http://home.kias.re.kr/MKG/h/cal16

Commemoration of the 600th anniversary of the birth of
KIM Dam (1416 - 1464)

International Conference on

History of World Calendars and Calendar Making

Nov. 29 ~ Dec. 2, 2016

Yeongju and Seoul, Korea

Organized by
Korea Institute for Advanced Study (KIAS) and
City of Yeongju
Hosted by
Korea Science and Culture Foundation - Yeongju Branch
Sponsored by
KIM Dam's 600th Birthday Commemorative Association

무송헌 김담 (1416~1464) 탄신 600주년 기념
撫松軒 金淡

국제학술대회

세계 曆書의 변천

2016.11.29. ~ 12.2.

영주, 서울

주관: 고등과학원(KIAS), 영주시

주최: (사)과학문화진흥원-영주분원

후원: 무송헌 김담 선생 탄신 600주년 기념사업회

Preface

The main aim of this conference is to commemorate the 600th anniversary of the birth of KIM Dam (1416 - 1464), a leading Korean astronomer and calendrical scholar during the celebrated reign of King Sejong (r. 1418 - 1450). Kim Dam is particularly noted for his joint book on the Korean calendar with another scholar, Yi Soonji. This work is entitled Chiljeongsan Naepyon-Oepyon ("Calendrical book on the positions of the Sun, Moon and five planets by traditional and Islamic methods"). The book had the honour to be included as a supplement to the Sejong Sillok, the official chronicle of the reign of King Sejong.

We invite papers on the themes of calendars and calendar making throughout the world from the 13th century to the 18th century. Topics may include the interactions/exchanges among different cultures and regions, and the contributions of astronomers to calendar making.

The conference will be restricted to a small number of participants to facilitate detailed discussion and exchange of ideas between participants. During the conference there will be opportunities for overseas visitors to relax and enjoy the environments of Yeongju − a centre of Korean Confucian culture for more than a thousand years.

NHA Il-Seong and F. Richard STEPHENSON
Scientific Organizing Committee Co-Chairs
November 2016

Scientific Organizing Committee

NHA Il-Seong (Co-Chair, Yonsei University, Korea)
F. Richard STEPHENSON (Co-Chair, Durham University, UK)
KIM Jaewan (Secretary-General, Korea Institute for Advanced Study, Korea)
S. M. Razaullah ANSARI (Aligarh Muslim University, India)
Shuhrat EHGAMBERDIEV (Ulugh Beg Astronomical Institute, Uzbekistan)
Jerzy KREINER (Cracow Pedagogical University, Poland)
Lee Yong-Doo (Advanced Center for Korean Studies, Korea)
Kam-Ching LEUNG (University of Nebraska, USA)
NAKAMURA Tsuko (Daito-Bunka University, Japan)
Wayne ORCHISTON (National Astronomical Research Institute of Thailand, Thailand)
Farhad RAHIMI (Ferdowsi University, Iran)
SUN Xiao-Chun (Institute for the History of Science, Chinese Academy of Sciences, China)
Costantino SIGISMONDI (Sapienza University of Rome, Italy)
Boonraksar SOONTHORNTHUM (National Astronomical Research Institute of Thailand, Thailand)
Richard STROM(Netherlands Institute for Radio Astronomy, Dwingeloo Observatory, The Netherlands)

지역조직위원회(Local Organizing Committee)

박원태, PARK Won-Tae (과학문화진흥원)
김태환, KIM Tae-Hwan (과학문화진흥원)
조　천, CHO Cheon (과학문화진흥원)
박석홍, PARK Suk-Hong (과학문화진흥원)
김규탁, KIM Kyu-Tak (과학문화진흥원)
홍현기, HONG Hyon-Ki (과학문화진흥원)
조홍제, CHO Hong Je (과학문화진흥원)
나사라, NHA Sarah (과학문화진흥원)
금창헌, KEUM Chang-Heon (영주시)
장사원, JANG Sawon (영주시)
오용원, OH Yong Weon (한국국학진흥원)

Invited Speakers and Co-Authors

AHN Sang-Hyeon (Korea Astronomy and Space Science Institute, Korea)
AHN Young Sook (Korea Astronomy and Space Science Institute, Korea)
S. M. Razaullah ANSARI (Aligarh Muslim University, India)
Helmer ASLAKSEN (University of Oslo, Norway)
Mohammad BAGHERI (Institute for the History of Science, University of Tehran)
Suzanne D'BARBAT (CNRS, Observatoire de Paris, France)
Shuhrat EHGAMBERDIEV (Ulugh Beg Astronomical Institute, Uzbekistan)
Matthieu HUSSON (CNRS, Observatoire de Paris, France)
S. ILYASOV (Ulugh Beg Astronomical Institute, Uzbekistan)
KIM Tae-Hwan (Korean Science and Culture Foundation, Korea)
Siramas KOMONJINDA (Chiang Mai University, Thailand)
Jerzy KREINER (Cracow Pedagogical University, Poland)
Arthit LAPHIRATTANAKUL (Chiang Mai University, Thailand)
LE Thanh Lan (Vietnam Academy of Science and Technology, Vietnam)
LEE Eun-Hee (Yonsei University, Korea)
LEE Jung Bok (Myungji Junior College, Korea)
LEE Ki-Won (Catholic University of Daegu, Korea)
LEE Sung Won (Nongam Traditional House, Korea)
Kam-Ching LEUNG (University of Nebraska, USA)
MIHN Byeong-Hee (Korea University of Science and Technology, Korea)
NAKAMURA Tsuko (Daito-Bunka University, Japan)
NHA Il-Seong (Yonsei University, Korea)
NHA Sarah L. (Korea Meteorologist Association, Korea)
NGUYEN Thi Truong (Vietnam Academy of Science and Technology, Vietnam)
OH Wan-Tak (Korea Meteorologist Association, Korea)
OH Yong-Hae (Korea Meteorologist Association, Korea)
OHASHI Yukio (Japan)
OKAZAKI Akira (Gunma University, Japan)
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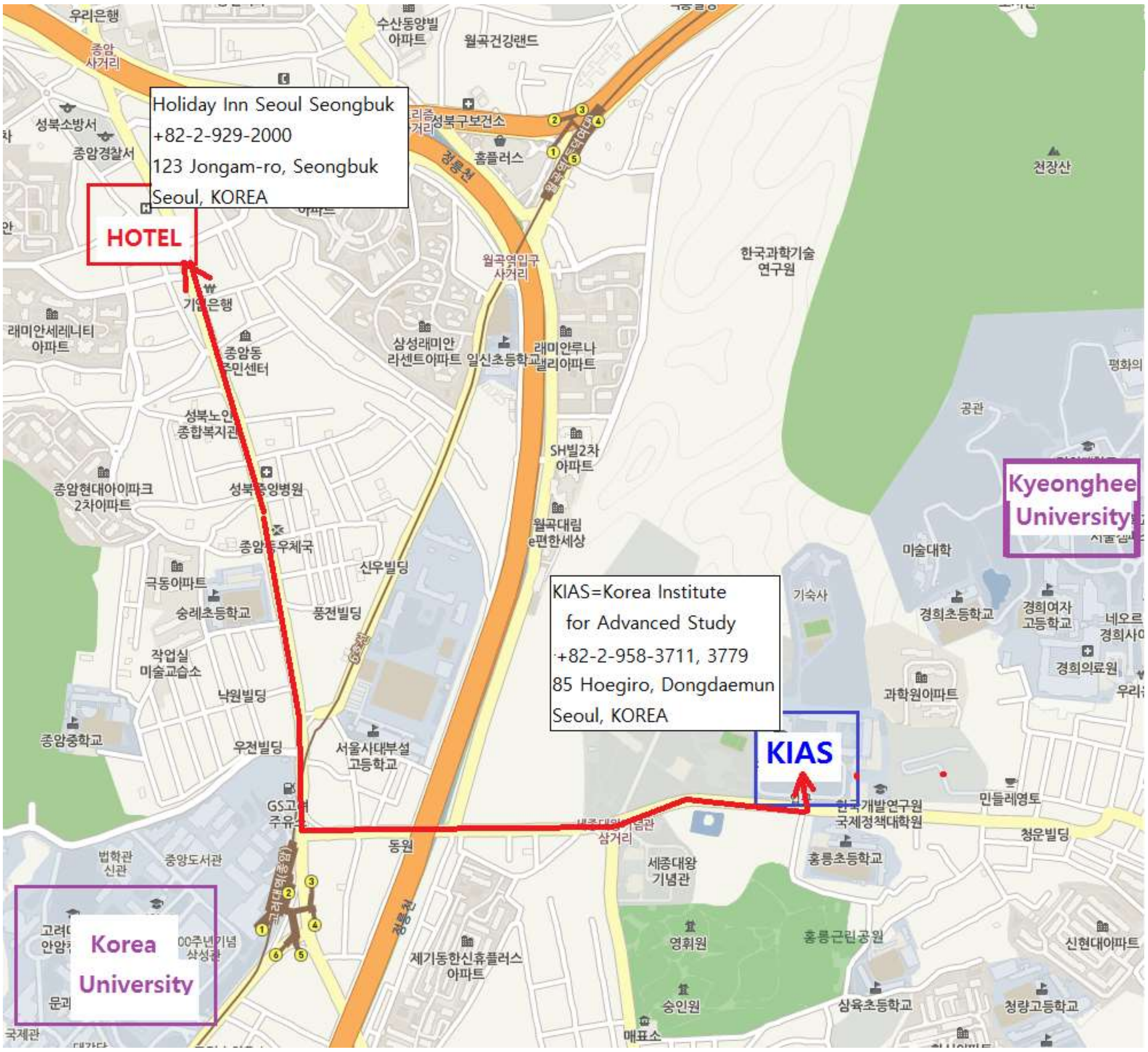
Wayne ORCHISTON (National Astronomical Research Institute of Thailand, Thailand)
PARK Won-Tae (Korean Science and Culture Foundation, Korea)
Kuysinoy RASHIDOVA (Ulugh Beg Astronomical Institute, Uzbekistan)
Costantino SIGISMONDI (Sapienza University of Rome, Italy)
Ockie SIMMONDS (Society for Maori Astronomy Research and Traditions, New Zealand)
SONG Woong Sup (Kyujanggak Institute for Korean Studies, Seoul National University, Korea)
Greg STACHOWSKI (Cracow Pedagogical University, Poland)
F. Richard STEPHENSON (University of Durham, UK)
Sacha David STERN (University College London, UK)
Adisak SUKWISOOT (Chiang Mai University, Thailand)
WANG Guangchao (University of Chinese Academy of Sciences)

HOTEL Holiday Inn Seoul Seongbuk
: Lodging for Nov 29 and Dec 1-Dec 2, 2016

http://www.holiday.co.kr/eng/about_location.htm

KIAS (Korea Institute for Advanced Study): Venue for Dec 2, 2016

http://www.kias.re.kr



FROM INCHEON INTERNATIONAL AIRPORT TO HOLIDAY INN SEOUL SEONGBUK

Please take an airport limousine bus from the Incheon International airport, which is one of the fastest and most convenient ways to the hotel.

1. Buy limousine bus tickets at the ticket office, bound for Dobong/ Seongbuk(Bus No. 6101)
   - Tickets can be purchased both inside and outside of the airport
2. Exit at Gate 3 or 10.
3. Board a bus bound for Dobong/ Seongbuk at either bus stop 3B or 10A.

* Main stops : Incheon International Airport → Gimpo International Airport

→ Jeongneung → Gireum Station → Holiday Inn Seoul Seongbuk

* Total time is approximately 1 hour and 10 minutes

FROM GIMPO AIRPORT TO HOLIDAY INN SEOUL SEONGBUK

Please take an airport limousine bus from the Kimpo int'l airport, which is the fastest and most convenient way to the hotel.

1. Buy limousine bus tickets, bound for Dobong/ Seongbuk(Bus No. 6101)
   - From the Domestic terminal - Bus Stop 3
   - From the International terminal - Ticket Office (inside of the airport)
2. Board a bus bound for Dobong/ Seongbuk at the bus stop.
   - From the Domestic terminal - Bus Stop 3
   - From the International terminal - Bus Stop 6
3. Get off the bus at the Holiday Inn Seoul Seongbuk hotel.

* Main stops : Gimpo International Airport → Jeongneung → Gireum Station → Holiday Inn Seoul Seongbuk
* Total time is approximately 45 minutes

PUBLIC TRANSPORTATION

Subway

The hotel is close to Gireum and Mia Samgeori subway stations (Line 4), and Korea Univ. station(Line 6).

Subway Line 4
- Mia Samgeori Station (Exit No. 5): Bus No. 101, 130, 141, 144, 148
- Gireum Station (Exit No. 2) : Bus No. 110A, 1213, 7211

Subway Line 6
- Korea Univ. station (Exit No.4 & No.6) : Bus No. 101, 110B, 130, 141, 144, 148, 163, 410, 1017, 1213, 7211

Yeongju Grand Convention : Venue for Nov 29, 2016

80 Wondang-ro, Yeongju, Kyeongbuk
+82-54-637-1000

Sosu Museum Lecture Hall : Venue for Nov 30 – Dec 1, 2016

2740 Sobaek-ro, Sunheung, Yeongju, Kyeongbuk
+82-54-639-7934

HOTEL Rich : Lodging for Nov 29 – Dec 1, 2016

17 Daehak-ro Himart, Yeongju, Kyeongbuk
+82-54-638-7070

Program Overview

Nov 28, Mon	Nov 29, Tue	Nov 30, Wed	Dec 1, Thu	Dec 2, Fri
	7:30 Check-out Holiday Inn Seoul Seongbuk & Move to Yeongju	Session 2 [Sosu MuseumLecture Hall] Chair: Sigismondi 9:00 Stephenson (read by Kim) 9:30 Komonjinda 9:50 Nha Sara 10:10 Break	Session 6 [Sosu MuseumLecture Hall] Chair: Aslaksen 9:00 Nha Sara 9:20 Ahn S.-H. 9:50 Ehgamberdiev 10:10 Break	
	Opening Ceremony [Grand Convention, Yeongju] 11:30 Opening: Nha I.-S. 11:35 Congratulatory Messages	Session 3 [Susu MuseumLecture Hall] Chair: Nakamura 10:30 Leung 11:00 Le T. L. 11:30 W.Orchiston	Session 7 [Sosu MuseumLecture Hall] Chair: Orchiston 10:30 Okazaki 11:00 Wang 11:30 Lee Ki-Won	
	12:10 Lunch	12:00 Lunch & Visit to Sosu Museum	12:00 Lunch 13:00 Visit to Buseok-sa Temple	
	Opening Session [Grand Convention, Yeongju] 13:30 Nha I.-S. 13:50 Song W. S. 14:10 Lee S. W. 14:30 Stephenson (read by Jeong)	Session 4 [Sosu MuseumLecture Hall] Chair: Komonjinda 14:00 Bagheri 14:30 Ansari 15:10 Ohashi 15:40 Break	15:00 Check-out Rich Hotel 15:30 Visit to Nha Il-SeongMuseum of Astronomy	Session 8 [KIAS] Chair: KANG 14:00 Stern 14:30 Aslaksen 15:00 Lee E.-H. 15:30 Break
	15:00 Visit to Kim Dam's birth town	Session 5 [Sosu MuseumLecture Hall] Chair: Ehgamberdiev 16:10 Husson 16:40 Kreiner - 17:10	17:00 Move to Seoul by bus & Dinner	Session 9 [KIAS] Chair: Leung 15:50 Nakamura 16:20 Sigismondi 16:50 Ansari Concludes
18:00-22:00 Public Lecturesand Star Observation [Ggachi Hall, Yeongju] * This is for Yeongju Citizens.	17:40 Welcome Dinner	18:30 Banquet	22:00 Check-in Holiday Inn Seoul Seongbuk	18:00 Banquet

Program

November 29, Tuesday (The first day) 11월 29일 화요일 (첫째 날)

09:00-11:30	Registration (등록)	
Opening Ceremony 개회식 [Grand Convention, Yeongju City] [영주 그랜드컨벤션]		MC: KIM Tae-Hwan (진행: 김태환)
11:30-11:35	Opening Address (개회사)	SOC Chairperson (조직위원장)
	Congratulatory Messages (축사)	1. Governor of Gyeonbuk Province (경북도지사) 2. Mayor of Yeongju City (영주시장) 3. Congressperson (국회의원) 4. Chairperson of Yeongju City Parliament (영주시의회 의장) 5. President of Yeongjong Society (영종회 회장) 6. President of KIM Dam Commemorative Association (기념사업회장)
	Welcome Speech (환영사)	KIM Dam's Major Grandson of 19th Generation, KIM Kwangho (무송헌 선생 19대 주손 김광호)
12:10-13:30	Lunch (점심)	
Opening Session 특강 [Grand Convention, Yeongju City] [영주 그랜드컨벤션]		Chair: KIM Jaewan (좌장: 김재완)
13:30-13:50	왜 칠정산법이 필요했는가? 제정과 그 시대배경 (Why was the Chiljeong-san calendar needed in the early Joseon?)	나일성 (NHA Il-Seong)
13:50-14:10	무송헌 김담의 관료 활동과 경세관 (Kim Dam's civil services)	송웅섭 (SONG Woong Sup)
14:10-14:30	영주 선성 김씨와 문절공은 영남선비문화의 선구였다 (Kim Dam and his family were pioneers of the culture of learned scholars in the Yeongnam region)	이성원 (LEE Sung Won)
14:30-15:00	외국 학자가 보는 조선의 과학 (Highlights of Science of the Joseon Dynasty as Viewed by Outside Scholar)	Richard Stephenson (정연철 박사 대독)
14:00-15:00 Rich Hotel에 투숙할 사람들은 이 시간에 Check-in하시고 회의장에 돌아옴.		
15:00-17:00	Visit to Kim Dam's Birth Town (무섬마을 견학)	Guided by KIM Tae-Hwan (안내: 김태환)
17:40-	Welcom Dinner (환영만찬:약선당)	Courtesy of KIM Dam's descendents (김담 탄신 600주년 기념사업회)

November 30, Wednesday (The second day) 11월 30일 수요일 (둘째 날)

Session 2 제2강회 [Sosu museum lecture hall] [소수박물관 강당]		Chair: Costantino SIGISMONDI
09:00-09:30	Analysis of Korean solar eclipse records during the first half of the Joseon dynasty	Richard STEPHENSON (Read by KIM Jaewan)
09:30-09:50	Thai Lunar Calendar and the Proposed Adjustment	Siramas KOMONJINDA,Adisak SUKWISOOT, & Arthit LAPHIRATTANAKUL
09:50-10:10	Restorations of the 16-18th century almanacs by *Datong-li* and *Shixian-li*	NHA Sarah, LEE Jung Bok, PARK Won-Tae, & KIM Tae-Hwan
10:10-10:30	Break (휴식)	
Session 3 제3강회 [Sosu museum lecture hall] [소수박물관 강당]		Chair: NAKAMURA Tsuko
10:30-11:00	US Navel Observatory Astronomical Almanacs	Kam-Ching LEUNG
11:00-11:30	Finds of Vietnamese Ancient Calendars	LE Thanh Lan and Nguyen Thi Truong
11:30-12:00	The Maori Calendar of New Zealand: A Chronological Perspective	Wayne ORCHISTON, Darunee Lingling ORCHISTON, & Ockie SIMMONDS
12:00-14:00	Lunch (점심) Visit to Sosu museum (소수박물관 견학)	
Session 4 제4강회 [Sosu museum lecture hall] [소수박물관 강당]		Chair: Siramas KOMONJINDA
14:00-14:30	The Calendars described by the Iranian Scholar Jamshid Kashani	Mohammad BAGHERI
14:30-15:10	Description of World Calendars in Zijes Compiled in Medieval India	Razaullah ANSARI
15:10-15:40	Indianized astronomy in Asia	OHASHI Yukio
15:40-16:10	Break (휴식)	
Session 5 제5강회 [Sosu museum lecture hall] [소수박물관 강당]		Chair: Shuhrat EHGAMBERDIEV
16:10-16:40	History of calendrical calculations through the lenses of the Paris Observatory Library and Archives	Suzanne DEBARBAT & Matthieu HUSSON
16:40-17:10	Adopts of Gregorian Calendar among European Countries	Jerzy KREINER & Greg STACHOWSKI
18:30-20:30	Banquet (만찬: 라라코스트)	Courtesy of Yeongju City Parliament Chairperson (영주시의회 의장 초청)

December 1, Thursday (The third day) 12월 1일 목요일 (세째 날)

Session 6 [Sosu museum lecture hall]	제6강회 [소수박물관 강당]	Chair: Helmer ASLAKSEN
09:00-09:20	A great AN family, calendar makers in the 17-19th century Korea	NHA Sarah, OH Yong-Hae, & OH Wan-Tak
09:20-09:50	Meaning of exhausted eclipses in ancient ephemerides calculations	AHN Sang-Hyeon
09:50-10:10	Calendar systems in Uzbekistan: past and present	Shuhrat EHGAMBERDIEV, Kuysinoy RASHIDOVA, & S. ILYASOV
10:10-10:30	Break (휴식)	
Session 7 [Sosu museum lecture hall]	제7강회 [소수박물관 강당]	Chair: Wayne ORCHISTON
10:30-11:00	Astronomical records in Vietnamese historical sources and Vietnamese calendars	OKAZAKI Akira
11:00-11:30	An Investigation on the computation and observation of the solar model in *Lixiang kaocheng* 曆象考成	WANG Guangchao
11:30-12:00	The *Datong* Calendar and its Almanac in Korea	LEE Ki-Won, AHN Young Sook, & MIHN Byeong-Hee
12:00-13:00	Lunch (점심, 소수박물관 흠경루)	Mayor of Yeongju City (영주시장)
13:00-15:00	Visit to Buseok-sa Temple (부석사 견학)	
15:00-15:30	Check-out from Rich Hotel	
15:30-17:00	Visit to Nha Il-SeongMuseum of Astronomy	
17:00	Move to Seoul by bus & Dinner	만찬, 해오름 (나일성 천문관 근처)
22:00	Check-in Holiday Inn Seoul Seongbuk	

December 2, Friday (The fourth day) 12월 2일 금요일 (네째 날)

<table>
<tr><td colspan="3">Free morning in Seoul</td></tr>
<tr><td colspan="2">Session 8 제8강회
[KIAS lecture hall #1503] [고등과학원 1503]</td><td>Chair: KANG Young-Woon</td></tr>
<tr><td>14:00-14:30</td><td>The problem of the date line in Jewish scientific sources, 12th-16th centuries</td><td>Sacha STERN</td></tr>
<tr><td>14:30-15:00</td><td>The Mathematics of the Chinese Calendar</td><td>Helmer ASLAKSEN</td></tr>
<tr><td>15:00-15:30</td><td>Comparative study between Chinese Huihui-lifa 回回曆法 and Korean Chiljongsan Oepyeon 七政算外篇: Focusing on the date conversion algorithm</td><td>LEE Eun-Hee</td></tr>
<tr><td>15:30-15:50</td><td>Break (휴식)</td><td></td></tr>
<tr><td colspan="2">Session 9 제9강회
[KIAS lecture hall #1503] [고등과학원 1503]</td><td>Chair: Kam-Ching LEUNG</td></tr>
<tr><td>15:50-16:20</td><td>The 28-Xiu Constellations in East Asian Calendars and Analysis of Their Observation Dates</td><td>NAKAMURA Tsuko</td></tr>
<tr><td>16:20-16:50</td><td>Easter Computus and Gregorian Reformation in Rome and Europe</td><td>Costantino SIGISMONDI</td></tr>
<tr><td>16:50</td><td>"Concluding Remarks"</td><td>Razaullah ANSARI</td></tr>
<tr><td>18:00</td><td>Banquet</td><td></td></tr>
</table>

ABSTRACTS 초록

(1-1)

왜 칠정산법이 필요했는가? -제정과 그 시대배경-
(Why was the Chiljeong-san calendar needed in the early Joseon?)

나일성 (NHA Il-Seong)
Yonsei University Observatory, Korea
Email: "NHA Il-Seong"<slisnha@chol.com>

중국을 중심으로 인접한 극동지역의 여러 나라 즉 몽고, 만주, 조선, 류뀨(琉球, 현 오끼나와) 그리고 안남(安南, 현 베트남)은 모두 중국에서 만든 역서를 받아서 사용해 왔다. 이 시기에는 중국인만이 역법을 개발하고 어려운 계산을 할 수 있었기 때문이었다. 그런데 다른 나라의 경우와 마찬가지로 조선도 북경에서 배포하는 역서를 매년 받아왔다. 그리고는 한양의 위도와 경도에 따라 내용을 수정하여 한반도에 맞는 역서를 만들어 전국 8도에 배포하기 위해서 대량으로 제작했었다. 그런데 중국 북경에서 역서를 받아서 오는 길이 멀고 험해서 필요한 때를 맞추지 못하는 일이 자주 생기기도 했다. 한편 관상감 관원들은 그 역서를 참고하여 조선의 역서로 개편하는데 많은 시간과 노력이 필요했으므로 항상 시간에 쫓겼다. 이런 어려움을 극복하기 위하여 세종대왕은 계산에 능한 이순지와 김담을 중용하여 한반도 지역에 맞는 역서를 계산할 수 있는 역법서를 만들게 하였으니, 이렇게 하여 출판된 것이 칠정산 내편과 외편이다. 이 일은 당시로서는 과감한 용단으로 이룩한 결과이지만 그렇게 이해하는 사람은 많지 않다.

이 논문은 세종대왕의 시대를 전후한 13-18세기에 전 세계의 여러 문명권에서 역서가 어떻게 만들어졌었고 또 어떻게 유통되어 왔는가를 간단히 살펴본 후, 칠정산 내편과 외편이 출판된 시대 배경과 역사적 의미를 조명해 보려고 한다.

(1-2)

무송헌 김담의 관료 활동과 경세관
(Kim Dam's civil services)

송웅섭 (SONG Woong Sup)
서울대학교 규장각 한국학연구원
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본고는 무송헌 선생에 대한 역사적 접근을 시도한 연구로서, 『실록』과 『무송헌선생문집』에 산견되는 자료들을 토대로, 무송헌이 살았던 시대적 상황과 그가 지향하고 있던 가치 등을 검토한 연구이다.

무송헌이 과거에 급제한 1435년(세종 17)은 세종이 집현전 관료들과 함께 창업기의 남은 과제들을 완수하는데 힘쓰고 있던 시기로서, 무송헌은 20세 약관의 나이로 과거에 합격하여 집현전에 배속된 뒤, 시대적 과제로 주어지고 있던 각종 문물제도들의 정비에 참여하고 있었다. 무송헌은 집현전 관료의 일원으로서 세종을 돕고 있었지만, 출중한 산학 실력에 기초하여 역법의 정비와 양전의 시행 등에서 두각을 나타내고 있었다.

무송헌이 관직 생활을 하던 세종~세조대는 군주가 강한 왕권을 행사하며 국정의 중심에 서 있던 시대였다. 다만, 동일하게 강력한 왕권이 행사되고는 있었지만 '公'이라는 측면에 있어서는 태종･세종의 왕권과 세조의 왕권은 차이가 많았다. 한편 무송헌이 지방관을 역임하는 충주목사 부임을 기준으로 그의 관직 생활을 전반기와 후반기로 나눌 때, 전반기는 강한 왕권의 표방 속에서도 공적인 국정 운영이 추구되며 무송헌의 영민한 자질이 마음껏 발휘될 수 있었던 시기였다면, 후반기는 여전히 강력한 왕권이 행사되고는 있었지만 공적 정치질서가 크게 훼손되었던 시기였다. 이에 무송헌은 모친 봉양을 명분으로 외직을 돌며 시대의 격랑을 피해가고자 노력하고 있었다.

무송헌은 조선왕조가 표면적으로는 유교 국가임을 선포하고 있음에도 이면에서는 여전히 불교적 습속으로부터 벗어나고 있지 못한 세태에 매우 비판적인 입장을 견지하고 있었다. 그가 집현전과 사헌부 등의 청요직 관료로 근무하고 있던 세종 중엽~문종 재위 기간 동안은 왕실의 불사 행위가 점점 잦아지고 있던 상황이었다. 이에 무송헌은 불교가 이단임을 천명함과 동시에 상장례를 계기로 왕실에서 승려들과 어울리며 커다란 불사를 자주 일으키는 문제점과, 왕실 인사의 방납에 승려들이 참여하면서 백성들에 대한 불법적인 침탈이 자행되고 있는 현실을 경계하고 있었다.

무송헌은 매우 적극적으로 효를 실천하고자 하는 의지를 갖고 있었다. 왕권이 강하게 행사되고 있던 당시에는 필요에 따라서는 부모상에 있어서도 국가에서 권면하고 있던 상제(喪制) 마저 온전히 마치지 못하게 하는 역설적인 모습을 보이고 있었다. 이 같은 상황에서 무송헌은 부친의 임종을 지키지 못하자 삼년상을 통해 효를 다하고자 했다. 하지만 역산에 뛰어난 능력을 갖고 있었기에 국가의 명을 받고 기복을 해야만 했다. 이에 무송헌은 수차례에 걸쳐 자신에게 내려진 기복 령의 철회를 요청하고 있었는데, 이는 지엄한 국왕의 명에도 불구하고 자신이 지키고자 하는 효에 대한 가치를 끝까지 고수하고자 했던 태도로서, 유교 의례가 막 정비되고 있던 시대 상황에 비추어 볼 때 매우 선구적인 모습이라고 할 수 있다.

(1-3)

영주 선성 김씨와 문절공은 영남선비문화의 선구였다

(Kim Dam and his family were a pioneer of the culture of learned scholars in the Yeongnam region)

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본 글은 '문절공 김담 선생 탄신 600주년 기념'을 염두에 두면서 문절공文節公 김담金淡(1416 태종16-1464 세조10년)선생과 예안 김씨들의 영남 사림파 내에서의 위상과 입지에 대해 살펴보고자 한다. 안동에 세거한 200여년의 세월, 즉 선계의 세거지 고향 안동 도산(옛 예안)의 위상과 산천과 유적과 혼인 관계를 추적하고, 다시 영주로 이거한 이후, 문절공과 그 후손들의 영남에서의 활약상과 위상에 대해 개괄적으로 요약하고자 한다. 이를 수행하기 위해 "영주 예안김씨와 문절공은 영남 선비문화의 선구였다"로 제목하고, 여섯 단락으로 구분하여 쓴다.

첫째 단락은 머리말로 논문 전개의 기본 방향을 제시한다.

둘째 단락은 예안김씨의 내력과 선계의 세거지인 도산(옛 예안)을 살펴보고, 현재 도산에 남아 있는 예안김씨의 유일한 유적인 전의비를 살펴 보고자 한다. 도산은 이른바 '도산9곡陶山九曲'이 있는 곳으로, 역동 우탁, 농암 이현보, 퇴계 이황, 월천 조목, 육사 이원록 등의 걸출한 인물들이 배출된 고장이다. 안동부 안에서도 섬처럼 행정구역이 독립적으로 존재하여 유교직할시 같은 성격을 유지했다.

셋째 단락은 예안김씨가 도산을 떠나 영주로 이거하여 도산시대를 마감하게 되는 경위를 살펴보고자 한다. 8세 로輅의 아들 4형제 중 소량小良이 영주의 호족인 판서 황유정黃有定의 사위가 되어 영주로 이거하였는데, 이 과정에서 처가 혼맥과 도산 혼맥을 살펴본다.

넷째 단락은 문절공의 생애와 환력을 살펴보는 장이다. 문절공이 세종의 명을 받아 이순지李純之와 함께 이룩한 천문학의 업적은 오늘날 세계 천문학계가 우리나라를 주목하게 만드는 기반이 되었다고 볼 수 있다. 문절공의 위상은 성삼문, 신숙주, 장영실, 정인지 등에 버금가는 인물임을 증명한다. 그리고 현재 종손, 종부가 살고 있는 문절공종택, 집경루가 소재한 무섬마을을 살펴보고, 무섬과 하회를 개괄적으로 비교 서술한다. 아울러 예안(선성)김씨와 반남박씨, 평해황씨의 인연도 거론한다.

다섯째 단락에서는 문절공 당시의 혼맥이 어떻게 형성되어 있는지 살펴보며, 후손들이 영주지방의 문화형성에 어떤 기여를 하였는지를 과환과 집성촌의 인물을 중심으로 개괄적으로 살펴본다. 영주로 이거한 예안김씨는 문절공 후손에서만 문과급제 20명, 무과 3명, 사마 82명, 문집과 유고를 남긴 자 128명, 독립유공자 30여명이 배출했다. 이런 숫자는 영주는 말할 것도 없고, 안동 유수의 성씨들과 비교해도 손색없다. 이들 후손들의 활약상을 살펴본다. 예안김씨는 당시 도산에 전입해 온 영양김씨-안동권씨-영천이씨-광산김씨-횡성조씨-봉화금씨-진성이씨로 이어지는 성씨들의 가족 같은 계보의 선두에 있었다. 모두가 10촌 이내의 통혼관계에 있었다. 도산의 전체 성씨들이 중첩적인 혼인관계에 있었다. 이를 중점해서 발표한다.

여섯째 단락은 맺음말로, 이번 행사가 문절공 탄신 600주년을 기념하는 행사인 만큼 문절공을 추모하는 것에 그치는 것이 아니라 이후 다시 600년을 이어가는 동력으로 삼고자 함이니 이를 다짐하고 전망하는 것으로 마무리 한다.

(1-4)

외국 학자가 보는 조선의 과학
(Highlights of Science of the Joseon Dynasty as Viewed by Outside Scholar)

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조선시대에 이룩한 가장 중요한 과학적 성과(highlights)가 무엇일까라고 묻는다면, 나는 육안으로 관찰되는 각종의 천문현상을 기록한 방대한 기록물이라고 말하고 싶다. 이것이 바로 오늘 내가 중점을 두고자 하는 대목이다. '역사적 천문학의 응용'이라는 학문에서 본다면, 제1급에 속하는 것들이 많다. 이것은 역사적 천문기록을 어떻게 현대과학에 적용시키느냐 하는 문제인 것이다.

한국에서 광범위한 천문현상을 체계적으로 관측하기 시작한 것은 고려시대(AD 918~1392)였다. 그 뒤를 이은 조선시대 (AD 1392~1910)에는 당시의 수도 한양(현재의 서울시)에서 천문대 관원들이 고려의 관측자들의 수행하던 업무를 계속하고 발전시켰다. 고려와 조선 두 시대의 관측은 중국의 전통적 방식과 거의 비슷한 것이다. 특히 천문현상은 주로 **占星的** 의미로 보았다. 하지만, 『고려사』에 기록되어 있는 것을 보면, 고려시대로부터 보존되어 있는 천문기록의 대부분은 상세한 관측내용을 간결하게 압축한 것이 많다. 이런 이유로 이 고려시대의 관측기록 대부분은 오늘날에는 과학적 관심의 대상으로는 제한을 받고 있다.

고려시대의 관측자들과 마찬가지로 조선의 측후관들도 수많은 천문현상을 체계적으로 관측했는데, 이런 천문현상으로는 일식과 월식, 달과 행성 또는 별들과의 접근, 행성끼리의 접근, 혜성, 신성, 유성, 오로라, 그리고 때때로 흑점 등이 있다. 그러나 조선시대의 관측기록은 고려시대와 비교해서 그 양이 월등하게 많다는 사실 뿐만 아니라, 매우 자세하다. 따라서 많은 조선시대의 관측은 현대과학에 중요한 자료가 되고 있다는 사실이 증명되었다. 이렇게 좋은 평을 받게 된 이유는 조선시대에 와서 측정기기의 정밀도가 향상된 측면도 있다. 그리고 덧붙여서 본다면, 이 시대에 관측된 여러 가지 천문현상이 상세한 공문서에 남아있기 때문인데, 그것은 거의 매일의 기록이면서 수 주간 또는 수 개월간 연속된 것들이다.

그 좋은 예가 있는데, 그것은 몇 개의 신성과 초신성을 면밀하게 관측한 결과 그 위치가 변하는 것이 아니라 고정되어 있다는 사실을 밝힌 것이다. 서기 1604년 초신성의 경우를 보면, 점차적으로 조금씩 변하는 광도변화가 있었다는 것을 정기적으로 측정했었다. 또 다른 예로는 세계의 다른 나라에서는 거의 기록하지 않은 오로라에 관한 기록이 많다는 것이다. 그 외에도 혜성의 운동도 관측했는데, 실제로 여러 차례 나타난 핼리혜성을 포함하여 많은 혜성들의 운동과 변화하는 겉모습을 용의주도하게 관찰했었다.

(2-1)

Analysis of Korean solar eclipse records during the first half of the Joseon dynasty

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One of the most effective methods of investigating the accuracy and reliability of calendar dates in a selected history is to study the solar eclipse records in that work. In particular, the various Korean official histories contain numerous references to solar eclipses. Solar eclipses have the advantage over most other celestial phenomena in being fairly frequent daytime events which are relatively easy to notice and — unlike comets for example -- are only visible on a single day. Recent studies of Earth's past rotation -- based on a wide range of both solar and lunar eclipse observations in Babylonian, Chinese, Arab and European history -- have enabled the Earth's rotational clock error (known as Delta T) to be determined with high precision as far back as 700 B.C. The main cause of this clock error is due to lunar and solar tides, but there is also clear evidence of non-tidal mechanisms. Although the length of the mean solar day has only increased by about 0.05 sec in the last 2700 years, as almost a million days have elapsed during that interval, the cumulative effect (i.e. Delta T) is very large: amounting to about 7 hours by 700 B.C. An ideal clock started in 700 BC would now be 7 hours afst relative to a clock keeping time by the Earth's spin! As a result, of such investigations, not only can the Julian or Gregorian dates of additional solar eclipses be computed exactly, the time of day of occurrence and degree of obscuration of the Sun at any selected place can be deduced with high precision.

(2-2)

Thai Lunar Calendar and the Proposed Adjustment

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Lunar Calendar is wildly used in Thailand as a Buddhist Calendar. The Buddhist holy days were schedule from this calendar. One month in this is 29.5 days duration; odd months have 29 days and even months have 30 days. This gives 354 days a year which is less than a tropical year. Every few years, a leap month will be added to the calendar to keep this lunar calendar related to the solar calendar. Following this method, the Buddhist holy days which should be on the Full moon and have a meaning related to the tropical season is shifted. This presentation will propose the new formulation to adjust the calendar to match the natural phenomena.

(2-3)

Restorations of the 16-18th century almanacs by Datong-li(大統曆) and Shixian-li(時憲曆) of Joseon Dynasty, Korea

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For four years since 2013 a project for the restoration of old calendars has been carried out by us. This is to commemorate the 600th anniversary of the Kim Dam who worked with his collaborator Yi Soon-ji during the reign period of King Sejong, the fourth king of Joeon Dynasty(1392-1911). Because the most existing copies of calendars, which were published by the Gwansang-gam(觀象監) of Joseon dynasty are in bad shape due to the ill preservations. Many of these are in the condition of unreadable due to the heavy scribbles with writing brushes.

We wish to display a total of 69 photographic editions of *Datong-li*, *Shixian-li* and *Shixian-shu*, which were restored and printed in the last four years, 2013-2016.

(3-1)

US Navel Observatory Astronomical Almanacs

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The US Naval Observatory was established in 1830. It’s main function was taking care of the charts and Instruments generated for the purpose of navigation. England had been one of the world's major naval powers since the 1600s following the defeat of the Spanish Armada, 1588, and the development, with royal support, of seamen as pirates of the seas bringing back plunder! Given this, they produced good navigational techniques and published the Nautical Almanac from 1767. The US Almanac followed the development of the English Almanac. The publication of the US Astronomical and Nautical Almanac was started in the year of 1855. The modern US Naval Observatory Almanac is published with Her Majesty’s Nautical Almanac Office. Unlike the popular almanacs such as the Farmer Almanac, the Naval Observatory Almanac is primarily for scientifically use. It is now including the ephemeris of our solar system, bright stars and extragalactic objects. As well as the astronomical information, the Almanac has Julian days while a usual calendar does not.

(3-2)

Finds of Vietnamese Ancient Calendars

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The paper written about the causes of misunderstanding about the nature of Vietnamese calendars; about the ancient Vietnamese calendar finding process; about the results of the study three old calendars; from which to draw the calendars of Vietnamese dynasties, find out the differences with the Chinese calendars and the difference between two calendars when they exists simultaneously and finally some consequences of the found of those ancient Vietnamese calendars.
This paper deals with the context: the finds of Vietnamese ancient calendars covering the period from the Giap Thin (甲辰) year, that is to say the 12thNguyenHoa(元和) year of king Le Trang Tong's [黎莊宗] of Restored Le dynasty (1544), up to the Quy Mao (癸卯) year, that is to say the 15th ThanhThai[成泰] year of Nguyen [阮] dynasty (1903).

(3-3)

The Maori Calendar of New Zealand: A Chronological Perspective

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When Europeans first settled Aoteroa/New Zealand in the nineteeth century they found that the indigenous people, the Maori, had an elaborate lunar-based calendar system that was used extensively to track the seasons and regulate horticultural, fishing, bird-hunting and other ecological activites.

In this paper we will begin by outlining the regional variants of the Maori calendar found in the nineeteenth century. Then we will look at the initial Polynesian settlement of Aotearoa/New Zealand 800 years ago, and explore ways in which the ancestral calendar system that was brought from the Society Islands-Marquesas area of the Central Pacific with the first occupants had to evolve in response to the major ecological changes that were required for survival in this strange new land.

(4-1)

The Calendars described by the Iranian Scholar Jamshid Kashani

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Jamshid Kashani(d. 1429), also known as al-Kashi in West, was contemporary of Kim Dam. He was from Kashan (Iran) and went to Samarkand upon Ulugh Beg's invitation. He designed and supervised the construction and operation of the observatory which still exists there. In his Zij-e Khaqani, he describes the Islamic, ancient Iranian, ancient Greek, Chinese-Uyghuric and Ilkhanid calendars.

(4-2)

Description of World Calendars in Zijes Compiled in Medieval India

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A specific feature of the Islamic astronomy was the emphasis particularly on the observational astronomy. Even in the early Abbasid period (750–850), astronomical observatories were established, in which practical astronomy was carried out quite diligently, e.g., Naṣiruddin Ṭusi's Observatory at Maragha (1270), and Ulugh Beg's Observatory at Samarqand (1420), to name just the most famous ones.

An important task at those observatories (*Raṣad Gah/Khane*) was the compilation of a *Zij* (plural *Zijat*), which are astronomical-mathematical tables or handbooks of sort to be used for determining the position of Sun, Moon, and various planets. All Zijes, in Arabic, Persian, Hebrew and Turkish, contain tables for functions of spherical astronomy and of trigonometrical functions as well. The compilers deal briefly also with the following topics: solar and lunar parallax and their eclipses, lunar visibility, gazetteers, star catalogues and tables of ascendants for astrological purpose. Besides these, an important chapter is also on chronology , i.e. on a number of calendars used for reckoning time and date, method of converting one calendaric date into another. In this paper I am concerned only with world calendars dealt in the *Zijes* compiled in India during Medieval period (12th -19th centuries).

(i) First, I deal briefly with the following 8 Zijes : Zij-i Naṣiri by Maḥmud bin 'Umar (13th c.), *Zij-i Jami*'*Maḥmud Shah Khilji* (15th c.), *Zij-i Raḥimi* and *Zij-i Shahjahani* by Mulla Fariduddin Mas'ud (17th c.), *Zij-i Muḥammad Shahi* by Raja Sawa'i Jai Singh (18th c.), *Zij-i Ashki* by the poet Kundan Lal Ashki (1816), *Zij¬i Sa*'*idi* by Muḥammad Mas'ud of Bareilly (1828) and *Zij-i Bahadurkhani* by Ghulam Ḥusain Jawnpuri (1838).

(ii) Second, I present the details of the following World Calendar sinthese Zijes. They are: Byzantine (Rumi / *Iskandrani*); Calendars of China (*Qata and* Uighur)*;* Coptic (*Bukhtanaṣar /Nabonassar)*; European (Christian); *Hubuṭi*; Hindu (*Hunud*) Calendars of India (*Samvat* and S*aka Salbahin*); Ilahi Calendar of Akbar; Islamic Hijri; Jewish Calendar; Persian Yazdigird and Maliki (Jalali); Roman eras (*Anṭinash, Aghasṭas , Dhulqarnayn , Faylqus and Philip); Tarikh-i 'Alam; Ṭufan* I (Food) and Ṭughyani.

(iii) In my presentation, I intend to deal with the above-mentioned insufficient details.

(4-3)

Indianized Astronomy in Asia

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Indian astronomy influenced several traditional astronomies in Asia mainly through Hinduism and Buddhism.

Traditional East Asian astronomy is mainly based on Chinese astronomy, but certain knowledge of Indian astronomy was also introduced through Buddhism.

Traditional Tibetan calendar is mainly based on Indian Classical Astronomy introduced through *Kalacakra* Buddhism.

Traditional Indian astronomy was introduced to several places in Southeast Asia through Hinduism and Buddhism. Especially traditional calendars of Mainland Southeast Asia (except for Vietnam) were largely influenced by Indian Classical astronomy.

Besides the traditional calendars, we can find Indian influence of cosmology (Meru mountain model), lunar mansions, zodiacal signs etc.

We shall see astronomical complexes of regional original astronomy, Indian influence, Chinese influence etc. at several places in Asia.

(5-1)

History of calendrical calculations through the lenses of the Paris Observatory Library and Archives

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Calendar, Almanac, Tables, Ephemerides were names under which the phenomena occurring during the solar year and the lunar months were obtained through calendrical calculations. During the 17th century, in French the expression Rglement des Temps was employed by Cassini (1625-1712). His opinions on the subject were published in *Histoire and in Mmoires of the Acadmie Royale des Sciences*(created in1666). Meanwhile, the members of this academy had established and published *la Connoissance des temps ou Calendrier et Ephemerides du lever et du coucher du Soleil, de la Lune et des autres plantes(…) pour l'Anne M.DC.LXXIX.* About twenty years later appeared, for travellers, ephemerides bearing the name of Baulieu or Desplaces, and established for ten years. This last one disappeared, by the end of the 18th century, soon after the first publication of the *British Nautical Almanac* in 1767, while the *Connaissance des temps*, is still alive under the leadership of the *Bureau des longitudes*. In the meantime Cassini IV created the Paris observatory library in 1785 and gave much of his family archive to the library. Soon after and until the 19th century scholars like Delisle, Lalande or Chasles augmented the library with a rich corpus of early modern treatises on calendrical matters as they got interested into the history of such computations. This presentation is devoted to the parallel development in Paris observatory of calendrical calculations and of its history.

(5-2)

Adoption of Gregorian calendar among European countries

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Until the second half of the sixteenth century, most European countries used the so-called "Julian Calendar", introduced by Julius Caesar in 46 B.C. The year in the Julian Calendar normally had 365 days, and an extra day was added every fourth year. This means that the average year was 365.25 days in length, however the value of the solar tropical year is ~365.2422 days.

Thus, by the 16th century the Sun passed through the vernal equinox (marking the very beginning of spring) 10 days before March 21. Pope Gregory XIII decided to correct the situation. The main principles of the reform of the calendar were prepared by Aloysius Lilius (Luigi Lilio) and the Pope decided to introduce the new calendar starting from the year 1582.

The Gregorian calendar (named after Pope Gregory XIII) had two features:

1) the number of *leap years* in every 4 centuries was not 100 (as in the Julian calendar) but 97. This means that the years 1600, 2000 and 2400 are leap years, but the years 1700, 1800, 1900, 2100 etc. are not.

2) Pope Gregory XIII decided to drop 10 days between October 5 and October 14, 1582. Thus the date after October 4 was October 15.

After the reform, the average length year of the year is 365,2425 days, very close to the value of 365, 2422 days.

Many Catholic countries in Europe adopted the Gregorian calendar as soon as it was announced in the Papal bull *Inter Gravissimas*. Non-Catholic countries generally adopted the calendar in the 17th and 18th centuries. For instance, the United Kingdom and its colonies adopted the calendar in 1752, when 11 days were skipped. Russia adopted calendar in 1918 (after the October Revolution), and finally Turkey in 1926.

(6-1)

A great AN family, calendar makers in the 18th century Korea

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The process of scrutinizing the archival sources related to the scientists of the Board of Astronomy and Meteorology(觀象監) in the Joseon dynasty(1392-1910) has found a very large number of scientists over five hundred as of to-day. Among these scientists we have encountered with a good many hereditary astronomy families. Of these an interesting family, who had been engaged calendar making with many generations at the Board, has been attracted our attention. This is the Soonheung An **genealogy**(順興安氏) rooting in this City of Yeongju for over five hundred years as of Kim Dam family.

In this paper, however, we have selected one family as an example of hereditary profession in the 17-19th centuries. It is a family of An Pil-won(安必遠), and we present here his family tree that reached its branches toward eight generations. Short biodata of some distinguished family members regarding mainly to their calendar makings are also presented.

(6-2)

Meaning of exhausted eclipses in ancient ephemerides calculations

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The term 'exhausted eclipses(日食既)' have been regarded as total eclipses. However, modern precise calculations show that a significant fraction of such records are not realized to be total. Hence its meaning is uncertain.

Here we investigate the meaning of 'exhausted eclipses' in the east-Asian calendrical history. A conversation between a king and his astronomer is left in Seungjeongwon-Ilgi of the 18th century Joseon dynasty, in which the astronomer mentioned that the eclipses of magnitude greater than 0.8 are 'exhausted eclipses' based upon the definition of 'exhausted eclipses' in the ephemerides of pre-modern Chinese dynasties. According to those ephemerides, the 'exhausted eclipses', whose magnitude is greater than 0.8, have the first contact at the western part of the solar disk and the fourth contact at the eastern part of the solar disk.

A simple geometrical calculation shows that such cases really occur when the magnitude of eclipse is greater than 0.7. We also analyzed the exhausted eclipses recorded in the ancient Chinese chronicles to find the average magnitude of eclipses for various expressions such as exhausted eclipses, daytime darkness, appearance of planets, 1st magnitude stars, and less bright stars etc.

We confirmed that the dark daytime or appearance of stars are expressions for true observations of totality. All the exhausted eclipses are not regarded as observational records. Thus, we have to be more cautious when we try to find the Delta-T value from the historical eclipse records.

(6-3)

Calendar systems in Uzbekistan: past and present

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First calendar discovered at the territory of Uzbekistan was a solar calendar used by Khorezmian civilization around 4th century BC. It was a modification of Zoroastrian calendar widely used in the Central Asia at that time. Starting 7th century AD Zoroastrian calendar was replaced by Islamic Hijri calendar which was official state calendar until beginning of 20th century, when Uzbekistan became a part of the SovietUnion. Since that time Gregorian calendar was in official use. At the same time Hijri calendar was used only by Muslims to celebrate Islamic holidays and festivals.
When the independence of Uzbekistan was proclaimed in 1991 Muslim holidays became celebrated at the state level the value of Islamic calendar is increased again. However in the context of globalization and rapid development of information technology some week points of the Hijri calendar which were looking insignificant before became essential. Some of problems of using Hijri calendar to determine the proper days on which to observe the annual fasting and to celebrate other Islamic holidays and festivals will be mentioned and discussed.

(7-1)

Astronomical Records in Vietnamese Historical Sources and Vietnamese Calendar

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Although Vietnamese lunisolar calendar was based on the Chinese calendar system, it is reported that there are a few differences in allocating intercalary months and long/short months. We will discuss Vietnamese calendar on the basis of astronomical records in Vietnamese historical sources (from the ancient times to the mid-18th century) from the following view points:

1. Are there any differences from Chinese records due to possible calendar difference?,
2. Are solar eclipse records the ones predicted by calendar calculation?, and
3. What time was the beginning of a day?

(7-2)

An Investigation on the computation and observation of the solar model in *Lixiang kaocheng* 曆象考成

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It is generally recognized that the computations at the basis of the Chinese calendar were as independent of any physical model of the world. It was not until 17th century that the mathematical astronomy had been changed under the influence of Western astronomy. *Lixiang kaocheng* 曆象考成 (Thorough Investigation of Calendrical Astronomy) was composed on the basis of Western astronomy introduced by Jesuit astronomers during the 17th century. It was edited in Kangxi's old years (from1713) and used to calculate the annual almanacs from 1726. This article examines the solar model in the *Lixiang kaocheng* from the perspective of the relation between theoretical computation and astronomical observation. Different with the eccentric solar model in *Xiyang xinfa lishu* 西洋新法曆書（Treatises on Calendrical Astronomy According to the New Method from the West） which was the former calendar in the Qing dynasty(1636—1912)，Lixiang kaocheng adopts the double epicycle model under the consideration that computation should be in agreement with observation. Though the observational data which were basis for computing the parameters of the solar model in Kaocheng were accurate but the calendar officials of the Kaocheng failed to construct a more accurate solar model. Moreover, we found that the so-called observational data might be originated from rather than real observations.

(7-3)

The Datong Calendar and Its Almanac in Korea

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We study the Datong calendar (Datongli, hereafter) and its astronomical almanac in Korea. It is generally known that the Datongli was first introduced into Korea in the nineteenth reign of King Gongmin (1370) of the Goryeo dynasty, and lasted until the fourth reign of King Hyeojong (1653) of the Joseon dynasty. However, the oldest extant almanac of the calendar is that for the year 1590, and is designated as a Korean treasure (No. 1319). To verify the period of use of the Datongli in Korea, we develop a Fortran code to calculate the calendar day by the Datongli, and also investigate historical documents, including extant almanacs. First, we find the possibility that the Datongli has been in use since at least 1389. However, we cannot verify whether the Datongli was first enforced in 1370 or not. Second, we confirm that the Datongli was used until 1653, and then reintroduced during the period from 1667 to 1669. Last, we find that our calculations show a total of ten discrepancies in the sexagenary cycle of the first day of the lunar month, compared with previous studies. In two cases, we find that this study is correct according to the astronomical almanacs of that time.

(8-1)

The problem of the date line in Jewish scientific sources, 12th-16th centuries

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The concept of a date line was first raised in Europe by Jewish scholars, in the early 12th century; they set the date line at 90 degrees east of the Jerusalem meridian. The debate on the date line continued among Jewish scholars until the end of the 16th century, when arguments had to be revised in the light of the discovery of the New World. Christian scholars, in contrast, only became aware of the issue in the 14th century, and only began to discuss it seriously in the 16th century, when circumnavigation of the earth turned the problem into a practical reality. In this paper, the medieval Jewish interest in the problem of the date line will be assessed in its broader context and interpreted.

(8-2)

The Mathematics of the Chinese Calendar

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Chinese New Year is the main holiday for more than a quarter of the world's population and variations of the Chinese calendar are used in many other countries in Asia and celebrated in many Asian communities around the world. Yet very few people know how to compute the date. The exact rules are very complex, but I will give some simple rules of thumb.

(8-3)

Comparative study between Chinese *Huihui-lifa* 回回曆法 and Korean *Chiljongsan Oepyeon* 七政算外篇: Focusing on the date conversion algorithm

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In the fifteenth century Korea, there were remarkable achievements in the calendrical science and instrument making through the astronomical project proceeded for about 20 years. During this period, lots of astronomical and calendrical books, including Chinese version of Islamic sources, were imported from Ming 明 China, and researched and corrected by Korean official astronomers. At the time, interestingly however, two genius Korean astronomers Yi Soonji 李純之and Kim Dam 金淡 found that there were numerous errors and omissions in the *Huihui-lifa* 回回曆法 which was a Chinese version of Islamic calendar system. One of main mistakes arose when Chinese astronomers made a date conversion formula between Chinese and Islamic calendar without fully understanding of Islamic calendar. This mistake made *Huihui-lifa* disabled calendar in China. Nonetheless, they were not aware of their misunderstanding, and had been thought that Muslim astronomers didn't transmit needed formulae or information. However, Korean astronomers recognized what the mistakes made a crucial problem. For that reason, they corrected all the errors, and applied newly revised algorithm and constants in their Korean editions. Finally, they were successfully able to predict the solar and lunar eclipses at Seoul by the Korean version of Chinese-Islamic calendar, titled *Chiljongsan Oepyeon* 七政算外篇.

In this paper, we discuss the main differences between Chinese *Huihui-lifa* and Korean *Chiljongsan Oepyeon*, and how to find and solve such mistakes and errors included in the *Huihui-lifa*.

(9-1)

The 28-*Xiu* Constellations in East Asian Calendars and Analysis of Their Observation Dates

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Traditional calendrical systems in East Asia, originated from the ancient China, consist of varied components. Among them the meridian transits of the 28-*xiu* (lunar lodges) constellations have the earliest origin to indicate seasons as 中星(Zhong xing). The 28-*xiu*s were invented before the fifth century BC for the purposes of astrology and a reference frame to specify positions of celestial bodies. Towards modern ages, however, the significance of the 28-*xiu*s has gradually faded away from the calendrical point of view. Nevertheless, star positions of the 28-*xiu*s measured in old star maps and catalogs are vitally important from the astronomical viewpoint, in order to know correctly when the stars in those materials were observed. We have recently developed a statistical method for dating analysis of the 28-*xiu* observation epochs based on precession theory, which is applicable to many historical star maps and catalogs in a unified way. In this conference we present the results on the star map in the Kitora tumulus of Nara in Japan, the Korean stone-inscribed star map of the fourteenth-century天象列次分野之圖 (Cheonsang Yeolcha Bunyajido), the Chinese star catalog in Shi-shi Star Manual 石氏星経(Shi shi xingjing), Ptolemy's star catalog in the Almagest. Using the same approach, more recent 28-*xiu* data observed by Guo Shoujing郭守敬 in 1276 (the Yuan dynasty) and Ulugh Beg of Uzbekistan around 1437 were also analyzed, succeeding in recovering their alleged observation epochs.

(9-2)

Easter Computus and Gregorian Reformation in Rome and Europe

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The Gregorian reformation (1582) faced the problem of the shift of the real spring equinox (11 march in 1582) with respect to the astronomic and the ecclesiastic one (every 21 march, after the Nicea Council).

Ten days between 4 October and 15 October were deleted. Other European countries accepted this reformation with some delay for political and religious reasons, since the Pope issued these prescriptions.

The Easter Computus is the other aspect dealt in the document of Pope Gregorius XIII “Inter Gravissimas”: according to Nicea Council, Easter is the first Sunday after the spring full Moon, so the mean lunar synodical month is approximated in the “Ecclesiastic Moon”.

The tradition of this Computus is examined in the beginning of Christian era: the Epact, the Octateris and the first Easter table of 112 years, the so called “Hippolytus Cathedra”(222 AD) are discussed as efficient algorithms used for the Ecclesiastic Moon in Alexandria of Egypt and after in Rome.