

# ĀYURVEDIC CONCEPT OF THE PSYCHOSOMATIC BASIS OF HEALTH AND DISEASE

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*(Received 8 May 1974 ; after revision 28 February 1975)*

The psychosomatic approach to the problem of health and disease has attained the central theme of the current trends of modern medicine. Though the body-mind issue has been a subject of consideration for long time, it has received maximum attention during recent years. Langley and Brand (1971)<sup>1</sup> have recently discussed the problem of body-mind relationship, and they have criticised the dicot concept of the body and the mind. Like many others they feel that the body and the mind are not two separate entities. They are the part and parcel of the same organism. The current trend is to identify every element of the mind in terms of bodily molecules. Thus no human study is complete without the implication of both these components, the body and the mind.

On the other hand several modern studies have failed to establish an explainable correlation between the features of the mind and that of the body. The Sheldon's classification of the human physique into ectomorphs, mesomorphs and endomorphs and of the temperament into the cerebrotonia, somatotonia and viscerotonia indicates the failure of this approach. Therefore some workers also feel that the man cannot be studied on one single parameter. One needs separate parameters for evaluating the body and the mind. However, it is generally believed that the man is a composite psychosomatic organism and accordingly he has to be studied or classified on one parameter which of course has to be comprehensive enough to implicate both the body and the mind.

Thus the man being a psychosomatic organism is naturally prone to psychosomatic disorders. Though in general every disease is psychosomatic in nature but in limited terms a psychosomatic disease is one whose main cause is in the psyche and the manifestations are predominantly visible in the body. Stress of any kind has a central place in causation of psychosomatic disease. It may be pointed out that probably after bacteriological and immunological etiology of disease, stress is the most widely applicable cause of disease. Stress concerns the adaptive and

adjustment processes of an individual, the sources of which may be physiological, psychological and social in nature. Accumulated frustrations and conflicts, when override the adjustment limit, lead to stress which bring about unusual and unhealthy changes in the personality, perceptions, attitudes, intellectual functioning and behaviour patterns. Further, the bodily changes may be brought about by mental stimuli, by emotion, just as effectively as by bacteria and toxins and such changes may disturb the function of any organ of the body (Damber 1943). The pathophysiology of such disorders is categorised as below :

- (1) Temporary physical changes related to acute emotional states,
- (2) somatic reactions expressing an inner conflict in symbolic form ; and
- (3) tissue changes, an organic disease resulting in part from long standing emotional problems.

The last category is psychosomatic disease, is also called organ neurosis as described by Femichel (1945) and psychophysiologic autonomic and visceral disorder as described by American Medical Association. The psychosomatic diseases develop in two phases as described by Kessler (1966) ; first there is functional disturbance caused by a chronic emotional disturbance, later the chronic functional disturbance gradually leads to tissue changes and to organic disease.

Though the psychosomatic approach has attained the current thought, it is relatively a recent development in modern system of medicine where as it has been the basis of Āyurvedic thought from the very beginning. As would be discussed later, the Āyurvedic system of medicine has significantly emphasised this fact. The entire approach of Indian medicine to the problem of health and disease is strongly psychosomatic in nature with greater emphasis on the phenomenon of the mind than that of the body. This can be illustrated by the definition of health<sup>2</sup>, the causes of disease<sup>3</sup>, the approach to the examination of the patient<sup>4</sup>, the application of psychosomatic constitution<sup>5</sup>, the regimen of mental and physical hygiene<sup>6,7</sup> and several other facts extensively dealt in Indian Medicine including the use of psychotropic drugs, i.e. the *medhya dravyas* and *medhya rasāyanas*.

Besides, the very genesis of the science of Āyurveda swings around the psychophysical concept of the evolution of the universe and the concept of 'Puruṣa' which is the object of the action of this science. It is conceived that *puruṣa* consists of the *satva* (mind), the *ātman* (soul) and the *śarīra* (body) and thus is a psychosomatic entity.<sup>8</sup>

Similarly, the effects of the body and the mind have been described in terms of *śarīra* and *manasa doṣas*, viz. *vāta*, *pitta*, *kapha* and *sattva*, *rajas* and *tamas*.<sup>9</sup> Thus the man who is the subject matter of Āyurveda is an integrated product of the mind and the body.

The psychosomatic approach to the human problem is so much fundamental to Āyurvedic system of medicine that the very definition of health and disease incorporates the elements of the body as well as the mind. It is conceived that a man whose *ātman*, *manas* and *indriyas* are happy or in other words whose mind is healthy and whose *doṣas*, *dhātus*, *malas*, and *agnis* are balanced or in other words whose body is healthy is a person who has been designated to be in the state of perfect health (see ref. 2). On the contrary a disease or a *vyādhi* is the state which causes pain and anxiety to the body as well as to the mind.

On the other hand *sukha* (a feeling of well being) and *duḥkha* (a feeling of ill being) have been described as the features of health and disease respectively.<sup>10</sup> The very use of the terms *sukha* and *duḥkha* implicates the psychosomatic approach.

Moreover, the inclusion of *kāma*, *krodha*, *roga*, *dveṣa* and similar other emotions into the category of *roga* or *vyādhi* again indicates the significance of a similar approach.<sup>11</sup>

Āyurveda conceives the concept of *deha prakṛti* in a similar perspective, where the man including his mind and the body has been classified into three psychosomatic constitutions or *deha prakṛtis* namely *vātaja*, *pittaja* and *kaphaja*<sup>12</sup>.

This psychosomatic classification and its application to the entire problem of health and disease appear to be the central theme of this system of medicine. However, this subject needs a separate discussion.

Though there seems to be a continued tradition of constitutional studies in almost all systems of medical learning, in ancient India the school of Āyurvedic Medicine is probably the first which emphasized the evaluation of the man's nature in health and disease to an optimum extent. Āyurveda has laid great emphasis on this aspect. As a matter of fact the psychosomatic basis of health and disease is the very fundamental of this system of medicine. According to Āyurveda the constitution or *prakṛti*, which is the sum total of the physique, physiology and psychology of the man can be divided in different manners and in different types such as *garbha śarīra prakṛti* or *doṣa-prakṛti* and *jāta śarīra prakṛti* corresponding to *jāti*, *kula*, *vayaḥ*, *deśa*, etc.<sup>13</sup>.

The most important one is the *doṣa prakṛti* that is the classification of the mankind according to relative preponderance of *doṣas*, viz. *vāta*, *pitta* and *kapha* which are supposed to be the three essential constituents of the living organism. The natural predominance of one or the other of these three *doṣas* presents the natural characteristics of the individual human constitution. In Āyurvedic system of medicine the whole concept of health and disease and prevention and treatment is based on these three types of constitutions. And thus it is rooted in the fundamental *tridoṣa* theory of Āyurveda.

In accordance to this fundamental consideration of psychosomatic constitution to the problem of health and disease in general, evaluation of *prakṛti* is an important part of the schedule of the examination of a patient according to the Āyurvedic clinical methodology as indicated in the *daśavidha parīkṣā* by Caraka.

In a similar spirit Caraka emphasizes that one who does not enter with the lamp of knowledge, the very inner most part of the patient in order to arrive at a correct diagnosis and to achieve confidence, can never treat the disease properly<sup>14</sup>.

This is to emphasize that a physician has to have a comprehensive approach to the careful study of the body and the mind of a patient before he plans the management of his illness.

The fundamental causes of disease as conceived in Āyurvedic system of medicine are ; (1) *prajñāparādha* ; (2) *asātmyendriyārthasamyoga* ; and (3) *pariṇāma*. This statement again emphasizes the fact that according to Āyurveda every disease has some or the other type of psychosomatic factor with causal relationship. The analysis of the concept of these three basic causative factors of disease would indicate that the basic factor involved is one or the other type of stress caused to the body and the mind through a variety of events. As a matter of fact *asātmyendriyārtha samyoga* is a term to describe all kinds of physical incompatibilities which can be conceived in terms of deficient, excessive or altered use of different *indriyas*. For instance an exposure of the eyes to excessive light for a long time or non-utilization of the eyes or looking towards undesirable objects may lead to some or the other type of *asātmyendriyārtha samyoga janya* disease. Similar events in relation to other *indriyas* may also produce different diseases. One finds that these are nothing but the examples of different kinds of stressful states. The prolonged and increased stressful state may lead to the failure of the adaptive mechanism both in the body as well as in the mind. This leads to the development of a disease. Thus a disease is not the direct effect of a stress factor but is the result of the bodily failure to adapt with the respective stressful state. Thus *asātmyendriyārtha samyoga* of minimal degree is an usual affair and may be essential for the development of varied biological adaptations in the organism but beyond a limit the same *asātmyendriyārtha samyoga* may produce a quantum of stress to which the body may fail to adapt and this may lead to the development of a diseased state.

Secondly *prajñāparādha* is nothing but an action taken by an individual due to the lack of *buddhi* or intellect, *smṛti* or memory, and other mental factors. This again reflects the similar situation as described above. *Pariṇāma* includes the stressful state caused by the seasonal and climatic variations.

The mental and physical stress have been further emphasized when Caraka says that *adharmā*<sup>15</sup> or misconduct is the essential cause of disease.

Similarly Caraka puts great emphasis on psychic stress and anxiety as a cause and aggravator of disease. In *agraṅgānīya adhyāya* in *Sūtra Sthāna*, he says that *viṣāda* or anxiety is the most important among the factors aggravating a disease<sup>16</sup> in contrast to *harṣa* or happiness which has been considered the most important among the factors causing growth and nourishment.<sup>16</sup>

The aetiopathogenesis and symptomatology of certain diseases such as *sokāti-sāra*, *kāmaja jvara*, *raktapitta*, *vātavyādhi*, *arocaka*, *chhardi*, *kāsa*, *hṛdroga*, *garbhapāta*, *vātajvara*, *pittajvara*, *kaphajvara*, *pittaja prameha*, *kuṣṭha*, *rājyakṣmā*, *vātagulma*, *pāṇḍu*, *pittātīsāra*, *sannipātātīsāra* and *āgantukātīsāra* clearly exhibit the psychosomatic concepts of Indian Medicine.

Thus Āyurveda has not only conceived but has laid great emphasis on psychosomatic basis of health and disease and on the role of mental and physical stress.

Thus there is a considerable conformity of the Āyurvedic concept of psychosomatics to the current thoughts on the subject to day. Caraka very clearly emphasizes that under circumstances a mental disease may be converted into a bodily illness and *vice versa*.<sup>17</sup>

How a mental factor influences the body and a bodily event influences the mind needs separate discussion, however it implicates the role of *doṣas*, *agnis*, the *śrotāṃsi* in general besides the role of *sajñāvaha* and *manovaha-śrotāṃsi*.

Similarly one finds extensive description regarding the psychosomatic approach to the prevention and treatment of diseases described under the terms of *ācāra rasāyana* and *sadvṛtta* while dealing with *anagatavadha pratiṣedha* and *svāsthavṛtta* regimen besides *satvavajaya*, *yoga*, *mantra*, *japa*, *samādhi*, etc. and the use of psychotropic drugs described as *medhya dravyas* and *medhya rasāyanas*.

Thus Āyurveda has given priority<sup>18</sup> to the psychosomatic basis of health and disease including the prevention and treatment of various disorders.

#### REFERENCES

<sup>1</sup> Langley, L. L. and Brand, J. L. (1972): The mind-body issue in early twentieth century American Medicine. *Bulletin of the History of Medicine*. March-April, 1972.

<sup>2</sup> समदोषः समाग्निश्च समधातुमलक्रियः ।

प्रसन्नात्मेन्द्रियमनाः स्वस्थ इत्यभिधीयते ॥ —सु.सू.११।४४

<sup>3</sup> इत्यसात्मेन्द्रियार्थं संयोग प्रज्ञापराध परिणामश्चेति त्रयस्त्रिविध

विकल्पा हेतवो विकारणा, सममोगयुत्तास्तु प्रकृतिहेतवो भवन्ति ॥ —च.सू.११।४३

<sup>4</sup> (a) तस्मादातुरं परीक्षेत प्रकृतितश्च विकृतितश्च सारतश्च संहलनतश्च सात्कृतितश्च, सत्त्वतश्च, आहारशकृतितश्च व्यायामशक्तिश्च वयस्तश्चेति, बलप्रमाण विशेषग्रहण हेतोः ॥ —च.बि.८।६४

(b) समीह्यदोषोषध देशकाल सात्म्याग्नि सत्त्वादि वयोबलानि । —च.सि.३।६

(c) सूक्ष्माणि हि दोषभेषज बलशरीराहारसात्म्य सत्त्व प्रकृतिवयसामवस्थान्तराणि ।

—च.सू.१४१४

5 सप्त प्रकृतयो भवन्ति दोषैः पृथक् द्विशः समस्तैश्च । —सु.शा.४।६१

6 सद्भूत—अनागतवाधाचिकित्साध्याय । —सु.चि.२४

7 आचार रसायन—रसायनाध्याय चतुर्थपाद । —च.चि. १

8 सत्त्वमात्मा शरीरं च त्रयमेतत् त्रिदण्डवत् ।

लोकस्तिष्ठति संयोगात्त्र सर्वे प्रतिष्ठितम् ॥ —च.सू. १।४६

9 (a) तत्र त्रयस्तु शरीरदोषाः वातपित्तश्लेष्माणः, ते शरीरं दूषयति द्वौ पुनः सत्त्वदोषौ रजस्तमश्च, तौ सत्त्वं दूषयतः । ता च सत्त्वशरीराभ्यां दुष्टाभ्यां विकृतिरूपजायते, नोपजायते चाप्रदुष्टाभ्याम् ॥

—च.शा.४।३४

(b) वातपित्तश्लेष्माणं एव देह संभवहेतवः ॥ —सु.सू. २१।२

10 विकारो धातुवैषम्यं साम्यं प्रकृतिरूच्यते ।

सुखसंज्ञकमारोग्यं विकारो दुःखमेव च ॥ —च.सू.६।४

11 मानसास्तु क्रोधशोकभयहर्षं विषादेभ्यःसूयादैन्यमात्सर्यं काम लोभ प्रभृतय इच्छाद्वेष भेदैर्भवन्ति ॥

—सु.सू.१।२३

12 सप्तप्रकृतयो भवन्ति—दोषैः पृथक् द्विशः समस्तैश्च ॥ —सु.शा.४।६१

13 तत्र प्रकृत्यादीन् भावान्वाख्यास्यामः । तद्यथा—शुक्रशोणित प्रकृतिं, कालगर्माशयप्रकृतिं, मातुराहारविहारप्रकृतिं महाभूतविकारप्रकृतिं च गर्भशरीरमपेक्षते ।

एताहि येन येन दोषेणाधिकतमनैकेनानेकेन वा समनुबन्धयन्ते तेन । दोषेण गर्भोऽवध्यते, ततः सा सा दोषप्रकृतिरूच्यते मनुष्याणां गर्मादिकृता । तस्माद्वातलाः प्रकृत्या केचित्, पित्तलाः केचित् श्लेष्मलाः केचित् । —च.वि.८।६५

14 ज्ञानबुद्धि प्रदीपेन यो नविशति तत्त्ववित् ।

आतुरस्यान्तरात्मानं न स रोगांश्चिकित्सति ॥ —च.वि.४।१२

15 वायुवादीनां यद्वै गुण्यमुत्पद्यते तस्यमूलमधर्मः ।

तन्मूलं वा सत्कर्म पूर्वकृतं तयोर्योनिः प्रज्ञापराध एव ॥ —च.वि.३।२०

16 — यथा बलमारम्भः प्राणोपरोधिनां विषादो रोगवर्णनानां ।

निवृत्ति पुष्टिकराणां हर्षः प्रीणनानाम् ॥ —च.सू.२५।४०

17 (a) ते च विकाराः परस्परं अनुवर्तमानाः ।

कदाचिद् अनुबन्धन्ति कामादयो ज्वरादयश्च ॥

—च.चि.६।८

(b) शरीरमपि सत्त्वमनुविधीयते, सत्त्वं च शरीरम् ॥

—च.शा.४।३७

18 रागादिरोगान् सततानुषक्ता न शेषकाय प्रसृतानशेषान् ।

औत्सुक्य मोहारतिदान् जघान योऽपूर्वं वैद्याय नमो स्तु तस्मै ॥

—अ.ह.सू.१।१२

## BOOK REVIEWS

*The Reception of Copernicus' Heliocentric Theory.* ed. JERZY DOBRZYCKI, D. REIDEL Publishing Company, Dordrecht-Holland and Boston—U.S.A. p. 368.

The *Revolutions of the Heavenly spheres* was published in 1543 A.D. *only* when the author—Nicholus Copernicus—was in his death bed. In fact he died soon after seeing his work in print. Did Copernicus himself firmly believe in his theory that the Sun was the centre around which the earth and planets revolve? In the introduction to his book he has clearly stated—some believe that these are not written by him—that its contents need not be regarded as true or even as probable. But the question is: did *he* regard it as true or probable? If he had firmly believed it why did he not publish it earlier even though the work was completed about thirty years before?

Today we know and understand the elegance of the Heliocentric Theory. But hundreds of years before when the Ptolemaic ideas of geocentric universe was firmly laid and quite obvious for anyone, —for after all the earth looks stationary—how did the new theory of Copernicus come to be received. Was it with laughter and ridicule or was it with serious contemplation and study?

The book, “the *Revolutions of the Heavenly spheres*” when first published was “an all time worst seller” (Arthur Koestler). Even the mere 1000 copies of the first edition was never totally sold. The work was neglected nearly for a century after which it slowly emerged into prominence.

*The Reception of Copernicus' Heliocentric Theory* is a collection of articles which were presented at a symposium to honour the 5th centenary of the great scholar's birth. The book contains eleven articles dealing with among other things, the influence of ‘Copernican hypothesis’ on such giants of astronomy as Tycho Brahe and Johannes Kepler. The papers also deal with the spread of the Copernican revolution in Europe, Asia and America.

The book is a notable collection of ideas in the history of science dealing with the progress of the idea which according to Copernicus himself is pleasing to the mind.

From the article of Robert S. Westman, we understand the impact of the observations made by his masters Mastlin and Brahe of comet of 1577 on Kepler. The comet of 1577, according to Mastlin, moved constantly with respect to the motion of Venus professed by Copernicus and he conjectured from its superlunary height that the comet completes its orbit in the same orb as the Copernican Venus which fact made him prove the Copernican hypothesis of the heliocentric theory. (In fact as Thomas Kuhn states, the comet could have been interpreted by a Ptolemaic astronomer just as readily by a Copernican). This influenced Kepler very much. Later he will discover the laws of planetary motion which bears his name and are simple rules made elegant due to the Copernican hypothesis.

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Kristian P. Moesgaard discusses the influence of Copernican thought on Tycho Brahe. Since Copernican view of the orbits of planets were assumed to be circular—and we know today that they are elliptical—one comes across a number of discrepancies. Tycho Brahe made an enormous amount of observations. He, himself, could not formulate any laws of planetary motion. It was left to his student, Johannes Kepler, to complete the work enunciating the concept of elliptical orbits and the consequent laws of planetary motions.

Today we know that these empirical laws of planetary motions are just the consequence of universal gravitation as propounded by Isaac Newton. The evolution of astronomical and consequent physical theories owes a lot to the concept of heliocentric universe.

Even though the Copernican theory originated in Poland, its acceptance in that country itself took more than two hundred years (Hans Blumenburg). This is even more remarkable because Copernicus was accepted and honoured as a great mathematician, astronomer and observer. Religious dogma played an important role in negating the Copernican concepts in Poland and elsewhere.

K. P. Moesgaard discusses Copernican concepts in Denmark and he concludes that the final acceptance of Copernican theory in Denmark came with the determination of stellar parallax. This according to Moesgaard is a pseudo effect and not real. Pseudo effect or not, it helped a lot in strengthening the foundations of Copernicus' concepts in Denmark and Norway. Of course, people outside the astronomical circle did not believe in the system.

Like the Christian Church in Europe, Buddhists in Japan were also not receptive to the ideas as they are not compatible with their beliefs. However, the delay in the acceptance of Copernican views was more due to the seclusion policy of the government, rigidly maintained until the early part of the eighteenth century. According to Shigeru Nakayama the linguistic barrier remained formidable until the end of the eighteenth century. The impact has been possible from Chinese sources and direct (though rare) contact with European literature.

It is curious to note at this juncture that there is no article on Copernican ideas from India. It is claimed that Indian astronomers have conjectured a helio-centric theory much earlier than Copernicus. In spite of that there seems to be no further work on the theory in India when Copernican thoughts spread all over Europe and even in China and Japan. Can some historians of science and sociology explain this paradox?

The work of Gilbert, Carpenter and Wilkins were largely responsible for the spreading of heliocentric theory in England. The system disturbed some people not because it reduced man's importance but because it undermined confidence in the power of reason. John L. Russell also discusses the impact of the theory in Scotland.



According to Henik Sandblad at the time of publication of Copernicus theory, the learned and scientific culture of Sweden was in a profound state of decay. He discusses the spreading of the concept starting in such a disadvantageous climate ultimately to take firm root around 1710. The subsequent gradual penetration into the broader strata of society of Copernicus' doctrine is a complex process difficult for historical research to grasp; and even today the process is hardly completed.

As in other places, Copernicanism in Spain had vehement opposers and its acceptance is traced by Juan Vernet with a keynote on the triumph of Copernicus when the *Diario de Barcelona* wanted to buy the work of people on Copernican system.

Harry Woolf makes this remarkable observation when he discusses Copernicanism in early America "No learning can long flourish in an inhospitable climate of public opinion . . . and the measure of support which a people give to the learned is often a result of the contact and exchange between the two." He stresses the importance of popular writing on this subject (in almanacs of the seventeenth century) which were fully understood by people (the almanacs were the most widely diffused literary form and the only kind of periodical literature in the colonies during the period). Contrast to this were certain essays which were replete with Latin quotations and host of allusions designed to demonstrate the learning of the writer rather than facilitate the understanding of the reader. The Almanac thus played an important role in narrowing the gap between the spiritual invisible world of seventeenth century and allegedly comprehensible world of eighteenth.

Jolan Zemplen discusses Copernicanism in Hungary in connection with natural philosophy and physics. According to him, in order to accept Copernican theory it was not only necessary for the new physics to emerge but this new physics had to be understood and become common knowledge.

All the articles in this book point to the fact that the opposition to Copernican concepts is universal in the beginning. More or less a similar trend is seen—from the point of outright rejection to the time of final acceptance.

Today, scientific theories get immediate access to the professionals and laymen alike through the mass media. Any theory, however complicated, is made popular to be digestible by one and all.

One would like to compare the acceptance of the theory of Relativity with the acceptance of Copernican concepts. In the case of Copernicus' theory the basic idea is not incomprehensible but that it was unacceptable by the then common sense views. In Relativity theory the basic ideas are still not comprehensible for many but the gifted. Still the theory has been accepted in a comparatively short time partly due to its experimental verification both in the field of astronomy and nuclear physics.

Today, the attitude of scientists and the people in general have changed a lot. The other man's point of view is heard even in such exotic propositions like UFO's (Unidentified Flying Objects) and visit of extraterrestrial beings to the earth.

One just wonders what would be the situation if Einstein were to be there to propose his relativity theory during Copernicus' time. May be the people will not bother about as they would have perhaps not absorbed it.

*The Reception of Copernicus Heliocentric Theory* is indeed a valuable collection of articles on the evolution of the concepts propounded by the great genius in the history of science. The articles contained in this book may be used as a model for analysis of evolution of any other theories such as Newton's theory of gravitation, Planck's quantum theory or Einstein's theory of relativity.

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E. Scott Barr, *An Index to Biographical Fragments in Unspecialized Scientific Journals* University of Alabama Press, Alabama (USA), 1973. pp. vii+294.  
The Price \$ 12.50.

The INDEX under review is a means of reference to biographical information of about 7700 distinguished persons who were active in scientific investigations prior to about 1920. It provides about 15000 citations as well as 1500 portrait locations. The unspecialized scientific journals made use of by the author are (i) *American Journal of Science* (200 volumes : 1819-1920); (ii) *Proceedings of the Edinburgh Royal Society* (40 volumes : 1832-1920); (iii) *Proceedings of the Royal Society of London* (172 volumes : 1800-1935); (iv) *Nature* (100 volumes : 1869-1918); (v) *Popular Science Monthly* (870 volumes: 1872-1915); (vi) *Philosophical Magazine* (210 volumes :1798-1902); and (vii) *Science*—First Series (24 volumes : 1883-1894); and (viii) *Science*—New Series (50 volumes : 1895-1919).

The author's biographic works, arranged in alphabetical order, is indeed commendable as he has patiently and meticulously consulted about 800 volumes, covering a period of over hundred years. The index is a valuable guide to those who are interested in locating information about those who, as the author says, 'were admired and respected by their contemporaries but are now generally unknown'. Unfortunately, no Indian name except Ramanujan, (whose biographical information appeared in the Proceedings of the Royal Society) seems to figure in this index and this is understandable possibly because such biographical information of Indian scientists was not published in the journals which the author has consulted.

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