

Poona 12-1-52.

My dear Krishnan,

In his letter ^{to me just received,} dated the 8th January 1952, K. G. Ramaswami writes as follows:—

"I received your two letters this morning. The telegram sent by Sri K. S. Krishnan was received here on the 22nd December, but since then, there has been no communication from the UNESCO. The letter promised in the telegram has also not been received. However, I have decided to wait till the end of the month before I try to book another passage. I have cancelled the passage I had booked for the 22nd January."

You may kindly do what is possible to expedite the action through the channels concerned, and also inform the young man suitably on the exact position in the matter. We are all just well. Trusting you all are, with kindest regards,
Yours affly
R. Ramdas

Poona 25/1/52

My dear Krishnan,
I am glad to inform you that in his letter just received, K. G. Ramachandran informs that he has heard from UNESCO, Paris, Communicating the award of Fellowship for Low Temp Physics at Max Lab for 4 months + 2 months at Leiden. They have also informed him that he will hear the details through the Government of India. I presume that you will kindly do the needful for considering the whole or at least a part of his extra stay since 1st July, 51 as ~~the~~ qualifying for the Fellowship. He may also ~~write to you~~ have written to you informing you of the above award.

In a recent letter, I had asked our friend Sreenivasiah, if he met you to find out latest info re = K. G.'s affairs. If he meets you you may kindly inform him as above.

There are a no. of things to write about, but they had better be left for the time when we may meet again. Re = one particular affair I shall write to you earlier as soon as I know more facts. We are all quite well. Trusting you all are,
With kindest regards,

Yours affly
R. S. Rawdas

Confidential

Poona 14. 8. '55.

My dear Krishnan,

I heard from Raja on the 5th and thought of running up to Bombay to meet you in person on the 6th. When I rang him up, Dr. Venkateswaran informed me that you had already left for Geneva, due to change of programme and had asked me to write to you at Geneva.

Meanwhile, I had a general chat with Dr. Pichavoty here who had spent 2 years or more in the USA. He informs me that one could join one of the universities in the USA either in October or in February, according to one's convenience. As you know, Raja has submitted his PhD thesis and it will be desirable to stay on at Bangalore at least until his results are out. He is keen, as we would be in his place, to leave Bangalore pleasantly. Also, I am told, that a post-doctorate candidate can get much better terms of service of the type you are thinking of, than a pre-doctorate candidate.

Now, coming to the main proposal, Raja says that he would like to have a change, now that he has spent 5 years at Bangalore. At the same time, he would be most happy if it could be so arranged that an offer can come to him, without his sending a formal application in

the routine manner. Through the "proper channel!" The
Correspondence with him in this connection may be
addressed to him C/o my Poona address, so
that we may arrange matters smoothly. Could
you kindly fix up everything in the above manner?
I am enclosing another copy of the particulars
regarding him, which I had sent you already,
for your use in this connection.

In his letter to me Raja mentions
the names of 3 persons whom he could think of
and with one of whom it may be worthwhile to
work; ~~in the~~ ^{in the} order mentioned below, -

- (1). E. M. Purcell, Lyman Laboratory of Physics,
Harvard University, Cambridge Massachusetts.
- (2) C. ~~Kittel~~ Kittel, California University,
Berkeley, California.
- (3). E. L. Hahn - Watson Scientific
Laboratory, Columbia University, New York.

He wonders whether you have in
mind any other suitable American Professors'
name? of course, the final choice of Professor
~~will be~~ we would naturally leave to you.
Whom are you thinking of?

Considering everything, joining an assignment in USA, with effect from February 1956, will be most convenient.

It would have been so nice to have discussed these matters in person. As this is not possible, just at present, kindly let me know by return mail, what exactly you propose to do in the matter and what you wish to be done at our end, here. I trust you will not mind sponsoring the case without a formal application and getting it through in such a manner that it will result in an offer. Or would you insist on an application forwarded by Professor? This, I understand, may be difficult to arrange.

Kindly reply at your earliest convenience and also let me have your home programme + addresses at different places so that I may endeavour to keep in touch with you.

Trusting this finds you enjoying the meetings at Geneva and in the best of health,
With kindest regards,

Yours affly
R. R. Law das

1. Name: ANANTHAKRISHNA RAMDAS (A. K. RAMDAS).
 2. Date of Birth: 19th May, 1930.
 3. Passed Matriculation Examination of Bombay University in 1946, securing 82% marks, standing 8th in rank and securing the Beedkar Prize.
 4. Passed I.Sc. (Bombay University) in 1948 in 1st Class, securing 71% marks; stood first in Physics and was awarded the Gibbs Prize.
 5. Passed B.Sc. Hons. (Poona University) in 1950, obtaining 1st class and standing 1st in Physics. Was awarded the Paranjape Prize of the Poona University.
 6. Has been Research Scholar under Sir C.V. Raman at the Raman Research Institute, Bangalore, from June 1950.
 - (i) Was awarded in 1953 the M.Sc.(Physics), by research, by the Poona University, for a thesis entitled "I. Infra-red Absorption Spectrum of Crystals, II. Thermo-optic behaviour of Crystals".
 - (ii) Has submitted in June 1955, a thesis for the Doctorate degree in Physics, to the Poona University. Title of the thesis is "Crystal Optics in relation to Crystal Structure". Results may be out by October.
 7. The Synopsis of the doctorate thesis is enclosed.
 8. A list of publications, etc., is enclosed.
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List of Papers by A.K. Ramdas, Research Scholar,
Raman Research Institute, Bangalore.

1. "The Infra red absorption Spectrum of Potassium Chlorate Crystals - Part I " by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol 35 No = 5, Sec A, 1952.
2. " The Infra red absorption Spectrum of Potassium Chlorate Crystals - Part II " by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol 36, No. 1, A, 1952.
3. "The Infra red absorption spectra of Sodium Nitrate and Calcite" by A.K. Ramdas . proc. Ind. Acad. Sci, Vol. 37, No = 3, A, 1953.
4. "The Infra red absorption Spectra of Sodium Chlorate and Potassium Chlorate Crystals " by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol. 37, No =3, A, 1953.
5. "The Infra red absorption spectrum of Silicon Carbide" by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol. 37, No=4, A, 1953.
6. " Thermo-optic behaviour of Silicon Carbide" by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol.34, No = 2, A, 1951.
7. "The Thermo-optic behaviour of Quartz." by A.K. Ramdas. Proc. Ind. Acad. Sci, Vol. 35, No = 2, A, 1952.
8. Thesis (MSc.) on "Infra red absorption spectra of Crystals and Thermo-optic behaviour of Crystals." by A.K. Ramdas. (MSc. awarded in 1953, for this thesis.)
9. "The Infra red absorption spectrum of Barytes." by A.K. Ramdas Proc. Ind. Acad. Sci, Vol. 39, 1954.
10. "On the Poly crystalline forms of Gypsum and their optical behaviour." by C.V. Raman and A.K. Ramdas. Proc. Ind. Acad. Sci, Vol. 39, 1954.
11. "The Structure and Optical Behaviour of Indescent Calcite." by C.V. Raman and A.K. Ramdas.
12. "Some illustrations of the optical behaviour of Indescent Calcite." by A.K. Ramdas.
13. Ph D. Thesis on "Crystal Optics in relation to Crystal Structure." by A.K. Ramdas. Submitted in June 1955.

CRYSTAL OPTICS IN RELATION TO CRYSTAL STRUCTURE

Thesis submitted for the Degree of
Doctor of Philosophy to the
University of Poona.

A. K. RAMDAS

PREFACE.

The present thesis embodies investigations on "Crystal Optics in Relation to Crystal Structure". It consists of three parts:

- I. Infra-red Spectre of Crystals.
- II. Structure and Optical Behaviour of Polycrystalline Forms of Gypsum.
- III. Structure and Optical Behaviour of Iridescent Calcite.

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I. Infra-red Spectra of Crystals:

The infra-red and Raman spectra of crystals together form the most powerful and direct methods of studying the vibration spectra of crystals. In the first section of this part a brief resume of the historical development of the subject to-date is given both on the experimental and theoretical aspects. A section on the principles of interpretation follows in which special emphasis is laid on the transformations which the vibrations of a free ion or molecule undergo when it forms a part of a crystal lattice. In the succeeding section these principles are illustrated with the cases of potassium chlorate, sodium chlorate, sodium nitrate and calcite. The experimental results for these cases have already been reported by me in the M.Sc. thesis. They have been included here as Appendices I, II and III.

In section IV of this part the infra-red and Raman spectrum of barytes has been considered. The infra-red absorption spectrum of barytes has been studied in the range 1 to 25μ using ten different specimens, belonging to 001 and 110 sections. The extension of the range of study beyond 16μ has revealed the presence of fundamentals at 21.3μ (470 cm^{-1}) and 22.8μ (439 cm^{-1}) besides other absorption maxima. The review of available data shows that out of the eighteen Raman active internal oscillations of barytes theoretically expected, fourteen can be identified including the one at 967 cm^{-1} not previously recognised as such. The infra-red studies give ten of the fifteen theoretically possible infra-red active internal oscillations. The numerous absorption bands in the range studied find satisfactory explanation in terms of the infra-red active fundamentals in conjunction with the Raman active ones, applying selection rules appropriate to the unit cell of the crystal.

The case of gypsum has been dealt with in section V. The infra-red spectra for the cleavage section, obtained by me in the range 1 to 26μ have been reported in this section. The fact that the smallest unit cell of gypsum contains two and not four as assumed by some previous workers, simplifies the nature of the vibration spectrum of gypsum. The number of oscillations (lattice internal to sulphate ions internal to water molecules) distributed amongst the symmetry types of gypsum have been deduced on this basis. The available infra-red and Raman effect data have been interpreted using appropriate selection rules.

A study of the transmission, diffusion and diffraction of light by a polycrystalline medium is important as one thereby obtains an insight into the state of aggregation of the micro-crystals of which the material is composed. In several ways, the study of the optical

phenomena exhibited by a polycrystalline medium supplies us with valuable information which is not accessible by X-ray methods. Investigations of this kind have been carried out with (1) polycrystalline forms of gypsum and (2) singly and multiply twinned calcite crystals showing iridescence and are reported in Parts II and III respectively.

II. Structure and optical behaviour of the polycrystalline forms of gypsum.

A detailed study of the optical phenomena displayed by the polycrystalline forms of gypsum disclosed the existence of a hitherto unrecognised species of polycrystalline gypsum which differs from both alabaster and satin-spar in its structure and exhibits optical phenomena of great beauty. It is not a fibrous material but consists of fine rods orientated nearly parallel to the b-axis of gypsum and exhibits a ready cleavage along planes perpendicular to that axis. A source of light viewed through a plate of the material exhibits, in general, three concentric circles which are polarised in a characteristic manner. It is demonstrated that these circles arise by reason of the reflection of light at the boundaries between the rod-like crystals composing the material for which the name "fascicular gypsum" is accordingly proposed. A theoretical explanation of the phenomena has been worked out. Observations on the optical behaviour of alabaster and satin-spar show that the former is a random aggregate of gypsum crystals and that the latter is fibrous along ~~with~~ the c-axis of gypsum.

III. Structure and optical behaviour of iridescent calcite:

It is well-known that calcite often twins along planes equally inclined to the two edges of the rhombohedral cleavage and parallel to the third. The presence of such twinning layers results in optical phenomena of great interest. A thorough examination of the structure and optical behaviour of calcites twinned in this manner yielded new results and a complete picture of the same has emerged. Amongst the phenomena the following may be noted in particular: (a) the formation of image patterns by multiply twinned crystals; (b) the vanishing of the reflections and refractions in the plane of symmetry; (c) the appearance of sharply defined boundaries of reflection, refraction and transmission; (d) dispersion and interference effects. Photographs illustrating these effects have been reproduced.

Private - Confidential

Dr. L. A. Ramdas, M. A., Ph. D., F. N. I.,
F. N. A. Sc., F. A. Sc.

Meteorological Office,

Poona, Dated 15. 11. 55.

My dear Krishnan,

We all returned to Poona by the 2nd instt. Before doing so I wanted to meet you - but you had just left for Calcutta - or Jamshedpur. On the 31st of Oct^r, I called on Shri. Jagjivan Ram for a few minutes. He said that he wd take up the question of a further extension and asked me to remind care in December. I feel much delicacy in further talking up my own case, but have given him the report by a Committee of I.C.R. on our work in Agri. Metgy during the last 25 years. which he appears to have read already when Shri Dangle sent him a copy. Would it be possible for you to mention A to him once again? I think that if any other method of keeping me ~~too~~ busy at work does not arise at the moment, you may kindly do so and try to get me extⁿ for 1 or 2 more years in the Met Deptt itself.

Dr. R. mentioned to me

the "Salt" Research post - but I told him
that I would not like to make any
application which we have to go thro'
the D.S.O & then thro' the same Ministry
which may like to consider my extension
of service - but that if any offer of that
kind for a 5 year period or so comes
to me, I wd certainly think of it.
Sincerely.

When I called on
Prof. Thacker during one of my visits
to CSSR - I did not make any suggestion
beyond hinting that I may have to think
of some plans to continue work.

I wanted to talk to
you about all this, but I was a bit
late in contacting you before leaving
Delhi for Poona. I know that Dr R
must have been in Delhi again recently.
If you have any alternative plans
do let me know and in any case do
try to see Shri J' Ram one again &
pursue that line which may at most give me
another year or two of active work before
finally retiring from Govt. Service. Trusting all well
then, with kindest regards,
Yrs affly
R. Ramdas

Personal
Confidential

Poona 7/8/56.

My dear Krishnaraj, ^(had written to Dr. Thacker to his U-K address, that I wd meet him at Bombay) I was hoping I wd have a chance of talking over with Dr Thacker when he arrived at Bombay en. route ~~to~~ Delhi. Owing, however, to the dislocation of train service between Poona and Bombay and the occurrence of my youngest daughter's delivery ^{she has a} (daughter) yesterday, I had to give up the trip to Bombay. I have written to Dr Thacker today suggesting that I may meet him when next he comes to Poona or if I happen to go to Delhi (less likely). Meanwhile, you may kindly talk ^(I had given you) over with him, but do not give him the draft for official filing, as I have had no chance to revise it in the light of what may be practicable, after discussion. Looking over my part letters to you, the whole plan as I put it, wd have gone very well as at the NPZ itself. Do still consider from that point of view, quite apart from any questions of salary etc - about which I do not bother - I would any day prefer that to changing to other ventures like the Air Zone -

of course, ~~what I have~~ the plan sketched in my draft would have given me the greatest *Sahisfukhi* — as an alternative to N.P.L. Let us see how things develop. Meanwhile, 2, out of my 4 months' leave, are over!

There is some good news: Raja ^{Associationship} has received an offer of a Research Fellowship of 5,000 dollars from the Purdue University, for research in Semi-Conductor Physics. He has accepted the same. The offer is for 1 year, (with 1 month's leave with pay). He has also had a promise of a similar fellowship from Canada, for the year after, but can take up any alternative arrangement with ~~himself~~ or any other persons to whom you had kindly written. He is planning to leave by end of September. We shall have plenty of time to discuss what he should do after the year at Purdue is over.

Trusting this finds you and family all quite well,
with kindest regards,

Yours affly
R. R. Rawdas

UGC

Dr L. A. Ramdas
Head of the Division of
Heat & Power

11 September 1957

Dear Dr Deshmukh,

Kindly refer to your letter
No F.4-1/57 NBT of August 14 addressed to
Dr K. S. Krishnan asking for suggestions for
the ^{at} National Book Trust of India. Dr Krishnan
as you may perhaps know, is now convalescing ~~in~~
in the Willingdon Nursing Home and has requested
me to inform you that he would be sending his
suggestions as soon as his health permits.

With kind regards

yours sincerely

Dr C.D.Deshmukh
Chairman, University Grants Commission,
New Delhi