Hard Science and the Paranormal in *Gravity's Rainbow*: Precognition Machines, Cockroaches, and Not *That* Helmut Schmidt

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Among the things that strike first-time readers as strange, unique and most certainly fictitious in *Gravity's Rainbow* (hereafter *GR*) are the ways Pynchon links hard science and the paranormal, or what Steven Weisenburger refers to as "[t]he points of connection between (on the one hand) procedures of science and technology and (on the other) the rituals of religion and occultism" (2). In the Zeitgeist of *GR*, the rational, quantifiable world of physics, engineering and rocket science coexists with the mysterious, occult demimonde of "The White Visitation," a bizarre locale characterized, from Brigadier Pudding's point of view, as

> a disused hospital for the mad, [containing] a few token lunatics, an enormous pack of stolen dogs, cliques of spiritualists, vaudeville entertainers, wireless technicians, Couéists, Ouspenskians, Skinnerites, lobotomy enthusiasts, Dale Carnegie zealots, all exiled by the outbreak of war from pet schemes and manias damned. (GR 77)

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*I met Steve Tomaske via e-mail in June, 2001, on a recommendation from John Krafft. I had come across a cryptic reference to precognition machines built at Boeing in the early 1960s, and the first e-mail I sent Steve late one Thursday night simply asked him if he knew anything about them. When I turned on my computer Friday morning, there was a complete bio of Helmut Schmidt (including his home address and phone number), as well as attached offprints of many of his articles and critiques of those articles. At the bottom was the classic Tomaske closer: "Hope you find some of this useful." Over the next several months, we corresponded via e-mail almost daily and worked on several essays, including this one. Steve was always game for any form of research challenge, producing reams of information on obscure and arcane subjects, and accompanying them with wickedly funny commentary. We had planned to present this paper at the Site-Specific conference in Köln, but Steve became ill and died suddenly in March, 2002. His death was a huge loss to the Pynchon community. I sure miss him. (TR)

With its collection of eccentric Pavlovians, Freudians, neurologists, statisticians, technicians, psychometrists and séance devotees, "The White Visitation" is a site where discourses concerning hard science and the paranormal first converge and interact. As the novel progresses, the seemingly disparate languages of the two systems—what Weisenburger calls the "professional jargon" of hard science and the "esoteric cant" of the paranormal (6)—become so inextricably interwoven that they may be seen as interdependent, interchangeable and, to a certain extent, symbiotic.

Readers familiar with Pynchon's first two novels will recall earlier versions of this theme. In *V.*, for example, chapter 4 begins with Esther's ruminations on *The Search for Bridey Murphy*, a book, the narrator notes,

> written by a Colorado businessman to tell people there was life after death. In its course he touched upon metempsychosis, faith healing, extrasensory perception and the rest of a weird canon of twentieth-century metaphysics we've come now to associate with the city of Los Angeles and similar regions. (95)

In *The Crying of Lot 49*, Pynchon develops this theme further with the Nefastis Machine, "a box with a sketch of a bearded Victorian on its outside, and coming out of the top two pistons attached to a crankshaft and flywheel" (85–86). With the Nefastis Machine, a sort of Isaac-Newton-meets-Rube-Goldberg contraption, Pynchon parodically conflates thermodynamics and telekinesis:

> [Koteks] went on to tell how the Nefastis machine contained an honest-to-God Maxwell's Demon. All you had to do was stare at the photo of Clerk Maxwell, and concentrate on which cylinder, right or left, you wanted the Demon to raise the temperature in. The air would expand and push a piston. The familiar Society for the Propagation of Christian Knowledge photo, showing Maxwell in right profile, seemed to work best. (86)

Koteks, of course, asserts that Nefastis is a *real* scientist, "'somebody who still invents things'" (85). But, although he offers to show Oedipa the patent as proof, the seriousness of the representation is undermined when Koteks says that the machine works—responds to telekinesis—only under the influence of "'"Sensitives"'"—"'people with the gift'" (87). Such serio-comic representations, far more fully elaborated and complex in *GR*, indicate Pynchon's interest both in contemporary scientific developments and in popular interest in the paranormal.

Our aim in this essay is to further the discussion of Pynchon's representations of science and the paranormal in two ways. First, we call attention to and discuss the work of Helmut Schmidt, a physicist who developed experiments and machines designed to test and measure precognition and psychokinesis while working at Boeing Scientific Research Laboratories from 1966 to 1969. Second, we illuminate some remarkable parallels between Schmidt's work and parts of *GR*. These parallels suggest that Pynchon was familiar with Schmidt's work and incorporated it into both the content and the narrative structure of *GR*.

In biographical notes that accompany his publications, and in a telephone interview we conducted on October 19, 2001, Schmidt has described himself as "a physicist who is particularly interested in statistical physics and the foundations of quantum theory" (Schmidt, Precognition 99). Raised in Danzig, Schmidt received his PhD in Physics from the University of Köln in 1954, and was an assistant professor and docent in the Physics Department there from 1954 to 1963. Subsequently, Schmidt moved to Canada, where he taught at the University of British Columbia from 1964 to 1965. He then took a position as a senior research physicist at Boeing Scientific Research Labs in Seattle, a position he held from 1966 to 1969. In 1970, he moved to North Carolina, where he continued his research at the J. B. Rhine Research Institute for Parapsychology at Duke University ("Schmidt"). He is now retired and lives in New Mexico.

Schmidt says his main interest is in developing ways to measure and quantify what are known as retro-causal quantum phenomena, those areas occupying the shady region sometimes designated the paranormal—ESP, telekinesis, precognition, psi-factors, etc.—just beyond the fringes of rational causality. The goal, Schmidt said in our interview, is first to design experiments that challenge accepted rules of quantum physics and then to build machines designed to measure and quantify the results, thus causing basic assumptions about quantum theory to be reconsidered and/or changed.

It is important to note that Schmidt was interested in the paranormal *before* he began working at Boeing (where Pynchon also worked, from 1960 to 1962), which brings up a rather obvious question: why would Boeing, a company whose ostensible main business included designing and building jet airplanes, and jet and rocket engines, hire someone to do precognition and telekinesis experiments at the height of the Vietnam war? Schmidt told us that Boeing had a lot of money in 1966, and the tax structure was such that it encouraged the company to have a pure research laboratory not

necessarily connected with the aircraft industry. While this may be true, many outsiders would tend to see the activities of the Boeing Scientific Research Labs as yet another example of top secret military research like that conducted at Lockheed's famous Skunk Works, the covert operations of Bell Labs during the 1950s and '60s, and so on. In the 1960s, such facilities were rather like the U.S. military-industrial complex's version of "The White Visitation" in *GR* or Yoyodyne in Pynchon's earlier novels. Recent books based on declassified documents show that labs such as these worked on all sorts of unorthodox projects, including remote viewing, astral projection, object manipulation, and here, of course, precognition and telekinesis.[1]

By 1969, Schmidt observes, "Boeing was in a very bad situation. They had started development of the SST and discontinued that; the 747 was nearly completed but not ready for delivery" (Telephone interview). In short, Boeing had lots of expenses and not much income, so the Research Labs' activities were curtailed, and many of the scientists sought work elsewhere. Schmidt left Boeing in late 1969, moved to Durham, North Carolina, and, as noted above, began working at the Rhine Research Institute for Parapsychology.

We want to review three of Schmidt's experiments conducted from 1968 to 1970 and consider them alongside the language of *GR*, parts of which Pynchon was writing at about the same time the results of these experiments were published. *The Journal of Parapsychology*, in which the articles resulting from these experiments appeared, was readily available in some of the libraries Pynchon used to research *GR*.[2] For the most part, the comparisons here are not so much event-specific, drawing one-to-one correspondences; but our approach, which includes quoting extensively from Schmidt's articles, gives insight into ways Pynchon may have used or been influenced by Schmidt's work in shaping the language of parts of *GR*.

In a June 1969 article in *The Journal of Parapsychology* titled "Precognition of a Quantum Process," Schmidt describes his first machine and his first two experiments as follows:

> In two precognition experiments, the subjects were faced with four colored lamps [red, orange, green, blue] which were lit in random sequence. Their objective was to guess which of the four lamps would light up next and to press the corresponding button. . . .
>
> In the second experiment, two of the same subjects plus a third had their choice of trying to predict, as before, which lamp would light next (to try for a high score) or to choose one which would not light next (low score). . . .

> During a test, the subject sits in front of a small panel with four pushbuttons and four corresponding colored lamps. . . . Each of the pushbuttons simultaneously activates a recorder switch and a trigger switch. The recorder switch serves to register which of the buttons has been pressed. The four trigger switches are connected in parallel such that pressing any one of the buttons closes a circuit, in turn triggering the random lighting of one of the four lamps [through the decay of a sample of radioactive strontium-90 nuclei]. The system is designed so that on repeated pressing of the buttons, the lamps light in random sequence, i.e., each lamp lights with the same average frequency, and there is no correlation between successively lit lamps, or between the buttons pushed and the lamps lit. In part of the tests, the subjects had to guess repeatedly which lamp would light next and to register this guess by pushing the corresponding button. This triggered the random lighting of one lamp, and the subject could see immediately if the guess was correct, i.e., if the lamp next to the pressed button was lit. The objective here was to obtain a large number of *hits*, i.e., coincidences between the button pressed and the lamp lit. In the other part of the tests the subjects tried to obtain a small number of such coincidences by pressing a button next to any lamp which they expected would not light. (99, 101; emphasis added)

Schmidt's vocabulary in this two-way test, as well as his rainbow-colored array of four lights, is particularly noteworthy. In *GR*, "four-color" usually serves as a metaphor for the rainbow or as a cartoon signature—the "comic-book colors" (GR 186) of "[f]our-color Plasticman" (206), for instance. Thus when Säure Bummer first calls him "'Raketemensch,'" Slothrop imagines "a full-scale Rocketman hype, in which the people bring him food, wine and maidens in a four-color dispensation" (366). Later, one of the pinball machines in Mouthorgan, Missouri, is described as featuring "four-color lovelies doing the cancan all over it" (583). Schmidt's choice of colors, we may speculate, contains the same comedic possibilities.

In the first part of this experiment, the subjects sought to score what Schmidt calls hits, that is, to correctly guess which lamp would light next. In the second part, the subjects were asked to try "to obtain a small number of such coincidences," that is, to choose a lamp that would not light next. Another way to paraphrase these two processes is to say that in the first, the subject seeks to predict the target, and a correct guess is scored as a hit; in the second, the subject is the target, and by successfully selecting a lamp that will not light next, he avoids being hit. It is this second process that provides the architectonics for many of the structural metaphors centered around the Slothrop/V-2/

parapsychology axes in *GR*. In terms of precognition, the questions are these: Does Slothrop know—or sense—where the V-2s will hit, or where they will not hit? Both? Neither?

Schmidt notes further of this first experiment, "in order to exclude the (fairly remote) possibility that the subject might synchronize (within a millionth of a second) the pushing of a button with the high-frequency pulse generator and thus produce a nonrandom sequence, a time delay was introduced. After pressing the button, *there is a waiting time of unpredictable length* (average 1/10 sec.) before the gate is closed" (102; emphasis added). This delta-t of indeterminate duration—the length of time between the pushing of the button and the closing of the gate in Schmidt's experiment—is an important metaphor that Pynchon articulates both as the delta-t between igniting the rocket's primary and main stages at launch (GR 758) and as the delta-t of the rocket's suspension just before impact on the novel's final page.

In the same article, Schmidt notes that we must

> [c]onsider also the other possibility, that there was some higher order pattern in the target sequence, a pattern which the subjects utilized, but which the randomness tests overlooked. Against such a pattern is the simplicity of the circuitry, for which all types of malfunction that could occur should affect the correlations tested. A further argument, which is stated only qualitatively, is that the majority of the subjects obtained their highest scoring rate in their first session of the preliminary tests, where they had a maximum of enthusiasm but a minimum of experience. (104)

He concludes that "the highly significant results which were obtained indicate that the subjects in this experiment were able to predict randomly selected events to a degree far exceeding what would be expected by chance" (108).

One of the subjects, however, used an approach that tested the boundaries of this experiment. The subject identified as KR

> used two different approaches for obtaining high scores. In some tests he waited for an intuition concerning the next light and then pressed the corresponding button. In other tests, however, he concentrated on the red lamp (the colors were blue, green, orange, red), operated only the button corresponding to this lamp, and tried to enforce the lighting of this lamp with increased frequency by PK [psychokinesis]. KR used this latter approach throughout the reported test runs and succeeded in having the red lamp lit with significantly above expectation frequency. The experimental setup, however, does not permit a distinction between precognition and psychokinesis. KR might have obtained the high score

> also by pressing the button only at times when he felt, precognitively, a good chance for the red lamp to light; and conversely, the high scores of the subject OC might also be the result of PK. (106–07)

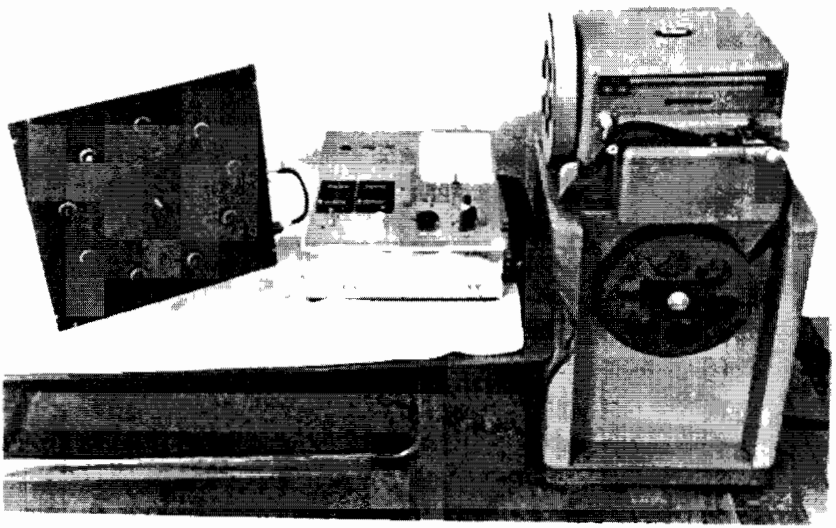
These comments about Schmidt's inability to determine whether the effect was brought about by precognition or psychokinesis recall the following exchange early in GR:

> When Slothrop was discovered, late in 1944, by "The White Visitation"—though many there have always known him as the famous Infant Tyrone—like the New World, different people thought they'd discovered different things.
>
> Roger Mexico thinks it's a statistical oddity. But he feels the foundations of that discipline trembling a bit now, deeper than oddity ought to drive. Odd, odd, odd—think of the word: such white finality in its closing clap of tongue. It implies moving past the tongue-stop—beyond the zero—and into the other realm. Of course, you don't move past. But you do realize, intellectually, that's how you *ought* to be moving.
>
> Rollo Groast thinks it's precognition. "Slothrop is able to predict when a rocket will fall at a particular place. His survival to date is evidence he's acted on advance information, and avoided the area at the time the rocket was supposed to fall." Dr. Groast is not sure how, or even if, sex comes into it.
>
> But Edwin Treacle, that most Freudian of psychical researchers, thinks Slothrop's gift is psychokinesis. Slothrop is, with the force of his mind, *causing* the rockets to drop where they do. He may not be physically highballing them about the sky: but maybe he is fooling with the electrical signals inside the rocket's guidance system. (85)

The psychical researchers in *GR* follow much the same pattern and use much the same terminology to discuss the anomaly of Slothrop's behavior as Schmidt does in speculating about KR's success.

Subject KR's approach in this first experiment led Schmidt to build a second machine and to develop another set of experiments designed to test psychokinesis as well as precognition. Schmidt did this work while he was at Boeing, but the results appeared in an article titled "A PK Test with Electronic Equipment" in the September 1970 issue of *The Journal of Parapsychology*, shortly after he had begun working at the Rhine Institute. Schmidt describes his second machine and second set of experiments as follows:

> The subjects in this research were tested for their psychokinetic ability by means of an electronic apparatus made up of a [binary] random number



generator (RNG) connected with a display panel. The RNG produced random sequences of two numbers which were determined by a simple quantum process (the decay of radioactive strontium-90 nuclei). The essential aspect of the display panel was a circle of nine lamps which lighted one at a time in the clockwise (+1) direction or the counterclockwise (-1) direction depending on which of the two numbers the RNG produced. The subject's task was to choose either the clockwise or counterclockwise motion and try by PK to make the light proceed in that direction. . . .

[T]he general objective was to have the subjects try to mentally influence the generator to produce one of the two numbers more frequently than the other. (175)[3]

While it would have been possible to use a simple row of lights, a linear +/-1 interface,

> [i]t seemed desirable . . . to use a *psychologically more stimulating* display in the form of a panel with nine lamps arranged in a circle and connected to the RNG by a 30-foot-long cable. One of the nine lamps was lighted at a time; and each time the RNG produced a signal, the light advanced one step in the clockwise or the counterclockwise direction according to whether the signal came to the +1 or the -1 output. Thus the light performed a "*random walk*" among the nine lamps. Rather than direct his PK toward the counters, then, the subject generally tried to "will" the light on the display panel to advance in an overall clockwise motion. (178; emphasis added)[4]

The phrase "random walk" is interesting in relation to *GR* on two levels. First, it occurs during Blicero's reflection, at the rocket-firing site in the forest near the Hague, on his loss of memory: "What is framed, dirt-blurry, in the prisms, the ritual, the daily iteration inside these newly cleared triangles in the forests, has taken over what used to be memory's random walk, its innocent image-gathering" (101). Second, Slothrop's peregrinations around The Zone could also be described as a kind of random walk, although Slothrop himself often fears he is actually subject to some mysterious—even sinister—control.

As for Schmidt's procedure, "during a test session, the subject sat in a dark closet with the display panel in front of him. The RNG and the experimenter were stationed in the room outside the closet" (178–79). And Schmidt's conclusions are as follows:

> The experiment has been discussed in terms of PK, but in principle the result could certainly also be ascribed to precognition on the part of the experimenter or the subject. Since the sequence of generated numbers depended critically on the time when the test run began, and since the experimenter, in consensus with the subject, decided when to flip the start switch, precognition might have prompted experimenter and subject to start the run at a time which favored scoring in a certain direction. (181)

Schmidt's emphasis on having the subject and the experimenter separated (one inside the closet and one outside the closet) stems from traditional questions about the problematic presence of the observer in relation to quantum phenomena: whether the mere presence of the observer may somehow influence the outcome.

We see a similar emphasis in *GR* in the scene of a typical day at "The White Visitation": "Subalterns encrypt, blindfolded subjects call Zener-deck guesses to hidden microphones: 'Waves . . . Waves . . . Cross . . . Star . . .' While someone from Psi Section records them from a speaker down in the cold basement" (78). Here, however, the

isolation of the subject from the observer is extended to an extreme, perhaps even absurd degree: not only are the subject and observer separated, but the subject is blindfolded, and the microphones are hidden. Moreover, the distance between subject and observer is so great that the subject's answers must be transmitted mechanically to the observer rather than being observed and recorded firsthand. (Here, as elsewhere in Pynchon's works, machines play vital, intermediary and yet limiting roles in human communication.)

The third article of particular interest to us, "PK Experiments with Animals as Subjects," appeared in *The Journal of Parapsychology* in December 1970. Schmidt's abstract describes the experiments as follows:

> The general purpose of these experiments was to use pleasant or unpleasant stimuli to activate the possible PK ability of animals and lower forms of life. The basic apparatus was a binary random number generator (RNG). In some exploratory tests with a cat, the RNG was connected to a heat lamp placed with the cat in a cold room. A total of 9,000 numbers generated resulted in 4,615 occasions on which the lamp turned on and provided the cat with heat. (255)

In the cat experiment, Schmidt writes, "the purpose of the experiment was to see whether the cat's feeling of pleasure when the lamp was lighted might cause the lamp to light more than the expected 50% of the time" (257). During the first five sessions, "the cat sat quietly next to the light bulb; at the end of the sixth, however, when the door of the shack was opened, the cat was hidden in a corner and raced out immediately." In subsequent sessions, the cat refused to sit quietly next to the lamp. The cat's impetus to flee, Schmidt notes, "seemed to have developed [from] a dislike for the flashing lamp" (258).

In the same article, Schmidt describes a follow-up exploratory experiment:

> [T]he test animals were cockroaches which were placed on a shocking grid, also connected with the binary RNG. The objective in this case was to see if the cockroaches could influence the apparatus so as to avoid the electric shock. *It was found that they received more, not less, than the expected number* [of shocks]. A confirmatory test showed the same direction of scoring: a total of 25,600 numbers generated by the RNG resulted in 13,109 shocks, a deviation of 309 more than expected by chance. (255; emphasis added)

In other words, the cockroaches seemed to like being shocked.

The apparatus Schmidt used was a Random-Number Generator connected to two small light bulbs:

> Opposite one of these light bulbs a photocell was mounted which activated a battery-operated relay. This relay, in turn, applied a voltage to a shocking grid formed by aluminum foil strips 5mm wide and 2mm apart, glued on a plexiglass plate. The voltage was supplied by a 300-volt battery in series with a large resistor (usually between 5 and 20 megohms) such that the total current through the cockroaches would be prescribed. The grid was cleaned regularly with alcohol. (258)

This cockroach experiment is especially intriguing when considered alongside the Byron the Bulb section of *GR*, and also in relation to the theme of mass suicide that resonates throughout Pynchon's text. The light bulbs in Schmidt's experiment were illuminated as a means to drive the cockroaches across the strips: or, as Byron the Bulb sings, "They'll come out 'n' love ya till the break of dawn, / But they run like hell when that light comes on!" (GR 648). Schmidt summarizes the tests as follows:

> The shock level was adjusted so that the cockroaches reacted strongly but were not paralyzed. The experimenter watched the animals during the run, partly to keep the shock level well adjusted and partly to return to upright position the animals which had fallen on their backs.
>
> Four runs, separated by short intermissions (typically two minutes), formed one session. Up to three sessions, separated by five-minute rest periods, were done with the same cockroach group on one day. The shock level usually had to be increased from one session to the next, sometimes even within the sessions, since the animals got somewhat habituated to the shock. If the cockroaches showed serious signs of paralysis at the end of one session, no new session was begun. After one day's rest, no after-effects from the shocks were observed.
>
> In the exploratory test, 25 test-sessions were held in order to see if perhaps the cockroaches' obvious dislike of electric shocks might cause the RNG to generate fewer +1s (which trigger the shock) than expected by chance. It was found, however, that in the total of 6,400 generated numbers, there were 109 more +1s than expected by chance. That means that the number of shocks administered by the random device to the cockroaches lay by 2.7 standard deviations above the chance level.
>
> The magnitude of this deviation suggested that it might be a real effect, even though *it raised the question of why a possible PK ability in cockroaches should work to their disadvantage*. (PK Experiments 259–60; emphasis added)

Two possible answers to this question, when considered alongside *GR*, suggest themselves: either the cockroaches liked being shocked, or—like The Empty Ones, Ludwig's lemming, Ursula, and so many others in *GR*—they were trying to commit individual or even mass suicide.

A curious echo of Schmidt's experiment occurs in the Byron the Bulb section late in *GR*, in the description of "Bulb Baby Heaven":

> Now and then a roach shows up on the floor, and all the Babies try to roll over to look [. . .], glowing feebly at the bewildered roach sitting paralyzed and squashable out on the bare boards, rushing, reliving the terror of some sudden blast of current out of nowhere and high overhead the lambent, all-seeing Bulb. In their innocence, the Baby bulbs don't know what to make of this roach's abreaction—they feel his fright, but don't know what it is. They just want to be his friend. He's interesting and has good moves. (647–48)

Schmidt dropped his work with animals after this experiment, but his interest in relations between the experiment and the experimenter led him to a number of other provocative theories in the late 1970s, '80s and early '90s, after *GR*'s publication but curiously related to Pynchon's text. One series of experiments involved retro-causal quantum phenomena, events Schmidt calls "strangely time- and space-independent" (Telephone interview). In an article titled "PK Effect on Pre-Recorded Targets," in the *Journal of the American Society for Psychical Research* in 1976, Schmidt reported having found that some subjects could influence the outcome of a sequence of prerecorded random events. For example, even if Schmidt prerecorded a series of 200 colored illuminations (red, red, green, blue, red . . . and so on) on a computer, subjects could somehow change the sequence. In our interview, Schmidt offered two possible interpretations:

> [The first] is that yesterday I recorded these events and today the subject comes in—suppose that the subject's effort now in my office today could affect the random generator yesterday. . . . You have that in precognition. You see, if somebody foresees a plane crash, then I would say yes, this plane crash must have affected the person's mental state . . . at some earlier time.
>
> The other interpretation of these PK effects with pre-recorded events is that people say, "ah, it was recorded on disk, but according to quantum theory, things happen, but the decision of what really happens—the transition to a reality—occurs only when there is an observer." So from this viewpoint, one would say Schmidt had these sitting on his disk, and nobody had looked at these events on the disk, so they are not quite real

> yet. They became real only when the subject saw them. (Telephone interview)

Perhaps the most significant parallel in *GR* occurs in the frequent narrative strategy Weisenburger has identified as analepsis (passim), not mere flashbacks, but a technique through which the past of an event becomes "real" only when interpreted in the light of subsequent events (see, for example, episodes 9 [GR 53ff.] and 14 [92ff.]).

Schmidt's secondary interest is in training adepts, or sensitives, and his comments in our interview—including one that "children are particularly good subjects"—recall Laszlo Jamf's work with Infant Tyrone:

> I have one concern, and that is that original experiments with selected people got very good results, . . . [but] there's a tendency now to work with unselected subjects. . . . The Princeton Group has done many such experiments, but they get very weak effects. And so my present interest is to revitalize experiments with highly selected participants. So I would like to see work in that direction, . . . how we can select good people and train them and improve their performance. You need lots of time for this. . . . You would have to raise them. . . . You'd have to start a real training camp, perhaps like one of those Buddhist meditation camps. . . . No one knows how strong these effects can get. (Telephone interview)

Almost but not quite like Schmidt, Roger Mexico says in *GR*,

> "there's a feeling about that cause-and-effect may have been taken as far as it will go. That for science to carry on at all, it must look for a less narrow, a less . . . sterile set of assumptions. The next great breakthrough may come when we have the courage to junk cause-and-effect entirely, and strike off at some other angle." (89)

We can theorize Helmut Schmidt's presence (and absence) in *GR* by rethinking the concept "Beyond the Zero" from part 1 of *GR*. As Hanjo Berressem has pointed out, "Pynchon proceeds from the idea of a completely textualized universe, in which the position of the subject directly depends on its position within discursive networks" (243). The notion of a textualized universe is helpful, for if we locate the zero point at the theoretical gravitational center of these discursive networks and regard the discourses as swirling or orbiting around that point in either regular or eccentric orbits, then identifying discourses and discursive contexts in *GR* becomes more like an exercise in astronomy than like one in literary criticism. Finding the visible referents is relatively easy:

we all know about Pavlov, Wernher von Braun, Richard Zhlubb. But the black holes and occult spaces in Pynchon's universe are often more engrossing, those figures and concepts that are obviously there but are not referred to explicitly and are not made readily or logically apparent in the narrative. For example, Lawrence Wolfley argued convincingly that Norman O. Brown is a major influence in *GR*; following Wolfley, Weisenburger noted that, although *GR* alludes directly "to Brown's psychoanalytic theory of history" only once, "its presence is strong throughout the text" (207), confirming and advancing the wide acceptance of Wolfley's argument. Perhaps it goes without saying that many similar instances in *GR* remain to be elucidated, and we offer Schmidt's work as another such referent in Pynchon's textualized universe.

An amazing feature of Pynchon's writing about the occult and the paranormal is his ability to give them substance, complexity and coherence rarely seen in western writing. Part of this is his uncanny ability not only to echo past and present language and to illuminate ways seemingly disparate discourses develop alongside each other but also to prefigure linguistic and ideological directions discourses will take. Thus Pynchon's writing in *GR* about the paranormal does not merely echo Schmidt's work or use Schmidt as a historical or discursive source; rather, *GR* also refers to and includes topics on the paranormal that researchers such as Schmidt would not begin to formulate until the late 1970s and '80s, well after Pynchon's text was written and published. Like studies of the paranormal, then, relations between Pynchon criticism and Pynchon's texts are often time- and space-independent, and move beyond the binary, beyond the rigid dichotomy of the Named and the Unnameable to the more open-ended realms of the Named and the Yet To Be Named. So, as one of the narrators in *GR* reminds us, "Names by themselves may be empty, but the *act of naming* . . ." (366).

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Notes

[1]For more on the work of such research labs in the 1960s, see Nick Cook, and Ben Rich and Leo Janos.

[2]*The Journal of Parapsychology* was readily available through the University of California and California State University library systems during the period.

[3]For more on the RNG, see Schmidt's article "A Quantum Mechanical Random Number Generator for Psi Tests," in the same issue of *The Journal of Parapsychology*.

[4]In "Build the PK Tester," Larry Duarte provides plans and schematics for building a replica of Schmidt's device. The main difference is that Duarte's model does not rely, like Schmidt's, on the random decay of strontium-90.

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