if they can be treated stochastically, a parameter like V_σ can be added to the transfer equation.

In 1950's it was realised that LTE is not applicable to solar and stellar chromospheres. Hence quasiempirical non LTE models of chromospheres and their effect on the disk spectrum were considered. In 1960's the non-LTE treatment was extended to photospheres also, which gave improved line profiles and abundances. Now the departure from LTE requires no new physics, we only need better computational techniques as provided by the modern fast electronic computers. The usual procedure is to obtain improved observational data and fit them to computed models. First we try the LTE approach and if it fails we go to non-LTE methods. In these we put all the necessary physics (such as spectroscopy, thermodynamics, hydrodynamics, magnetic fields, etc.) and the complexities (like inhomogeneities, turbulence, velocity gradients, etc.) into large computers and obtain a model which fits all the data. By this procedure, we get better values of abundances and turbulence parameters as well as predictions concerning polarization, molecular species, etc. The questions to be considered in the coming decade are : Can the simpler curve of growth method be extended to non-LTE situations ? Is it possible to find a new theorem which will enable individuals, who do not have large computers, to make non-LTE computations on a ' do-it-yourself-kit ' basis ?

As far as the ' extended' stellar atmosphere's therory is concerned, we must use the fluxes from the ' interior ' storage models and obtain a model atmosphere which smoothly merges into the interstellar medium. Here we have to consider not only the radiative flux but also the flux of mass which is evident from observations. The mass motions must be related to the photon transport. Inside the star we have an LTE screen which leaks radiation and matter at the boundary. Hence radiative transfer must be studied along with the hydrodynamic transfer of energy by mass outflow. Some of the interesting problems which the ' extended ' theory will have to tackle are : Abundence variations in stars ; Circumstellar envelopes and their relation to the interstellar medium ; Protostars in which shock wave serves as a photosphere ; Inhomogeneities involving time dependent radiative transfer ; Chemistry of molecules ; Study of complex objects like ϵ Aur ; and Thermodynamics of stellar atmospheres.

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A REPORT ON COLLOQUIA COPERNICANA

The Colloquia Copernicana, to mark the quincentenary birth anniversary of Nicholas Copernicus were held at Toruń (Poland) between September 5-12, 1973. The colloquia were organised by the Polish Academy of Sciences in cooperation with the International Union of History and Philosophy of Science, UNESCO and the International Astronomical Union. The scientific programme of the Colloquia was organised in the form of four symposia, each consisting of about two sessions, namely :

I The Astronomy of Copernicus and its Background.

II Man and Cosmos.

III The Reception of the Heliocentric Theory.

IV Copernicus and the Development of Exact and Social Sciences.

The first Symposium, which was historically the highlight of the Colloquia, was initiated by W. Hartner (Frankfurt) with an introductory review paper on the Astronomical Background, i.e., the Islamic antecedents of Copernicus. Hartner began his talk by a quotation from Abū-Naṣr Ali (Al-Birūni's teacher, 11th century) about the planetary "elliptical" orbits. According to Hartner, Abū-Naṣr refuted the two natural motions of Aristotles, i.e., the rectilinear (finite) and circular (infinite), and he talked about some kind of ellipses although in ambiguous terms. Hartner wondered why Ibn Al-Haitham and Al-Birūnī could not notice the inconsistency of the Ptolemic lunar theory, since lunar evection could not be explained by the hypothesis of perfect uniformity. He also mentioned similarities of Peuerbach's and Azakael's elliptical motion. According to him there were many Islamic astronomers who were interested in the idea of elliptical motion, although they did not wish to renounce Aristotle altogether. Hartner then discussed especially the works of Qutbuddīn, Ibn Shātir, and Naṣīruddīn Ṭūsī. Finally he projected two diagrams, one from Copernicus' and the other from Naṣīr Al-Ṭūsī's work, which everyone saw to be identical even in the lettering. Hartner propounded the thesis that there should be some mode of transmission of Islamic astronomy to Copernicus, which has yet to be discovered.

The next paper of Miss G. Rosińska (Cracow) on the Islamic Tradition in Cracow was therefore very appropriate. Miss Rosińska is collecting a bibliography of Arab astronomical works which could be extant at that time at the Cracow University and she is also studying the work of Cracow astronomers to look for the reception of Arab astronomy. She is of the opinion that most probably Cracowian (models of) astronomy could be thought of as the link between the Arab and Copernicus' astronomy. A preliminary investigation indicates the hypothesis to be true for the Lunar Theory

David A. King (Cairo) presented a short survey of the Islamic Astronomical Tables, which, in his opinion are based on complicated trigonometrical formulae. Besides that, King said, that the Muslim astronomers also tried to simplify the use of the planetary equation table based on the Ptolemic model. Such tables have in fact many thousand entries. He suggested that the accuracy of these tables should now be worked out and the achievement of the Arabs should be re-estimated in the light of the new findings.

The last two papers in this session were read by W. Petri (Munich) : Earth's Rotation in the Aryabhatas and by S. N. Sen (Calcutta) : Indian Planetary Theories of Ancient and Medieval Times. Prof. Petri pointed out that whereas Aryabhata's rotation of the earth was a part of his geocentric universe, Copernicus coupled it with a heliocentric model. However, heliocentricism was accepted as a reality only since Kepler and Newton in the 16/17th century.

The second session of this Symposium was devoted to the Astronomical Traditions of the Middle Ages. By examining the various astronomical books (codices) and curricula of the medieval Europe. Olaf Pedersen (Denmark) classified the principal stages of medieval Latin astronomy as follows: Up to the 11th century the antique astronomical tradition was continued. Only the contact with the Muslim world created a new interest in astronomical instruments and tables. Later, as various translations of Almagest were available, astronomy became quite a respectable subject in the syllabi of the Latin Universities and even computational astronomy became a field worthy to be pursued. According to Pederson, the clue to the critique and therefore reform of the ancient astronomy is to be sought in the growing interest in the studies of primary source and in the humanistic-philosophical trends of the time.

The philosophical background of Cracow in the 15th century was treated very aptly by Z. Horský (Czechoslovakia) who talked on the Role of Neo-platonism and by R. Palacz (Poland) on the Philosophical Background of the Cracow XVth Century Astronomy. The latter emphasized especially the philosophies of Albertus of Brudzewo and of Ibn-Rushd whose criticism of the Ptolemic system was, as Palacz asserted, particularly well-known to the Cracowian scholars. On the other hand, Horský talked about the Neo-platonism of Ficini and Callimachus.

The third session of this Symposium, Copernicus' Astronomy, began with a review by Prof. E. Rosen (U.S.A.) on The Achievement of Copernicus. In his view, the greatest contribution of Copernicus was the recognition of the true "position" of our earth in the cosmos, i.e. the realization of the dimensions of our solar system. In fact, Copernicus did not seek recognition for himself as father of the heliocentric system, since he quoted Greek sources. It might well be that he was himself not conscious of the far-reaching consequences of his own work.

Another important paper of this session was by N. M. Swerdlow (Chicago) who spoke about Copernicus' derivation of the Helio-Centric Theory, on which Copernicus himself did not say anything at all. Swerdlow put forward the hypothesis that by means of a special transformation, which Copernicus performed on an eccentric model for the inferior planets given by Regiomontanus, he got his system. This special transformation is very similar to the one which, on being carried out on Regiomontanus' model for superior planets, leads to the model of Tycho Brahe. Swerdlow presented several convincing evidences for his thesis, especially a page from the Uppsala notes. On these very notes, Dr. J. Dobrzycki (Incharge of the Copernicus Section of the Polish Academy of Sciences) then read a very instructive paper.

In the second Symposium on *Man and the Cosmos*, the following papers were contributed in the morning session:

B. Suchodolski:	Man in Cosmos and Man on Earth
T. Araki:	Man and Cosmos
J. Werle:	Scientific Perspectives of Space Flights
L. Siedow:	The Ideas of Copernicus and the Evolution of Mechanics.

In the afternoon session E. de Gortari spoke on La logique celeste de Copernic, S. K. Runcorn on the Physics of Moon, followed by a discussion which was initiated by B. Lesnodorski. The various talks were of general interest and popular in nature.

The third Symposium on The Reception of the Heliocentric Theory began with two review papers, viz.,

P. Rybicki (Poland):	The Reception of Copernicus' Theory: Misunderstanding and Real Consequences from the sociological viewpoint
P. Costabel (Paris):	Actual State of Research of the Reception of the Heliocentric Theory

Rybicki discussed in detail the two stages of the reception of a scientific theory: "Theory" as a working (methodological) model and theory as a representation of the real structure (of some part) of the physical world. Actually this latter ontological aspect of a theory is the main hurdle in its being accepted by the society in general and the time period needed for a full reception depends on the philosophical disposition of the time. This philosophical tradition, as Barbara Bieńkowska (Poland) observed in her paper: Some Remarks on the Reception of the Heliocentric Theory from the 16th to 18th Century, was nothing but the antique heritage: the physics of Aristotle, the astronomy of Ptolemy and the Bible, of course. The heliocentric theory was fully accepted only when the "traditional authorities" were completely defeated and collapsed. That the reception of the heliocentricism is still a very rich theme for research was stressed further by Prof. Costabel in his afore-mentioned paper. He pointed out especially that the role of heliocentricism in the elaboration of the celestial mechanics at the end of the 19th century is not without diverse ambiguities. According to him, the difficulties of Copernicus' epoch were not confined to the religious and philosophical issues involved but they were also due to theoretical problems, namely the relativity of movement, infiniteness of the space, empty space vs. matter. In short, the new cosmology had not been worked out in all its complexities which is only now possible to do in the context of the present day science and also because of the progress of the historical method now.

In the fourth Symposium, which was devoted to Copernicus and the Developement of the Exact and Social Sciences, several scholars from the German Democratic Republic, e.g. S. Hoyer (Halle), F. Herneck (Humboldt University, Berlin), G. Jackisch and H. Wussing (Leipzig) as well as the famous Russian astronomer A. A. Mikhailov (Pulkovo Observatory) read their contributions. The themes were as wide as, for

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FeH in the solar photospheric spectum At last the expectation has come true and Carroll and McCormack (*Ap. J.* (*Letters*), **177**, L33, 1972) have determined the laboratory spectrum of the FeH in blue and in green and identified many unidentified solar photospheric lines with the lines of FeH. The identified lines have been found to become stronger in sunspot spectrum. This is consistent with the expectation. The laboratory spectrum is also consistent with the high multiplicity of the transition, in agreement with the theoretical calculation of electronic levels of FeH. However, no rotational analysis of the laboratory spectra has been reported yet. The calculated energy levels also show that many more electronic bands will be observable in solar spectrum. This is possible only if the different bands of FeH are studied and analysed in laboratory spectroscopically. The laboratory determination of the dissociation energy of FeH will also be useful.

Incidentally, the lines due to molecular ion, FeH^{+}, which is more abundant than FeH at temperatures and pressures corresponding to solar photosphere, if its dissociation energy and rotational constant are not very different from that of FeH, may also be observable in the solar photospheric spectrum. However, nothing is known about its spectrum, though one expects it to have bands in visible region similar to its isoelectronic molecule MnH.

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instance, "Copernicus and Galileo", "Copernicus and the Newtonian Mechanics", "Copernicus and his world-view as reflected in Humboldt's Cosmos-lectures" and "The Opinion of the German Reformers on Copernicus' books" etc.

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ANNOUCEMENTS :

The International Astronomical Union, in coopperation with the International Union for the History and Philosophy of Science, is sponsoring the preparation of a four-volume General History of Astronomy with M. Hoskin as General Editor. It will include the Indian astronomical contribution also. It will be appreciated if the names (possibly with short bio-data) of competent historians of Indian astronomy—ancient, medieval and modern, is sent to Dr. S. M. R. Ansari, Department of Physics, Aligarh Muslim University, Aligarh 202001, who has agreed to coordinate the effort and forward the names to the General Editor or respective editors of the different volumes.

The seventh international conference on Gravitation and Relativity will be held at Tel Aviv, Israel, June 23-28, 1974.

Astronomical Events

D. K. Mohanty, V. Balasubramanian and G. Swarup (Radio Astronomy Centre, Ootacamund) announced on October 18, 1973 the detection of a new pulsar with the following coordinates :

$$\alpha\,(1950) = 19\text{ h }11\text{ min }48\text{ s} \pm 1\text{ min}$$
$$\delta\,(1950) = 03^\circ\,54' \pm 1'$$
$$l_{II} = 39^\circ.1$$
$$b_{II} = -3^\circ.3$$

with a period of 2.33043 s, pulse width of 450 ms, dispersion measure < 50 cm-3 pc and average energy per pulse $\sim 100 \times 10^{-29}$ Jm^{-2} Hz^{-1} at 327 MHz. This pulsar is about 1.4 degree away from the centroid of the supernova remnant HC 28, which has an angular diameter of $\sim 60'$ of arc.

A. Bhatnagar (Vedhshala, Ahmedabad) and R. V. Bhonsle, R. G. Rastogi and P. V. Kulkarni (Physical Research Laboratory, Ahmedabad) observed the transit of Mercury across the solar disk on November 10, 1973 and determined the time of first and second contact.

The first meeting of the Astronomical Society of India, coupled with the Seminar on Infrared and Milli-meter Range Astronomy was held at Osmania University, Hyderabad, between February 25-28, 1974. The Seminar, sponsored by the University Grants Commission, comprised of eleven invited talks. There was a General Body meeting of the Astronomical Society of India, which included the Presidential address by Dr. M. K. Vainu Bappu on 'Stellar Spectroscopy' and a scientific meeting with forty-eight contributed papers. Indian Institute of Astrophysics will be the host at Kodiakanal for the next meeting of the Society.

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I, M. S. Vardya, hereby declare that the particulars given above are true to the best of my knowledge and belief.

March 1, 1974 (Sd.) M. S. Vardya