"Second-class citizen" is how researchers on soft money, who have to raise their salaries from grants, describe their position. It can be fraught with financial insecurity, disrespect, and poor facilities—as well as some advantages

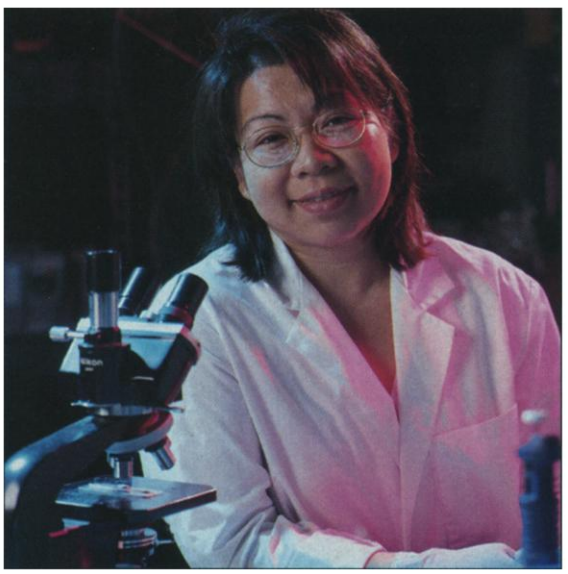
Soft Money's Hard Realities

The University of California, San Francisco, didn't want to lose star geneticist Nelson Freimer in 1995 when his wife, mathematical biologist Sally Blower, was looking for a job. But they didn't have a tenure-track position open in her field. So UCSF offered Blower, who has an international reputation for her work on the transmission dynamics of infectious diseases, a position as an adjunct associate professor—in other words, a "soft money" job in which she had to raise her own salary. Blower accepted the offer, but while Freimer thrived, Blower festered. She found her position "humiliating and offensive" and felt she had to grovel to senior faculty members who controlled her lab space. "Many women get shoved into this [kind of position] who should have proper jobs," Blower said last spring before she and Freimer left UCSF for two tenured positions at UCLA (7 April, p. 26).

Stanford analytical chemist Maria Dulay, on the other hand, willingly turned down a tenure-track faculty job at Wake Forest University in Winston-Salem, North Carolina, for a long-term, soft-money position as a research associate in Richard Zare's lab at Stanford. Although she craved the status and independence of a faculty position, she also wanted to be with her scientist husband, who was firmly ensconced in a Silicon Valley start-up company. Dulay points out the upsides of her job: She is part of a premier research team, has few funding worries because Zare's grant covers her salary, and gets to spend more time with her young daughter than she would as a faculty member. But, she notes, her choice was "career limiting": There is now little chance that she will ever hold a full-fledged faculty position.

Such are the disparate experiences and often conflicting emotions—rage, resignation, and contentment—of scientists in soft-money positions. These jobs come in various forms, with titles ranging from researcher or research associate to adjunct or in-residence professor. Some positions are under the wing of a tenured faculty member, while others offer principal investigator or faculty status. Although data on the exact numbers of these positions are scarce, they make up a substantial fraction of the scientific workforce at many universities, especially medical schools (see table, p. 2026). What scientists in these positions have in common is that they are not on the esteemed tenure track, their salaries are paid by grants rather than their institutions, and they have little or no long-term job security. "Second-class citizen" is the phrase that even those who like their jobs often use to describe their status in the departments where they work.

The majority of soft-money scientists work within collaborative groups, and many of them are willing to trade some status for freedom from administrative duties. It is spouses like Dulay and Blower who tend to be the most frustrated, because they feel they deserve a crack at the tenure track. Soft-money positions are especially tough on those scientists who decide to go it alone as independent investigators. They often feel overwhelmed by the stress of having to conduct their research with minimal resources or departmental support, all the while competing with tenure-track faculty members for the grants that provide their salaries and facing the prospect that their employment could end when their current grant expires.



Tough choices. Many researchers, like Maria Dulay, trade a shot at tenure for a chance to work near their spouse.

CREDIT: RON JONES

And virtually all soft-money scientists, even those who profess to be happy, have tales of disrespect and humiliation they have suffered. Neuroscientist Ratnesh Lal, an associate research biologist on soft money at the UC Santa Barbara Neuroscience Research Institute, compares the academic culture to the caste system in his native India, with soft-money researchers trapped at the bottom. "You have to have a strong will" to survive in such a position, he says. It also helps to have an accommodating department, friends in high places, and money in the bank as a cushion—not to mention emotional security and a tough skin.

A steppingstone to tenure?

For those with strong wills—and exceptional scientific talent—styling oneself as an independent soft-money researcher can occasionally pay off with a tenure-track position. But tenured professors at top institutions who started out that way warn that it's a difficult route, in which the chance of success is tenuous at best. "If I were making the decision again, I certainly wouldn't take that track," says developmental biologist Marianne Bronner-Fraser, a full professor at the California Institute of Technology in Pasadena who began her career on soft money at UC Irvine. "It is so easy to get stuck."

The best insurance against getting stuck, says Bronner-Fraser, is to regard the position as temporary and be prepared to switch jobs within a few years. She was 27 and still writing her Ph.D. thesis when she was offered an adjunct faculty position at Irvine in 1980 as part of a recruitment package for her husband, Scott Fraser. She found the offer "very flattering" and accepted it. With minimal teaching and no administrative responsibilities, her research flourished, and she brought in ample grant support. It took her several years to realize that she had come in at the lowest pay scale, a rung rarely if ever used for starting tenure-track faculty. Then "I started putting myself up for accelerated promotions, just about every year until I caught up." But she soon tired of having to pay 100% of her salary from her grants and wanted a tenure-track position.

When a slot opened up at Irvine, Bronner-Fraser applied but didn't get the job. "I felt

Satisfaction Sans Status

Developmental biologist Susan Bryant was already a tenured professor at the University of California (UC), Irvine, in 1980 when she met her future husband, David Gardiner, who was a postdoc at UC Davis. When they married in 1983, Gardiner took a soft-money position as a researcher at Irvine. Because Gardiner was flexible in his goals and committed to raising children, it seemed a better choice than trying to get two jobs somewhere else, he recalls. And 17 years and two children later, Gardiner says that decision was right for them as a couple—and that he has learned to endure the indignities that come with the territory.

Personally as well as professionally, says Gardiner, the arrangement has given the couple "tremendous advantages." For one, it enabled Gardiner to spend a lot of time with the children when they were young. Gardiner also appreciates the freedom to immerse himself in the couple's joint research on amphibian limb development, without the distraction of administrative and teaching responsibilities. Gardiner keeps the lab productive when Bryant, who is now dean of biological sciences, has to attend to other matters. Gardiner likens the couple's arrangement to a small business whose success depends on teamwork.

The two didn't expect to work so closely; indeed, when he first moved to Irvine, Gardiner was determined to pursue his own research interests in fertilization. But with no fertilization researchers at Irvine, he felt isolated, while Bryant had built an exciting team. Before long Gardiner gave in and joined the group, and the couple has enjoyed collaborating ever since. "If biology is a big part of your life, then being able to work together is really tremendous," says Bryant.

Gardiner says his toughest challenge has been accepting that his position does not command respect. The concrete indignities, such as not being listed in the campus directory, may seem trivial, but Gardiner compares the overall effect to institutionalized sexism or racism. "The attitude is ... 'We all have agreed that there is a hierarchy, and we are at the top and you are not. So, gosh, don't feel bad about it.' " He feels he gets even less respect because he's a man in a spousal soft-money position: "A lot of men think, 'That's OK for a woman, but why's a guy doing this? What's wrong with him?' " Realizing that his decision to join Bryant's research project hasn't helped his quest for respect, Gardiner recently took on a project of his own: studying the deformed frogs that began turning up in the Midwest 5 years ago, a project that has brought him national prominence and the ear of federal policy-makers. That recognition, based on his work rather than faculty status, "felt really good," Gardiner says.

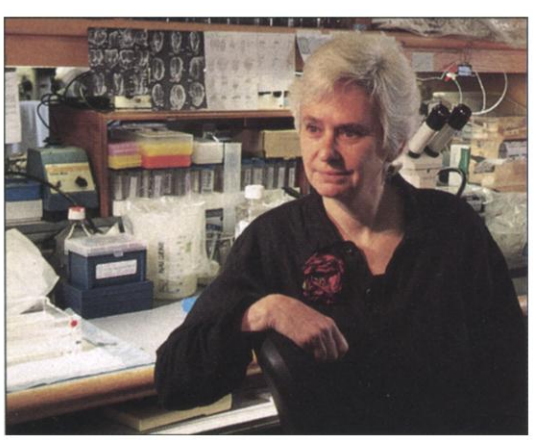
Partners. David Gardiner likens working in the lab of his wife, Susan Bryant, to running a small business.

Bryant says it has been painful to realize that others view Gardiner as an "underling" rather than giving him equal credit for their lab's success: "I feel somewhat guilty about it." As dean of biological sciences, Bryant hopes to improve the status and job security of those on soft money. But she realizes that she has to tread carefully so that she does not appear self-serving in the reforms she tries to enact.

–M.B.

really disgruntled," she says. "I thought I was much better than this guy who got hired." So she began looking elsewhere. The prospect of her departure was enough to persuade another department at Irvine to offer her a tenure-track job, where she went on to become a full professor. Although Bronner-Fraser didn't have to move to another university to make the leap, "you have to be willing to go," she says.

Threatening to leave is not guaranteed to crack open the tenure track, however. In February of this year, Freimer wrote to UCSF Chancellor J. Michael Bishop complaining about Blower's treatment and status, and he threatened that they would both leave if her situation did not improve. Despite a world-class reputation and a steady stream of papers in top journals, Blower did not get a tenure-track offer from UCSF. Blower blamed it on sexism; the university said that a position simply wasn't open in her field. Freimer and Blower made good on their threat and left for independent tenured positions at UCLA.



CREDITS: (LEFT TO RIGHT) M. KLIMEK/LIAISON AGENCY; WALTER URIE

Leverage. Gail Martin felt stuck in a soft-money position until powerful advocates took up her cause.

The power of advocates

Researchers who are unwilling to consider moving elsewhere lack that leverage. Developmental biologist Gail Martin took a soft-money position at UCSF in the mid-1970s because she and her husband Steve Martin wanted to live in the Bay Area. Gail was a postdoc at University College London, and Steve had his own lab at the Imperial Cancer Research Fund when he was offered a job at UC Berkeley. "I said, 'Let's go, and I'll figure something out,' " Gail recalls. She was highly marketable, having just published an important paper on using teratocarcinoma stem cells as an in vitro model for mammalian development. In retrospect, she says it may have been a mistake not to look nationwide for a pair of tenure-track offers. Instead, she took a second postdoc at UCSF and within a year negotiated herself a soft-money faculty position.

Before long Martin realized the limitations of the path she had chosen. "There I was with 300 to 400 square feet [28 to 37 m^2] of space, old and unrenovated. I had no salary support and zero setup money." Without setup funds to install the basic lab furniture they needed, she and her postdocs had to scavenge discarded lab benches from other labs that were being renovated. What's more, she was in a common situation for soft-money faculty members, with a position cobbled together with resources from more than one department; in her case, she had space from one department and a faculty appointment in another. And that meant she had no advocate watching out for her interests—and advocates are key, she says.

Nevertheless, over the next 9 years, Martin built an international reputation with publications in top journals including *Nature*, *Cell*, and *Science*. She was given addi-

tional space—albeit unrenovated—and was promoted to full professor in residence on the nontenure track. But her status in her field greatly outstripped her status at home. "People outside didn't have a clue that I was working with such marginal institutional resources," she recalls. It was "really a struggle." It was not until the mid-1980s that her fortunes changed. UCSF was looking for someone to head a new program in developmental biology, and several influential faculty members, including UCSF cancer biologist Bishop, now chancellor of the campus, and Bruce Alberts, now head of the National Academy of Sciences, saw Martin as the ideal candidate to lead the program. With Bishop and Alberts as her advocates, she says, "for the first time in my career at UCSF I had some real leverage." Martin took the post, and as recompense got not only a tenured position and newly renovated lab space but the opportunity to recruit two top young developmental biologists as her neighbors.

Whereas Martin charted her soft-money course independently of her husband, many soft-money spouses begin in their spouse's lab, which can prove an extra impediment. Developmental biologist Christine Holt took a soft-money position at UC San Diego in the late 1980s so she could be with her husband, development biologist Bill Harris. But she soon faced the problem of how to differentiate her work from her husband's. Although Holt was working on an independent project that she had begun before she even met Harris, she shared his lab space, and they often collaborated, leading their colleagues to view her as a glorified postdoc. "There was a tendency to credit my work to him," says Holt, now a tenured reader at the University of Cambridge, equivalent to full professor in the United States. "I remember being told by the department that if I wanted to have a job, we would have to stop publishing together." Closing down their collaborative work was painful, says Holt, but it won her tenure at UC San Diego.

Settling into a soft-money life

Whereas some scientists view soft-money positions as temporary, others settle into them as careers, without expecting tenure. Fresh out of a postdoc in the early 1980s, UC Davis neuroscientist Karen Sigvardt was offered a tenure-track position at the State University of New York, Buffalo. But she turned it down because she didn't want to leave California. She had already received a grant from the National Science Foundation for her work on spinal cord physiology, so, grant in hand, she went around to colleagues in northern California to negotiate a job. She succeeded, striking a deal for a soft-money position with the chief of neurology at the Veterans Administration hospital affiliated with UC Davis.

Sigvardt was never promised, nor did she expect, a chance to make the hop to the tenure track, but that hasn't dampened her sense of fulfillment in her career. Although she misses the financial security of tenure, she revels in the freedom from administrative responsibilities that comes with her position. "You can say 'no' to anything they ask you to do within reason, because 100% of your salary is paid by your grant," she says. "I just joke and say, 'Nobody is paying me to do this.' " Taking advantage of that freedom, Sigvardt has gone to work in a collaborator's lab in London for months at a time. But Sigvardt has also volunteered to do department service she enjoys: She has been a graduate adviser for her department and directs the neuroscience graduate program.

"I personally value the contribution that our adjunct faculty make," says Sigvardt's department chair, William Jagust. "Karen is incredibly productive scientifically, and she has been a very good colleague." Sigvardt acknowledges that she is lucky to feel like "a valued member" of her department. Satisfaction in soft-money positions "is very department-dependent," she says. "I know people on this campus who think adjuncts are just inferior scientists who couldn't get a job."

Salary jitters

Even soft-money researchers like Sigvardt who are appreciated by their departments face the specter of financial insecurity. "Every single year I get this letter that reminds me ... that should I fail to have sufficient funds to cover my salary and benefits, my appointment will cease," Sigvardt says. Funding "is a continual source of stress and anxiety," agrees neuroscientist Don Anderson, although he has survived 22 years as a soft-money research biologist at UC Santa Barbara without a lapse in funding. "You go through a roller coaster mentally every few years. You get funded and feel pretty good," but soon begin to worry about the next grant cycle.

Some researchers opt for alternative duties, such as teaching, to secure part of their salary. But for one microbiologist, at least, that choice only compounded her problems by gobbling up precious research time. Because one grant is insufficient to pay her salary, this researcher, who asked to remain anonymous, signed on to teach for two quarters in exchange for about one-third of her

SOFT-MONEY SAMPLER

A tabulation of soft-money positions as a percentage of total faculty for some institutions, based on 1999–2000 statistics

Institution	Schools or departments	Total faculty	Tenure-track faculty	Soft-money positions at faculty level (percent of total)
Harvard	Arts and Sciences (all departments)	916	594	322* (35%)
	Medical School campus	317	187	130* (40%)
	Medical School (teaching hospitals)	7950	2878	5072* (64%)
Univ. of Michigan	College of Engineering	385	299	86 (22%)
	College of Literature, Science, and the Arts	852	815	37 (4%)
	Medical School	940	762	178 (19%)
	School of Public Health	112	96	16 (14%)
	Institute for Social Research	33	1	32 (97%)
Univ. of Chicago	Physical and biological sciences	714	576	138† (19%)
Stanford	Total academic senate (science, humanities, medical school)	1361	1274	87 (6%)
Univ. of California	Total faculty	13,918	7481	6437‡ (46%)

* This number contains all nontenure-track faculty and so may contain nontenure-track instructors and clinical faculty at the hospitals.

† At the University of Chicago, soft-money investigators are not faculty, but this number includes only soft-money researchers with positions parallel to faculty rank, i.e., above the level of postdoc or laboratory staff.

‡ This number contains all nontenure-track, soft-money, faculty-level positions, but also includes clinical faculty, lecturers, and faculty with dual appointments, such as professionals who are hired as lecturers to teach a course or Veterans Administration hospital employees with adjunct positions.

Geology Couple Plots a Path to Success

In 1988, experimental geophysicists Quentin Williams and Elise Knittle were on the job market, having completed their Ph.D.s with Raymond Jeanloz at the University of California (UC), Berkeley. They landed a lot of interviews but suffered from the "two-body problem": husband-and-wife job candidates in the same field needing jobs in the same geographical area. Pennsylvania State University offered them two tenure-track positions. But the offer that intrigued them most was from the department of earth sciences at UC Santa Cruz: a tenure-track position for Knittle and a soft-money slot for Williams at the department-affiliated Institute of Tectonics.

They chose Santa Cruz in part, says Knittle, because UCSC offered a better setup package, which would enable them to get up and running faster. "We were trying to balance the short-term advantages of having two tenure-track positions versus the long-term advantages of having a better lab," she says. "We felt that ultimately our success or failure in a tenure-track position or otherwise was going to depend on getting the science going." They also felt they were joining a young, growing, and dynamic department at UCSC. "It looked like it was probably going to expand over the next several years, and there was a possibility if not a likelihood that I could be part of that expansion," says Williams. Indeed, the UCSC department promised that within a few years it would advertise a position in Williams's research area, for which he could apply.

As a soft-money recruit, even in such a sympathetic department, Williams realized that getting the job was not a sure bet. "Having an internal candidate come out as the best person in an open search is often difficult," he says. "I knew I would have to be extremely productive [so] that ... there would be no question that I would be head and shoulders above the other candidates." He also realized he needed to prove his commitment as a department citizen. To this end he helped raise money for department programs, advised graduate students, developed and taught new courses, and became a regular participant at seminars and department events. The couple also made an effort to increase their individual value to the department by diverging their research paths. "We run a lab together, and a decent portion of our work is jointly published," says Williams, but "we have differentiated ourselves intentionally over time. I take more of a geochemical route, and Elise sells herself as a geophysicist."

Upward mobility. Elise Knittle and Quentin Williams saw opportunities for his promotion from soft money to the tenure track.

In 1990, Santa Cruz made good on its promise, and Williams's hard work paid off; the position came open, and he got the job. They have since thrived at UCSC: Knittle received tenure in 1992 and Williams in 1995; she became full professor in 1998 and he in 1999. Knittle just became chair of the department.

Looking back at her own experience and forward into the department's future, Knittle thinks its use of soft-money positions to attract couples has paid off. She acknowledges that a spouse's area of research may not be in the direction the department originally intended to grow, "but people [in the department] have been very open to change." And by offering a job search in the spouse's area, she says, "we have been able to hire people I don't think we could have recruited otherwise." **–M.B.**

salary. "I feel there is much more pressure on me in this position than on a regular tenure-track professor. If I had tenure, I would have to come up with just 3 months of my salary [from my grant] and would only have to teach one quarter. I would have much more time to do research, write papers, and get funding." She adds: "I love my research, but sometimes I just feel like quitting."

Lifestyle choice. Karen Sigvardt chose California and soft money over New York and the tenure track.

CREDITS: (LEFT TO RIGHT) M. KLIMEK/LIAISON AGENCY; RON JONES

And sometimes the money does run out, throwing researchers into what Alex Peinado of Albert Einstein College of Medicine in New York City recalls as "a young investigator's worst nightmare." As a postdoc at Einstein 7 years ago, Peinado landed a FIRST award from the National Institutes of Health (NIH)—a grant designed for beginning faculty members—and along with it a promotion to assistant professor at Einstein, where most faculty members are on soft money. But when his experiments didn't pan out, his funding lapsed. Einstein provided crisis support for 18 months, a benefit many institutions offer in some limited fashion. But when that ran out and another grant proposal was rejected, Peinado wound up last January working without pay for 6 months. "I was very lucky that with my wife's salary and our savings we had enough money to support our family," he says. "[Otherwise] my career as a scientist would be over."

Peinado now has a grant that will begin in December. Meanwhile, his chair has generously given him an additional 5 months of crisis support and reinstated his position even before his grant kicks in. Despite his ordeal, Peinado believes that soft-money positions are "not ... intrinsically bad." In principle, he says, 2 years of crisis support should be adequate. But he would like to see more flexibility in how the safety net is applied, to allow for the failures that can result when capable young investigators shoot for overly ambitious goals.

To reduce that risk, soft-money investigators might be well advised to work in collaborative groups rather than on a single-investigator grant, says Jagust of UC Davis. "That is a tough life. You are the only one, and if you fail, you are dead," he says. Indeed, some institutions, such as the University of Chicago, don't have independent soft-money positions. Soft money is best used to hire researchers whose work fits in with ongoing research projects, says Robert Zimmer, Chicago's deputy provost for research. "We have made the decision to avoid the situation where you have somebody who says ... 'I have a grant. Just give me some space.' "

Finding a balance

Administrators at a number of institutions reached by *Science* say they are commit-

Look Before You Leap

For those considering a soft-money position, either as a temporary or permanent career move, researchers and administrators advise going in with your eyes wide open and well informed about the specifics of your situation. Here are some of their suggestions:

• Think hard about whether you are up to the emotional as well as intellectual challenges ahead. Unless you land in an unusually enlightened department, you are going to feel like a second-class citizen. "You have to be a fairly secure person in your own right; otherwise I think you'd probably have a nervous breakdown," says University of California (UC), Davis, neuroscientist Karen Sigvardt, who has had a soft-money position for 17 years. "It is a very stressful situation for some people."

• Make your job move a positive choice rather than a passive slide into a default option. Biologist Nancy Hopkins of the Massachusetts Institute of Technology warns postdocs and faculty members alike not to allow a postdoctoral stint to stretch out into a semipermanent soft-money position just because the postdoc is having trouble finding a job.

• Think of the hurdles you need to clear for whatever route you have chosen, from getting your own funding to meeting promotion milestones, to qualifying for a tenure-track slot. Then get unbiased advice about whether you have what it takes, advises geophysicist Quentin Williams of UC Santa Cruz. That means an evaluation from a former adviser or someone in your field—and not your spouse.

• Recognize the department's reason for offering you the position, says developmental biologist Gail Martin, who spent 9 years on soft money at UC San Francisco. If the department is recruiting your spouse, things may change once your spouse has signed on, and your needs may sink to a lower priority. So expect that whatever the department offers up front is all you're going to get. Judge whether you have a true advocate, other than your spouse, in the department—someone who sees your value and has an interest in your development—advises Martin.

• If you are offered a spousal appointment, says Williams, "you need to be very adept at detecting whether a department is friendly to this kind of thing." For instance, are there other spouses in soft-money positions who have not advanced?

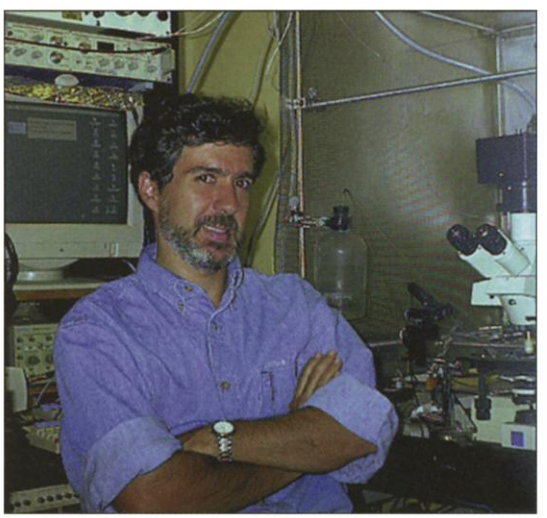
• And finally, see whether the university is committed to supporting what the department is offering you. Martin says those making the offer "may sometimes blur the distinction between what they would like to give you and what they actually can provide." Stanford Vice Provost Charles Kruger encourages people "to get an assessment of how the system works and to get it from a person who doesn't have a stake in the situation."

–M.B.

ted to minimizing the perils of soft-money positions. But they also want to balance fairness to the investigators with maintenance of their institutions' standards for high-quality research. Most administrators say that the best way to prevent soft-money failures is to appoint only those people who are well-equipped to succeed. Charles Kruger, vice provost and dean of research and graduate policy at Stanford University, says his office reviews every appointment of a soft-money faculty member. If a department chair were appointing a weak person to a soft-money position "out of desperation," says Kruger—say, as part of a spouse's recruitment package—"it probably wouldn't pass … the review process."

At least some institutions take special care to fully disclose the nature of the appointment. "We want to be sure … that the conditions and expectations are laid out adequately," says Marvin Parnes, associate vice president for research at the University of Michigan. To that end, he said, his office reviews the offers that departments make to job candidates to ensure that the offers clearly spell out what kind of support and resources the person will receive and precisely what will be expected of them come promotion time.

Regarding the biggest concern of soft-money researchers—emergency salary support—university administrators say it should be doled out judiciously. No one should be turned out immediately upon losing a grant, says Ellen Switkes, assistant vice president for academic advancement at the University of California. The university has "an investment in this person. Their research is up and going; there may be graduate students working with them. It behooves the institution to tide the person over until their new grant comes through." Departments usually provide this kind of bridging support, she says, although it is UC policy not to promise it. On the other hand, say Switkes and other administrators, it is a mistake to postpone the eventual termination of grantless researchers by supporting them for too long. When grievances over such support reach her office, Switkes says, the department most often has erred on the side of generosity, floating an unfunded researcher for so long that he or she feels entitled to further support. Parnes says Michigan has a well-defined sliding scale for the amount of crisis support available to its soft-money faculty: up to 18 months in any 5-year period for the most senior people. But, he emphasizes, support is only offered in cases to "truly bridge" a short-term gap between grants: "This is not a substitute for severance pay."



Worst nightmare. Alex Peinado worked for 6 months without pay after his crisis support ran out.

CREDIT: A. PEINADO

Despite evidence of concern from the top, there is no guarantee at any university that rules won't be bent or abuses won't occur. "It is definitely 'buyer beware' " for the person considering a soft-money job, says Switkes (see sidebar above). "You have to be very careful about the kind of department you are getting into, what the local politics are, and the perspective for long-term grant funding. Those are all very individual things."

"There is nothing inherently exploitative or bad about soft-money positions," adds Gillian Einstein, a scientific review administrator at NIH who held a soft-money faculty position at Duke University Medical Center for 11 years. "They can be incredibly useful. The key is the structure, and a sense of the culture in which they exist, and whether you can grow and be creative. Because that is why you're doing science."

–MARCIA BARINAGA