FIRST STELLAR IRON ABUNDANCE MEASUREMENTS IN THE GALACTIC CENTER

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The disk of the Milky Way galaxy shows evidence for gas-phase abundances which increase with decreasing radius (Simpson et al. 1995; Afflerbach et al. 1997). Sustained star formation in the center of the Milky Way Galaxy may be fueled by inflow of inner disk gas (Serabyn & Morris 1996), suggesting that Galactic Center (GC) stars may be metal-rich. Measurements of stellar abundances in the GC allow us to explore the chemical evolution of our Galaxy's nucleus and to infer its star formation history.

We have obtained spectra of the M supergiant IRS 7 to determine its iron abundance. IRS 7 belongs to a cluster of massive stars in the central pc of the GC (Lacy, Townes, & Hollenbach 1982; Lebofsky, Rieke, & Tokunaga 1982; Krabbe et al. 1995). Its metallicity, therefore, should reflect the composition of the gas which fueled this burst of star formation a few Myr ago in the GC.

We have acquired our spectra on the NASA IRTF on Mauna Kea, using the infrared spectrograph CSHELL at a resolution of $\lambda/\Delta\lambda$ = 40,000. We use the program MOOG (Sneden 1973) for a detailed abundance analysis. We obtain *differential* abundances by analyzing spectra of both IRS 7 and the solar neighborhood M supergiant α Ori in parallel.

Our abundance analysis requires as input the effective temperature $T_{\rm eff}$, the microturbulent velocity ξ, and the surface gravity g for each star, and the oscillator strengths gf for each line. We use empirical gf values measured from the infrared solar atlas (Wallace et al. 1996). We measure $T_{\rm eff}$ from our spectra, by requiring that the carbon abundance measured from

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weak CO lines be independent of excitation potential. Similarly, we determine ξ by requiring that the carbon abundance measured from weak and moderate-strength CO lines be independent of equivalent width. We estimate g by comparing the observed luminosity and $T_{\rm eff}$ to stellar evolutionary tracks. We adopt model atmospheres from Kurucz (1991) for the Sun, and from Plez (1992) for α Ori and IRS 7.

We find [Fe/H] = -0.01 ± 0.14 for IRS 7. This solar abundance appears to contradict results from low resolution spectra at $\lambda/\Delta\lambda = 600 - 3000$ which find that IRS 7 and other GC stars have stronger "Na" and "Ca" absorption features than in similar solar neighborhood stars (Sellgren et al. 1987; Blum et al. 1996). High-resolution spectra of cool giants and supergiants show, however, that the "Na" feature is actually a mixture of lines of Na, Sc, V, and other elements (Wallace & Hinkle 1996; Ramírez et al. 1997*a*). We have obtained a CSHELL spectrum of IRS 7 which shows that Na lines are the same strength in IRS 7 and α Ori, but that Sc and V are stronger in IRS 7. The difference is more likely a stellar atmospheric effect rather than an abundance enhancement, since the strength, low excitation, and hyperfine structure of these Sc and V lines will make them very sensitive to the outer layers of the atmosphere.

We conclude that the GC star IRS 7 has a *solar* iron abundance from our spectra at $\lambda/\Delta\lambda = 40{,}000$. We are currently acquiring more data, both for additional stars and for additional elements, in order to determine the mean metallicity in the GC (Ramírez et al. 1997*b*). We also find that the strong "Na" feature measured in spectra of IRS 7 at $\lambda/\Delta\lambda = 600 - 3000$ is due to strong Sc and V absorption rather than a high Na abundance. We caution against deriving stellar abundances from low-resolution spectra.

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