hot dust shells with temperatures of 1,800–3,600 K could explain the measurements. Some colleagues argued that also small H II regions around the stars might be responsible for these IR excesses. So I tried another approach towards the solution of the problem a year later. This time I intended to get some spectra of the stars, to learn about their temperature and mass. Furthermore, I wanted to observe the energy distribution out to 20 μm; this would have answered the question whether the stars are still embedded in dust shells. Therefore I submitted two proposals for spectroscopy and IR photometry, respectively. "Due to heavy demand on the 3.6 m telescope" I got no time for spectroscopy but 7 nights for photometry.

July 1982 was one of the worst observing runs I have ever had: blue skies throughout the day and complete cloud coverage during the night. I could not open the dome for a single hour and left La Silla without any IR observations but with a large number of colour slides of amazing sunsets from these days. I had to wait a whole year before I could "see" my objects again. The application for another IR observing run at the 1 m Telescope was successful and I went to La Silla at the end of August 1983.

Measurements between 5 and 20 μm require excellent weather conditions, a sensitive bolometer and a night assistant familiar with the equipment; a lot of constraints, but I was lucky to find all requirements satisfied. It was possible to observe during 3 nights with a newly developed Ge-bolometer and with the help of R. Vega. After a short time we found that at 10 and 20 μm my objects were so bright that they might well have served as standard stars. This clearly indicated that a lot of hot dust around these stars must give rise to the large IR excesses. Within one night the objects had turned into some of the most heavily reddened visible stars known today. By means of the new infrared equipment on La Silla it was also possible to search for hydrogen recombination lines at 2.2 and 4 μm. They should show up if the stars had formed small H II regions in their environment. No such lines could be found, and that was a further indication that the IR excesses are mainly caused by circumstellar dust.

The observations described so far, i.e. the energy distribution from 0.3 to 20 μm, are shown for a typical object of the sample (C 24) in Fig. 2. For illustration the spectrum of a B2 V star with 6.4 mag of visual extinction (these values have been derived from the UBV photometry) and two black-body curves for temperatures of 1,100 and 170 K have been included. Obviously, these fits do not reproduce the observations very well, but they may help to understand the objects qualitatively: the visible light which is heavily reddened comes from a young luminous star, whose spectral type is uncertain. This star is still embedded in its protostellar dust shell and has not yet formed a detectable H II region. The radiation at IR wavelengths comes from the hot dust shell, whose temperature varies with the distance from the star. The inner regions are comparatively hot (e.g. 1,100 K) whereas the outer regions are "fairly cool" (e.g. 170 K). If this interpretation is correct, we are witnessing a very early short-lived stage of stellar evolution. Additional support for this idea comes from the location of the objects within the M 17 complex. In fact, they are all situated near the interface of the H II region and the molecular cloud, probably indicating that they belong to the youngest generation of newly born stars within that complex. Slightly older stars are found inside the H II region itself and even older stars at larger distances from the complex. In that sense M 17 would be an example of "sequential star formation", where stellar winds of newly formed stars compress the interstellar medium in their surroundings and thus give rise to a subsequent star-forming process.

These far-reaching conclusions need, of course, additional observational support. For that purpose I applied again for telescope time on La Silla to perform the necessary spectroscopic observations. This time I was successful. Three nights have been allotted to my programme at the new 2.2 m telescope during June 1984. Then I hope to clarify the physical nature of the embedded stars. During five additional nights of IR observations in the same period I want to investigate whether the dust shells are very compact structures or possibly extend to larger distances from the stars. If the objects continue to give me further surprise during future observations I shall still have to spend quite a few hours at the telescope until I may say: "Now I do know my objects."

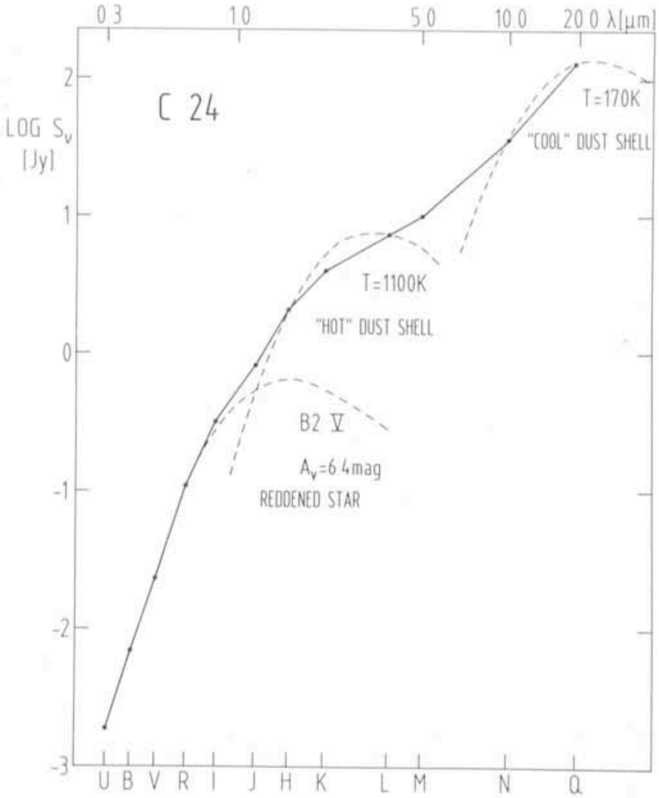


Fig. 2: *The observed energy distribution of one of the objects with strong IR excess. Between 0.3 and 0.9 μm the data points can be fitted by a B2V star with 6.4 mag of visual extinction. At longer wavelengths a circumstellar dust shell of various temperatures might explain the observational points. For illustration, two black-body curves of 1,100 and 170 K are shown.*

# Visiting Astronomers

## (April 1–October 1, 1984)

Observing time has now been allocated for period 33 (April 1–October 1, 1984). The demand for telescope time was again much greater than the time actually available.

The following list gives the names of the visiting astronomers, by telescope and in chronological order. The complete list, with dates, equipment and programme titles, is available from ESO-Garching.

### 3.6 m Telescope

April: Ulrich / Iye, Zuiderwijk / v. Paradijs, Hunger / Heber / Drilling / Kudritzki, Zuiderwijk / v. Paradijs, D'Odorico / Iye / Bouvier, Zuiderwijk / v. Paradijs, Iye, Zuiderwijk / v. Paradijs, Kudritzki / Nissen / Gehren / Simon, Zuiderwijk / v. Paradijs, Willems / de Jong, Stanga / Felli / Oliva / Salinari, Shaver, Shaver / Robertson / Cristiani, Danziger / Cristiani / Shaver.

May: Danziger / Cristiani / Shaver, Ilovaisky / Motch / Chevalier / v. Paradijs / Pakull, Larsson / Dravins, Pietsch / Krautter / Sztajno / Trümper, Ilovaisky / Motch / Chevalier / v. Paradijs, Pakull, Oliva / Moorwood, Moorwood / Glass, Fossat / Grec / Gelly, Motch / Pakull / Ilovaisky / Beuermann, Rosa / D'Odorico.

June: Rosa / D'Odorico, Koester / Reimers, Koester / Weidemann, Spite, F. / Spite, M., Zuiderwijk / v. Paradijs, Kudritzki / Méndez / Simon, Zuiderwijk / v. Paradijs, Cristiani / Danziger / D'Odorico, Zuiderwijk / v. Paradijs, Bertola / Zeilinger, Capaccioli.

July: Capaccioli, Ilovaisky / Motch / Chevalier / v. Paradijs / Pakull, Brahic / Sicardy, Ilovaisky / Motch / Chevalier / v. Paradijs / Pakull, Gemünd / Kreysa / Steppe, Steppe / Witzel / Biermann, Schultz, Sieber / Wielebinksi / Kreysa / Gemünd, Caloi / Castellani / Danziger / Gilmozzi, Sadler, Mouchet / Motch / Bonnet-Bidaud, Houziaux / Heck / Manfroid.

August: Houziaux / Heck / Manfroid, Miley / Lub / de Jong, Gratton / Ortolani / Sneden, D'Odorico / Miley / Heckman / Ciani, Alloin / D'Odorico / Pelat, Bergeron / D'Odorico, Ferlet / Dennefeld / Maurice, Wolf / Appenzeller / Klare / Leitherer / Stahl / Zanella / Zickgraf.

September: Wolf / Appenzeller / Klare / Leitherer / Stahl / Zanella / Zickgraf, Olofsson / Bergvall / Ekman, Danziger / Maraschi / Tanzi / Treves, Perrier / Chelli / Léna / Sibille, Zuiderwijk / de Ruiter, Lequeux / Azzopardi / Breysacher / Westerlund, Barbieri / Cristiani.

## 1.4 m CAT

April: Querci, M. / Querci, F. / Yerle, Noci / Ortolani, Finkenzeller, Gustafsson / Frisk / Edvardsson, Gry / Ferlet / Vidal-Madjar.

May: Gry / Ferlet / Vidal-Madjar, Westerlund / Krełowski, Münch / Gredel, Baade / Danziger, Holweger / Steffen, Weiss / Schneider / Knölker, Felenbok / Roueff / Czarny.

June: Felenbok / Roueff / Czarny, Waelkens / Rufener, Soderblom, Soderblom / Avrett, Soderblom / Hartmann, Soderblom / Kurucz, Vander Linden, Danks / Lambert, Spite, F. / Spite, M., Doazan / Thomas / Bourdonneau.

July: Doazan / Thomas / Bourdonneau, Foing / Bonnet / Crivellari / Beckman, Foing / Bonnet / Fossat / Grec, Foing / Bonnet / Crivellari / Beckman, Foing / Bonnet / Fossat / Grec, Barbuy, Crane / Mandolesi / Hegyi.

August: Crane / Mandolesi / Hegyi, van Dessel, Gratton / Ortolani / Sneden, van Dishoeck / Black, Grewing / Bianchi / Kappelmann.

September: Grewing / Bianchi / Kappelmann, Foing / Bonnet, Gustafsson / Andersen / Nissen.

## 2.2 m Telescope

April: Sadler / Carter, Zickgraf / Leitherer / Stahl / Gail, de Waard / Miley / Schilizzi, Rosa / Richter, Richter / Williams, Ulrich / van Breugel / Miley / Heckman.

May: Ulrich / van Breugel / Miley / Heckman, Ilovaisky / Motch / Chevalier / v. Paradijs / Pakull, Ilovaisky / Motch / Chevalier / Hurley / Pedersen, Pedersen, Crane / Capaccioli, Chincarini / Manousoyannaki, Motch / Ilovaisky / Pakull / Beuermann, Fusi Pecci / Cacciari / Buonanno.

June: Fusi Pecci / Cacciari / Buonanno, van der Kruit, Chini, Finkenzeller / Mundt, Felli / Stanga / Oliva / Salinari, Bertola / Zeilinger, Kollatschny, Fricke / Witzel, Hoffmann / Geyer, Fricke / Witzel, Kollatschny.

July: Kollatschny, Ilovaisky / Motch / Chevalier, v. Paradijs / Pakull.

August: Sadler, Jensen, Zuiderwijk / de Ruiter, Olofsson / Bergvall / Ekman, Bergvall / Ekman / Johansson, Olofsson / Bergvall / Ekman.

September: Olofsson / Bergvall / Ekman, Bergvall / Ekman / Johansson, Bertola / Danziger, Jensen, Jørgensen / Nørgaard-Nielsen / Hansen, Cayrel R. / Buser, Bergeron / Boissé, Elst / Nelles.

## 1.5 m Spectrographic Telescope

April: Maurice / Louise, Grenon / Trefzger, D'Odorico / Iye / Bouvier, Giovannelli / Persi / Vittone / Bisnovatji / Sheffer / Lamzin, Schulte-Ladbeck, Stenholm / Lundström.

May: Stenholm / Lundström, Friedjung / Bianchini, Bianchini / Sabbadin, Wendker / Heske, Chmielewski / Jousson, Spite, F. / Perrin / Spite, M., Didelon, Gomez / Floquet / Gerbaldi / Grenirer, Rufener / Waelkens, Molaro / Franco / Morossi / Ramella.

June: Molaro / Franco / Morossi / Ramella, Schild / Maeder, Didelon, Reimers / Groote, Hänel, de Jager, Vander Linden, Didelon, Chincarini / Kotanyi, Capaccioli, Bica / Alloin.

July: Bica / Alloin, Strupat / Drechsel / Rahe / Wargau, Tanzi / Pakull / Tarenghi, Dennefeld / Pottasch, Labhardt.

August: Labhardt, Maciel / Barbuy, Didelon, van Dessel, Didelon / Jaschek, M. / Jaschek, C., Didelon, Testor / Lortet / Heydari-Malayeri / Niemela, Zuiderwijk / v. Paradijs / Bath / Tjemkes, Alloin / D'Odorico / Pelat, Zuiderwijk / v. Paradijs / Bath / Tjemkes.

September: Zuiderwijk / v. Paradijs / Bath / Tjemkes, Danziger / Maraschi / Tanzi / Treves, Zuiderwijk / v. Paradijs / Bath / Tjemkes, Richtler, Zuiderwijk / v. Paradijs / Bath / Tjemkes, Wargau / Drechsel / Rahe / Strupat, Zuiderwijk / v. Paradijs / Bath / Tjemkes.

## 1 m Photometric Telescope

April: Sadler, Liller / Alcaíno, Willems / de Jong, Giovannelli / Persi / Vittone / Bisnovatji / Sheffer / Lamzin, Zickgraf / Leitherer / Stahl / Gail, Krautter / Brinkmann / Doll / Kendziorra.

May: Krautter / Brinkmann / Doll / Kendziorra, Wendker / Heske, Oliva / Moorwood, Chalabaev, v.d. Hucht / Thé, Bues / Rupprecht, Koester / Weidemann.

June: Koester / Weidemann, Terzan, Hänel, Chini / Krügel, de Jager, Fricke / Loose, Clementini / Battistini / Focardi / Fusi Pecci.

July: Clementini / Battistini / Focardi / Fusi Pecci, Bertout / Bouvier, Tanzi / Pakull / Tarenghi, Houziaux / Heck / Manfroid, Heck / Manfroid / Didelon, Mouchet / Motch / Bonnet-Bidaud, Sadler.

August: Sadler, Di Martino / Zappala / Farinella / Paolicchi / Cacciatori / De Sanctis / Knezevic / Debehogne / Ferreri, Poulain.

September: Poulain, Olofsson / Bergvall / Ekman, Le Bertre / Epchtein / Nguyen-Q-Rieu, Epchtein / Group of astronomers of São Paulo, Alcaíno / Liller, Wargau / Drechsel / Rahe / Strupat.

## 50 cm ESO Photometric Telescope

April: Scaltriti / Busso / Cellino, Udalski / Geyer, Zickgraf / Leitherer / Stahl / Gail, Gustafsson / Frisk / Edvardsson, Leandersson.

May: Leandersson, Carrasco / Loyola, Lodén, K. / Kennedahl, Mauder.

June: Mauder, Westerlund / Thé.

July: Westerlund / Thé, Carrasco / Loyola, Häfner.

August: Häfner, Di Martino / Zappala / Farinella / Paolicchi / Cacciatori / De Sanctis / Knezevic / Debehogne / Ferreri. Wolf / Appenzeller / Klare / Leitherer / Stahl / Zanella / Zickgraf, Carrasco / Loyola.

September: Carrasco / Loyola, Debehogne / Zappala / De Sanctis.

## GPO 40 cm Astrograph

April: Burnage / Fehrenbach / Duflot, Ferreri / Zappala / Di Martino / De Sanctis / Cacciatori / Debehogne / Lagerkvist.

May: Ferreri / Zappala / Di Martino / De Sanctis / Cacciatori / Debehogne / Lagerkvist, Dommanget / Léonis.

June: Dommanget / Léonis.

September: Debehogne / Machado / Caldeira / Netto / Vieira / Mourao / Tavares / Nunes / Zappala / Di Sanctis / Lagerkvist / Protitch-Benishek / Bezerra.

## 1.5 m Danish Telescope

April: Veillet / Dourneau / Mignard / Ferraz-Mello, Liller / Alcaíno, Cristiani / Barbieri / Danziger / Romano, Pedersen / v. Paradijs / Lewin, Kunth / Viallefond / Vigroux.

May: Kunth /Viallefond / Vigroux, Pedersen / v. Paradijs / Lewin, Larsson / Dravins.

June: Ardeberg / Lindgren / Maurice / Prévot, Benz / Mayor / Bouvier / Foing / Gondoin, Mayor / Burki, Mayor / Mermilliod, Andersen / Nordström / Olsen.

July: Andersen / Nordström / Olsen, Melnick / Danziger / Terlevich, Castellani / Caloi / Danziger / Gilmozzi, Miley / Lub / de Jong.

August: Miley / Lub / de Jong, Durret / Bergeron, White / Mason / Parmar, Testor / Lortet / Heydari-Melayeri / Niemela, Quintana.

September: Quintana.

## 50 cm Danish Telescope

May: Schneider / Maitzen, Weiss / Schneider / Knölker, Vander Linden.

June: Vander Linden.

## 90 cm Dutch Telescope

April: Grenon / Lub.

May: Grenon / Lub, Pakull / Beuermann / Weißsieker / Klose.

June: de Jager, de Zeeuw / Lub / Blaauw, Foing / Bonnet / Linsky / Walter.

July: Foing / Bonnet / Linsky / Walter, Tanzi / Pakull / Tarenghi.

August: v. Paradijs / Tjemkes / Bath / Charles.

September: v. Paradijs / Tjemkes / Bath / Charles, v. Paradijs / Tjemkes / Bath / Zuiderwijk, v. Paradijs / Damen.

## 61 cm Bochum Telescope

May: Lodén, L. O. / Engberg, Wendker / Heske, Vogt.

June: Vogt, Maitzen / Catalano / Gerbaldi / Schneider, Kohoutek / Pauls.

July: Kohoutek / Pauls, Sterken group.

August: Sterken group.

September: Sterken group.

# Magnesium Isotopes in Halo Stars of Various Metallicities

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### Introduction

Population II stars are very old objects, and their relative abundances can give clues on the chemical enrichment at early times. The elemental composition of stars depends on the initial mass function of the progenitor stars which enrich the gas from which they form. Some element ratios in the oldest stars are especially sensitive to the mass of the preceding stars, the so-called population III or population O, first generation of zero-metal stars, today dissappeared.

Important ratios are, for example, the oxygen-to-iron, nitrogen-to-iron, magnesium isotope ratios, as well as sodium and aluminium-to-magnesium ratios. In halo stars, oxygen-to-iron ratios above solar seem to point to a first generation of massive ($M > 10\ M_{\odot}$) stars. Nitrogen-to-iron ratios in these stars indicate the primary nature of nitrogen at early times, and this can be explained by a first generation of intermediate or high mass stars.

Calculations are available for the production of magnesium isotopes in intermediate mass stars ($2 < M/M_{\odot} < 8$) and in ordinarily massive stars ($M > 10\ M_{\odot}$). The main controversy is whether they are formed through explosive or hydrostatic carbon burning. In the explosive case, the isotopic $^{25}$Mg abundance should be proportional to that of $^{24}$Mg, whereas $^{26}$Mg forms from $^{25}$Mg; in this case, one expects a strong deficiency of $^{25,26}$Mg in metal-deficient stars. On the other hand, if their production occurs in hydrostatic conditions, $^{24}$Mg is formed during hydrostatic carbon burning, whereas during hydrostatic helium burning one has the reaction $^{22}$Ne ($\alpha$, n) $^{25}$Mg followed by conversion of some $^{25}$Mg into $^{26}$Mg by neutron capture. In this scenario, a small overdeficiency of $^{25,26}$Mg is expected.