Portrait of Perpetual Zest

Solar astronomer Harold Zirin came to Caltech looking for ideal atmospheric conditions and brought an atmosphere of his own.

Solar astronomer Harold Zirin is known as "unchained energy" to the three postdoctoral fellows who work with him. This limitless energy, they say, makes for a man easily impatient with those around him who can't or don't work as prodigiously as he does. It also spreads a certain amount of dismay among the people in charge of astronomical equipment. (*They* say some of it buckles under Zirin's energetic approach.) And his co-workers admit that Zirin's perpetual zest results in occasional mistakes as he hacks his way through scientific underbrush to blaze a path to the sun.

In the same breath all these critics reveal, with considerable admiration, that Zirin will always cheerfully and candidly admit a *gaffe*—a quality, along with his generosity to colleagues, that is not invariably found among scientists. And a close co-worker, astronomer Robert Howard, adds that Zirin has not only brought solar observation to the campus, but is a never-ending source of provocative and stimulating ideas in the realm of solar physics.

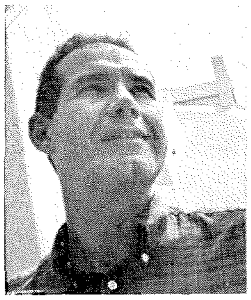
Zirin came to Caltech in 1965 from the High Altitude Observatory at the National Center for Atmospheric Research in Boulder, Colorado, largely because of Howard and Caltech physicist Robert Leighton. He had worked with them as a visiting professor at Caltech in 1963 and found it exciting. When he was invited to join the Caltech faculty in 1965, the timing was right. He was dissatisfied with the atmospheric conditions in Colorado, and Pasadena offered ideal ones (very stable air). In addition, he knew there was solid interest at Caltech in building a solar telescope somewhere in southern California. After three years, he is convinced that Caltech has the most stimulating environment that an astronomer can find anywhere.

The trio has been very productive at Caltech. They each have a particular interest in the structure of the sun's chromosphere: Zirin in cinematography and the morphology of the sun; Leighton in the theory of sunspot cycles; Howard in solar magnetism. Howard and Zirin have conceived and designed the large reflecting telescope system that JPL is contributing to the Apollo Applications Program. And all three were involved in the selection of the site for Caltech's new solar observatory now under construction at Big Bear Lake, with Zirin responsible for its funding and design.

Solar astronomy is a relatively small field; there are only about five active solar observatories in this country. Zirin estimates that the number of people really active in the field is no more than 50, so they work with each other as "cooperative competitors."

"I don't know why solar astronomy isn't as popular in the United States as it is in Europe," he ponders. "Every college has its little 16-inch telescope for stellar work, but they seldom have a solar telescope. They're relatively cheap—we get beautiful results with a five-inch photoheliograph that cost about $30,000—and we have all the benefits of daytime observing."

Solar astronomy has become more important re-



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cently because of space exploration; intermittent solar phenomena can interrupt long-distance communications or injure astronauts. Then too, scientists who have been observing x-rays and cosmic rays are becoming more interested in the solar flares that produce them.

Zirin got his Harvard PhD in 1953 as a theoretician, but has long since become what he calls a "working astronomer." In fact, he refers to those who wear heavy trappings of theory as the *bêtes noirs* of solar astronomy—the phrase being loosely translated from the French as pains-in-the-neck.

"There are still too many people who are so wound up in mathematical analyses that they forget to think of the sun or stars as real. Until about 1910 astronomy was very classical, with no physics in it at all. Then, largely through the influence of Hale and others, the new physics came in and theory became important. In time a lot of the emphasis shifted from observation and interpretation to theory.

"Theory is great as long as it's physical theory. It's when it becomes giant mathematical exercises that there is danger. Now, if you look at an astronomical journal, you sometimes find about half the papers are just big calculations somebody did in order to get a degree or to publish. They're more academic exercises than steps forward."

Zirin thinks the biggest job in his field today is to *see* what is actually happening on the sun. He is convinced that most of its mysteries will be solved by physical thinking rather than by extensive mathematical analysis.

"One example," he says, "is solar flares. For years theoreticians tried to explain them when most had never seen one. They were like the blind men trying to describe the elephant."

He believes that the primary reasons for studying the sun are because it has such a great influence on the earth and because it is the one star that we can really see well.

"When you study a distant star," Zirin says, "its spectrum is just a little track—a fingerprint. With the sun it's like seeing the whole man."

One of the most absorbing features of his work is that the sun is always different, changing from day to day. Eventually he wants to see a chain of three coordinated solar telescopes in good locations to film the sun every minute of the 24-hour day. So far he has the funds for just one of them. The project ("one of a number that are dragging me down in the mire") has taken him all over the world in search of ideal sites. He considered Iran but ran into problems. He tried northern Sweden, but atmospheric conditions stymied him. He finally decided on Israel, where support facilities and trained people were available, but even there he hasn't found the going easy.

He took a telescope there in May 1967—a twin of his pet five-inch photoheliograph on the roof of the Robinson Laboratory of Astrophysics on the Caltech campus. It was all set up and ready to be used when the war broke out. (He considers it lucky that the instrument wasn't fired on by the Arabs; perched up on the roof of a building, it looks just like a cannon.) When the telescope was finally put into use this year, it didn't work properly, so he had to return to Israel this summer to straighten things out. He subsequently sent David Bohlin of his staff to do further work on it.

Meanwhile at Caltech he anxiously awaits completion of the new solar observatory at Big Bear Lake.

"We think it's going to be a terrific spot. This is the first time in history that a solar observatory was really chosen as the result of a detailed study, so we're expecting optimum conditions—air that is clear *and* stable.

"I'm still interested in spectroscopy and its interpretation. At Big Bear we hope, for the first time, to make rapid spectrograms so we can see immediately what we're getting."

He and his group are already using the new telescope, which will be moved to Big Bear but which is temporarily installed on the roof of the Robinson Laboratory. By the time it is finally on the site, the project will be four years old—and that's a long time in Zirin's frenetic life. He won't be surprised if the new installation will then have to be updated to meet the needs of the day.

"But," he says, "you have to be flexible—continually. Every *day* we change what we're doing with the telescope. Maybe I don't stick to one thing long enough. Maybe I change too often." □