calendar and seasonal changes throughout the book (vide infra), while the uncited last line ("It is Margaret you mourn for") is explicitly paraphrased, but not until nearly 400 pages further on (552). Similarly, only parts of the first two verses of the second poem, by Yeats ("When you are old and grey and full of sleep"), are quoted initially (276); another line ("One man loved the pilgrim soul in you") is voiced by a different lover near the very end of the book (634); while the last few lines of the poem ("...how Love fled,/And paced upon the mountains overhead/And hid his face amid a crowd of stars."), which appear the most relevant to Ressler's story, remain uncited (except for a fragment in passing (583)) and implicit.

Of course, these allusions are accessible only to the reader who is familiar with or takes the trouble to look up the originals. Powers's fondness for messages that take the form of puzzles is evident: one line from The Merchant of Venice is given in hexadecimal ASCII (437), while Beethoven's 9th is coded numerically (572). A description of the Goldberg Variations as "slip[ping] inconceivably downstream from the peaceful thematic trickle of its source Brook" (461) only has full significance to those who know that the (helpfully) capitalized word is a translation of Bach. The effectiveness of this technique lies in forcing the active participation of the reader, so that all the associations that arise during the decoding process are brought into play along with the coded and decoded messages. The reader must function as central processing unit in these subroutine calls.

An even more elaborate example runs through the text: Ressler is introduced to the Goldberg Variations by way of "a two-year-old recording ... in a debut performance by a ... Canadian" (156). The latter is, of course, Glenn Gould, who is frequently referred to but, again, is never explicitly named. There are several parallels between the careers of the real Gould and the fictional Ressler: born in the same year (1932); preferences for solitary and nocturnal lifestyles; premature deaths at about the same

age; and most notably, their withdrawals from public life at the height of their abilities.[18] Readers familiar with patent literature may find this reminiscent of a common phrase: "The entire content of [an earlier patent] is incorporated herein by reference." Here we have an entire character, whose story may help to understand Ressler's actions and motivations, incorporated by reference. Like the previous examples, this is a most economical device for keeping a book dealing with the infinite short of infinite length.

Beyond these individual examples, the text is constructed upon and unified by structural metaphors. Close parallels between the three coding motifs — the genetic code, the Goldberg Variations, computer programming — are repeatedly drawn, so that finally each may be understood to encode for each other. The following are just a few of many examples. The Goldberg Variations are "Ressler's best metaphor for the living gene" (579), where "in every canon....Two copies twist about each other with helical precision." (580).[19] An attempt to give a co-worker a bonus by manipulating a program, which goes disastrously awry, can also be read as a cautionary tale about the potential pitfalls of genetic engineering — a reading reinforced by the chapter subheading in which the attempt is described: "Trace Mutagen" (458). Ressler, asked why he

gave up science, denies that he ever did, and produces a batch of his musical compositions as proof. When further asked if any of the pieces have been performed he replies, referring to the programming foray he is about to launch to recover from the above disaster, "Opus One debuts tomorrow." (609-11). Other parallels — philosophical, numerological — abound throughout.

This equivalence principle may next be seen to extend to the entire text itself. The strongest connections are made between the structure of the text and the Goldberg Variations. On the most obvious level, the book is organized into 30 chapters, with an introductory poem titled "Aria" and a brief closing "Aria Da Capo e Fine," just as the Bach piece consists of an aria, 30 variations, and a recapitulation of the aria. Only in a few instances are there specific parallels between the contents of a chapter and the corresponding variation. Chapter 25 deals mostly with "Disaster;" Gould's recorded performance of variation 25 depicts, not the drama of a disaster itself but rather the ensuing anguish, as vividly as any musical piece written before or since. Variation 30 is a "Quodlibet," based on popular tunes of Bach's time; one of them is a song whose first line is: "I've been away from you for so long." The Quodlibet immediately precedes the return of the Aria, which has not been heard since the

beginning of the piece. Chapter 30 features the reuniting of two lovers who have been separated for a long time, brought about when the Quodlibet is sounded on a bank Automatic Teller Machine.

However, the major structural link between book and Bach is much more subtle than any facile parallel between literary and musical events. The narrative is presented in a literary analog of the form that Bach employs for 9 of the 30 variations. Every third variation, starting with number 3, is a canon, wherein a melodic line or voice is accompanied by itself, with the start of the second voice delayed by one-half, one or two measures with respect to the first. In most cases the voices are exactly parallel, but in two (variations 12 and 15) the second voice is in inversion — all intervals are the opposite (up instead of down) from the first. A third voice, present in all but the last canon, does not imitate the first two but serves to unify them.

The Gold Bug Variations similarly has three narrative lines. The first begins with Ressler's arrival at the University of Illinois in 1957 to join a team working on deciphering the genetic code. Ressler becomes triply obsessed: with his project; with a married member of the team, Jeanette Koss; and with music, specifically the

Goldberg Variations, after he receives a recording as a present from Koss. He develops a promising approach to the scientific problem (alone among his colleagues), and at the same time, believes that Koss will leave her husband for him. However, on the brink of success, Ressler discovers that Koss will remain with her husband and leave the project. He abandons the project and disappears from public view.

The second line starts with the meeting between Jan O'Deigh, a reference librarian in Brooklyn, and Franklin Todd, Ressler's coworker in a computer data processing firm, in 1983. They are fascinated with Ressler and seek to understand his past; at the same time, they become lovers. The couple breaks up; Todd and Ressler are fired when their manipulation of the computer system comes to light, and both leave New York; O'Deigh is left to her library. Line three is triggered when O'Deigh receives a message from Todd, that Ressler has just died. She quits her job and spends the ensuing year studying genetics, retracing Ressler's path to understanding. Todd comes back to her.

The connection between these plot lines and Bach's canonic structure centers on the two love stories, which are highly if not perfectly imitative. In both cases the

woman, aged about 30, who already has a mate, meets and is attracted to a man, about 25. The new couples progress very gradually, especially on the physical side, towards new and apparently stable relationships; but both founder, ultimately because of the woman's infertility. Some of the parallels between the lines are inverted, just as in two of the canons. Koss desperately wants children but is sterile; O'Deigh is afraid to have children and has had herself sterilized. Koss leaves Ressler to return to her husband, and never sees Ressler again; O'Deigh does not return to her former lover, and eventually gets back together with Todd.

Thus there are two imitative narrative lines, and a third (O'Deigh's year alone) that serves as unifier. How are they organized to give a canon-like structure? One could imagine a quite literal canonic form, with the three lines printed one underneath another as in a musical score; but that would merely be annoying: readers are not equipped to take in several lines of text simultaneously as musical listeners can.[20] Instead, Powers frames the narrative lines within the calendar, which is another key structural element of the text. All three lines start around the same date, just after the beginning of summer. In fact, O'Deigh's meeting with Todd, which initiates line 2; her learning of Ressler's death, which starts line 3; and her

reuniting with Todd, which terminates the narrative, all take place on exactly the same date, June 23. All three lines run for approximately one year. However, besides the quarter-century separation in time, there is a consistent temporal displacement within the year, in many of the key marker events that define the parallel nature of lines 1 and 2. These events — first meeting, first date, first kiss, first consummation, separation — all take place on dates around two months earlier for O'Deigh and Todd than for Koss and Ressler. Presenting the narrative as a time line (Figure), with one year displayed above the other, we see the two love stories running parallel but with one shifted two months later, just as the musical score of a canon shows two parallel lines with one starting a measure or so later. Thus Powers exploits the structure that Bach employs for every third variation, but on a much larger scale: not for the individual chapters that correspond to the canonic variations, but for the construction of the entire narrative.

Other musical devices are used as well. Most chapters consist of several subchapters, which mark shifts from one plot line to another. Chapter 22, in contrast, contains but a single sub-heading ("Alla Breve," the marking of the 22nd Goldberg Variation), within which rapid alternation between the three lines takes place. This is the verbal

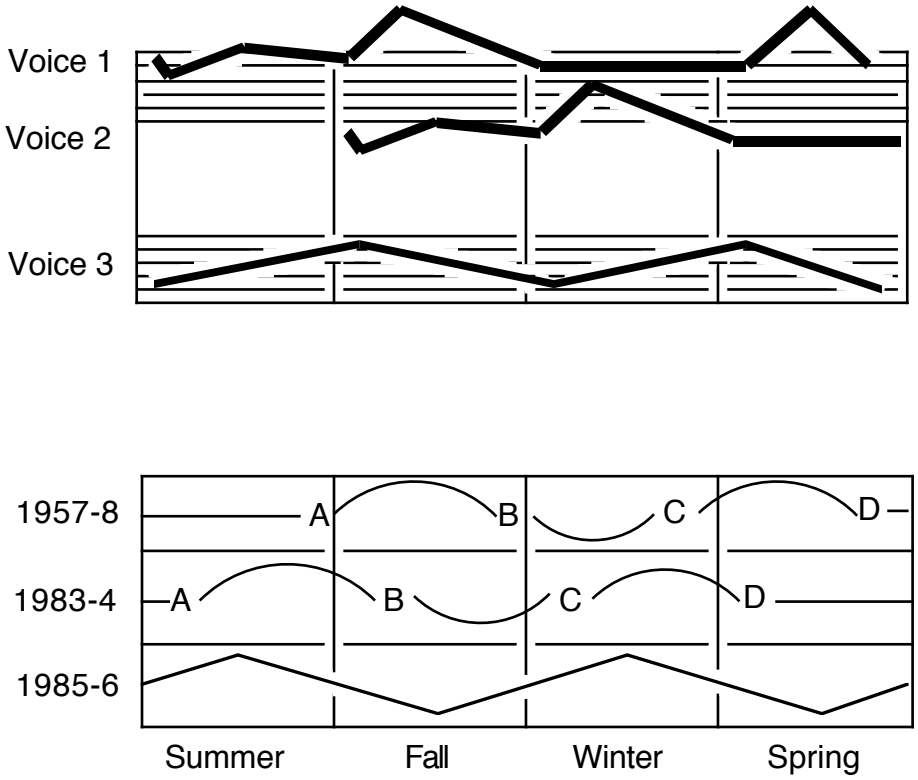

Figure. Top: Schematic representation of a canon from the Goldberg Variations. Voice 2 imitates voice 1; voice 3 is independent. Bottom: Time line representation of the three narrative lines in The Gold Bug Variations. The parallel events in the love stories are represented by letters (A = first date; B = first kiss; C = first consummation; D = breakup). Some of the dates are not given precisely in the text, and may be off by a few weeks in either direction.

equivalent of a stretto, a fugal device where the musical voices follow one another at shorter temporal intervals than the previously established pattern. Conversely, in each of chapters 13 and 14 the subchapters remain within the same narrative line, producing the opposite effect (the musical term is augmentation).

Connections between the narrative and the other coding motifs are far less elaborate, though present. The Aria relates the love stories to the structure of DNA: "two couples at arm's length of thirty years bend/in ascending spiral dance around each other" (8), while chapter 19 shows how the narrative can be encoded in the form of a computer program. It really is unnecessary to do any more, though: since the parallels between the motifs are established, connecting the narrative to one of them serves to connect all. Powers has carried metaphor almost to the point of mathematical argument: things equal to the same thing are equal to each other.

One last connection is required: to establish all of human existence as yet another, parallel, infinite coding motif. The key to this connection is the perpetual calendar, which is a recurring theme: it appears as the subheading for the initial Aria (7) as well as in later chapters (164, 265, 626). Like the genetic code, it is a

remarkably simple system, "a model of informational economy" (265). But the limited number of possible arrangements of the coding elements — 14 counting leap years — nonetheless generates all possible years and, by implication, everything that has happened, or can happen, during those years. The calendar is tied to the text as well, as has already been described: not only are the narrative lines framed by calendar dates, but their termini correspond closely to seasonal changes. "Everything that ever happened happens at equinox." (168). (The significance of the poem "Spring and Fall" is thus strongly reinforced.) Like all codes, the calendar is subject to misreading: O'Deigh is led to a major misinterpretation of Todd's character by incorrectly taking 12/6/85 to mean December 6, rather than June 12 (473); the subheading here is "Transposon". Even mutations are possible, as illustrated by the adoption of the Gregorian calendar — an event whose importance is underscored when librarian O'Deigh selects it for her "Today in History" display (149).

As with all the other coding motifs, the distinction between the simple, repetitive generating principle and its richly varied product is clearly drawn. O'Deigh asks "February repeats; so does the 3rd: why not the year as well?" (428). Powers replies by demonstrating, over and

over, that in a world of infinite possibility, going back and repeating is the equivalent of dying. Ressler tells O'Deigh that he is returning to Illinois to join a new research project; but it is a cancer study that he is joining as subject, not scientist (624). Later, Todd repeats a story Ressler told him, dating from just before their meeting:[21]

> "... he turns the radio on.... It's the Canadian kid....Playing the piece that woman gave him....he's shocked to hear that it's not the same piece, not the same performance. It's a radical rethinking....He can't believe his luck at getting a new recording. But...the announcer reports that the pianist has suffered a massive cerebral hemorrhage just after releasing this take two." (636-7)

The last "chapter" of the book runs in its entirety: "Aria Da Capo e Fine. What could be simpler? In rough translation: Once more with feeling." (639). The phrase "what could be simpler?" does indeed repeat the beginning of the book. However, the last phrase must be read as irony: the title, which concludes Bach's work, is properly translated "aria from the beginning and end. The one apparent exception to the pattern is the event that immediately precedes the end, when O'Deigh and Todd resume

their relationship. Even if an occasional return is possible, though, stasis is not: when O'Deigh says the relationship would not last because of her sterility, Todd replies:

> "And let me ask you another thing." One for the perpetual Question Board. His eyes were full beyond measure. His whole throat shook like a beginner's in wonder at the words he was about to discover. "Who said anything about lasting?" (638)

If Life itself is to be taken as a coding motif, then it must encode the same message of infinite possibility as the others. Indeed, the various characters' attempts at reading this message — in most cases, not very successfully — comprise a substantial component of the narrative. One member of Ressler's research group, Lovering, sees himself as a subject of, not a participant in, the universe's great experiment of Life: "'You know what we're going to find out, we researchers? We're going to finally get down to that old secret code in the cell, and the string is going to come out spelling D-U-M-B space S-H-I...'" (548-9). When he kills himself that evening, he takes all the laboratory animals — his colleagues as experimental subjects — along with him. Koss's eulogy makes it

explicit: "Joey lost the signal. Read the message wrong." (551).

Another colleague, Woytowich, walks out on his wife and adored baby daughter because the child appears to be color-blind and he decides, with no other cause for suspicion whatsoever, that she can't be his: "One in several tens of thousands. Which do you think is more likely? A fluke mutation or a woman getting herself plowed?" (564). O'Deigh's error is similar: while doing some research on birth defects for a library user, she becomes so terrified of the possibilities that she has herself sterilized. "The endless catalog of things that can go wrong...had killed me....I had assumed that childbearing was a perfected process with a few tragic accidents impinging on the periphery. I now saw that the error-free lived on a tiny, blessed island of self-delusion." (385). Only much later does she realize "I've misinterpreted...from the start....It's about saying, out loud, everything there is, while it's still sayable. The whole, impossibly complex goldberg invention of speech, wasted on someone who from the first listened only to that string of molecules governing cowardice." (625). Todd is also paralyzed by infinity: he cannot write his dissertation on an obscure Flemish painter because there is always something more to be learned (30). All have

misunderstood the world's message of infinity: with everything being possible, it must be wrong to reject a favorable interpretation even though it appears to be of low probability, or to become paralyzed because of potential risk. As Ressler notes, "once the experiment gets underway, all possible outcomes are already implied" (193).

From a scientific viewpoint, an interesting aspect of this question of reading messages from Life is the possibility of thereby gaining insight into a research problem. Ressler says "We were looking for the right analogy, the right metaphor that would show us how to conduct the next round of experiments." (190). That metaphor may direct science is not by any means a new idea; Bronowski cites Kepler as an illustration:[22]

> Kepler wanted to relate the speeds of the planets to the musical intervals. He tried to fit the five regular solids into their orbits. None of these likenesses worked, and they have been forgotten; yet they have been and they remain the stepping stones of every creative mind. Kepler felt for his laws by way of metaphors, he searched mystically for likenesses with what he knew in every strange corner of nature. And when among these guesses he hit upon his laws, he

> did not think of their numbers as the balancing of a cosmic bank account, but as a revelation of the unity in all nature.

Hesse discusses the role of metaphor in explaining research, if not necessarily inspiring it, by referring specifically to Black's interaction view of metaphor,[23] discussed earlier.

Ressler's research group is divided (as was the real scientific world at the time) between two fundamentally different approaches to solving the genetic code problem. One was cryptographic in nature: by studying recurring patterns and their frequencies of appearance, it would be possible to decipher the message. "Pure pattern-breaking attracted the lion's share of fascination...." (138). Ressler is at first drawn to this approach: "...why dirty one's hands [with experiments] when the problem of pure coding is at stake?" (72) but later comes to realize its futility: "Brute tabulature might work if the underpinning translation were preordained, symmetrical. But there's no guarantee the runaway data enfold formulaic simplicity. In fact, <u>just the reverse</u>." (268; italics mine). This takes us back to the primary message: the focus must be on the infinite variations rather than on the simple pattern that engenders them. "[The Code] is just its working out....a

figure. A metaphor. The Code exists only as the coded metaphor." (271). This understanding leads Ressler to the correct approach: "There had to be ... a way we could get the cell to crack the code for us" (139) and eventually to the design of the successful experimental plan, while most of his colleagues remain mired in dead-end computer-based cipherology.

The final version of Ressler's experiment, which he never carries out, closely resembles the actual work that led to cracking the genetic code. Accounts of the real-world scientists' work, however, do not particularly suggest that they were guided by any such metaphoric understanding. In The Gold Bug Variations, Ressler recognizes the need to let the cell do the decoding, and works towards an in vitro cell-free enzyme synthesis system that could accomplish this. In contrast, in actual event, the in vitro system was developed first; the crucial step in the deciphering process, attributed to Nirenberg, was the recognition that the existing technique could be thus applied.[24] Still, it is interesting to speculate about the degree to which extra-scientific world view has influenced, or may yet influence, the course of scientific progress.

Powers sums up Bach's work: "The Goldbergs are layered all the way from bottom to top and back down again, with

every layer of ordering...contributing to, particularizing, and lost in the next rung of the hierarchy it generates." (583). The same description might be aptly applied to The Gold Bug Variations. The core message – the overriding importance of the infinite arising from the simple – is embedded in every level: in the metaphor-, allusion- and pun-rich language; in the individual coding motifs; in the narrative; and in the structure of the entire text, which shows how each of the above encodes for each other at the same time that it itself encodes all of them. The Gold Bug Variations may be seen as a sort of metacode: a completely integrated structure that both contains and is its coded message of infinity. Slade has proposed that:[25]

> As a master coder, the writer of literature knows how to sort through the barrage of information that assaults us daily, to find the messages that may be most valuable but most elusive, and to encode them anew....To write literature, as the structuralists and their colleagues maintain, is to create a world in a text....with proper coding it is possible to transmit even under noisy conditions a message that is as free from error as the sender cares to make it. That kind of accuracy is a theoretical upper limit, but one any writer can shoot for.

The last sentence suggests a comment Powers cites about the Goldberg Variations: "To compose it, Bach insisted, required only that one work as hard as he did." (586). Whether or not Powers has produced an enduring masterwork, there is little doubt that he followed that prescription.

Notes

[1]. J. Bronowski, Science and Human Values (New York, Harper Torchbooks, 1965), p. 16.

[2]. G. S. Rousseau, "The Discourse(s) of Literature and Science," University of Hartford Studies in Literature 19 (1987): 1-24.

[3]. I use this word in its "natural" sense, if such a thing exists; at any rate, I do not mean to allude to any discipline, such as semiotics, for which "code" has a special significance.

[4]. Douglas R. Hofstadter, Gödel, Escher, Bach: an Eternal Golden Braid (New York: Vintage, 1980), p. 164.

[5]. This is of course severely oversimplified: with both computers and genetics, there are many more than two levels of meaning for the concept of decoding. See, for example Hofstadter, Gödel, Escher, Bach, pp. 290-4, 531-2. For our purposes, however, this limited dichotomy will serve.

[6]. Richard Powers, The Gold Bug Variations (New York: William Morrow & Co., 1991), p. 585. All subsequent references are given by page numbers within the main text.

[7]. David Lodge, Small World (New York: Macmillan, 1984), p. 25.

[8]. Jacques Lacan, Le Séminaire, ed. Jacques-Alain Miller (Paris: Éditions du Seuil, 1978), Book II, p. 322.

[9]. Ibid., Book I, p. 262.

[10]. Ibid., Book II, p. 352.

[11]. Max Black, Models and Metaphors (Ithaca: Cornell University Press, 1962), pp. 31-2.

[12]. Ibid., p. 38-44

[13]. Lacan, Le Séminaire, Book I, p. 262

[14]. Richard Powers, Three Farmers on Their Way to a Dance (New York: William Morrow & Co., 1985), p. 339

[15]. Richard Powers, Prisoner's Dilemma (New York: William Morrow & Co., 1988), p. 41.

[16]. Louis B. Jones, New York Times Book Review (August 25, 1991), pp. 9-10

[17]. Chico, not Karl.

[18]. Otto Friedrich, Glenn Gould: A Life with Variations (New York: Random House, 1989).

[19]. Parallels between genetic coding and canonic structure have also been drawn in Hofstadter, Gödel, Escher, Bach, pp. 525-8.

[20]. For a not-quite-so-literal verbal rendering of fugal structure, see Hofstadter, Gödel, Escher, Bach, pp. 311-36.

[21]. Ressler's return from his self-imposed solitary existence — including taking up the Goldberg Variations again — begins when he meets Todd: "...he chose the moment of Todd's arrival to return to the unlistenable piece." (194). One might speculate that the symbolism (Todd = Tod?) inspired the choice of name here. Many of the characters' names could be subject to similar readings (Ressler = wrestler?), but in the interest of brevity, this topic will not be pursued any further.

[22]. Bronowski, Science and Human Values, p. 12.

[23]. Mary Hesse, "The Explanatory Function of Metaphor," in Revolutions and Reconstructions in the Philosophy of Science (Bloomington: Indiana University Press, 1980), pp. 111-124. On this see also Stephen J. Weininger, "Concept

and Context in Contemporary Chemistry," in Beyond the Two Cultures, ed. Joseph W. Slade and Judith Yaross Lee (Ames, Iowa State University Press, 1990), pp. 46-7.

[24]. Marshall Nirenberg, "The Genetic Code," in Nobel Lectures in Molecular Biology, 1933-1975, ed. David Baltimore (New York: Elsevier North-Holland, 1977), p. 335. Also see Ernest Borek, The Code of Life (New York: Columbia University Press, 1965), pp. 200-11. As an amusing sidelight, Borek argues earlier in his book (p. 10) that this century will eventually be notable for three things: the monstrous slaughter of its wars, unlocking the energy of the atom, and breaking the Code of Life; it would not be much of a distortion to offer those three as the respective themes of Powers's three novels to date.

[25]. Joseph W. Slade, "Beyond the Two Cultures: Science, Technology, and Literature," in Beyond the Two Cultures, ed. Joseph W. Slade and Judith Yaross Lee (Ames, Iowa State University Press, 1990), pp. 3-16.