

### 3. Justification for Inscription





Darwin's first illustration of his theory



Darwin joined pigeon fancier clubs to discuss the differences between the birds for his research on artificial selection for *The Origin of Species* (1859)

Darwin walked along the sand-walk to reflect on his scientific ideas (previous page)

*'After all we have achieved at the Rio and  
Johannesburg Summits,  
I particularly welcome the emphasis on  
Darwin's historic role in explaining the central  
significance of biodiversity.'*

**Maurice F Strong**  
Secretary-General of the Rio Earth Summit, 1992.

# Section 3 - Justification for Inscription

## 3.a Criteria for Inscription

1. Darwin's Landscape Laboratory is nominated as a Property under the World Heritage Committee's Criteria (iii) and (vi) (Operational Guidelines (2008) paragraph 77) and as a cultural landscape.

2. Knowledge and its application is fundamental to human progress and the pursuit and application of knowledge underlies all achievements of humanity. Biological sciences underpin modern society and human survival through their role in agriculture, medicine and conservation. The natural sciences as a whole are of central importance to UNESCO because of their bearing on vital areas such as global warming, human health, the relief of poverty, and threats to biodiversity.

3. These achievements, many of which have been recognised on the World Heritage List, are in the fields of technology and agriculture as well in other fields of architecture and religion and are of Outstanding Universal Value to all. The World Heritage Convention recognises that cultural heritage may consist of monuments, groups of buildings and/or Properties which are of '*Outstanding Universal Value from the point of view of history, art or science*'. However, there is a gap in representation on the World Heritage List of Properties demonstrating scientific and technological importance. The natural sciences (physical sciences including astronomy and chemistry, and biological sciences) are particular areas under-represented on the List.

4. The World Heritage Committee has recognised this gap and in 2005 requested, 'the Director of the World Heritage Centre to further explore the thematic initiative "Astronomy and World Heritage" as a means to promote, in particular, nominations which recognize and celebrate achievements in science;' (Decision 29 COM 5B at Annex 7). In 2007, the Committee subsequently considered the benefits of exploring further the opportunities, issues and additional guidance necessary to achieve its aims in recognising and celebrating achievements of science on the World Heritage List (Decision 31 COM 9 at Annex 7). In response to this an Expert Working Group (EWG) met in London in 2008 to: assess and examine the interpretation of scientific heritage in the context of the 1972 WH Convention; identify the opportunities to celebrate landmarks of scientific achievement; develop guiding principles for the nomination and evaluation of such Properties; and recommend a framework for the Advisory Bodies to implement future thematic studies in this area.

5. In 2008 the Committee considered the recommendations of the EWG (WHC-08/32.COM/INF.10 at Annex 7) and decided that the findings should be incorporated into the Operational Guidelines for the Implementation of the World Heritage Convention (Decisions 32 COM 10A and 32 COM 13 at Annex 7). It is in the context of the World Heritage Committee's acknowledgement of these findings that the criteria for inscription for Darwin's Landscape Laboratory.

6. The key findings of the Expert Working Group (EWG) concerning the physical heritage were:

- There is often a strong link between the tangible and intangible heritage of scientific and/or technological Properties of possible Outstanding Universal Value. This is particularly so with scientific heritage, where the link to the intangible nature of 'great ideas' may be particularly strong.
- Nevertheless, for the World Heritage Convention, the focus should be upon the physical Properties, which are the tangible heritage, where great achievements of universal value were manifested, and to an extent, remain. Tangible evidence needs to survive and this can be in the form of landscape and natural features, buildings and objects.
- The tangible context for the original scientific insight is also important.
- The EWG noted that the World Heritage List is not primarily a means to commemorate famous individuals, and alternative means should be considered for recognition in most cases.
- Although each nomination should be examined on a case-by-case basis, the focus should be upon the place, or a collection of places, where the most important fundamental developments, of universal significance, occurred.



Cudham Valley

7. The Expert Working Group recognised that the principles of authenticity and integrity are fundamental to the World Heritage Convention. In the case of scientific and technological heritage, the Expert Working Group suggested that it is possible to have elements of faithful reconstruction on a Property, in exceptional circumstances.

#### Criterion (iii)

8. Criterion (iii) requires that that the nominated Property should bear a unique or at least exceptional testimony to a cultural tradition or a civilisation which is living or which has disappeared.

9. The living cultural tradition is the modern scientific approach to the understanding of the natural world by observation, hypothesis and experiment, free and wide exchange of information and ideas, theory-building and communication.

10. The Property is a supreme testimony to that tradition showing how Darwin used the compact, varied and farmed landscape around his home together with his own house and grounds as resources for observations and experiments that were landmarks in the history of science. The patterns of life Darwin first observed are still available for us to see, in the valleys, fields, woods, meadows and grounds where Darwin studied them. The ability to repeat Darwin's observations and experiments, both in the nominated Property and also elsewhere around the world are important foundations of the tradition of modern science and is a powerful education tool. His scientific work was then combined with an exhaustive exchange of ideas with fellow scientists throughout the world and culminated in the development and production at Down House, of his world changing theories that are of fundamental importance for modern culture.

*Charles Darwin's concept of evolution via natural selection pervades our entire understanding of the biosphere, and of humanity's place in nature. It is one of the greatest scientific ideas of all time. As an iconic figure, Darwin is matched only by Newton and Einstein - indeed, he has perhaps had a more pervasive influence on human culture than any other scientist. He is, more than most great men, associated with a single place where she lived, researched and wrote. Recognising the special status of Downe House and its environs would be a service to future generations who wish to understand his life and his mind.*

Lord Rees, Astronomer Royal and President of the Royal Society

*After all we have achieved at the Rio and Johannesburg Summits, I particularly welcome the emphasis on Darwin's historic role in explaining the central significance of biodiversity. It is wonderful to hear that the World Heritage Property will include the places where Darwin first studied biodiversity and envisioned the web of relations between all living creatures, and that we can see there today a wealth of flora and fauna close to those which inspired his great insights.*

Maurice F Strong, Secretary-General of the Rio Earth Summit, 1992

This unique testimony is tangibly demonstrated in two ways:

11. Firstly the farmed and wooded valley landscape of the nominated Property, that attracted Darwin and led him to work in the locality for the last 40 years of his scientific maturity until the end of his life, leaving it seldom, still contains similar resources to those he documented and, studied. Many of his important observations and experiments on plant and animal life can be repeated today on the descendents of the plants and animals that Darwin observed.

12. Darwin accessed the landscape around his house and grounds via many historic lanes and paths. These enabled him to observe ploughed fields and the growing of crops, pasture for grazing for food and fodder, woodland coppicing and the laying of hedgerows and these can still be observed using the same lanes and paths that Darwin used. The underlying geology and soils, changing over short distances adds even greater variety to this managed landscape. This wealth and diversity of landscapes and habitats meant that Darwin seldom left the nominated Property.

13. Secondly Darwin's home and grounds contain many features which he created and used in his scientific research for *The Origin of Species* and his later work on plant and animal life. The property itself was essential for his achievements as it was his main workplace and open-air laboratory during the seventeen years he worked on the theory of evolution between the first sketch he pencilled in 1842 and the final publication in 1859. Among the bespoke arrangements that he created and used in his scientific work and still extant today are the study; the greenhouse, flower garden, lawn, orchard, sheltering banks and kitchen garden and the sandwalk copse and path which he planted and created. Among the features that were created by him which can be clearly seen today are:

- the study (now furnished with Darwin's own furniture, documents and books ) he created documented in a photograph dated in the 1870's where he undertook his observations, documented his research, developed and tested his theories which he communicated to scholars world wide and wrote his books and scientific papers;
- the veranda he added to the house and on which he grew many kinds of creeper for his seminal investigations into climbing plants;
- the flower garden, lawn, orchard, sheltering banks and kitchen garden that he laid out, planted with many different species and varieties and managed for his many other studies of cultivated and wild plants, their insect pollinators and other organisms;
- the wormstone, an installation designed for his long-term scientific investigation of soil;
- the pasture he cultivated as a hay meadow and used for field experiments;
- the greenhouse and garden laboratory he built for cultivation and investigation of plants from other climates and habitats around the globe and for laboratory experiments; and
- the Sand-walk copse which he planted and maintained as an area of sheltered woodland, with the gravel path he laid down around the copse as his 'thinking path' for scientific contemplation.

**14.** The nominated Property was the setting for research of historic significance in zoology, botany and the study of biodiversity. The work was of fundamental importance for the life sciences as a whole, including core aspects of animal and plant physiology, palaeontology, ecology, anthropology, psychology, ethology, molecular biology, medical sciences and agricultural sciences. The achievement, based as it was on a uniquely effective combination of factual observation, conjecture, experiment, discussion, generalisation and exposition, stands as one of the greatest successes in history for the scientific approach as a whole.

*Charles Darwin is one of the several most important scientists of all time. His On the Origin of Species is with certainty the most important book. The incubation of his thought and the field work he conducted there make Downe one of the world's greatest historical sites.*

Professor Edward O Wilson, Harvard University, world authority on biodiversity and author of The Diversity of Life (1992)



*Insectivorous plants in Darwin's greenhouse*

#### Criterion (vi)

**15.** Criterion (vi) requires that the Property should be directly or tangibly associated with events or living traditions, with ideas or with beliefs, with artistic and literary works of outstanding universal significance. (Paragraph 77 (vi)).

*As an Ecuadorian I see Darwin first at his point of insight in the Galapagos. Among conservationists with a global view of imperatives for protection of natural ecosystems, I value the fundamental truths about the interdependence of all forms of life which Darwin discovered and explained to us. The works he produced during his years at Downe and his example in field research have been our inspiration. Darwin's heritage at Downe is of outstanding value for the world's present and future understanding of conservation needs.*

Sra. Yolanda Kakabadse, Executive President of the Fundacion Futuro Latinoamericano, former Minister for the Environment, Ecuador, and former President of IUCN

**16.** The ideas of Outstanding Universal Value with which the nominated Property is directly associated are Darwin's theory of evolution by natural selection, his explanation of global biodiversity as a fundamental principle of the natural world, and his demonstration of the ecological interdependence of all life forms. These three fundamental insights are closely intertwined and together provide the central principles for the present scientific understanding of the history of life on earth,

a. the web of interrelations between organisms in ecosystems of all ranges,

- b. the influence of human pressures on the natural world and
- c. global needs for survival.

The ideas are of such outstanding significance that they have transcended the global scientific community and become a central feature in everyday life and understanding.

**17.** The Property has unique value for humanity's understanding of those ecological processes and biological diversity because it shows how they were first clearly identified and understood by Darwin. Darwin did this through careful observations in semi-natural habitats close to human settlement; studying how the processes work, globally, in all such habitats and all others; and how they can now be understood by anyone, anywhere who looks at the wildlife around them with the appreciation Darwin gave us of the interactions between all living organisms and the endless flux they give rise to. Through his studies of the natural life in his neighbourhood at Downe and his comparisons of what he observed there with natural life in other places throughout the world, Darwin developed a truly global explanation of natural processes that is the basis for our present understanding of life on earth. The nominated Property articulates tangibly scientific understanding of the natural world, and the essential link between local views and the global perspective which Darwin developed with supreme effectiveness in his research at Downe and the outstanding series of works he produced there.

**18.** The ideas born in Darwin's Landscape Laboratory are so strong that people visited the Property as pilgrims even in Darwin's lifetime and have continued ever since. The global correspondence Darwin conducted resulted in his ideas being spread throughout the world. The Property was revered and recognised as it became a museum in 1929 and it has continued ever since to attract visitors from throughout the world. With the dawning of the development of photography Darwin became the first widely recognisable scientist. His image has since been popularly used internationally on banknotes, stamps and in cartoons. Darwin200 is an international programme of events celebrating Charles Darwin's scientific ideas and their impact focused around his two hundredth birthday in 2009.

**19.** It is one of the most distinctive and valuable features of Darwin's science that he found so many of his most important insights in the forms and life of plants, insects and animals that he observed in his everyday ordinary surroundings at Downe. Visitors to Downe are able to

see what he saw and, as they do so, to share directly in his insights. But Darwin also, most importantly, presented his findings in such a way that anyone elsewhere can share his insights in their own surroundings if they learn what to observe and most importantly, how to look. Generations of scientists and naturalists around the world have done so and made Darwin's heritage their treasured possession.

**20.** The event of Outstanding Universal Value with which the nominated Property is directly linked was Darwin's writing and publication of *The Origin of Species* (1859), one of the most influential books of all time. This transformed scientific and wider public thinking about natural life and humans' place in the natural world. The change in thinking that the book brought about was a historic stage in the development of the modern understanding of life on earth and human nature.

*Darwin's explanation of the processes of organic evolution is today the very basis of our understanding of nature and underpins biological research in every part of the world. It is humbling and salutary to realise that although as a young man he spent five years sailing round the world, he gathered and collated the vast majority of his evidence sitting in his study at Down House and observing, with unparalleled acuity, the processes of nature in his own English garden and surroundings. The house, its grounds and the countryside around must surely have a pre-eminent claim to be given World Heritage status.*

Sir David Attenborough CH FRS, leading conservationist and presenter of the BBC television series, 'Life on Earth'

*There is no law of nature more important than evolution. Darwin's profound insights were to see the unity underlying all living organisms and to understand how variation with natural selection has led to the glorious diversity of life.*

James Watson, Nobel Laureate.

*The importance of the Galapagos Islands as the living evolutionary laboratory where Darwin found the clue to evolution is abundantly clear. But without his reflections and investigations when he came to Downe, the lessons of the archipelago would not have developed into the theory that revolutionized science worldwide. While the Beagle voyage set the stage, Downe became the theatre where Darwin developed and tested his ideas. Although the habitats were man-managed and distant from the wild areas visited on the Beagle voyage, they displayed similar patterns of life and Darwin's findings there confirmed and added to evidence coming in from the rest of the globe. In this sense, Downe and Galapagos are inseparably linked in the development of the theory that changed the world.*

Dr Jim Thorsell, Senior Advisor on World Heritage to IUCN and Board member of the Charles Darwin Foundation for the Galapagos.



Cudham Valley

## Cultural Landscape

**21.** The countryside around Darwin's property which was so important to him in his scientific work is put forward as a cultural landscape on the basis of the 'powerful cultural associations of the natural element' (Operational Guidelines for the Implementation of the World Heritage Convention, Annex 3 paragraph 10).

*The landscape around Downe provides a wonderful visual encapsulation of Darwin's appreciation of the immensity of geological time as he reflected on how the richness of the biological world could only have come about through evolution acting in the context of an ever-changing world. The totality of Darwin's world view can still be appreciated in the patterns of hills and valleys, hedgerows and woods. What a great thing it would be to preserve the outcome of his vision in all its complexity and compass.*

Professor Richard Fortey FRS, Department of Palaeontology, Natural History Museum, author of *Life*, an Unauthorised Biography (1997) and *Trilobite* (2001).

*Recognising this landmark location as a World Heritage Property would continue the legacy of enhancing mankind's education about the scientific underpinnings of Life on Earth.*

Angela Cropper, Co-Chair of the UN Millennium Ecosystem Assessment and President of the Cropper Foundation, Trinidad and Tobago.

## 3.b Proposed Statement of Outstanding Universal Value

### Summary

**22.** Darwin's Landscape Laboratory is the site where the modern scientific study of natural life was pioneered with the development of the theory of evolution by natural selection. It is an intimate farmed valley landscape surrounding Charles Darwin's home at Down House in the Kent North Downs. He walked in the Downe and Cudham valleys every day and studied them intensely for the forty years of his scientific maturity. Many landscape features bear unique witness to the evidence he collected for his world-changing ideas in the natural sciences that were developed at Down House.

**23.** Darwin's Landscape Laboratory is of fundamental importance to humanity because of his use of the landscape as a resource for science not simply as a commemoration of the man who developed the theory. The ideas developed at this Property have had a profound influence on life sciences, medicine, agriculture, philosophy and religion, as well as on general views of humankind's relation to other living creatures in the natural world and on the sustainability of the planet's resources.

24. Following his inspirational 5-year voyage around the world on HMS Beagle including 5 weeks observing and collecting on the Galapagos Islands in the Pacific, Darwin settled in London and then in 1842, moved 16 miles south to Down House to be able to investigate the natural life around him and to cater for his growing family. The surrounding farmed landscape and its varying geology and soil types also enabled him to access, via numerous footpaths and lanes, a wide variety of plants and wildlife, the raw materials for his research and scientific work. Finding all that he needed for his science he seldom left the locality until his death in 1882. The farmed landscape, together with Down House and its gardens were thus his workplace for his greatest period as a scientist. Easy access to nearby London and to the worldwide postal system, offered Darwin opportunities to test opinion of his developing theories from Downe.

25. The farmland and woodland management of the two small valleys linked by high ground has been sustained since Darwin's time. Thus the tangible context for his original scientific insight is clearly apparent. Darwin's home, gardens and many of habitats and features in the surrounding farmed valleys which he examined and used, survive to reflect his ideas which we are able to study in extensive and comprehensive collections of Darwin's scientific writings. Due to there being no main roads or railway stations in the area it has escaped much of the 20th century development associated with London's hinterland and the landscape and buildings remain remarkably unchanged since Darwin's death.

### Landscape

26. Down House is situated on a plateau, sloping from the south with chalk valleys both sides and an area of high ground to the north-west. A layer of impermeable acidic clay separates the two valleys and the surface water. After exceptionally heavy winter rain runs in small temporary streams known locally as 'bournes' or into man-made ponds. The steep valley sides have permeable chalk close to the surface, which means there are no permanent surface water features on the thin alkaline soil. As the chalk is overlain by sands and pebbles to the north at Keston, water quickly seeps through the thin acidic soil and emerges on the clay that supports the River Ravensbourne and the Keston bog.

27. The soils have been worked by man for woodland, pasture and arable farming for millennia. Very little of the landscape was or is natural in the sense of not being affected by human presence. It has been settled more or less continuously since pre-Roman times. There was a range of fluctuations in land use in Darwin's time.



*The pasture continues to be managed by sheep grazing*

was proportionately more pasture and some designed parkland. A mixture of small landholdings and parkland still exists and this allows a similar variety of land uses. The pasture continues to be managed by stock and horse grazing, meadows are cut for hay and these are interspersed by arable fields. The farmland was and remains separated frequently by hedgerows, many still managed by traditional laying and periodic cutting. The woodland persists on otherwise unproductive land and still exhibits management as high forest, coppice with standards or secondary woodland with scrub.

### Darwin's use

28. Darwin's Landscape Laboratory is a man-managed cultural landscape in which Darwin observed processes such as clearance, grazing, ploughing and hedge-laying over time and their impact on natural habitats and the way in which the habitats change as a result. This intimate landscape of just 7km<sup>2</sup> enabled him to conduct in places very close together, a wide variety of activities such as: observation of wildlife; experimentation in natural settings and cultivation; and observation and experimentation in his grounds. He was welcome to investigate the land owned by his neighbours within a 30 minute walk. An established network of lanes and footpaths, partly for managing the land and partly as access between settlements, was used by Darwin for half day outings from Down House to reach different places for study.

29. Darwin made extensive use of his own flower garden, lawn, orchard, kitchen garden, field, plantation and house for observation and experiment on cultivated and exotic plants, and native plants growing in the countryside around which he wanted to investigate with frequent and close monitoring.

30. The different semi-natural habitats, all in close proximity, supported the species that Darwin studied, including for example, 13 species of native wild orchid that still grow in the locality and which Darwin was able to examine as the basis for his work on the inter-dependence between orchids and their insect pollinators. He also used different slopes and flatlands in the neighbourhood for work his seminal work on the global influence of earthworms' perpetual working of the soil on landscape forms.

31. Time, both human and geological, was very important in Darwin's thinking, particularly for his theory that small changes could have large impact on natural forms and the evolution of species. In addition to geological observations and his observations on earthworm activity, he undertook a series of experiments and surveys, some lasting over 30 years. These include observations to show the:

- rate chalk and stones are subsumed into the soil;
- viability of buried seed over time;
- establishment of plant diversity in Great Pucklands; and
- ecological succession in grassland and hedgerows.

#### Attributes on which Outstanding Universal Value depends

32. The attributes of the landscape resource on which the Property's Outstanding Universal Value and which can all be seen today are:

- the geomorphology of the area, the compact 7km<sup>2</sup> valley landscape that Darwin observed and experimented in, with its two steep chalk valleys to the east and west of Down House standing on clay with flints soils between, with a promontory of sands and gravels to the north, which is a basis for the various semi-natural habitats for the range of organisms that Darwin studied;
- the range of semi-natural and managed habitats resulting from the human settlement of the area and its use for agriculture and forestry
- the many historic lanes and paths which enabled Darwin to explore the Property freely, collect and experiment as he wanted;

- the garden, plant houses and grounds at Down House, which Darwin was able to use both when he needed to make close or extended investigations of plants he found elsewhere in the landscape, and when he wanted to study plants from elsewhere in the world and compare them with local and native plants in order to reach conclusions of global value;
- Down House, Darwin's private home, which he was able to use to further his investigations of plants and other organisms in the landscape, and to draw together all his findings and produce the scientific works in which he gave his ideas to the world.
- Downe Village and other buildings within the landscape that reflect the social context for his work and the people in the local community on whose help he depended.

#### Features known to have been used by Darwin

33. There are many tangible features of the landscape which Darwin documented that he used for his science and these include:

Feature	Habitat/management
<b>Semi-Natural habitats</b>	
Keston Bog	Acid bog
Keston Common	Acid heathland
Cudham School Pond	Clay pond
Ravensbourne	Gravel stream
Hangrove	Ancient woodland
Downe Valley Terrace	Woodbank and chalk grassland
Orchis Bank	Chalk grassland
Holwood Park	Acid grassland
<b>Managed habitats</b>	
Sand-walk hedge	Managed hedge
Sand-walk copse	Plantation
Cudham Valley	Ploughed land
Great Pucklands	Pasture
Green Hill	Footpaths and bridleways
High Elms	Landscaped grounds
<b>Down House grounds</b>	
Hay meadow	Hay and pasture
Lawn	Mowing grass like grazing
Kitchen garden	Cultivation and plant experiments
Flower bed	Exotic plants
Orchard	Domestication of fruit



*Batholomé and Santiago Islands in the Galapagos*



*Galapagos Tortoise*

Hothouse	Tropical plants
Greenhouse	Temperate plants

**Down House**

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External walls	Climbing plants
Interior	Dissection, microscopy, observation of plants and animals
	Rooms for study, writing and talking.

**Buildings**

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Farm buildings	Agriculture
Farmsteads	Agriculture
Gamekeeper’s cottage	Management of game
Country mansions	Estate management
Gentry villas	Neighbours’ help with horticulture
Villages with artisans’ and labourers’ cottages.	Crafts and labour
Village churches, schools and inns.	Community and education

**3.c Comparative Analysis**

**Introduction**

34. The Operational Guidelines (paragraph 133) require a comparison of the nominated Property with other properties, in both its national and its international context, and a statement of the reasons that make the nominated Property stand out.

35. There are very few Properties relating to science on the World Heritage List and to increase the number of Properties on the List the World Heritage Committee has asked for fuller recognition of the global heritage of science and technology (Decision 29 COM 5B). In response to this need, the UK government and the UK National Commission for UNESCO with support from the World Heritage Centre hosted an international expert meeting in 2008 to facilitate the definition of a framework for the identification and recognition of Properties of interest for the heritage of science and technology, which are of Outstanding Universal Value, on the World Heritage List.

36. The nominated Property is put forward as a prime example for the life sciences as it tangibly demonstrates the landscape resource which Darwin used to develop his theories of Outstanding Universal Value. The survival is unusual at both a national and international level as many places important for science are changed following completion of the scientific work. For these reasons and some others, the survival of physical features for science heritage is generally poor. Only a handful of sites attesting scientific achievements of Outstanding Universal Value and tangible remains still survive; for example we cannot see or touch Newton’s apple tree and there are no features of the sites that demonstrate Copernicus’ astronomy, Boyle’s chemistry, Newton’s physics, Galileo’s mechanics, Mendel’s genetics, Einstein’s physics, or Watson and Crick’s molecular biology.

37. There are few Properties on the current World Heritage List that have features associated with science heritage and fewer still that are concerned with the life sciences. Some sites have relations to science heritage that are not evident from their inscription information and in each of these cases the statement of Outstanding Universal Value does not reflect their scientific importance, in the way that Darwin's Landscape Laboratory does.

#### **Loire Valley (France) Cultural: Leonardo da Vinci**

38. The Loire Valley was inscribed for its outstanding cultural landscape of great beauty, containing historic towns and villages, architectural monuments (the châteaux), and cultivated lands but not for the technological work that Leonardo da Vinci did within the World Heritage Property when he worked on a project draining the Sologne River.

#### **Galapagos (Ecuador) Natural: Charles Darwin**

39. The Galapagos Islands, termed the 'living museum and showcase of evolution' were inscribed on the World Heritage list for the abundance of marine and other rare species. Observations made by Charles Darwin on his visit here in 1835 first showed the indication of species change which he subsequently confirmed in his theory of evolution that he developed at Downe. The theory has provided scientific evidence that all species of life have evolved over time from one or a few common ancestors through the process of natural selection. It forms a key foundation of biology, as it provides a unifying empirically based explanation for the diversity of life.

#### **Lednice – Valtice Cultural Landscape (Czech Republic) Cultural: Gregor Mendel**

40. This was inscribed as a magnificent cultural landscape. It is one of the largest artificial landscapes in Europe, comprising Baroque architecture with a countryside designed according to English romantic principles of landscape architecture. The inscription does not refer to the work done by Gregor Mendel (1822-1884) who undertook experimental research in the gardens of Brno and had connections with the Valtice Cultural Landscape.

#### **Thingvellir National Park (Iceland) Cultural: Alfred Wegner**

41. The Property of the Thingvellir National Park, Iceland, was inscribed in 2004 as a cultural landscape under criteria (iii) and (vi) mainly for the Althing – an open-air assembly. It does not refer to the work done on continental drift done by Alfred Wegner (1880 – 1930).

The phenomenon is now taken into account by the working group on the transnational serial nomination of the Mid Atlantic Ridge.

#### **Alejandro de Humboldt National Park (Cuba) and Teide National Park (Spain) Natural: Alexander von Humboldt**

42. The World Heritage Committee inscribed in 2001 the Alejandro de Humboldt National Park on the World Heritage List under natural criteria (ii) and (iv) and in 2007 the Teide National Park but the inscription does not relate to the work of the German geographer Alexander von Humboldt (1769-1859). Humboldt was however referred to in the evaluation of the recent nomination of the Teide (Spain): "Teide National Park has attracted the interest of naturalists and geoscientists from all over the world, including pioneer work at the beginning of the 19th century by researchers such as Alexander von Humboldt, Leopold von Buch and Charles Lyell, who established basic concepts of geology and volcanology while studying this island."

#### **Piazza del Duomo, Pisa (Italy) Cultural: Galileo Galilei**

43. The Property of the Piazza del Duomo was inscribed on the World Heritage List in 1987 under criteria (i) (ii)(iv)(vi) mainly for the masterpieces of medieval architecture. Pisa is also the birthplace and workplace of one of the "Father of Sciences" Galileo Galilei. In the Advisory Body Evaluation ICOMOS makes the following references to the work of the scientist: "Criterion VI: It was at the Cathedral of Pisa that Galileo Galilei (1564-1642), observing the oscillations of the bronze chandelier created by Battista Lorenzi, discovered at the age of 19 the theory of isochronisms of small oscillations, a prelude to his pioneering work on dynamics. From the top of the campanile, he conducted experiments which led him to formulate the laws governing falling bodies. Two of the principal buildings of the Campo dei Miracoli are thus directly and tangibly associated with a decisive stage in the history of physical sciences."

#### **Royal Botanic Gardens, Kew (UK) Cultural:**

44. The heritage of plant science is a central element in the inscription of the Royal Botanic Gardens, Kew as a cultural Property. It states that "Through their unrivalled plant collections, they have made a significant and uninterrupted contribution to the scientific study of plant diversity, ecology and economic botany." The Royal Botanic Gardens were important for Darwin because his close friend Sir Joseph Hooker worked there from 1855 to 1885 as Assistant Director and then



*The Royal Botanic Gardens, Kew*

Director, and through his generosity, Darwin was able to draw on Kew's unrivalled collections of exotic plants for his botanical work. Hooker and his staff also gave Darwin expert advice and help on a wide range of matters to do with plant identification and botanical research. Towards the end of his life, Darwin provided funds for the creation of the Royal Botanic Gardens 'global index of plant names', the 'Index Kewensis' which has since become the 'International Plant Name Index', an essential tool for the worldwide study of plant taxa and diversity

#### **Struve Geodetic Arc Cultural:**

**45.** The Struve Geodetic Arc is a chain of survey points made for a sequence of triangulations across Northern Europe between 1816 and 1855. It is inscribed as a Cultural Property because the survey helped in determining the shape of the earth and is associated with Sir Isaac Newton's theory that the world was not an exact sphere but rather an oblate spheroid. The construction of the Arc was an outstanding achievement of scientific measurement during a period which overlapped with Darwin's years at Downe. Struve and Darwin's achievements were comparable in their global dimension and in their dependence on international scientific cooperation, but there are no other links.

#### **Dorset and East Devon Coast (UK) Natural:**

**46.** The Dorset and East Devon Coast is inscribed as a Natural Property because of its uniquely rich and complete exposures of fossil-bearing rocks of the Mesozoic Era. Its significance in the history of geology is also referred to in the inscription as 'researches on its deposits have fundamentally shaped the development of geological thinking since the discoveries of ... the early 1800s.' Darwin's first main interest in science was geology and the history of living forms through geological time was an important dimension of his theory of evolution but he did not make significant use of fossils in the



*Dorset and East Devon Coastline*

Dorset and East Devon exposures in his scientific work at Downe.

#### **Weimar (Germany) Cultural:**

**47.** Weimar is inscribed as a Cultural Property because of its testimony to the cultural flowering of the town during its Classical period in the late eighteenth and early nineteenth centuries. There is no mention of science in the inscription but two important features of the Property, Goethe's House and his Garden House and Garden in the Park on the Ilm, have associations with his extensive botanical writings including his studies of the metamorphosis of plants. His treatment of the subject was seen by some as proto-evolutionary, and some of Darwin's supporters in Germany saw him as a precursor. Goethe's approach was more philosophical than scientific and Darwin did not make any significant use of his work.

#### **Botanical Garden, University of Padua (Italy) Cultural:**

**48.** The Botanical Garden at the University of Padua, founded in 1545, is inscribed as a Cultural Property because it is now identified as the original of all botanical gardens throughout the world. The Property represents the birth of science, of scientific exchanges, and the understanding of the relationship between nature and culture. It has made contributions to the development of botany, medicine, chemistry, ecology, and pharmacy. However, its primary importance was as a garden and plant collection and Darwin's botanical research had no significant link with the heritage it represents.

#### **Maritime Greenwich (UK) Cultural:**

**49.** The inscription of Maritime Greenwich as a Cultural Property makes reference to the Old Royal Observatory because of the significance of the building and the instruments preserved there in the seventeenth and eighteenth century history of astronomy and navigation, and the adoption of the Greenwich Meridian as the

world standard for the measurement of space and time. There is no link between the observational astronomy represented in the Old Royal Observatory and Darwin's work at Downe.

### **Comparison with non World Heritage Properties and national sites with direct or indirect links to science and technology**

**50.** Places of value for science heritage can be grouped in different kinds according to the particular aspects of scientific work that were carried out there. The groups include landscapes for field studies; gardens and laboratories' and centres of learning for information retrieval, discussion or exchange. The nominated Property can be compared with the following locations, not inscribed as World Heritage Properties where scientific activities similar to Darwin's were carried out.

### **Landscapes for Study of Natural Features**

**51.** There are a few areas of natural and semi-natural/farmed habitats around the world that can be compared with Darwin's Landscape Laboratory because of the value of scientific observations carried out there and survival. Two other areas of natural wilderness that can be compared in certain respects are Bear Island, Svalbard, off the coast of Norway where Charles Elton carried out pioneering ecological surveys and experiments in the 1920s, and the Smithsonian Tropical Research Institute's Barro Colorado Nature Monument in the Panama Canal. However they both differ significantly from Darwin's Landscape Laboratory in that they are places remote from the scientists' other work so that field work was carried out for defined periods rather than on a daily basis enabling detailed authoritative records to be built up over the years, Darwin developed his methodology of observation, experiment, analysis and theory building, dissemination and replication using this resource and adapting his surroundings to enable him to study and analyse it effectively. Two other areas surrounding naturalists' homes that are more closely comparable to Darwin's Landscape Laboratory are the English naturalist Gilbert White's Selborne in Hampshire, and the French entomologist Jean-Henri Fabre's surroundings at l'Harmas, Sérignan du Comtat in France. Darwin was one of many in the nineteenth century who admired White as the pre-eminent naturalist of a locality, showing the value of careful and patient attention to birds and animals' behaviour and other patterns of natural life through the seasons. Darwin also admired Fabre's penetrating perceptions of the minute details of insect behaviour around his home. Neither Selborne nor Sérignan compare with Downe in global significance because neither White nor Fabre used their observations to draw scientific conclusions with general applications to natural life around the world.

### **Experimental Gardens**

**52.** Darwin's garden at Down is one of a small number of 'experimental gardens' that played significant roles in the development of the scientific study of plant physiology and reproduction before the establishment of plant laboratories in the last decades of the nineteenth century. These include the Reverend Stephen Hales's garden at Teddington for the origins of modern plant physiology in the 1720s; Carolus Linnaeus' garden at Hammarby for plant taxonomy in the 1760s; the Jardin des Plantes, Paris for experiments on acclimatization and evolution in the 1800s; the Duke of Bedford's Hortus Gramineus at Woburn Abbey in the 1800s; Thomas Andrew Knight's garden and orchards at Downton Castle, Shropshire, for experiments in plant breeding and hybridisation in the 1820s; the Abbé Gregor Mendel's garden at Abbey of St Thomas, Brno started in the 1850s, and Professor Julius Sachs's botanic garden at the University of Würzburg in the 1860s. Each of these gardens was shaped by the scientist in simple ways for his research. These gardens do not survive well. Darwin's garden at Down is outstanding in the whole group for the survival of its main features, and the global range and partly because of the value of the botanical work done there.

### **Laboratories**

**53.** Laboratories are normally simple working places and because of the practical nature of their contents, few built laboratories survive intact from the nineteenth century. A number have been reconstructed with varying degrees of authenticity. One of the best known, Michael Faraday's laboratory at the Royal Institution in London, is a room built later in a part of the building close to where the original room was situated; its value lies mainly in the original equipment which is preserved, and in the arrangement of the room according to contemporary pictures. Other laboratories of historic importance in the nineteenth and twentieth centuries were the Cavendish Laboratory in Cambridge; Louis Pasteur and Pierre and Marie Curie's laboratories in Paris, Thomas Hunt Morgan's laboratory at Columbia University, New York, for his work on *Drosophila*; the Los Alamos National Laboratory, New Mexico, and James Watson, Francis Crick and other molecular biologists' laboratories in Cambridge, England. Little of any of these survives.

**54.** Darwin had three indoor working spaces for laboratory activity - his study, the greenhouse, and the garden laboratory built for him towards the end of his life but not used. Compared with the other laboratories that survive, Darwin's three working spaces are significant for their simplicity, consistent with the simplicity of many of his investigative and

Property	Science	Work	Country	Period	Global scientific Significance	Value in representing scientific approach	Significance of place	How much is known	How much survives of the scientific work
<b>Galapagos</b>	Life	Field	Ecuador	C19	Supreme	One aspect	Unique	Much	Much
<b>Selborne</b>	Life	Observation	UK	C18	Low	One aspect	Important		
<b>Royal Botanic Gardens Kew</b>	Life	Experiment Collection	UK	C18-C20	High	One aspect	Important	Much	Much
<b>L'Harmas</b>	Life	Observation	France	C19	Low	One aspect	Some	Some	Little
<b>Linnaeus' garden at Hammarby</b>	Life	Classification	Sweden	C18	High	One aspect	Some	Some	Some
<b>Dorset and East Devon</b>	Palaeontology Geology	Field	UK	C18-C20	High	One aspect	Unique	Much	Much
<b>Brno</b>	Genetics	Observation and experiment	Czech Republic	C19	High	Two aspects	Unique	Some	Little
<b>Weimar</b>	Botany	Experiment Study	Germany	C18-C19	Low	Limited	Some	Some	Some
<b>Padua</b>	Botany	Collection	Italy	C16	Low	Limited	Important	Some	Some
<b>Struve</b>	Geology	Field	N Europe	C19	High	One aspect	Unique	Much	Much
<b>Leaning tower of Pisa</b>	Physics	Experiment	Italy	C17	High	One aspect	Important	Much	Little
<b>Darwin's Landscape Laboratory</b>	Life, Zoology, botany, biology, ecology	Field , observation, Experiment Communication Theory building	UK	C19	Supreme	Many aspects	Unique	A great deal	Almost all

experimental techniques, and for the purely domestic nature of the study and the greenhouse, showing how Darwin carried out his science in and around his home, a significant feature of his achievement. The three spaces all survive with some of their interior fittings. The original furniture in Darwin's study has been in place apart from the years when it was a school. This includes his desk and his scientific equipment is also present, notably two of the microscopes that were his main instruments for examining specimens. The value of these elements is enhanced by the surviving photographs of the three spaces and equipment in use in them and extensive documentary evidence both from Darwin, his family and fellow scientists. Seen in the context of his methods of work, more survives of Darwin's laboratories than of those of any other great scientist of the nineteenth century.

#### **Studies and Other Places for Reading, Communication and Writing**

55. The study of a scientist, pictures of it or information about it can be of great value in understanding what kinds of information the scientist used, how he or she gathered and sorted it, and how they put it together and developed their ideas in written form. But studies, like laboratories, being rooms for use rather than display, few survive from before the 1900s, and almost all, like laboratories, involve elements of reconstruction. Goethe's study in Weimar and Linnaeus's study at Hammarby both bear comparison with Darwin's for authenticity but so much of Darwin's furniture is outstanding and is where one of the greatest works of the human mind was composed.

#### **Conclusions of comparison of the nominated Property with inscribed and non inscribed World Heritage Properties**

56. From the comparison with Properties so far inscribed on the World Heritage list, there is no Property that is similar to Darwin's Landscape Laboratory as a landscape with persistent associations with scientific method and research linked to scientific ideas of global significance. The Outstanding Universal Value of Darwin's Landscape Laboratory is therefore not already reflected on the World Heritage List.

57. Comparing Darwin's Landscape Laboratory as a landscape that still demonstrate today what was observed and used to develop a scientific theory of world-wide significance, with other scientific places not already inscribed, the nominated Property, is seen as exceptionally well documented and complete, and its surviving features are of high value in displaying the values it represents. No other site matches its combined

strength in these respects because it represents a supreme achievement of the scientific approach in the life sciences which provides the basis for the current scientific understanding of human and natural life and the need for urgent action to counter global threats to the environment and sustainable development.

58. The table on the facing page compares Darwin's Landscape Laboratory and other scientific sites focusing on the main aspects of the different Properties (significance of the achievement, its value in representing the scientific approach, the amount of information that survives about the work done there, and the value of the surviving features in representing it) and scoring each aspect based on surviving fabric.

### **3.d Authenticity and Integrity**

#### **Authenticity**

59. Darwin was meticulous in recording his scientific work, and his observations and experiments at Downe are extensively documented in the many thousands of pages of his scientific papers and other material that survives from his time at Downe. There are also more than a hundred photographs and drawings of Down House, the grounds and Darwin's scientific work during the forty years he spent there. These have all been studied and archived and are available in the Darwin Collection at Down House and the Darwin Archive at Cambridge University Library and will be soon available electronically on the web.

60. Thus the relationship between Darwin and the landscape, and between Darwin and Down House, is based on firm evidence. He describes very clearly the landscape assets that were of value to him and the way he used them. He also describes in detail how he researched the evidence he collected at Down House.

61. There is further evidence for the form and evidence of use of the landscape in Darwin's time in historic mapping by the 1896 UK Ordnance Survey, and the 1840 Tithe Apportionment Survey, which can be used to assess the authenticity of the landscape as it survives.

62. The Nomination dossier shows how the relationship between Darwin and the landscape, what he was able to observe, and the evidence he chose to use, can be appreciated by visitors to the landscape today, as the key landscape characteristics and habitats created by farming and woodland practices still persist.

**63.** The Outstanding Universal Value of Darwin's Landscape Laboratory is truthfully and credibly expressed through the attributes that carry Outstanding Universal Value. These are:

- **The characteristics of the compact 7km<sup>2</sup> valley landscape that Darwin witnessed,**

**64.** The dense and varied landscape patterns, related to farming and woodland uses still persist. There have been few changes in field patterns or paths and tracks; there is still a mix of meadows, pasture, arable and woodland uses, and the habitats that Darwin observed have been maintained. In many cases, the original field boundaries, whether hedgerow, wooded banks, survive. The factual basis is provided in the full records of the uses of the land in 1840, 1869 and 1942 which survive in the 1840 Tithe Reapportionment Survey of the two parishes, the 1869 25 inch Ordnance Survey and Books of Reference, the 1942 National Farm Survey and aerial photographs from the last 60 years.

- **Farming and woodland traditions**

**65.** Farming is still the dominant land use, although some meadows are now managed by conservation volunteers rather than farmers; the woodlands are now maintained for conservation reasons rather than as productive woodlands but where appropriate following local practices such as coppicing. Overall the distinctive mix of arable, pasture and managed woodland, so important for Darwin's work, is maintained in present times.

- **The many varied habitats that Darwin studied;**

**66.** The majority of the complete range of habitats that Darwin studied – as a by-product of geology and the farming and woodland systems – still survives to be studied today. The most significant loss, of 80% of the open heathland and bog on Keston Common, is reversible through management of the vegetation on the Common, and action is in hand to restore the former habitats and reintroduce *Drosera rotundifolia*, one of only three individual plant species out of over 50 important for Darwin to have been lost.

- **Lanes and paths which enabled Darwin to explore the Property freely**

**67.** These are still in place and have public access

- **Down House, and garden**

**68.** Darwin's house and garden have survived well since Darwin's time despite its twenty year period as a school. The original fabric of the house, garden and estate still survives (in excess of 90%) and is clearly recognisable. English Heritage purchased the property in 1996 from

the Royal College of Surgeons who were responsible for display of the museum to the public and undertook a meticulous archaeological, architectural, cartographic, pictorial and documentary survey of the house to inform repair, maintenance and interpretation proposals. Given the wealth of documentary and photographic evidence of the study in 1877 it was decided that the reassemblage of material should be based on that date.

**69.** It has thus been possible, as has been set out above, to conserve and restore the house using evidence from:

- Darwin's scientific papers
- Physical evidence from the building (e.g. paint, wallpaper, floor coverings etc)
- Correspondence of Darwin's family and accounts of visitors to the House
- Darwin's correspondence
- Archaeology in the garden and building recording
- Botanical analysis

**70.** This was aided by oral history as many of Darwin's family were involved and have items on long term loan, and photographs taken by Darwin's son Leonard. Original furnishings and furniture have been used wherever available and possible although wallpaper and paint surfaces have been refreshed to enable visitors to see the home and resource where Darwin worked.

**71.** Some elements of the building's history e.g. some of the buildings connected to its brief use as a school were removed in the early 20th century when the house was converted into a museum by Buxton Brown. Nonetheless, the greater part of the fabric of Down House and its outbuildings survives as they existed in Darwin's time, original and untouched. The only significant losses have been a small section of the greenhouse, the fixtures of the garden laboratory, the well-head, some outbuildings for livestock and the pigeon house which was a wooden structure subject to decay.

**72.** Some replanting work has taken place in the garden reflecting the fact that annual and perennial plants have a finite life but the basic structure, the hedge plants, many of the trees, greenhouse base (but not the glass) and Sandwalk are original. The garden has been restocked carefully according to available documentary sources and key experiments recreated to aid visitor understanding.

## · Downe and Cudham Villages

**73.** These villages were the houses of the farmers, workers and artisan people who worked the land that Darwin used. The villages are now protected as Conservation Areas.

**74.** The “Downe Village Conservation Area Appraisal and Management Plan 2008” describes the built form of the village as being that of a small rural settlement, clustered closely around a road junction with the 13th Century Church of St Mary the Virgin in its churchyard taking a prominent central position. Comparison with the Ordnance Survey Maps of 1868-78 shows that the strong nuclear form of the village has not changed significantly since that time. There has been very little development taking place in the village since mid-Victorian times. There are 8 statutory listed buildings (including the grade II\* listed church) and 15 locally listed; all buildings are protected by virtue of being in the Conservation Area. Victorian photos show that despite some buildings having been altered and despite the presence of parked cars, the general appearance and form of the village has not changed.

**75.** The “Cudham Village Conservation Area Appraisal and Management Plan 2008” describes Cudham as a dispersed village strung out along Cudham Lane but with vernacular cottages and farmyard buildings grouped tightly around the 12th century Church of St Peter and St Paul. This group of buildings has not altered significantly since Victorian times, neither has there been any prominent development. The church and nearby Cudham Court are Statutorily Listed and the 4 cottages in the central group are Locally Listed. All buildings in the village are protected by virtue of being in the Conservation Area.

**78.** Both villages are active places where people today live and work and inevitably, there are some aspects of modern life that affect their appearance. For example, parked cars are present at most times of the day. The villages however retain much of their quiet rural charm and an understanding of village life in the time of Charles Darwin can still be appreciated. The cars and other aspects of modern activity do not detract from the Outstanding Universal Value as represented by the particular features of the landscape as described above.

**79.** There are other intrusions from the modern world that reflect the property’s location on the edge of London and which impact to a degree on the way the attributes carry Outstanding Universal Value. In particular, there is a line of electricity pylons which cross the northern part of Cudham Valley, and the low noise of aircraft

using London Biggin Hill Airport and flying at high altitude to Gatwick and Heathrow. Whilst these factors do have some adverse effect on the appearance and ambience of a small part of the northern part of the nominated Property, they do not detract significantly from the Outstanding Universal Value as represented by the particular features in the landscape as described above.

**80.** The physical fabric of Down House is in good condition and the effects of deterioration processes on Down House and its gardens are controlled by strict conservation management. Similarly, the other buildings in the two villages and elsewhere in the nominated Property are generally in good condition and protected by statutory controls to prevent their deterioration. Appropriate management is undertaken of the wider landscape in the nominated Property to sustain the attributes. In conclusion, the attributes identified clearly express truthfully the Outstanding Universal Value of the Property.

## Integrity

**81.** The nominated Property includes all the attributes necessary to express the outstanding universal value of the Property – almost the entire rural landscape around Down House in which Darwin observed and collected plants and insects during his 20 years there and the specific places that were important for his observations and research.

**82.** The only elements of the landscape that Darwin used on a regular basis and which lie outside the boundary are parts of the Big Woods as these are now separated from the main valleys by a golf course. Sufficient attributes lie within the boundary to encapsulate the Outstanding Universal Value of the Property and thus allow the landscape to be perceived through the eyes of Darwin and show how assets of a fairly commonplace landscape could be used to demonstrate universal scientific theories, which changed perceptions of the way the world evolved.

**83.** There are few adverse impacts of development and/or neglect. As noted above, there is some visual intrusion from electricity pylons across the northern part of the Cudham valley. There is also evidence of modern traffic in the form of parked cars and the use by them of the roads within the Property. Nonetheless, the nominated Property maintains a high level of integrity.

