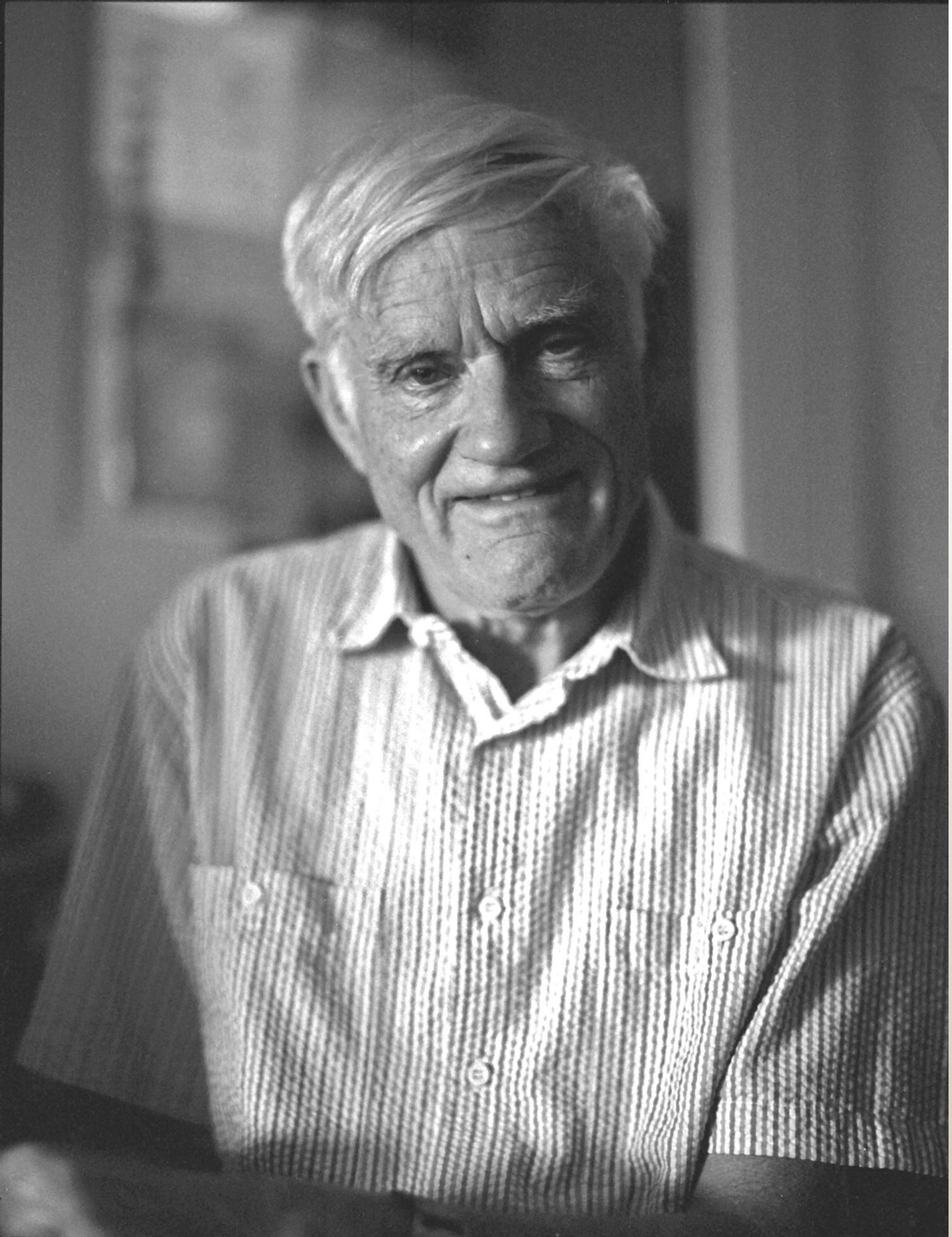


HENRY RISHBETH

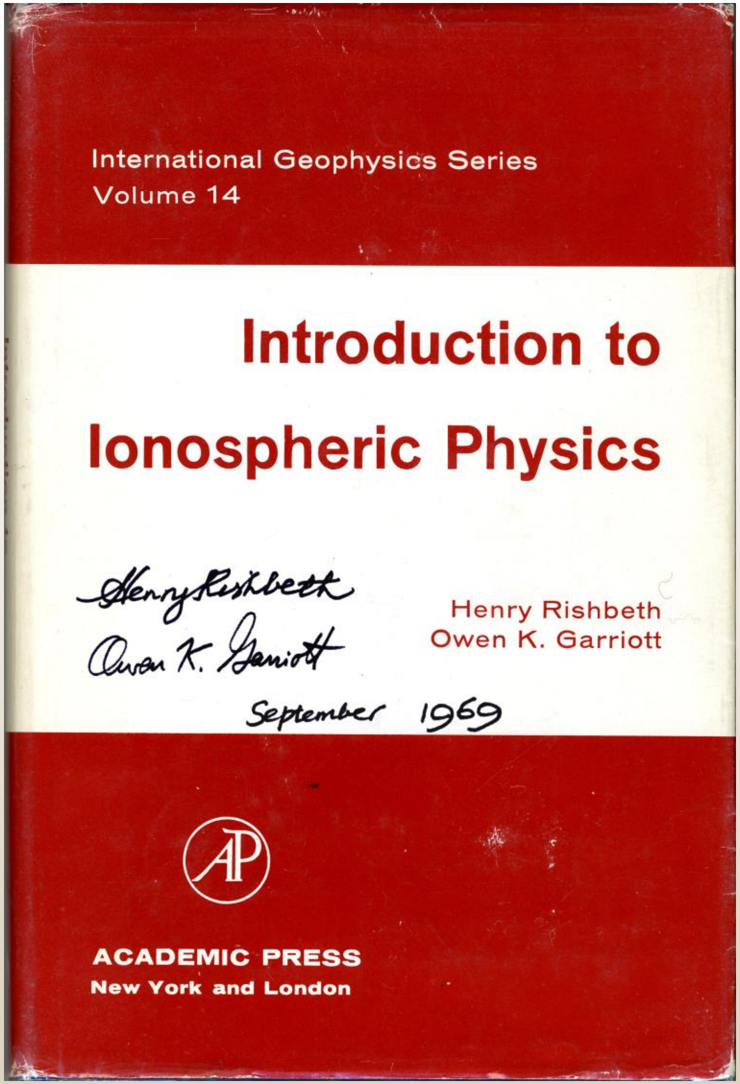
(1931 – 2010)

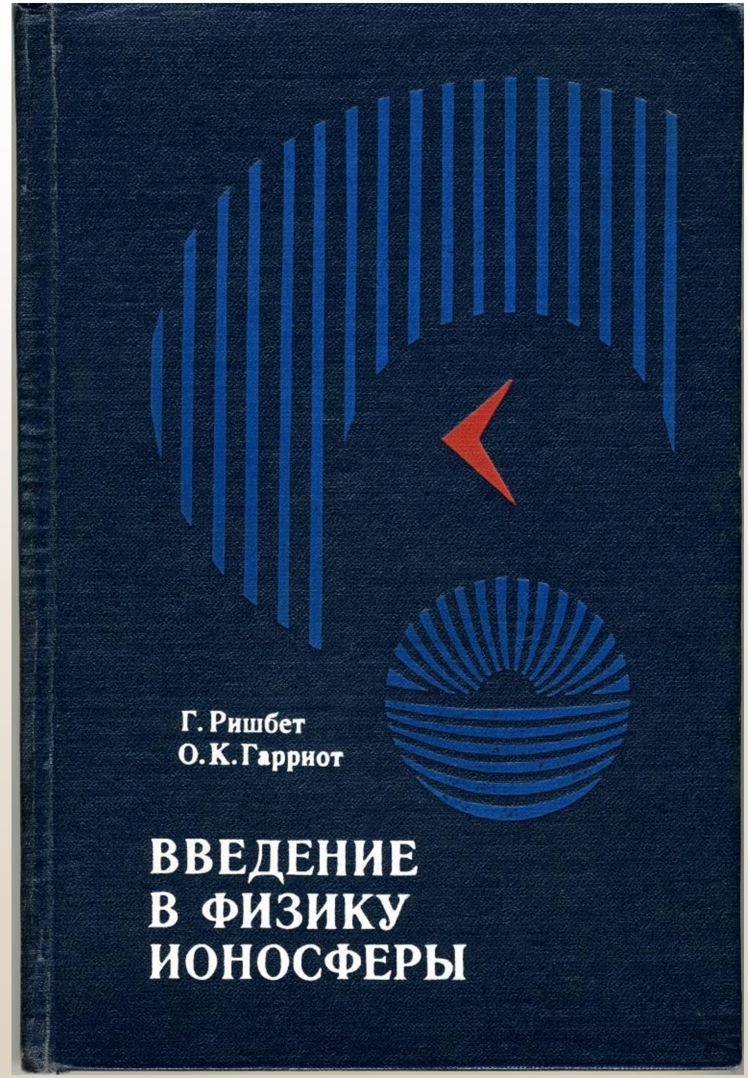
--- A Remembrance ---

25th CEDAR Meeting
June 2010
Boulder, CO

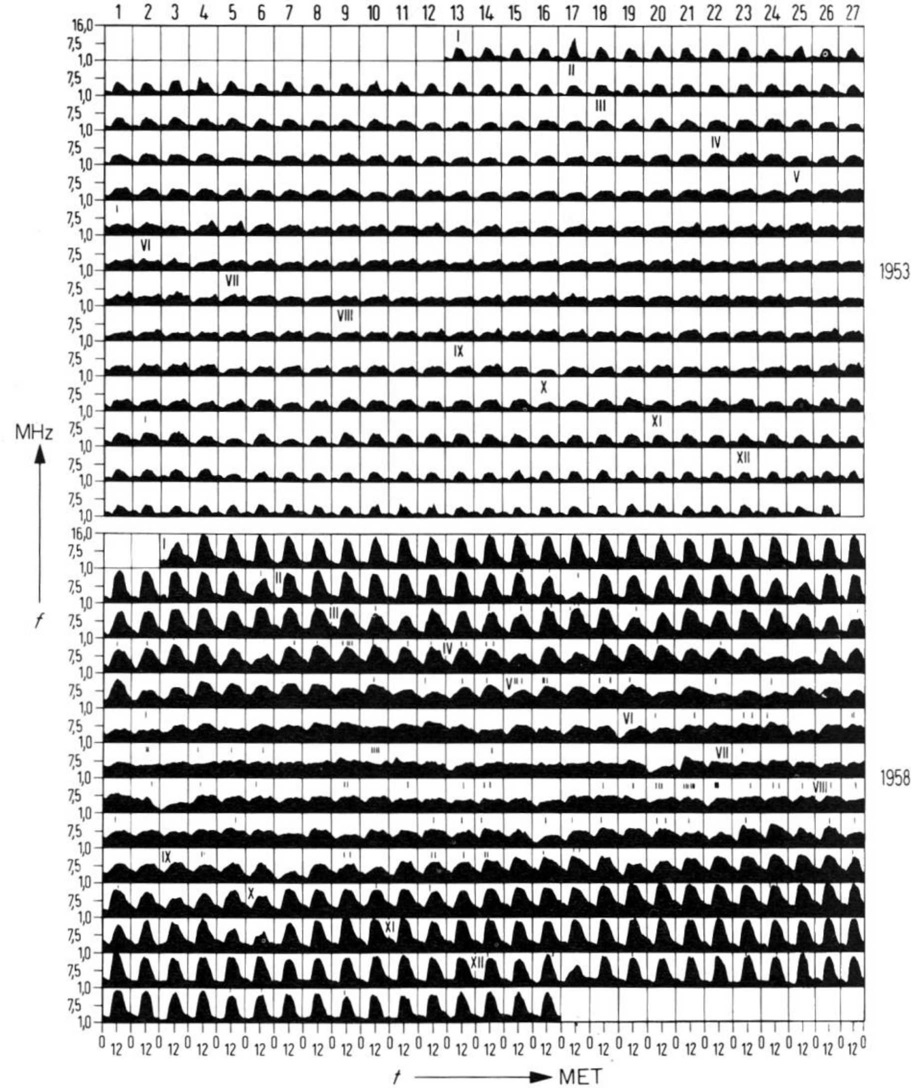
M. Mendillo
Boston University

Photo by Joei Wroten, Boston University





Dr. Larisa Goncharenko's copy



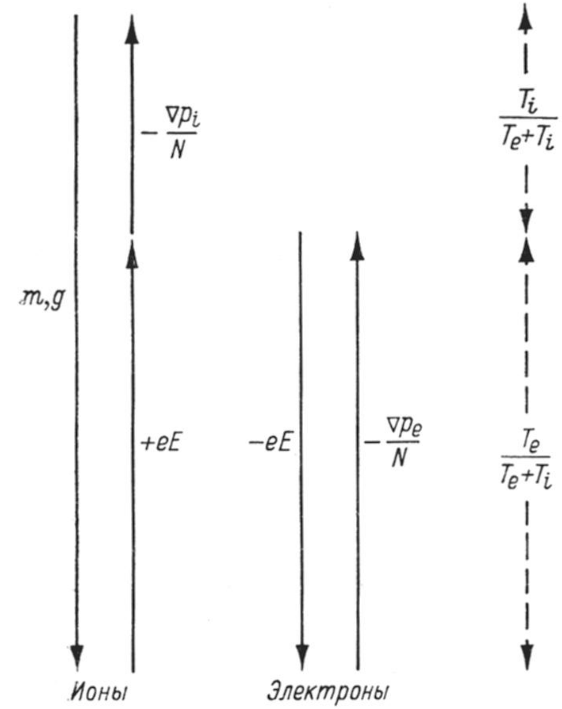
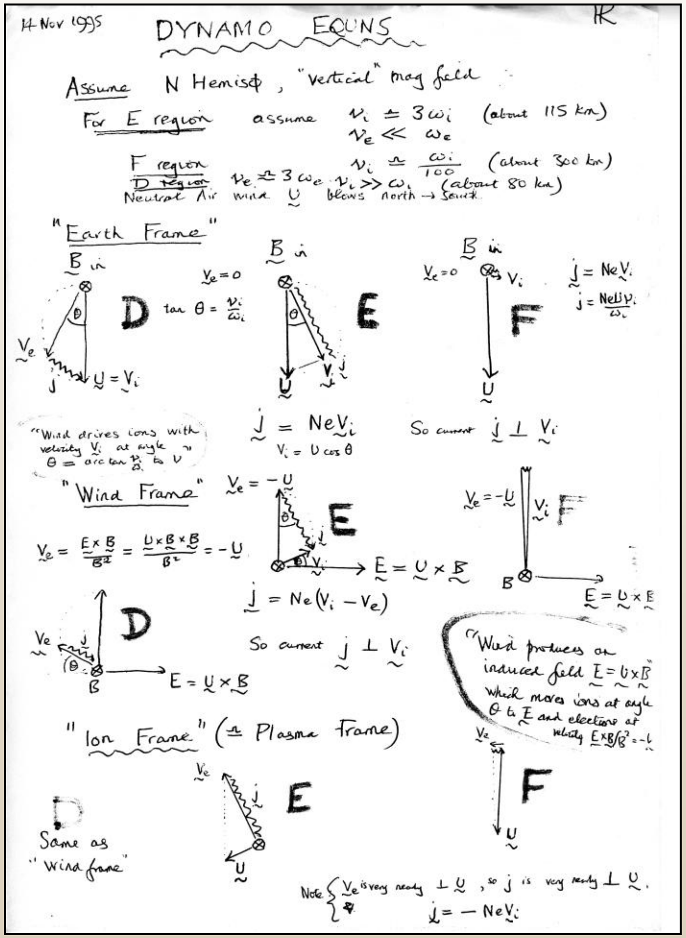
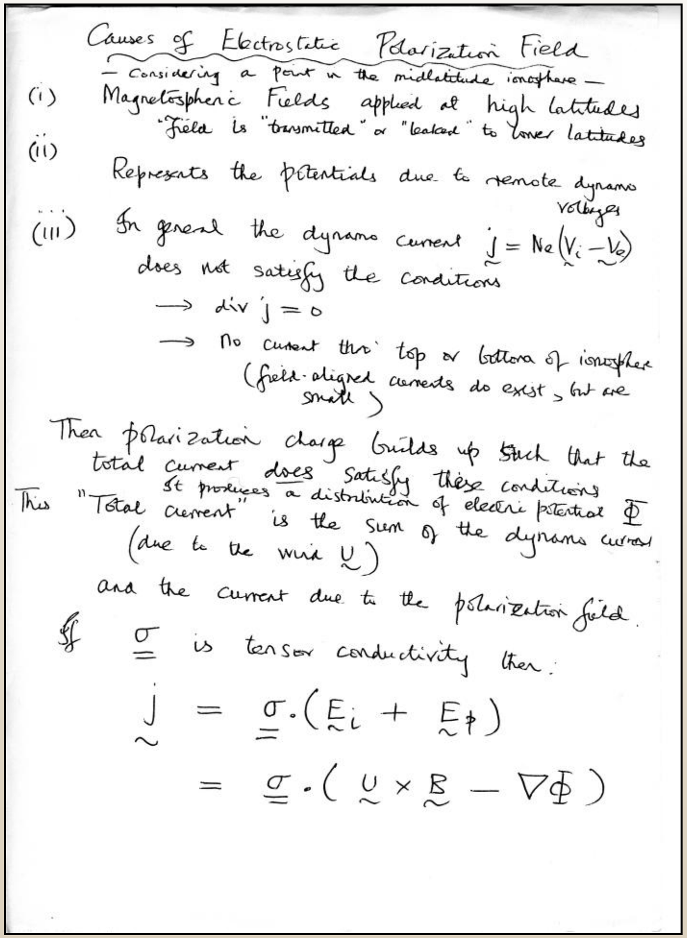


Рис. 36. Силы, действующие на отдельный электрон или ион в условиях диффузионного равновесия. Сила тяжести для электронов не учитывается. Предполагается горизонтальная стратификация атмосферы, так что градиенты парциальных давлений $p_i = NkT_i$ и $p_e = NkT_e$ направлены вертикально. Возникает вертикальное поляризационное поле E, уравновешивающее другие силы. Принято отношение температур $T_e/T_i = 2$, что типично для дневных условий. Справа показаны относительные длины векторов.

Rishbethian Tutorials

- "Circuit Analogue"
- "Servo Model"
- "F-Layer Dynamo"





Causes of Electrostatic Polarization Field

— Considering a point in the midlatitude ionosphere —

(i) Magnetospheric Fields applied at high latitudes
"Field" is "transmitted" or "leaked" to lower latitudes

(ii) Represents the potentials due to remote dynamo voltages

(iii) In general the dynamo current $j = Ne(V_i - V_e)$ does not satisfy the conditions

→ $\text{div } j = 0$

→ No current thro' top or bottom of ionosphere (field-aligned currents do exist, but are small)

Then polarization charge builds up such that the total current does satisfy these conditions
It produces a distribution of electric potential Φ
This "Total current" is the sum of the dynamo current (due to the wind U)
and the current due to the polarization field.

If $\underline{\underline{\sigma}}$ is tensor conductivity then:

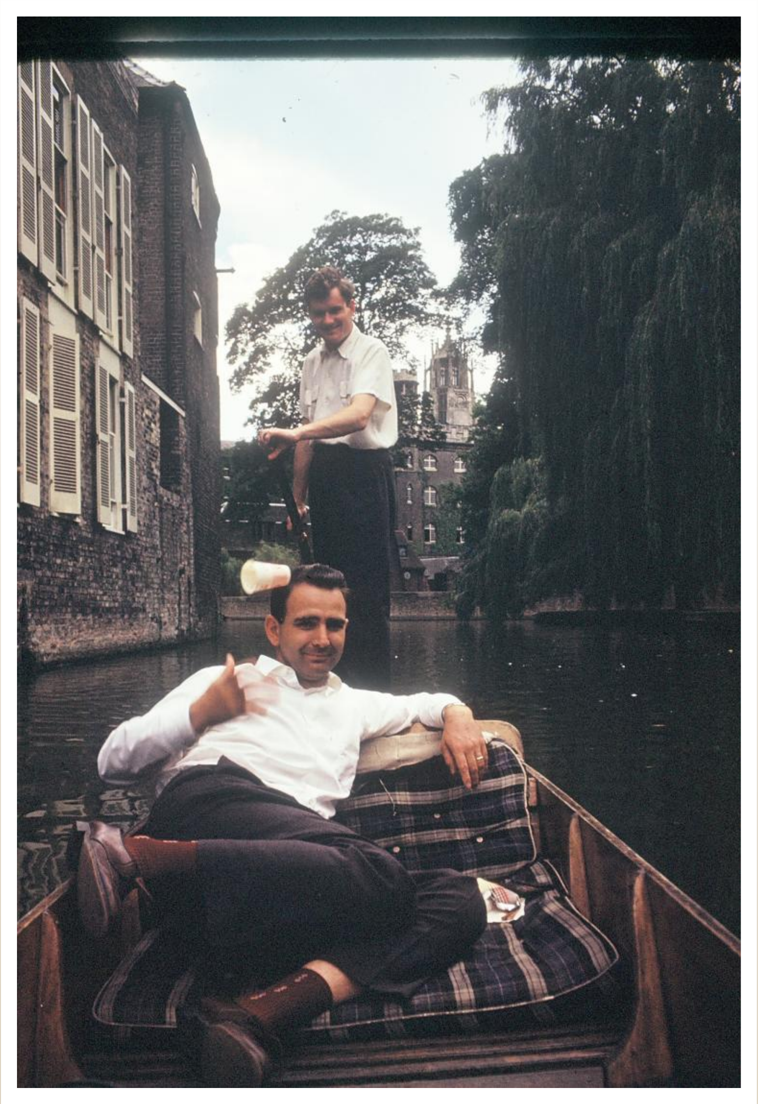
$$j = \underline{\underline{\sigma}} \cdot (E_i + E_\phi)$$

$$= \underline{\underline{\sigma}} \cdot (U \times B - \nabla\Phi)$$

Henry Rishbeth was a Cambridge Man

- B.A. 1954
- M.A. 1958
- Ph.D. 1960
- Sc.D. 1972

Bill Wright punts, Henry rides.



Bob Knecht rides, Henry punts.

Photos courtesy of Bill Wright

But…between B.A. and M.A.

- CSIRO Radiophysics Laboratory

  Sydney Australia

  1955 - 1957

- First papers on Galactic Radio Astronomy

Aeronomy of the Planets

Title: The Ionosphere of Jupiter
Authors: Rishbeth, H.
Journal: Australian Journal of Physics, vol. 12, p.466
Bibliographic Code: 1959AuJPh..12..466R

SHORT COMMUNICATIONS

THE IONOSPHERE OF JUPITER*

By H. Rishbeth†

It has been suggested that the radio-frequency emissions from Jupiter are due to plasma oscillations in the planet's ionosphere (e.g. Gardner and Shain 1958). This note shows that, according to standard theory, sufficient ionization may be produced by solar radiation; but it does not attempt to explain the actual cause of the disturbances.

Evidence so far available suggests that the radiation from Jupiter is strongest at frequencies near 20 Mc/s (Gardner and Shain 1958). If this is taken to be the fundamental frequency of a plasma oscillation, then the corresponding electron density is $N=5\times10^6$ cm^{-3}, a value which is seldom approached in the terrestrial ionosphere. Since the intensity of the ionizing radiation is presumably much less than at the Earth, the required electron density will only be attained if the recombination coefficient α is very low. It is suggested that this may be so.

The relevant theory is that of Chapman (1931), who considers the absorption of monochromatic radiation in an isothermal atmosphere. The theory may be expected to give rough quantitative results even if its assumptions are not strictly true.

Let I be the intensity of ionizing radiation incident vertically at the top of the atmosphere and q the rate of production of ionization. Let n be the number density of the ionizable constituent, H its scale height, and A its ionization cross section. Then, at the level of maximum production, under conditions of equilibrium:

$$q=\alpha N^2, \quad \text{(1)}$$
$$q=Ie^{-1}/H, \quad \text{(2)}$$
$$1=nAH. \quad \text{(3)}$$

Also

$$H=kT/mg, \quad \text{(4)}$$

where k is Boltzmann's constant, T the temperature, g the acceleration due to gravity, and m the mean molecular mass, which may be written as $\mu\times$(mass of hydrogen atom).

PERGAMON

Planetary and Space Science 48 (2000) 51–58

Planetary and Space Science

Dynamics of Titan's thermosphere

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[b]Department of Physics and Astronomy, University of Southampton, Southampton, SO17 1BJ, UK

Received 11 January 1999; received in revised form 28 May 1999; accepted 23 June 1999

Abstract

We estimate the wind speeds in Titan's thermosphere by considering the various terms of the wind equation, without actually solving it, with a view to anticipating what might be observed by the Cassini spacecraft in 2004. The winds, which are driven by horizontal pressure gradients produced by solar heating, are controlled in the Earth's thermosphere by ion-drag and coriolis force, but in Titan's thermosphere they are mainly controlled by the nonlinear advection and curvature forces. Assuming a day–night temperature difference of 20 K, we find that Titan's thermospheric wind speed is typically 60 m s^{-1}. In contrast, the Earth's thermospheric winds, of order 50 m s^{-1}, do not equalize day and night temperatures. We speculate on other factors, such as the electrodynamics of Titan's thermosphere and the tides due to Saturn. © 1999 Elsevier Science Ltd. All rights reserved.

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Planetary and Space Science

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Short communication

Ionospheric layers of Mars and Earth

Henry Rishbeth[a,b,*], Michael Mendillo[a]

[a]Center for Space Physics, Boston University, Boston, MA 02215, USA
[b]School of Physics and Astronomy, University of Southampton, Highfield, Southampton, SO17 1BJ, UK

Received 11 September 2003; received in revised form 24 February 2004; accepted 24 February 2004

Abstract

We compare the electron densities of two martian ionospheric layers, which we call M1 and M2, measured by Mars Global Surveyor during 9–27 March 1999, with the electron densities of the terrestrial E and F1 layers derived from ionosonde data at six sites. The day-to-day variations are all linked to changes in solar activity, and provide the opportunity of making the first simultaneous study of four photochemical layers in the solar system. The 'ionospheric layer index', which we introduce to characterize ionospheric layers in general, varies between layers because different atmospheric chemistry and solar radiations are involved. The M2 and F1 layer peaks occur at similar atmospheric pressure levels, and the same applies to the M1 and E layers.
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Keywords: Mars; Ionosphere

Henry Rishbeth was a Family Man

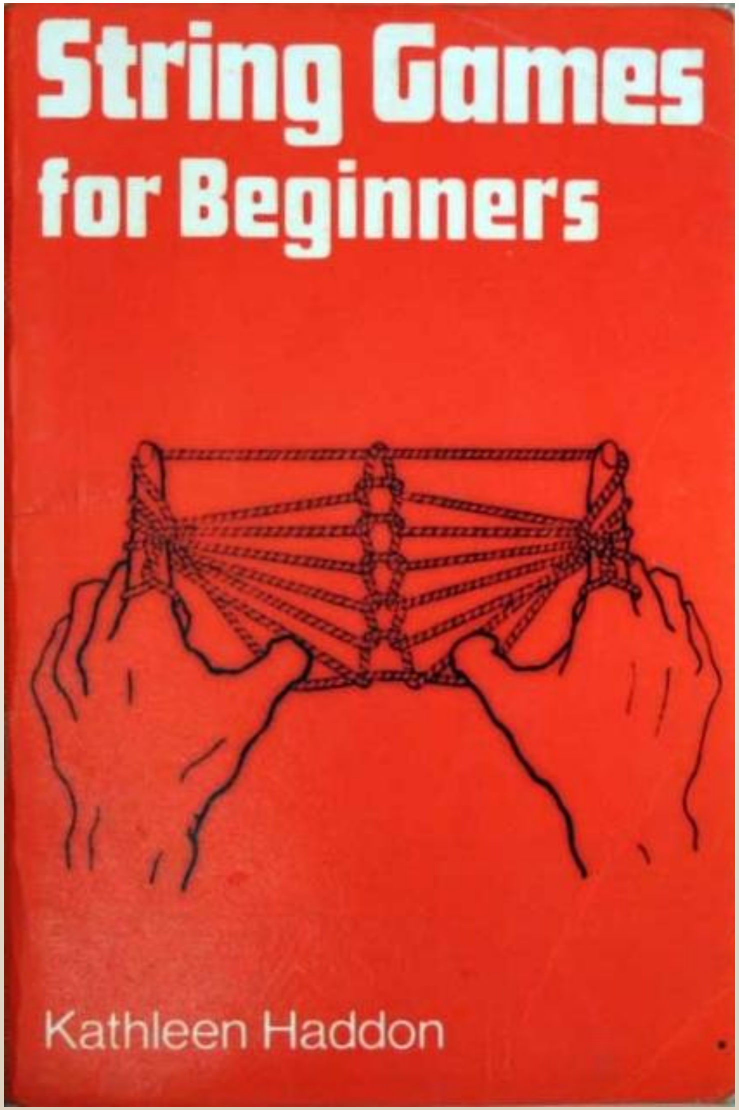
- Wife Priscilla (“Pril”)
- Daughters Clare and Tessa
- 3 Grandchildren

String Figures by the ***Rishbeth*** *Family*
Left to Right: Clare, Henry, Tessa.
Photo by Pril Rishbeth, 09/24/96

An Academic Family

- Father a classicist & Professor of Geography in Southampton
- Mother an Anthropologist

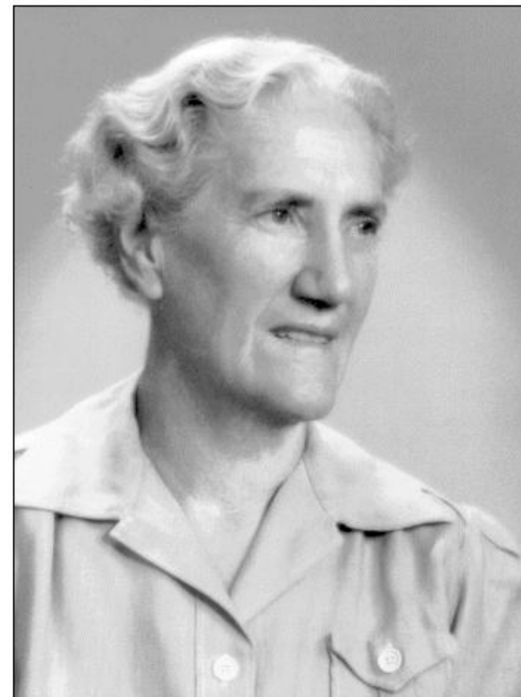
Oswald and Kathleen Rishbeth on their wedding day, 1917



Bulletin of the International String Figure Association, Vol. 6, 1-16, 1999

Kathleen Haddon
(1888-1961)

by
HENRY RISHBETH, *Southampton, England*



Kathleen, around the time of her retirement in 1953
(Juliet Haddon, Photographer, St. Albans, Herts).

Native girls doing string figures on Yam Island.
Photographed by Kathleen Haddon, 1914.

Copyright: Cambridge University Museum of Archaeology & Anthropology, ref.P.1130.ACH1

Kathleen Haddon in Australia, 14 June, 1956

Copyright: John Fairfax & Sons Ltd., Feature Services, Sydney

A Good Life

Give me courage for the day, for there is much to bear;

Give me the capacity to rise above despair;

Give me patience for whatever task may come to hand;

Give me strength to carry through the things that I have planned.

Give me understanding and a sympathetic heart;

Give me grace to struggle on and play my humble part;

May I face my trials and troubles with a cheerful face;

Help me Lord, to see Your beauty in the commonplace.

(From Methodist Book of Remembrance, Johannesburg, adapted)

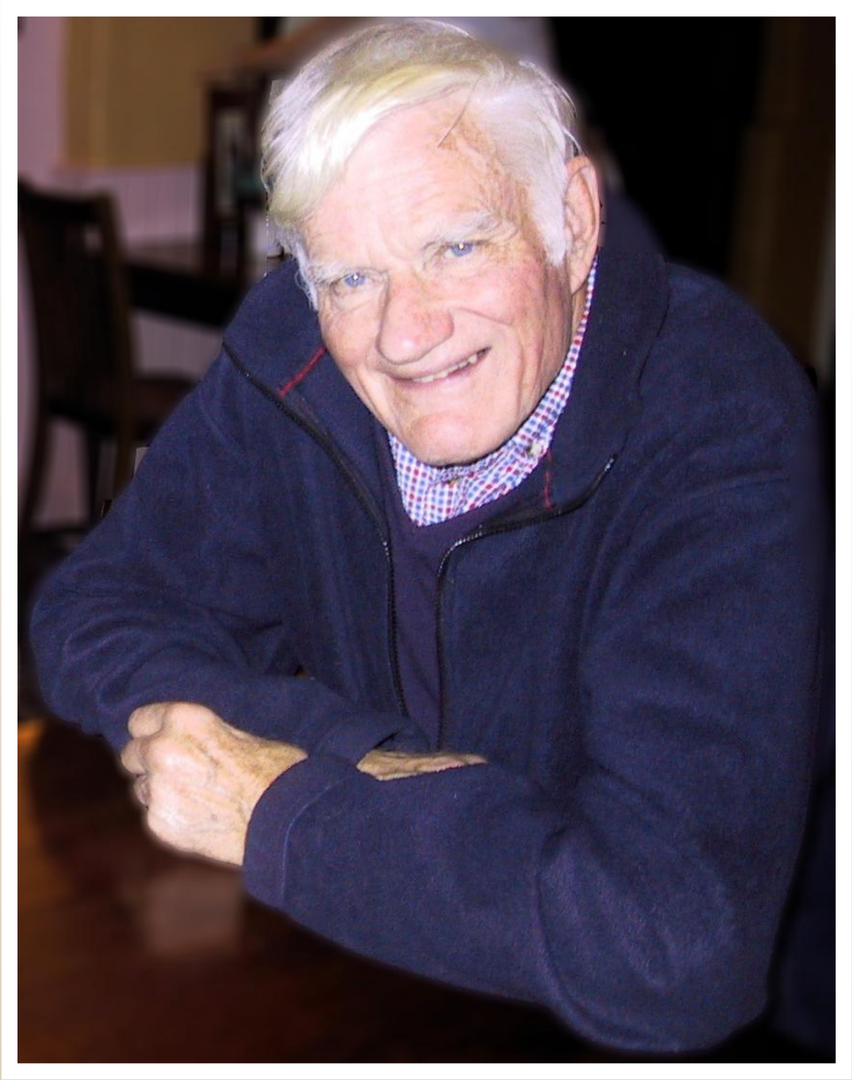


Photo by Ingo Müller-Wodarg, Imperial College