Alfred Bader Queen's University - Herstmonceux Science Centre.

2001-2002

Attention: Please see attached form. If you have a private caregiver please provide me with a complete background check information. This information has to be done on all private caregivers. You will be able to obtain this information from the Internet or EastCastle Place human resources can obtain this information for you, at a cost of a 100.00$. If you could please have this completed by July 20th 2016. Any question please see me.

Thank you,

Teresa Jenkins, Resident Advocate.

INDEPENDENT LIVING

The resident/legal representative for healthcare must notify the Marketing and Sales Coordinator prior to making arrangements with Outside Private Personnel (OPP). All OPPs who will be providing routine services for the resident must comply with the following requirements.

Outside Personnel Provider Agreement
The Outside Private Personnel Agreement and the OPP Registration and Information Form must be completed, signed, and submitted to the Marketing and Sales Coordinator. The Outside Private Personnel Agreement must be approved for each OPP prior to initiating services.

Background Checks
The resident/legal representative for healthcare must provide a copy of the OPP's background checks listed below. The checks must have been completed within the last 60 days. If OPP does not have evidence of recent background checks, OPP shall complete all documentation necessary for Eastcastle Place, Inc. to complete such a check on the resident's behalf. Eastcastle Place, Inc. will charge the resident/legal representative for healthcare a minimum of $100 to obtain the background checks.

The resident/legal representative for healthcare will provide updated background checks at least every four (4) years for as long as OPP is providing services to Eastcastle Place, Inc. residents. OPP shall immediately inform resident/legal representative for healthcare and Eastcastle Place, Inc. of any events that may change the prior background information check provided.

1. Background Information Disclosure Form (BID)-see attached.
2. Caregiver Registry:
   Online – www.dhfs.state.wi.us/caregiver/index.htm
   Phone: 608-243-2019
3. Sexual Predator Check:
   Online – www.sexualpredators.com
   Phone: 608-240-5830
4. Wisconsin Criminal Record Check:
   Online – www.wi-recordcheck.org
   Phone: 608-266-5764
5. Wisconsin Nurse Aid Registry:
   Online – www.asisvcs.com/services/registry/search_generic.asp
   Phone: 877-224-0235

Responsibility for Services
Facility is not responsible for any claims or actions arising from the services of OPP or other acts or omissions of OPP. OPP is solely responsible for any and all claims or actions arising from OPP's acts or omission.

Communications
Communications are critical when providing multidisciplinary services. OPPs are considered part of the Eastcastle team. Concerns regarding the resident's well-being should be directed to

Herst-
monceux

Subject:
Date: Thu, 17 Jan 2002 12:53:03 -0500
From: Otto Naumann <Otto@DutchPaintings.com>

Anglo Consulting Models Meet French Gastronomy: A Study of Cultures
A few days ago I went to an elegant French restaurant with some friends, and as our waiter passed us our menus, I noticed a teaspoon poking out from his immaculately pressed shirt pocket. This seemed a bit strange to me but I ignored it until when the sommelier arrived, he too had a teaspoon poking out from his pocket. Looking around the room, I came to the realization that everyone who worked in the restaurant was similarly equipped with a teaspoon. When the waiter returned to take our order, I asked him politely "What is the teaspoon for?" He replied in a thick Parisian accent "Ah bon, the owner recently hired efficiency consultants at Anderson Consulting to review all our working procedures, and after months of statistical analysis, they concluded that our clients drop teaspoons 73% more often than the other utensils on the table, with a frequency of 3 spoons per hour per shift. By anticipating this eventuality, we can reduce the number of trips to the kitchen to replace the spoon and save time...almost an hour and a half of work per person per shift." Just as he finished his sentence, a "cling" came from the table behind us, and he instantly replaced the teaspoon that fell to the ground. He then added "You now see the simple genius of the scheme - I replace the spoon in my shirt the next time I go to the kitchen to get an order, rather than making a special trip to replace the fallen spoon." I was very impressed, and he, filled with Gallic pride, continued to take the orders at our table. While my friends were ordering, I then noticed that every male employee in the restaurant had a small black string hanging from his trouser zipper. My curiosity rose, and I couldn't resist asking the obvious question. "Excuse me," I inquired, "this may seem impolite but could you explain the black string that is hanging from the fly of all the male employees?" He whispered in a very low voice "Ah oui monsieur, tres bien, very few people have your powers of observation. The same consultant arrived at the conclusion that we could save time in the men's toilette as well." "How's that?" I asked. "You see monsieur, by attaching this string to the end of our, how do you say, *Jean-Henri*, we can pull it out in the toilette without using our hands, and by eliminating the need to wash our hands, we reduce the time we need to spend in the toilettes by 93%." "That makes sense" I replied, but after reflecting further on the concept, I couldn't help following the path of reasoning by asking "And how do you put *Jean-Henri* back in his his petite *maison*?" Leaning over and whispering in an even lower voice, he replied "I don't know how everyone else does it...*mais moi*...I use the teaspoon."

St. Louis Section
American Chemical Society

95th Anniversary
Lecture Series

Featuring:

Dr. Alfred Bader
and
Isabel Bader

Lecture:

"Richard Anschütz, Archibald Scott Couper and Josef Loschmidt: A Detective at Work"

University of Missouri
St. Louis

Benton Hall 451

September 11, 2002

Dr. Alfred Bader

Dr. Bader was born in Vienna, Austria on April 28, 1924. At the age of 14, he was sent to England to escape Nazi persecution. In 1939, he was deported as an enemy alien to Canada. He was released in 1941 to study engineering chemistry at Queen's University, Kingston, Ontario where he graduated with a degree in Engineering Chemistry in 1945. Under the direction of Louis F. Fieser at Harvard University, he graduated with a Ph. D. in chemistry in 1950. He worked for a Canadian paint company, which was acquired by Pittsburgh Plate Glass and subsequently offered a position in the research laboratory at PPG in Milwaukee in 1950. In 1951, Dr. Bader founded the Aldrich Chemical Company, which became incorporated with the Sigma Chemical Company in 1975. He has served as president, CEO, chairman and chairman emeritus of Sigma-Aldrich. In 1962 Dr. Bader became both collector and dealer in fine art when he created "Alfred Bader Fine Arts" and began operating an art gallery in the Astor Hotel in Milwaukee. Dr. Bader was the curator of "The Bible through Dutch Eyes" exhibition at the Milwaukee Art Center in 1976 and co-curator with his wife Isabel of "The Detective's Eye" exhibition in 1989. He has published widely on chemistry, art and the Bible. He has helped establish and fund through gifts and donations fellowships, scholarships, and awards in art and chemistry.

> *"I am an inveterate collector. It may be a sickness, and it began with stamps at eight, drawings at 10, paintings at 20, and rare chemicals at 30."*

-- Alfred Bader

History of the ACS in St. Louis

Chemistry came to St. Louis with the arrival, in 1800, of Antoine Saugurain, physician, chemist and explorer. The geographical situation of St. Louis, the Gateway to the West, made it the logical city, west of the Mississippi, to be a chemically oriented community. Mallinckrodt, the first chemical company west of Philadelphia, was founded in 1867. By 1903, the need for a society where chemists could meet, discuss their interests and increase their knowledge was evident. On February 3, 1903, the St. Louis Chemical Society was organized. Efforts were made to affiliate the Section to the American Chemical Society (ACS), the Academy of Science and the Society of Chemical Industries. On December 7, 1907, amongst a quite large and enthusiastic crowd, St. Louis became a member of the American Chemical Society. Activities of the Section during the next few years included the establishment of a library of Chemical journals, consultation on the "Great Water Controversy", on the method of purification of the St. Louis water systems and strong support of the Pure Food and Drug Law. In April 1920, when the Leather and Sugar Sections held their first meetings and the Dye Section became a Division, the St. Louis Section hosted the 59th National Meeting of the ACS. In 1928, there were 260 members within a territory 75 miles from St. Louis, Missouri,

and 25 miles in Illinois. The Section hosted the National Meeting, April 16-19, 1928, at the Chase Hotel. The Midwest Regional Meeting in May, 1932, drew a large crowd in spite of the Depression and the National Meeting held at the Jefferson Hotel, April 7-11, 1941, had almost 4,000 registrants. The first Midwest Award was given to a resident of the Midwest Region who has made meritorious contributions to the advancement of pure or applied chemistry or chemical education in 1944. In 1948, Charles Allen Thomas, Monsanto, was president of the ACS. The Midwest Regional Meeting was held in St. Louis that year and there were 2725 chemical plants producing 4030 items. In 1951, after topping 1000 members in 1950, Dr. Desiree leBeau, Research Director, Midwest Rubber Reclaiming Co., was the first woman to serve as Chair. During the 1960's steady progress was made in the Section. The "Chemical Bond" was initiated in 1965, continuing education courses were offered at Washington University (1965 and 1968), started the chemistry seminar program at St. Louis University and created the Steering Committee for long range planning and continuity in 1967. In 1970, the St. Louis Section Award was initiated to be given annually to members or affiliates of the Section who has shown outstanding contributions to the profession of Chemistry as well as demonstrated potential to further the advancement of the chemical profession. The excellence of Chemistry in the St. Louis area has produced several Nobel Prize winners such as Drs. Joseph Erlanger, Edward Doisy, Carl and Gerty Cori, Arthur H. Compton and William Knowles . In 1973, there were 206 firms in the St. Louis area producing chemicals and allied products with about 1,600 employees. The 1984 spring National Meeting was held in St. Louis and the Midwest Regional Meeting in 1989 and 2000. The Section has received the Outstanding Performance of a Local Section Award in 1984, 1986, 1992, 1993, 1996, 1997 and 2000. Section members, Clayton Callis and Al Heinenger, went on to become National ACS Chairs in 1989 and 1991, respectively. Currently, there are approximately 1900 members in the Section. Members are involved in the Awards, Education, Professional Activities, Program and Publicity, Younger Chemist, Women Chemist and Public Relations Committees. They are actively involved in Chemical Progress Week, National Chemistry Week and special projects such as "Speak Out - The Chemical World" and "Kids and Chemistry". The St. Louis Section continues to introduce new programs to its members and the community to further our understanding of the chemical world.

Sponsored by

St. Louis Section
American Chemical Society
and
University of Missouri - St. Louis


AMERICAN CHEMICAL SOCIETY
ST. LOUIS SECTION
95th
Anniversary
1907-2002

FAX FROM:

Dr. Alfred Bader
924 East Juneau Avenue
Astor Hotel - Suite 622
Milwaukee, WI 53202
Ph: (414) 277-0730
Fax: (414) 277-0709
e-mail: baderfa@execpc.com

A Chemist Helping Chemists

October 16, 2001

TO: Mr. Martin Hayman
Development Manager
University of Edinburgh

FAX #: 011 44 0131 650 2239

Dear Mr. Hayman,

Isabel and I had much looked forward to being in Edinburgh from Sunday, November 25th until Wednesday morning, the 28th, and then go to Glasgow.

But of course we had hoped that during those two days, Monday and Tuesday, you would invite me to give three or four lectures.

Would the National Gallery not be interested in talk #9 of the attached Menu and a combination of Chemistry and your Business School in talk #1?

The requirements for all of my talks are given on the attached Menu.

Of course we look forward to talking to Professor Osborne, though we will not be able to hide our disappointment that he has not been able to build a bridge between Edinburgh, Herstmonceux Castle and Queen's University.

In my fax to Professor Chapman I inquired whether we could again stay at the comfortable hotel near the Chemistry Department, where we have stayed twice before. Unfortunately, I have forgotten its name.

Of course we look forward to talking with you on October 27th.

With best regards I remain

Yours sincerely,

Alfred Bader
AB/az
Att.

Dr. Alfred Bader
2961 North Shepard Avenue
Milwaukee, Wisconsin 53211

(414) 962-5169

February 7, 2002

Mr. Stephen Phillips
West Wing, Carters Corner Place
Hailsham. East Sussex BN27 4HX
ENGLAND

Dear Stephen,

I have Principal Leggett's permission to share his fax of February 5th with you.

Of course we very much hope that you will be able to work out a lease agreement and then be successful in your application to the lottery fund.

With best regards to you and Simone, I remain

Yours sincerely,

Alfred Bader
AB/az
Enc.

Dr. Alfred Bader
2961 North Shepard Avenue
Milwaukee, Wisconsin 53211

(414) 962-5169

February 7, 2002

Mr. Steven Pizzey
The Science Centre
Herstmonceux Castle
Hailsham BN27 1RP
ENGLAND

Dear Steven,

I have Principal Leggett's permission to share his fax of February 5th with you.

I am of course happy that Queen's is agreeable to extending your lease to 50 years, and understand the difficulties of making my gift to the Science Centre through Queen's.

There are other ways for me to make gifts to you which are tax-deductible to me, and I would appreciate your air mailing me a simple description of the Science Centre's activities.

One of your interesting printed folders will suffice.

With all good wishes I remain

Yours sincerely,

Alfred Bader
AB/az
Enc.
C: Principal William Leggett

Subject: INAT
From: Stephen Phillips <stephen@montsegur.clara.net>
Date: Mon, 11 Feb 2002 16:47:24 +0000
To: baderfa@execpc.com

Dear Alfred,

I hope you and Isabel are very well. Just to let you know that we received the copy of Principal Legget's letter to you along with your accompanying note, for which, many thanks.

The Trust will meet soon to discuss progress on the arrangements for a lease.

Recently we have made encouraging progress with some European funding bodies, with several new grant-givers now aware of and excited about the Observatory scheme.

Stephen and I continue with our enthusiasm unabated and are convinced that something marvellous and visionary can be achieved with this extraodinary building for the arts.

Our best wishes,

Simone

ITINERARY
FOR

Dr. Alfred Bader

Feb. 21	Mon.	Lv. Milwaukee Ozark Airlines # 607 Lunch served	12:10 P M
		Ar. St. Louis	1:14 P M
Feb. 22	Tues.	Lv. St. Louis Republic Airlines # 403	4:50 P M
		Ar. Milwaukee	5:50 P M

Reconfirm return reservations with Republic in St. Louis - 621-9177

Kosher meals have been requested for meal service.

H A V E A G O O D T R I P

ITINERARY
FOR

9 Dec 2001

Dear Alfred,

Thanks for giving us a copy of the INAT accounts. We can't comment on the accuracy of anything except the payments made to us.

Unfortunately the accounts indicate that we were paid £1,000 over the year and in fact we were paid only £250.

Shelley accepted the £250 on 30.12.2000 for his work arranging music for the Three Divas programme.

The next £500 listed on 30.4.2001 is money which was awarded to Shelley by South East Arts for his Kaddish. Shelley agreed to donate his commisioning fee for composing the piece to Castle Concerts because the performance we gave of it at the castle lost money. Stephen insisted that it go through INAT possibly so that he could say that INAT had received the grant and then paid it to Shelley. The cheque from South East Arts was paid to Shelley, who gave it to Tom, who gave it to Stephen who then gave it back to Tom to pay us for our performances at the Castle Concert in March. We tried to argue with Stephen that it was ridiculous but he had already convinced Tom and we didn't want to come into serious conflict with anybody.

The last £250 listed as paid to me for work on the Midsummer Madrigals was returned by me with the enclosed letter.

M & S

Diana Gilchrist Katz
30 The Ridgeway
Herstmonceux BN27 4PQ

Stephen Phillips
West Wing
Carter's Corner Place
Hailsham BN27 4HX

4.7.01

Dear Stephen,

Many thanks for your kind letter. We were pleased to lend our support in whatever capacity seemed most helpful and it is always gratifying to be involved in events which bring pleasure to the public and which assist young performers in gaining experience.

However, concerned as we were that the event might not make a profit, we happily volunteered our efforts. It would have been nice if the return on the investment of all the generous individuals involved was such that each could have been properly rewarded for their efforts, but that was never an expectation!

We were touched by your gesture of sending us a cheque for £250 but under the circumstances we don't feel that it would be right to cash it. Please consider this to be one of our ways of promoting the greater project.

We look forward to participating in the production of other medium-scale events. Certainly, the knowledge we all gained through this experience will help with any future endeavors.

Finally, when I e-mailed you last Saturday with some post-performance observations I didn't single out Simone's efforts on the programme which I thought was beautiful. Please give her my compliments along with those of several others.

With best wishes,

[illegible]

FOR: [illegible] BAD [illegible]

SEND

RECEIVE [illegible]

01144[illegible]307

FAX FROM:

Dr. Alfred Bader
2961 N. Shepard Avenue
Milwaukee, WI 53211
Ph: 277-0730
Fax: 277-0709
E-mail: baderfa@execpc.com

March 19, 2002

TO: Mr. Stephen Pizzey
Science Projects Ltd.

Page 1 of _1_

FAX: 011 44 20 8741 2307

Dear Stephen,

I would like to arrange to send a cheque to you which, as you know, could not be sent via Queen's. Please let me know whether the cheque should be made out to Science Projects Ltd. or to the Observatory Science Centre and whether it should be sent to you at Herstmonceux or in London.

With best regards I remain

Yours sincerely,

Alfred Bader
AB/az


THE OBSERVATORY
CITIZEN CORPS

FACSIMILE TRANSMISSION

To Sandy Montgomery
Company ISC
Fax No 01323 834499
From Sheila Snowden
Date 8/3/2
No pages 8

Science Projects Ltd.
20 St James Street
Hammersmith
London
W6 9RW
T +44 (0)20 8741 2305
F +44 (0)20 8741 2307

Sandy

Here is a copy of our memorandum of Association. The original is rather faint so if it does not come through clearly let me know and I will post it to you

Sheila.

Notes to add to the Memoranda and Articles (Science Projects) regarding the Observatory Science Centre, Herstmonceux.

The centre has recently received a Heritage Lottery Award to renovate the buildings and surrounds and restore the historic telescopes housed in the domes. In addition to this work the educational activities and resources of the centre will be enhanced by the addition of an exhibition, publications and courses to interpret the workings of the observatory.

The intention of the Trustees is to develop the Observatory as a regional centre for informal science learning. At present the centre runs day courses for children, an astronomy course for adults, activities for school visits, interpretive tours for visitors and family events in addition to its exhibitions.

The exhibitions are designed and built at the Charity's London Workshop.

Stephen Pizzey (Director)

Science Projects
20 St James Street
London W6 9RW

Tel. 020 8741 2305

Observatory Science Centre
Hailsham
E. Sussex BN27 1RN

Tel. 01323 832731

08/03/2002

THE COMPANIES ACT 1985

COMPANY LIMITED BY GUARANTEE AND NOT HAVING A SHARE CAPITAL

MEMORANDUM OF ASSOCIATION

- of -

SCIENCE PROJECTS

1. The name of the Company shall be SCIENCE PROJECTS (in this Memorandum called "the Charity").

2. The registered office of the Charity shall be in England.

3. (a) The charitable objects for which the Charity is established are to educate the public generally in respect of science and technology in all its branches and, in particular, (without diminishing that generality) to promote the same by assembling and putting on interactive exhibitions of every kind including the commissioning and procuring of the things to be exhibited thereat.

(b) In furtherance of the above object but not otherwise the Charity shall have the following powers:-

(i) to promote the invention creation and use of scientific and technological resources of all kinds including artistic manifestations and applications in and towards the objects aforesaid by any and every charitable means

(ii) to promote the creation and exhibition performances and display of travelling and interactive science and technology exhibits models and phenomena of all kinds in and towards the objects aforesaid

(iii) to organise or procure the organisation (temporary or permanent) of exhibitions performances and displays as aforesaid and the provision of educational and explanatory materials and resources of all kinds in relation thereto (whether by sale or otherwise) and facilities ancillary to all the foregoing

(iv) to arrange and provide for or join in arranging and providing for the holding of conferences, competitions, exhibitions, meetings, lectures, colloquia, classes, seminars and training courses

(v) to promote and carry out or assist in carrying out research, surveys and investigations and topublish the useful results thereof

(vi) to collect and make available information on all matters affecting or relating to the said objects and exchange such information with other bodies having similar objects, whether in the United Kingdom or elsewhere

(vii) to procure to be written and print, publish, issue and circulate gratuitously or otherwise papers, books, periodicals, pamphlets or other documents, films, exhibits, devices, displays, records or other media of communication

(viii) to employ or engage any person including (subject to Clause 4 hereof) any member of the Charity for the purposes aforesaid or any of them at such remuneration and on such other terms and conditions (including pension and insurance arrangements) as the Charity may determine

(ix) to establish promote amalgamate or co-operate with or become a part of or member of or affiliate to or associate of or act as or appoint trustee(s) agent(s) nominee(s) or delegate(s) to control manage and superintend any charitable institutions trusts associations or bodies incorporated or unincorporated the objects of which are wholly or in part similar to those of the Charity

(x) to promote development work on new means of explaining to and educating people of all ages and abilities in scientific and technological developments and phenomena

xi) to engage in any trade (on a temporary basis only) ancillary to promotion of the purposes aforesaid

(xii) to undertake and execute or to create any charitable trust and to support or subscribe to any charitable fund or institution

(xiii) to purchase take on lease tenant licence hire or otherwise acquire and hold any real or personal property and any rights or privileges therein and to

construct erect alter improve and maintain any buildings thereupon

(xiv) subject to such consents as may be required by law to sell grant leases tenancies or licences or dispose of mortgage or in any way turn to account all or any of the property or assets (real or personal) of the Charity and to do so for or without any consideration and subject to such terms and conditions as may be thought expedient

(xv) to provide endow furnish and fit out with all necessary furniture and other equipment and maintain and manage such offices and centres as the Charity may require from time to time (whether for its own use or not)

(xvi) subject to such consents as may be required by law to borrow or raise money upon such terms and on such security (if any) as may be considered expedient and in particular by means of any mortgage debenture charge or lien upon all or any of the property and assets of the Charity (both present and future) and by the issue of any securities

(xvii) to invest or loan the moneys of the Charity not immediately required for its purposes in or upon such investments security (if any) or property on such terms as the Charity shall think fit from time to time subject nevertheless to such conditions (if any) as may for the time being be imposed or required by law and subject also as hereinafter provided

(xviii) to procure contributions to the Charity by personal or written appeals, public meetings or otherwise and to accept gifts

(xix) to apply for and obtain any Charter Act of Parliament or Provisional Order for any purpose which may be deemed expedient and to oppose any proceedings which may seem calculated directly or indirectly to prejudice the interests of the Charity

(xx) to enter into any arrangements with any government or authority (supreme municipal local or otherwise) and to obtain from any such government or authority any rights privileges and concessions and to carry out exercise and comply with any such arrangements rights privileges and concessions

(xxi) to procure the Charity to be registered or recognised in any part of the British Commonwealth or in any foreign country or place and to establish branches or parallel organisations therein

(xxii) subject to Clause 4 hereof and to the Articles of Association to appoint or retain on such terms as to remuneration and otherwise any person firm association or company to carry out any of the managerial or administrative functions activities or powers of the Charity including but without prejudice to the generality thereof the administration and management of all or any part of the property and assets of the Charity

(xxiii) to do all such other lawful and charitable things as are necessary for the attainment of the main object

PROVIDED THAT:-

in case the Charity shall take or hold any property which may be subject to any charitable trusts the Charity shall only deal with or invest the same in such manner as allowed by law having regard to such charitable trusts

the object of the Charity shall not extend to the regulation of relations between employers and workers or organisations of employers and organisations of workers

the Charity shall not engage in any activity which has not as an object directly or indirectly the furtherance of the charitable objects of the Charity

in case the Charity shall take or hold any property subject to the jurisdiction of the Charity Commissioners for England and Wales the Charity shall not sell mortgage charge or lease the same without such authority approval or consent as may be required by law and as regards any such property the members of the Board of the Charity shall be chargeable for such property as may come into their hands and shall be answerable and accountable for their own acts receipts neglects and defaults and for the due administration of such property in the same manner and to the same extent as they would have been as such members of the said Board if no incorporation had been effected and the incorporation of the Charity shall not diminish or impair any control or authority exercisable by the Chancery Division or the Charity Commissioners over the members of the said Board but they shall as regards any such property be subject jointly and separately to such control or authority as if the Charity were not incorporated

(c) Words defined in the Articles of Association of the Charity for the time being shall (unless the context clearly otherwise requires) have the same meaning in this Memorandum

4. (a) Subject to the remaining paragraphs of this Clause income and property of the Charity whencesoever derived shall be applied solely towards the promotion of the objects of the Charity as set forth in this Memorandum of Association and no portion thereof shall be paid or transferred directly or indirectly by way of dividend bonus or otherwise howsoever by way of profit (which shall not refer to or include reasonable and proper remuneration as referred to in sub-Clause (b) of this Clause) to the members of the Charity

(b) Nothing herein shall prevent the payment in good faith to any officer or servant or agent of the Charity or to any member of the Charity or other person of

(i) reasonable and proper remuneration in return for any service or services rendered

(ii) interest at a rate not exceeding 2% less than the base lending rate for the time being of the Charity's clearing bankers or at a rate of 3% (whichever is the greater)

(iii) a reasonable and proper rent for premises demised or let

(c) Subject to Article 55 no member of the Board of the Charity shall be appointed to any salaried office of the Charity or any office of the Charity paid by fees and no remuneration or other benefit in money or moneys worth shall be given by the Charity to any member of the said Board except repayment of out of pocket expenses and such payments as are referred to in sub-paragraphs (ii) and (iii) above but this paragraph (c) shall not apply to a payment to any company in which a member of the said Board shall hold shares carrying not more than 1l per cent of the votes attaching to or of the total par value of the shares of the company of any kind in issue

(d) In respect of any payment to any officer servant agent or member of the Charity mentioned in this clause any Board member personally interested shall neither deliberate nor vote in respect thereof

5. The liability of the members is limited.

6. Every member of the Charity undertakes to contribute to the assets of the Charity in the event of its being wound up while he is a member or within one year after he ceases to

be a member for payment of the debts and liabilities of the Charity contracted before he ceases to be a member and of the costs charges and expenses of winding up and for the adjustment of the rights of the contributories among themselves such amount as may be required not exceeding Ten Pounds

7. If upon the winding up or dissolution of the Charity there remains after the satisfaction of all its debts and liabilities any property whatsoever the same shall not be paid to or distributed among the members of the Charity but shall be given or transferred to some other institution or institutions established for charitable purposes only having objects similar to or comparable with the objects of the Charity and which shall prohibit the distribution of its or their income and property amongst its or their members to an extent at least as great as is imposed on the Charity under or by virtue of Clause 4 hereof such institution or institutions to be determined by the members of the Charity at least 28 days before any final dissolution failing which by the Board and if and so far as no such determination is made or effect cannot be given to such provisions then to some charitable object

8. Article 1 shall be deemed incorporated into this Memorandum

WE, the several persons whose Names, Addresses, and Descriptions are subscribed are desirous of being formed into a Company in pursuance of this Memorandum of Association

NAMES, ADDRESSES AND DESCRIPTIONS OF SUBSCRIBERS

ANTHONY LAWRENCE TOMEI 100, HIGHGATE WEST HILL, LONDON N6 6NR, CHARITY EXECUTIVE.

STEPHEN DIZZEY 67 Eccles Road London SW11 1LY

DATED the 2nd October 1987

WITNESS to the above signatures -

JENNIFER DYER
20 OLD BAILEY
LONDON EC4M 7EN.

Science Projects

20 St James St
Hammersmith
Lon

Dr. Alfred Bader
2961 North Shepard Avenue
Milwaukee
Wisconsin 53211
USA

11 February 2002

Dear Dr. Bader,

Thank you for your letter and your continued efforts on our behalf. I outline the main activities of the science centre below. Our intention is to expand our activities as a centre for informal learning as well as an exhibition centre at an historic site.

The activities which comprise the centre are:

1. **Preservation and interpretation** of the telescopes and observatory buildings.
2. **Science exhibits and exhibitions** for the general public.
3. **Special events** such as observing evenings, conferences and family weekends.
4. **Workshops and training** days such as our SEDs (science experience days).
5. **Curriculum enhancement** activities for schools.
6. **Graduate and post graduate projects** using the telescopes (proposed)

I enclose our leaflet and brochure.

Yours sincerely,

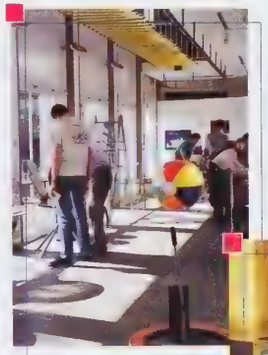
Stephen Pizzey

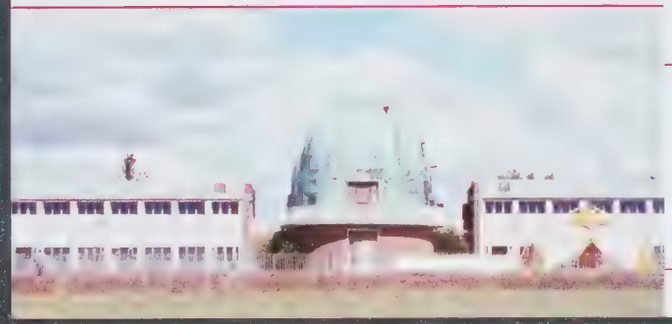
Shop and Café

Gifts, books, souvenirs and science toys are on sale in our shop, and you can enjoy a range of refreshments, drinks and snacks in the café.

Special Events

Our year-round events programme includes *Viewing Evenings* with the historic telescopes, *Holiday and Half-term Activities* for children, a *Family Activities Weekend* (13-14 July 2002), and a 12-week *Evening Astronomy Course* for beginners (September to December). For details, and to book places, please phone 01323 832731.





Opening Times

We are open seven days a week from 9-17 February, and from 23 March – 3 November 2002
Hours: 10.00am – 6.00pm (5.00pm in February, October and November).
Last admission one hour before closing.

Group Visits

We are open for pre-booked visits and for children's parties from February to November. Please phone 01323 832731 to request an information leaflet or make a booking.

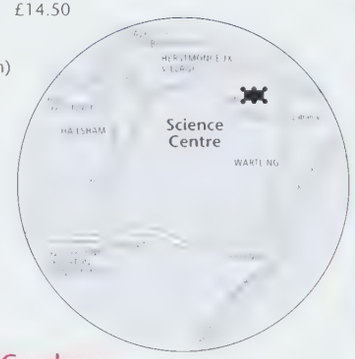
Admission Charges

Adult	£4.95
Concessions	£3.65
Children (4-15 yrs)	£3.65
Family group	£14.50

(Family group covers 2 Adults + 2 Children or 1 Adult + 3 Children)

How to find us

The Observatory Science Centre is in East Sussex, two miles east of Herstmonceux village, on the Boreham Street to Pevensey road. Look for the sign to 'Herstmonceux Castle and Science Centre' from the A271.



Herstmonceux Castle Gardens

Herstmonceux Castle is adjacent to the Science Centre. If you wish to visit both the Centre and the Castle grounds, please purchase a combined ticket from the Castle Entrance Kiosk before visiting the Science Centre.

THE OBSERVATORY SCIENCE CENTRE
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Website www.science-projects.org

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THE OBSERVATORY SCIENCE CENTRE

HERSTMONCEUX SUSSEX

Hands-on Science among the domes and telescopes of a world-famous astronomical observatory

Historic Astronomy Site

With its domes and telescopes, the Science Centre is part of the former home of the Royal Greenwich Observatory. Savour the unique atmosphere of a place where astronomers studied the heavens on every suitable night from the 1950s to the 1980s, and visit some of their giant telescopes now on display.

Set amid beautiful Sussex countryside, the green domes of The Observatory Science Centre provide a unique and inviting environment for a country outing. There's plenty of picnic space, and ample free parking.

Hands-on Science

With more than 100 exciting exhibits, The Observatory is one of the country's leading Science Centres, a place where visitors of all ages can have fun as they explore and make their own discoveries.

Shake hands with yourself in the Optics Dome or investigate the *Orbit Well* in the Forces and Gravity Corridor. See tiny things made huge with the *TV Microscope*, or build your own bridge and walk across it. With exhibits indoors and out, the Centre's hands-on approach puts the emphasis firmly on doing and finding out for yourself, rather than just standing back and looking.

Exhibitions

Our Astronomy Exhibitions illustrate the work and history of the Royal Greenwich Observatory, and reveal some of what was seen and discovered with the telescopes here.

Discovery Park

Explore science on a grand scale in the **Discovery Park**, The Observatory's exciting outdoor science playground. Join with friends to try the *Balance Board* exhibit or power the *Energy Track*.

Use your muscles on the *Big Lever*. Guess who'll win the *Roller Race*, then try the *Magic Sticks*, *Echo Tube* and other giant-sized exhibits.

Admission to the Discovery Park is included in the price of your Science Centre entry ticket.

HERSTMONCEUX
SCIENCE CENTRE

Guide and Souvenir

Contents	Page

Front cover: The Yapp telescope in Dome B – see page 9.
Inset: 'Coloured Shadows' exhibit – see page 11.

Herstmonceux Science Centre is run by Science Projects Ltd, a charitable company dedicated to the promotion of science through the medium of interactive exhibits.

For information about Science Projects Ltd, phone 0181 741 2305/6 or visit our website: http://www.science-project.org.

For information about the Centre, contact Herstmonceux Science Centre, Hailsham, East Sussex BN27 1RP, phone 01323 832731 or fax 01323 832741.

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All photos are by Charlie Hooker (Herstmonceux Science Centre) except: front cover (main) - Sara Gadd (SG); p1 - local astronomy society; page 3 (both) - Royal Greenwich Observatory (RGO); p5 (lower) RGO; p6 & 7 (upper) - SG; p7 (lower) The Graphic, 8 August 1885; (background) Robert Williams/Hubble Deep Field Team (STScI)/NASA; p9 - SG; p12 (top) - David Ring; p15 - National Maritime Museum; p16 (upper) - International Study Centre, Herstmonceux Castle; (lower) - RGO; pp16-24 - all RGO except p18 (lower) - H.Weaver, T.Smith (STScI)/J.Trauger, R.Evans (JPL)/NASA, p20 (left) - Hui Yang/NASA, p24 (upper) - J.Hutchings, B.Woodgate, M.B.Kaiser, S.Kraemer/STIS Team; inside back cover (upper right) David Ring, (lower right) - Chas Parker.

Because of the need to update and maintain the Science Centre we cannot guarantee that everything mentioned in this Guide will be available on the day of your visit.

HERSTMONCEUX
SCIENCE CENTRE

WELCOME TO HERSTMONCEUX, once a world famous Observatory and now a leading Science Centre for South-East England.

There is much to see and do here. You can make your own discoveries with the many hands-on exhibits housed in the main building – and be sure to try the larger ones outside on the lawns too.

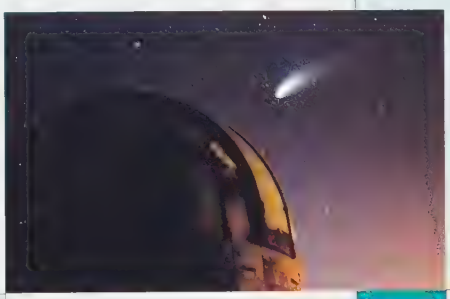
Then there is the site itself to explore, with its unusual landscaped setting and historic telescopes open for inspection. A suggested tour is described on pages 4 to 9 of this Guide.

The Centre runs a regular programme of special events, including astronomical viewing evenings in spring and autumn. For details of these, and of our special facilities for school visits, please contact any member of staff or phone us on 01323 832731.

I hope you will have a really enjoyable visit to the Science Centre and will come here again in the future. Tell your friends, too – we welcome everyone to join us in bringing this unique site back to life.

Stephen Pizzey

Stephen Pizzey
Director, Science Projects



Comet Hale-Bopp over Herstmonceux in March 1997.

Guide to the Site

Plan of the Centre

The following domes are normally open for viewing:

Dome B: (reached up stairs adjacent to the shop inside the main building): The Yapp 36-inch telescope

Dome E: The Thompson 26-inch telescope

Dome F: The Hargreaves 38-inch telescope

Introduction – the Equatorial Group

The buildings that are now the home of Herstmonceux Science Centre once housed six large telescopes belonging to the world-famous Royal Greenwich Observatory. Astronomers worked here on every suitable night from the 1950s to the 1980s, observing, measuring and photographing the stars and other night-sky objects. In 1990 the Observatory moved on to Cambridge, but most of its telescopes remained at Herstmonceux. You can visit three of them today, in Domes B, E and F.

With its six green domes, the Science Centre building is the most distinctive – and distinguished – of the new buildings constructed for the Observatory at Herstmonceux. It was officially known as the 'Equatorial Group', after the way the telescopes are mounted. A telescope on an equatorial mount can swing round on a tilted axis that is exactly parallel to the Earth's own axis of rotation; this is convenient for following the stars as the Earth's rotation makes them appear to move across the sky during the night. In 1995 the Equatorial Group came back to life as Herstmonceux Science Centre. With its many hands-on science exhibits it is now a place where everyone – not just astronomers – can make discoveries. There are over fifty exhibits inside the main building, and more outside in the grounds.

The Yapp telescope in Dome B, as set up for use in 1974.

Tour of the telescopes

We recommend a walk round the site to visit the telescopes – before or after you spend time with the hands-on exhibits. A good route is to start with **Dome E**, and then cross to **Dome F** before returning to **Dome B**, whose telescope is reached up the stairs inside the Centre. Details are on the following pages.

Beyond the Water Circuit exhibit and the DNA Climbing Frame, the silver dome of the Isaac Newton telescope can be seen in the distance. From 1967 to 1979 this housed the largest telescope in Western Europe, but it now stands empty. You can read more about the 98-inch Isaac Newton telescope on page 22.

Notice the many landscaping features around the site, such as walls, lawns, steps and the lily pond. Because of local concern, the Equatorial Group was carefully designed to look good and blend into the Sussex countryside. But features added to make the site more pleasing to the eye were far from ideal for astronomers, who have to move around in near-total darkness in order to preserve their 'night adaption' – the extra sensitivity your eyes develop after a spell in the dark. At least one person is known to have stepped straight into the lily pond at the end of a night's observing!

The six domes are set apart from each other, and at differing levels, so that they do not block each other's view of the sky.
Domes **A**, **B** and **C** along the north side originally housed reflecting telescopes mounted at first floor level. The linking buildings contained workshops, darkrooms and equipment for recoating the telescope mirrors with aluminium.
Domes **D**, **E** and **F** stand separately along the south side, and originally housed refracting telescopes.

You can find out more about the different types of telescope on pages 8-9.

Details: Architect for the Equatorial Group – Brian O'Rorke. Completed 1958. Faced with wood-burnt West Sussex brick. Balconies and window surrounds in Portland stone. Terrace paved with York stone, with Portland stone steps and edgings.

The domes of the Equatorial Group were clad in copper sheet and coated with a chemical that has helped them weather to today's distinctive green – another feature intended to make the buildings blend into the Sussex countryside. Today most observatories have domes painted white or silver to reflect away daytime heat. Light pollution from nearby Eastbourne is all too apparent in this time-exposure.

The Equatorial Group in construction in 1955. When you leave the Centre, look back at its 'flint-knapped' external walls. Flint-knapping is an ancient skill, also used to make stone tools and weapons, in which lumps of flint are shaped by striking them with precisely aimed blows.

Dome E *The Thompson 26-inch refractor*

This is one of the largest refracting telescopes in the world. Between 1897 and 1988 it was used to take 60,000 photographs of the night sky.

The telescope works as a powerful camera. A glass lens is fixed inside the top of the large grey tube and the 'film' – actually a six-inch square glass plate coated with photographic emulsion – goes at the other end. The rest of the tube is empty.

The Thompson telescope catches starlight with a giant lens that weighs 19 stone (118 kg).

Look for the smaller guiding telescope that rides piggyback on the main one. By looking through this guider the observer can ensure that the main telescope is trained on exactly the right spot in the sky.

Although its moving parts weigh nine tonnes, the telescope is finely balanced and can easily be turned to point to different areas of the sky. Looking overhead, you can see that the dome has shutters which open so that the telescope can see out. Electric motors mean that the roof of the dome can be made to rotate at the push of a button.

An unusual feature of this dome is its floor, which can be made to rise and fall like a lift. This means that the observer can easily gain access to the lower end of the telescope, whether it is pointing vertically or nearly horizontally.

Because its tube is so long, the Thompson telescope takes large-scale photographs (like using a zoom lens on a camera). This makes it useful for 'positional astronomy' – measuring the exact positions of stars in the sky. From this it is possible to work out how fast the stars are moving and how far away they are – see page 20 for details). This telescope can photograph stars that are 100,000 times fainter than the faintest ones we can see with the naked eye.

Details: Constructed by Sir Howard Grubb, Dublin, 1896. Cost: £5,000, roughly equal to £200,000 today, the gift of Sir Henry Thompson, a London surgeon. Objective lens (doublet): aperture 66 cm, focal length 6.82 m. Faintest stars photographed: ~19th magnitude. Main uses: stellar parallaxes and proper motions, photographic photometry of quasars, supernovae etc. Guiding telescope: objective by Merz (1859): aperture 33 cm, focal length 5.44 m.

A century of astronomical progress separates the Thompson telescope (shown here with the dome floor raised) from the Hubble Space Telescope, whose first Deep Field image of extremely remote galaxies forms the background to this page.

The guiding telescope attached to the 26-inch also has a long history. Its 12.8-inch main lens was originally used in a telescope known as the 'Great Equatorial' at Greenwich, acquired in 1859 by the then Astronomer Royal, Sir George Airy. The engraving shows it in use in 1885.

Dome F *The Hargreaves 38-inch reflector*

This is the largest and newest of the Herstmonceux telescopes, but has never been used for serious observing. It was built in 1960 for an observatory in the Belgian Congo in Africa, but civil war broke out there before it could be installed. It was eventually brought to Herstmonceux where tests showed that it was unsuitable for use for astronomical research here. As well as being used as a normal reflecting telescope, with its large mirror at the bottom facing up the tube, the Hargreaves could also be converted into a Schmidt telescope *(see below)*.

Refractors and reflectors

Refracting telescopes (like the Thompson 26-inch) collect starlight using a large lens at the top end of the tube. Reflecting telescopes (like the Yapp 36-inch) don't have this lens. Instead they collect light with a large curved mirror, facing upwards at the bottom of the tube. A Schmidt camera (like the Hargreaves 38-inch) has a mirror at the bottom and a special lens, called a 'corrector plate' at the top. This allows it to cover a wider area of sky in one photograph than can be done with a normal reflector.

The wider the lens or mirror on a telescope, the more light it catches, and hence the fainter the objects it can detect in the sky. All big modern telescopes are reflectors, because it is not possible to make and mount very large lenses.

Details: Designed and built by Cox, Hargreaves and Thomson, 1960; installed at Herstmonceux 1972. Primary mirror: aperture 96 cm, focal length 1.93 m. Intended for use at prime, Cassegrain or coudé foci, or as a Schmidt camera.

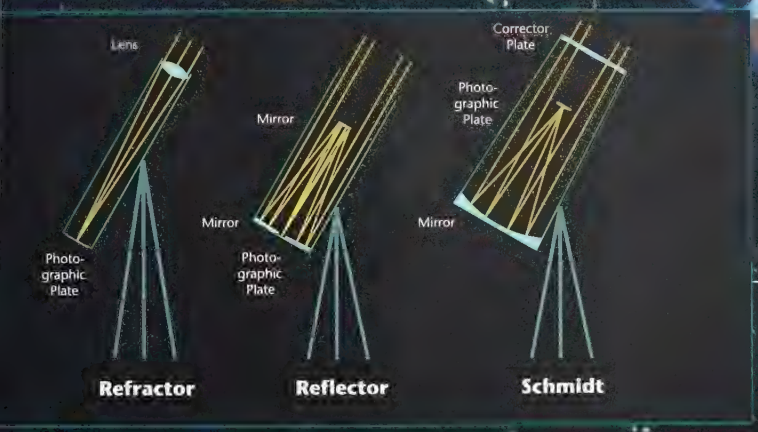
Dome B *The Yapp 36-inch reflector*

To reach this telescope go up the stairs near the Shop in the Main Building, and turn right.

This was the largest working telescope at Greenwich, and is now the second largest at Herstmonceux. Astronomers used it to find out about individual stars – how hot they are, what they are made of, and whether they are moving towards or away from the Earth.

As you can see, this telescope does not have a lens at the top. Instead there is a large concave mirror at the bottom, facing up the tube. Light from the stars falls onto this mirror and is focused back up the tube. A smaller mirror near the top of the tube reflects this light back down the tube, through a hole in the main mirror.

A special instrument called a spectrograph was attached to the telescope to split starlight into colours, like a miniature rainbow.



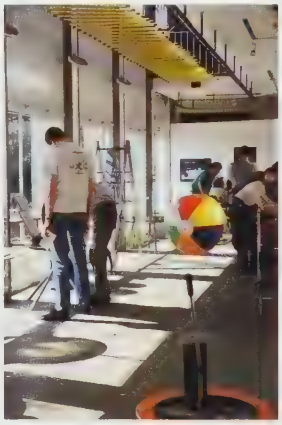
Details: Constructed by Grubb-Parsons, Newcastle-on-Tyne, 1932. Cost: £15,000 (including dome), the gift of Mr William Yapp, an industrialist. Primary mirror aperture 91 cm, focal length 4.60 m. Cassegrain focus: f/15. Used for stellar spectroscopy and photometry, and later as a testbed for equipment developed for use elsewhere – particularly the Isaac Newton telescope which is also f/15.

The Science Exhibits

Hands-on Exhibits

Hands-on exhibits fill the ground-floor corridors and domes of the Science Centre's main building – with more, larger exhibits outside in the grounds. There's no set route, so feel free to visit the exhibits in any order you like.

The challenge is to discover what you can make happen at each one. You can read about some of the exhibits in the following pages, and also in the Information Labels adjacent to the exhibits themselves.



Air Stream. It's no great surprise that the ball is held up by air blowing against its under side, but feel how reluctant the ball is to be pulled out sideways from the jet of air. Air rushing past it exerts forces – called Bernoulli forces – that lock the ball inside the jet. Aeroplane wings are carefully shaped to take advantage of the same forces, although in this case the air rushes past horizontally instead of vertically. You rely on Bernoulli forces to keep you airborne every time you travel by plane.

Atom stacking. When you stack the balls to make a neat shape you're imitating what nature does with atoms to make a crystal. There's only a small number of possible shapes that crystals can take – whether they are diamonds, snowflakes, or grains of sugar. In this model it is gravity that holds the balls down. In a real crystal the atoms hold each other in place with electric forces that behave like tiny springs linking each atom to its neighbours.

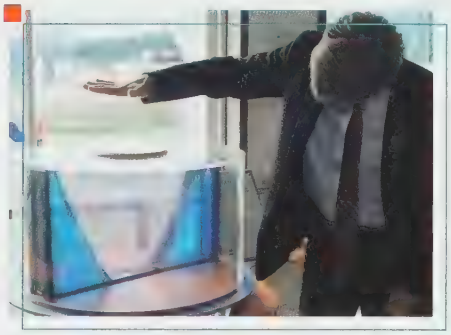
Chaotic Pendulum. This is an exhibit that never does the same thing twice. Although it looks simple, no-one can predict exactly what it will do next. This is because its behaviour depends critically on how you start it moving. Even the tiniest change in how hard you push it to start it moving can lead to a totally different pattern of movement later on. Many systems in nature show the same sort of chaotic behaviour. The best-known example is the weather; one scientist has even suggested that the weather patterns we have in Britain today could depend on whether or not a butterfly flapped its wings in Beijing last month!

Coloured shadows. All the colours of the rainbow can be made by mixing just three coloured lights – red, green and blue – in the correct proportions. (Different rules apply when you mix paints.) In the exhibit you can mix the primaries to make new colours, either by pressing the buttons or by making shadows. Computer screens and colour television use the same primary colours. Study a TV screen through a strong magnifying glass and you will see that the only colours that ever appear are tiny patches of red, green and blue. By varying the proportions of these three, a full-colour picture is built up.

Light house. Here you can investigate the way rays of light often change direction when they pass through shaped pieces of glass. This bending is known as 'refraction', which is why telescopes that use large lenses are called 'refractors'. Refraction also happens in the atmosphere. Light from stars is deflected slightly as it makes its way down to Earth, making each star appear to be in slightly the wrong place. Herstmonceux's astronomers had to allow for this in their accurate measurements of the positions of stars.

Microscope. Telescopes and microscopes are opposites. One looks outwards and has brought discoveries about the universe; the other looks inwards and has helped scientists unravel the mysteries of living things. With the TV microscope you can zoom in on various specimens and see details that are normally invisible. Better still, you can find your own specimens to study – like soil or an insect from outside, dust from a pocket, or the skin of your finger.

Hands-on Exhibits



Parabola tank. 'A liquid always finds it own level' – but not if it's spinning! The surface of a steadily-spinning liquid forms a shape called a paraboloid. Astronomers have put this to good use when preparing the huge glass mirrors needed for their largest telescopes. A paraboloid is exactly the shape some of these mirrors need to have, so the mirror is kept slowly rotating as it gradually solidifies from molten glass. That way the paraboloid shape gets frozen in, cutting down the time needed to grind and polish the mirror to its final form.

Sound dishes. The sound dishes are also paraboloids. One of them collects the sound from your voice and converts it into a parallel beam which carries across the Centre to the other dish. This catches the beam of sound and focuses it into the ear of the person receiving the message. On a larger scale, radio astronomers use enormous dishes to collect faint radio signals from distant objects in the universe. On a smaller scale, dishes outside our homes do the same job for television signals from satellites.

Spectroscopes. Most lamps give out a range of colours mixed together. A spectroscope can split this light back into its original colours – like turning sunlight into a rainbow. In the exhibit, atoms of neon, argon or sodium are made to glow in special lamps. Seen through the spectroscope, light from these lamps doesn't split into a rainbow; instead it forms a 'barcode' pattern of coloured spectrum lines. Each chemical element has its own barcode, which can be used like a fingerprint to identify that element wherever in the universe it may be. Herstmonceux's astronomers used spectroscopes to study what stars are made of.

Spin Stand. Lean back as you spin round slowly on the turntable. Then notice what happens as you pull yourself in towards the centre: you begin to spin much faster. It's all to do with 'angular momentum'. Ballet-dancers and ice-skaters use the same technique when they want to spin fast. In astronomy the same thing sometimes happens to stars. Many stars spin round quite slowly – roughly once a month in the case of our Sun. But some stars, when they reach the end of their lives, collapse down to a much smaller size. When that happens their rate of spin goes up enormously. Astronomers have even detected a star that spins sixty times a second.

Upside down mirror. It's easy to see that this parabolic mirror produces an image – a 'picture' of whatever is in front of it – that is upside down and is formed a little way in front of the mirror. (If you go very close to the mirror it also works like a magnifying glass). Astronomers use this type of mirror, though not so deeply dished, at the bottom of many of their reflecting telescopes. Telescope mirrors have the shiny surface, coated with silver or aluminium, on the front, so that the starlight does not have to go through any glass. The mirror in the exhibit is different; it was originally used for sending out a searchlight beam and the shiny coating is on the back where it is better protected from wear and tear.

What scientists do

Hands-on science exhibits are designed to let you make your own discoveries about how science works. We've devised the experiments, trying to make them interesting and fun to do, but they are useless without your participation. With many of the exhibits, when you use it you are asking a question of nature itself: 'Show me what happens when ...'. What happens at the exhibit is nature's answer to your question.

'Proper' science is a hands-on business too. Experiments and observations are at the root of it. Like Science Centre visitors, scientists ask questions of nature – and they have to abide by the results. Scientists can build grand theories, but if the experimental evidence disagrees, then it's the theory that has to go. As Isaac Newton himself put it: 'There is no arguing against facts and experiments'.

Astronomers at Work

The Observatory at Greenwich

King Charles II founded his Royal Observatory at Greenwich in 1675. Its purpose was a practical one: to reduce shipwrecks. At that time mariners had no accurate way of working out their position when out of sight of land. They could find their latitude (north-south position) by observing the sun or stars, but not their longitude (east-west position). As a result many sailors' lives were lost when their ships struck rocks unexpectedly.

By the 1770s the problem of longitude had been solved. One answer was for a ship's captain to carry a reliable clock to keep 'Greenwich Time' throughout the voyage. Alternatively he could use the Moon as a clock by measuring its position in the sky, relative to nearby stars, and referring to a detailed set of tables prepared annually at Greenwich. Armed with either of these time-keepers, or preferably both, mariners could make their own astronomical observations on board ship, and use them to work out their position anywhere on Earth.

Solving the problem of longitude didn't mean the Observatory had nothing to do. The essential work of measuring time and compiling tables went on from year to year, and the Greenwich astronomers developed new interests too. In particular they began to do research, studying the stars and other objects in the sky, to find out what they are and how they work.

The original Observatory in Greenwich Park, a few years after it opened. The first Astronomer Royal, John Flamsteed, erected an unwieldy 60-foot long telescope, visible on the right in this painting.

Night duty at Herstmonceux

By the early twentieth century, London had expanded so much that Greenwich was enveloped. The city's smoky air and bright lights meant that astronomers could no longer study faint objects in the night sky.

The remedy was to move the whole Observatory to the clearer, darker skies of Sussex. The transfer began in 1947, and by 1958 the Royal Greenwich Observatory was fully up and running at Herstmonceux. The people who actually operated the telescopes at Herstmonceux were called 'Night Observers'. They were on duty every night when the sky was clear and the Moon not too bright. On the Thompson 26-inch telescope, for example, the Night Observer's job was to line up the telescope on a succession of specified points in the sky, working from a prearranged list of 'shots', and to load in a photographic plate for each shot and expose it for a time that usually ranged from five minutes up to an hour or more. It was precision work which required much care and skill. Cold was a great enemy, since the domes had to be unheated to prevent currents of warm air blurring the photographs.

Herstmonceux Castle was the headquarters of the Observatory and official residence of the Astronomer Royal. The Castle gardens are now open to the public daily from Easter to October; tickets may be obtained from the kiosk near the Science Centre Car Park.

JUPITER, 1953 295

Date	Apparent Right Ascension		Apparent Declination		Polar S.D.	Hor. Par.	True Distance from the Earth		Meridian Passage
	h m s	s	° ′ ″	″	″	″			h m
Aug. 16	5 21 28·50	+41·86	+22 33 43·2	38·9	16·84	1·01	5·457 338	−13 439	7 44·1
17	5 22 10·36	41·37	22 34 22·1	37·7	16·88	1·62	·443 908	13 530	7 40·8
18	5 22 51·73	40·89	22 34 59·8	36·6	16·93	1·62	·430 378	13 629	7 37·6
19	5 23 32·62	40·39	22 35 36·4	35·4	16·97	1·62	·416 749	13 724	7 34·3
20	5 24 13·01	39·88	22 36 11·8	34·3	17·01	1·63	·403 025	13 817	7 31·1
21	5 24 52·89	+39·37	+22 36 46·1	33·3	17·05	1·63	5·389 208	−13 907	7 27·8
22	5 25 32·26	38·86	22 37 19·4	32·2	17·10	1·64	·375 301	13 995	7 24·5
23	5 26 11·12	38·33	22 37 51·6	31·1	17·14	1·64	·361 306	14 080	7 21·2
24	5 26 49·45	37·80	22 38 22·7	30·1	17·19	1·65	·347 226	14 164	7 17·9
25	5 27 27·25	37·26	22 38 52·8	29·1	17·23	1·65	·333 062	14 243	7 14·6

Part of the Nautical Almanac for 1953. When these figures were calculated at Herstmonceux the word 'computer' still meant a person who did calculations by hand. By the end of the 1950s the Nautical Almanac Office had its first electronic computer.

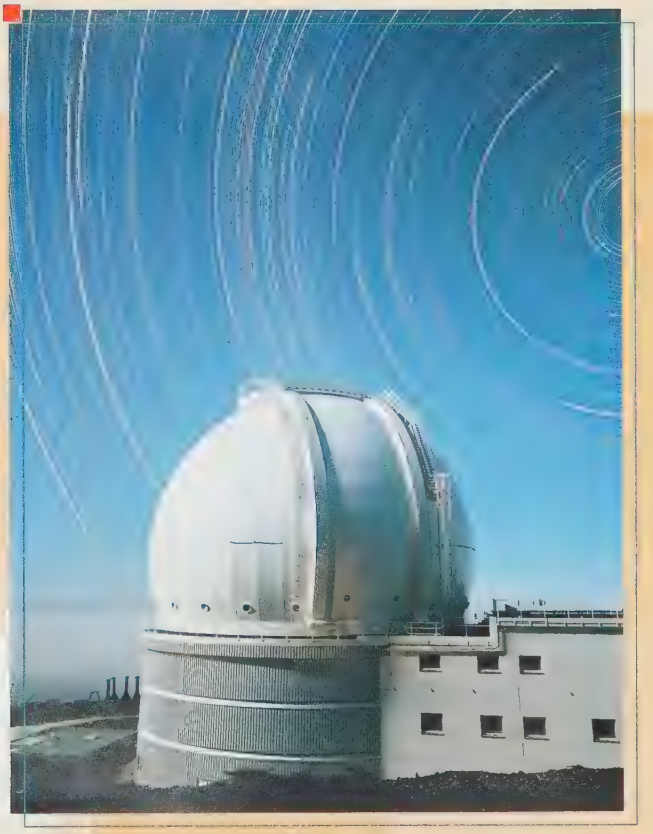
On the move again

The Observatory's stay in Sussex was to be a brief one, little more than three decades. The main problem this time was that astronomy itself was changing. Research was now done with huge telescopes that took advantage of the crisp and cloudless air at carefully-chosen mountaintop sites around the world. Cheaper air travel meant astronomers could fly out to these sites when necessary. With much of its observational function gone, there was less justification for retaining the Observatory's rural site. It was thought that economies could be made by locating its remaining activities closer to other institutions.

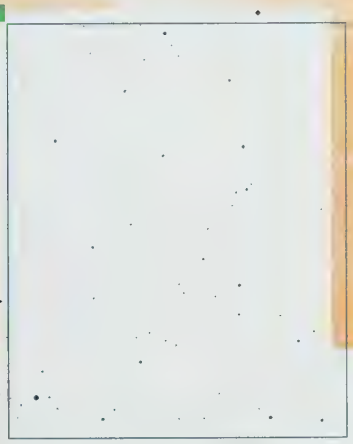
So in 1990 the Observatory moved its headquarters again, this time to Cambridge. Here its stay was to prove even shorter. In 1998 most of the historic institution's remaining functions were transferred elsewhere, leaving the remnants of King Charles' 323-year-old Royal Observatory with a very uncertain future.

With this 'Photographic Zenith Tube' astronomers could time the exact instant when a star crossed the meridian (the north-south line through Herstmonceux) to better than a hundredth of a second. The instrument was so sensitive that it could detect tiny movements at Herstmonceux synchronised with the rise and fall of the tide in the English Channel. They arise because the extra weight of water in the Channel at high tide causes the whole of coastal Sussex to tilt downwards very slightly, taking the Observatory and its telescopes with it.

As custodians of the nation's time, Herstmonceux staff for many years supplied the 'pips' for the BBC time signal. At first the Earth's rotation was used as the ultimate timekeeper, but later, atomic clocks took over, accurate to one second in 300,000 years. The Earth is a less steady timekeeper, and its rotation slows by more than a thousandth of a second every 100 years.



The 4.2-metre William Herschel reflector in the Canary Islands, jointly established by astronomers from Herstmonceux and elsewhere in the 1980s. In this all-night exposure the Earth's rotation has turned starlight into trails.



Part of a plate exposed on the Thompson telescope in 1979. Every dot is a star, with brighter stars producing larger dots. Many hours were spent measuring the positions of individual stars on plates like this, to an accuracy of one-fiftieth the width of a human hair.

Exploring the Universe

The solar system

Herstmonceux's astronomers focused their telescopes on a wide variety of objects in the night sky. In the following pages we take a brief tour of the universe, with the help of Herstmonceux photographs and more recent images from the Hubble space telescope, starting close to home with the solar system.

The solar system is the only part of the universe that has been directly explored, mainly by unmanned spacecraft despatched from Earth. The Sun is at the centre of the solar system, with the Earth and other planets orbiting around it. Most planets are circled by their own Moons – at least eighteen of them in the case of Saturn. The solar system also includes miniature planets called asteroids, and comets which occasionally swoop in from distant parts and grow glowing tails as they approach the Sun.

A new moon of Jupiter was discovered with the Thompson 30-inch reflector now in Dome A at Herstmonceux (inset).Tiny dots on photographs taken by P. Melotte at Greenwich in 1908 turned out to be an unknown satellite, orbiting backwards round the giant planet. Christened Pasiphae, the satellite is less than twenty miles across. This is one hundredth the size of another of Jupiter's satellites, Io, here seen crossing in front of the planet, and casting its shadow on it, in an image taken by the Hubble telescope in 1994.

History was made, and Einstein vindicated, with this photograph taken through the lens of the 13-inch refractor now in Dome D at Herstmonceux. The lens was taken to Brazil to photograph a total eclipse of the Sun on 19th May 1919. Stars near the Sun (clearly visible on the original plate and circled in this photograph) appeared slightly out of place. This was because the light coming from them had been deflected by the Sun's gravity. This direct confirmation of one of the predictions of Einstein's General Theory of Relativity caused a scientific sensation.

A laser beam reflected from Earth satellites passing overhead helps Herstmonceux's Satellite Laser Ranger to measure the Earth with great precision. Its results, with those of other similar stations, show that Europe and America are drifting apart, by about one centimetre a year. It also detects a twice-daily up and down movement of the ground at Herstmonceux, through a distance of about twenty centimetres. This 'land tide', caused by the gravitational pull of the Moon and Sun, is similar to the tides at sea and shows that the Earth's surface is not completely rigid. The Satellite Laser Ranger was the only part of the Observatory to remain in action at Herstmonceux after 1990. As a working scientific station it is not open to the public.

Among the stars

Beyond the solar system lie the stars. On a dark night you may see a thousand of them in the sky – each one really a Sun. Telescopes pick out millions more stars too faint for our eyes to see.

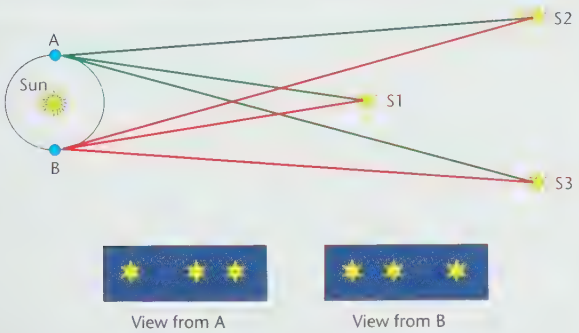
How far to the stars?

The 'parallax method', used at Herstmonceux to measure the distances to nearby stars, relies on the fact that our view of the universe changes slightly as the Earth moves round the Sun. Photographed from A, the star S1 will appear closer to S3 in the sky than to S2. Six months later, when the Earth has moved to B, a photograph of the same patch of sky will show S1 closer to S2 than to S3. In practice the apparent movement of a nearby star, compared to distant ones, is so small it can only be measured on a photographic plate using a microscope. Results show that typical nearby stars are about 50 million million miles away – a journey that would take several million years at the speed of Concorde.

Stars move through space in huge swarms called galaxies. Our own galaxy, the Milky Way, contains our Sun and 100 thousand million other stars. Most of the observing done from the Equatorial Group was concerned with the stars within our galaxy, either 'astrometry' to determine their precise positions and movement, or 'astrophysics' to find out what they are made of and how they work.

New stars are being born in this huge gas cloud or 'nebula', imaged by the Hubble telescope in 1995. The nebula is embedded in the nearby galaxy M33. Inset is a photograph of the whole galaxy taken with the Isaac Newton telescope at Herstmonceux. M33 is nearly three million light-years away and is made up of ten thousand million stars. The nebula shown in the colour image appears here as the largest white blob near the edge of the galaxy at the top left.

The Sun, like all stars, is a glowing ball of gas with a nuclear furnace at its centre. This photograph, taken from Herstmonceux on 9th May 1970 shows several sun-spots – cooler patches on the Sun's surface which sometimes send out flares that cause magnetic storms on Earth. The darker spot near the centre is the planet Mercury which happened to pass in front of the Sun that day.



The depths of the universe

Far beyond the limits of our own galaxy lie thousands of millions of other galaxies, stretching away to the farthest reaches of the universe. At Herstmonceux, galaxies, quasars and black holes were investigated with the 26-inch telescope, and with the largest telescope of all, the Isaac Newton.

The Isaac Newton telescope was the fifth largest reflector in the world when the Queen inaugurated it in 1967. Its tall dome, now empty, can be seen to the south of the Science Centre.

Because its main mirror was so large – eight feet across – the Isaac Newton telescope could collect light from extremely faint and distant objects. Astronomers from around the country booked in to use it for their deep-sky research. But by 1979 it was clear that the telescope deserved a better location, so it was rebuilt and transferred to a mountain-top site in the Canary Islands.

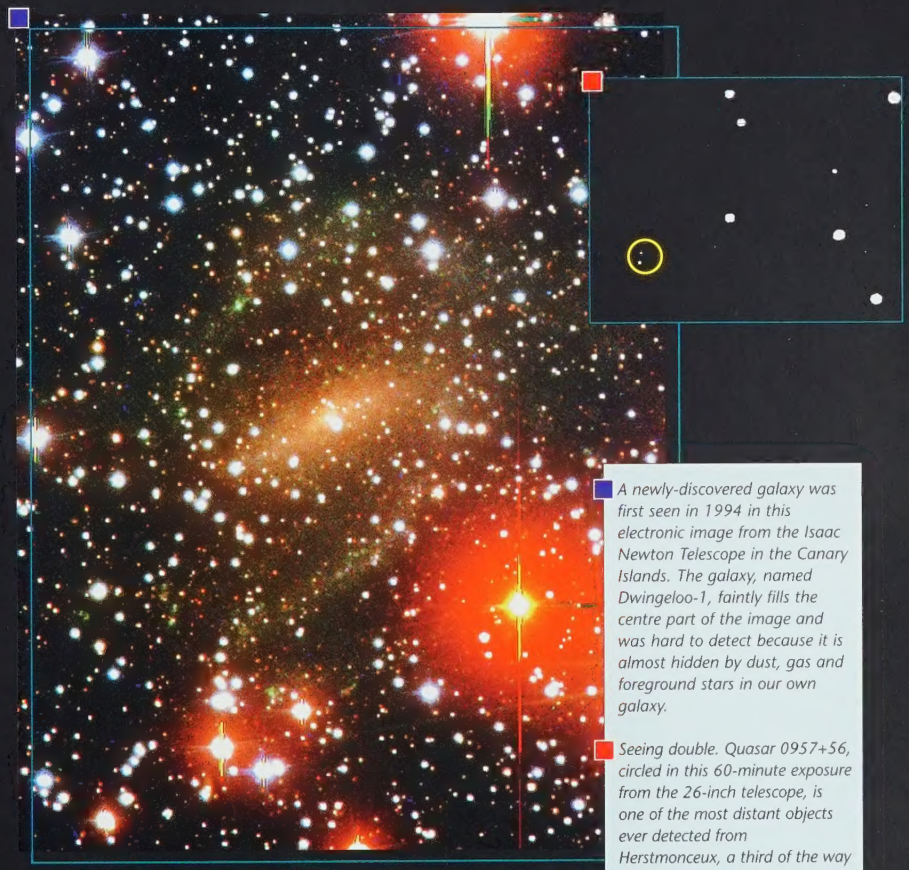
The Isaac Newton telescope weighed 100 tonnes, but could be precisely lined up on any point in the sky.

Grinding and polishing the glass for the four-tonne mirror took more than a year.

Details: Constructed by Grubb-Parsons, Newcastle-on-Tyne, 1967. Cost: about £1,000,000 (with dome). Primary pyrex mirror: aperture 2.5 m, focal length 7.5 m, used at prime, Cassegrain and coudé foci. Used for spectrography, photometry and interferometry with photographic and electronic detection.

Investigating quasars

Quasars look like stars but have 'red-shifts' as large as those of distant galaxies. (Astronomers use the red-shift – a shift in colour of an object's spectrum – to measure how far away galaxies are.) In the 1960s nobody knew what quasars were, so Herstmonceux's 26-inch telescope was pressed into service to monitor the changing brightness of one of them. The surprising result showed that the quasar's brightness could vary by as much as twenty times over a period of a few months. This meant that although the quasar might be as bright as an entire galaxy, its size must be millions of times smaller than that of a galaxy.



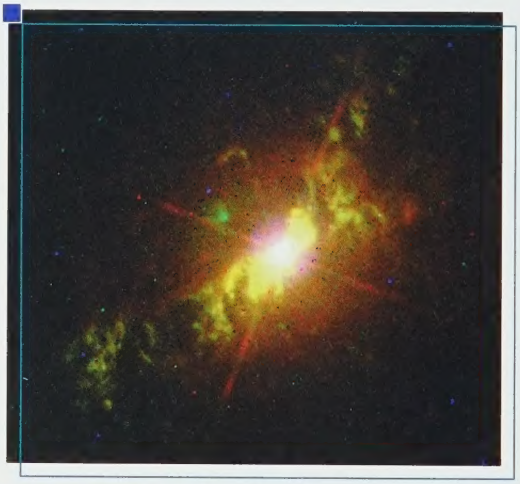
A newly-discovered galaxy was first seen in 1994 in this electronic image from the Isaac Newton Telescope in the Canary Islands. The galaxy, named Dwingeloo-1, faintly fills the centre part of the image and was hard to detect because it is almost hidden by dust, gas and foreground stars in our own galaxy.

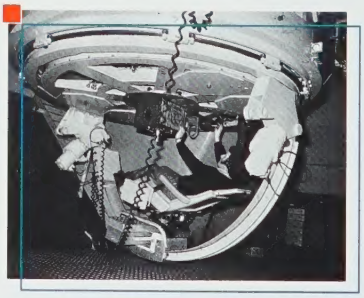
Seeing double. Quasar 0957+56, circled in this 60-minute exposure from the 26-inch telescope, is one of the most distant objects ever detected from Herstmonceux, a third of the way out to the edge of the observable universe. Astronomers think there is really only one quasar in the picture, but gravity from a nearer galaxy (not visible) works like a lens and splits the quasar's light in two.

On the track of black holes

In 1971, Herstmonceux astronomers used the Isaac Newton telescope to help track down the first known black hole, a collapsed star that had become so dense that not even light could escape its gravity.

An orbiting satellite had just discovered x-rays coming from a patch of sky in the constellation *Cygnus*. A few night's work at the Isaac Newton showed that this source coincided with a faintly-visible star, and that this star is orbiting around an ultra-heavy, but invisible, companion – detectable only by the pull of its gravity. Most astronomers now agree that this invisible companion must be a black hole, less than twenty miles in diameter but six times heavier than our Sun.





In the early 1980s, Herstmonceux astronomers played a leading role in the first team of scientists who ever 'weighed a black hole'. By observing the effects of the black hole on stars around it, they worked out that a galaxy known as NGC4151 contains at its centre a 'super-massive' black hole a thousand million times heavier than the Sun. Their conclusion was reinforced in 1997 when this image from the Hubble Space Telescope revealed a cosmic firework display at the centre of NGC4151. Astronomers believe the black hole obtains its prodigious energy supply by devouring huge quantities of dust and gas.

To operate the Isaac Newton telescope the observer sometimes rode at 'prime focus' inside the telescope, or in a cradle attached below it, as shown here.

How to find us

Herstmonceux Science Centre is in East Sussex, two miles east of Herstmonceux village, on the Boreham Street to Pevensey Road. Look for the signs to 'Herstmonceux Castle and Science Centre' from the A271.

Opening Times

The Centre is open to the public from Easter to October, and also over the local half-term periods, seven days a week from 10am to 6pm (or dusk if earlier). Phone 01323 832731 for details.

School Visits

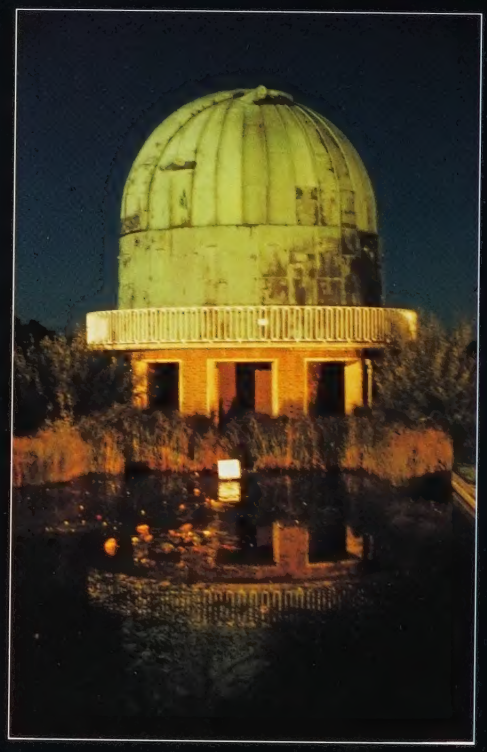
We are open for pre-booked school visits from February to November. Details of educational facilities are available in the Schools Information Leaflet.

Special Events

We run special events from time to time throughout the season. Please phone for details.

British astronaut Helen Sharman meets a 'Face-painted Alien' at a Science Centre event.

Back cover: Dome D, which houses a 13-inch refracting telescope built in 1888 and used at Greenwich and Herstmonceux for photographic mapping of the sky and for the study of comets and asteroids.



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