

# THE WORKS OF IMAM-UD-DIN AR-RIYADI THE GRANDSON OF THE ARCHITECT OF THE TAJ MAHAL

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SOME years back the Lucknow University (Tagore) Library purchased a rare (and probably a unique) manuscript copy of *Baghistan*, a biographical work of eminent saints, divines and poets, past and contemporary, by Imamud-din Ar-Riyadi, the grandson of Ustad Ahmad, the famous architect of the immortal Taj. Ar-Riyadi was the last and perhaps the greatest scientist that the fading patronage of the Mughal Rule produced in India. His astronomical treatise *At-Tasrih* occupies an important position in the classics of Muslim contributions to science and still forms a part of the syllabi of Arabic Madrasas.

Ar-Riyadi's *Baghistan* has been reviewed by Dr. Nazir Ahmad, formerly Lecturer, Lucknow University and now Reader, Persian Department, Aligarh University, in *Islamic Culture* of October, 1956 and January, 1957. He has supplemented the description of the text by a life sketch of the author and an analysis of his works, mostly derived from the *Baghistan*. The author gives a long list of his works on different sciences. This list is the basis of Dr. Nazir Ahmad's comment, but he did not give it in the original. Now the same is given below :—

واز مصنفات کمترین دو شرح تہذیب است یکے کبیر موسوم بنصویب دوم  
صغیر موسوم بتقریب و تقریب منظوم فارسی از والدین است رحمة الله علیہ ونیز از بن احقر  
است حاشیہ بر شرح ہدایۃ حکمت موسوم بتہایۃ الحکمہ و حاشیہ شرح مطالع و حاشیہ فارسی  
ہیئۃ و رسالہ در علم موسیقی بر قانون اہل ہند و حاشیہ بر شرح خلاصہ کہ والد ماجد نوشتہ  
اند و حاشیہ اخلاق ناصری و ترجمۃ منظوم کیدانی و حاشیہ بر شرح چغمینی و رسالہ بیانیہ در  
علم بیان و رسالۃ تحقیق آیۃ الوضو و رسالہ بدیعیہ و رسالہ منظوم النجوم بر طریق مدخل است  
و رسالہ مرآت الموافف و رسالہ نسبت مشنۃ و مثلث بالتکریر و تصریح شرح تشریح الافلاک  
شیخ بہاء الدین محمد عاملی و حاشیہ مدون بر شرح خود تصریح مسمی بہ تر شیخ و تفسیر سورہ  
فاتحہ مسمی بمفاتیح و رسالہ مجمع الجرین و شرح مناظر اقلیدس کہ شصت و چہار شکل است و  
شرح خلاصۃ الحساب کہ در حقیقت شرح شرح والدین لطف الله مہذس است حامل متن و شرح  
مہندسی و کتاب الکمرہ و المخروط و الاسطوانہ و دیوان اشعار و انشا دیگرے باغستان کہ این  
کتاب است -<sup>1</sup>

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1. Vide *Baghistan*, fol. 683b.

Fortunately, the age of Ar-Riyadi was not so dull as ours, and therefore he did not think it necessary to specify the subject-matter. But the present age will not be able to appreciate the achievements of this stalwart of Muslim learning and erudition without having an idea of the range and depth of the subjects he has dealt with. Though Dr. Nazir Ahmad has tried to determine the nature of the subject-matter of these works, his descriptions are sometimes incorrect and vague.<sup>2</sup>

However, an attempt has been made to give the precise nature and importance of the subject-matter Ar-Riyadi has dealt with in his numerous works, and it is hoped that the following short description will reveal the man in his true stature :—

1. *The Taswib Sharh-i-Tahdhib*
2. *The Taqrib Sharh-i-Tahdhib*

‘Tahdhib’ is the name given to the standard works of various sciences, e.g.

1. *Tahdhib fit-Tafsir* by Abu Sa‘d Muhsin al-Jashmi on the science of Exegesis ;
2. *Tahdhibul-Athar* by Imam ibn Jarir at-Tabari and
3. *Tahdhib fi Gharibil-Hadith* by ‘Abdul-Wahid ibn Isma‘il on the science of Tradition ;
4. *Tahdhib fil-Furu‘* each by Imam Baghwi and Abu ‘Ali Hasan ibn Muhammad az-Zajjaji and
5. *Tahdhibul-Waq‘at* by Shaikh Ahmad Qalanasi on the science of Jurisprudence ;
6. *Tahdhibu Tariqil-Wusul* ila ‘Ilmil-Usul by Shaikh Jamalu‘d-Din Yusuf ibn Mutahir al-Hilli on the principles of Jurisprudence ;
7. *Tahdhib fi‘l-Jadal* by Ka‘bi on Dialectics ;
8. *Tahdhib fi‘n-Nahw* by ‘Ukburi on the science of Syntax ;
9. *Tahdhib-ut-Tab‘fi Nawadiril-Lughah* by Abu Muhammad Qasim al-Isfahani on Philology ;
10. *Tahdhibul-Balaghah* by Abu ‘Ali Ahmad al-Halabi on Rhetoric ;
11. *Tahdhibul-Asrar* fi Tabaqatil-Akhyar by Abu Sa‘id ‘Abdul-Malik an-Naisaburi ;
12. *Tahdhibul-Asma wal-Lughat* by Imam Nawawi, and
13. *Tahdhibut-Tahdhib* by Ibn Hajar ‘Asqalani on biographies of eminent saints and traditionists ;
14. *Tahdhibul-Akhlaq* wa Tathirul A‘raq by Ibn Miskawayhi on Ethics, and lastly
15. *Tahdhibul-Dala‘il wa ‘Uyunul-Masa‘il* by Imam Razi on Philosophy etc.

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2. Examples follow.

But when the only word *Tahdhib* is spoken, it denotes *Tahdhibul-Mantiq* or the first part of *Tahdhibul-Mantiq wal-Kalam* (which deals with the problems of Logic) by 'Allamah Sa'dud-Din at Taftazani. This book has been very popular with the scholars from the point of view of teaching as well as writing commentaries and glosses on it. Although a large number of books were written on Logic, yet it was the *Tahdhibul-Mantiq* by at-Taftazani that received general appreciation and popularity, as Haji Khalifa says :—

ولما كان منطقہ احسن ما صنف فيه اشتهر وانتشر في الافاق فاكب عليه المحققون بالدرس والاقراء فصنفوا له شروحا -

Consequently, this book has been prescribed for the courses of study in India as well as other countries, and even today it is included in different syllabi of Arabic Madrasas and their examinations.

Numerous scholars have written commentaries on the *Tahdhib*, among which those of the following writers are well-known :—

1. Shaikhul-Islam Ahmad ibn Muhammad, the grandson of 'Allamah Taftazani, 2. Najmud-Din Shihab called 'Abdul-Lah, 3. 'Ubaidul-Lah al-Khabisi, 4. Zainud-Din 'Abdur-Rahman, 5. Murshid ibn Imam ash-Shirazi, 6. Muhyiud-Din Muhammad al-Kafji, 7. Muhammad ibn Ibrahim, 8. Hibatul-Lah al-Husaini well-known as Shah Mir, 9. Muzafarud-Din 'Ali ash-Shirazi, and 10. Muslihud-Din Muhammad al-Lari.

But the most popular and famous commentary is that by Muhaqqiq Jalalud-Din Dawani<sup>3</sup> concerning whose worth and originality Haji Khalifa quotes from Muhaqqiq Dawani himself as follows :—

ذكر انه لم يلفت الى ما اشتهر ولم يحمد على ما ذكر بل اتي بتحقيقات خلا عنها الزبر المتداولة و اشار الى تدقيقات لم يحوها الصحف المتطاولة -

And in view of its popularity, it has been prescribed in Arabic Madrasas, and a number of writers have written glosses on it, among whom the following are worth notice :—

1. Mir Abul-Fath Sa'idi, 2. Mir Fakhrud-Din Muhammad al-Astrabadi, 3. Abul-Hasan al-Abiwardi, better known as Danishmand, 4. Muslihud-Din Muhammad al-Lari, 5. Husain al-Husaini al-Khalkhali and 6. Mir Zahid al-Hirawi.

But Muhaqqiq Dawani could not complete his commentary. It was completed by Mir Abul-Fath Sa'idi, and, according to Azad Bilgrami, by Amir Fathul-Lah Shirazi, as he says while enumerating his works :—

از مصنفات او تكملة حاشية علامه دواني بر تهذيب المنطق وحاشيه بر حاشيه مذکور متداول است -<sup>4</sup>

3. See the writer's articles on Muhaqqiq Dawani' in the *Burhan* of Delhi, May, 1957.

4. *Ma'athul-Kiram*, p. 238.

It was Amir Fathul-Lah himself who brought to India *Tahdhib* and *Sharh-i-Tahdhib* with him, as Azad Bilgrami says further :

نصانیف علمائی متاخرین ولایت مثل محقق دوانی و میر صدر الدین و میر غیاث الدین منصور و میرزا جان میر بهندوستان آورد و در حلقهٔ درس انداخت و جم غفیر از حاشیهٔ محفل میر استفاده کردند و از آن عهد معقولات را رواجی دیگر پیدا شد.<sup>5</sup>

Afterwards teaching of *Tahdhib* gained currency in India, and various scholars wrote commentaries on it. Of these commentaries, that of Shaikh Nurud-Din Ahmadabadi (1064-1155 A. H.), a contemporary of Ar-Riyadi, is the most celebrated as well as difficult. In this connection Azad Bilgrami says :

و شرح تهذیب المنطق و هو ادق تصانیفه<sup>6</sup>

But most of the Indian scholars wrote glosses either on Dawani's commentary, generally known as Mulla Jalal, or on the gloss written by Mir Zahid Hirawi, better known as Mir Zahid Mulla Jalal. Among the glosses on Mulla Jalal, those of Mir Zahid Hirawi and Mir Sayyid Isma'il Bilgrami are most important, while among the gloss-writers on Mir Zahid Mulla Jalal Qadi Mubarak of Gopa Mau, Mulla Kamalud-Din of Suhali and Maulvi Waliul-Lah of Lucknow are of great significance.

This brief introduction, I hope, will bring into light the importance of the book *Tahdhib* and its popularity with the Indian scholars. At the time when 'Allamah Imamud-Din Ar-Riyadi was engaged in teaching religious as well as philosophical sciences *Tahdhib* occupied a prominent place in the prescribed course of Logic. Hence it was but natural for him to write a commentary on this monumental work.

*Tahdhibul-Mantiq* was taught in Madrassas from two view-points: firstly as an introduction to Logic, the beginners studying it from this point of view; secondly, as a standard work on advanced Logic in the form of Mir Zahid Mulla Jalal. Hence Allama Ar-Riyadi wrote two commentaries on it, a smaller one which was probably meant for beginners and which he called "*Taqrib*" (meaning introduction), and the other a more detailed one which was presumably for advanced study; and because it contained the evaluation of the views of different scholars, he gave it the name of *Taswib* (meaning rectification).<sup>7</sup>

### 3. *The Nihayatul-Hikmah.*

Shaikh Athirud-Din Mufaddal ibn Umar al-Abhari wrote a brief text on Logic and Philosophy, entitled *Hidayatul-Hikmah*. It was divided into three parts: the first was on Logic, the second on Physics and the third on Metaphysics. A lot of books have been compiled by numerous scholars on Logic and

5. *Ma'athir-ul-Kiram*.

6. *Ibid* p. 219 and *Subhat-ul-Marjan*, p. 94.

7. Dr. Nazir Ahmad takes *Taswib* and *Taqrib* as the commentaries on *Tahdhib-ul-Akhlaq*.

Philosophy, but only a few were destined to become popular. *Hidayatul-Hikmah* also was one of those fortunate works in which the learned doctors were highly interested. They taught it and wrote commentaries and glosses on it. Among the commentary-writers, the following are worthy of note:—

1. Mirak Shamsud-Din Muhammad, 2. Qadi Mir Husain al-Maibudhi, 3. Mu'inud-Din as-Salimi, 4. Sa'dud-Din Mas'ud ibn Muhammad al-Qazwini, 5. Amiud-Dawlah, 6. Khwajah Sa'idud-Din, 7. Maulana Ahmad Zadah, and 8. Mulla Sadrud-Din ash-Shirazi.

Besides, there is one more commentary on *Hidayatul-Hikmah*, entitled *An-Nihayah*. But of all these commentaries those of Maulana Ahmad Zadah and Qadi Mir Husain al-Maibudhi are the most celebrated. The commentary of the latter, especially, was held in high esteem throughout Iran and Turkey as also in India, so much so that it was called *al-Maibudhi* after the name of its author, and the following illustrious scholars wrote super-commentaries on it :

1. Muhammad ibn Sharif al-Husaini, 2. Khwajah Zadah, 3. Muslihud-Din Muhammad al-Lari, 4. Nasrul-Lah ibn Muhammad al-Khalkhali, 5. Lutful-Lah ibn Ilyas ar-Rumi, and 6. Amir Fakhrud-Din al-Astarabadi, whose glosses are frequently referred to by Mulla Sadrud-Din in his commentary on *Hidayatul-Hikmah* under the *Hawashi-i-Fakhriyah*.

In India, too, Maibudhi's commentary has been popular from the very beginning. Mulla 'Abdul-Hakim Sialkoti wrote a gloss on it, as Azad Bilgrami includes it in the long list of his works :—

و الحواشى على هوامش شرح هداية الحكمة للمبذى<sup>8</sup>

In short, the learned doctors were very much interested in the teaching as well as annotating of *Maibudhi* and, therefore, it was but natural for Imamud-Din Ar-Riyadi to write a gloss on it, which he entitled *Nihayatul-Hikmah*.

Dr. Nazir has given two pronunciations of the word مبذى : (1) *Maibazi*, and (2) *Maibadi*, but unfortunately both are incorrect. The correct pronunciation of the word is *Maibudhi*, as Yaqut says in his *Mu'jamul-Buldan* ;

”مبذ - بفتح المم و سكون الياء و ضم الباء الموحدة و سكون الذال للمعجمة“ -

#### 4. The *Hashiya-i-Sharh-i-Matali*

Qadi Sirajud-Din Mahmud Ibn Abu Bakr al-Urmavi (died in 689 A.H.) compiled a book on Logic and Philosophy under the title *Matali'ul-Anwar*. It contains two parts, each of which is called *taraf*. The first *taraf* was on Logic, and the second on Philosophy which was further sub-divided into four sections : (1) On Ontology (Umur-i-'Ammah), (2) On Substances (Jawahir), (3) On Accidents (A'rad), and (4) On Metaphysics ('Ilmul-Ilahi). Prominent scholars have taken keen interest in its teaching and annotation. The author of *Kashfuz-Zunun* says :—

8. *Ma'athir*, p. 205 and *Subhat*, p. 64.



و هو كتاب اعتنى بشأنه الفضلاء و يهتمون بالبحث فيه و تدريسه و يستكشفون  
من مظان دروسه -

Qutubud-Din ar-Razi was the first to write a commentary on this book, which he named *Lawami' ul-Asrar*. This commentary, generally known as *Sharh-i-Matali'*, was most favourably received by the scholars, and numerous writers of Iran and Turkey wrote glosses on it. For example :

1. Maulana Abu Wardi, 2. Maulana Da'ud Shirwani, 3. Maulana Abdur-Rahim Shirwani, 4. Mir Sayyid Sharif al-Jurjani, 5. Haji Pasha, and 6. Muhyiud-Din Muhammad ibn Shihabud-Din Shirwani.

Later scholars wrote super-glosses on that of Mir Sayyid Sharif, e. g., Mir Murtada Shirazi and Mirza Jan Habibul-Lah Shirazi etc.

There were other scholars, besides Qutbud-Din Razi, who also wrote commentaries on *Matali' ul-Anwar*, prominent among whom are the following :—

1. Shamsud-Din Mahmud al-Isfahani, 2. 'Izzud-Din ibn Jama'a, and 3. Badrud-Din Muhammad al-Yamani etc.

But it was only the commentary of Qutbud-Din al-Razi which was destined to become popular. It became popular in India, too, and a number of Indian scholars wrote glosses on it, e.g.,

1. Mulla 'Abdul-Hakim Sialkoti (died in 1067 A. H.) and 2. Shaikh Nurud-Din Ahmadabadi (1064-1155 A. H.), etc.

The last-named was a contemporary of Ar-Riyadi. This shows that in the days of Ar-Riyadi the 'Ulama used to teach *Sharh-i-Matali'* and write glosses on it. So Ar-Riyadi, who was one of the most learned doctors of his age, also wrote a gloss which is called *Hashiya-i-Sharh-i-Matali'*.

• Dr. Nazir is wrong when he says : “*The Matali-ul-Anwar* is an important work on astronomy”.

##### 5. The *Hashiya-i-Farsi Hai'at*

Mulla 'Ali al-Qaushaji had compiled a short treatise on *Hai'at-i-basitah* in the Persian language, called *Ar-Risalatul-Fathiya*. Haji Khalifa's words *وهي رسالة نافعة* indicate that this treatise, though short, was very useful. Many Turkish scholars wrote commentaries and glosses on it. For example, Sinanud-Din ibn Yusuf, a pupil of Al-Qaushaji and Bairam Chalpi. In India also this treatise became extremely popular and the great Indian scholars wrote commentaries and glosses on it, among whom Shaykh Wajihud-Din 'Alavi Gujrati (died in 998 A. H.) figures prominently. Maulana Azad Bilgrami, while enumerating his works on astronomy, says :—

حاشية شرح الجعمني و شرح التحفة الشاهية و شرح رسالة الملا علي القوشجي في

الهيئة بالفارسية - 9

So it was quite impossible for Imamud-Din Ar-Riyadi, who was an acknowledged authority of his age on astronomy and mathematics, to have left this work untouched. Therefore, he also wrote a gloss on it which he mentioned in the *Baghistan* under the *Hashiya-i-Farsi Hai'at*.

This treatise of Al-Qaushaji has been printed so many times. The copy before me was printed in Mujtabai Press in 1898 A.D. entitled *Al-Qaushaiyyah*.

#### 6. The *Risalah dar 'Ilm-i-Musiqi*.

According to the philosophers, music is an important branch of philosophy, because philosophy is primarily divided into "Practical Philosophy" (*Hikmat-i-'Amali*) and "Theoretical Philosophy" (*Hikmat-i-Nazari*). Each of these two main divisions is sub-divided into three branches: the Theoretical into Mathematics (*Riyadiyat*), Physical Sciences (*Tabiyat*) and Metaphysics (*Ilahiyat*); and the Practical into Ethics (*Tahdhibul-Akhlaq*), Economics (*Tadbirul-Mazil*) and Politics (*Siyasatul-Mudun*). Mathematics (*Riyadiyat*) is further sub-divided into four branches: Arithmetic (*Hisab*), Geometry (*Handash*), Astronomy (*Hai'at*), and Music (*Musiqi*). Allama Ar-Riyadi was well read in all the branches of Philosophy, particularly in those of Mathematics. In Arithmetic he wrote a commentary and a gloss on *Sharh-i-Khulasatul-Hisab* of his father Maulana Lutful-Lah Muhandis; in Geometry he wrote a commentary on Euclid's Optics شرح مناظر اقليدس and a book on Sphere, Cone and Cylinder (كتاب الكره و المخروط و الاسطوانه); and in Astronomy he compiled *Tasrih*, *Tarshih*, *Risalah-i-Manzum-un-Nujum*, *Hashiya-i-Sharh-i-Chagmini* and *Hashiya-i-Farsi Hai'at*. In the fourth branch, namely Music, he also wrote this treatise.

#### 7. The *Hashiyah bar Sharh-i-Khulasah*.

*Khulasat-ul-Hisab* is a fine work on Arithmetic by Baha'ud-Din 'Amili (died in 1030 A. H.). It contains a preface, ten chapters and an appendix. The preface deals with the definition and divisions of Arithmetic, and the contents of the chapters are as follows :—

- (i) Arithmetic of positive integral numbers (حساب صحاح)
- (ii) Arithmetic of fraction (حساب كسور)
- (iii) Rule of three (استخراج المجهولات بالاربعة المتناسبة)
- (iv) Method of trial and error (استخراج المجهولات بحساب الخطاين)
- (v) Method of conversion (استخراج المجهولات بالعمل العكس)
- (vi) Mensuration (المساحة)
- (vii) Measurement of height and distance etc.  
وزن ارض و معرفة ارتفاع مرتفعات وغيره
- (viii) Algebra (استخراج المجهولات بطريق الجبر و المقابلة)
- (ix) Useful formulae (القواعد الشريفة و الفوائد اللطيفة)
- (x) Miscellaneous problems. (المسائل المتفرقة)

The appendix deals with some difficult problems of which the fourth one, that is (عدد مکعب قسم بفسمین مکعبین) deserves special notice, as Fermat's last problem, i. e., ( $x^n + y^n = z^n$ ), where  $n$  is greater than 2, is based on it.

The above description of the contents shows how useful and important this book is. Hence a number of scholars wrote commentaries on it. In India two commentaries are generally celebrated: one by Mulla 'Ismat-ul-lah Saharanpuri, which has been published under the title *Anwar-i-khulasat-ul-Hisab*, and the other by Ar-Riyadi's father Lutf-ul-Lah Muhandis. On the latter Ar-Riyadi wrote a super-commentary. He says:

ووالد این فقیر براں دو شرح نوشتہ یکی فارسی بود دوم عربی و فقیر براں شرح عربی  
حاشیہ نوشتہ در نہایت تفصیل و توضیح -<sup>10</sup>

(Lutfullah wrote one more commentary in Persian which is most probably identical with his Persian translation of the same work under the title 'Muntakhab'. The Mss. of the *Muntakhab* are preserved in the British Museum (No. 16744), India Office Library (Nos. 2253 and 2254), Asifiyah Library, Hyderabad (No. 211 of Persian Mathematics), Subhanallah Khan Oriental Library, Muslim University, Aligarh (No. 511/3), Jami'a Milliya Library (No. 76 Delhi and Diwan Madras Library).<sup>11</sup>

#### 8. The *Hashiya-i-Akhlaq-i-Nasiri*.

The science of Greek Ethics exercised but little influence on Muslim thought, because, as Maulana Fazl-i-Haq Khairabadi observes, after the Holy Qur'an and the Sunnah of the Holy Prophet the Muslims had no need for it. Still, there were some philhellenics who produced works on Ethics purely on the lines of ancient philosophers. Among such works, the *Tahdhib-ul-Akhlaq wa Tathir-ul-A'raq* by Ibn Miskawayhi is quite well known. Muhaqqiq Nasir-ud-Din Tusi, who was kidnapped by Nasir-ud-Din, the Isma'ili Governor of Quhistan, and sent to Alamut where he was confined for some time, was asked to translate the above work into Persian. He says himself:—

بمحرر این اوراق فرمود کہ این کتاب نفیس را تبدیل کسوت الفاظ و نقل از زبان  
تازی بزبان پارسی تجدید ذکر می باید کرد -<sup>12</sup>

But as Ibn Miskawayhi's book contained only ethical parts of the Practical Philosophy, Muhaqqiq Tusi supplemented it by writing discussions on Economics and Politics, as he himself says:—

هرچند آن کتاب مشتمل بر شریف ترین بابی است از ابواب حکمت عملی اما از  
دو قسم دیگر خالی است یعنی حکمت مدنی و حکمت منزلی و تجدید مراسم این دو رکن نیز کہ  
بامتداد روزگار اندراس یافته است مهم است -<sup>13</sup>

10. Vide *Baghistan*, fol. 682b.

11. The *Ma'arif*, March 1936, pp. 170-171.

12. *Akhlaq-i-Nasiri*, p. 9. 13. *Ibid*, p. 10.



The *Akhlaq-i-Nasiri* became considerably popular not so much from the scientific as from the literary point of view, and it is regarded as one of the classics of Persian literature. In spite of this, the problems discussed therein are those which could only be written by a pen that wrote *Tajrid* and commented upon Ibn Sina's *Isharat*. Hence from the technical point of view, its subtleties were waiting for their elucidation by a genius like Ar-Riyadi.

Dr. Nazir's observation that "Nasir-ud-Din Tusi, being a renowned philosopher had greatly influenced this family" seems to have no basis for the following reasons:—

(1) There is no indication in *Baghistan* or in any other book of Ar-Riyadi's family that they were influenced by Nasir-ud-Din Tusi.

(2) Only writing commentaries and glosses on other people's works is not sufficient proof of the one's being influenced by the other.

(3) In the seventh Bagh of *Baghistan* Ar-Riyadi has given biographies of no less than thirty-five scholars, ancient as well as modern, but he did not consider it worth while to devote even a single line to him. Had Ar-Riyadi's family been greatly influenced by him, he could not have ignored him.

(9) The *Tarjuma-i-Manzum-i-kidani*.

*Khulasa-i-kidani* is a well known-book on the principles of prayer, but its author is unknown. Tashkubra Zadah ascribes its authorship to Shams-ud-Din Muhammad Ibn Hamzah al-Fanari, while Hasan Aq Hisari to Ibn Kamal Pasha, the author of *al-Idah wal-Islah*. I have got two glosses of *Khulasa-i-kidani*, one by Mir Sayyid Sharif and the other by Sa'd-ud-Din at-Taftazani. The former died in 816 A. H. and the latter in 791 A. H., whereas the year of death of Al-Fanari is 834 A. H. and that of Ibn Kamal Pasha 940 A. H. So neither of these two can be its author, because in the days of Mir Sayyid Sharif and at-Taftazani this book was exceedingly popular, as Mir Sayyid Sharif says in his Gloss:—

اما بعد فهذه حاشية مترجمة ببيان اساس الدين في كشف عويصات الكتاب الماخص  
المنير عمدة التفسير في بيان اقسام المشروعات مع افادة احكام الصلوة واحسن النبيين -

And in the days of at-Taftazani it enjoyed so much popularity that a student, unless he had studied the *Fiqh-i-kidani*, was considered as ignorant, as he remarks in his Gloss,

تأخواني توفقه كيداني لذت علم را كجاداني

However, since Mir Sayyid Sharif and at-Taftazani's time was earlier than that of al-Fanari and Ibn Kamal Pasha, neither of the two last-named can be the author of this book. The third view is that it is the composition of a certain writer, Lutfullah an-Nasafi, but there is no mention of this writer in the biographies of Hanafite jurists, as Maulana Abdul-Hayy points out:—

وهو رجل مجهول فانه، لم نقف في كلام احد ممن الف في تراجم الحنفية للطف الله  
النسفي خبرا ولا اثرا -<sup>14</sup>

14. 'Umdat-ur-Ri'ayah, the gloss on *Sharh-ul-Wiqayah*, Introduction, p. 12.

In spite of this, this book received so much popularity and favourable response that notable scholars ('ulama) wrote commentaries and glosses on it, e. g., 'Allama at-Taftazani and Mir Sayyid Sharif, 'Tashkubra Zadah, Hasan al-kafi Aq Hisari, Shamsud-Din Quhistani and Ibrahim Bukhari, etc. Until the last century this book occupied a prominent place in the syllabi of Arabic Madrasas in Afghanistan and Transoxiana, as Maulana Abdul-Hayy observes :—

فانها وان انتتھرت فی بلاد ماوراء النھر اشتھارا و تدا ولوافیا بینھم حفظا و استدراکا  
الا انه لم یعرف الی الان حال مؤلفھا -<sup>15</sup>

In India too this book was extremely popular, and Maulana Muhammad Hasan Sambhali, one of the gloss writers of the *Hidayah*, wrote a commentary on it. Therefore, in view of its utility and celebrity 'Allama Ar-Riyadi also translated it in verse to facilitate its memorization by the students.

This book begins with a preface which contains definitions of various technical terms of Islamic jurisprudence and their *ahkam*. Afterwards there are eight chapters on Fara'id (15), Wajibat (21), Sunan (27), Mustahabbat (23), Muharramat (14), Makruhat (59), Mubahat (11), and Mufsidat (5).

This is, in brief, a description of the book. After the above analysis the Dr. Nazir's observation that

"Kidani's important book is *al-Khulasah*, in which he has discussed that the raising of (the) index finger, while pronouncing the Kalima in prayer, is not permissible."

needs no further comment.

#### 10. The Hashiya bar Sharh-i-Chaghmini

• Mahmud ibn Muhammad ibn Umar al-jaghmini compiled a concise book on *hai'at-i-basitah*, which is generally known as *Mulakhkhas-i-chaghmini*. This *Mulakhkhas* became very much popular among the students in Arabic Madrasas, and a large number of eminent scholars wrote commentaries on it, e. g.,

1. Qadi Zadah Rumi, 2. Kamal-ud-Din Turkmani, 3. Fadl-ul-lah 'Ubaidi, 4. Mir Sayyid Sharif Jurjani, 5. Sinan-ud-Din Yusuf generally called Qara Sinan, 6. Muhammad ibn Husain ibn Rashid Mashhadi, 7. Maula 'Abd-ul-Majid, 8. Badr-ud-Din Thabiti, 9. 'Abdul-Wahid ibn Muhammad and 10. Muhammad ibn Muhammad ibn Abu Talib, known as Humam the physician.

But universal popularity and admiration were destined for the commentary of Qadi Zadah Rumi, which he wrote in the year 815 A. H. and dedicated to Ulugh Beg Mirza. This commentary, which is generally known as 'Sharh-i-chaghmini, is even to-day included in the prescribed courses of

15. *Ibid*, p. 11.

studies of Arabic Madrasas, and numerous writers wrote glosses on it, e. g. 1. Fath-ul-lah Shirwani, 2. Maula Sinan Pasha, and 3. 'Abd-ul-'Ali Barjandi.

In India also a number of scholars wrote glosses on the *Sharh-i-Chaghmini* among which that by Shaykh Wajih-ud-Din Alavi Gujarati (died in 998 A. H.) was the most celebrated. Azad Bilgrami has included "حاشیه شرح چغمنی"<sup>16</sup> in the list of his numerous works.

Similarly, Imam-ud-Din Ar-Riyadi, who was in fact an Imam (authority) on this subject, also wrote a gloss on it, which he frequently refers to in his book '*Tasrih*'.

The *Sharh-i-Chaghmini* that I possess is an edition of Mujtabai Press, Delhi, published with the marginal notes of Maulana 'Abdul Halim in 1316 A. H. It contains extracts from the glosses of the following scholars:—

1. Imam-ud-Din Ar-Riyadi, 2. 'Abul 'Ali Barjandi, 3. Maulana Muhammad Sa'd-ul-lah, 4. Maulana Muhammad Amin-ul-lah, 5. Mulla Sadr-ud-Din Shirazi, 6. Baha-ud-Din 'Amili, 7. Mulla 'Ismat-ul-lah Saharanpuri, 8. Shams-ud-Din Khalkhali, 9. Mir Sayyid Sharif Jurjani, 10. Maulana Fasih and 11. Maulana Muhammad 'Abdul Hayy.

But the quotations from the gloss (Hashiya) of Ar-Riyadi are more numerous than those by any other.

#### 11. The *Risala-i-Bayaniya*:

This is one of the extant works of Ar-Riyadi which was originally written during his student life, but due to some official duties assigned to him by the Royal Court, he could not arrange it till A. H. 1107. In this year, when Zeb-un-Nisa Begum, the daughter of 'Alamgir, came to know of it, she asked him to complete it, as the author himself says after doxology:—

اما بعد چنین گوید افقر عباد الله الغنی امام الدین الرياضی بن لطف الله المهندس  
اللاهوری تم الدهلوی کہ در خلال از منہ تحصیل و اصناف آونہ اکمال و تکمیل قواعد چند کہ  
اساس علم بیان رفیع البنیان است، تحریر نموده بود لیکن بسبب اشغال بعض امور ماسورہ نفل آن از  
مسودہ بمیضہ بمقتضائی وقت نمی نمود۔ ثانی الحال چون درسہ الف و مائتہ و سبع ہجری مطابق  
سنہ سی و نہ جلوس امیر کبیر بسیار بختن اندک پذیر اورنگ زیب بہادر عالمگیر این معنی  
بعرض جناب . . . . . زیب النساء بیگم سلمہا الله و ابقی ظلال رافتہا علی العالمین عموماً و  
علی العالمین خصوصاً رسید، حکم جہاں مطاع عالم مطیع شرف صدور و عز و رود بخشید کہ آن  
را مرتب و مہذب سازد۔<sup>17</sup>

16. *Ma'athir-ul-Kiram*, p. 197.

17. The *Risala-i-Bayaniya*, pp. 2-3.

One Ms. of this treatise is preserved in the Nadwa Library (Nawab 'Ali Hasan Khan's Section) in a collection of seven treatises (Nos. 2151—2157). It comprises 16 pages and was transcribed by Ahmad 'Ali in four hours, as the colophon shows :—

عاصی احمد علی در عرصہ چہار کھری نوشت سنہ ۱۲۴۵ ہجری نبوی -

There seems to be some oversight in the reading of the Ms. too. For instance, the word *یعنی* occurring in the reading of the learned Doctor is in reality *الغنی* (see above).<sup>18</sup> The year 1007 ought to be 1107 (الف و مائة و سبع).

## 12. *The Risala-i-Tahqiq-i-Ayat-ul-Wudu.*

The Qur'anic verse relating to ablution is the following :—

يا ايها الذين آمنوا اذا قمتم الى الصلوة فاغسلوا وجوهكم وارجلكم الى الكعبين -

(O you who believe ! when you rise up to prayer, wash your faces, and your hands as far as elbows, and wipe your heads, and (wash) your feet to the ankles ;)

Imam Razi has enumerated forty-one problems under this verse in his commentary, *Mafatih-ul-Ghaib*, commonly known as *Tafsir-i-Kabir*, and the main problem is whether a Muslim, while performing ablution, should wash his feet or perform 'mash' (i.e. wipe over them with his wet hands). There is a difference of opinion among the jurists on this point. This controversial issue has been described by Imam Razi as follows :—

(المسئلة الثامنة و الثلاثون) اختلف الناس في مسح الرجلين وفي غسلها فقل الففال في تفسيره عن ابن عباس و انس بن مالك و عكرمة و الشعبي و ابي جعفر محمد بن علي الباقر ان الواجب فيها المسح و هو مذهب الامامية من الشيعة و قال جمهور الفقهاء و المفسرين فرضها الغسل و قال داؤد الا صفهاني يجب الجمع بينهما و هو قول الناصر للحق من ائمة الزيدية و قال الحسن البصري و محمد بن جرير الطبري المكلف مخير بين الغسل و المسح -

It is just probable that *Ar-Riyadi* discussed this particular problem and supported his point of view in this treatise.

## 13. *The Risala-i-Badi'iya.*

As the title suggests, it must have been a treatise on علم بدیع. I am afraid by his definition of علم بدیع as "the science whereby is known the manner of adapting language to the requirement of the case," Dr. Nazir has confused between *Badi'* and *Balaghat*, of which the former is a branch. The definition

18. Employing antithesis between الغنى and افقر -



given by him is that of *Balaghat*. The author of the *Talkhis* says :

والبلاغة في الكلام مطابقتها لمقتضى الحال مع فصاحتها<sup>19</sup>

Whereas *Badi'* ought to have been defined as the science whereby are known the manners of beautifying the language, as the above author says :—

وما يعرف به وجوه التحسين علم البديع<sup>20</sup>

Similary, the author of the *Hada'iq-ul-Balagha* observes :

علم بديع عبارت است از شناختن وجوه محسنات كلام و بدائع و صنائع كه در الفاظ و معانی بكار مى رود بطريق تحسين نه برسبيل وجوب<sup>21</sup>

Besides, I am unable to agree with Dr. Nazir that this treatise “should be regarded as a supplement to treatise No. 11”, i. e. *Risala-i-Bayaniya*, because *Badi'* is an independent science. It is not a branch of *Bayan*. Hence it is that Ibn-ul-Mu'tazz, the originator of this science, compiled a book exclusively on this subject and entitled it “*Kitab-ul-Badi'*”. There were other scholars too who produced works confined to this subject alone, e. g., Abu Ahmad Hasan 'Askari, Shihab-ud-Din Ahmad and Shaikh Mutarrazi, etc. Likewise, *Badi'iyat-ul-Udaba* have been composed exclusively on this science in metrical form, among which *Badi'iyat* by Jalal-ud-Din Suyuti, which he originally named *Nazm-ul-Badi'*, is well-known. Therefore it is incorrect to consider this treatise as a supplement to the *Risala-i-Bayaniya*.

#### 14. The *Risala-i-Manzum-un-Nujum*.

This treatise in Persian verse was written, as Ar-Riyadi says himself, as an introduction (*madkhal*) to the science of stars. Numerous scholars have written introductory text-books on this science under the title ‘*al-Madkhal*’; out of them the following are worth notice :—

1. Khwaja Nasir-ud-Din Tusi, 2. Abu Ma'shar Balkhi, 3. 'Abdu'l-'Aziz Qabisi, 4. Koshiyar ibn Laban-al-jili, and 5. Abu Talib Mufaddal Lughawi.

Khairullah, the younger brother of Ar-Riyadi, also composed in A.H. 1150 a treatise on this science under the title *Madkhal-ul-Manzum fi 'Ilm-in-Nujum*. It was Maulana Sayyid Sulaiman Nadwi who first discovered a Ms. copy of it in the Nadwa Library. The reader is referred to Ma'arif, September, 1950 where the Maulana has given a detailed description thereof (pp. 215-217).

I am unable to subscribe to the view of Dr. Nazir that “it is most probable that he (Khairullah) must have had his elder brother's *Madkhal* before him while completing this treatise.” Because Khairullah himself says :—

دو سه مدخل زعمد های قدیم دید در نظم بهر فیض عمم

19. The *Talkhis*, p. 4. 20. *Ibid*, p. 5.

21. The *Hada'iq-ul-Balaghah*, p. 59.

i. e. he had before him while composing this treatise in A.H. 1150 some *qadim* (ancient) *Madkhals*; so it seems improbable for him to characterise his elder brother's *Madkhal* as *qadim*, who was only his contemporary and had been living, according to Nata'ij-ul-Afkar, quoted by Nuzhatul-Khawatir, upto A. H. 1145. In my opinion, by 'qadim' *Madkhals* Khairullah means those of Nasir-ud-Din Tusi and others of the ancient times.

#### 15. The *Risala-i-Mir'at-ul-Mawaqif*.

As the title indicates, it must have been an introduction to *Mawaqif*. I am aware of the following books under the title "Mawaqif":—

1. *Mawaqif-ul-Ghayat fi Asrar-ir-Riyadat* by Shaykh Abul-'Abbas Ahmad al-Boni al-Qarashi, 2. *Mawaqif fit Tasawwuf* by Shaykh Muhammad ibn 'Abdul-Jabbar ibn Hasan an-Naghzi as-Sufi, and 3. *Mawaqif fi 'Ilm-il-Kalam* by Qadi 'Adud-ud-Din al-Iji.

Of these three books the first two are out of the question, as they have not been heard of anywhere in this part of the country. Of course, the *Mawaqif* by Qadi 'Adud is most popular in Eastern countries, especially in India, so much so that a number of scholars wrote commentaries on it, e.g.,

1. Sayyid Sharif al-Jurjani, 2. Shams-ud-Din Muhammad al-Kirmani, 3. Saif-ud-Din al-Abhari, and 4. Maula 'Ala ud-Din 'Ali at-Tusi.

In India the commentary of Sayyid Sharif al-Jurjani, generally known as *Sharh-i-Mawaqif*, has been extremely popular and numerous scholars wrote glosses on it. Out of them the following writers are worthy of note:—

1. Shaykh Wajih-ud-Din 'Alavi Gujrati (died in A. H. 998), 2. Mulla 'Abdu'l-Hakim Sialkoti (died in A. H. 1067), 3. Mir Muhammad Zahid al-Hirawi (died in A. H. 1111), 4. Hafiz Aman-ul-Lah (died in A.H. 1133), and 5. Maulana Nur-ud-Din Ahmadabadi (died in A. H. 1155).

It is very probable that Ar-Riyadi wrote, according to the practice of his contemporaries, an introduction (or gloss) to *Sharh-i-Mawaqif* under the above title.

#### 16. The *Risala-i-Nisbat Muthannat wa Muthallath bit-Takrir*.

Reference has already been made to *Hidayat-ul-Hikma* and its various commentaries (Vide No. 3). The book was divided into three parts (aqsam) dealing, respectively, with Logic, Physics, and Metaphysics. The second part was further subdivided into three parts, (Funun) of which the first is on the General properties of matter (الفن الاول في اعيان الاجسام). This *fun* contains ten sections (*Fusul*). The opening section establishes the infinite division of particles of matter and thereby disproves the existence of "atoms" (جواهر فردة) or اجزاء لا تتجزئ i.e., minute particles of matter incapable of further subdivision. As is known, the basis of Aristotelian philosophy, and especially of its physics, is the fundamental conception that "the primordial stuff of the universe is the

formless matter (hayula) and form (surat). This, the peripatetic philosophers, especially their Muslim followers, sought by proving the infinite division of any particle of matter. Hence the importance of the first section.  
(في ابطال الجزء الذى لا يتجزى)

The author of *Hidayat-ul-Hikma* was content with giving only two proofs for the infinite division of bodies. But subsequent writers vied with one another in supplying more and more proofs, and in this arduous task sought the help of Euclidean Geometry. The great Dawani invented a new proof for the continuity of material bodies (اتصال الاجسام), which in its turn leads to the disproof of "atoms" (جواهر فردة). This ingenious proof was taken by Mulla Sadra and incorporated into his additional proofs (ten in number) for the infinite division of material particles and the continuity of corporeal bodies (اتصال الاجسام). According to Mulla Sadra, this proof runs as follows:—

الثانية ان مربع قطر المربع بحكم العروس ضعف مربع ضلعه فيكون للقطر الى الضلع نسبة اذائنين بالتكرير صارت ضعفا لائنين في الاصول من ان نسبة المربع الى المربع نسبة الجذر الى الجذر مثناة بالتكرير - ولما لم يكن بين الواحد و الاثنين عدد لم تو جد في الاعداد نسبة يكون مثناها هو الضعف فيكون نسبة قطر المربع الى ضلعه من النسب التى تختص بالمقادير دون الاعداد وهى ما يتحقق بين المندرين لا يوجد لها عداد مشترك كى امر يفنيها باسقاطه مرة بعد اخرى ولا يتصور ذلك فى الاعداد حيث ينتهى الى الواحد العاد للجميع فتحقق النسبة الصمية فى الاجسام دليل على اتصالها -

Thus the question whether bodies are continuously extended or are made up of atoms reduces to the geometrical problem: "Is there any rational number such as  $m/n$  (where  $M$  and  $N$  are any positive integers) whose square is the positive integer 2?" A brief proof of this mathematical problem is given in modern times by Prof. G. H. Hardy in his "A Course of Pure Mathematics", p. 6. But Muslim thinkers also attempted this problem and offered a number of solutions with the help of arithmetical books of Euclid's elements. As many as five solutions of this difficult but important problem have been quoted by Maulana Abdul-Hayy in *ميسر العسير فى مبحث المشناة بالتكرير* (pp. 198-199).

Imamud-Din Ar-Riyadi also tried to solve this problem, but an expert mathematician, as he was, he would not be content with confining his attention to the case of square root only. He also discussed the problem of cube root (مثلث بالتكرير), i.e., a number or magnitude multiplied by itself and the product so obtained multiplied again by the same magnitude. This problem takes two forms:—

(a) To prove that the cube root of 2 is irrational, i. e. there is no rational number  $m/n$  (where  $M$  and  $N$  are two positive integers) whose cube is 2. This was comparatively easy.

(b) To find the cube root of 2. Whereas the square root of 2 can be geometrically effected, the extraction of cube root of 2 is very difficult, nay impossible, with the help of a simple ruler and compass. Or, what is the same thing, to find two mean proportionals X and Y between two given magnitudes a and b such that  $a : x :: x : y :: y : b$ ?

This problem known as Delian problem baffled the intellects of ancient Greek mathematicians as well as early Muslim geometers. In the past centuries they occupied themselves with this problem. For instance, Banu Musa wrote a geometrical treatise "كتاب معرفة مساحة الاشكال", recently published by Dairatul-Ma'arif, Hyderabad, in which he tried to solve this problem, as Qifti says:—

حدث نفسه، باستخراج مسائل لم يستخرجها احد من الاولين . . . . . كطرح  
خطين بين خطين ذوي توال على نسبة -<sup>22</sup>

Such an important and thought-provoking problem could not escape the attention of the famous mathematician Imamud-Din Ar-Riyadi, and so he appended to the problem of proving that 2 has no rational square root (مسئله نسبت مشنات بالتكرير) the old Delian problem to find the cube root of 2.

This was the subject-matter dealt with by Ar-Riyadi in this treatise. A word or two for the explanation of *نسبت مشنات بالتكرير* and *مثلث بالتكرير* I would reproduce the explanation given by Maulana 'Abdul-Hayy. He says:—

فان كانت النسبتان متحدتين بان يكون الكسر المضاف عين المضاف اليه و يكون هناك  
ثلاثة اعداد مفادير نسبة الاول الى الثاني كنسبة الثاني الى الثالث تسمى النسبة المؤلفة منها وهي  
نسبة الاول الى الثالث مشنات بالتكرير -

And on this analogy he further defines (نسبت مثلث بالتكرير) as follows:—

وان كان الناليف باضافتين متحدتين بان يكون الكسر مضافا الى نفسه وهو مضاف  
الى نفسه تسمى النسبة الحاصلة منه مثلثه بالتكرير -

The learned Doctor's remark that "Riyadi seems to have added the problem of *مثلث* and attempted to find out the relation *نسبت* between *مشنات* and *مثلث*", instead of clarifying the terms, has further confused their imports.

### 17. The Tasrih

The book which has kept the name of Ar-Riyadi alive till today is the *Tasrih*. It is a commentary on the *Tashrih-ul-Aflak* composed by the versatile scholar Baha'-ud-Din 'Amili in A. H. 1030 on astronomy. The general scheme of this book is similar to that of *Mulakhkhas-i-Chaghmini*. It comprises a preface, five chapters and an appendix. The preface opens with the

22. Qifti (Cairo edition), p. 287.



description of the composition of the universe. The author says that it is composed of thirteen spheres whose form is like one ball in another. Over and above all is the sphere of the spheres or the smooth sphere (*falak-i-Atlas*), then the sphere of the fixed stars, then the spheres of the seven planets (i. e., Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon). Below the sphere of the moon is the sphere of fire, then that of air, then that of water and lastly the sphere of the Earth, which occupies a central place. The spheres of the nine heavens are actually round, while those of the four elements are not such, particularly the sphere of the earth whose surface is uneven, but this unevenness does not make it apparently unspherical.

The preface concludes with two interesting problems:— (1) If the water is carried above to a considerable height, its quantity would be diminished. (2) If from a certain place a man starts westwards, another eastwards, and a third one stays there, till the first two meet again at the same place after going round the earth, then if the day of their meeting is Friday for one who stayed, it would be Thursday for the one who started to the west and Saturday for the one who proceeded to the east. The latter problem is today an established fact, and there is a particular longitude called the International Date Line, after crossing which the navigators have to adjust their watches and calendars.

The first chapter deals with the Great Circles which are generally used in astronomical calculations. They are ten in number as given below:—

(١) معدل النهار (٢) منطقه البروج (٣) ماره بالاقطاب الاربعه (٤) دائرة الميل (٥) دائرة العرض (٦) افق (٧) نصف النهار (٨) اول السموت (٩) وسط سماء الرؤيه (١٠) دائرة الارتفاع -

The second chapter deals with the structure of the spheres of the seven planets. Each major sphere consists of a number of minor spheres, technically called *hawamil* and *tadawir* (i. e., eccentrics and epicycles), etc. In this way the number of the major spheres is nine; while that of the minor spheres used in astronomy is twenty-four or twenty five.

The third chapter opens with the rate at which different spheres rotate round their centres or in modern terminology, about their axes and it ends with different phases of the moon and a description of the solar and lunar eclipses.

The fourth chapter gives a description of the earth and its seven climes.

The fifth chapter contains a description of morning and dusk.

The appendix deals with the Meridian and the methods of finding out the direction of the holy Ka'ba.

This brief description of the contents of the book will throw light upon its worth and value, and will justify the praise the author himself has expressed about the book.

هذه درة يتيمه احتوت من فن الهيئه على اصوله ولبابه وانطوت على الدهم من  
فصوله و ابوابه و تضمنت لطائف فوائده واشتملت على طرائف فرائده - 23

*Mulakhkhas-i-Chaghmini* and its commentary were standard works, hence unintelligible to the beginners. So 'Amili compiled his *Tashrih-ul-Aflak*, keeping in view the intellectual level of the ordinary students. Therefore, this book received unusual popularity among the students of astronomy and numerous scholars wrote commentaries on it. First of all one of the disciples of the author called Khalkhali wrote his commentary, of whom Mulla 'Ismat-ul-Lah Saharanpuri says :-

وقد شرحه بعض الفضلاء من تلامذة المصنف في الزمان الخالي شمس الدين علي بن محمد  
بن علي الخلخالي - 24

Then came Shadman Balkhi and he prepared his commentary, to which Ar-Riyadi has referred in his *Tasrih* :-

ولهذا قال بعض الشارحين بعد قرله الحاصله عند المنطقه الا ولي حقيقه - 25

In India two commentaries became generally successful : one by Mulla *Ismat-ul-Lah Sharanpuri* which he wrote in A.H. 1086, and to which he gave a historical name, *Bab-u-Tashrih-i-Aflak*, as he himself says :-

ولما افتتحته منه ست وثمانين و الف بعون ملك الا ملاك سميته على مطابقه تلك  
السنه باب تشریح الافلاك -

and the other by Ar-Riyadi entitled *Tasrih* which he extemporized hastily in A.H. 1103 at the request of his friends. The last-mentioned was received with universal appreciation by teachers and the taught alike, hence its numerous editions have been published, and even today it is included in the prescribed courses of study for the Arabic Examinations in the Punjab and U. P., besides the syllabi of dars-i-Nizami.

### 18. *The Tarshih.*

Ar-Riyadi wrote afterwards a gloss (hashiya) on his *Tasrih*, under the title *Tarshih* which has been mentioned by the gloss-writers. Dr. Nazir Ahmad says that "Maulana Hafizullah, the teacher of Maulana Sulaiman Nadwi, has referred to Riyadi's *Tarshih* in his Hashiya on *Tasrih*". I am unable to agree with the Doctor, because the original words of Maulana Sulaiman Nadwi are as follows :-

”ہمارے استاذ مولانا حفیظ اللہ صاحب . . . . استفادہ کیا ہے۔ (خاتمہ حاشیہ تصریح

مطبوعہ مجتبائی دہلی)،، 26

23. The *Tasrih*, p. 4.

24. *Bab-u-Tashrih-il-Aflak*, p. 3.

25. The *Tasrih*, p. 25.

26. The *Ma'arif*, April 1936, p. 249.

On the other hand, Maulana Hafizullah himself says that when he succeeded in finding the original copy of the author's gloss, which was extremely rare, he did his best to correct it along with the original book and supplemented it with useful glosses.

والتعليقات التي هي منقولة عن الشارح كانت اعز الوجود لسهولة فيحصل بها المقصود  
فوجدتها باصلها منقولة عن كتاب المصنف فبالغت في تصحيحها مع اصل الكتاب وزينته بالحواشي  
المفيدة للطلاب - 27

Now turning to the *Tasrih*, we find that Maulana Hafizullah has given no less than one hundred and sixty-six quotations from Ar-Riyadi's Gloss. There is hardly a single page on which three or four quotations are not given. There are even pages where all the glosses have been taken from that of Ar-Riyadi; for instance, take the case of page No. 24, which comprises seven glosses, and all of them are taken from Ar-Riyadi's *Tarshih*.

#### 19. *The Mafatih.*

The subject-matter of this treatise has been specified by the author himself that it was a commentary on the first Surah of the holy Qur'an. The original words are (تفسير سورة فاتحه). While giving this title to his commentary Ar-Riyadi had probably before him the commentaries of Fakhr-ud-Din Razi and Jalal-ud-Din Suyuti, which have been named by their authors *Mafatih-ul-Ghaib*. The correct reading in the *Baghistan* is "*Mafatih*" and not "*Miftah*" as read out by Dr. Nazir.

#### 20. *The Risala-i-Majma'-ul-Bahrain.*

At present I am not in a position to determine its subject-matter, as writers prior to Ar-Riyadi have written books under this title on various subjects, such as,

- (1) *Majma'-ul-Bahrain* by Jalal-ul-Din Suyuti on Qur'anic exegesis.
- (2) *Majma'-ul-Bahrain* by Shamsud-Din Muhammad Sanjari on mysticism.
- (3) *Majma'-ul-Bahrain* by Ibn-us-Sa'ati Baghdadi on Hanafite jurisprudence.

#### 21. *The Sharh-i-Manazir-i-Uglides.*

Dr. Nazir left this book without any comment. The subject-matter of this book is the science of Optics. Optics was a branch of Applied Mathematics, according to Muslim philosophers. Muhaqqiq Tusi says in his *Akhlaq-i-Nasiri* :-

اما اصول علم رياضي چهار نوع بود . . . . . و فروع علم رياضي چند نوع بود چون  
علم مناظر و مرايا و علم جبر و مقابله و علم جراثيق و غير آن - 28

27. The *Tasrih*, p. 75.

28. *Akhlaq-i-Nasiri*, pp. 15-16.

The logical definition of the science of al-Manazir, as understood by Muslim scientists, has been given by Shams-ud-Din Amuli in his *Nafa'is-ul-Funun* as follows :—

علم مناظر و آن عبارت است از علمی که از و احوال حاسه بصر از جهت کیفیت شعور او، بمجسوسات او معلوم کنند -<sup>29</sup>

(‘Ilm-ul-Manazir is the science which deals with the faculty of seeing and tells how it perceives the visible objects!)

This is what we understand now-a-days by Optics or, to be more precise, Geometrical Optics, (as Physical Optics is taken to be true and summarily dealt with in the preface).

It is not known who founded this science nor who was the first to write a systematic treatise on Optics. But the oldest text-book known to us is the Optics of Euclid. It is a kind of elementary treatise on perspective and it may have been intended to forearm the students of Astronomy against paradoxical theories. It begins in the orthodox fashion with definition based on the Platonic theory of visionary process.

Ptolemy also wrote a treatise on Optics in five books. It was translated into Arabic, and from the Arabic version the Latin translation was made in the twelfth century. But universal recognition was reserved for Euclid's Optics, and Pappus included it in the collection of works known as *Little Astronomy* (Mutawassitat), generally taught after Euclid's "Elements" but before Ptolemy's "Almagest". Euclid's version of the book was discovered by Heiberg in two manuscripts, one at Vienna and the other at Florence. He published it in 1895 in Vol. VII of the Heiberg-Menge text of Euclid.

But Euclid's Optics was later reedited by Theon of Alexandria in the fourth century A. H., and it was probably Theon's recension that was translated into Arabic. The name of its Arabic translator is not known, but the book was received with general recognition and was included among "Mutawassitat".

In the fifth century A.H. Ibn-ul-Haitham wrote another book on Optics under the title *Kitab-ul-Manazir* with the help of the two Optics (i. e. of Euclid and Ptolemy), as he himself says :—

والخامس كتاب لخصت فيه علم المناظر من كتاب اقليدس و بطلميوس وتتمته بمعاني مقاله الاولى المفقودة من كتاب بطلميوس -<sup>30</sup>

(The fifth is a book on Optics in which I epitomized the Optics of Euclid and Ptolemy and supplemented it with the contents of the first book of Ptolemy's Optics, which has been irreparably lost).

29. *Nafa'is-ul-Funun*, Section 2, p. 170.

30. Ibn Abi Usaibi'ah, Vol. 2, pp. 93-94.



Ibn-ul-Haitham (or al-Hazem, as he has been called by Bacon) was considered the last word on Optics in medieval times. His book *Kitab-ul-Manazir* was commented upon in seventh century A. H. by Kamal-ud-Din al-Farsi under the name of *Tanqih-ul-Manazir*.

Fortunately, this monumental work of a Muslim genius was published by Dairat-ul-Ma'arif, Hyderabad in A. H. 1359 in two volumes.

But as I have said above, universal recognition was accorded only to Euclid's Optics. In the seventh century the Arabic text of Euclid's *Manazir* was edited along with other treatises of the "Little Astronomy" by Nasir-ud-Din Tusi, who wrote valuable notes on Theorems Nos. 3, 8, 10, 26, 28, 43, 48 and 61 of the book. Ever since his time this book has attracted the attention of scholars. It was lithographed at Delhi some thirty years ago. But a beautiful edition of this book, along with other translations of *Mutawassitat* has been recently published by Dairat-ul-Ma'arif, Hyderabad.

It has been pointed out above that Optics is closely related to Astronomy. Ar-Riyadi has repeatedly made reference to this science. For instance, he refers to Euclid's Optics in the fifth chapter of the *Tasrih* on Morning and Dusk :—

لأبينه ، اقليدس في ثالث المناظر - 31

(As Euclid has stated in Theorem 3 of Optics).

At another place he refers to Ibn-ul-Haitham's Optics and says :—

كما بزهن عليه ابن الهيثم في كتاب المناظر - 32

(As has been proved by Ibn-ul-Haitham in his book on Optics).

Similarly, he refers to Tusi's edition of Euclid's Optics in his Gloss *Tarshih* :—

كما لا يخفى على متتبع علم المناظر سيما تحقيق ما في شرح تحرير المناظر للمحقق الطوسي  
غفر الله بلفظه القدوسي - 33

(As will not be unknown to one who pursues the study of the science of Optics, especially the investigations of what is in Tusi's edition of Optics).

Keeping in view the extraordinary importance Optics enjoys, it was natural for Ar-Riyadi to write a detailed and comprehensive commentary on Euclid's *Optics* under the title '*Sharh-i-Manazir-i-Uqlides*'.

The correct pronunciation of Euclid is either "Uqlides" or "Icludes". (T. L. Heath, "Thirteen books of Euclid's Elements", Vol. I. P. '6), "Uqlidas," as given by Dr. Nazir, is incorrect.

Moreover, the correct translation of the term 'Shakl' occurring in Ar-Riyadi's words *که شصت و چهار شکل است* is theorem, and not figure, as given by Dr. Nazir.

31. The *Tasrih*, pp. 67-68.

32. *Ibid*, p. 29. 33. *Ibid*, p. 67. Gloss No. 1.

22. *The Sharh-i-Sharh i-Kulasatul-Hisab*

Mention has already been made of the *Khulasat-ul-Hisab* and its commentary by Ar-Riyadi's father Lutfullah Muhandis, and it has also been said that Ar-Riyadi wrote a gloss on the *Sharh-i Muhandisi*. (Vide No. 7). Now it is just possible that this *Sharh* may be identical with the *Hashiya*, or some independent work. Since the *Khulasat-ul-Hisab* was the only book current in India on Arithmetic, it is very probable that Ar-Riyadi, in order to display his extra-ordinary merit in the subject, wrote a commentary on his father's commentary besides his gloss.

23. *The Kitab-ul-Kurah wal-Makhrut wal-Ustuwannah.*

Astronomy is closely related to Spherical Geometry. Hence from ancient times mathematicians and geometers have occupied themselves with the investigation of properties of spherical figures. It is not known who first wrote a systematic treatise on Sphaeric. To Tannery it was Eudoxus, the originator of the theory of Concentric Spheres, the very basis of Ptolemaian and Muslim astronomy. Loria, on the other hand, is very sceptic about this suggestion. However, Autolycus is the earliest Greek mathematician from whom treatises on Sphaeric have entirely come down to us, next being Aristarchus and Archimedes. But there are strong reasons to believe that there was already in existence in his time a text-book on the Elementary Geometry of the Sphere.

Two works of Autolycus on Sphaeric are extant, one "On the Moving Sphere" (كتاب الكرة المتحركة), and the other "On Rising and Setting" (كتاب الطلوع والغروب). They were included by Pappus in "Little Astronomy" (*al-Mutawassitat*). Next comes the famous Euclid, author of the immortal 'Elements of Geometry'. Euclid's book on Sphaeric was designated by him as "the Phaenomena". Then comes Aristarchus with his "Sizes and distance of the Sun and the Moon" (كتاب في جرمي النيرين وبعديهما), Hypsicles with his "Ascension" (كتاب في المطالع), Theodosius with his Sphaerica, besides "On Habitations" (كتاب المساكن) and "On Days and Nights" (كتاب الايام والليالي), Menelaus with his Sphaerica (كتاب الاكبر) and lastly Archimedes with his monumental work "On Sphere and Cylinder" (كتاب الكرة والاسطوانه). But universal appreciation was reserved for Sphaerica of Theodosius, Sphaerica of Menelaus and "On Sphere and Cylinder" of Archimedes.

Some scholars include "The Conics" (كتاب المخروطات) of Appolonius also in the "Little Astronomy" (*al-Mutawassitat*).

These component treatises of "Little Astronomy" were translated into Arabic in the 3rd century A. H. Muslim geometers and astronomers wrote commentaries on them. Some of them are extant, and others have perished. But the texts of the treatises were edited by Muhaqqiq-i-Tusi in the 7th century A. H. or 13th century A. D. Fortunately, the collection of Tusi's *Mutawassitat* was published by Dairat-ul-Ma'arif, Hyderabad, under the title *Rasa'il-ut-Tusi* in two volumes in 1358-59 A. H.

References frequently occur to these standard texts on Spherical Geometry in astronomical treatises, including the *Tasrih* of Imam-ud-Din Ar-Riyadi. For instance, while giving an elucidation of the third Great Circle (دائره مارة بالاقطاب الاربعه) Ar-Riyadi says:—

لما بين في الاكر من ان عظيمه اذا مرت بقطبي عظيمه اخرى مرت الاخرى ايضاً بقطبي

الاولى - 34

(As it has been proved in Sphaeric that if a Great Circle passes through the two poles of another Great Circle, the latter will pass through the two poles of the former).

Similarly, he refers to “the sizes and distance of the sun and the moon” (كتاب في جرمي النيرين و بعد يهما) of Aristarchus as follows:—

لما بينه، ار سطر خس في كتابه اذا قبل الضوء كرة صغرى من كرة كبرى كان

المستضى من الصغرى اكثر من نصفها - 35

(As has been proved by Aristarchus in his book, if a smaller sphere receives light from a bigger one, more than half of the smaller one will be illuminated).

As the study of “Little Astronomy” was indispensable for a student of Astronomy, and at the same time the book was very bulky, Ar-Riyadi wrote a compendium of necessary propositions on Sphaerics. He also supplemented it with necessary properties of Cylinder and Conics. References very frequently occur to the latter in the discussion of eclipses. For instance, he defines a Cone as follows:—

المخروط شكل مجسم يحيط به دائرة هي قاعدته و سطح مستدير يرتفع منها متضاباً

الى نقطه هي رأسه - 36

(A Cone is a solid figure bounded by a circle which is its base and a surface which ascends from it (the circle), gradually becoming narrower to a point which is its vertex).

Thus all necessary problems were collected by Ar-Riyadi in a treatise named by him *Kitab-ul-Kuroh wal-Makhrut wal-Ustuwana*.

The following points need consideration:—

(1) Due care has not been taken in presenting the famous problem that the ratio between the highest mountain and the diameter of the earth is the same as between one-seventh of the breadth of a barley seed and the diameter of a sphere having a circumference equal to a cubit. Dr. Nazir Ahmed has described it as

“The proportion between the earth and the highest mountain is the same as between the diameter of the circumference of the hand and one-seventh of the breadth of a barley seed”.

34. *Tasrih*, p. 23.

35. *Ibid*, p. 50.

36. *Ibid*, p. 52.

(2) Qazi Zadeh Rumi, I am afraid, never wrote any margin (or gloss) to the *Sharh-i-Chaghmini*, as has been claimed by Dr. Nazir Ahmad.

(3) The correct equivalent of the Arabic term *al-Ustuwanah* is cylinder and not pillar as translated by Dr. Nazir. "A *sutun*" or a pillar in architecture is quite different from "ustuwanah" or a cylinder in Solid Geometry.

(4) Dr. Nazir Ahmad observes: "Imam-ud-Din Riyadi has supported the view-point of Muhaddiq-i-Tusi and others in a treatise which he has referred to in his *Tasrih*. It is just possible that this treatise might be identical with the *Kitab-ul-Kurah* because:

(1) The title of the treatise indicates that it was somehow connected with the spherical shape of the earth.

(2) The treatise mentioned in the *Tasrih* should necessarily find mention along with the complete list of his book given in *Baghistan*."

I am unable to agree with him. As regards his first argument, I would remark that the spherical shape of the earth may be connected with the word "al-Kurah", the first part of *كتاب الكره والمخروط والاسطوانه*, but what about the implications of al-Makhrut (cone) and al-ustuwanah (cylinder)?

The second argument is also not convincing because there are other treatises too written by Ar-Riyadi which are not included in the list given in *Baghistan*, though they are mentioned in the *Tasrih*. For instance:—

(i) Ar-Riyadi wrote a book under the title "Qut-ul-Auqat" as a commentary on his father's tract *Auqat-us-Salat*, which he has mentioned in his *Tasrih* (vide the *Tasrih*, Mujtabai Press, Delhi, p. 69).

(ii) The eccentrics rotate round their centres with a velocity not uniform. This problem had baffled old astronomers. Muhaddiq-i-Tusi and Qutb-ud-Din Shirazi tried to solve this difficult problem by assuming more component spheres (*aflak-i-juz'iyah*). Ar-Riyadi refers to a treatise of his own on this problem (vide the *Tasrih*, p. 43, n. 5).

#### 24. *The Diwan-i-Ash'ar.*

Ar-Riyadi was also an accomplished poet, as is evident from the notices given in the biographical works, e.g., *Nishtar-i-Ishq*, *Subh-i-Gulshan* and *Makhzan-ul-Ghara'ib*. He had also compiled a *Diwan* (collection) of his poems, which is not found anywhere today. Pieces of his poems are scattered here and there in the *Baghistan*. Besides, three couplets are also given in the *Tasrih*.

#### 25. *The Baghistan.*

Dr. Nazir has mentioned one more book *Insha-i-Digar*, commenting that "these seem to be miscellaneous writings not compiled under any separate title". But Ar-Riyadi's original words *وانشا دیگری باغستان که این کتاب است* indicate that the *Insha-i-Digar* is not different from the *Baghistan* because:

(1) There is no "Waw-i-Atifah" between *Insha-i-Digar* and *Baghistan*.

(2) "*Insha-i-Digar*" taken separately is meaningless.