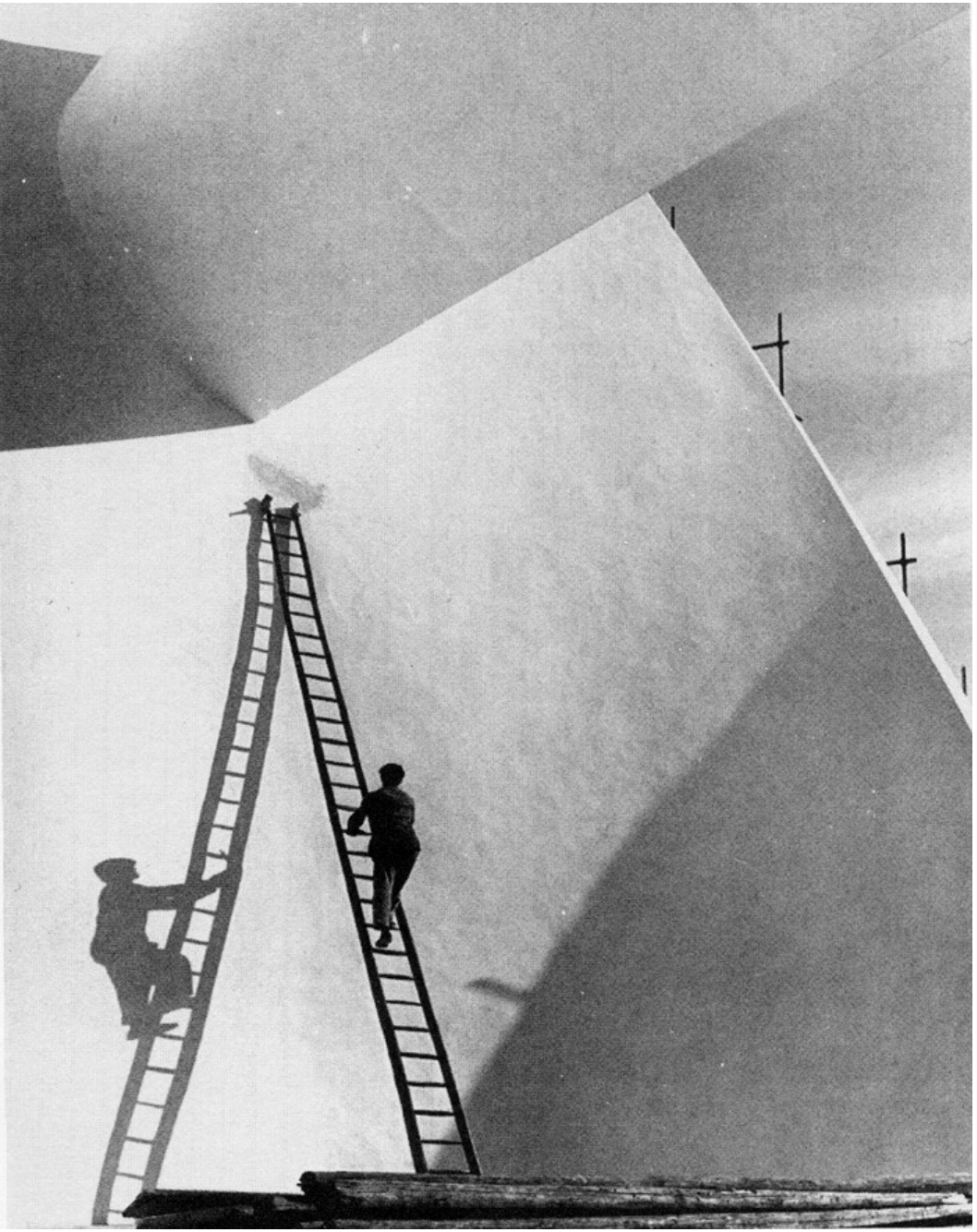


The Legacy of S. Chandrasekhar (1910-1995)

What impressed about your picture was the extremely striking manner in which you visually portray one's inner feelings towards one's efforts at accomplishments:

one is half-way up the ladder, but the few glimmerings of the structure which one sees and to which one aspires are totally inaccessible, even if one were to climb to the top of the ladder. The realization of the absolute impossibility of achieving one's goals is only enhanced by the shadow giving one an even lowlier feeling of one's position

- One of the foremost scientist of the 20th century
- Dedicated and charismatic teacher (50 plus students from all over the world graduated and many of them have become leaders in their fields
- Sole editor of the Astrophysical Journal for nearly twenty years
- A man of two cultures –The culture of sciences and humanities
- A product of the complexities of three widely different countries

Chandra's early life, a few highlights

- Born in Lahore (now in Pakistan)19-10-1910
- Early education at home till he was 11. He began regular schooling in 1921 in Madras (now Chennai). University education at Presidency College, Madras (1925-30)
- Exceptionally brilliant student throughout his career, Chandra had determined to pursue a career in pure science from an early age. He had the example of his uncle Sir C.V. Raman.

Encounter with Arnold Sommerfeld

- **Sommerfeld's visit to the Presidency College in 1928 and Chandra's meeting with Sommerfeld**

Chandra,

"The single most important event in my life"

Journey to England

- **Award of a Government of India Scholarship to study abroad**
- **Chooses Cambridge and Fowler as his thesis advisor.**
- **Leaves India on July 31, 1930**

- **Extension of Fowler's theory to find more details of the internal structure of a white dwarf.**
- **On the long voyage from India to England makes a startling discovery**
- **A limit on the mass of a star that could become a white dwarf !!**

Chandra in 1932

For all stars of mass > M_{lim} the perfect gas equation of state does not break down, however high the density may become and matter does not become degenerate. An appeal to Fermi-Dirac statistics to avoid the central density cannot be avoided.

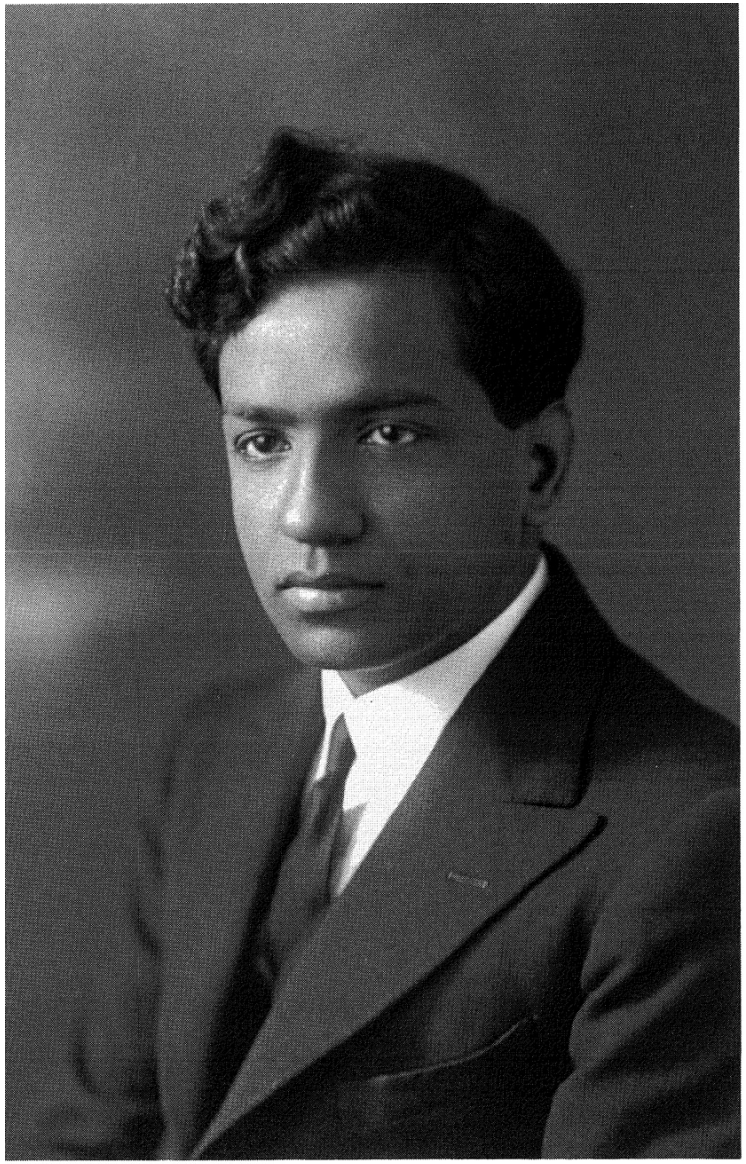
Great progress in the analysis of stellar structure is not possible before we can answer the following fundamental question: Given an enclosure containing electrons and atomic nuclei, what happens if we go on compressing the material indefinitely

- **Chandra elected to a Trinity Fellowship; visit to Russia; Ambartsumian's encouragement to work out the complete theory.**

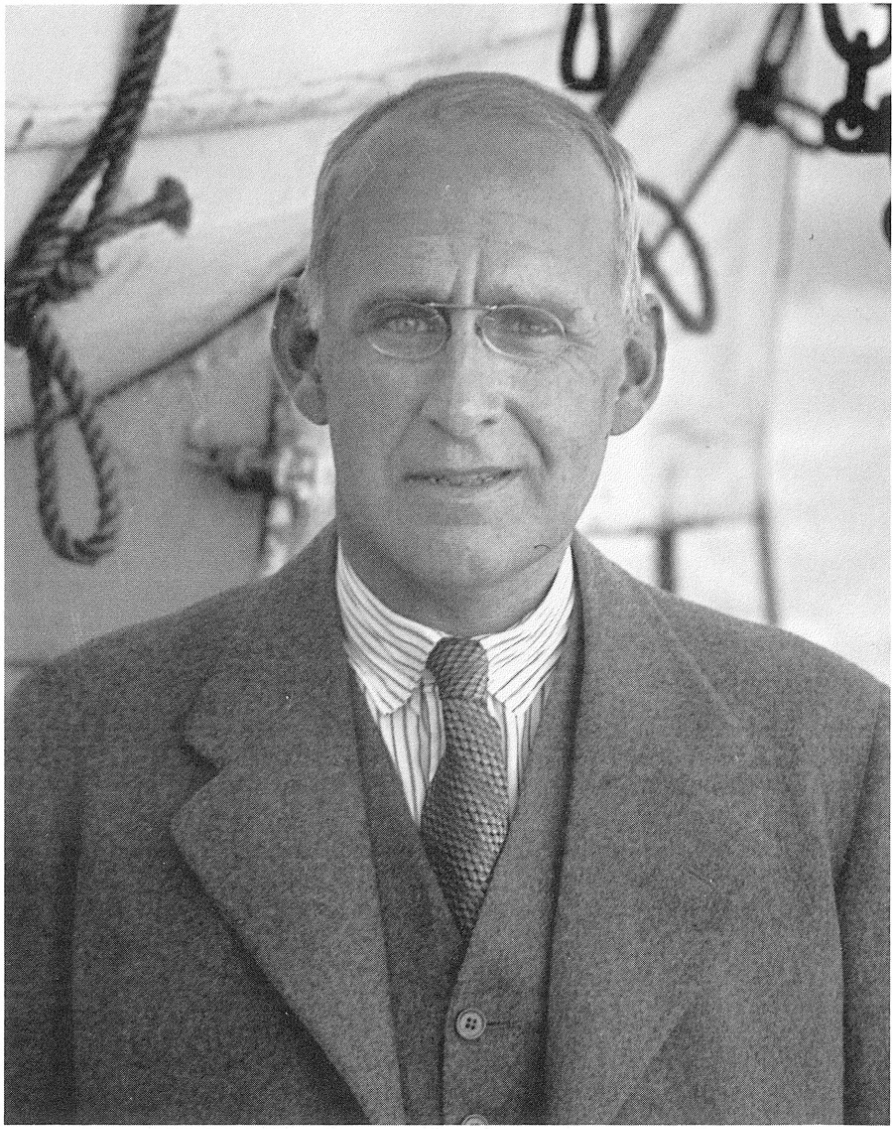
- **After month's of work, when presented at the Royal Astronomical Society met with ridicule and humiliation.**

- **Unexpected Encounter.. Sir Arthur S. Eddington**

- **Defies conventional "smoothed out" accounts of scientific discoveries.**



12. Chandra as Fellow of Trinity College, Cambridge, 1934.



13. Sir Arthur Stanley Eddington (1882–1944), 1932. Photograph courtesy of The Bettmann Archive, UPI/Bettmann Newsphotos.

January 1935 Astronomical Society Meeting

- Eddington:

I do not know whether I shall escape this meeting alive, but the point of my paper is that there is no such thing as relativistic degeneracy

Chandrasekhar, using the relativistic formula which has been accepted for the last five years shows that a star of mass greater than a certain limit M remains a perfect gas and can never cool

The star has to go on radiating and radiating and contracting and contracting until, I suppose, it gets to a few KM radius, when gravity becomes strong enough to hold in the radiation, and the star can at last find peace.

Dr. Chandrasekhar had got this result before, but has rubbed it in, in his last paper, and , when discussing it with him, I felt driven to the conclusion that this was a reductio ad absurdum of the relativistic degeneracy formula. Various accidents may intervene to save a star, but I want more protection than that. I think there should be a law of Nature to prevent a star from behaving in this absurd manner

Sir Arthur Stanley Eddington

- An Imposing Scientific Luminary
- Had won all the coveted medals and prizes
- Leader of the expedition to detect the bending of predicted by Einstein's general relativity
- A great popularizer of science. Chiefly responsible for popularizing Einstein's theory in the English speaking world.
- *Chandra, on the other hand, new in research, just completed his doctorate.*

- Eddington cavalierly dismissed the whole idea! He made it look like the young man had made a conceptual error. Nature couldn't behave like that.

- Chandra felt humiliated as people came by after the meeting to console him, saying it was too bad. They all felt Eddington was right.

- Chandra sought the reaction of among renowned physicists (Rosenfeld, Bohr, Pauli, Dirac). They all agreed privately Chandra was right, but were unwilling to come out and say openly that Eddington was wrong.

I foresaw myself some thirty years of scientific work, and I simply did not think it was productive to constantly harp on something which was done. It was much better for me to change the field of research and go on into something else. If I was right, then it would be known as right. For myself, I was positive that a fact of such clear significance for evolution of the stars would in time be established or disproved. I didn't see a need to stay there, so I just left

A Scientific Autobiography

The various installments describe in detail the evolution of my scientific work during the past forty years and records each investigation, describing the doubts and the successes, the trials and the tribulations. And the parts my various associates and assistants played in the completion of the different investigations are detailed.

Lalitha, only rarely mentioned, was always present, always supportive, and always encouraging. And this is the place to record the depth of my indebtedness to her. But the full measure of it cannot really be recorded :it is too deep and tooall persuasive. Let me then record very simply that Lalitha has been the principal motivating force and strength in my life. Her support has been constant, unwavering, and sustained. . . .

And so , I dedicate this autobiography, which is indeed my life, to her

My research on radiative transfer gave me the most satisfaction. I worked on it for five years, and the subject, I felt, developed on its own initiative and momentum. Problems arose one by one, each more complex and difficult than the previous one, and they were solved. The whole subject attained elegance and a beauty which I do not find to the same degree in any of my other work. And when I finally wrote the book, "Radiative Transfer," I left the area entirely. Although I could think of several problems, I did not want to spoil the coherence and beauty of the subject [with further additions]. Furthermore, as the subject had developed, I also had developed. It gave me for the first time a degree of self-assurance and confidence in my scientific work because here was a situation where I was not looking for problems. The subject, not easy by any standards, seemed to evolve on its own.

Autobiographical Account in Nobel Lecture

After the early preparatory years, my scientific work has followed a certain pattern motivated, principally, by a quest after perspectives. In practice, this quest has consisted in my choosing (after some trials and tribulations) a certain area which appears amenable to cultivation and compatible with my taste, abilities, and temperament. And when after some years of study, I feel that I have accumulated a sufficient body of knowledge and achieved a view of my own, I have the urge to present my point of view ab initio, in a coherent account with order, form, and structure.

1. Early years; stellar structure, the theory of white dwarfs (1929-39)

2. Stellar Dynamics; Stochastic, Stastical problems in Astronomy(1939-43)

3. Radiative Transfer, Polarization of the Sunlit sky and the Negative ion of Hydrogen(1943-50)

4. Turbulence; Hydromagnetic Problems in Astrophysics and Magnetohydrodynamics (1950-60)

5. Ellipsoidal Figures of Equilibrium (1960-68)

6. Relativistic Astrophysics (1965-75)

7. Mathematical theory of Black Holes; Colliding Waves; Non-radial Oscillations of Stars and Newton's Principia (1975-95)

Ryerson Lecture preparation

. . . consisted in reading several biographies of Shakespeare, his sonnets in Rowses editions very carefully, and listening with the text to all the great tragedies (in their Marlowe editions); reading several biographies of Beethoven (particularly Turner's and Sullivan's); and similarly reading several biographies of Newton; besides, the lives of Rutherford, Faraday, Michelson, Moseley, Maxwell, Einstein, Rayleigh, Abel; and books and essays by Hadamard, Poincare, and Hardy; and the works of Keats and Shelly, and most particularly Shelly's A Defense of Poetry and King-Hele's biogrpahy of Shelly

The pursuit of science has often been compared to the scaling of mountains high and not so high.

But who amongst us can hope, even in imagination, to scale the Everest and reach its summit when the sky is blue and the air is still, and in the stillness of the air survey the entire Himalayan range in the dazzling white of the snow stretching to infinity.

None of us can . for a comparable vision of Nature and the universe around us, but there is nothing mean or lowly in standing in the valley below and waiting for the sun to rise over Kanchanjunga.

Quoting from a letter of Milne

Posterity, in time, will give us our true measure and assign to each of us our due measure and humble place; and in the end it is the judgment of posterity that rally matters. He really succeeds who preserves accordingly to his lights , unaffected by fortune, good or bad. And it is well to remember there is no correlation between posterity and the judgment of contemporaries.


Subrahmanyan
Chandrasekhar,
age 5.

Subrahmanyan Chandrasekhar and his wife, Lalitha, in Williams Bay, Wisconsin, circa 1940.