Part 2.

**IDEAS
AND FOUNDATIONS.**

Good Writing Is Not Enough

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Only a month after it appeared in Analog in mid-December 1985, S. C. Sykes's short story "Rockabye Baby" was well on its way to nomination for a Nebula, one of the two most prestigious awards in science fiction. It also had been picked up for a "Best of the Year" anthology, and was doing quite nicely in Ahalog's own annual reader poll. Another story attracting much favorable comment in that poll (it was our readers' favorite short story of the forty-two we published last year) and elsewhere was Stephen L. Burns's "A Touch Beyond" (January 1985). "A Touch Beyond" was a first sale; "Rockabye Baby," a second. Editors do buy, and successfully publish, stories from new writers.

Yet, a magazine like Analog receives so many submissions that it has room for only one or two percent of them. Many stories are rejected not because of anything conspicuously wrong with them, but simply because nothing sufficiently special about them makes them stand out from ninety-eight percent of the competition.

What makes stories like "Rockabye Baby" and "A Touch Beyond" stand out? How can you make your stories do the same? The key words are imagination, discipline--and the first word in "science fiction."

What about writing? It's important, but good writing is not enough. Oh, it can be. If your writing is truly extraordinary, you may breathe enough new life into an old idea to make something fresh and commanding of it. "Rockabye Baby" deals with a paraplegic faced with the opportunity to have his nervous system restored to normal--at the price of all his present memories. The idea of nerve regeneration is not new to science fiction, but the vividness with which Sykes makes the reader feel what it's like to be handicapped--and what memories really mean--makes the story unforgettable. "Emergence," by David R. Palmer (another highly successful first story, which we published in January 1981), brings some novel twists to the global holocaust and superman themes--such as minimal use of nuclear weapons to trigger biological ones, and a plausible way for a natural epidemic to produce a new "species"--but the basic ideas behind the story are among the

oldest in science fiction. The story draws most of its impact from a remarkably vivid portrayal of an exceptionally memorable character. Palmer dared to tell his story through the journal of an eleven-year-old girl, trapped alone in an underground shelter after the war, who doesn't yet realize just how special she is. Her personality is so unusual, engaging and wide ranging, and every word so carefully chosen, that when Palmer complained that a routine copy-editing change of a single word was "out of character," there was no question that he was right.

Few stories can pull that off. What I see more often are stories that are competently written--but little more--and don't say very much. They lack content--ideas. Science fiction requires two sets of skills: writing, and imagining in that special way that makes speculations both plausible and integral to the story. I want to concentrate on that second set of skills. Too many writers try to get by on good writing alone, without developing the other tools of their trade.

Adam and Eve, Revisited

To write science fiction, you must first understand what it is. Watching movies is not enough; most "science fiction" in movies and television is not science fiction at all, by the standards of written science fiction. If you haven't read many science fiction books and magazines, you should--both to get a feel for what it takes to write them, and to avoid rehashing worn-out ideas. (Ben Bova, my predecessor at Analog, warned me that I'd get several stories a month involving a man and woman who find themselves alone on an unnamed planet and turn out to be Adam and Eve. I quickly learned to recognize these stories on the first page.)*

Science fiction is fiction in which:

At least one speculative idea is integral to the story.
Whatever science the story uses is plausible in the light of known science.

What do these criteria mean? "Rockabye Baby" is very much a "people" story; you may not even realize it's science fiction until you're halfway through it--but its final impact depends completely on its characters' having the option of the nerve regeneration process. In "Emergence," the speculative ideas on which the story depends are a war that wipes out most of humanity and a new kind of human being that supersedes Homo sapiens. In Marc Stiegler's "Petals of Rose" (November 1981, and yet another memorable story by a writer with only one previous sale), humans must cooperate on a long-range project with beings whose adult lives are one-day frenzies of intensely concentrated activity. In "A Touch Beyond," Stephen Burns extrapolates the well-known "phantom limb" effect experienced by amputees to imagine a kind of surgery done telekinetically by surgeons who have sacrificed their physical hands; the story focuses on the other sacrifices such a surgeon is forced to make in exchange for his special ability.

*See "The Ideas that Wouldn't Die," p. 200.

As demonstrated in these examples, an idea being "integral" to a story means that you

can't remove the speculation without destroying the whole story. This does not mean that stories must contain a lot of talk about science or technology--or that the presence of such talk automatically makes the stories science fiction. The movie Star Wars is full of "science fictional" hardware and trappings, but at heart it's a western. Replace the spaceships and light sabers with horses and six-guns, and you can tell essentially the same story in the Old West. In contrast, Daniel Keyes's Flowers for Algernon (or the movie Charly) contains almost no science fictional gimmickry or jargon, yet it is quite clearly science fiction. It is a story first and foremost of what goes on in a particular human being's mind; the speculative element-the one that makes Flowers a science fiction story in its comfortably contemporary setting--is the operation that increases Charlie Gordon's intelligence. The book does not go into much detail about the operation--but everything that happens to Charlie grows directly out of it. Remove the operation and nothing remains of the story. You might still tell a story about Charlie Gordon, but it would not be even remotely this story. And it certainly wouldn't be science fiction.

The plausibility of that speculation is also important. What can and can't happen in a particular setting is determined by scientific laws, primarily those of physics, chemistry, and astronomy; there is strong evidence that these laws apply everywhere in the universe. Others, such as the principles of earthly biology, are special applications of the more general laws of physics and chemistry. You must reckon with them if you're writing about life on Earth, but physics and chemistry may lead to quite different biologies elsewhere (such as the silicon-based organisms in Stanley G. Weinbaum's classic short story, "A Martian Odyssey").

To tell a plausible story about a situation covered by known scientific laws, you must know what those laws say and how they apply to your imagined situation. You will not, for example, write about enormous spiders running around eating people: a spider of such a size could not support its own weight.

Original Sins.

For another example, my first two novels, The Sins of the Fathers and Lifeboat Earth, form a single large story in which humans must escape an explosion of our galaxy's core by accepting the aid of mysterious aliens who offer to move Earth bodily to another galaxy. The story is about people and what happens to their lives--but the changes in their lives are all consequences of the core explosion and planet-moving. In writing Lifeboat Earth, I had to make such calculations as the apparent position and brightness of the sun at various stages of the Earth's journey and how much the ground appeared to tilt as a result of acceleration. It got so involved that I bought a programmable calculator and developed some fairly exotic programs that will probably never be used again.

"But I can't do that," you may say. "You're talking about calculation, and I'm a writer, not a mathematician." Sorry; you must do that, to the extent that you can, and get help when you need it. You don't have to be a professional scientist or engineer; few stories need as much background calculation as Lifeboat Earth. But if you want to write real science fiction, and not fantasy or westerns with spaceships, you must check the consequences of your assumptions and see whether they work and what side effects they have.

How can you develop solid scientific backgrounds if you're not a scientist? Learn all

you can about everything. Take courses-but don't depend on them. Learn to teach yourself. Read widely. Basic physics, chemistry, astronomy, and biology are essential. Virtually anything else will sooner or later prove useful: geology, psychology, anthropology, history, linguistics--the more the merrier. Use recent books, and don't stop there. These fields change rapidly (astronomy has changed more in the last twenty years than in the preceding four hundred.) Watch the tip of the iceberg, at least, in magazines like Scientific American and New Scientist. All this reading serves not only as a safeguard against unworkable story ideas, but also as a source of good ones. Knowing where the present limits of knowledge are will suggest what lies beyond.

No matter how thorough your basic education, you'll run into questions for which it has no ready answers. Things like "How long does a radio message take to get from Earth to Titan?" or "How high can a Piper Gherokee fly on a planet with ninety percent of the gravity and eighty percent of the atmospheric pressure of Earth?" Sometimes you can evade such questions by setting up your story in such a way that the exact numbers aren't critical. But if you do give (or imply) numbers, make sure they're consistent, because readers love to catch authors in mistakes. Learning about all kinds of things is part of the fun of writing science fiction; but since you also want to make money at it, you can't afford to spend too much time answering simple questions. So it pays to develop good library ski{{s, covering not onty encyclopedias and card files but also the semi-popular scientific journals and the scientific abstract indices. The more you can do for yourself, the better; but don't hesitate to ask the reference librarian for needed help. The same applies to calculations: it's nice to do them yourself, but some will probably be beyond you. For those cases, cultivate experts you can ask for help. Universities have them on all kinds of subjects, and many of them are surprisingly willing to help writers who approach them politely and professionally (which means first having done all you can on your own). For information dealing specifically with the kinds of background problems commonly encountered by science fiction writers, see the references listed at the end of this essay.

Fundamentals

Does all this mean that you must prove rigorously that everything you write about is possible, and that you must avoid things not covered by present-day science? Not at all. Science has changed radically just in this century; it would be arrogant and unrealistic to assume we're not due for more big surprises. A fundamental breakthrough, by definition, cannot be deduced from existing theories. I use a "negative impossibility" criterion: anything that nobody can currently prove impossible is fair game for science fiction. For example, faster-than-light travel (FTL) is okay if you postulate it in a form that doesn't contradict existing theory in any region of experience that has been thoroughly tested experimentally--even though it would surely require radical changes in theory outside the tested range. Several of my own stories, including Lifeboat Earth, have used a form of FTL in which objects can "tunnel" to superlight speeds without an increase in energy, while objects traveling below the speed of light act just as Einstein said they do. (The resulting consternation among theoretical physicists becomes part of the story background.) Other writers have used scientific rationales ranging from "hyperspace" (a shortcut through a dimension not normally perceived by humans, as in John W.

Campbell's The Mightiest Machine and Robert A. Heinlein's Starman]ones) to a new kind of force that increases with the mass it is accelerating (as in Norman Spinrad's "Outward Bound").

Psychic talents, like the Bergmann surgery in "A Touch Beyond," are a somewhat special case. Parapsychological phenomena such as telepathy and telekinesis are highly controversial in the scientific community. Some scientists think their existence is well enough established that further research on them is not only worthwhile but important, though the underlying mechanisms are not yet even remotely understood. Others dismiss everything that's been done on the subject as sloppy or fraudulent and deny that there's any real evidence that the phenomena exist at all. For science fiction, if you accept my negative impossibility test, it doesn't matter whether "psi" phenomena have been proved to exist or not. If you portray them as something that could exist, in a way that is self-consistent and does not contradict scientific knowledge that is well established, they are perfectly legitimate subjects for science fiction. But you do have to put them on a reasonably scientific basis--if not providing a detailed explanation for them, at least making sure they operate according to consistent rules. An occult or "anything goes" approach will not do.

Most speculative ideas are either "extrapolations" (based solidly on known science) or "innovations" (radically new concepts, subject only to the negative impossibility test). With either type of idea, work out as much detail as you can--and include no more in the story than the reader needs in order to understand what's going on. After doing all that work, it's tempting to show it off-but resist the temptation. You don't want to scare off readers who aren't specialists--and even they will sense that you did the work, in a feeling of solidity that the story would otherwise lack. If explanation is necessary, slip it in subtly. Readers won't accept large blocks of lecture, even if they're disguised by having characters ask questions they wouldn't really need to ask. A good rule of thumb: Know as much as you can about your background-and tell no more than you have to.

From Idea to Story

In its early days, much science fiction was written by scientists or engineers, such as Isaac Asimov, E. E. "Doc" Smith, and George O. Smith, who picked up storytelling as a sideline (and perhaps as an outlet - or speculations too {ar out for the "respectable" iournals of their professions). Many early writers, primarily concerned with exploring challenging ideas, did not shape words into stories with the finesse of today's best writers. The "New Wave" of the '60s, associated with such writers as Harlan Ellison, Thomas M. Disch, and Samuel R. Delany, stressed experimentation with literary forms and techniques, sometimes giving these aspects greater emphasis than they did to idea content. There is less avant-gardism now; many editors are leaning toward clear, straightforward, vivid storytelling--and if it happens also to be especially evocative or subtle, so much the better. The lasting heritage of the "New Wave" is a set of standards for writing that are higher than ever before.

Yet, trying to make a story stand out with writing alone, without fresh and interesting ideas, requires awfully impressive writing. Trying to make it on ideas alone requires awfully impressive ideas. Most stories must be good on both counts. "Petals of Rose," for example, is a story based on an idea so striking that it would have stood out even with

mediocre writing. The Rosans, the aliens with whom humans must cooperate, live so fast and intensely that contact with them is dazzling and exhausting. The number of characters in the story is enormous and each exists for a very short time, yet the reader must come to know and care about each one during his brief appearance. That requires vivid, concentrated characterization (for example, the life of Sot Lai Don Shee lasts less than three pages, and Dot Laff To Lin lives and dies on a single page). Long-term cooperation between humans and Rosans is possible only because part of the memory of each Rosan generation is transmitted chemically to the next--but only a small part. One human, Cal, is driven over the edge by the inevitable death of one special Rosan student. He tells a psychologist:

"I can't stand it. Every day I teach the same thing, again and again, and the faces are different." The last ended in a howl of horror. "Every day different, never the same person twice." He whimpered. "Please, let me have iust one student twice."

Since a story can almost always be analyzed as one or more people (or reasonable facsimiles) struggling to solve a problem, start plotting by trying to imagine the problems that would arise should your speculation become reality. Don't try to plunge right into the story; play with the implications of the idea. Consider "Petals of Rose": the Rosans live and die in a single day. How does that affect their concept of life? What do they think about humans, who the Rosans consider immortal? What frustrations and other problems do the humans suffer because of the short lives of their allies? Because of the short individual life spans, generations flash by, and the entire structure of the society can change within a week--how will this "instability" affect the humans?

Think of all the problems that will result from your idea that you can; don't stop with the first one that comes to mind. Thinking of problems will inevitably suggest people who have them-and they will become your characters. When you know them well enough, you will begin to understand how they will react to their problems, and how those reactions create other problems, including conflicts with other characters. At each key point in the story, ask yourself what is the best thing each character can do--from his own point of view. Then let him do it. All you have to do is write it down.

Perhaps the most important fact a science fiction writer must grasp is that all the changes that make a future or a new world are interdependent. In Lifeboat Earth, for example, I started with an almost contemporary Earth, let the aliens make certain changes in it, and then figured out everything I could about what effects those changes had on life. Both individuals and political economic systems had to react to the physical changes, and some of their actions in turn produced still more changes. And so on.

Building Worlds--And Moving Them.

Oddly enough, the first step in the creation of Lifeboat Earth focused on an idea that is barely visible in the finished story. I wrote a minor short story based on the realization that an FTL ship could be used to get a second look at an astronomical event seen years ago on Earth. Ben Bova, then editor at Analog, quite rightly bounced the story, but added: "The basic idea is good. What can you build on it?"

That kind of question is one of the few things editors are good for. It got me thinking, and when I realized that that idea could combine with a couple of others I had in my

"What-do-I-dowith-it?" file, the story ignited and took off. The other two ideas were:

A galactic core explosion, like those seen in other galaxies, could have occurred in ours any time in the last 30,000 years--and we wouldn't know it until the light reached us. Suppose the Earth were about to become uninhabitable and aliens offered to rescue us, but refused to discuss the reasons for their offer. Should we accept their help?

That last question is the basis of The Sins of the Fathers. Before you can start telling such a story, you must recognize and answer key questions. The questions, at this point, are more important than the answers, because knowing the problems that must be solved will lead to your story. In the case of Sins, the questions were: Is such an explosion possible and how would it affect Earth? That took library research. How could the aliens move planets, how did they get the ability, and why didn't they want to talk about it? That required me to invent their civilization in quite a bit of depth, including tracing their history back far enough to provide consistent origins for all their characteristics. I had to invent their methods of travel in enough detail to provide a consistent chronology for the trip and, once the trip was underway, to understand how it would affect the planet being moved.

The central question of Lifeboat Earth became: What happens to human life during the trip? First I had to know the purely physical effects; that required the calculations I described earlier, which, given the assumed properties of the aliens' innovative technology, was mostly extrapolation. Finally, I had to get to know some of the people affected and watch how they coped with such problems as surviving the loss of the sun, changing apparent gravity, radical changes in political systems to cope with the practical problems of survival, and the psychological problems of underground life and the wholesale extinction of the other species.

Then--and only then--I could write the story.

Writer Poul Anderson once remarked that the best science fiction requires a "unitary" approach, in which "philosophy, love, technology, poetry, and the minutiae of daily living would all play parts concomitant with their roles in real life, but heightened by the imagination of the writer."

To which fellow SF writer James Blish added; "You will note, I think, that this is more than just a prescription for good science fiction. It is a prescription for good fiction of any kind."