

PORTFOLIO

on Public Outreach

This is Dr Rami Rekola's Public Outreach Portfolio, which gives a concise summary of the many public outreach activities Dr Rekola has been involved in over the past quarter of a century. Even though he was educated and began his career as a researcher, an observational and theoretical astronomer, he found his calling closer to disseminating, rather than exploring, the frontiers of science. Dr Rekola has, however, been active in some research efforts as well, which has kept him close to the latest knowledge of the discoveries and methods in modern astronomy.

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Introduction

Rami Rekola was born and educated in Finland. He has a high school diploma from the Lorenzo High School, Texas, USA and a senior secondary school diploma from Meri-Porin lukio, Pori, Finland. He graduated with a degree in astronomy from the University of Turku, Finland, with Master's Thesis that was given the highest grade, Laudatur, and later received his doctorate with an award-winning PhD Thesis "Distance Determinations to Nearby Galaxies" that was approved with honours.



Dr Rekola worked over 18 years at Tuorla Observatory, the astronomy unit of the University of Turku. During this time he initiated the planning of Tuorla Observatory Visitor Centre and founded Tuorla Planetarium in 2008 together with his colleagues to serve as a first stage towards the visitor centre. He gave over a hundred public talks and presentations, including guided tours to Tuorla Observatory.



In 2011 Dr Rekola founded Astromatkat, a company that provides education and science communication services. He gave courses in Finnish schools and created a programme to take senior secondary school students to La Palma, Canary Islands, Spain, to make observations with the Nordic Optical Telescope (NOT), reduce the images, and produce scientific results of the data.



Since the beginning of 2012 Dr Rekola has served as the European Southern Observatory (ESO) Science Outreach Network representative for Finland. He has translated hundreds of newsletters into Finnish, organised exhibitions and communicated with Finnish media.



In 2014 Dr Rekola moved to the USA where he worked in the Institute for Astronomy at the University of Hawai'i and became an Adjunct Assistant Professor in Embry-Riddle Aeronautical University, which *U.S. News & World Report* ranked as No. 1 Online Educator in the USA in 2016.



Early activities

Rami Rekola was interested in astronomy already at a very young age. He was able to educate his co-students and even teachers on the topic at school. He wrote a lengthy introduction of astronomy in Lorenzo High School, as part of his English studies, and received special commendation on his mastery of the topic.

As a young student in the University of Turku he had his first science popularisation text published by *PYRY*, a magazine for entrepreneurs in Pori – the town where he grew up. The text was mostly about Rami's scientific work with the Nordic Optical Telescope (NOT) and telescopes of European Southern Observatory (ESO) (see the two scanned pages on right).

Finnish commercial television, channel 3, or MTV3 as it is abbreviated in Finnish, has a morning programme called *Huomenta Suomi* (Good morning Finland), which has news every 30 minutes. In between the news reporters dig deeper into current topics. Europe basked in the lack of sunlight during a total solar eclipse on 11 August 1999. MTV3 contacted Rami's professor, Mauri Valtonen and asked for a professional astronomer to come and explain the eclipse in the morning show. So, a year after he received his Master's Degree, Rami was sent to Helsinki to appear on national television. He was interviewed for a full eleven minutes about how solar eclipses were understood in the past and what is the current scientific knowledge on the topic.

Tähtitieteellisiä havaintoja La Palmalla ja muuallakin



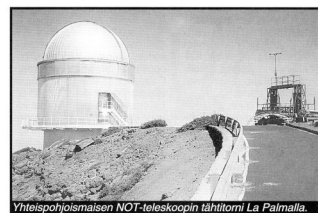
Rami Rekola

Selvitellen seuraavassa tähtitieteellisten havaintojen taustaa, itse havaintojen tekemistä ja niistä seuraavista tuloksista. Esittelen hivenen historiaa, tähtitieteiden tutkimista laitteita ja havaintopaikkoja. Tärkeimmät havainnot on tehty La Palmalla sijaitsevalle NOT-teleskoopille. Ja jos sattuisi saamaan jonkun kiinnostumaan jostakin tähän artikkeliin tai yleensä tähtitieteeseen liittyvästä aiheesta, kerron varmudeksi vielä kuinka saa helposti lisätietoja.

Kirjoittajan on toiminut tutkimusavustajana Turun yliopiston Tuorian observatoriossa vuodesta 1996 suorittaen opintojaan ja jatko-opintojaan. Hänen toimenkuvansa kuuluu galaksiryhmien dynamiikan tutkimus ja tutkimuksessa tarvittavien opistien havaintojen tekeminen.

Havaintojeni mukaan harvalla maailmalla on kovinkaan selkeää käsitystä siitä mitä tähtitieteelliset havainnot ovat, jokin käsitys on, sekin on usein väärä. Mielikuva kaukoputken okulaarin yötä läpensä tuijottavasta hamaapartaista ukosta on peräisin menneiltä vuosidoilta. Silloinkin tähtitieteilijät eivät, ainakaan nuorina, olleet hamaapartaista. Valokuvauksen keksimisen (vuonna 1816) jälkeen okulaarin tuijotettiin lähinnä havaittavan kohteen löytämiseksi, minkä jälkeen silmän tilalle lalettiin valokuvauslevy ja odotettiin sen valotumista ennen seuraavaa kuvaa tai kohdetta. Pian itse kaukoputkea ei käytetty näköhavaintoihin lainkaan vaan sen kykyä kiinnitettiin pienempi putki, jolla kohde etsittiin ja aloitettiin valokuvien ottaminen laletetulla. 1970-luvulla yleistynyt digitaalinen kamera, CCD, tarjosi tähtitieteilijöille uusia mahdollisuuksia paremman hylytyshuhteen ja digitaalisuutensa ansiosta. Kuvat saatiin suoraan tietokoneelle analysoitaviksi eikä enää ollut riippuvaisuutta silmänmääräisestä "musta tuntuu" arvioinnista. Toki yhä edelleenkin löytyy ihmisiä, jotka tuijottelevat yötä läpensä taivaalle. He tuijottelevat sitä mielenkiinnosta ja tähtitaivaan kauneuden vuoksi. Heitä kutsutaan harrastelijoiksi eli amatööristäronneiksi.

Mistäkö nämä havainnot sitten tulevat? Osa tulee edellämainituista simulaatioista, mutta toki ammattilaisekin yhä turvautuvat kaukoputken saadaksen havaintoja. Kaukoputket ovat vain muuttuneista ajoista, kun hamaapartaista ukot tuijottivat metallisylinterien päässä oleviin aukoihin. Nykykaiksen teleskooppi on linssit tai yleisemmin peiliin sisältävä sylinteri tai vastaava kehikko tarvittavine jalustoineen, ohjauksilaitteineen ja valaistuksineen. Ja koska säteilyä (valon tai säteilyä) tulee muillakin aaltopituksilla kuin näkyvässä valona, on teleskooppejaikin erilaisia erilaisin säteilyä havaitsemiseen. Näkyvää valoa, infrapuna- ja ultraviolettisäteilyä havaitaan yleensä pelikaupputen. Tunnetuin toisenlainen havaintolaitte on radioteleskooppi, valittava radiolähteiden, jollain havaitaan radioaaltosäteilyä. Koska erityisesti asuttu maailma on täynnä valoa- ja radioaaltosäteilyä, on useimmat näistä havaintolaitteista viety asutuille alueille, joihin vaikkepaasyyllisille alueille, lähes aina korkealle vuoristoon. Nykyään jostakin on jo viety ja yhä



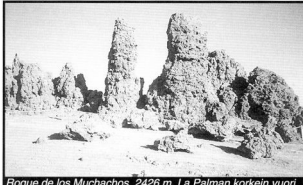
Yhteispohjoismaisen NOT-teleskoopin tähtitorni La Palmalla.

NOT = Nordic Optical Telescope
ESO = European Southern Observatory
SEST = Swedish-ESO Submillimetre Telescope
IAC = Instituto de Astrofísica de Canarias
CCD = Charge-Coupled Device

useampia suunnitellaan vietyäksi avaruuteen, joko maata kiertäville radalle, etäälläms avaruuteen tai Kuuhun.

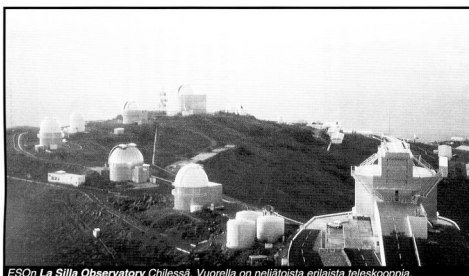
Tutkimusta maailmalla
Turun yliopiston Tuorian observatoriossa on oma 1 metrin (peili halkaisija) pelikaupputensa, jolla silloinkin tehdään havaintoja – sään sallien, ehkä vain. Tärkeimmät havainnot menään tekemään La Palmalla sijaitsevalle NOT-teleskoopille (peili 2.56 m) tai radiotähtitieteen tapauksessa Chileen ESO:n SEST-radioteleskoopille – joskus muuallakin. Havaintomatkat vievät usein paljon aikaa lähtemiseen ja takaisin, jättäen siltä yleensä opiskelijoiden ja erityisesti jatko-opiskelijoiden vastuulle. Näin minäkin oman havaintomatkan kokemukseni olen saanut.

Pro gradu -työhöni liittyvä simulaatio alitellen kyttyä ja ultraviolettisäteilyä havaitaan yleensä pelikaupputen. Tunnetuin toisenlainen havaintolaitte on radioteleskooppi, valittava radiolähteiden, jollain havaitaan radioaaltosäteilyä. Koska erityisesti asuttu maailma on täynnä valoa- ja radioaaltosäteilyä, on useimmat näistä havaintolaitteista viety asutuille alueille, joihin vaikkepaasyyllisille alueille, lähes aina korkealle vuoristoon. Nykyään jostakin on jo viety ja yhä



Roque de los Muchachos, 2426 m, La Palmalla korkein vuori.

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ESOn La Silla Observatory Chilessä. Vuorella on neljatoista erilaista teleskooppi.

havaintoyönnämme ESO:n 3.6 metrin pelikaupputella. Saatamme kuvaa pitkin kestoja eli kasteleita niin, että niistä saisi tietoa irti. Hakemamme tieto liittyy kauniin NGC 253 -spiraaligalaksin planeetaaristen sumuun kirkkaiksi nittamaisiin ja sitä kautta galaksin etäisyyden selvittämiseen. Hämkykuksa 1997 meihin. Torontoon tätä tudeoita avustamaan. Kuvaavaa havaintoprojektien kestolle on, että vielä nyt huhtikuussa 1996 on lopullisia tuloksia ole Torontosta kuulunut.

Omien jatko-opintojeni merkeissä yrittä professorini ja kanadalaisen kollegamiehen kanssa parinkin kertaan saada havaintoaikaa NOTilla uutta etäisyysmittausprojektiavarten. Havaintoaikahakemus oli kertaalleen hylätty sen pitkin keston vuoksi (10 yötä), mutta uudelleen yrittäessämme on tarjottu saati uusi, entistä helpempi CCD-kamera, jonka avulla taskein tarvittavan vain 7 yötä. Uusiin hakuksia osoittavasti liian alkaavaksi – kahdesti – joten professorini kysyi oleskohanavaintoaikaa saaneilla turorialaisilla yhteistyöhalukkuutta joko ottaa meille kuvia omilla havaintovaroillaan tai antaa minun mennä tekemään heidän havaintojaan ja ottaa samalla pari omaakin kuvaa. Useampikin suostui näihin järjestelyihin. Mori lupasi ottaa kuvia ja FM Harri Pietilän kanssa sovimme, että minä menisin tekemään havainton kahtena hänen kolmesta havaintovorostaan ja saisin samalla muutaman tunnin havaintoaikaa omaan projektiin.

Tarkoitukseni on selvittää läheisen spiraaligalaksin IC 342 etäisyyttä kefeidihavainnoin. Yksinkertaisesti kysymys on fyysikkäisellä käyttäytymisellä hyvin tunnetuista muuttuvista

teikini sitten Hassen seuramatkana, jolloin pääsin lentämään suoraan Helsingistä La Palmalle ja hintakin tuli halvemmaksi. Toisin matkoihin kuluu aika ja huomattavasti enemmän kuin matkailuun, mutta tällennollia oli ollut (ja Finnairen "palvelus" laatu oli entisellään). Tällä kertaa monta viikkoa jatkunut heikkopäiväni tuli. Sa-harasta ja paikalliset kovat tuulet olivat pitkään haitanneet havaintojen tekemistä, mutta sain jälleen pääosan havainnoista tehdyksi.

Olin vuokrannut auton yhdeksi ylimääräiseksi päiväksi, joten ajelin saarta ympäri nähtävyyksiä katsellen. La Palma on vain 40 km leveä ja 60 km pitkä, joten päivästä siitä ehti nähdä suunninman osan. Eikä bensininhinta (3 mk/litra) ollut ajelen esteenä. La Palma merkitävin piirre on sen keskellä oleva, hienoisia ja kymmeniä kilometrejä pitkä Caldera de Taburiente, joka on suurimpia laatuun maailmassa. Saaren eläimistöä valkua-

Ennen matkaa pitimmin viettä ottaa yhteyttä IAC:n taloustoimistoon saadakseen EU-rahoituksen lisensointia ja yöpymis-

Residenciassa sekä lähettää NOTin henkilökunnalle täyttämäni WWW-kaavake tarvittamien havaintolaitteiden. Observatorioilla elin jännityksessä ilmotamalla lähtevän päivän, sillä taivas oli pilvessä. Pidin myös Tuorialaisien jännityksessä ilmotamalla lähtevän päivän, sillä taivas oli pilvessä. Pidin myös Tuorialaisien jännityksessä ilmotamalla lähtevän päivän, sillä taivas oli pilvessä. Pidin myös Tuorialaisien jännityksessä ilmotamalla lähtevän päivän, sillä taivas oli pilvessä.

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Rami Rekola

Liittelen alle luettelon erilaisista lähteistä. Mistä tahansa tähtitieteeseen tai avaruuteen liittyvistä kysymyksistä vastaan mielelläni sähköpostiosoitteesta rareko@astro.utu.fi

Lisätietoja (World Wide Web-sivuja, kirjoja ja julkaisuja)
• Laajempi (suomenkielinen) kuvaus matkasta La Palmalle löytyy (muuton englanninkielisiltä) WWW-sivuilta: <http://oj287.astro.utu.fi/~rareko/LaPalmaFin.html>

• NOTin omat WWW-sivut: <http://not.iac.es>

• ESO'n omat WWW-sivut: <http://www.eso.org>

• Tuorian observatorion erinomainen linkkisivu tähtitieteellisiin WWW-sivuihin: <http://oj287.astro.utu.fi/tuoriafin.html>

• Tuorian observatorion systeemimanageri **Hannu Karttunen** Tieto-Finlandia -palkinnon voittanut johdatus tähtitieteen historiaan: **Vanhin tiede** (Ursa, 1996)

• **Hannu Karttunen** (et al.) toimittama johdatus tähtitieteen alkeisiin: **Tähtitieteen perusteet** (Ursa, 1995)

• Tähtitieteen kansantajuiseksi suomenkieliseksi esitellyt yleistiedekaavalehti: **Tiede 2000**

• Ursa amatööreille toimittama julkaisu: **Tähdet ja avaruus**

• Kevyitä lukemista: **Douglas Adamsin** *Linnumuradn käsikirja* liffareille

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Positions of trust

Dr Rekola has served over 60 years, combined, in various positions of trust, mostly in scientific or science-related organisations. His most notable public outreach position was to serve as a council member for four years in Ursa Astronomical Association, which has almost 20 000 members and is the biggest publisher of astronomical non-fiction in Finland. Dr Rekola has also served 18 years as the auditor of the amateur astronomers' association in Turku, the Turun Ursa, and 10 years as the secretary and treasurer of Tuorlan Astronomical Society.

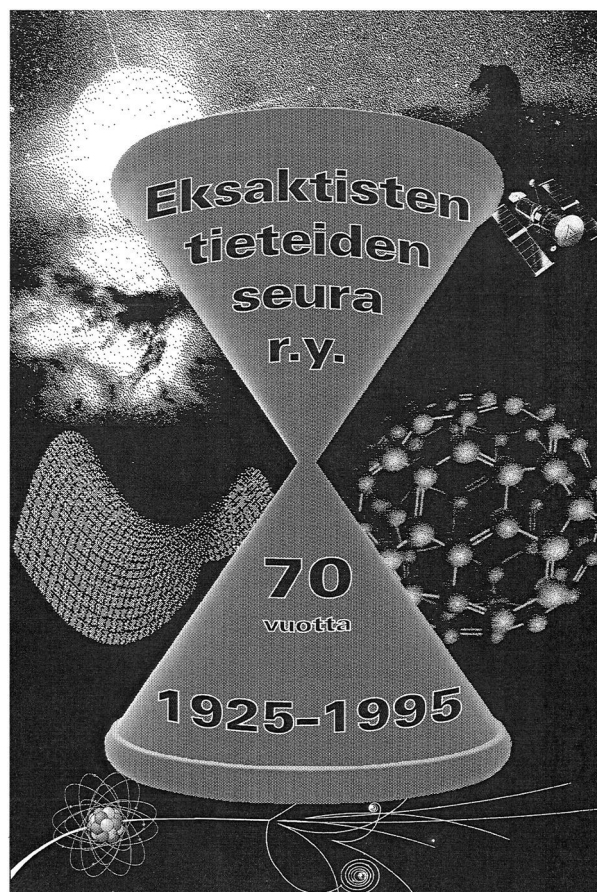
His scientific positions of trust include memberships in the councils of the Finnish National Committee for Astronomy, Finnish Astronomical Society, Tuorla Observatory, and the Department of Physics of the University of Turku. Dr Rekola has also served in the Local Organising Committees of various international astronomy conferences.

Dr Rekola is a Fellow of the Royal Astronomical Society (FRAS) and a member of the International Astronomical Union (IAU), Finnish Astronomical Society, Tuorlan Astronomical Society, National Space Society, and The Planetary Society.

Exact Sciences Society

Rami Rekola served three years as a student member in the council of the Department of Physics, University of Turku, in 1993–1995. He demonstrated such integrity that Dr Ensio Laine, the director of the department, who also served as the chairman of Exact Sciences Society invited him to become the secretary and treasurer of the society. Rami agreed and served altogether ten years, from 1993 to 2002.

During this time he organised annual meetings of the society and arranged for a presentation or two to be held in each of these meetings. This made the society meetings popular events for the members and member candidates to meet and discuss current topics. He also wrote the history of the society: “Eksaktisten tieteiden seura r.y. 70 vuotta 1925–1995” (Exact Sciences Society, 70 years 1925–1995), published in the Tuorla Observatory Reports. The 62 page history was a thorough review of the activities of the society and was so well received that the University of Turku awarded Rami a grant as a reward for the work for which he received no other compensation.



Tuorla Observatory Visitor Centre and Tuorla Planetarium

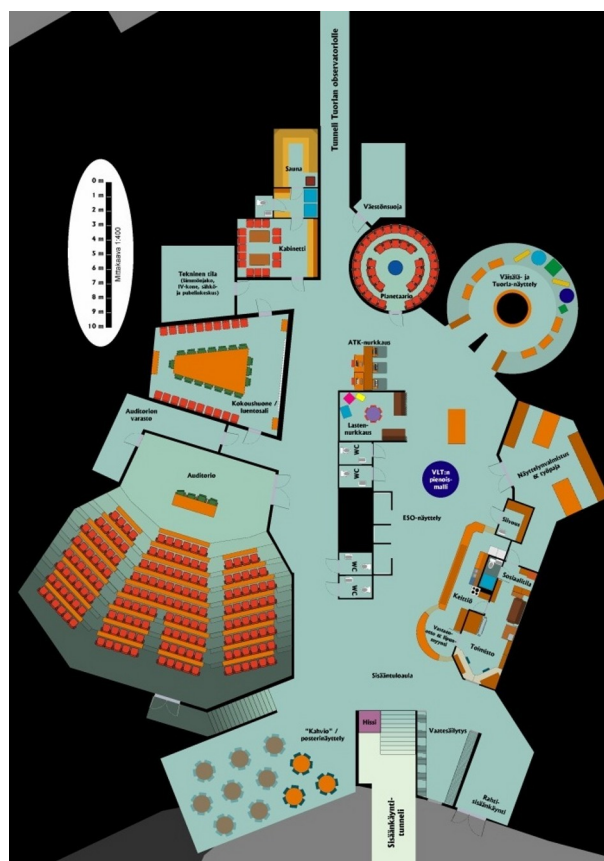
Rami began working in Tuorla Observatory in January 1996. Occasionally some visitor groups contacted the observatory and usually a short tour was organised for them. There were initially two tour guides, Dr Leena Tähtinen and Dr Aimo Sillanpää. Rami joined the effort soon after he was initiated to the history and workings of Tuorla Observatory. Over the years there was constant talk about developing the visitor programme and even dedicating some corner of the observatory for an exhibition of sorts. Finally Rami had had enough of it – always talk, never action.

He grabbed one of his good friends, Dr Pekka Heinämäki and together they spent one lovely summer day making detailed plans for a proper visitor centre. The centre was to have a building with two exhibition rooms and an auditorium. They introduced the idea to the observatory staff and finally, on 16th of January 2004, a number of the staff members founded Tuorlan Astronomical Society. The top priority of the new society was to promote the idea of the visitor centre. Dr Rekola became the secretary of the society and held the office until he moved to the USA in 2014. During this time Dr Aimo Sillanpää was established as the eternal chairman of the society.

Over the years the project developed and gathered momentum. Eventually both local politicians and members of Finnish parliament were involved. Funding for a feasibility study was received from the European Union. The visitor centre was to cover over 1000 square metres with several exhibition halls, an auditorium for 200 people, a planetarium, a 3D theatre, and several other functions. Dr Rekola's architectural design for the visitor centre is shown below. At the time it was planned to be built in underground tunnels to be excavated under Tuorla Observatory. The city of Kaarina and the University of Turku were heavily involved and about half of the projected space was to be built when economic recession ground the project into a halt. Currently the project is waiting for the recession to ease off and will be revived soon thereafter.

However, Tuorla Planetarium was founded on 1st of September 2008 as a preliminary stage and to prove the feasibility of the visitor centre in a more solid manner than the two studies commissioned from experts. The planetarium has been running ever since and is an astounding success in science popularisation and a much liked destination for families and school groups.

Dr Rekola was the workhorse during the process of planning for the visitor centre and founding and running the planetarium. His and Dr Aimo Sillanpää's passion in driving the project carried them through unimaginable obstacles and was rewarded with the founding of the planetarium, even though the visitor centre still awaits a better economic climate.



Tuorlan Astronomical Society

Besides the Tuorla Observatory Visitor Centre project, Tuorlan Astronomical Society (reg. n:o 188847) has been active in many other ways of popularising astronomy. As the secretary of the society Dr Rekola was in charge of carrying out, and usually devising, activities such as observatory open house days, exhibitions, and participation in fairs.

The very first Tuorla Observatory Open House Day was organised on 15th of May 2004, and was attended by some one thousand interested members of the public. See below the poster Dr Rekola designed for the event.

One important part of the society activities was to host groups visiting Tuorla Observatory. For this purpose Dr Rekola manufactured a detailed presentation that was given either in the auditorium of Tuorla Observatory or at Tuorla Planetarium. He gave this presentation and usually also a guided tour to the groups himself tens of times. Some of the more interesting such events are listed on the right.

Tuorlan tähtitieteellinen seura ry
järjestää Tuorlan observatoriolla, Piikkiössä
avoimien ovien päivän
lauantaina 15.5.2004
kello 10–16.

Ohjelmassa mm.:

- observatorion yleisesittelyt kello 11, 13 ja 15 *
- observatorion teleskoopit ovat nähtävillä koko päivän
- Tähtitieteellinen yhdistys URSA ry:n siirrettävä planetaario; useita esityksiä päivän aikana
- Leena Tähtisen esitelmä: "Marsin vesi kuohuttaa" kello 12:00 *
- Rami Rekolan esitelmä: "Mitä uutta Suomen jäsenyys Euroopan eteläisessä observatoriossa ESO:ssa tuo Tuorlalle" kello 14:00 *

*) Esitelmien kuulijamäärä on rajattu 60:een

Perheen pienimpiä opastetaan tähtitieteen saloihin erityisessä lastennurkkauksessa.

Lisätietoja: www.astro.utu.fi/TAS/

Tuorlan observatorio sijaitsee n. 12 km:n etäisyydellä Turun keskustasta 110-tien varrella Varsinais-Suomen Maaseutuopillaitoksen ja Tuorlan Majatalon naapurissa.

Huom!
Myyntipisteessämme on esillä mm. Stellkronos Oy:n ja Tähtitieteellinen yhdistys URSA ry:n myynnissä olevia kaukoputkia ja kirjoja.



Some of Dr Rekola's Tuorla Observatory presentations and guided tours:

- 24/10/2001: lecture to school pupils on the life of a university student
- 2/5/2002: tour to group from ESO, in Eng.
- 20/11/2002: presentation and tour for Exact Sciences Society
- 29/11/2002: pres. for gynaecologists
- 8/4/2003: pres. and tour for Piikkiö Works & Royal Caribbean Cruise Line, in Eng.
- 19/5/2003: pres. and tour for Swedish People's Party of Finland
- 24/4/2004: pres. and tour to science teachers from Helsinki
- 9/12/2005: pres. for gynaecologists
- 11/2/2006: presentation and tour to Finnish Heart Association
- 28/2/2006: presentation for dentists
- 16/6/2006: presentation and tour to Turku City Council in English
- 18/9/2006: tour to Matti Vanhanen, the Prime Minister of Finland
- 15/12/2006: tour for Department of Physics
- 15/1/2007: tour for The Finnish Society of Sciences and Letters
- 16/2/2007: pres. and tour for Lions Club
- 16/3/2007: pres. and tour for Wallac Inc.
- 6/6/2007: presentation and tour for an international group, in English
- 20/11/2007: presentation and tour for a local congregation
- 27/11/2007: pres. and tour for Orion Inc.
- 4/3/2008: pres. and tour for senior secondary school students from Italy, in Eng.
- 26/8/2008: pres. and tour for Ministry of Agriculture and Forestry
- 5/12/2008: tour and planetarium show for LM-Instruments
- 19/5/2009: pres. and tour for Åbo Akademi
- 1/8/2009: pres. and tour for medical physicists from the University of Turku
- 2/9/2009: planetarium show for business women's association of Turku
- 24/9/2009: pres. and tour for X-ray nurses
- 22/10/2009: presentation for Bayer
- 20/11/2009: tour for the Naantali Lions
- 18/2/2010: pres. and tour for International Rotaries, in English
- 2/3/2010: pres. and tour
- 14/4/2010: pres. and tour for Hiukkanen
- 17/4/2010: presentation and tour for Canadian reporters, in English
- 6/5/2010: pres. and tour for RIL seniors
- 18/5/2010: pres. and tour for STX Europe
- 1/6/2010: presentation and tour
- 8/9/2010: presentation
- 11/2/2011: astronomy talk for Turku Vocational Institute
- 30/8/2012: presentation for the University of Turku Computing Centre
- 11/12/2012: presentation and planetarium show for Finnish Red Cross

Astronomy Olympiad

Dr Rekola embarked on a journey to Russia in April 2008. He visited the Sternberg Institute at Moscow State University, gave a seminar talk there, and discussed the sixty year old tradition of organising Astronomy Olympiads for kids interested in astronomy both there and with astronomers in St. Petersburg.

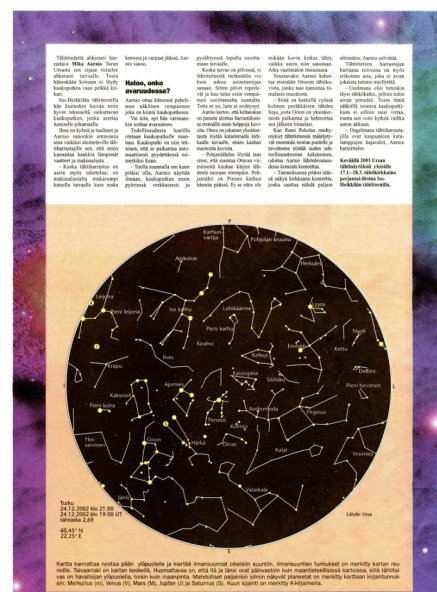
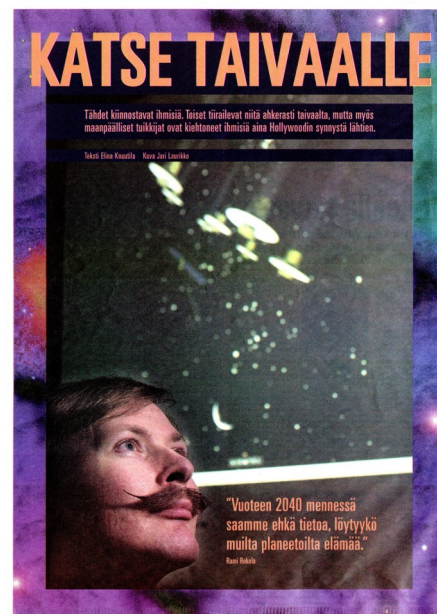
Together with some colleagues from Tuorla Observatory Dr Rekola had envisioned bringing the Olympiads also to Finland. The idea was to test the Olympiads with a few schools and then expand them to the whole country. The project received a handsome grant, with which the test run was carried through, but it failed to secure permanent funding from the Ministry of Education and therefore it had to be cancelled after a very successful test with some half a dozen schools all around Finland.

Dr Rekola in the public eye

Besides preparing educational and public outreach material himself, Dr Rekola has appeared in the Finnish media several times. Besides the groundbreaking appearance in the morning television on the solar eclipse in 1999 he has been interviewed for Finnish television news twice. He was on TV on 3rd of October 2005 regarding his participation in the University of Turku astrobiology project that attempts to find ways of growing food for astronauts using a simulated Mars atmosphere and again in 2008 describing the grand opening of Tuorla Planetarium.

Finnish Broadcasting Company interviewed Dr Rekola on radio regarding his famous presentation "The End of the World 2012?" on 1st of November 2011.

Newspapers have often published stories of him. On 24th of December 2002 he was in the weekly supplement of Turun Sanomat ("the news of Turku"), the main newspaper in Turku region and one of the biggest newspapers in Finland. Together with an amateur astronomer, Mika Aarnio, he explained the value of astronomical observations and reasons to fight light pollution. Scanned copy of the three page story is on the right.



In 2010 he appeared on the pages of the daily newspaper Turun Sanomat itself, in a whole page story about the effects of economic recession on the funding of astronomy and the subsequent problems of highly educated professionals keeping their jobs or finding income to match their expertise.

In 2011 he was interviewed by Satakunnan Kansa, a major regional newspaper in western Finland, about the end of the world. Scanned copy of the story is below.

Dr Rekola spent several months on La Palma in 2012. Turun Sanomat was interested again and made a half a page story on his exploration of the island.

Maailmanloppu tulee varmasti, mutta ei vielä ensi vuonna

Totuus: Unohtakaa Mayojen kalenterit. Miljardin tai kahden vuoden kuluttua aurinko räjähtää.

ANNE MÄKELÄ
Pori

Etäisesti Salvador Dalia viiksiltään muistuttava mies vakuuttaa, että maailmanloppu ei tule 23. joulukuuta vuonna 2012.

Kyseinen mies, **Rami Rekola**, on tohtori ja tähtitieteilijä. Hän on myös tutkija ja tiedemies, joten hänen pitää olla oikeassa.

Mutta uskommeko me häntä?

Rekolan perusteet ovat vakuuttavat.

Hän puhuu maya-kulttuurista ja heidän kehittyneistä tavoistaan laskea aikaa: arkikalenterista, uskonnollisesta kalenterista ja pitkistä luvusta.

Jos koko paketin avaisi, voisimme varata sivutillan tiedejulkaisusta.

Keskitymme siis vain pitkään lukuun, siihenkin oikopolkua pitkin ja hyvin lyhyesti.

Maaginen pitkä luku

Mayojen mukaan pitkä luku on noin 5125 vuotta. Nykyisen tietämyksen valossa nykyinen järjestyksessään neljäs pitkä luku, alkoi 13.8.3114 ennen ajanlaskun alkua, ja päättyy siten ensi vuoden joulukuussa.

Mayojen uskomuksen mukaan jokaisen pitkän luvun lopussa maailma muuttuu ja syntyy jostain uutta.

Varsinaisesta maailmanlopusta ja tuhosta alkoivat puhua atsteekit.

Kuuntelemme ja nyökkäilemme.

Kunnes tutkija faktat pöytään lyötyään toteaa, että kukaan ei silti voi olla täysin varma, kuinka pitkä tämä pitkä luku itse asassa on.

Eikä myöskään siitä, milloin nykyinen pitkä luku on alkanut.

Sitten tähän sekoitetaan vielä muita uskomuksia. Joidenkin mielestä maailmanloppu tulee 21. joulukuuta 2012, jolloin on talvipäivänseisäus. Ja numerologia, alkää koskaan sekaantuu siihen.

Loppu tulee, joskus

Unohtetaan siis mayojen kalenterit, uskomukset ja Raamattu. Jotain Rami Rekola voi luvata



Hanna Leppänen/SK

Mayojen kalenterin mukaan maailmanloppu tulee ensi vuonna. Tähtitieteilijä Rami Rekola mukaan syytä huoleen ei ole. Enemmän hän on huolissaan ilmastomuutoksesta. - Sen vakavuutta poliitikot eivät ymmärrä vielä.

Jokainen vakavasti otettava tutkija vastaa tuohon kyllä.

Rami Rekola
Kysymykseen onko maapallon ulkopuolella älyllistä elämää

varmasti: maailmanloppu tulee jossakin vaiheessa.

Yhden tai kahden miljardin vuoden kuluessa aurinko alkaa kuumeta ja paisua.

Siitä tulee punainen jättiläis-

tähti, joka höyrystää kaiken veden ja tekee maasta tuliperäisen paikan, jossa on mahdoton elää.

Rekola uskoo, että maailman-kaikkeuskin loppuu aikanaan, sillä sen rakenne laajenee niin voimakkaasti, että kappaleita yhdessä pitävät sähkömagneettiset voimat kumoutuvat.

Mutta.

- Voi olla, että maailman-kaikkeudessa piilee sellaisia salaisia asioita, jotka muuttavat asioiden suuntaa tai kaikki alkua alusta. Eihän suuren alkuräjähdyksen syytä ole voitu tieteellisesti todistaa.

Uskooko Rekola Jumalaan?

- En voi vastata tuohon kyllä enkä en.

Uskooko Rekola älylliseen elämään maapallon ulkopuolella.

- Jokainen vakavasti otettava tutkija vastaa tuohon kyllä.

Rami Rekola puhui mayojen kalenterin ennustamasta maailmanlopusta studia generalian yleisöluennolla Porissa viime keskiviikkona.

Keskustele

→ Millainen on maailmamme loppu?

→ SK24.fi

Kuka?

Rami T.F. Rekola

Filosofian tohtori, tutkija, tähtitieteilijä.

Työpaikkana Tuorlan observatorio Piikkiössä (Turun yliopiston Fysiikan ja tähtitieteen laitos).

Useampia alan julkaisuja. Royal Astronomical Societyn jäsen.

Käynyt koulunsa Porissa, ylioppilas Meri-Pori lukio 1989.

Nimessä oleva lyhenne T.F. tulee nimistä Tapani Fritiof.

Oho!

Asteroidiuhka

Noin 300-metrinen asteroidi Apophis saattaa törmätä maahan vuonna 2036 tai 2037.

Se vastaa energialtaan 20000:ta Hiroshiman atomipommia.

Ei hätää, nykyään voidaan estää jopa kilometristen asteroidien törmäys maapalloon. Asteroidien kytkeen viedään moottori työntämään niitä sivuun kurssiltaan. Aikaa tarvitaan vuosia eli asteroidi pitää havaita ajoissa.

Astromatkat

Dr Rekola founded Astromatkat (Astro Tours), a company specialising in education consulting, teaching and public outreach, on 4th of April 2011. The company sold numerous talks, continued the tradition of taking visiting groups to Tuorla Observatory, and participated in the education effort of Turku region. Through the company Dr Rekola taught astronomy at a school for children with learning disabilities, devised and taught an astrophysics course at a high school in central Turku, and created a programme to take talented high school students to the Nordic Optical Telescope, on La Palma, Spain.

The NOT Science School was carried out nine times between 2007 and 2013. It consisted of an initial visit to Tuorla Observatory, where Dr Rekola and some other researchers gave lectures on astronomical instruments and observations, and prepared participants for the trip. Once on La Palma he gave the students further lectures on astronomical topics, prepared them for observations at the telescope, hosted a trip to the observatory, supervised half a night of observations per group at a large professional telescope, and afterwards helped them reduce the acquired data using tools of professional astronomers. They also had a geology field trip to volcanoes of the island. Dr Rekola planned most of the observations together with his colleagues at Tuorla Observatory so that they could be used, after the trip, by astronomers on their research projects. One refereed paper and three circulars have been published on the data and more are expected for the next couple of years.

One important part of the Astromatkat are public presentations, mostly ordered by various organisations for their members. The most popular one of the presentations was “The End of the World 2012?”, which debunked the apocalyptic ideology and even proved wrong the erroneous date people were using for the final day of the Mayan calendar. The presentation discussed the Mayan society, mathematics and astronomy, their complex calendar systems and how the corresponding idea of the end of the world emerged – in the 20th century.



Some of the public outreach presentations of Dr Rekola:

- 21/3/1997: presentation for Odd Fellow organisation in Pori
- 12/2/1999: presentation for amateur astronomers in Pori
- 4/6/2005: invited speaker at the graduation of his former senior secondary school, Meri-Porin lukio, in Pori
- 16/1/2006: presentation in a senior secondary school in Pori
- 12/3/2008: presentation in Nordea Bank
- 6/10/2009: 3 presentations in Merikarvia
- 6/10/2009: presentation in Siikainen
- 20/1/2010: presentation in Rauma
- 20/1/2010: presentation in Rauma
- 28/5/2010: presentation in Tuorla Inn
- 8/11/2010: presentation in Ulvila
- 16/10/2010: Life in the Universe? presentation in Rauma
- 7/3/2011: History of the Universe presentation in Rauma
- 7/3/2011: Life in the Universe? presentation in Rauma
- 6/4/2011: End of the World 2012? presentation in Pori
- 29/9/2011: presentation in Kemijoki
- 20/10/2011: Milky Way presentation in Yläne
- 1/11/2011: End of the World 2012? presentation in Rauma
- 23/5/2012: End of the World 2012? presentation in Helsinki University
- 30/8/2012: Moon presentation in Lemu
- 6/10/2012: End of the World 2012? for Finnish teachers' association, in Pori
- 10/11/2012: presentation for women sailors, in Lemu
- 27/11/2012: presentation in Yläne
- 17/12/2012: End of the World 2012? in Koulu, Turku, in English
- 13/5/2013: presentation in Ulvila
- 9/7/2013: presentation for Comenius group at Tuorla Inn, in English
- 9/7/2013: 2 presentations for EWASS participants at Tuorla Observatory, in English
- 7/11/2013: 2 presentations about Prof. Yrjö Väisälä, at Tuorla Observatory

ESO Science Outreach Network representative for Finland

Dr Rekola has been a European Southern Observatory Science Outreach Network (ESON) representative for Finland since the beginning of 2012. During this time he has been in charge of the public outreach translations from the original English texts to Finnish. He has translated over 200 newsletters in person and supervised several translations made by Miss Auni Somero from Tuorla Observatory. Since February 2015 he has supervised picture-of-the-week translations made by Dr Anni Määtänen from Centre national de la recherche scientifique (CNRS), France, and since September 2015 translations of announcements, by Dr Pasi Nurmi from Tuorla Observatory.

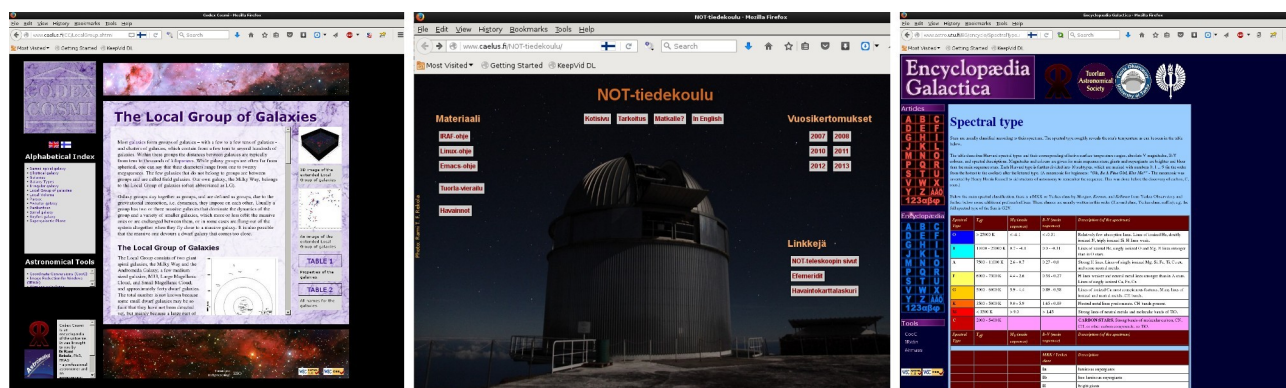
Besides the regular work on various online publications Dr Rekola has translated brochure “Reaching New Heights in Astronomy” and subtitles for several of the informational videos ESO has published. In 2012 ESO celebrated the 50th anniversary of the signing of its charter. As part of the celebrations Dr Rekola arranged for the “awESome universe” exhibition to be displayed first in Turku City Library and then in the Centre for Astronomy in the old Helsinki observatory. After the official exhibitions Dr Rekola arranged for the exhibition material to have a permanent home at Tuorla Observatory, where visiting groups and planetarium guests have a chance to admire the universe through the eyes of ESO.

Online presence

Rami made his first home page in 1993, soon after the first popular web browser, Mosaic, was released. He operated his own public web server `olympus.astro.utu.fi` for a few years before the University of Turku banned private web servers due to vague and quite paranoid security reasons. He was in charge of the Tuorla Observatory web server `www.astro.utu.fi` and its contents for nearly ten years. In 2011 Tuorlan Astronomical Society acquired a web server, `www.caelus.fi`, and Dr Rekola became its webmaster. In 2016 Dr Rekola established web pages at `www.drakanon.com` to sell his services in the USA.

Dr Rekola maintains several web sites dedicated to popularising astronomy and sciences:

- `www.astro.utu.fi/EG` – **Encyclopædia Galactica**, online astronomy dictionary
- `www.caelus.fi/CC` – **Codex Cosmi**, online astronomy encyclopædia
- `www.caelus.fi/astromatkat` – **Astromatkat**, public outreach company
- `www.caelus.fi/NOT-tiedekoulu` – **NOT Science School**, astronomy education
- `www.drakanon.com` – **Drakanon**, public outreach company



Editorial work

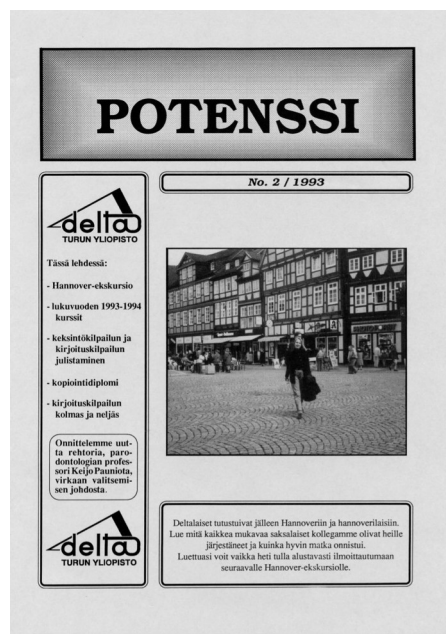
Rami Rekola and four of his close friends began publishing an underground paper, *Imuke*, in the Finnish senior secondary school, Meri-Porin lukio. The first issue, published in some 20 copies, was just full of jokes and other material to entertain and amuse the other students. The idea was, however, so well received that the group prepared more serious articles about the school and local topics, besides the pure entertainment, and sold advertisements to increase the circulation to 300 so that each student and teacher could get his own copy. Altogether nine issues were made during the school year 1986–1987. After this, the group was dispersed because of exchange studentships etc. During the graduation festivities in May 1987, however, each group member received a stipend from the school for great work in building togetherness in the school. The group prepared yet another, the tenth, issue to celebrate the 5th graduation anniversary of their class and class reunion in 1993.

While an exchange student in Texas, Rami Rekola participated in making a similar school paper at Lorenzo High School during school year 1987–1988. His host family published the local newspaper, The Lorenzo Examiner, and Rami spent much of his free time helping out typing and editing pages at the editorial office.

Rami Rekola joined the Turku University mathematical and physical sciences' student organisation Delta when he began his studies in the University of Turku in September 1990. Soon thereafter, from the beginning of 1991, he was appointed as the editor-in-chief of *Potenssi* (a Finnish word that by a staggering coincidence has two meanings: exponent and sexual prowess). *Potenssi* was and still is the magazine of Delta and appears normally four times a year. During his era as the editor-in-chief, Rami changed the page size from A5 to A4, introduced a range of new, more relevant and down-to-earth topics, besides the traditional line of “fun stuff” and reports of student life and parties. He also acquired much external funding (advertisements) towards publishing the magazine. See one of the front covers and one editorial on the right.

In 1993 Rami Rekola was a co-editor-in-chief of *Turku University Faculty of Sciences Alternative Guide for Students*, an annually published manual for new students of natural sciences in the University of Turku.

Dr Rekola served as one of the two editors of European Union FP7 *Science-in-Society* proposal “Promoting Awareness and Learning of Science through Astronomical Exploration” (acronym: GALILEO), submitted in May 2007, and soon thereafter as one of the editors of European Union FP7 *Space Science* proposal “Applications of Solar Sails in Handling the Asteroid Hazard” (acronym: AHA). The following year he was a co-editor of European Union FP7 *Infrastructures* proposal “Two Dedicated Automatic Telescopes for the EURONEAR Network” (acronym: EURONEAR).

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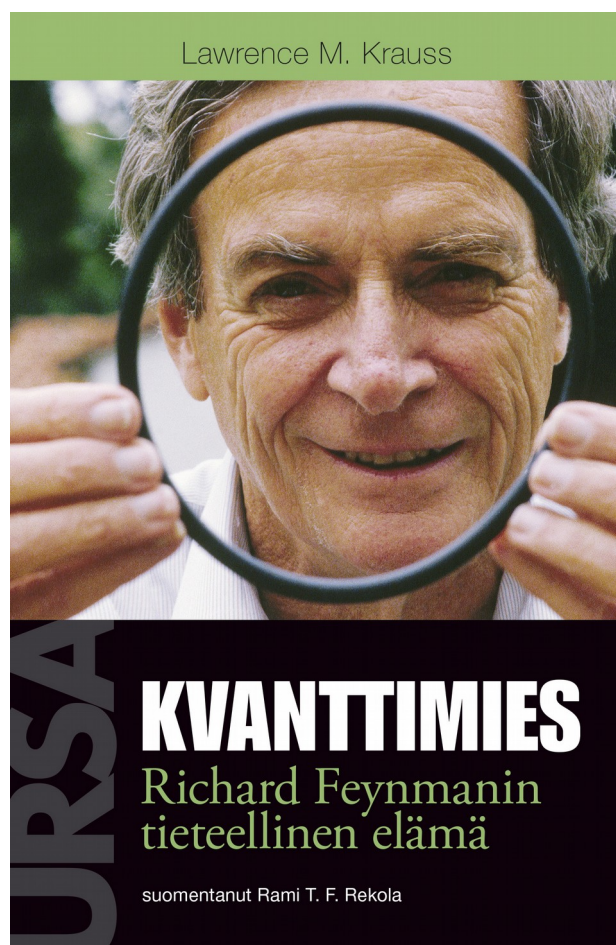
Writing

Besides all the writings presented or implied above (writings published in magazines, editorials and other material in Potenssi and Imuke, science popularisation material online, and the history of Exact Sciences Society), Dr Rekola has written or participated in writing 19 refereed publications and 10 conference publications. He has written a 109 page doctoral thesis (ISBN 951-29-2825-6) and is in process of writing a scientific biography of professor and academician Yrjö Väisälä, the founder of Tuorla Observatory and, amongst other achievements, original inventor of the 'Schmidt' telescope.

Dr Rekola's first-author publications are:

- Rekola R., 2009, *Planetary and Space Science*, **57**, 430: Life and Habitable Zones in the Universe
- Rekola R., 2008, *International Journal of Astrobiology*, **7**, 59: Life, the Universe and habitable zones
- Rekola R., Richer M. G., McCall M. L., Valtonen M. J., Kotilainen J. K., Flynn C., 2005, *Monthly Notices of the Royal Astronomical Society*, **336**, 330: Distance to NGC 253 based on the planetary nebula luminosity function
- Rekola R., Jerjen H., Flynn C., 2005, *Astronomy and Astrophysics*, **437**, 823: New distances of unresolved dwarf elliptical galaxies in the vicinity of the Local Group
- Rekola R., Jerjen H., Flynn C., 2005: *Charting the Neighbourhood*, in *Proceedings of the IAU Colloquium N:o 198*, ed. Jerjen H., Binggeli B., IAU Conference Proceedings, 376
- Rekola R., 2004, Ph.D. Thesis: "*Distance determinations to nearby galaxies*", Turku: University of Turku, 109 pages, ISBN: 951-29-2825-6
- Rekola R., 1995, History of the Exact Sciences Society "*Eksaktisten tieteiden seura r.y. 70 vuotta 1925 - 1995*", Turku: University of Turku, Tuorla Observatory Reports Informo No. 177, 62 pages, ISSN: 0789-6719

Besides the aforementioned more than 200 European Southern Observatory newsletters and other material Dr Rekola has also translated a book, Richard Feynman's scientific biography (*Quantum Man – Richard Feynman's Life in Science* by Lawrence Krauss) into Finnish (*Kvanttimies – Richard Feynmanin tieteellinen elämä*, ISBN 978-952-5985-14-6). See the cover of the translated book on the right.



Appendix 1: Translation of “Early Activities” article, page 3

(Please note that this is a translation of a text written by Rami Rekola at a young age and at the beginning of his professional career in astronomy.)

Astronomical observations on La Palma and elsewhere

Rami Rekola

In the following I shall explain the background of astronomical observations, making the observations, and the resulting findings. I shall present a wee bit of history, instruments and locations used by astronomers. I shall delve in more detail in my own observing trips to the NOT on La Palma. And should I manage to get somebody interested in some topic related to this article or astronomy in general, I shall also tell how to easily access further information.

The writer has been research assistant at Tuorla Observatory of the University of Turku since 1996, while doing his pre-graduate studies and PhD studies. His job description is to do research on the dynamics of galaxy groups and to make optical observations needed in this research.

It has been my observation that few laymen have much of an understanding on what astronomers actually do. If there is some understanding, it is often wrong. A mental image of a grey-bearded old man staring into the ocular of a telescope belongs to past centuries. Since the invention of photography (in 1816) ocular was glanced mainly to find the target of interest, after which the eye was replaced by a photographic plate, in order to wait for the exposure to be finished before the next picture or target. Soon the telescope was never used for visual observing at all, but a smaller telescope was attached to the side of the big one in order to use it to find the target before taking the photographs with the big telescope. Digital camera, CCD, became commonplace in the 1970's and offered many new possibilities for astronomers due to its better quantum efficiency and digital nature. Pictures were acquired directly on the computer for analysis and were no longer dependent on dumb estimates. Certainly there are still people who spend their nights ogling the sky. They do it out of fascination of the beauty of the night sky. They are called amateur astronomers.

So, what do professional astronomers do? Mostly they sit by a computer running simulations on everything that may be going on in the universe, or analyse various observations into figures, curves, tables, equations and finally make up a story around all that to explain what it means in their opinion. This story is then sent to some distinguished international journal where it is checked and prodded, scrutinised for a time and finally returned to be corrected. Finally it is published and the author (or more generally authors – sometimes up to tens of them) proudly add the article into his CV and begins to analyse new observations.

Where do these observations come from? Some come from the aforementioned simulations, but certainly professional astronomers still use telescopes to acquire observations. Telescope have changed, however, since the grey-bearded old men stared into openings at the end of a metal tube. A modern telescope is a cylinder or frame with lenses or, more commonly, mirrors, and necessary mounting, guiding and instruments. And since radiation (light is radiation after all) comes at also other than visible wavelengths, there are different kinds of telescopes for observations of different kinds of radiation. Visual light, infra-red and ultraviolet radiation are commonly observed with mirror telescopes. The best known other kind of a telescope is a radio telescope – a huge radio dish – that is used to observe radio wavelengths of radiation. Since especially the inhabited parts of the world are full of light and radio pollution, most of these instruments have been taken to uninhabited or remote regions, almost always on high mountains. Nowadays some have been taken, and increasingly many are planned to be taken, into space – either an orbit around the Earth, further out in space, or onto the Moon.

Research around the World

Tuorla Observatory of the University of Turku has its own 1 metre (diameter of the mirror) reflector telescope that is used for observations – weather permitting, or rarely. The most

important observations are done with the NOT on the island of La Palma (mirror 2.56 metres) or in case of radio observations, the ESO SEST radio telescope in Chile – sometimes also other locations. Observing trips take a lot of time from more important work and are therefore often given to students and especially PhD students to do. Thus I have had my own observing experience, too.

When I was beginning my Masters Thesis simulations, my professor, Mauri Valtonen, asked me if I would like to go as Tuorla representative of a collaborative project on an observing trip to Chile. I was only happy to go. At the beginning of September 1996 I spent 9 days in Chile; 5 days in Santiago de Chile and 4 at ESO La Silla Observatory. Our collaborators in Canada sent Michael Richer to be in charge of the observing project. I served as his assistant on the three observing night we had at the ESO 3.6 metre reflector telescope. The images we acquired had to be reduced, or treated in such a manner that we could make science out of them. The science we were after was to measure brightnesses of the planetary nebulae of the beautiful spiral galaxy NGC 253 and through them to establish the distance of the galaxy. In February 1997 I travelled to Toronto to assist the reduction. It is descriptive of the length of observing projects that now, in April 1998, we have still not heard the final results from Toronto.

As part of my PhD studies I tried a couple of times, together with my professor and our Canadian colleague, to have observing time at the NOT for a new distance measuring project. The observing time proposal had once been rejected due to its long duration (10 nights), but when we tried again the NOT had acquired a new and more sensitive CCD camera, with which I calculated our need was only 7 nights. Even the new proposal appeared to be too time consuming – twice – so my professor asked if any other Tuorlan, with awarded observing time, had any interest to collaborate and either take some images for us during their own observing nights or let me go in their stead to make their observations and at the same time take a couple of images of my own. Several of them agreed. Some promised to take some images and Mr Harri Pietilä (MSc) agreed with me that I could make observations during two of his three observing rounds and I could spend a few hours of observing time for my own project.

My aim is to find the distance of a nearby spiral galaxy, IC 342, using observations of Cepheid variable stars. Simply put we are speaking of stars whose physical behaviour is well known. The relation of their variability periods to their brightnesses tells us very accurately the distance to the stars. If you observe a sufficiently large number of Cepheids in a galaxy, you can establish its distance. Cepheid observations are the most accurate known method to measure extragalactic distances – generally the error is at most only 20%. Unfortunately Cepheids can be observed only in the nearest few hundred galaxies even with the most powerful telescopes, so other, less accurate methods must be applied to the millions more distant galaxies.

“My” galaxy, IC 342, is – according to these less accurate methods – at a distance of 1800–3400 kiloparsecs (6–11 million light years) – just outside our Local Group of galaxies. The aim is to measure the distance using the Cepheid method to the accuracy of at most some tens of kiloparsecs. Observations have been acquired now over a three month period.

My Experiences on La Palma

My first trip to La Palma took place on 17–22 January. I reserved scheduled flights, even though both flights there and those back had four layovers to change planes. The first day out of the six day trip was spent reaching there, the next two getting acquainted to the city of Santa Cruz de la Palma, after which I continued to Observatorio del Roque de los Muchachos. I spent two days on the 'mountain', which was followed by one night in Santa Cruz and flight back to Finland. I reserved my accommodations by emailing the NOT administrator, Paco Armas, on La Palma. He reserved accommodations both at the observatory Residencia and in Aparthotel Castillete in Santa Cruz. He reserved also a rental car for me for three days. Due to observatory deals both hotel accommodations and car rentals came with heftily reduced pricing.

Before the trip I had to contact also the IAC financial office to receive EU funding for my flights and accommodations in the Residencia, and send a WWW form to the staff of the NOT regarding the instruments I needed.

At the observatory I lived in suspense the day before my observing night as the sky was covered by clouds. I kept also the Tuorlans in suspense by letting them know of the situation via

email. When the evening came I drove up to the telescope with the NOT support astronomer, Colin Aspin, and prepared for observations just in case. When darkness came, an unexpected opening cleared over us in the clouds (we were following the cloud movements constantly using satellite images in the WWW). Therefore I managed to take almost all of my observations and I didn't need to return back to Tuorla empty-handed.

I made my second trip on 26 February – 5 March as a Hasse conducted tour. Therefore I managed to fly directly from Helsinki to La Palma and the price was cheaper, too. On the other hand the time spent on the trip was significantly longer than the scheduled flights had been (and the Finnair “service” was at its normal quality level). This time the high sand content wind from Sahara, which had continued for several weeks, and local high winds had obstructed observations for a long time. However, I managed to take most of my observations again.

I had rented the car for one extra day, so I drove around the island enjoying the scenery. La Palma is only 40 km (25 miles) wide and 60 km (38 miles) long, so there was time to see most of it in one day. Petrol price (3 FIM / litre) was not an obstruction for driving around either. The most remarkable feature of La Palma, at its centre, is the volcanic crater of a diameter of ten kilometres, La Caldera de Taburiente, which is one of the largest of its kind in the world. The volcanic regions in the south of the island and the pine forests in the north belong to the most notable sights. Due to the size of the island, there is not much to see beyond a trip of one week, but it is certainly worth visiting.

Astronomers are therefore doing first-rate science both at their desks and on observing trips, and frankly also at home – I believe few scientists can completely shut their brains off of science, even on a holiday. Despite of the required travelling and comprehensive nature of the work I have never regretted getting into the field – on the contrary.

Rami Rekola

I attached below a list of various sources of further information. I shall also be happy to answer any questions regarding astronomy or this article by email: rareko@astro.utu.fi.

Further information (World Wide Web pages, books and publications)

- A more extensive (Finnish) description of my trip to La Palma can be found on my (otherwise English) WWW pages: <http://oj287.astro.utu.fi/~rareko/LaPalmaFin.html>
- The NOT WWW pages: <http://not.iac.es>
- The ESO WWW pages: <http://www.eso.org>
- The excellent link page of astronomical WWW pages at Tuorla observatory: <http://oj287.astro.utu.fi/tuorla/links.shtml>
- The Tieto-Finlandia award winning introduction to the history of astronomy by Tuorla Observatory system manager, Hannu Karttunen: *Vanhin tiede* (Ursa, 1996)
- Introduction to the basics of astronomy, edited by Hannu karttunen (et al.): *Tähtitieteen perusteet* (Ursa, 1995)
- A general popular science magazine in Finnish with astronomy sections: *Tiede* 2000
- Publication published by Ursa for amateurs: *Tähdet ja avaruus*
- Light reading: *Hitchhikers Guide to the Galaxy*, but Douglas Adams

Pictures:

- 1) The Nordic Optical Telescope on La Palma
- 2) Roque de los Muchachos, 2426 m, the highest mountain on La Palma
- 3) ESO La Silla Observatory in Chile. There are fourteen different telescopes on the mountain.

Appendix 2: Translation of the 1st “Dr Rekola in the public eye” article, page 7

(Please note that this is a translation of a text written by a journalist and contains similar grammar and contextual errors as those produced by the journalist. The same applies to the translation in appendix 4 on page 19.)

A View to the Sky

People are interested in stars. Some seek them out from the sky, but also the glitter of those on Earth has fascinated people ever since the beginning of Hollywood.

Text: Elina Knuutila

Picture: Jari Laurikko

“By the year 2040 we may have information on whether there is life on other planets.”

Rami Rekola

Researcher Rami Rekola was interested in stars already before school. An astronomy book he received from his dad followed him to all trips and the contents of the pages ended up being read several times.

– We have that same book of fundamental astronomy here in Tuorla Observatory, so it was not a kiddie book as such, Rekola describes.

Even though the little boy was interested in the stars, a future as an astronomer was not in his plans. Physics became an increasingly fascinating a topic over the years.

– I was interested in physics and I enrolled in the university to study it. After a few years we had to choose our main topic and different departments came to present themselves to the students.

While considering the main subject Rekola felt somehow that theoretical physics could not offer as much variety as he yearned. When researcher Kari Nilsson came to present astronomy as an option, Rekola became interested in the subject.

– The main culprit for my choice to become an astronomer sits actually there, in the next office, Rekola points left from his office door.

– I was the only student who wanted to visit the observatory and so Kari drove the young student to Tuorla and the place seemed interesting. I popped up here almost accidentally.

Even though Rekola claims to have ended up as an astronomer accidentally, it is not so simple to become a researcher of space. A professional astronomer must have excellent skills in

physics and mathematics.

– There is many benefits from knowing other topics as well. Surprising topics may merge with each other. A relatively new branch of science is astrobiology. That means the discovery and study of extraterrestrial intelligence.

– The goal is not to find little green men from space, but researchers would be jumping with joy if they found mold on Mars.

Rekola shows an European Space Agency satellite project Darwin on his computer. Darwin has six satellites, which can provide very detailed images.

The goal is to find Earthlike planets with a similar atmosphere orbiting other stars.

By the year 2040 we may have information on whether there is life on other planets.

Was Jupiter the Christmas Star?

It is common to speak of the star of Bethlehem during Christmas season, the star that guided the three magi. A thought of a great, bright star brings many ideas to an astronomer.

– Probably it was a conjunction of two planets, Jupiter and Venus or Jupiter and Saturn, next to each other on their orbits, Rekola tells.

He thinks it was not

necessarily just a bright light on the sky, but Jupiter had a notable planetary significance for the cultures of the era.

– It may also have been a bright supernova, or a massive star. As the star finally explodes, there is shockingly bright light, which may be so intensive that it can even be seen during a daytime.

– No other culture or story has a mention of such a

phenomenon, so I consider the conjunction of two planets more plausible an option.

Astronomy has many funny words: supernova, planet, sun, meteorite, black hole. In popular talk there are often just stars on the sky. What is exactly a star then?

– In brief a star is a luminous sphere of gas. Our Sun is a good example. In some cases the difference between a star and a planet may be subtle.

For instance Jupiter is a gas giant planet, but its mass is too small and the pressure in its core is not sufficient to ignite nuclear fusion, which would produce energy and light.

A shooting star, on the other hand, is a meteoroid that impacts with high speed the atmosphere that shields the Earth. A layer of air is

compressed in front of it and heats up and begins to glow. We can see the object from the surface of the Earth thanks to this glowing air.

This is where many regular members of the public are becoming lost. It is though even more difficult to imagine the lifespans of stars, which vary from millions of years to tens of billions of years

depending on the mass of the star. Rekola begins to smile when the question comes to stellar distances.

– There are no terrestrial comparisons when we begin to speak of stellar distances. The distance of our Sun is 150 million kilometres, but the second closest star is already 4.2 light years away.

Telescope for Sale

One could imagine Rekola ogle the sky all the time with a telescope, but surprisingly he does not even own such a contraption.

– I used to have a telescope my father bought me when I was small, but I sold it, Rekola grins.

Rekola is not interested in looking at small dots of light through the telescope, the gas belts of Jupiter or rings of Saturn.

– I am more interested in theory. My interest lies with distant galaxies, not “nearby” celestial bodies. You could always find new moons of Jupiter, but I am more

interested in phenomena that actually take science forward.

– It is interesting to theorise the lightcurve of quasar OJ287 that can be seen even in the asteroid photographs of Yrjö Väisälä. They have found a 12 year period of brightening in it and researchers have been pondering why that is. They have also been able to find out quite accurately when the phenomenon takes place. It went wrong only by a few days.

An active amateur astronomer, Mika Aarnio from the Ursa of Turku is on the other hand often looking up to the sky. He doesn't have a

telescope at home either, but just binoculars.

At Iso-Heikkilä observatory he does dig out a very technical looking telescope that he places on the snow covered yard.

The weather is cold and windy and Aarnio says he always gives a hint to new amateur astronomers that they should get warm clothes and a sleeping pad.

– Because amateur astronomy is also often just waiting, a sleeping pad is more comfortable to stare the sky on than neck in an angle and toes frozen, Aarnio says.

Hello, is this space?

Aarnio grabs a phone looking device that is connected to the telescope. Ok, now he must be calling space then.

In reality the device gives guiding to the telescope. Telescope is so technical that it will automatically point to the Moon, for instance.

– The Moon should be over there, Aarnio points to the air, as the telescope rotates slowly and finally stops to point to the sky.

As the sky is cloudy, a person not initiated to astronomy can only believe an expert. Then clouds break up and the Moon appears at the direction the telescope is pointing to. It is true, the device was not

wrong.

Aarnio tells that a freshman should begin his hobby by looking for the simple constellations. The Big Dipper is simple to find for anybody by looking at the clear sky, looking for a dipper shaped object.

– Polaris can be found by pointing out from the tip of the dipper directly forward. Polaris is at the end of the tail of the Small Bear. It is not even a bright star, even though they often claim so. It is actually quite modest.

Next Aarnio suggests you should find the constellation of Orion, which can be recognised by the hour-glass

shape.

– In the middle of the belt it has a line of three stars in a row. Orion is easy to locate using it and then figure out the hour-glass.

While Rami Rekola has mainly interest in theory and his goal is to figure out a new theory of relativity, Aarnio expects to see handsome comet in the near future.

– There should be a bright comet in the east in January. You may see it even with your naked eyes, Aarnio clarifies.

The devout wish of an amateur astronomer is something unusual that might not make everybody happy.

– My dream is naturally a total blackout, when it would be completely dark. On the other hand, this electricity powered telescope would not be operational, but you could always connect it to the battery of a car.

– The amateur astronomer's problem are random lights of the city streets, Aarniolamments.

Ursa organises star showings to general public in the spring of 2003 on

clear Friday nights of 17/1 – 28/3 at the Iso-Heikkilä observatory.

Star Chart texts:

Turku
24/12/2002 at 21:00 o'clock
24/12/2002 at 19:00 UT
sidereal time 2.69
60.45° North
22.25° East

Source: Ursa

It is advisable to lift the map on top of your head and rotate cardinal directions to correct orientation. Signs of cardinal directions are marked at the edge of the chart. Zenith is in the middle of the chart. Please note that east and west are reversed to geographic maps, because the night sky is above the observer, unlike the ground. All planets possible to see with naked eyes are marked on the chart with letters: Mercury (m), Venus (V), Mars (M), Jupiter (J) and Saturn (S). The location of the Moon has been marked with letter K.

Appendix 3: Translation of “Tuorlan Astronomical Society” poster, page 6

**Tuorlan Astronomical Society
organises an open house day
at Tuorla Observatory, Piikkiö
on Saturday 15/5/2004 at 10–16**

The program features e.g.:

- observatory presentation at 11, 13 and 15 o'clock
- the observatory telescopes are open all day long
- movable planetarium of Astronomical Association Ursa; several presentations during the day
- presentation by Leena Tähtinen:
“Martian water stirred up” at 12:00 noon *
- presentation by Rami Rekola:
“What new will Finnish membership in the ESO bring to Tuorla” at 14:00 o'clock *

*) Audience for the presentations has been limited to the maximum of 60 persons.

Children will be initiated into the secrets of astronomy in a special children's corner.

More information: www.astro.utu.fi/TAS/

Tuorla Observatory is located about 12 km from the centre of Turku by road 110, as a neighbour of both the Agricultural School of Varsinais-Suomi and Tuorla Inn.

NB:
Our sales corner features e.g. telescopes and books by Stellkronos Inc. and Astronomical Association Ursa.

Appendix 4: Translation of the 2nd “Dr Rekola in the public eye” article, page 8

The End of the World Will Certainly Come, But Not Yet Next Year

The truth: Forget the Maya calendars. The Sun will explode in one or two billion years' time.

Anne Mäkelä Pori

A man with moustache resembling slightly Salvador Dali reassures that the end of the world will not come on the 23rd of December 2012.

This man, Rami Rekola, is a PhD and an astronomer. He is also a researcher and a scientist, so he must be correct.

But do we believe in him?

Rekola's justifications are convincing.

He speaks of the Maya culture and their advanced ways of calculating time: regular calendar, religious calendar and long count.

If you would open the whole package, we could reserve pages from a science journal.

We shall concentrate therefore only in the long count, and even then using a short-cut and very briefly.

The Magical Long Count

According to the Maya, the long count is about 5125 years. According to current knowledge, the current long count – the fourth one in total – began on 13/8/3114 Before Current Era, and will therefore end in December next year.

According to the Maya beliefs, each long count ends with change and something new will be born.

The Aztec were the first ones to speak of the actual end of the world and apocalypse.

We listen and nod.

Until the researcher, having set the facts, announces that nobody can still be certain how long this long count in

fact is.

Nor when the current long count began.

– Then we confuse this with other beliefs. Some think that the end of the world comes on 21st of December 2012, which is a winter solstice. And numerology, never believe in any of that.

The End Will Come, Sometimes

So, let's forget everything about the Maya calendars, beliefs and the Bible. There is something Rami Rekola can promise with certainty: the end of the world will come sometimes.

In one or two billion years the Sun will become hotter and it will swell up.

It will become a red giant star that vaporises all water and makes the Earth volcanic place where life is impossible.

Rekola believes that the universe will end in time, because its structure expands so violently that the electro-magnetic forces keeping objects intact will be cancelled out.

But.

– It may be that such secret things lurk in the universe that change the direction of things or everything begins anew. The reason for the great big bang has not been proven scientifically either.

Does Rekola believe in God?

– I can not answer yes or no to this question.

Does Rekola believe in extraterrestrial intelligent life.

– Each real scientist will answer yes to this question.

Rami Rekola gave a presentation on the end of the world predicted by the Maya calendar in the studia generalia public lecture series in Pori last Wednesday.

Discuss

– What will the end of our world be like?

– SK24.fi

Who?

Rami T.F. Rekola

Doctor of Philosophy, researcher, astronomer.

Works at Tuorla observatory in Piikkiö (The Department of Physics and Astronomy in the University of Turku).

Several publications in the field.

Fellow of the Royal Astronomical Society

Did his school in Pori, graduated from Senior Secondary School of Meri-Pori 1989.

The abbreviation in his name, T.F., comes from names Tapani Fritiof.

Oops!

Asteroid threat

About 300 metre sized asteroid Apophis may impact the Earth in 2036 or 2037.

Impact energy corresponds with 20 000 Hiroshima atom bombs.

No worries, nowadays even kilometre sized asteroids can be kept from impacting the Earth.

An engine will be taken to the side of the asteroids to push them aside on their orbits. It will take years, so the asteroid must be detected in time.

Appendix 5: Translation of “Early Activities” article, page 11

EXPONENT

In this magazine:

No. 2 / 1993

- excursion to Hannover
- courses or the academic year 1993–1994
- declaration of the innovation competition and writing competition
- diploma of copying
- the third and fourth of the writing competition

We congratulate the new rector, professor of periodontics Keijo Paunio, for being elected into the office.

The Deltans reacquainted themselves with Hannover and Hannoverians again. Read all about the wonderful things our German colleagues had organised for them and how successful the trip was. Once you have read, you can immediately come and enrol preliminarily for the next excursion to Hannover.

Exponent 4 / 1992

Published by:

EDITORIAL

It is again the time to shed the dust of old year from one's feet and spring forward toward the new year. The past year was quite rich with events and it has brought many changes to the lives of each of us.

The year has been a celebration of Finnish independence, which is deepening further as soon we shall be part of the European integration. Much less attention has received another milestone, which is much closer to home: This year Exponent has already been published as Delta's organisational magazine for fifteen years. There have been no gaps, but the number of magazines per year has varied a little. I planned to make this issue some sort of a special issue to celebrate, but the lack of resources and largely because the last issue of the previous year was the fifteenth anniversary issue of Delta and contained writings about the history of Delta and Exponent, I felt it better to leave the celebration of Exponent to a comment in the editorial.

It takes a lot of work to prepare a magazine like Exponent and it is of utmost importance to receive material from representatives of different fields in order to compile any issue. Without writings from the chairman and other board members, the organisational magazine would be a meagre torso. I want to thank here the board of the current year for active participation in the manufacturing of Exponent. I do now want to leave without a mention any of the regular members either, who have provided a lot of material considering the circumstances. The staff members of departments have also participated commendably by answering our interview requests and by sending additional material voluntarily.

In the end I wish all our readers good and energetic new year. Let us build collaboration also next year in the benefit of ourselves and our organisational magazine.

Rami Rekola

[Contents...]

[Editorial information...]