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What Is Our Real Knowledge About the Human Being?

The Proceedings of the Working Group
4-6 May 2006

VATICAN CITY
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WHAT IS OUR REAL KNOWLEDGE ABOUT THE HUMAN BEING?

Address:

The Pontifical Academy of Sciences
Casina Pio IV, 00120 Vatican City
Tel: +39 0669883195 / Fax: +39 0669885218
Email: academy.sciences@acdscience.va

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Working Group on

WHAT IS OUR REAL KNOWLEDGE ABOUT THE HUMAN BEING?

4-6 May 2006

Edited by
H.E. Msgr. Marcelo Sánchez Sorondo

EX AEDIBVS ACADEMICIS IN CIVITATE VATICANA

MMVII

The opinions expressed with absolute freedom during the presentation of the papers of this meeting, although published by the Academy, represent only the points of view of the participants and not those of the Academy.

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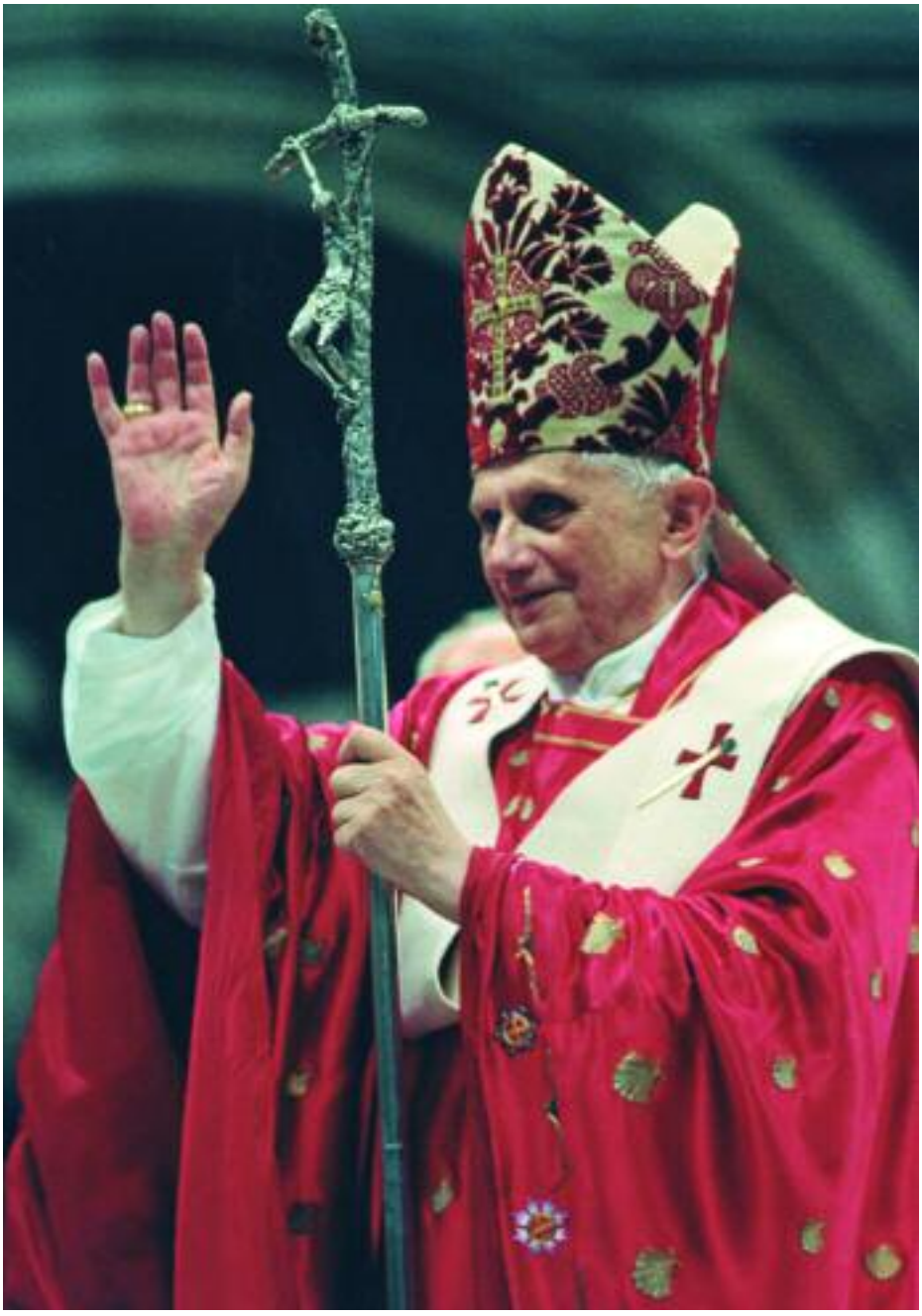

His Holiness Pope Benedict XVI

The Participants of the Working Group of 4-6 May 2006

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STATE TELEGRAM

The Most Reverend Marcelo Sánchez Sorondo
Chancellor of The Pontifical Academy of Sciences
00120 Vatican City

His Holiness Pope Benedict XVI sends cordial greetings to the distinguished participants in the joint meeting taking place in the Vatican under the auspices of the Pontifical Academy of Sciences and the John Templeton Foundation. It is his hope that the colloquium, devoted to the question *'What Is Our Real Knowledge About the Human Being?'*, will contribute to a comprehensive approach to issues essential to a correct and fruitful understanding of our common humanity. Conscious of the profound religious implications of the colloquium's theme and the importance of a sound anthropological vision for the authentic advancement of the human family, His Holiness willingly invokes upon all taking part in the deliberations God's blessings of wisdom, understanding and peace.

Cardinal Angelo Sodano
Secretary of State

INTRODUCTION

BISHOP CHANCELLOR MARCELO SÁNCHEZ SORONDO

The Working Group on 'What Is Our Real Knowledge About the Human Being?' will reconsider this perennial question, which was formulated by King David when he asked: 'Yahweh, what is man, that you care for him?' (*Ps* 144:3). Science does not provide the sole answer to this question and we believe that in this scientific age a dialogue between science and the humanistic tradition is required for its effective exploration.

In the interest of a balanced quest, which can lead to a fuller understanding of the critical issues that currently confront us as regards our real knowledge about the human being, we need to re-examine the historical relationship between philosophy and science, and more specifically between the humanistic tradition (which has its roots in philosophy) and the scientific tradition. Today, it seems, there is a great need for reconciliation between these two traditions. Indeed, ever since Galileo launched the modern scientific revolution these two traditions have become progressively detached from one another and appear, as science has grown ever more specialised and complex, to have reached a point of inflection which offers a new horizon of mutual comprehension. In this endeavour it is helpful to revisit the thought of Greek (Plato and Aristotle) and medieval (St Thomas Aquinas) philosophers, as well as that of modern philosophers (Hume, Kant, Hegel), on the one hand, and the thought of modern scientists, on the other, for the light this philosophic and scientific background sheds on the identity of human beings, who share their bodies with nature but also emerge from nature (as the philosopher Anaxagoras was the first to observe when he argued that intellect is not mixed with matter). We can then turn our attention to a some central problems presented by science today, as well as to the opportunities provided by science for rethinking philosophical and theological views on human beings and their place within the Creation. The issues being probed by cognitive science, with its new

language of neurons and synapses, in relation to the classic language of intellect, desire and emotion, are central to our topic. So, too, are the ongoing discoveries about our genetic inheritance, which pose questions about free will and the connection between evolution and creation. Lastly, there are anthropological (and moral) questions that relate to the time before a person's birth and to the state of death. It is our hope to forge, through a profound and interdiscipinary discussion, greater understanding of these three clusters of issues as we use them to clarify our central question: what is our real knowledge about the human being?

This colloquium is a joint meeting and has been organised by the John Templeton Foundation's 'Humble Approach Initiative' and the Pontifical Academy of Sciences. The choice of the meeting place, the Academy's headquarters at the Casina Pio IV in the Vatican gardens, given its illustrious scientific history, reflects our wish to contribute to the creation of a new relationship between these traditions, and prompts us to ponder what role religion can play in achieving such a synthesis, in particular in relation to the anthropological question. This villa, which in the sixteenth century was a summer residence of Pope Pius IV and a meeting place of great scholars, in 1923 became the seat of the Pontifical Academy of Sciences, whose origins date to the founding of the Academy of the Lynceans, the world's first scientific academy, by Prince Federico Cesi in 1603. Galileo, the father of modern science, was a founding member and its acknowledged leader.

As can be seen from the list of participants, science, philosophy and theology are well represented at this joint meeting, and it is thus our hope that this colloquium, which is based upon an interdisciplinary approach, will constitute an important contribution to answering today's central anthropological question: what is our real knowledge about the human being?

PROGRAMME

THURSDAY, 4 MAY 2006

19:30 Cocktails in the Cortile Ovale, Casina Pio IV

20:00 Dinner at the Casina Pio IV

FRIDAY, 5 MAY 2006

9:00 *Welcome*
Nicola Cabibbo, President of the Pontifical Academy of Sciences

9:05 *Greetings*
Mary Ann Meyers, Senior Fellow of the John Templeton Foundation

9:10 *Opening Remarks*
Marcelo Sánchez Sorondo, Chancellor of the Pontifical Academy of Sciences

SESSION I

Perspectives from History

Chairperson: H.E. Msgr. Marcelo Sánchez Sorondo

9:15 Felipe Fernández-Armesto
Being Human: A Historical Approach

9:45 Fernando Vidal
Person and Brain: A Historical Perspective from within the Christian Tradition

10:15 Coffee Break

10:30 General Discussion

SESSION II
Perspectives from Anthropology
Chairperson: Janet Martin Soskice

11:00 Berhane Asfaw
The Origin of Humans: The Record from the Afar of Ethiopia

11:30 Alison Brooks
What is a Human? Archaeological Perspectives on the Origins of Humanness

12:00 General Discussion

12:30 Lunch at the Casina Pio IV

SESSION III
Perspectives from Science
Chairperson: Jürgen Mittelstrass

13:45 Malcolm Jeeves
Soul-Searching and Mind-Reading: Issues Raised by Twenty-First Century Neuropsychology and Evolutionary Psychology

14:15 Jean-Didier Vincent
The Need for Others

14:45 Antonio Battro
Homo Educabilis: *A Neurocognitive Approach*

15:15 Tea Break

15:30 Hideaki Koizumi
A New Science of Humanity: A Trial for the Integration of Natural Sciences and the Humanities towards Human Security and Well-Being

16:00 General Discussion

19:30 Cocktails in the Cortile Ovale, Casina Pio IV

20:00 Dinner at the Casina Pio IV

SATURDAY, 6 MAY 2006
SESSION IV
Perspectives from Philosophy
Chairperson: Antonio Battro

9:00 Evandro Agazzi
The Scientific Images and the Global Knowledge of the Human Being

9:30 Enrico Berti
Is DNA Range a Sufficient Definition of Human Nature? Aristotle vs. Thomas Aquinas and Jacques Maritain

10:00 Franco Chiereghin (read by Luca Illetterati)
A Solely Human Aspect of Existence: The Experience of Beauty

10:30 Coffee Break

10:45 Thomas Nagel
Science and the Mind-Body Problem

11:15 Jürgen Mittelstrass
Science and the Search for a New Anthropology

11:45 General Discussion
13:00 Lunch at the Casina Pio IV

SESSION V
Perspectives from Philosophical Theology
Chairperson: Enrico Berti

14:15 Peter van Inwagen
Our Deepest Beliefs about Ourselves

14:45 Janet Soskice
Imago Dei *and Sexual Difference*

15:15 Marcelo Sánchez Sorondo
The Knowledge of Ourselves in Dialogue with Science

15:45 Tea Break
16:00 General Discussion
16:45 Summary and Discussion of Next Steps
19:30 Cocktails in the Cortile Ovale • Casina Pio IV
20:00 Dinner at the Casina Pio IV

LIST OF PARTICIPANTS

Prof. Nicola Cabibbo, President
H.E. Msgr. Prof. Marcelo Sánchez Sorondo, Chancellor
The Pontifical Academy of Sciences
Casina Pio IV
00120 Vatican City

Prof. Evandro Agazzi
Università degli Studi di Genova
Dipartimento di Filosofia
Via Balbi, 4
I-16126 Genova (Italy)

Dr. Berhane Asfaw, Director
National Museum of Ethiopia
Paleoanthropology Laboratory
P.O. Box 5717
Addis Ababa (Ethiopia)

Prof. Antonio M. Battro
Battro & Denham
Billinghurst 2574 (1)
Buenos Aires 1425 (Argentina)

Prof. Enrico Berti
Università degli Studi di Padova
Facoltà di Lettere e Filosofia
Palazzo Liviano
Piazza Capitaniato, 7
I-35139 Padova (Italy)

Prof. Alison Brooks
The George Washington University
Hortense Amsterdam House
2110 G Street, N.W.
Washington, DC 20052 (USA)

Prof. Franco Chiereghin
Università degli Studi di Padova
Facoltà di Lettere e Filosofia – Dipartimento di Filosofia
Piazza Capitaniato, 3
I-35139 Padova (Italy)

Prof. Felipe Fernández-Armesto
University of London
Queen Mary
Mile End Road
London E1 4NS (United Kingdom)

Dr. Charles L. Harper, Jr., Vice President
John Templeton Foundation
300 Conshohocken State Road, Suite 500
West Conshohocken, PA 19428 (USA)

Prof. Luca Illetterati
Università degli Studi di Padova
Facoltà di Lettere e Filosofia
Palazzo Liviano
Piazza Capitaniato, 7
I-35139 Padova (Italy)

Prof. Peter van Invagen
The University of Notre Dame
100 Malloy Hall
Notre Dame, IN 46556-4619 (USA)

Prof. Malcom Jeeves, C.B.E.
University of St Andrews
School of Psychology
St Andrews, Fife KY16 9JU (Scotland)

Dr. Hideaki KOIZUMI
Hitachi, Ltd.
Hatoyama
Saitama 350-0395 (Japan)

Dr. Mary Ann MEYERS
John Templeton Foundation
300 Conshohocken State Road, Suite 500
West Conshohocken, PA 19428 (USA)

Prof. Jürgen MITTELSTRASS
University of Konstanz
Center of Philosophy and Science Theory
Universitätstrasse 10
D-78464 Konstanz (Federal Republic of Germany)

Prof. Thomas NAGEL
New York University
418 Vanderbilt – 40 Washington Square South
New York, NY 10012 (USA)

Dr. Janet M. SOSKICE
Cambridge University
Faculty of Divinity – Jesus College
West Road
Cambridge CB3 9BS (United Kingdom)

Dr. Fernando VIDAL
Max Planck Institute for the History of Science
Boltzmannstrasse 22
D-14195 Berlin (Federal Republic of Germany)

Prof. Jean-Didier VINCENT
C.N.R.S.
Institut de Neurobiologie Alfred Fessard
Building 33
1, avenue de la Terasse
F-91198 Gif-sur-Yvette Cedex (France)

SCIENTIFIC PAPERS

PERSON AND BRAIN: A HISTORICAL PERSPECTIVE FROM WITHIN THE CHRISTIAN TRADITION

FERNANDO VIDAL

'Person P is identical with person P* if and only if P and P* have one and the same functional brain'. This formula, from Stéphane Ferret's *Le philosophe et son scalpel. Le problème de l'identité personnelle* (1993), enunciates a theory about the conditions of personhood and personal identity: To have the same brain is to be the same person; conversely, the brain is the only part of the body that we need, and that has to be ours, in order for each of us to be ourselves. The human being depicted here is a 'cerebral subject' characterized by the property of 'brainhood', i.e. the property or quality of *being*, rather than simply *having*, a brain. Ferret coined his formula while discussing philosophical views about personal identity. Such views, however, are intimately connected with scientific developments and social realities. Far from being a theoretical entity, the cerebral subjet is a major anthropological figures of contemporary society and culture.

The first part of this paper outlines a history of the cerebral subject. Historians, philosophers, anthropologists and sociologists have carried out important studies on related topics. Nevertheless, a notion seems to be missing that might bring to the fore what is common to these various fields as regards views about man. 'Brainhood' and 'cerebral subject' may fulfill that function. The second part of this paper uses the history of Christianity as a resource for thinking the relation of person and brain. It explores how the history of the Christian tradition, and especially that of the doctrine of the resurrection of the body, can illuminate contexts and ways of 'knowing human nature' through issues concerning the definition and practices of personal identity.

In a 1979 article entitled 'The Body as Understood in Contemporary Thought and Biblical Categories', Father Antoine Vergote, a psychoanalyst, theologian and professor emeritus of the University of Louvain, wrote that for Christianity a person 'is not someone who has a body but whose exis-

tence is corporeal'; in other words, 'the body is the whole man'. The doctrine of the resurrection of the flesh highlights that while man is not reducible to the body, there is no such a thing as a disembodied person. But the doctrine itself was an object of debates, the focus of which can be epitomized in the question, What is the part of body that we need in order to be ourselves? The anthropology of brainhood gives a straightforward answer: If the brain of A were transplanted into the body of B, then the new entity would be A with the body of B. I am where my brain is. 'This simple fact', commented leading neuroscientist Michael Gazzaniga in *The Ethical Brain* (2005), 'makes it clear that you are your brain'.

Yet the fact is simple, and the ontological inference legitimate, only if one has accepted the anthropology of brainhood – an anthropology that Christian thought problematizes radically. My proposal, in short, is that the history of the debates about the resurrection of the body in the Christian tradition are one of humanity's most profound explorations of personal identity; as a centuries-long self-reflective thought-experiment, they have defined and elaborated such questions as, What is a human being? and What is the relation of self and body?

1. The Emergence of Brainhood

At the meeting *Mind, Brain, and Education* that took place at the Pontifical Academy of Sciences in November 2004, I used for the first time the term 'brainhood', and sketched the historical development of the anthropology of the cerebral subject. I argued that, rather than being a consequence of advances in knowledge of the brain, the 'cerebralization' of personhood largely resulted from seventeenth-century transformations in the philosophies of matter and personal identity.

In the second edition of his *Essay concerning human understanding* (1694), the English philosopher John Locke claimed that if my little finger is cut off my hand, and my consciousness is located in the little finger, then 'it is evident the little finger would be the person, the same person; and self then would have nothing to do with the rest of the body'. In his view, personal identity (as both temporal continuity and self-same sameness) depends on memory and consciousness; it thus becomes purely psychological, and distinct from bodily identity. In comparison with the essential corporality of the self in the Christian tradition, the Lockean approach implies an obvious loss of body.

Understandably – since the brain was known to be somehow the seat of memory and consciousness – several Enlightenment authors expressed the belief that the brain is the only organ essential to the self. The Swiss Charles Bonnet, for example, wrote in his 1776 *Essai analytique sur les facultés de l'âme* that 'If a Huron's soul could have inherited Montesquieu's brain, Montesquieu would still create'. It did not matter that the soul and body were those of a 'savage'; what counted was that the brain be the philosopher's own.

One feature makes Bonnet's early statement of the anthropology of brainhood look extremely modern: the substantial link for the constitution of personhood is between soul and *brain*, rather than soul and *body*. As Ferret, Bonnet reduced to the brain the body relevant for personal identity. Another feature, however, dates the naturalist's remark to its century and to its Christian context: the joint that makes up the human person is that between the brain and the *soul*.

The later development of the neurosciences reinforced the ontological centrality of the brain. In the nineteenth century, brain research evolved towards increasing technical, descriptive and argumentative sophistication and precision, and towards the abandonment of the concept of soul. Self no longer depended on soul, and at the same time the connection of brain to self and personhood was confirmed and refined. Cerebral localization, differentiation of brain function, and the correlation of function and structure became basic neuroscientific principles.

The reinforcement of brainhood in the nineteenth century is also apparent in the belief that the characteristic traits of geniuses, criminals and the mentally ill were inscribed in their brains. Such localizationism paralleled the elaboration of physiognomic, cranial, and bodily typologies; closely related to craniometry, the measurement of differences in brain weight and size dates back to the early days of physical and racial anthropology.

In the twentieth century, clinical and experimental methods joined forces, and provided ever more detailed data about the cerebral control of behavior and mental life. Some areas of brain research gained considerable media presence, and became paradigms of what the brain sciences could teach about human personhood. The work of Wilder Penfield (1891-1976) and Roger Sperry (1913-1994) are among those that had most public impact before the spread of brain imaging and the notion of brain plasticity. Penfield knew that before an epileptic seizure, patients experience an 'aura'. By provoking the aura through electrical stimulation of the brain, he determined the source of the seizure, and could remove the tissue. His sur-

gical procedure allowed him to map the cortical areas responsible for motor and somatosensory functions. Penfield's findings are represented in a well-known 'homunculus' whose features, drawn proportionally to the associated brain areas, include comically large fingers and lips.

Sperry, also a surgeon, is famous for his work on split-brain and complementary hemispheric specialization. A surgical treatment of epilepsy consisted of separating patients' hemispheres by cutting the corpus callosum. A typical post-operatory finding was that patients shown an image in the left visual field cannot name or say anything about what they saw, because the image has arrived only on the right side of the brain, and speech is generally controlled by areas on the left. Yet they can grasp the corresponding object with the left hand, which is controlled by the right side of the brain. The same happens with touch, smell or sound stimulation. Starting with these observations, split-brain became a major neuroscientific topic, gave support to the modular model of brain organization, and inspired studies reaching into the areas of consciousness and brain plasticity.

Concurrently, philosophers of the Anglo-American analytic tradition, such as Sidney Shoemaker in *Self-Knowledge and Self-Identity* (1963) and later Derek Parfit in *Reasons and Persons* (1984), revived Locke's use of thought experiments (e.g. consciousness located in the little finger) as a conceptual instrument to think personal identity. Now, however, the puzzle-cases concerned the brain, mainly in the form of experiments, bisections, transplants, or extra-bodily conservation. This usage was so widespread that it seemed virtually impossible to discuss personal identity without having recourse to cerebral surgical fictions. At the same time, philosophers became increasingly interested in neuroscientific research and its consequences for understanding mind, consciousness and personhood.

Outside the academy, three processes seem salient since the 1980s: the usages and media presence of brain imaging, the somatization of the self, and the critique of brainhood.

Computerized axial tomography (CAT or CT scanning) is in use since the early 1970s. It employs computers to generate three-dimensional static pictures on the basis of two dimensional x-rays of 'slices' (Gr. *tómos*) of an organ. The development of single photon or positron emitters that stay in the bloodstream or bind to receptors in the brain led to the functional imaging techniques SPECT and PET, single photon emission computed tomography and positron emission tomography. These procedures allow the mapping of blood flow in the brain, and thus the visualization of localized brain activity during cognitive tasks. The discovery that MRI

(magnetic resonance imaging) also records blood flow changes measured by PET opened the way to functional MRI (fMRI), since the 1990s the dominant brain-mapping technique.

Brain imaging has had enormous impact outside the strictly neuroscientific and medical domains. Judy Illes, director of the Stanford Program in Neuroethics, has demonstrated the phenomenal expansion of fMRI-based research during the 1990s, with a dramatic decrease in studies of sensory and motor functions, and a corresponding growth of studies on cognition, attitudes, moral and social judgment, and religious experience. If fMRI has become a favorite tool to explore the functional essence of personhood, it is because the envisaged self is essentially that of a cerebral subject. Brain imaging technologies have also driven new 'neuro-' fields whose common purpose is to enrich, or even reform the human sciences on the basis of knowledge about the brain. Neuroesthetics, neuroeconomics, neuropsychoanalysis, neurotheology and neuroeducation have all emerged during the 1990s, 'decade of the brain'. Neuroethics, a rapidly growing new frontier discipline, explores the ethical (but also social and legal) issues that result from the findings and technologies of the basic and clinical neurosciences.

In the same period, brain images have flooded the public domain. In addition to sustaining the legitimacy of the 'neuro-' areas, this phenomenon affects how we understand the person-brain relation. In *Picturing Personhood. Brain Scans and Biomedical Identity* (2004), anthropologist of science Joseph Dumit examines how the media presents such images as if they were depictions of human types and realistic portraits of the self, resulting in cerebral typologies and corresponding human kinds (normal, healthy, depressed, handicapped...). On the positive side, brain images help destigmatize mental illnesses by pictorially asserting that they are no more than conditions of the brain.

The diffusion and social and individual impact of brain images relates to a second process: the somatization of the self. Sociologists Carlos Novas and Nikolas Rose, of the BIOS Center at the London School of Economics, identify a 'wider mutation' in personhood that they call 'somatic individuality'. The psyche, they write, 'is becoming flattened out and mapped onto the corporeal space of the brain itself. Such technological developments as neurochemistry ... and brain scanning ... appear to establish direct and "superficial" empirical and observable relations between the physiological and the ethical: between the brain and all that makes a human person'. Such analysis highlights the wider context of the emergence of the cerebral subject.

The third process in question is the critique of brainhood. The methodologies of the human sciences generally imply the critical posture that comes with trying to understand supposedly natural phenomena ('we are our brains') in historical and social contexts. Among philosophers, Kathleen Wilkes, in *Real People* (1988), defends a philosophy of personal identity 'without thought-experiments'. She takes the brain into account as a condition for 'real people'; for her, the problem with philosophical brain fictions is not that they are about the brain, but that they are theoretically impossible, and therefore irrelevant fictions. Other authors could be mentioned, not only philosophers, but neuroscientists themselves, who are critical of brain reductionism.

To close this sketch, I would like to connect brainhood and death. The brain-death criterion, widely used since the late 1960s, relies on the permanent cessation of signs of central nervous system activity, thus replacing the arrest of cardiac and pulmonary functions as signs of death. There are, however, partisans of cardiopulmonary criteria, as well as varieties of brain-death (whole-brain, higher-brain, brainstem).

Higher-brain criteria assume that such functions as consciousness, memory and reasoning define us as human beings. They therefore imply that anencephalic babies, persons in a permanent vegetative state, or advanced Alzheimer patients can be treated as if they were dead (as human *persons*), or at least that they can be allowed to die. That is why in a 1993 issue of the *Hastings Center Report*, Robert Veatch (professor of medical ethics at Georgetown University) announced 'the impending collapse of the whole-brain definition of death', and proposed to reduce the brain-death criteria to the 'irreversible cessation of the capacity for consciousness'.

The ultimate questions in the brain-death controversy are, What does it mean to be human? What parts of our bodies can be irreversibly damaged, and which psychological functions destroyed, in order for us to conclude that we are in the presence of an organism that, though alive, is no longer a human *person*? Some authors, for example Robert Blank in his book *Brain Policy. How the New Neuroscience Will Change Our Lives and Our Politics* (1999), ask if it is legitimate to distinguish between life as a strictly organic function, and *human* life 'as an integrated set of social, intellectual, and communicative dimensions'. What weight should these dimensions have in deciding to terminate life? Should locked-in syndrome patients be allowed to decide that they wish to be killed? Would such a patient be the same person if the preserved parts of his brain were transplanted into another body? We see here the tension between opera-

tional definitions of death that emphasize the use of standardized medical tests, and ontological definitions according to which consensus about death requires previous consensus on definitions of personhood or personal identity.

Finally, discussions about brain-death potentially raise the issue of 'brain-life'. The problem of the beginning of life – more precisely, of conferring moral and personhood status on a human embryo – offers a gripping symmetry to the problem of death, with markers shifting from fourteen days (formation of the primitive streak), to 23 weeks, when the fetus becomes viable. If the end of a person's life is defined by a brain state, shouldn't the same terms apply to its beginning? In both cases, the debates we just outlined illustrate the many social, philosophical, medical, and political issues involved in the view of the human being as cerebral subject.

2. Personhood and the Resurrection of the Body

How does the Christian tradition illuminate these issues, and especially the person-brain relationship? In his speech of 21 November 2005 to the Pontifical Academies of Sciences and Social Sciences, His Holiness Benedict XVI recalled that, for Christianity, human beings are part of nature, but also transcend it by virtue of their being free subjects with moral and spiritual values; he also observed that 'according to God's intention, the person cannot be separated from the physical, psychological and spiritual dimensions of human nature'. Christianity asserts the irreducibility of human personhood to one of its dimensions. Being a person cannot be identified to having any one bodily organ – not even the organ whose 'emergent properties' are said to include what is otherwise called *soul*, or *personality*, or *psychological* and *spiritual life*. From the standpoint of the Church's *magisterium*, these assertions derive from 'God's intention' about human nature. From a historical perspective, however, divine intention and human nature are best approached through their changing definitions and uses. Of course, there might be some very basic phenomenological facts (such as erect posture, emphasized in Samuel Todes's *Body and World*) that contribute to determine our being-in-the-world. Such facts, however, are far from covering the historical diversity of notions of nature and human nature (see *Note* at the end of the paper).

Before going any further, here is an outline of this paper's argument:

– Brainhood and the cerebral subject have become a major anthropological figure of contemporary culture;

- such a figure is a statement about the self-body relation;
- it thus shows that the person-brain question is also that of knowing what part of the body we need in order to be ourselves;
- and this formulation highlights the extent to which the anthropology of brainhood breaks with the Christian tradition, specifically with the intrinsic corporality Christianity attributes to the human person;
- finally, as a fundamental expression of Christian anthropology, the doctrine of the resurrection of the body can be examined as an exploration of personal identity;
- nevertheless: I don't claim that debates about the resurrection doctrine can be restrospectively read as debates about personal identity; rather, I propose to consider them as a main context of gestation and elaboration of the very notion of personal identity in Western thought.

The place of the human body in Christian anthropology derives from the mystery of the Incarnation. Although there are reasons to see Christianity as inimical to the body, the Church has always condemned the denigration of matter and the human body. As historian of early Christianity Peter Brown demonstrated, such practices as permanent sexual renunciation can be understood as a means to live the body as 'temple of the Holy Spirit' (I *Cor.* 6.15), and to prepare it to be like the body of the risen Christ. In the Christian framework, the doctrine of the resurrection of the body is integral to the belief that our existence as persons is intrinsically corporeal, and that there is no such a thing as a disembodied human.

The position that became official in the early centuries of Christianity is that both the bodily and the psychological identity of resurrected individuals will be the same as that of the persons they were while alive. In this view, 'identity' in the sense of the reflexive *ipse*, necessitates 'sameness' in the sense of temporal continuity, of *idem* (used when two predicates are referred to the same subject or in the comparison 'the same as').

The resurrection doctrine generated questions about how decayed bodies will become whole again, or how to reconcile the properties of the 'glorious' and 'spiritual' resurrected body with the old ones of the terrestrial body. They entailed asking, for example, If all our flesh has to be restored to resurrected bodies, what happens with the matter we lose and replace throughout our lives? If I am eaten by a cannibal who assimilates my flesh to his own, where does the assimilated flesh end up, in the cannibal's resurrected body, or in mine?

These questions rehearsed the ontological quandaries of personal identity. Since Christ declared that 'there shall not a hair of your head perish' (*Luke* 21.18), the doctrine requires that resurrected bodies remain identical to the corresponding terrestrial bodies both qualitatively and physically. For each of us to be ourselves, we need to have bodies – not just any body, but our own. This view was challenged through three interrelated process in the context of the seventeenth-century Scientific Revolution: the relative disincarnation of personhood, the psychologisation of personal identity, and the increasing focalisation on the brain of the body relevant for personal identity.

The corpuscular philosophy (espoused for example by Robert Boyle and Isaac Newton) explained the phenomena of nature by the motion, figure, rest, and position of interchangeable particles of matter. Differences among physical bodies did not derive from the essential nature of their substance, but from the mechanical properties of the composing particles. As Boyle and others noted, corpuscularianism implied that resurrected bodies no longer had to include exactly the same matter as the corresponding terrestrial bodies. Material continuity thus lost its importance as a constitutive element of personal identity; and this, as Locke realized, applied not only to resurrected persons, but to the very definition of personhood.

We have already seen that Locke separated substance and personal identity, and made the latter depend on a continuity of memory and consciousness. A person's identity, he explained, reaches 'as far as this consciousness can be extended backwards to any past action or thought', and derives from the 'same consciousness that makes a man be himself to himself', regardless of the substances to which consciousness might be 'annexed'. Since the seventeenth century, many authors responded to Locke; reactions to its consequences for the resurrection doctrine are among the earliest. For example, in *The resurrection of the (same) body asserted* (1694), the English divine Humphrey Hody acknowledged that sameness of body did not depend on the sameness of every particle. In order to preserve the Christian doctrine of the resurrection, he nevertheless insisted on the intrinsic corporality of personhood, and explained that three bodies animated by the same soul would be three different persons.

Even for Locke's partisans, disincarnation was not total. As already mentioned, Enlightenment psychologists localized in the brain the mental powers necessary for identity. Resurrection discussions serve again as a historical magnifying glass. Several eighteenth-century thinkers speculated that our brains enclose a tiny indestructible particle that combines

the qualities of a brain and seat of the soul with those of an embryological germ. On Judgment Day, the particle will develop and restore each individual's original personality, as well as a body that, though materially different from the original, would still be the person's own because it will grow from a germ that belongs to the person. In this hypothesis, the crucial requirement for personal identity is the union of soul and brain; we've already quoted Bonnet's statement that 'If a Huron's soul could have inherited Montesquieu's brain, Montesquieu would still create'.

The resurrection of the *same* body became thereby implausible or unnecessary. By the end of the eighteenth century, the psychological problem of personal identity had pushed aside the issue of the numerical sameness of bodies. Traditional Christian eschatology was largely replaced by spiritism, spiritualism, and other beliefs (including reincarnation) about the persistence of personality after death. Still, a few nineteenth- and twentieth-century authors explored the relations between the resurrection of the flesh and scientific models and data. An updated version of the germ theory was proposed in 1888; a century later, some imagined that DNA and raw materials would be enough for the resurrection of the body.

But what body? If, following Locke, only a conscious personality is necessary for a fair Last Judgment, then resurrection might be limited to brains, or even to some brain structures. As German neuroscientist Detlef Bernhard Linke has asked, since only part of the brain is necessary to be a person, shall we need it whole to enjoy the beatific vision? The fraction that contains the information necessary for defining our self might suffice. But information might be stored in a machine. Hence the argument of physicist Frank J. Tipler in *The Physics of Immortality. Modern Cosmology, God, and the Resurrection of the Dead* (1994), for whom the resurrected *I* need be nothing other than the computer equivalent of my brain.

To sum up: From the early centuries of Christianity to present-day speculations, the doctrine of (and debates about) the resurrection of the body have elaborated questions about human identity, and functioned as a source of knowledge about the human being – not knowledge as a body of information, but as a process of *knowing* located at the crossroads of scientific and humanistic fields. They might therefore help us critically grasp the full significance of contemporary anthropologies of brainhood and the cerebral subject, at the same time that they argue for the inescapable role of the body in the constitution of human personhood.

Note on 'Nature'

Since awareness of the problematic polysemy of the notions of 'nature' and 'human nature' is not new, it may be useful here to make a small historical detour. In 1686, the chemist and natural philosopher Robert Boyle, a founding member of the Royal Society of London, published a *Free Enquiry into the Vulgarly Received Notion of Nature*. The gist of his argument was that the notion of nature had no place in natural philosophy. Nature, he observed, commonly plays the role of God's vicar, of an 'intelligent overseer' appointed 'to regulate, assist, and control the motions' of the different parts of the universe. Such reification (the word is obviously not Boyle's) detracts from the honor due to the creator, and 'defrauds the true God' by diverting acts of veneration and gratitude to 'the imaginary being' called *nature*. When God defined the laws of matter and motion, and endowed things with particular properties and powers, He set a course that neither needs nor allows for interventions other than His own. This view of the universe seemed to Boyle more consistent with religion than the one that took nature as God's 'lieutenant' or 'viceregent'.

For Boyle, the notion of nature was as prejudicial to science as it was to religion. In his opinion, accounting for phenomena by an appeal to nature precluded the search and formulation of precise 'physical reasons'. The word and its cognates should be discarded and replaced:

(1) 'Nature' as *natura naturans* can be substituted by 'God'.

(2) Insofar as the word designates 'that on whose account a thing is what it is', it can be replaced by 'essence'.

(3) The idea of nature as that which belongs by birth to a living creature may be expressed by saying that the creature under consideration was born so or is so by temperament.

(4) As for the notion of nature as internal principle of local motion, it could be couched in terms of a body moving in a certain way or direction spontaneously or as the result of determinate causes.

(5) In other cases, the word 'nature' can be given up in favor of 'the established order, or the settled course of things'.

(6) 'Nature' as the name for the powers belonging to a living body designates that body's constitution, temperament or mechanism, condition, structure or texture; when applied to 'greater portions of the world', it is better to use such expressions as 'system of the universe'.

(7) And when 'nature' designates *natura naturata*, the universe itself, why not use this word, and speak of 'phenomena of the universe' or 'of the world'?

(8) Finally, as regards nature as 'goddess' or 'semi-deity', the best 'is not to employ it in that sense at all'.

Boyle's manifesto was unsuccessful. In a study of 1935, historian of ideas Arthur Lovejoy found 66 meanings of 'nature', some in literary and philosophical works, others (normative ones generally derived from these works) used in ethics, politics and religion. In *Human Universals* (1991), Donald Brown offered a list of about 300 items from *abstraction*, *baby talk* and *belief in the supernatural* to *distinguishing right and wrong*, *males more aggressive*, *poetic lines demarcated by pauses*, *promise*, *semantic category of giving*, *sexual attraction*, *sucking wounds*, *tools*, and *world view*. One wonders why it would be necessary or useful to use the concept of 'nature' to designate such heterogeneous and questionable collections of features. The historian's answer may consist, as Lorraine Daston and I suggested in our edited volume *The Moral Authority of Nature* (2004), to document the contexts and conditions in which 'nature' exerts its cognitive and ethical appeal.

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THE ORIGIN OF HUMANS: THE RECORD FROM THE AFAR OF ETHIOPIA

BERHANE ASFAW

I would like to start with just one simple statement. Our own species is anatomically and behaviourally very recent, and cannot be understood or appreciated without taking into account where it came from and the form it evolved from. That is the reason why we need to understand our biological history. I just want to review the road we had to pass through in our 6 million year biological history. Just to reiterate, evolution is a fact. The reason why we say that we are evolved is because of evidence from comparative anatomy, molecular biology and fossil evidence. My work is mostly on the fossil evidence.

Just to give you a summary, we can classify our six million year biological history into three chapters (Fig. 1, see page 163). The first chapter, starting from the bottom, from the third one, is the chapter of *Ardipithecus*. That is a very remote group of ancestors that lived from about 6 million years ago to about 4.4 million years ago, according to our knowledge in the fossil record. The second chapter, the *Australopithecus* era, is the second phase of our biological history. It emerged, from the fossil record as we know it, around 4.1 million years ago and then continued later, the specialised forms continued up to around 1.3 million years ago, overlapping with the third chapter of our history. The third chapter is the *Homo* phase. I am classifying humans in the Linnean sense, by pure comparative biological information, comparative anatomy, by just grouping different creatures based on what they share and how they look alike. Based on that classification, the early groups that we identify, as palaeontologists, to be our closest ancestors look something like this (Fig. 2, see page 163). This fossil is 6 million years old, from Chad. This is the same 6 million year old fossil from Kenya and this is from Ethiopia around 5.8 million years old, which is almost six million years old, and all of them belong to the first chapter of human evolution, or the biological history of ourselves, the base of everything.

The second chapter started around 4.1 million years ago and the first record comes from Kenya and Ethiopia and is known as *Australopithecus anamensis*. These are the species that formed the base of the second chapter, which spread out all the way to South Africa. You do not find them outside Africa. On the basis of recent work, some researchers have been able to identify the same species, members of the same group of the second chapter, the *Australopithecus* chapter, as far as Chad, but nothing out of Africa. Then, after 4.1 million years, for the first time we see footprints. Our human ancestors had been walking on this planet for at least 2 million years before *Au. afarensis*, or Lucy's group, but we have very good records, good footprints from Tanzania and we have a collection of skeletal remains from Ethiopia. This is Lucy (*Au. afarensis*) (Fig. 3, see page 164). So the second phase of our evolution is very well documented. It is not such a scanty record as we see it in the first chapter. As we get closer and closer to the present the record gets better and better, which is natural.

In the second phase of our biological history, which is the era of *Australopithecus*, after 3 million years, after Lucy's time, after *Au. afarensis*, you see lots of species, a big variety (Fig. 4, see page 164). The species *Au. africanus* is from South Africa, younger than 3 million years, and *Au. garhi* is from Ethiopia, around 2.6 million years, and with this for the first time, at least in the same time period, we start to find stone tools, but the brain size is still the same as the others, very small. *Au. aeithiopicus* is also another species from Ethiopia and Kenya, and *Au. boisei* is a species found in Kenya, Tanzania and Ethiopia. *Au. robustus* is another species and a very close relative of *Au. boisei*, and is found exclusively in South Africa, but this is the same era as *Australopithecus*, which shows the maximum diversity of the species and takes us to the third phase. However, some of the specialised forms, the relatives of *aeithiopicus*, which are *boisei* and *robustus*, continued to live side by side with the second phase until about 1.2 million years ago.

The third phase of our biological history is the phase of the time of the genus *Homo*. That is the group that we can really closely identify with, because they have a bigger brain. We evolved directly from these groups and the oldest record that we have, for the third phase, is about 2.3 million years ago, and that is from Ethiopia. After that we have a good collection from Kenya, Tanzania and also South Africa (Fig. 5, see page 165). Up to this time, all the records that we have, the fossil records, the biological history that we have, are exclusively African. It is after this time period, after this group of hominids, human ancestors, that we start to pick up the fossil record, a record of our biological history in Europe and Asia. That is the

time of the *Homo*. By this time they have evolved, this is the time of *Homo erectus*. *Homo erectus* is the species that you find almost in all parts of the old world. The earliest ones were found in Kenya, Ethiopia and South Africa, but you can find them at least in the Eastern part of Africa all the way down to the south. This (Fig. 6, see page 165) is the Georgian one. It is the smallest, it is very small brained, but structurally it is very similar and the age is almost the same as the one we found in Kenya. And the next one is from Indonesia. This is just to show how widespread these species are: once they appeared, once they evolved and started to use stone tools they developed big brains and were able to expand in the old world very widely.

Then these species of *Homo erectus* were later followed by a bigger brained kind of people. This is the time, according to our work in Ethiopia, when we were able to see what can possibly be interpreted as ritual activities, because we were able to observe some cut marks on the skull. However, without going into that part, but dealing only with biological history, they have a very expanded brain, this is almost about 600 to 500 thousand years ago and you find them in Europe, Asia and Africa (Fig. 7, see page 166).

Then the last ones are us, we are the latecomers. But our steps through time are fully recorded. As we can see it, through time the brain has expanded and the cultural material that is associated with these fossils has changed. The tools have changed and our biology has changed. The most significant part that we can observe is a very expanded brain and a reduced face, at least from the biological prints we can see that these groups are *Homo sapiens*, the last groups that are us. Again the oldest record that we have is from Ethiopia (Fig. 8, see page 166). These two (Ethiopia, *Afar* – Ethiopia, *Omo*) are almost contemporaries, if not a little bit less, but still the time difference is about 165 thousand years (Ethiopia, *Afar*), and this is still over 100 thousand (Ethiopia, *Omo*) and this is from Israel, about 100 thousand, and similar kinds of fossils, 100 thousand years old, can be found all the way down to South Africa.

This is our fossil record that I tried to walk you through, without counting the huge fossils that we have in Europe, the *Neanderthals*, who were living side by side with *Homo sapiens*, but this is just to show you that humans evolved. The data I presented may be enough, but I can take you to one single place in the world, on this planet, where the whole record of human history, not the whole but at least a whole chapter, is represented, and that is the Middle Awash of Ethiopia. A single place on earth were the six million years of biological history is found in time-successive sediments is the Middle Awash in Ethiopia. I can take you there and I can show you where it is and

the time-successive sediments and what type of record we have in that place.

This is Addis Ababa, the capital city of Ethiopia, and this is the Awash River. The Middle Awash is just right at the triangle of the rift. This is the Red Sea, so the Awash is right here. That is where I work. If you travel from Addis Ababa towards the Ethiopian Rift Valley, which is the very northern part of the East African Rift, once you have finished the highlands and are descending into the lowlands, you will have to go down this sharp cliff but Fig. 9 (see page 167) shows you a window at very high altitude, about 2,900 to about 3,000 metres above sea level, so when you go down you drop into the place where we have a big cache of fossils, a record of our biological history, and the altitude that you are going to reach is about 600 metres above sea level, so you are dropping about 2,300 metres from this highland.

The Rift Valley, especially the Afar Rift, is a big area but my area of interest, where I am working now with my group, is this place (Fig. 10, see page 167) and this is the place where we get six million years of human history. At present this place is desolate and dry, it is a desert. But if we were able to go back in time, this is one of the 2.5 million year old sites, and then if you go back to 4 million and 6 million this place was lush and green, a very beautiful place, because the fossil evidence of the animals and of the plants tells us that our ancestors were living in a very beautiful environment, not a desert like this one. This (Fig. 11, see page 168) is just to show you the thickness of the sediments. It is one kilometre thick. And we compiled these one kilometre thick sediments in different ages and each exposure gives you a snapshot of the past. We have twelve horizons, from the bottom 6 million years till the top, about 80 thousand, and in this one kilometre section we have 12 snapshots. These 12 snapshots give us an idea of our past in time-successive sediments. The earliest one comes from the bottom. This is the species we call *Ardipithecus kadabba*, from the western part of the Middle Awash. The Awash divides the area in two, we call this side the eastern side and this side the western side and this is the earliest evidence of our ancestors. When we go up to about 4.4 million years ago we find another species. That species of the first chapter is called *Ardipithecus ramidus* (Fig. 12, see page 168). As I have told you earlier, when you try to reconstruct the past and draw the picture of what it was like 4.4 million years ago, the picture that we get of this place is something like this, because the kind of animals that were associated with these human ancestors, the fossil ancestors, are Colobine monkeys, which are forest-loving monkeys, and different kinds of antelopes, which are forest-dependent. So the area was lush and green and foresty.

When you go higher in the section you find a different form, a more evolved form. As we are walking through time, up in the section these species change and become closer and closer to us by adding more and more of the features that we have now. They add them through time and they evolve. This is the level of the 4.1 million year old *Australopithecus anamensis* (Fig. 13, see page 169). This species is only from Kenya and Ethiopia. The evidence, these are fossils from that time, and recently we have also found additional specimens from that horizon. When you go up, from 4.1 million years I am taking you to 3.4 million year old horizons, that is the area of Lucy's ancestors and relatives, and that is what we call the *Australopithecus afarensis* time (Fig. 14, see page 169). And we have the record of it in the Middle Awash. What I am showing you is only in one area, in one place, that is the record we have as a good evidence of human evolution. And we have the species *Australopithecus afarensis*. It is a different species, even though we find them in one place in time in successive sediments. It was also living in Kenya, Ethiopia and Tanzania. And then higher, at around 2.6 million years ago, we find a new species and that new species was found also with stone tools (Fig. 15, see page 170). When we published the finding of human ancestors from 2.6 million years ago, the first time it was published we did not have any record of stone tools in this horizon. The only thing we had at that time was evidence of cut marks on the bones. But last year, when we were doing our fieldwork, we found stone tools from the 2.6 million year horizon, which means the same horizon where this human ancestor came from. When we first discovered this in 1997, we had indirect evidence and were not really sure whether this human ancestor was really responsible for it or not. But now we have found more bones from the same time period and more stone tools, so now I can say conclusively that this species may be the one who is the first stone tool maker. And then we go higher, to around 1 million years ago, in the same place, the same Middle Awash. Here we find a bigger brained human, a member of the third chapter of our biological history (Fig. 16, see page 170). That is *Homo erectus*, with stone tools (Fig. 17, see page 171) And when we go higher we find another one. From 1 million years I am taking you to 500 thousand. This one has a bigger brain and still has stone tools. And then we go higher, to 165 thousand years ago and there we find this, a much bigger brained human and this is basically what we call 'us', *Homo sapiens*, the first species (Fig. 18, see page 171). And we can go higher and I will stop there and, at around 100 thousand years ago, we find sophisticated tool types, a different kind of tool which we call the Middle Stone Age, well-shaped, some of them look like arrow points, and we also find lots of bones (Fig. 19, see page 172). And those bones, basically we did not

only find skulls like the ones that I showed you, skulls of different types, but in this horizon we found skeletons from head to toe. This may be the time that if we find skeletons in the open air sites, not in the cave sites, then we may be able to talk about something more sophisticated, about our cultural beginnings, our consciousness of these people. We have to do a serious investigation and see what is coming. It does not stop there. That is about 100 thousand years ago. Where I am taking you is a place where Alison Brooks has been working for four years, and in that place we also find a human ancestor. It is about 80 thousand years old. And then you can see the tool types (Fig. 20, see page 172). As the biology changed, as the biology evolved, there was also a cultural evolution taking place side by side, but the speed of the cultural evolution was really picking up after the emergence of *Homo sapiens*, the one that I showed you from 165 thousand years ago.

Just to summarise, what we have found is only the last 1 million year biological history of us in the Middle Awash (Fig. 21, see page 173). You can see the *Daka* man at 1 million, and then this one, the *Bodo* man, at half a million, and then *Herto* at 165 thousand years ago, and *Aduma* at about 80 thousand years ago. This is evidence, the undeniable and irrefutable evidence of our biological history and of the fact that humans have evolved. It is impossible to understand modern *Homo sapiens* without understanding the road that we went through the course of our evolution. If we do not understand that, it is totally impossible to understand ourselves as a species, as human beings.

In conclusion, we have a good fossil record showing that humans have evolved. The fossil record is getting denser and denser as our work continues. Human evolution is a fact based on evidence. The evidence comes from three parts: comparative anatomy, molecular biology and fossil record. However, although we have this much fossil collection and know much more than those people who started the fieldwork 100 years ago, in Darwin's time, still there are lots of things that we do not know. We do not know who the last common ancestor was. We do not know the origin of *Homo*. I have shown you five species of *Australopithecus* and which one gave rise to the genus that we all belong to, the genus *Homo*, which one really is the basis, we do not know yet. I have my own views, my other colleagues have different views but we are not yet clear on that. And we do not know the place of the *Flores hominid*. Our own species is anatomically and behaviourally very recent and cannot be understood or appreciated without taking into account where it originated and the species it evolved from. I would like to repeat it again. As I told you earlier, the place is the Middle Awash of Ethiopia, where we have the irrefutable evidence of human evolution (Fig. 22, see page 173).

WHAT IS A HUMAN? ARCHAEOLOGICAL PERSPECTIVES ON THE ORIGIN OF HUMANNESS

ALISON S. BROOKS

Defining Human, Early Scientific Efforts

During the late 17th and 18th c., natural historians and biologists wrestled anew with the problem of defining humans within the natural world. In the context of the first anatomical studies of great apes, they found morphology alone was insufficient to achieve the appropriate degree of distinctiveness they felt was warranted, so many definitions and discussions fell back on distinctions in behavior such as language, innovation, or technology. In 1699, Tyson, in the first description of chimpanzee anatomy, named the chimpanzee *Homo sylvestris*, arguing that it was only the soul that differentiated this animal from ourselves. Buffon in 1749, wrote: 'If our judgement were limited to figure [morphology] alone, I acknowledge that the ape might be regarded as a variety of the human species'. Linnaeus in 1732 put *Homo sapiens* in the same order as the chimpanzee (*Homo troglodytes*), but Blumenbach and Lamarck put humans in a separate order, *Bimana*, emphasizing our reliance on bipedalism and free hands for making tools. However, Blumenbach's definition of human: '*Homo, erectus bimanus, mentum prominulum, dentes aequiliter approximati, incisores inferioires erecti*', would have excluded not only all the apes but also the large body of fossil human ancestors without chins. Lacking fossil evidence for human evolution, some early systematists who dealt only with living populations, saw behavioral continuity between humans, 'wild children' who lacked the essential ability to speak, and apes. Newly discovered peoples, such as the 'Hottentots' of southern Africa, were sometimes accorded a less-than-human status.

With the discovery of hundreds of fossil human remains, scientists have developed biological/morphological criteria for inclusion in the human lin-

eage, based on bipedalism, brain size, skull shape, tooth morphology and so on (Figs. 1 & 2, see page 171). These discoveries began around 1835 with the first fossil Neanderthals in Belgium (Engis) and have accelerated up to the present including new finds announced in the last few weeks (White *et al.*, 2006, e.g.), But were all of these ancestors fully human? What do we mean by human? Are even all members of the genus *Homo* human? For that matter, anthropologists do not even agree on what should be placed in the genus *Homo*. Does it start with the first signs of brain enlargement in Ethiopian and Kenyan fossils from 2.3 mya (million years ago) or only with the first individual with a larger brain, smaller teeth, modern body size and modern limb proportions found in Kenya at 1.5 mya (Wood and Collard, 1999). Should we limit the definition of 'fully human' only to members of the species *sapiens*, defined morphologically by their large brains in relation to their body size, by their small teeth, their chins, their minimal brow ridges and vertical foreheads, and by the way the face is tucked under the braincase, bringing the larynx closer to the mouth to facilitate speech? Clearly the expanding fossil record has blurred the morphological distinction between human and non-human primates which Blumenbach saw so clearly. Can behavioral contrasts provide the distinction we seek?

Behavioral Perspectives on 'What is Human?'

Even for 18th and 19th c. scholars, behavior played a major role in the definition of humans, as it did for Aristotle, Horace and other ancient writers. Distinctions cited by these and other early scholars included language, shame, reason, use of fire and tools, a sense of justice and a sense of the sacred. Once the great apes were known, these distinctions like the morphological ones became more nuanced. James Burnett – Lord Monboddo – argued in 1779-1799 that orangutans and chimpanzees were human in every way – they had a guttural form of communication believed by native Indonesians to be language, and used simple stick tools. (He also argues they had a sense of shame, built huts, used fire, and buried their dead, for which there is no modern evidence).

New research on great ape behavior has further blurred the behavioral distinctiveness of humans. All the great apes make and use simple tools, and for both chimpanzees and orangutans, tool use and other behaviors vary between populations, suggesting that a rudimentary form of 'culture' is being handed down from one great ape generation to the next. (Whiten *et al.*, 1999). While spoken language is still a major defining feature of humans,

many humans use other forms of communication, and apes have proven capable of learning and passing on a rudimentary ability for sign language. (Their anatomy does not facilitate the rapid production and distinction of multiple speech sounds). Furthermore there is now evidence that babies, who share some of the same anatomical disadvantages in speaking, can communicate complex ideas in sign language long before they can talk, suggesting, if ontogeny recapitulates phylogeny, that sign language may have an older history in humans than spoken language. Psychologists (evolutionary and otherwise) are focusing on the expression, in humans, of such characters as 'theory of mind', 'ability to imitate', 'empathy', 'problem solving abilities' and so on, but in every case, at least one of the great apes (and other animals as well) has shown a degree of these features that will not permit an absolute distinction between humans and other animals.

Genetics appears to provide another biological definition of humans or at least of modern humans since the full decoding of the human genome in 2001. But genetic sequences, even those derived from fossils, actually do not shed much light on whether the bearers were fully human or not – only on their degree of relatedness to ourselves. The difference between the Neanderthal mitochondrial genome and ours tell us nothing about the complexity of Neanderthal language(s) or whether Neanderthals shared ethical constraints, held complex beliefs about death and the afterlife, whether they sang or made up poems or told stories about their ancestors. Genetics may be more informative on this issue in the future. Animal studies of behavioral genetics and the genetics of brain growth and development are just beginning to yield results. Due to the essential unity of the genetic code in all living things, such results may carry implications for the evolution of human behavior. (According to some calculations, humans share 98.5% of their DNA with chimpanzees but also ca. 50% with bananas).

Defining Human: the Archaeological Approach

If we want to study the evolution of human behavior, we must necessarily turn to the fossil and archaeological records. Fossils can reflect behavior, in the shape of bones, their chemical composition, the position and strength of muscle markings, the damages suffered over a lifetime and the disposition of the skeletal remains. Archaeological sites are formed by definition only through human activities, although Mercader *et al.* (2002) have shown that chimpanzees also leave archaeological traces of their behavior. The fossil and archaeological records are limited, however, in what they can say

about the past, as they require definitions of humanness that are amenable to recovery in the material record. For example, one cannot recover fossil languages, at least not until the development of writing, although dead languages can be reconstructed up to a point from words preserved in living languages. But one can recover traces of symbolic behavior, or morphological traces of changes in brain or vocal tract morphology that suggest an ability for language. Ideologies or the capacity for abstract thought are not preserved, but one can recover traces of practices that seem to conform to ideas about spirituality – burial of the dead and cave art. Problem solving and innovativeness cannot be directly observed in the past, but one can document increases in technological sophistication and rates of innovation. And while the social networks and societies in which humans live are abstraction which must be inferred from physical evidence even in living populations, through geochemical characterization of sources, one can trace the movement of materials over very long distances, rule out natural transport and infer the size of such networks. In addition, from patterns of variability in the material record, it is possible to infer whether or not people distinguished themselves from their neighbors through their material culture, and what the size of the distinctive groupings might have been. Signs of empathy may also be evident in the survival of individuals with crippling injuries or major deficits, who could not have survived long on their own.

From the perspective of modern humans, behavioral definitions of humanness include what could be called 'living in our heads' – in reference to the fact that we do not live in a natural world but in one of our own imagination – an imagination which has led in many cases, perhaps inadvertently, to actual transformation of the natural world. Humans think up cultural solutions to scarcity, risk and the quest for food, shelter and mates, resulting in an astounding diversity of cultural forms, and the transformation (and endangerment) of vast areas of the earth's surface. Since human teeth and their two-legged gait are utterly inadequate for defense against natural predators, humans are totally dependent on invented technologies. Rather than living in a physical herd or a pack, humans live in what Anderson has called 'imagined communities', populated by individuals one may never physically encounter – distant relatives, compatriots, ancestors, and spiritual beings. Humans use symbols extensively to represent both themselves, their social groups and their thoughts. In addition, symbols are used to reify social groups to the extent that disrespect to a symbol, especially a religious symbol, is tantamount to an act of violence against a person. And humans have the ability to

imagine the feelings and lives of those around us as both separate from and similar to one's own – in a way that leads to extraordinary capacities for altruism and sympathy, even for individuals one may never meet.

The capabilities of modern humans must involve at least six different faculties:

Abstract thinking: the ability to act with reference to concepts not limited in time and space. A chimpanzee can be taught to use symbols correctly to solicit a reward, but not to go the grocery store with a shopping list and remember that she forgot to write down the milk.

Planning depth – the ability to strategize in group context. Social carnivores share this ability in the immediate future, but lack our ability to plan for next year, or for contingencies that may never happen.

Problem-solving through behavioral, economic and technological innovation. Many animals are good problem solvers, but modern humans solve problems that have not yet arisen, and devise entirely new ways of living in the process.

Imagined communities. Our present communities, from family to nation, may include people we have never met, spirits, animals and people who have died and the not-yet-born. These communities exist in our heads, and never meet face-to-face as a group.

Symbolic thinking, especially with regard to information storage. This involves the ability to reference both physical objects/beings and ideas with arbitrary symbols, and to act on the symbol even if the person who planted it is no longer present. It is both the arbitrariness of such symbols and their freedom from time and space constraints that distinguish our symbolic behavior from that of animals.

Theory of mind – the ability to recognize oneself as a separate intelligence but at the same time to read the emotions and thought of others (empathy). Apes and even domestic carnivores possess this to a degree, but only modern humans can recognize and respond to humanity in individuals they will never meet.

The Early Record of Behavioral Evolution 2.6-0.6 mya

When do these abilities first appear? It is difficult to say, not only because the record is sparse and patchy but because the capability may or may not be expressed for hundreds or thousands of years after it appears, and may depend on the development of other factors, or historical events. The capability for inventing computers may have existed in

the late Pleistocene, but could not be expressed without the appropriate cultural and technological milieu. The limited evidence for early expression of some of these characteristics, however, suggests however, that the total package was not assembled over a short period.

Problem-solving and technological innovation. The first stone tools date to 2.6 mya from Ethiopia, slightly later in Kenya (Fig. 3, see page 175). There is little evidence for abstract thinking in these artifacts as they consist of simple flakes directly related to the form of the raw material, although the ability to choose appropriate raw materials and to derive multiple flakes from a single block is far beyond what even the smartest apes can be taught to do. The rate of change or innovation is initially very slow; new forms such as bifacially-worked symmetrical handaxes appear only after the first 900,000 years and tools remain very static for more than 1 mya after that (Fig. 4, see page 175). Nevertheless, such tools made it possible for early humans to shift from the frugivorous diet of the great apes to one involving substantial carnivory, and also to expand into the Near East, Indonesia and China, far beyond their original range, by 1.9-1.6 mya. Technology also seems to have made possible a shift in food preparation from teeth to tools, so that teeth become smaller while body size increases. Early human diets were probably omnivorous, with meat obtained largely by scavenging, although the 'early access' pattern of marks on many bones suggests that at least some early humans confronted felid or canid carnivores at kill sites. Fire was controlled by 0.8 mya or earlier, facilitating a new diet, the use of caves, hunting, new technologies and social time at night (Figs. 5, 6, see page 176).

There is no evidence from this time for *imagined communities* or *symbolic thinking*. Stone and other materials appear to have largely derived from the immediate area, and the shapes and technologies are very similar from India to England and from France to South Africa The early presence of language in some form is also debatable, as brain asymmetries exist in early *Homo*, but modern speech would have been difficult. The symmetrical pointed or blunt-ended forms of large cutting stone tools after 1.7 mya may have carried a symbolic meaning, but since they are also utilitarian objects, their symbolic meaning, if any, is obscure.

Empathy, which appears very early in children before competent speech, may already be reflected in a very early human skull from Dmanisi in the Caucasus at 1.9 mya, (Lordkipanidze *et al*., 2005) of an individual who had lost almost all his teeth a considerable time before death, a condition which is rarely found in wild primates. Survival of this toothless indi-

vidual required either a new, very soft diet or the assistance of others. The 1.5 mya *Homo ergaster* skeleton from Kenya also appears pathological in its vertebral column, yet survived into adolescence (Fig. 7, see page 177).

The early appearance of these features does not mean they were as fully expressed as in modern humans or even that the full capacity existed as in ourselves. But it does indicate that the capacity did not arise suddenly in full-blown form but developed or evolved over time from non-human antecedents.

Late Archaic Humans and Neanderthals

After 600 kyr (kiloyears), most fossils exhibit essentially modern brain sizes, yet evidence of an increase in technological innovation, larger social networks or symbolic behavior is minimal until ca. 300 kyr. A new stone technology (Levallois) required a degree of abstract thought to imagine the flakes whose shapes were predetermined by the shaping of the cores. Wooden spears or javelins from Germany and numerous remains of large animals constitute the first evidence of hunting technology, which may have facilitated the occupation of much more temperate latitudes by 600 kyr, especially in Europe (Fig. 8, see page 177). One cave in Spain contains the remains of more than 30 individuals, mostly children and young adults, who lived ca. 400 kyr. It is unclear if this concentration was due to deliberate disposal of the dead or some other factor.

Neanderthals, who occupied Eurasia west of China between ca. 250 and 40 kyr, were significantly more like modern humans in their behavior than their predecessors (Fig. 9, see page 178). They buried their dead, used black and red mineral pigments found as powder, lumps and 'crayons', made stone-tipped spears, and were competent hunters of large game. Their fossil remains bear traces of both interpersonal aggression, in the form of knife wounds, and empathy, as elderly and handicapped individuals survived for much longer periods than previously. Evidence of cannibalism is also found at many sites. Although Neanderthals occupied Europe for at least 200 kyr, their technology shows very little innovation or regional differentiation over this time. Although the Neanderthal brain was similar in size to ours when adjusted for their large body mass, the relationship of the tongue and soft palate to the laryngeal space suggest that they may still not have been capable of the complex speech sounds made by modern humans. Clear evidence of symbolic behavior in the form of personal ornaments is only found at the most recent Neanderthal

sites, dating to a time when anatomically modern humans were already on their periphery. Does this mean they possessed a capacity for innovation and symbolic behavior, or only a facility for imitation?

Into the 1970s it was thought that modern humans evolved in Europe. But with the advent of new fossils and better dating techniques, it became clear that the oldest anatomical *Homo sapiens* fossils were African (Fig. 10, see page 178). The oldest fossil attributed to *Homo sapiens* in Africa is more than five times as old as the oldest *Homo sapiens* in Europe. At the same time, genetic studies demonstrated that all living humans share a 'recent' African common ancestor who lived between 100 and 200 kyr, ago or more, while one group of African genetic lineages shares a common ancestor with all Eurasians and Native Americans that is considerably younger, perhaps 40-80,000 years ago or more. Although at first this result was disputed, but repeated genetic analyses have confirmed our African origin repeatedly. MtDNA has been recovered from five Neanderthals who lived as far apart as Germany and Siberia, and the resulting sequences share similarities with one another but are quite different from living humans, suggesting around 600 kyr or more of separate evolution.

The rapid appearance of modern-looking people in Europe was not some punctuated 'human revolution' or 'great leap forward' but was clearly an invasion of people with long tropical limb proportions. Asia has a more complicated but equally punctuated history, also suggesting invasion and ultimate dominance by outsiders. Indeed the first 'out-of-Africa' migrations of *Homo sapiens* were to the Near East, with modern humans appearing first at Qafzeh and es-Skhul, in Israel, by 90-100 kyr. After 90 kyr, however, as the weather became cooler and drier, the *Homo sapiens* in the Near East retreated or went extinct and were replaced by Neanderthals. A second re-expansion of *Homo sapiens* ca. 60-50 kyr was more successful, reaching Australia by at least 50 kyr. It is unclear if the migration(s) involved one route out of Africa via the Nile valley, or an additional 'Southern route' over the Bab-el-Mandeb strait.

Becoming Fully Human: the Later Evolution of Behavior

The earliest *Homo sapiens* in Europe and Asia ca. 40 kyr and later, were almost certainly capable of the same range of behaviors as we are, as indicated by their cave paintings, musical instruments, beads and other jewelry, trade networks, technological innovations, regional diversity, economic flexibility and ability to colonize the entire globe (Fig. 16, see page 181). About

earlier humans in Africa who were physically similar to ourselves in many ways, there is considerable debate. Scholars like Richard Klein argue that they were physically modern but behaviorally primitive. To him and others, modern behavior came about suddenly, a 'Human Revolution' tied to a rapidly spreading genetic mutation for language. Sally McBrearty and I have argued otherwise, that the capabilities for these behaviors began to be expressed and therefore existed before modern physical appearance, with a gradual assembly of the kinds of behaviors we see later. This assembly was not unilineal but geographically and temporally spotty, with many reversals.

As archaeologists, we look especially for technological innovation and complexity, long-distance exchange, economic intensification, regional styles that change over time, and beads, images and notational pieces along with burial of the dead. For all of these material expressions of behavioral capabilities, there are modern, even living groups which lack them. While being demonstrably capable of producing such items, they clearly lack the impetus or the history to do so, so absence may not be a good marker of non-modernity. But absence of all of these over long archaeological stretches of time cannot be characterized as 'modern behavior'.

The rest of this paper will focus on three particular expressions of behavioral capabilities: technological innovation, long distance exchange and symbolic behavior. Since modern humans evolved in Africa, one should look particularly at the African evidence, which is still very scanty. There are more excavated sites dating to 250-40 kyr in the Dordogne region of France than in the vast African continent In particular the more typical tropical regions of Africa are poorly known; most of the evidence comes from the temperate regions at the northern and southern edges of the continent. Despite the limited quality of the evidence, more than 150 sites testify to the gradual assembly of innovative, social and symbolic behaviors, and to a complex interrelationship between behavior and morphology, leading to modern humans.

Before ca. 200 kyr ago, there are no known fossils attributed to *Homo sapiens* sensu strictu. The oldest examples to date are from Ethiopia, from the Middle Awash (160 kyr) and a second region in the far south, on the Omo river (195 kyr). All humans found in Africa after this date are grouped in *Homo sapiens*, distinguished by smaller teeth, a chin, a vertical face tucked under the cranium, a vertical forehead, and vocal tract proportions conducive to spoken language. Several lines of evidence converge to suggest that East Africa rather than South Africa is the likely cradle not only of our physical selves but also of our behavior. Not only are the oldest hafted

points and the oldest *Homo sapiens* from there, but new mtDNA and Y-chromosome studies suggest that an east African population, the Sandawe, may reflect as deep a root of the human genetic tree as the southern African San. Genetics also suggest that the ancient east African population was larger. In central Kenya, as well as in northern Tanzania and areas of Ethiopia, archaeological remains suggest a density of human occupation that is quite rare outside this area, with the possible exception of the South African coast, where habitation areas were limited by harsh climates.

But after more than a million years with little change in technology, the African record suggests that well before the appearance of *Homo sapiens*, before 285 kyr, behavior had begun to change (Fig. 12, see page 179). New technologies produced standardized stone flakes and long thin blades, ocher processing increased, and many sites have small quantities, up to 5%, of stone material derived from sources a considerable distance away – as much as 200 or more km., the first sign of an expanded social network. The increased use of ocher in Africa might suggest body painting or possibly a more utilitarian function. And in Israel and Morocco, two slightly modified stones with traces of ocher dating to between 500 and 200 kyr may or may not represent crude images. The behavioral changes reflected in these finds are not sudden or directional. The evidence for them is interspersed with sites containing the old symmetrical large cutting tools, or simple flake technologies, or lacking evidence for ocher or exotic stone. But the general trend is towards more complex behaviors with time. By ca. 260-235 kyr, several sites in South and East Africa include carefully made stone points, designed for hafting onto spear shafts.

New Technologies

More dramatic changes in behavior occur after the appearance of *Homo sapiens* (Fig. 13, see page 180). From South Africa to Egypt and from the western Sahara to Ethiopia, evidence for complex technologies and new tools increases especially after 100 kyr. In the Middle Awash region of Ethiopia, the first *Homo sapiens* at ca. 160 kyr are associated with both advanced flake technologies and the older symmetrical large cutting tools. Before 90 kyr, stone points are large or thick, and were likely hafted onto thrusting spears in close encounters with prey. But after 90 kyr, the points become tiny and light (Fig. 14, see page 180). We measured points from a number of other sites of about the same age from North, South and East Africa and compared them to contemporaneous points

made by Neanderthals. In comparing these to the range of points made by historic groups of hunter-gatherers, we concluded that these ancient examples had to have served as armatures for a complex projectile weapons system, involving a point, a haft and some sort of propulsion system, either a bow or a spear-thrower. It is also likely that these very small points, which could not have delivered a lethal blow to a large animal, were associated with the use of poison (Fig. 15, see page 181).

A projectile weapons system has parallels to a grammar, in that it involves non interchangeable forms: point, haft, binding, propulsion agent, which can be combined in a limited number of ways, with each point or haft filling a role that can only be interchanged with another similar point or haft. Such a system provides tremendous advantages to the hunter, who can now kill at a distance, with much more success and less risk to himself (or herself), resulting in greater survivorship. What were they doing with these weapons? In the western Kalahari desert, we excavated a site dating to 77 kyr on a seasonal pan, which today serves as an ambush hunting venue at the end of the rainy season, when other water sources are dry and game is concentrated around this resource. More than 600 small finely made points constitute the dominant tool class and associated animal remains suggest that humans were hunting large dangerous animals such as African buffalo and giant warthog with points weighing less than 10g, well within the range of arrowheads and spear-thrower darts known from historic peoples. At Klasies in South Africa, one of these small points was actually stuck into the cervical vertebra of a giant buffalo, providing proof of its use as a weapon (Fig. 16, see page 181).

At Mumba Shelter in Tanzania, there are also small projectile armatures, the smallest in levels dated to between 45 and 60-70 kyr (better dates are pending). But these are not triangular but geometric crescents and trapezoids, designed for hafting multiple elements in a single haft in the manner of predynastic Egyptian arrowheads. Again, this level of technological sophistication is also found in a very limited time and space in southern Africa, 60-65 kyr. What is even more interesting in the Tanzanian case is that some of the tools are made of obsidian, not from Tanzania but from central Kenya, almost 300 km away. So we are not only looking at technological sophistication, but also at a likely exchange network. A few other African sites show comparable exchange distances in small amounts (Fig. 17, see page 182).

As early as 130 kyr, another set of technological innovations appears to have focused on fishing. In eastern DR Congo, (Zaire), we discovered a series of what appeared geologically and typologically to be MSA localities

along the river at a place called Katanda, following an old land surface. We excavated three sites, each with mammalian fauna and lithic artifacts but also with a series of barbed bone points. Francesco d'Errico is studying the manufacture and use of these points and has suggested that there is wear from some sort of line or string on the base, indicating probable use as a harpoon. The dates for these sites have varied, but the trapped charge dating techniques suggest an age of 80-90 kyr would be likely, and that there is no evidence for an age of less than 60 kyr. Again, this is a complex technology that appears to have been outside the competence of Neanderthals.

The associated fauna includes a very large component of fish remains, all of the same species (*Clarias*) and age, suggesting a seasonal fishing activity. The fish were very large; we caught one weighing 74 pounds and the excavated ones were larger (Fig. 18, see page 182). Thus these three sites testify to a both technological and economic innovation. In addition, fish provides important nutrients – omega-3 fatty acids – which nourish the brain. Bone points very much like this one are known from the MSA-LSA interface at WPS. Very different cylindrical bone points resembling historical bone arrow points are known from ca. 77 kyr at Blombos cave, from Peers Cave and a number of other South African coastal sites, predating 65 kyr. In each case, fish bones have also been recovered (Fig. 19, see page 183). Bone points are a major technological advance, requiring considerably more time and effort to manufacture. Their advantage, according to ethnographic accounts, is that they float, allowing the fisherman to retrieve them easily.

Small projectile armatures in a complex weapons system could have given the edge to later modern humans, allowing populations to expand both within and outside Africa at the expense of the Neanderthals and other archaic populations. Neanderthals had many injuries from personal encounters with large dangerous animals, later moderns had very few. Neanderthals also had many more signs of dietary stress in their bones and teeth than the early moderns who succeeded them.

These projectiles are also quite variable in time and space – at least as variable as the small arrow tips that succeed them. The patterning of regional variation is to a large extent independent of climate and raw material – a stone industry with geometric shapes (the Howiesons Poort) for example, is found from Namibia to the Cape Province of SA in a limited time band and is made on a wide variety of raw materials from quartz to silcrete and chert. The distribution of regional styles of early *Homo sapiens* is thus as suggestive of ethnic or regional differences as any later African stone tools (Fig. 20, see page 183).

Symbolic Behavior

So far, we have demonstrated the presence of technological innovation, economic intensification, long distance exchange and regional styles in the behavioral repertoire of early modern humans. But is there hard evidence for symbolic behavior? Until very recently, there was little evidence before 40 kyr. An image from Apollo 11 of an antelope with human hind legs, was found in a level with an old date of 27,000, although we have dated the industry found with it to 65,000 at that site (Fig. 21, see page 184). In 2002, this extraordinary piece of engraved ocher (Fig. 22, see page 184) was described from Blombos cave in South Africa. It and a second similar piece clearly suggest that ocher had more than a utilitarian function. Multiple other pieces of ocher, bone and eggshell with engraved geometric or linear designs are known both from this site and from other sites in southern Africa, such as these fragments of decorated ostrich eggshell containers from ca. 65 kyr at the coastal site of Diepkloof (Fig. 23, see page 185).

Bead and other body ornaments are unequivocal evidence for symbolic behavior and for fully human status, as they have little utilitarian function (Fig. 24, see page 185). In traditional hunting societies, beads provide the basis of exchange networks that serves to tie distant people together in a mutual support network, which can be activated when times are bad. Individuals deliberately build these networks up as they grow into middle age, and acquire major responsibilities for raising and marrying off children or for supporting elderly parents. As they age and their needs decrease, individuals begin to reduce the size of these networks. Beads and personal ornaments such as rings, or headpieces, also serve as markers of social identity or status worldwide, from wedding bands to the colorful collars of the Maasai to the diamond necklaces of society women (or men). Despite extensive excavation, no beads are known from Europe before ca. 40 kyr. Early African sites have yielded a few ostrich eggshell beads in early sites – an unfinished one from South Africa (Boomplaas) dated to ca. 60-80 kyr, and several from Tanzania (Mumba) dated directly to between 45 and 52 kyr. In 2004, a series of perforated shell beads from the coast of South Africa, dated to 76 kyr, made headlines as the oldest evidence for body ornaments. New finds of shell beads, of the same genus, will shortly be published from even older sites in North Africa and the Middle East, in direct association with modern humans at one site, but dated to as much as 110 kyr (Fig. 25, see page 186). More and older bead sites are being reported, as we excavate more sites with modern technologies.

The evidence for human burial practices within Africa is limited, due in part to poor excavation practices, but there is an elaborate modern human burial at Qafzeh, in Israel dated to 90-100 kyr. The individual was associated with 71 pieces of red ocher, and also with a perforated bivalve shell (Fig. 26, see page 186). Although the perforation could have been natural, the shell was brought to the site and placed in the burial, along with some possible offerings of animal remains. This is the clearest evidence for symbolic burial with grave goods, and red ocher, practices which suggest a belief in the survival of a spirit after death.

Summary: Why Humanness Is a Gradual Process, Not a Sudden Event

The accelerating rate of technological innovation was a stepwise process, not a sudden event related to language. By 70 to 60 kyr, well before the out-of-Africa event that led to Neanderthal extinction, anatomically modern humans in Africa (and occasionally in the Levant) had: light complex projectile weaponry, fishing and bone fishing spears, long distance exchange networks, ocher, deliberate burial with grave goods, regionally distinctive point styles, symbolic engravings and personal ornaments. Within Africa, there is probably a complex web of inter-regional migration and local extinction that makes the record patchy and discontinuous. In addition, demographic and climatic factors may affect the degree to which any of these modern human capabilities are expressed; ethnographic studies suggest that symbolic expression, subsistence practices, and regional networks intensify under condition of resource stress. It is also interesting that the first Australians, who must have come from Africa but entered an empty continent ca. 50 kyr, lack evidence for any of these behaviors until after 30 kyr when the population had grown to fill the available regions, and the climate turned hyperarid.

Neanderthals, on the other hand, before 40 kyr, had hafted spear points, but possibly mainly in the Levant, they used a large amount of black coloring materials (they probably had light-colored skin) and simple burials without offerings or ocher. There is little evidence for Neanderthal fishing and none for bone tools, musical instruments, cave art or personal ornaments. After 40 kyr, when the modern humans were already on their periphery or perhaps in their midst, Neanderthals responded to pressure by developing or adopting some of the same traits – particularly the beads, and stone technologies. But they still lacked small light projectile armatures, they never went fishing and really long-distance raw material transport is

only marginally present towards the end at the northeast end of their range in Eastern Europe and Central Asia, where we would expect human territories to be very large and populations sparse.

Why was *Homo sapiens* able to replace Neanderthals in Eurasia after 50kyr but not before? There seem to be three possibilities: one is the sudden genetic mutation theory, one is about technological superiority, and one concerns the development of more sophisticated social networks, supported by a greater use of symbols, which buffered human populations against risks, much like the naming and gift-giving relationships of the Kalahari hunter-gatherers.

While the answer is almost certainly more complicated that any of these simple hypotheses, and may involve combinations of them and other arguments, I would argue that the evidence against a revolutionary genetic event is strong when you look at Africa. That continent is characterized by the earlier appearance of technological and economic complexity, as well as of complex symbolic behavior. The patterning of change both during and at the end of the Middle Stone Age period of early *Homo sapiens* is also very different from that consistent with a revolution, as it is both spotty and gradual. Such patterning is much better explained by the existence in earlier anatomically modern humans of modern behavioral capabilities that are variably expressed when conditions call for them – when either climate or population growth creates effective crowding, in an otherwise sparsely inhabited landscape.

At what point did *Homo* become fully human? The more we know the harder it is to draw a line between human and non-human or pre-human. The evidence suggests that the capabilities for 'living in our heads' were present before 130 kyr, and developed in a step-wise fashion, possibly in a feedback relationship with our morphology. Capacities for some of the most human qualities: creativity, empathy, reverence, spirituality, aesthetic appreciation, abstract thought, and problem solving (rationality) were already evident soon after the emergence of our species.

SOUL-SEARCHING AND MIND-READING ISSUES RAISED BY 21st CENTURY NEUROPSYCHOLOGY AND EVOLUTIONARY PSYCHOLOGY

MALCOLM JEEVES

Attempts to answer the question posed by Saint Augustine almost two millennia ago, 'What then am I, my God? What is my nature?', remained for many centuries the almost exclusive domain of philosophers and theologians. Today questions about human nature have moved centre stage in some media accounts of possible wider implications of scientific discoveries made primarily by neuroscientists and evolutionary psychologists. Developments in both fields over the past few decades have been remarkable. At the inaugural meeting in 1969 of the Society for Neuroscience there were fewer than 100 participants. By 2004 there were 27,000, such has been the exponential growth in the amount of effort and funding devoted to brain research.

It is arguable that the Nobel laureate David Hubel initiated the fresh impetus of research in neuroscience by his discoveries, with Torsten Wiesel, of brain cells that responded selectively to bars of light depending on their orientation. Two decades later as he reflected on the advances made, he wrote, 'Fundamental changes in our view of the human brain cannot but have profound effects of *our view of ourselves* and the world' (my italics).

The attention-grabbing book by Nobel laureate Francis Crick entitled *The Astonishing Hypothesis* contained such provocative statements as, 'The idea that man has a disembodied soul is as unnecessary as the old idea that there was a Life Force. This is in head-on contradiction to the religious beliefs of millions of human beings alive today'. Crick maintained his views until shortly before he died in 2004 when he further asserted, 'in the fullness of time educated people will believe there is no soul independent of the body, and hence no life after death'.

More recently it has been the rapid expansion in the relatively new and specialised field of evolutionary psychology which has raised questions about, for example, the uniqueness of human beings. According to the media with every fresh discovery the gap between humans and non-human primates seems to be narrowed. There is no doubt that such developments in research at the interface of psychology and evolutionary biology will continue to produce exciting and challenging discoveries.

In the late 1980s an unanticipated bridge appeared between neuroscience and evolutionary psychology when Giacomo Rizzolatti and his colleagues at the University of Parma discovered what have become labelled as mirror neurons. Initially this discovery attracted little attention. However, it was thrust into the limelight when the high profile neurologist Ramachandran predicted that 'mirror neurons will do for psychology what DNA did for biology: they will provide a unifying framework and help explain a host of mental abilities that have hitherto remained mysterious and inaccessible to experiments… and thus I regard Rizzolatti's discovery as the most important unreported story of the last decade'.

Research at the Interface of Psychology and Neuroscience

Within the communities of scientists, humanists and religious people there have been well-publicised speculations about how some of our traditional ways of thinking about human nature may need to change as we take account of the impact of some of the discoveries in neuropsychology.

With the advent in the 1960s of the so-called cognitive revolution in psychology, together with rapid developments in experimental techniques by psychologists and the developing field of brain imaging, rapid progress resulted in neuropsychology. The results from study after study demonstrated the intimate links between mind and brain, what used to be called soul and body. Mind was seen to be firmly embodied in brain. It became more and more difficult for most neuropsychologists to defend a view of human nature which claimed that there is within each of us an immaterial part labelled the soul, a part which, because immaterial, might be expected to be invulnerable to changes, whether naturally occurring as in old age, or by accident or destruction in our brains.

The accumulating neuroscientific evidence made traditional dualism an increasingly difficult position to defend. Nevertheless it remained possible to line up equally distinguished neuroscientists, Nobel laureates in their field, who would, on the one hand, such as the late Sir John Eccles, defend dualism and others, such as the late Roger Sperry, to argue against dualism.

It was Roger Sperry who emphasized the crucial importance of giving full weight to mental activity, to psychological process, to what he called 'top-down' processes. He had no time for reductionism. He did, however, see that the intimate links between mind and brain posed, with a new urgency, questions about how free we are to choose and to act. The relevance of these questions became more pronounced as evidence emerged for differences, for example, between the brains of psychopaths and normals. How responsible were some psychopaths for their behaviour? Similar dramatic findings began to emerge from case studies of individuals engaged in paedophilia and other forms of abnormal sexual behaviours.

It is important remember that these are not issues exclusively for people with a religious commitment. They are, as the recent book, *The New Neurosciences: Perils and Pitfalls* underlines, in its sub-title, issues for all thoughtful people, humanists and religious people alike.

In my presentation I shall give, for the nonspecialist, examples of state-of-the-art research in neuropsychology. Some of these examples will come from approaches usually labelled 'bottom-up' approaches. By this is meant that changes are made in the basic neural substrates and then the results of such changes carefully observed as they manifest themselves in cognition and behaviour. Other examples will come from so-called 'top-down' researches. Using these methods it has been possible to map out ways in which cognition and behaviour habitually engaged in, can be shown to 'mould' or 'sculptor', selectively, different parts of the brain.

It will be argued that it is sensible to follow the advice of neurologists such as Antonio Damasio when he wrote, 'The distinction between diseases of brain and mind and between neurological problems and psychological/psychiatric ones, is an unfortunate cultural inheritance that permeate society and medicine. It reflects a basic ignorance of the relation between brain and mind'.

These comments of a neurologist were echoed by a recent Past President of the Royal College of Psychiatrists in Britain, Robert Kendell, when he wrote, 'Not only is the distinction between mental and physical ill-founded and incompatible with contemporary understanding of disease, it is also damaging for the long-term interests of patients themselves'.

I shall hope to open up a discussion of how most appropriately to think about the intimate links between mind and brain. For debate I shall suggest that we need to give full weight to an irreducible duality of human nature best thought about as a duality of aspect rather than a duality of substance. I shall further suggest that it is more helpful to talk about

interdependence between brain and mind, rather than an identity or interaction. Mental activity and correlated brain activity may be regarded as inner and outer aspects of one complex set of events that together constitute conscious human agency. Two accounts can be written about such a complex set of events, the mental story and the brain story, and these demonstrate logical complementarity.

Mirror Neurons: a Bridge from Neuroscience to Evolutionary Psychology

The mirror neuron story began fourteen years ago, when Giacomo Rizzolatti and his colleagues reported the discovery of neurons in the frontal parts of the brains of monkeys which possessed functional properties not previously observed. Whilst their report caused considerable interest among neuropsychologists, it passed largely unnoticed by evolutionary psychologists. These unusual neurons located in an area known as F5 in the primate brain, did not respond when the monkey was presented with a conventional visual stimulus. Rather, they were visually activated when the monkey saw another individual, whether the experimenter or another monkey, making a goal-directed action with a hand, or, in some cases with the mouth. The responses evoked were highly consistent and did not habituate. The unusual properties of these cells were that they were active, not only when the monkey itself initiated a particular action, but also when the animal observed another monkey initiating and carrying out the same action. For this reason, they were labelled by some 'monkey-see, monkey-do' cells. One of the co-authors of Rizzolatti's paper, Vittorio Gallese, speculated that one of the primary roles of these mirror neurons is that they underlie the process of 'mind reading', or are at least a precursor to such a process.

Roughly speaking, 'mind reading' refers to the activity of representing to oneself the specific mental state of others, their goals, their perceptions, their beliefs and their expectations. Rizzolatti later commented, 'It is now agreed that all normal humans develop the capacity to represent the mental state of others'. They also believe that there are sufficient examples from the behaviour of nonhuman primates to constitute a strong argument supporting the hypothesis that they are also indeed endowed with cognitive abilities that cannot be easily dismissed as the results of simple stimulus response operant conditioning.

Within evolutionary psychology 'mind reading' has its intellectual roots in the research of a group in California led by Cosminides and Tooby. The main focus of research in evolutionary psychology is the question of how

humans came to be the apparently special animal we are today. In 1992 Tooby and Cosminedes defined evolutionary psychology as 'psychology informed by the fact that the inherited structure of the human mind is a product of evolutionary processes'. As far back as 1978, Premack and Woodruff had described animals who had the ability to understand the mind of another as possessing a 'theory of mind'. According to two of the leaders in the field Andrew Whiten and Richard Byrne, 'Having a theory of mind or being able to mind-read concerns the ability of an individual to respond differentially, according to assumptions about the beliefs and desires of another individual, rather than in direct response to the other's overt behaviour'.

One of the main contentions in evolutionary psychology is that any straightforward separation between cognitive and social capacities is likely to be unsatisfactory. The unprecedented complexity of human beings as compared to monkeys and great apes has come about precisely because these two domains are integrated in mutually reinforcing ways. Of relevance for our discussions is whether all this has any implications for our understanding of what constitutes human uniqueness. It warns us against seizing upon 'mind reading' as a uniquely human capacity. In also flags up for us the need to think carefully when focusing on the capacity for relationships as a key feature, if not *the* key feature, in defining what some have called 'soulishness'. The capacity for social relationships is itself, according to evolutionary theory, an evolved capacity, but one that may well have taken a quantum leap when combined with cognitive ability to equip homo sapiens with capacities and achievements so clearly different from those of our nearest, nonhuman primate relatives.

In our discussions I shall offer suggestions about how some of the discoveries of evolutionary psychologists may give a fresh prompt, and perhaps suggest a rethink, of claims that the capacity for moral agency and moral behaviour is a uniquely human capacity.

Some Issues at the Interface of Portraits of Human Nature from Neuropsychology and Evolutionary Psychology and Traditional and Widely Held Beliefs About Human Nature

Within mainline Catholic and Protestant traditions there are repeated and strong affirmations about belief in an immaterial and immortal soul. The scientific evidence reviewed suggests, I believe, that it is a distortion of reality to say that accounts given in mental categories, and accounts given in neural categories, are competitors, rather they should be seen as com-

plementary descriptions. It is therefore wrong to say that 'nothing but' the one or 'nothing but' the other will suffice. There is an intrinsic duality about the reality we have to deal with, but that does not need to be seen as duality of substances. Perhaps the evidence from neuroscience is encouraging us to consider reinterpreting some of the traditional ancient texts and to recognise what an increasing number of Biblical scholars have been telling us recently, namely, that we should return to a more holistic view of the human person. If the belief in the possession of an immaterial soul needs to be reconsidered so also do several other ways in which, historically, the assertion that humans are made in the image of God has been portrayed. For example, the view that the *imago dei* is possessing a unique capacity to reason. But then what do we make of the evidence of a theory of mind in chimpanzees and other nonhuman primates. The variety of complex reasoning tasks they perform would make such a view difficult to defend unless one continually changes the definition of what is meant by reasoning. Or again we may remember the view advocated by the North American theologian Jonathan Edwards that the capacity for moral behaviour and moral agency is part of what it means to be made in the image of God. How do such claims stand today and in the light of developments in evolutionary psychology? Behaviour which we should regard as moral behaviour, self-giving and self-limiting behaviour, if we saw it in our fellow humans is well-documented in nonhuman primates.

Other theologians, notably in the Orthodox tradition, have underlined the capacity for personal relatedness as a key feature of what it means for humans to be made in the image of God. The mirror neuron story makes it clear that our capacity for personal relatedness to a degree depends upon the intactness of our neural substrates and it is clear that these we share with the nonhuman primates. The mirror neurons were discovered in monkeys.

Perhaps we should do better to heed the advice of a contemporary New Testament scholar who wrote, 'The image is not located in any of these (possession of the soul, etc) but in our human vocation, given and enabled by God, to relate to God as God's partner in covenant. To join in companionship of the human family and in relation to the whole cosmos in ways that reflect the covenant love of God. This is realised and modelled supremely in Jesus Christ'.

THE NEED FOR OTHERS

JEAN-DIDIER VINCENT

If we consider the earth's living creatures we are struck by one remarkable similarity between them all and one key difference. For the similarity, we note that all living things are designed on the basis of a highly conserved developmental system (phylotype, by the developmental, or 'Hox' genes) read from a universal language coded in DNA base pairs. In contrast, we note the lack of any universal means of communication between individuals of a given species, or between species. We might note from this fact that the faculty mediating human communication is remarkably different from that of other living creatures, but we should also underline the similarity between the human faculty of language and the organization of the genetic code, i.e. hierarchical, generative, recursive and virtually limitless with regards to its field of expression.

In exploring the apparition of language in the human species, it is important to distinguish between problems concerning computation, including the hardware networks underlying these capacities and problems concerning interpersonal communication at the interface between abstract internal computation and both sensory-motor and conceptual-intentional interfaces.

In order to better understand the relative rarity of the anatomical specialities of the human brain in comparison with other primates, we shall consider separately the constraints from the environment of humans.

In this paper I shall defend the position that the major constraint on the adaptation of pre-humans was social and affective, rather than rational and intellectual. The extraordinary development of one particular sense: *the sense of others*, led to the development of this amazing faculty for language which played such a large role in determining the human state.

This 'sense of others' is composed partly of the motor resonance between the self and the other, but also of the process by which we are able

to take into perspective the subjective point of view of the other. Human social cognition encompasses all cognitive processes relevant to perception/action (a process that I call *representaction*) and to the understanding of conspecifics. It is widely recognized that what distinguishes human social cognition is the human ability to understand the mind of others.

In my approach, affect precedes action/representaction, in contrast with other hypotheses which subordinate feelings, affect, passion or emotion to the action. Affective cognition is basic. The sharing of knowledge of affect is called compassion, and this capacity constitutes the necessary step for the mysterious passage from animal to man.

In the universal figuration of compassion, I identify the mysterious passage from animal to man in the giving way of the exchange of emotions to that of smiles and tears, from the interplay of hormones to that of symbols. The regions of the brain that produce a mirror-activation in response to the gestures we see in others have given us an anatomical substrate, present even in the monkey, for inter-individual communication based on the representation of hand gestures and facial expressions, amplified and extended in the case of man to the dimensions of language. However this neurological basis can only partially account for the sharing of interior processes between two beings. Language can only be addressed usefully to a listener who is already present in the interior of the speaker.

In my presentation I shall rapidly consider the behavioral constraints of the adaptative corporal responses which have led to the development of the communication of affect as it is this latter that gives a profound sense to human language. It is surprising how small the mutations and changes are that have been necessary to lead to such an amazing transformation, in the animal nature of man i.e. from a neurophysiological aspect spindle cells in the frontal cortex versus mirror neurons, and genetically speaking the expression of the gene FoxP2.

In the final part I shall focus my presentation on the functions of language.

Buhler, one of the great psychologists of the Gestalt, attributes three functions to language as a communication instrument: a) *the expressive function* – language serves to express the emotions or the thoughts of the speaker; b) *the injunctive function, signaling or calling attention* – here language serves to provoke certain reactions in the listener; c) *the descriptive function* – language serves here to describe the state of things. According to Buhler, the first two functions are common to both animal and human languages whereas the descriptive function is exclusive to human lan-

guage. Popper attributes a fourth function to human language – *the argumentative function*, which constitutes the basis of critical thought. I would like to add a fifth function: *the compassionate function*, which I shall develop separately.

We can wonder at the specifically human nature of the *descriptive function*, as described by Buhler. The observation of vervet monkeys shows that they react to the sound of calls emitted through loudspeakers just as if they had heard a real predator. For instance if they hear the sound of an alarm call signaling the presence of an eagle, they scrutinize the sky before going to hide in bushes. It looks exactly as if the signal had provoked the representation corresponding to the description of a given type of predator. Is it not possible in this case to talk of words: arbitrary sounds with *a referential content*? According to Hauser, the alarm system of the grivet monkey has at least three properties in common with human words. Firstly the relationship between the sounds and the referential content is arbitrary: the cry signifying 'eagle' does not at all resemble the cry of an eagle. Secondly, the brain does not determine the class of objects or events associated with a given signal; it acquires the association from experience. Baby vervets start by giving out imperfect signals and making mistakes; at the same time they react wrongly to the signals of others. Vervets living in Nairobi where leopards don't exist use the leopard warning call to designate other large terrestrial predators like the dog. Thirdly, the vervet understands what the call is referring to without seeing either the caller or the event: he understands the sense of the call. Is this rudimentary semantics? The question remains.

The argumentative function of language described by Karl Popper belongs to man alone. He excels in convincing the next man, in 'instrumentalising' him to make him change his mind and to obtain his subscription to a point of view. I would like to advance the hypothesis that language is in fact a tool that serves to manipulate other human beings. A tool is an object used to act on the world and the physical objects of the world. Animals have been known to use pieces of straw, sticks or stones as a means to an end; man has acquired the capacity to articulate two or three objects in order to make a composite engine for a predetermined use: a flint at the end of a stick to make a lance; feathers at the other end to obtain an arrow to throw at the enemy or prey; a carved stone attached by weaved grasses to the end of a piece of wood to make an axe to shape the woodwork for a dwelling; and so on right up to the so-called weapons of mass destruction whose only use is to be turned against the species.

Human language obeys the same principles. The word is a tool constructed from basic elements. By articulating fragments of sense it can address arguments to another person in order to convince them to act in a coordinated way. But the *compassionate function* is probably the most essential function of human language. By language and the sharing of emotions, man/woman accedes to the 'being' of the other, and thus by a series of mirror reflections to his/her own being, otherwise called self-conscience. This is what confers the statute of human *being*; the second birth of the individual.

In this way human language shows itself for what it fundamentally is: the sharing with others of '*representactions*' and the passions that they convey.

Talking is an act of compassion. The Word is the beginning of man in the image of the great Other who was made man.

HOMO EDUCABILIS: A NEUROCOGNITIVE APPROACH

ANTONIO M. BATTRO

The butterflies of the soul

> *As the entomologist chasing butterflies of bright colors, my attention was seeking in the garden of gray matter, those cells of delicate and elegant forms, the mysterious butterflies of the soul, whose fluttering winds would some day – who knows? – enlighten the secret of mental life.*
>
> Santiago Ramón y Cajal (1923)

The Greek name for mind or soul is *psyché*, which is also the name of a species of butterfly. Moreover, Psyche was the name of the charming girl engaged to Cupid, the god of love, who gave her the gift of immortality. Iconography pictures Psyche with butterfly wings, which is an exception to the bird wings of so many spiritual creatures in the art of different cultures. Metaphors are bridges between worlds but, today, the language of science has shifted to 'models' as the only acceptable metaphors able to describe and predict many kinds of phenomena, our mental life, among them. Therefore we should try to go beyond the beautiful myth of Psyche and the prophetic vision of Cajal. In his work the great neuroanatomist was opening the way to a systematic analysis of neuronal growth and plasticity. As a matter of fact the growth cone at the tip of an axon moving in search for a synapse reminds us of the flight of a butterfly. I opened the workshop co-chaired by Kurt W. Fischer and Pierre Léna on *Mind, Brain and Education* at the Pontifical Academy of Sciences in 2003 where we celebrated the 400th anniversary of the foundation of the famous Accademia dei Lincei, origin of our Pontifical Academy, with a short video produced by a young high school student based on Cajal's metaphor where butterflies and neurons were entangled in a fascinating dance.[1]

[1] www.rossinstitute.org/default.asp?nav=publications&content=butterfliesCD

This poetic vision also inspired the work of the International Mind, Brain and Education Society, IMBES,[2] launched at that meeting, and the first summer school (2005) on *The Educated Brain* at the Ettore Majorana Center for Scientific Culture at Erice.[3]

Educability and Human Nature

Human nature has many dimensions and the contemporary sciences have several ways to identify, understand, explain and even predict some of them. One of the unique properties of human nature belongs to the 'educability' of the human being. This is why the expression *Homo Educabilis* reveals a substantial aspect of humanity and, following the classical terminology, 'educability' is a 'proprium' of our species, not a mere 'accident'. Other expressions such as *Homo Ludens*[4] have been analyzed in depth. Perhaps a constellation of human properties may continue to expand, so great is the richness of the *Homo Sapiens*. My thesis is that 'educability', i.e. the remarkable capability to learn and to teach, is based in the extraordinary plasticity of the human brain. As a corollary to that we can assume that the practical outcomes of education, the enormous expansion of schools around the world, the incredible feats of many students and teachers, the sad failures of others, are related to this potential for neuronal change, to the ever changing neural networks in our brains. In this sense we can predict that future interventions in the process of education would take in due account the neurobiological foundations of teaching and learning. As a result of this change of perspective we can understand education as a 'neuronal recycling' process of the brain, in the sense of Stanislas Dehaene.[5] In fact, human brain has not evolved in our species since the inception of formal education in human societies (some 5000 years ago) and to explain the fast growth of learning and teaching in society we need to rely on specific functional changes in the neuronal endowment of individuals. We can draw the conclusion that education unfolds a second nature in the human being because culture can change our brains.

[2] www.imbes.org
[3] www.ccsem.infn.it
[4] Huinziga, 2000.
[5] 2005, in print.

Learning and Teaching Brains. Human and Animal Models

An increasing amount of research has discovered the intimacy of these changes, in particular of synaptic changes during learning.[6] What we lack is a similar insight into the 'teaching brain'. As a matter of fact it is difficult to find brain images of the teaching brain while the study of functional images of the human 'learning brain' is growing at a geometric rate. The human brain is educable in a strong sense, because it can be transformed by education. Educability has two properties, one is related to learning the other to teaching. Most studies in animal and men related to the brain are focused in the learning aspect but we do not have comparable studies in the teaching brain. This is due to the scarce interest in the (neuro)cognitive aspects of teaching in most current psychological and pedagogical research, as has been clearly shown by Sidney Strauss.[7] But teaching is a natural neurocognitive ability, a natural skill in all humans. We teach at all ages. Children as young as 3 years old spontaneously teach other children when they play a new game, first by demonstration later by explanation. At age 5 they have already a well developed 'theory of mind' that allows them to perceive cognitive and emotional changes in the partner, predict and avoid errors during teaching, stop when the apprentice has understood, change the teaching approach when there is an obstacle, etc. With all this knowledge available it is certainly odd that still we do not have images of the teaching brain! Of course we need both sources of the educational cycle, teacher and student, in order to understand the whole process of education. However, the evidence that most, if not all, of our knowledge of brain processes in the course of education comes from the studies of learning and not from teaching is a warning, a signal of a serious bias. Perhaps the reason is that animal models used in many laboratories can tell us a lot about some common learning skills but nothing about human teaching skills. Animals cannot teach in the way humans do, but of course they can learn many things, and this is why animal studies are helping us to understand many human learning processes and about the neuronal plasticity involved.[8] For instance Albert Galaburda (2002) has investigated some specific brains lesions in rats that are similar to human lesions in severe dyslexias.

[6] Huttenlocher, 2002.
[7] 2002, 2005.
[8] Hauser, 2000; Premack & Premack, 1996; Tomasello & Call, 1997.

Certainly rats are not dyslexic but they can show us some intimacies of the mechanisms of dyslexia. Perhaps one of the most radical proofs of 'neuronal recycling' in animals has been offered by the work of Mriganka Sur and his team at MIT. They reoriented by surgery the visual paths to the auditory cortex of ferrets at birth with the result of producing a radical cortical rearrangement.[9] The retinal axons were routed to the medial geniculate nucleus (MGN) and the visual input was relayed from the retina through the MGN to the primary auditory cortex. As a result of these new connections visually responsive neurons in the rewired auditory cortex show orientation modules similar to those groups of visual cells that share a preferred stimulus orientation in the visual area. This is an extreme case of anatomical-induced neuronal recycling in animals, but we can also see in the clinical human practice several good examples related to a cortical functional substitution or 'cortical shift'.

One example is the effect on the cortical visual cortex during the Braille training of blind people.[10] This occipital portion of the brain is normally the site of the primary processing of visual stimuli, letters, for instance, but the blind person is unable to have any access to it. However, the tactile information given by the Braille code is still processed in these visual areas, an unexpected and fascinating discovery indeed. And what is even more important, a systematic training in Braille reading produces significant stable changes in the amount of the visual areas involved in decoding the tactile information given into embossed letters or dots. Moreover the cortical motor area representing the 'reading' finger, increases during the week of intensive training and decreases during the weekends and vacations. This result is one of the first controlled experiments of neuronal recycling in an educational setting. We can imagine in the future many other experiments on brain plasticity related to the educational schedule.

As a complement to this study, physicians use magnetic stimulating devices (Transcranial Magnetic Stimulation, TMS) on the skull to test those cortical areas under the magnet that can be excited or inhibited. A very short pulse can inhibit the cortical functioning under the magnet for a short time and allows the surgeon to localize a lesion, for instance. Alvaro Pascual-Leone and his colleagues have used this technology to investigate the effect of magnetic stimulation of the visual cortex of blind students of

[9] Sharma, Angelucci & Sur, 2000.
[10] Pascual-Leone *et al.*, 1999.

Braille. They discovered that the reading tactile skills can be specifically inhibited or excited by repetitive TMS of different frequencies, clearly proving the involvement of the primary visual area in blind persons. It seems that the visual cortex is recycled into the tactile mode and it is not necessary for the brain to create a brand new neural network for reading Braille. In other words, education is quite conservative at the brain level: we use what we already have, but in different ways. The questions are how do we shift neural circuits? What are the synaptic mechanisms involved in that particular recycling dynamics? How is the recruitment of the visual cortex to interpret a tactile skill as Braille produced? These questions go deep into the nature of 'educability' and brain plasticity.

In the same vein we can interpret as 'neuronal recycling' the use of the same cortical areas for processing sign language and oral language as Laura-Ann Petitto has clearly shown. Deaf babies 'babble' with their hands: 'by hand or by tongue ... there is a common brain activation in sign and spoken language'.[11] This is another example of the remarkable plasticity and parsimony of human brain learning mechanisms. Distance communication, of course, is a main obstacle in the deaf community but the expanding use of networked computers will help to overcome this issue. Incidentally, the deaf pupils formed, in many places, the first cohort of students with access to computer networks, local area networks in the eighties, internet in the nineties, even before mainstream primary school students became connected to the web. In the near future we will have schools extensively connected where all students and teachers alike will enjoy the use of portable and powerful computers, as in the 'One Laptop Per Child' program developed at MIT by Nicholas Negroponte and his team,[12] a program that will involve disabled students as well. Adding to that we should refer to the increasing use of computer prostheses for the disabled, in particular the cochlear implants for the deaf, which is the first brain-computer interface tested with great success in the educational practice. Nowadays many special schools for the deaf have a large proportion of implanted children and we can affirm that the whole practice of deaf education has been radically changed because of that. The deaf child must 'learn to hear' from the very beginning, some of them are now implanted in the first year of life and the teacher wears a microphone

[12] laptop.org
[11] Petitto 1991, Petitto *et al.*, 1998.

which is tuned to the frequency of the hearing aids in order to enhance the quality of the audition. At the same time cochlear implants become more sophisticated and better adapted to everyday life while experts analyze the functional plasticity of language related areas in implanted brains.[13] Again, because of the plasticity of the nervous system the impaired auditory paths can be supplanted by digital artifacts that bring hope and education to thousands of deaf persons around the world. In other words, the 'educability' of a deaf person is enhanced and his inclusion in society is growing, a society which is increasingly globalized.

The 'click option' is a universal asset[14] and plays a decisive role in the case of the disabled persons. When somebody interfaces with a computer into the web a whole world of possibilities is opened. Today we can even 'train our brain' to control a cursor on the computer without any voluntary muscular movement, just 'thinking' to go to the right or to the left and click. This has been experimented in extreme cases with implanted electrodes in the cortex of some patients suffering from a complete locked-in syndrome and who are unable to perform any voluntary movement.[15] Non-invasive techniques arrive at similar feats, by controlling a cursor via eye movements,[16] by biofeedback of EEG records or by voiced commands, as was the case of the talented quadriplegic architect we trained 'to draw with his voice' and produce professional architectural work with a voice recognizer system.[17] These examples dramatically show how much we can stretch our learning capability beyond severe neurological limitations with the help of special digital devices. We verify, once again, in those extreme cases, the remarkable 'educability' of our species. We can always trust in the marvelous plasticity of our nervous system and in our creativity to produce effective prostheses to enhance our cognitive capacities. It is our responsibility to provide this kind of assistance to those who need it.

[13] Guiraud, 2001.
[14] Battro, 2004.
[15] Kennedy *et al.*, 2000.
[16] Farid and Murtagh, 2002.
[17] Battro, 1991.

The Educated Brain

> *The great thing in all our education is to make our nervous system our ally instead of our enemy.*
>
> William James, *The principles of psychology* (1890)

Today we can have a glimpse in the organization of the neuronal nets during the educational process via the powerful imaging techniques available in our laboratories. However the enormous amount of information given about the living human brain should be carefully analyzed if we don't want to fall into a new kind of sophisticated phrenology. It is important to note that many components at different levels interact in a working brain: cerebral blood flow and metabolism, neuronal activity and neurotransmitter dynamics interact with behavior in a closely related manner.[18] We must be cautious to interpret our findings, in particular when we display them in the press without the necessary caveats. Despite the immense effort and the remarkable accomplishments of the neurocognitive sciences we must recognize that we are still exploring the fringes of the mental universe in our quest without end about our human nature. It is impossible to review all the fields of knowledge and culture already explored by the neurocognitive scientists. The arts and sciences, the ethics and virtues, all are under close scrutiny with the help of the most advanced brain techniques. In the following I will summarize only some findings that are relevant to the study of neural plasticity in the process of education. They will shed, I hope, some new light on our knowledge of human nature.

One of the most spectacular effects of culture on the brain function is detected in bilingualism.[19] It has been shown that early bilingualism showing comparable proficiency in both languages is represented in the same areas of the temporal cortex while in late bilingualism the cortical representation is more distributed in different cortical areas. As bilingualism is becoming more and more an asset in the globalized world many educators and policy makers are proposing different strategies but it is plain that some of them, as banning bilingualism in public schools, contradict basic neurocognitive findings. Another case is the prevention and remediation of the troubles in reading and writing so common in dyslexic children around the world. The impressive results of the brain sciences in the understanding of

[18] Kéri and Gulyás, 2003.
[19] Paulesu *et al.*, 2000.

the basic mechanisms of ortography, phonology, grammar, semantic memory, etc, are now helping thousand of dyslexic students to overcome their troubles.[20] On top of that languages differ in many ways and one important aspect is how ortography maps into phonetics, some languages being more 'transparent' than others. Monolingual readers of Italian and English, for example, show different distributions of cortical language activities. In other words different cultures shape differently the linguistic brain. We cannot underestimate the impact of culture on the human brain.

Reading, writing and arithmetic define the common ground of education for all students around the world. While a great variety of languages are investigated by hundreds of neurocognitive scientists in different cultures, arithmetic, instead, has the privilege to be unique, it has the same content and form in every culture: 2+2 = 4 everywhere and always. This universality is an epistemological issue from the point of view of the brain studies. However our mathematical brain can be shaped differently by training and mathematical prodigies show clear particularities in functional brain images.[21] Stanislas Dehaene (1999) and his team in Paris have shown the remarkable differences between the reading of letters and the detection of Arabic symbols at the cortical level. A common parieto-precentral network for elementary calculations has been observed in adults belonging to different cultures and languages. Moreover, the 'numerosity' of small sets of objects is found also in animals and babies and it has been discovered that some individual neurons in the parietal area of monkeys are tuned to some preferred numerosity. This specific area, the same in all individuals, is not the result of training but is the prerequisite of learning arithmetic in humans. A confirmation of this innate capability is that a specific lesion in this region disables the brain and the person will show dyscalculia or acalculia. Quantity representation at the cortical level is one of the most striking features of the mathematical brain and the task now is how to proceed from this quasi-automatic level of detection of numerosity to the most advanced mathematical representations. It will be a long time before scientists arrive to conclusions but the exploration of this path is under way. Mathematics is, without doubt, a touch stone for the study of the *Homo educabilis*.[22]

[20] Wolf, Goswami, in press.
[21] Butterworth, 1999, 2001.
[22] Changeux and Connes, 1989.

It seems that we can also detect in the cortex the traces of a 'conceptual change' such as the shift from Aristotelian to Newtonian physics. Andy di Sessa (1982) some decades ago showed with the aid of computers the amazing difficulty of students to interact in a Newtonian world where forces correlate to velocity and not to position as in Aristotelian mechanics. Most students have a naïve theory, a preferred set of concepts (called phenomenological primitives by di Sessa) that are in contradiction with what they have learned in the physics class but they still use them, for instance the 'impetus' idea or that objects move in the direction you push them. J. Fugelsang and Kevin Dunbar[23] have shown changes in the brain representation of 'Newtonian' and 'naive' movies where balls of different sizes fall at equal or different rates, respectively. They have tested two groups of subjects, physics students and non-physics students looking at these films. The fMRI records an increased activation in the Supplementary Motor Area and in the Anterior Cingulate that may 'inhibit' the naïve theory in the physics students and 'inhibit' the Newtonian theory in the non-physics students. This kind of research opens a completely new field in neuroeducation and will enormously enrich our knowledge of the mechanisms of human educability.

Half a Brain is Enough

Human nature is marked by the most complex system of the world, the human brain. In his remarkable book on *Finite and infinite machines* (1967) Marvin Minsky expressed a profound intuition: 'the human brain is probably too large already to use in an effective manner all the facilities which seem to be anatomically present!'. In fact we are gathering more and more evidence that it is not sheer encephalic volume or gray mass that expresses the overwhelming superiority of our species over other animals with larger brains than ours. Norbert Wiener (1948) half a century ago gave us a provocative view: 'In man, the gain achieved by the increase in the size and complication of the brain, is partially nullified by the fact that less of the organ can be used effectively at one time'. And he gave the example of Pasteur who suffered a cerebral hemorrhage on his right side when he was 46 years old. 'It has been said that after his injury "he had only half a brain". Nevertheless, after this injury, he did some of his best work'.[24]

[23] In press.
[24] See also Valéry Radot, 1922.

The question now, in the context of *Homo educabilis* can be the following: how much brain do we need to learn? My answer is: half a brain is enough. This is the title of my book[25] which relates the story of Nico, a right hemispherectomized child I have studied for ten years, and who is still a source of marvel for all of us. Perhaps he may even become a teacher someday in some specific discipline. In that case he will prove that half a brain is also sufficient to teach. I am convinced that the 'half-brain' studies will become a necessary complement to the well established 'split-brain' studies lead by Roger Sperry and Gazzaniga.[26] They will show us some of the incredible tricks human beings use to learn from the environment in the most extreme situations. The importance of these longitudinal studies should be evident for neuroeducation.

Nico, now 16 years old, cannot do everything with the left part of his body, however he plays tennis, swims, rides a bike and is good at fencing. But he can learn many things in high school in the arts and in the sciences. His right hemisphere was removed when he was 3 years and 7 months old, because of intractable epilepsy produced by polimicrogyria. How can he manage to perform so well with only his left hemisphere? We can compare his performance with another exceptional case, Brooke, a young man, now 22, who had his left hemisphere removed when he was 10 years and 10 months old and was diagnosed with a Rasmussen syndrome with severe seizures at age 9 and 7 months. Brooke is now going to college. Nico never lost his speech after surgery but Brooke became mute and took about 18 months to regain his language. In both cases the basal ganglia and the cerebellum remained intact. A comparative study of the cognitive and emotional strategies of both was done by Mary-Helen Immordino-Yang at the Harvard Graduate School of Education (2005) and can help us to better understand the relations between educability and plasticity. Brooke and Nico were tested in controlled tasks concerning prosody (tone discrimination for sarcasm or sincerity) and emotions (categorizing positive and negative relations and identifying pictures of faces evoking sadness, joy, fear, etc). We know that each hemisphere contributes in specific ways to process emotions and prosody in the intact brain. Both reveal outstanding performances in prosody, for example, but they use different strategies. The strategy for Nico was to rely more on

[25] Battro, 2000.
[26] Gazzaniga, 1970.

categorization (a mostly left hemisphere skill) and for Brooke to rely more on emotions and pitch recognition (a mostly right hemisphere skill). 'Nico was relatively efficient at categorizing based on tone and emotion, but quite poor at making connections between his judgment and the broader social and emotional contexts that would normally inform them'. Brooke, on the contrary, 'brought either emotional or intonational explicity to bear, even on basic discriminatory tasks requiring only categorical judgments'. In other words, 'both boys appear to be compensating so successfully because, instead of changing themselves to suit the problem, they have used their remaining strengths to reinterpret the processing problem itself into something they know how to do'. Immordino-Yang concludes that learners approach new problems differently not simply by 'bringing different strengths to bear on the same problem but may actually be transforming the intended problem in something new'. The author said that 'rather than compensating for their extensive brain damage by painstakingly adapting their remaining hemisphere to take over functions normally associated to the missing hemisphere, both Nico and Brooke appear to have instead transformed the nature of the processing itself to suit the existing strengths of their remaining hemisphere'. I think this is a good way to capture the essence of 'educability' as a proprium of human nature. We can shift cognitive and emotional strategies because the brain has an incredible degree of plasticity, and even half of our brain power is sufficient to cope with most stituations, old and new.

The NeuroLab in the School

As I said before, we should bridge the 'brain gap' between learning and teaching. We need to study the teaching brain with the same interest we are studying the learning brain. We have done practically nothing until now in favor of a neurocognitive approach towards teaching although we know a lot about teaching from many other perspectives. It seems to me that we need to create a new mind set, a corporate task, a teamwork with teachers and neurocognitive scientists. The best place for this encounter of the two cultures, teaching and research, is certainly the school, not the standard laboratory far away from the school and alien to most educational questions. We can imagine a NeuroLab inside a school. The time is ripe for this endeavour, we need to bridge the gap between the laboratory and the school. Of course it is a challenge for both communities of scientists and educators but we have discovered that a small interdisciplinary team can

make a difference. We have recently started a Neurolab in Argentina with Daniel P. Cardinali in the Colegio Marín, a traditional school of Beccar, Buenos Aires. In our NeuroLab we have focused on the effects of chronobiology in school performance[27] as a first step towards neuroeducation. We call this Chronoeducation.[28] We are now using low-tech equipment as electrocardiograms to measure the variability of the autonomic nervous system, online questionnaires about sleep habits, etc., but we hope to introduce high-tech devices in the near future. We think that the Near Infrared Spectroscopy NIRS would provide us with relevant data from the functional cortex in the classroom setting.[29] We can imagine, for instance, a class with the students and the teacher wearing head caps with the necessary computer interfaces for the online recording of the activities of their brains during a particular lesson. New portable brain technologies will come to make this dream possible. In all cases we should use our creativity to bring the brain into the classroom.

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A NEW SCIENCE OF HUMANITY: A TRIAL FOR THE INTEGRATION OF NATURAL SCIENCES AND THE HUMANITIES TOWARDS HUMAN SECURITY AND WELL-BEING

HIDEAKI KOIZUMI

1. Introduction

The modern age, especially science and technology, achieved great progress through the philosophy of reductionism proposed by Descartes. The idea of breaking things down into their basic elements led to the establishment of an exact science, enabling a more accurate understanding of nature, and generating new technological applications and industries. Disciplinary fields, however, were as a result subdivided, characterized by sectionalism and specialization, which made mutual discussions of a trans-disciplinary nature difficult. The coming 'post-modern age' is predicted to see an increase in the interaction between and fusion of these segmented disciplinary fields and the creation of new integrated fields. Such a post-modern age might be referred to as 'the age of integration with a comprehensive overview', whereas the current modern age is called 'the age of reductionism'. A methodology or behavior pattern to allow such integration with an overhead view might be a trans-disciplinary approach that synthesizes the science of humanity, the social and natural sciences, and integrates disciplinary and practical fields [1].

One prototype for the trans-disciplinary integration with overhead view is a 'New Science of Humanity'. This paper attempts a partial 3-D spiral synthesis of brain science, developmental behavioral science, cognitive science, psychology, anthropology, linguistics, pedagogy and ethics, based on physics and biology, using completely non-invasive high-order brain-function imaging, with a goal to integrating them in a New Science of Humanity. In synthesizing different fields into a New Science of Humanity,

those fields must be integrated and sequentially combined as an interactive entity, taking advantage of the fundamental concepts shared by those fields. This paper regards all natural phenomena as a probability process, and surveys and integrates the existence of matter as reciprocal, that is, the time during which a state might be sustained ($t = \tau \exp(E/kT)$, $\tau: 10^{-13} \sim 10^{-14}$ s, by E. Schrödinger (1951)). Assuming that a hierarchical structure of matter is formed, based on the sustainable time of that state, the basis is the dynamical mutual interaction of the four kinds of forces. Based on such a perspective, the same logical development can be applied to physical and biological evolution. Morphologies, structures and functions generated from them can be surveyed and integrated from a topological perspective. In this paper, the combination of physical and mental elements from such a perspective is attempted for understanding contributing to the achievement of human security and well-being.

2. Practical Integration Between Different Disciplines

The primary points of the survey and biological entities to be integrated in this paper are as follows:

No. 1: The essential conditions for generating, driving and sustaining the global biosphere are defined by the mass of the earth (its gravity), and the distance between earth and the sun.
No. 2: The above conditions allow the creation of a thin-film atmosphere that consists mainly of nitrogen, oxygen, vapor and carbon dioxide.
No. 3: For Nos. 1 and 2, the average temperature of the earth's surface is kept at 15°C (288 K) (including the greenhouse effect of 33°C) corresponding to a thermal energy of 0.0248 eV.
No. 4: For Nos. 1 and 2, the global biosphere can work as a thermodynamic external-combustion engine, because it is irradiated by high-energy low-entropy photons from the sun and emits low-energy high-entropy photons to the universe.
No. 5: For Nos. 1 and 3, hydrogen bonding (bonding energy: around 0.1 eV) can handle entropy, which is necessary for hydrologic circulation and sustaining life forms.
No. 6: The conditions for Nos. 1 and 3 enable DNA (base bonding energy: 2~3 eV) to sustain genetic information for a long period of time.
No. 7: The global biosphere and plant cells containing chloroplast are

regarded as partially isomorphic from a topological perspective on energy and entropy.

No. 8: Animals take in plants and other animals in the food chain and therefore can be considered as thermodynamic internal-combustion engines.

No. 9: With a topological survey of biological evolution, the structures of all animals from lower vertebrates to humans can be considered to be isomorphic.

No. 10: Genes slowly adapt to environments by repeating intergenerational gradual modification, and the cranial nerve system adapts by nerve selection (synapto-genesis and elimination) within one generation of individuals.

No. 11: Using non-invasive high-order brain-function measurements, mental activities are observed as physical phenomena based on neuronal network information processing, and quasi one-to-one correspondence between the mental and physical elements may be possible.

No. 12: 'Learning' is considered to be a process of establishing central nerve circuits by receiving external stimuli from environments (all surrounding things and people excluding oneself), and 'education' is the process of controlling and supplementing such external stimuli.

No. 13: Modern man's cerebrum, which still retains the trace of evolution, works on a subtle balance of information processing between the old cortex (the cerebral limbic system) and the new cortex.

No. 14: A New Science of Humanity can help develop a deeper understanding of humans and human behavior by grasping the essence of the human brain and incorporates research related to social systems.

The abovementioned does not mean determinism because the genetic and epigenetic processes are highly interdependent. The large part of the brain, an information processor, is constructed by stimuli from the environment. Uncertainty often appears in complex systems.

3. The Purpose of 'A New Science of Humanity'

The abovementioned accumulation of special physical factors created the global biosphere. How will a global biosphere with a 3.8-billion-year history transform into a solar system estimated to last another 5 billion years? Can humans sustain their existence? It may be necessary to ask if

the existence of humans who themselves are drastically changing the global environment, is really desirable from the perspective of sustaining the global biosphere. We humans have been destroying tropical forests, turning land into deserts, destroying the ozone layer, and polluting the hydrosphere and atmosphere. We are also contributing to the rapid extinction of many species. We cannot deny the possibility that the existence of humans, with our hypertrophied cerebral new cortex, radically increasing every kind of human artifact and deteriorating the global environment, is like a cancer to the global biosphere. The hypertrophied cerebral cortex, however, has also enabled reason, wisdom and complex sensitivities. Human-specific religions, ethics and morality were born, and a high-level mentality such as 'compassion' is a result.

On the other hand, 'hatred', which also emerged during evolution, is a persistent and intense emotion, sometimes passed down to descendants, hidden at the bottom of a culture. Current international conflicts involve 'chains of hatred and violence'. Research to eliminate such hazardous chains, combined with such concepts as 'human dignity' and 'acceptance of diversity', is highly practical, substantial and desired by people worldwide.

As a realistic research system, research addressing new bioethical issues might also be valuable. For the first time in our history, we humans are close to obtaining a methodology for reading minds from the outside. We must be cautious and meticulously so, however, in our approach to the possibility that even a small part of the mind might be exposed. To address this ethical issue, an innovative ethical committee to concurrently connect and conduct the practice and study of ethics is being prepared under international alliance and guidance. One of the principal goals of the New Science of Humanity is to understand 'learning' and 'education' as an exact science. In this paper, I have attempted to prepare guidelines for basic ethics through an overview and integration, since a desirable future for humans will be based on 'education', in its extended meaning. We are committed to the achievement of human security and well-being.

4. Practical Trials

As a concrete methodology, the focus is on non-invasive brain-function measurements to propose a new framework of human science. 'Optical Topography', an original creation of the author and his colleagues, is a completely non-invasive higher-order brain-function imaging technology which

may be used anywhere (even at the bedside, in the living room or in an automobile), anytime (even during sleep or motion), by anybody (even by neonates, children or elderly people) [2]. The author believes that this could be the first instrumentation to integrate natural sciences and the humanities. Practical applications of Optical Topography will be mentioned, as well as the present status and the future of the 'Brain-Science & Society' Research Initiative including 'Brain-Science & Education' [3], 'Brain-Science & Ethics' [4], etc., are some Japanese national programs being conducted from the viewpoint of human security and well-being. In the 'Brain-Science & Education' initiative led by the author, there are 12 trans-disciplinary projects over 3 years for each; 1 major developmental cohort study project (National Children's Study), and 6 satellite cohort study projects with non-invasive higher-order brain-function analysis at least over 5 years.

5. Brain-Science & Ethics

'Brain Sciences and Ethics' is also a possibility for a new field of study; to render the brain function images of the limbic-type which attacks or defends on perception of personal danger, the reward-seeking-type which perceives reward (from instinctive pleasure to prestige), the relationship between the new and old cortex which controls emotions such as love and hate, and the ability to read others thoughts (Theory of Mind) to research. The frontal lobe, particularly well-developed in humans, is where humanness is born. A warm heart, the ability to empathize, consider things from another's viewpoint, are an extrapolation of the mind theory, and perhaps the type of ethics that the world today needs.

At the same time, ethical issues regarding brain science itself have been raised. The brain houses the most private intimate thoughts of a person. In 1999, on the request of families of ALS patients (Amyotrophic Lateral Sclerosis), the author and his colleagues measured the brain activity of ALS patients in a completely locked-in state in cooperation with a medical school. When the son of a patient spoke, the area of the brain which controls semantic understanding (the Wernicke area in the left hemisphere) was activated. Next, when we asked the patient to turn and try and speak to his son, the area of the brain which control speech (the Broca area in the left hemisphere) was activated. It was then, for the first time, that we realized that this patient had full consciousness and mental capabilities. Further, using brain imaging techniques, we were

able to allow the patient to communicate with the family for the first time in two and a half years. By asking the patient to imagine different things for a 'yes' or 'no' reply to questions, it was possible to distinguish the different responses [5]. While providing a glimmer of light to the unimaginable anguish of the patient on life support and the family, it also raised the ethical question of whether it was a good thing to be able to observe what a person is thinking about from the outside.

It is commonly held that science and technology itself is neutral, and that whether it is good or evil depends on the humanness of the people using it. At the same time, the naïve logic that therefore a scientist may research whatever takes his or her fancy, is no longer accepted. An ethics which defines the ideal human nature is also required by scientists, not an ethics which determines how much 'progress' may be permitted in a given line of research. A workshop entitled 'Brain-Science & Ethics', sponsored by JST, was held in March 2005.

6. Conclusions

'Warm-heartedness', as human nature, has many meaning including compassion, but I believe it is based on an ancient Indian philosophy which finds its origins in the Pali terms *metta*, *karuna*, *mudita*, *upekkha*. *Metta* is unconditional loving kindness, such as that in the gentle heart of a good friend or a mother; *karuna* translated as compassion, is the ability to share another's pain as if it were one's own; *mudita* is the altruistic joy in another's good fortunes, and *upekkha* (also *upeksa*), translated as equanimity, is a balanced state of mind with no strong attachments.

The Pali language has been used for about 2,500 years, originating from regional and unsophisticated ancient Indian languages. The original thoughts on the above words existed before Buddhism. I believe these qualities are at the very core of human nature, going beyond the boundaries of a religious concept, and are a key to human dignity and happiness. Advanced neuroscience has recently begun to succeed in scanning functional areas responsible for these neurological mechanisms, and developmental precursors using noninvasive brain-function imaging. For example, there is growing evidence suggesting a relationship between the medial frontal lobe which projects nerve fibers from the old cerebrum cortex to the new cortex, and imagining oneself in another person's situation (Theory of Mind). Finally, I believe that in pursuing human happiness and to break the

'chain of hatred', it is essential to understand the workings of the brain and mind. This is why I am devoted to the 'Brain-Science and Education' Initiatives mentioned above. It is my sincere wish that today's infants, children and their offspring will find a happy and peaceful future.

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THE SCIENTIFIC IMAGES AND THE GLOBAL KNOWLEDGE OF THE HUMAN BEING

EVANDRO AGAZZI

Knowing What Man Is

Know yourself was considered already in antiquity as the imperative in which the core of wisdom is concentrated, and the force of this imperative was stressed by its being attributed to Apollo's oracle (hence to a divine source), so that a correct answer to the question implicit in this imperative ('Who am I?') was considered the solution to the problem of finding one's happiness. That of attaining an adequate knowledge of oneself is a task of paramount importance, since it coincides, in the last analysis, with the problem of finding a *sense* and a *value* for one's life and this is certainly the most radical and essential problem for every conscious being. Unfortunately many humans do not have the necessary time and existential conditions for devoting the adequate *reflection* to this capital issue, but no *conscious* life (i.e. no *genuinely human* life) can develop without some kind of awareness of this problem, simply because no human being can escape being confronted with the totality of his whole *experience* (i.e. his own *Life* taken in all its multifaceted dimensions), in which he is personally involved and has to find out *his* best way of spending life.

Is this an easy or a difficult task? At first it seems easy, since in the case of self-knowledge we do not need to 'cross the gap' between subject and object of knowledge, that is often seen as an obstacle in the effort of ascertaining 'how things are'. Nevertheless we quickly become convinced that in the effort of knowing ourselves we do not really enjoy a significant privilege with respect to the knowledge of the so-called 'external world': we do not know, for instance, how the internal structure and functioning of our body are organised, how our emotions can drive our conduct, how we can retain memories of past experiences, and so on. Of all these aspects of our reality

we do not have an *immediate knowledge,* and this is why humans have tried from time immemorial to obtain such a knowledge by using suitable *means,* or by resorting to reliable *sources and authorities.* This is true, in particular, not only regarding 'matters of fact' such as those we have just mentioned, but also (and even more significantly) regarding those 'ultimate questions' that regard the sense and value of Life taken globally, and which imply a correct understanding of 'what is man', of 'what is the world', and 'what is the position of man in the world', besides the question of whether this world exhausts the reality in which human life can find its sense and value. For many centuries humans have resorted to *religion* and *philosophy* as sources for the solution of the 'ultimate questions'. Simply because these were considered as the most reliable sources of *knowledge* in general, and the methods they used were divine *revelation* and *metaphysical speculation.*

The New Intellectual Authority: Modern Natural Science

The situation changed at the beginning of 'modernity', when a new source of knowledge, equipped with its peculiar methods, appeared in Western culture: the natural *science,* understood in the new 'modern' sense of this concept. This 'new science' (the adjective 'new' explicitly appears in the title of Galileo's scientifically most relevant work) was initially well aware of its limited and delimited scope, that is: (i) the object of inquiry was only the 'local motion' of material bodies, (ii) the aim of 'grasping the essence' of things was considered a desperate enterprise (the 'what is?' is not the kind of questions to be asked in this science), (iii) only strictly empirical evidence (phenomena) must be considered as reliable knowledge from which only prudent generalizations can be tentatively admitted, (iv) moreover, among the properties of material bodies only a few will be investigated, those that are expressible as mathematical magnitudes, (v) the combination of empirical evidence with mathematical calculations is the backbone of the *experimental method* thanks to which it is possible (and mandatory) to submit to test any not strictly empirically supported scientific assertion, (vi) in particular this mathematization and these experimental testing are possible because artificial *instruments* are designed for making observations and measurements.

The new natural science attained, in the course of just one century, such an impressive harvest of knowledge that even philosophers gradually became convinced that this progress was obtained not 'in spite of', but 'in virtue of' the above mentioned limitations. While thinkers like Descartes,

Spinoza and other 'rationalists' maintained that sound knowledge in any field can be acquired by a generalized adoption of the mathematical method of reasoning, other thinkers, and paradigmatically Kant, theorized that genuine knowledge in general is possible only by respecting the conditions fulfilled by the modem natural science (i.e., application of mathematical conceptualization to empirical phenomena). This science was, at that time, mechanics whose tacit ontological elements were matter and motion. Therefore it was implicitly admitted that genuine knowledge can be attained only in the domain of material things. Philosophers were aware of this situation and, apart from a minority that was already embracing a materialistic metaphysics, the majority was still adhering to the general conception that had been characteristic of Western philosophy and, in particular, admitted a spiritual and transcendent dimension of reality of which God was the supreme being and also humans participated, as far as their nature included the possession of a spiritual immortal soul. The most typical representative of this 'spiritualistic' trend was Descartes, whose philosophy was very welcome at his time especially for having found a plausible solution to the problem of recognizing the full value of the new mechanistic natural science and at the same time the no less genuine value of the metaphysical speculations. This solution consisted in the famous *dualism* according to which reality is split into two separate *substances (res cogitans* or spirit, and *res extrensa* or matter), and while the study of material entities was entirely and exclusively attributed to the competence of the natural sciences, the study of the spiritual entities was entirely and exclusively attributed to the competence of metaphysics, religion and theology.

The Cartesian Dualism

Since the said partition reflected itself also in the consideration of man, the consequence was that the human body (which is a material substance) can and must be studied through the natural sciences and is exclusively endowed with material properties, while the human spirit is immaterial, is endowed with properties that cannot be investigated by natural science but can and must be studied and recognized with the tools of metaphysical knowledge (that, in particular, justifies the traditional perspectives of the Christian religion).

Despite its *prima facie* plausibility this compromise solution was rather fragile, especially in its interpretation of man. The ontological separateness of the two substances implied the impossibility that the one could act upon

the other or, in general, have any kind of causal influence on it, and this made impossible, for example, to explain sensory knowledge in which we form intellectual immaterial images of the external world that can act upon our material sense organs, or, inversely, to explain how an immaterial act of volition can produce the motion of my hand or any part of my material body. These, and similar, difficulties were actually the consequence of having artificially imagined something that is contrary to the most immediate content of our existential experience, that is, the *unity* of this experience, in which we do not distinguish soul and body, and, in any case, any human being apprehends himself as *one* and not as *two*. This is also reflected in our use of the language: when I say 'this is *my* hand' I do not mean that this hand is my 'property', but that it is 'part of' myself (at variance with the sense of a sentence like 'this is *my* car', which means the possession of something different from myself).

This is why a tendency towards the overcoming of this dualism was tacitly at work in the history of western philosophy and it can be seen as the programme of eliminating one of the two poles by 'reducing' it to the other: materialism pursued the proposal of reducing the whole of reality (in particular of man) to matter, by showing that the alleged spiritual characteristics are either the product of complex material structures or simply intellectual inventions; spiritualism attempted to prove the opposite thesis, that is, that matter is simply an initial still unconscious stage in the development of spirit. One could say that such opposite trends were not that new, after all, but we must consider what powerful support the materialistic perspective had received by the development of the new natural science. This development not only had shown that in the domain of matter a great and uncontroversial amount of new knowledge had been actually achieved, but that the validity of this knowledge could be proved also *concretely,* that is, through the construction of a great display of new artefacts, the *machines*.

The Fascination of Machine

The significance of machines in the development of Western culture is often recognized in the sense that they offered to humans the capability of magnifying their *practical power* of operation and production, paving the way to the industrial revolution. This is true, but even more significant is that modem machines are to a large extent the 'application' of knowledge acquired in the natural sciences, so that we know how they will function and why they will function in a given manner *before* their concrete realiza-

tion (they are *invented* or *projected* and not *discovered*). In this sense they seriously represent a tangible empirical *confirmation* of the scientific theories that were used in their design and play a genuine *intellectual role*. Moreover, in a machine nothing remains mysterious or secret: scientific knowledge completely *explains* its structure and functioning. Therefore, if of a certain object of study we are able to propose a 'model' in the form of a certain kind of machine, we have the impression of having completely understood and explained this object. We can call this the *epistemological purport* of the machine, which explains the fruitfulness of adopting machines for the modelling of different processes. But this feature very easily drew with itself an *ontological reduction*: if a certain domain X of investigation becomes intelligible by using models derived from a given natural science N, it seems obvious that its properties are reducible to properties of the objects treated by that science, and if N is concerned with material objects, its competence seems to become extended also over X (i.e. the properties of X are 'in the last analysis' also material).

This actually happened in the interpretation of the human being. Descartes was one of the first to present an articulated picture of the human organism as a complex mechanical machine, but he explicitly intended that this picture concerned exclusively the human body (including also several functions that we qualify as psychic and are common to many animals). In his view the spirit (that is, the sphere of our conscious activities and in particular self-consciousness) remains out of reach of this mechanical investigation and explanation, and taking the intellectual evidence of the *cogito* as starting point, metaphysical reflection can lead us to prove the existence of God, free will, the immortality of soul and the other fundamental metaphysical doctrines of the tradition. Other thinkers, however, who subscribed to a materialistic philosophy, did not follow this Cartesian distinction: in his famous work *L'homme machine* Lamettrie made the effort to show that the whole of human capabilities can be expressed and explained in terms of mechanical procedures taking place in the body, while the alleged spiritual realities in man and outside man are simply inventions of persons wanting to dominate people by exploiting their general ignorance and their fear of death. This trend never stopped in the following centuries: after mechanics, other sciences attained a leading position in the domain of natural sciences, and they easily suggested various forms of 'machines' (chemical, thermodynamic, electrodynamic, cybernetic, and so on) for the modelling of the human being, a modelling that was taken in a reductionist sense by all those who were inspired by a pre-

conceived materialist metaphysics. The novelty that has emerged more recently is that such machines (that formerly had the status of *conceptual* constructions very similar to the hypothetical constructions of scientific theories) can now be *concretely* realized and, in certain cases, can actually perform some functions and operations of which man (according to traditional views) is capable thanks to his intelligence. This is taken by several scholars as an evidence that no spiritual intelligence is needed in order to account for these functions. The reasons for which this conclusion is not justified cannot be discussed in this paper.

The Elimination of Finality

The elimination of spirit was not the only reason of dissatisfaction with the materialistic interpretation of reality based on the new natural sciences. An additional reason was that the methodological framework of these sciences explicitly excluded the consideration of *final causes*. Natural science could not dispense with the concept of cause and with causal explanation, but reduced it to the meaning of efficient cause (i.e., of something that 'produces' an event), that was introduced under the seemingly non-metaphysical notion of *force*. Force, that produces the *change* of motion (not motion itself, that is as primary as matter), acts on material bodies *from the outside* (and not from the inside, as the ancient formal and final causes were thought to act), and the result of physical actions is *fully determined* by the initial conditions and the applied forces, but does not conform to any design or pursue any goal. Therefore the suppression of finality and freedom were inexorably included in the worldview solely based on the new natural sciences and such an elimination (besides posing serious problems in the conceptual and theoretical construction of the lifesciences) jeopardized the possibility of giving a sense and a value to whatever reality, and cut the roots of morality. Once again the way for avoiding this conclusion was seen by several philosophers in the adoption of a *dualistic perspective*. Since it was impossible to deny that natural science had acquired a tremendous amount of knowledge by its methodological restrictions, it seemed legitimate to claim that this approach was pertinent precisely in the domain of nature, but not in other domains. The most interesting example of this special form of dualism is that of Kant, who maintains that deterministic efficient causality is necessarily present in our knowledge of nature, because this knowledge regards only *phenomena* that are organized deterministically by our own intellectual categories. But beside the world of phenome-

na (the only we really *know*) there is also the world of *noumena,* of 'things in themselves' that we cannot know in a proper sense, but we can *think of* without contradiction. In this world freedom and finality are thinkable and can exist, and we can even come to affirm their existence (without precisely knowing in what they consist and how they act) if we have other *sources* of information. For Kant this source is the interior experience of *morality,* that induces us to distinguish a *homo phenomenon* (a phenomenal man) deterministically included in nature and a *homo noumenon* (a noumenal man) endowed with free will, inviolable dignity, an end in itself and immortal. In short, we could say that with Kant the following dualistic compromise seemed attained: science has a full competence on natural phenomena, while philosophy has competence on man. The scientific discourse has a cognitive status in full sense, while the philosophical discourse has a less cogent cognitive status since its certitudes are rather 'moral certitudes' sharing to a certain extent the characteristics of a faith.

The Irruption of the 'Human Sciences'

But even this renewed version of dualism could not last too long. In the second half of the nineteenth century a new kind of sciences emerged whose domain of inquiry was precisely man (for this reason they are called in certain languages 'human sciences', though this expression is not common in English). While the inclusion of the study of man in the field of biology (significantly developed in the nineteenth century especially after the birth of the Darwinian evolution theory and the physical anthropology) was essentially a development of the perspective according to which the 'body' of man is a proper object of study of the natural sciences, these new sciences presented themselves as investigations of what has traditionally been considered the domain of the human 'spirit', that is, the individual human mind (that became the object of 'scientific psychology') and the collective product of the minds, that is, human culture (that became the object of sociology and various historical and social sciences). It is not really important, here, that the 'scientificity' of such new disciplines was advocated by certain authors in virtue of an alleged reducibility of their discourse to that of the natural sciences, by others in the name of a methodological affinity with these sciences, by others on the contrary, by vindicating a specificity of contents, aims and methods with respect to the natural sciences. What is important is the fact that, according to a view inaugurated by positivism, that became very influential and still dominates among cultivated people,

the creation of these sciences completed the maturation of an historical process in which science replaced philosophy everywhere and has been recognized as the only genuine form of *knowledge* that, in particular, can also offer the means for a *rational solution* to all human problems. This attitude is commonly also called *scientism*.

At first sight this situation has the advantage of having finally overcome *dualism* and its difficulties, in particular as regards the interpretation of man. But it is easy to see that this is not really the case. First, the majority of the partisans of scientism openly or tacitly subscribe to a materialistic worldview, so that the alleged elimination of dualism simply amounts to the old reductionist metaphysics. Second, the real shortcomings of dualism consisted in the fact that this perspective was unable to account for the *unity* of reality, and in particular of the reality of man, a unity in which the two dimensions have to interact, to become 'joined', so that the unity of experience that is present in every human being can be accounted for. Now, when the different sciences offer us their different *images* of reality (i.e. of *whatever* reality, including man), we are confronted not just with two, but with a very large display of images, so that the situation is not that of a reduction but of a multiplication of the difficulties already present in dualism. Indeed, contrary to a naïve first impression, two different sciences do not differ because they investigate two different domains of 'things', but because they investigate all things *from a delimited and specific point of view.* We can express this basic fact in different ways: from a logico-linguistic point of view we can say that every science adopts its specific *predicates* and constructs its technical vocabulary; from a methodological point of view we can say that every science provides the *methods* for establishing the *meaning* of its predicates and the immediate *truth* of its statements (criteria of *referentiality);* from an *ontological* point of view we can say that all this depends on the fact that every science does not investigate any reality *as a whole* but only a delimited number of *attributes* (properties and relations) of reality. These different ways of describing the situation amount to a unique fact: it is totally illusory to speak of *the scientific image* of reality globally understood no less than of any particular reality. This not so much owing to the fact that science is in continuous process of evolution and modification (such that it would be impossible to say *what is* this alleged scientific image), but especially because *there is not* a single scientific image, even taken at a given historical moment: there are the physical image, the chemical image, the biological image, the psychological image, the sociological image, and so on, and it is obvious that, given a certain

'thing', only a limited number of these different images can be applied to it (e.g. it would be meaningless to give the chemical image of a mathematical theorem or of a dream, or the psychological image of a stone). In short, it is an untenable claim to maintain (as Wilfrid Sellars once affirmed) that the progress of our knowledge consists in continuously replacing the *manifest image* of the world by its *scientific image,* because the former is intrinsically wrong and only the latter is true. Actually there is a sense according to which the manifest image and the different scientific images of the same reality may be 'true', but this sense must be carefully indicated.

Telling the Truth and Telling all the Truth

What has been said does not intend to underestimate the cognitive value of the scientific images. Quite the contrary, every scientific image is *partial* not only because it does not capture 'the whole of reality', but also 'the whole of any single reality', but this partiality is the price paid for a great advantage: *objectivity.* Indeed, it is the fact of having decided to *limit* attention to a few attributes of reality, of having denoted them in its language through technically well defined predicates, of having established standardized operational procedure for testing statements containing these predicates that has permitted to natural scientists first, and to other scientist later, to mutually control and test their empirical discoveries and theoretical constructions, attaining in such a way a considerable level of intersubjective agreement and an increased knowledge *regarding those delimited aspects of reality* they intended to investigate. But this is tantamount to saying that the partial scientific images obtained in this way are *true,* provided that we are conscious that no proposition or set of propositions can be true (or false) 'in itself', but always and necessarily *about its domain* of *reference.* Now, since every science speaks only about its domain of reference, and since we can be confident that (despite never attaining an 'absolute certainty') it is able to produce a reliable *image of* its domain, we must conclude that this image is *true relatively to its domain of reference.* Precisely because truth is always relative in this referential sense, it would be absurd to pretend that any partial image is true also in other domains of reference, and even less in the whole of the thing from which the partial set of attributes has been selected. Coming to our theme, we say that any of the different sciences (natural and human) that offer scientific images of man, tells the truth about man, but *does not tell all the truth.* One could think that in order to know 'all the truth' it would be sufficient to cumulate the partial

truths coming from all the single sciences, but this conclusion is untenable. First, it makes allusion to a kind of infinite and indefinite task (not only the present sciences; but also the future ones should be taken into consideration); second, it is still biased by *scientism* because it is said that only the accumulation of scientific images can contribute to the attainment of the *complete truth.* But this is simply a dogmatic presupposition, that excludes the possibility that other kinds of truth could contribute to the attainment of the complete truth or, maybe better, of *the whole truth* (i.e. the truth regarding 'the whole' in its globality, in which also the relations between the different partial images should be considered).

The Richness of the Unity of Experience

In order to capture this global truth we have to rescue the cognitive relevance of many aspects of our *experience* in its full richness, such as we have already characterized it. In particular those aspects that are not strictly bound to sensory evidence alone and that we, nevertheless, commonly qualify as 'experience' (such as moral, aesthetic, religious, sentimental, affective experience), or are present to us in fundamental aspects of our cognitive activity, such as introspection or reflection. As we have already said, this Unity of Experience is, for every human, his *Life* that we could also call the *manifest image* of reality, not in the impoverished sense we encountered above, but in the sense of 'what is immediately present' to us and that, for this reason, is *methodologically* the starting point of any knowledge, but especially the *source of any fundamental problem.* This happens because the global unity of Life, once it becomes the object of reflection, inevitably generates the problems of its *sense and value.* This is *the problem* for every conscious being. and, characteristically, this problem generates the subquestion whether the value of Life is contained in the Unity of Experience or not. This is the *problem* of *the Absolute,* that coincides with the problem of giving a value to Life, that is of paramount interest for any human simply because from its solution depends *how one should* concretely conduct one's life. A conscious being, a being endowed with *reason,* inevitably wants to find the *true* solution to his problem of Life relying upon *knowledge and reasoning.* This is tantamount to recognizing that a *postulate of the rationality of the real* is implicit in this fundamental attitude, this postulate must be understood simply as the claim that it is possible to provide a conception of the Absolute capable of granting the value of Life. The effort will be that of transforming this postulate in a kind of theorem, by

actually finding this determination of the Absolute, and in this enterprise no element of truth can be disregarded. This is why the scientific truths must be included in this effort, because they become part of this Unity of Experience that we cannot ignore, but at the same time we are brought to consider what problems regarding the sense and value of Life overstep the possibility of treatment of these different scientific frameworks, and we easily find a great deal of them. In such a way we necessarily recover the full legitimacy of metaphysics as an intellectually not eliminable enterprise, since it is the only rational discourse concerning *the Whole* of reality, as well as the full intellectual legitimacy of the idea of *transcendence,* since this is (along with immanence) one of the two alternatives open to the rational solution of the problem of the Absolute. Of course, the existence of this problem and the postulate of the rationality of the real do not warrant that we will find the solution, and in this case this solution would be chosen as an act of *free faith,* as fortunately do many people who cannot devote themselves to philosophy. It is important, however, to see that this rational inquiry is possible and cannot be forbidden in the name of science.

IS THE DNA SEQUENCE A SUFFICIENT DEFINITION OF HUMAN NATURE? A COMPARISON BETWEEN ARISTOTLE, THOMAS AQUINAS AND JACQUES MARITAIN

ENRICO BERTI

In order to answer this question it might be useful to examine how Aristotle and Thomas Aquinas – i.e. the ancient and medieval philosophers more often associated with the concept of human nature – would have answered it, had they been aware of DNA, and how their most recent interpreters have indeed done so.

As we all know, DNA was discovered in the 1950s by James Watson and Francis Crick, who, also thanks to research carried out by other scientists, managed to describe the structure of deoxyribonucleic acid, one of the two acids which make up the nucleus of the cells. Watson and Crick discovered that DNA molecules are formed of two chains of nucleotides resembling an entwined double helix: when the cell divides, the two helixes separate and two more helixes form attaching to them, in order to rebuild their primitive structure. DNA can thus reproduce without changing its structure, except for occasional errors or mutations. For their discovery, Watson and Crick obtained the Nobel Prize for Medicine in 1962.

The philosophical relevance of this discovery was highlighted a few years later, by Jacques Monod, in his famous book *Chance and Necessity*,[1] but also by an American biologist of German origin, Max Delbrück (1906-1981), who, in turn, won the Nobel Prize for Medicine in 1969 for his research on bacteriophage viruses, with an article about Aristotle ironically entitled 'Aristotle-totle-totle', a play on a well-known German song, which continuously repeats the name Mariandle.[2]

[1] J. Monod, *Le hasard et la nécessité*, Paris 1970.

[2] M. Delbrück, Aristotle-totle-totle, in J. Monod and E. Borek (eds.), *Of microbes and life*, New York-London, Columbia University, 1971, pp. 50-55.

In his article, Delbrück argued that, if a Nobel Prize to the memory of someone existed, it should be awarded to Aristotle for the discovery of the implicit principle of DNA. Indeed, in his biological works, Aristotle maintained that the germ from which the embryo developed, which for him was only the male seed (Aristotle did not have a microscope to see the female ovum), was not a mini-man, as Hippocrates thought, but a formal principle, that is, a 'development plan', a 'programme', containing a certain amount of information (this is Delbrück's translation of the Aristotelic terms *eidos* and *morphê*). This principle acts as a motive cause, transmitting a series of mechanical impulses to the matter, constituted by the menstrual blood provided by the mother, which cause the matter to organise and, in turn, form the various organs, beginning with the heart and ending with the complete individual who appears at the moment of birth.[3]

According to Delbrück, Aristotle's thought in general had been completely misunderstood due to the way in which it re-entered Western culture through the theology of the Christian scholastics (and, earlier still, I add, through the Muslim theology), which created a total barrier of misunderstandings between theologians and scientists, from Thomas Aquinas to today's mystical movements, Catholic, Protestant and linked to LSD (quoting the American scientist). A new look at Aristotle the biologist – concludes Delbrück – can lead to a clearer understanding of the concepts of purpose, truth and revelation, and maybe to something better than the mere coexistence between us, scholars of the natural sciences, and our colleagues of the other faculties.

A significant example of this misunderstanding is the Thomistic doctrine of generation, which was adopted for a long period of time by the Catholic Church and summoned up in recent times by a philosopher, Jacques Maritain, who was not at all ignorant of biological studies, and by a theologian who at the same time was a geneticist, Father Norman Ford. Indeed, in *De generatione animalium*, Aristotle writes that the embryos of animals have, first of all, a vegetative soul, one that also belongs to plants, and then a sensitive one, which makes them animals, because 'It doesn't become in fact simultaneously animal and man, neither animal and horse'.[4] Taking this sentence as a starting point, Thomas Aquinas maintained that the vegetative soul was in potency to the sensitive soul and that

[3] Aristotle, *De generatione animalium*, I 18 and 21-22.
[4] *Ib*., II 3, 736 a 35-b 2.

the latter was in potency to the intellectual soul, 'as it appears in human generation, in which the fetus lives first by plant life, then by animal life, and finally by human life'.[5] And, since Aristotle in a subsequent passage affirmed that 'It remains, then, for the intellect alone so to enter from outside (*thurathen*, literally through the door) and alone to be divine',[6] Thomas immediately thought, as a Christian creationist, of God's creation of the intellectual soul and of its infusion in the embryo only when a matter proportionate to it has been formed, that is, 'that multitude of organs that is necessary for the exercise of his many capabilities' (today we would say the nervous system),[7] and concluded authoritatively: '*Haereticum est dicere quod anima intellectiva traducatur cum semine*'.[8] The heresy in question is the so-called 'traducianism', professed in antiquity by Tertullian arguing against the excessive spiritualism of the gnostics.

Hence, in 1967, apparently ignoring the discovery of DNA, Maritain derived the thesis that St Thomas was an evolutionist too, because he admitted some substantial mutations, though in the development of the embryo and not yet in the evolution of the species, i.e. true forms of generation and corruption, in the sense that, at a certain point, the embryo apparently loses the form that animated it, be it the vegetative soul first or the sensitive soul later, to make room for a higher form, the intellectual soul.[9] And Father Ford, who, on the contrary, surely knew about the discovery of DNA, in his successful book *When did I begin?* (1988), relies on Thomas and Aristotle to defend the thesis supported by the 'Warnock Report', according to which, until the 14th day, the moment in which the 'primitive streak', i.e. the first element of the nervous system, forms within the embryo, the embryo does not yet possess an individuality, because it is made up of totipotent cells and thus can still divide.[10]

In actual fact, Thomas, in his reading of Aristotle, here as elsewhere, was totally conditioned by the Neoplatonic and Augustinian culture that dominated the Middle Ages, to the point of forgetting that, for Aristotle,

[5] Thom. Aq., *Summa Contra Gentiles*, III, 22.

[6] Aristotle, *De gen. an.*, II 3, 736 b 28-29.

[7] Thom. Aq., *Summa Contra Gentiles*, II, 75.

[8] Thom. Aq., *Summa Theol.*, I, q. 118, a 2, c.

[9] J. Maritain, Verso un'idea tomista dell'evoluzione, in Id., *Approches sans entraves*. Scritti di filosofia cristiana, Roma, Città Nuova, 1977, vol. I, pp. 87-153.

[10] N.M. Ford, *When did I begin? Conception of the Human Individual in History, Philosophy and Science*, Cambridge, 1988.

a substance could not have more than one form, not even at a subsequent time, and man possessed a single soul, the intellectual one, which contained within it potentially both the vegetative and the sensitive soul, as a polygon contains within it the square and the triangle, in the sense that, in man, the vegetative faculties develop first (eating and growing), followed by the sensitive ones (perceiving and moving) and finally the intellectual ones (thinking, wanting, etc.), but his soul always remains the same, i.e. the intellectual one.

Indeed Aristotle writes in *De anima*: 'The cases of figure and soul are exactly parallel; for the particulars subsumed under the common name in both cases – figures and living beings – constitute a series, each successive term of which potentially contains its predecessor, e.g. the square the triangle, the sensory power the self-nutritive. Hence we must ask in the case of each order of living things, What is its soul, i.e. What is the soul of plant, animal, man?'.[11] As this passage makes clear, each living being possesses the soul that is proper of its kind and of its species (plant, animal or man), and possesses a single one, because the higher one, although appearing last, contains in potency the inferior ones, that is, it is also the principle of the inferior faculties, which appear first. In the abovementioned passage of *De generatione animalium* Aristotle explicitly makes reference to *De anima*, thus that passage must be interpreted in the light of the latter work, signifying not a succession of different souls within the same being but a successive manifestation of the functions all contained in potency in the higher soul, starting from the inferior ones.

Again in *De generatione animalium* Aristotle says that human embryos have in potency all three souls, vegetative, sensitive and intellectual,[12] which, in the light of the abovementioned passage of *De anima*, cannot be interpreted if not in the sense that they have the intellectual soul, which contains in potency the sensitive and the vegetative ones, and that 'sperm carries the animation principle which, in all intelligent animals, is separate',[13] that is, it can also carry out immaterial functions, such as thought.

The statement 'for the intellect alone so to enter', as proven some time ago by Paul Moraux, a great scholar of Aristotle and of his doctrine of the

[11] Aristotle, *De anima*, II 3, 414 b 28-33.
[12] Aristotle, *De generatione animalium*, II 3, 736 b 8 ss.
[13] *Ib.*, 737 a 5-15.

intellect, does not mirror Aristotle's thought but is part of a dialectic discussion in which Aristotle presents the point of view of the Platonics.[14]

This means, in terms of modern science, that human DNA is present since the beginning in the nucleus of the cells that form the zygote (a cell resulting from the union of the two gametes, male and female), then the morula (composed of four cells), then the blastocyst (a structure made up of more cells) and finally the embryo itself. And the human genome, the group of approximately 25,000 genes that form the chromosomes contained in the zygote, which were entirely mapped at the end of the 1990s, is formed of human DNA, which is different, although minimally (less than 5%), from that of the other animals (for example the chimpanzee, which was mapped even more recently), that is, it already contains the programme of the adult individual who will develop the sensitive and the intellectual faculties, as well as the vegetative ones.

Returning to Aristotle, we can state that biological individuality is determined by form, i.e. by the soul (it is well known that, for Aristotle, the soul is not an independent substance, but is the form, the capacity to live and to carry out a whole series of functions proper of a living organism), which is absolutely individual. This comes not so much from the passage of *De anima* affirming that 'each body seems to have a form of its own',[15] which might also allude to a form that is proper to the entire species, a universal one, but from a famous passage of *Metaphysics* which says that: 'the causes of things in the same species are different, not in species, but in the sense that the causes of different individuals are different, your matter [i.e. your body] and form [i.e. your soul] and moving cause [i.e. your father] being different from mine, while in their universal definition they are the same'.[16] The age-old problem of whether the form for Aristotle is universal, as the

[14] P. Moraux, A propos du "nous thurathen" chez Aristote, in AA.VV., *Autour d'Aristote. Récueil d'études de philosophie ancienne et médiévale offert à Monseigneur A. Mansion*, Louvain, Publications Universitaires de Louvain, 1955, pp. 255-295. To this end I must correct what I wrote in an article on Father Ford's book, that is, Quando esiste l'uomo in potenza? La tesi di Aristotele, in M. Mori (ed.), *Quale statuto per l'embrione umano? Problemi e prospettive*, Milano, Politeia, 1992, pp. 52-58. Ford replied to it in the Italian edition of his book, pp. 309-322, while I returned to the topic in La generazione dell'uomo secondo Aristotele, *Bioetica*, 4, 1999, pp. 590-595. Both articles of mine have now been reprinted in my *Nuovi studi aristotelici, II – Fisica, antropologia e metafisica*, Brescia, Morcelliana, 2005, pp. 143-150 e 151-156.

[15] Aristotle, *De anima*, I 3, 408 a 23-24.

[16] Aristotle, *Metaphysics*, XII 5, 1071 a 27-29.

definition requires, or individual, is solved. As a recent article also stated very well, it is universal in potency, in the sense that, in its essential characteristics, for example the human soul's capability of thinking or speaking, it can exist in all the individuals of the same species, but it is individual in act, in the sense that it always exists in a single individual and could exist even if it were unique in all its species.[17]

In terms of modern science I think we can say that human DNA is the same in all individuals of the human species and different from that of all of the animals, but also that the DNA of each single human individual is different from that of all the others (like fingerprints, for instance). Indeed, DNA analysis is also used today for paternity tests, or to identify the author of a crime or of an action, if he or she has left traces containing DNA cells. This is neither 'biologism' nor an over-emphasization of the biological aspect, an accusation that is addressed to the notion that makes individuality depend on biological identity from sources often involuntarily spiritualistic,[18] because the human being is fundamentally a biological reality, a living being, albeit one that lives a human life. If we should want to reconcile Aristotle with a creationist vision of the soul, we could admit that the intellectual soul was created directly by God and infused in the human zygote at the same time as its conception, because the DNA contained in the nucleus of the zygote (ignored by Aristotle and Thomas) already contains all the information necessary for the development of the nervous system, i.e. of matter, by means of which the intellectual soul operates. Besides, even the supporters of the discontinuity of the embryo's development, that is, of subsequent stages of its development, separated for example by the 'decision' of forming a single individual or two twins, by the formation of the primitive streak or by the activation of the chromosome which determines the gender of the baby, must recognise that these mutations do not take place through an external intervention, therefore they are all already planned or envisaged by the DNA of the zygote. Thus it would appear that the question of whether the DNA sequence is a sufficient definition of human nature should be answered affirmatively.

[17] R.W. Sharples, Some Thoughts on Aristotelian Form: With Special Reference to Metaphysics Z 8, *Science in Context*, 18, 2005, pp. 93-109.

[18] I am referring to the article by C.A. Viano, L'embrione è arrivato tra noi, *Iride*, 9, 1996, pp. 541-553, to which I replied in Sostanza e individuazione, Seconda navigazione. *Annuario di filosofia*, 1998, pp. 143-160.

However, 'human nature' does not yet mean 'human life', because nature is capacity, which Aristotle calls the first act, while life is activity, that is, the second act, the exercise of capacity.

What does 'human' life mean? Aristotle would reply that it means a life lived by means of an intellectual soul, which is specifically identical in all human individuals and specifically different from that of all the other living beings, and is already contained in the embryo, even though only in potency. But this does not mean that human life is determined only by biological identity, i.e. the genome. Again Aristotle theorized the existence of 'character/disposition' (*êthos*), which forms through habit (*ethos*), i.e. the repeated exercise of 'actions' (*praxeis*), which are the fruit of 'choice' (*prohairesis*).[19] The 'good life', living well, the happiness of each human individual, requires first of all forming a good character, a character which is virtuous, which means excellent, perfect ('virtue' in Greek is *aretê*, which means excellence, perfection), throught the exercise of 'ethical virtues', so called because they are proper of character. The 'dianoetic' virtues are thus added to this, such as wisdom (*phronêsis*) and knowledge (*sophia*), which however presuppose a fair society, one founded on justice (ethical virtue) and the possession of friends with which to philosophise, i.e. to make friends (another ethical virtue).

Finally, we should not forget Aristotle's well-known affirmation contained in *Politics*, according to which man (all human beings, be they male and female, free or enslaved) is 'by nature' – today we would say genetically – a political animal, that is to say, made to live in the *polis*, who can reach his fulfilment and 'live well' only in the *polis*.[20] Therefore, human nature is fulfilled in the *polis*, which today we would call 'civilisation' (the Latin word *civilitas* derives from *civilis*, that is belonging to the *civis*, to the citizen), 'culture' (the Greeks would have said *paideia*, which is possible only in the *polis*). Indeed, it is not by chance that, precisely in the Politica, Aristotle declares that 'the nature (*phusis*) of a thing is its end (*telos*). For what each thing is when fully developed, we call its nature, whether we are speaking of a man, a horse, or a family'.[21]

Therefore, how can one reconcile the Aristotelic thesis according to which the soul, which, in the case of living beings is the intellectual soul,

[19] Aristotle, *Nicomachean Etics*, III 4, 1111 b 6.
[20] Aristotle, *Politics*, I 2, 1253 a 2-3.
[21] *Ib.*, 1252 b 32-34.

is transmitted by the father through his sperm, and thus is already present in the embryo from the start, with this other thesis, equally Aristotelic, according to which human nature is only fulfilled in the *polis*? This is possible by recalling the famous Aristotelic doctrine of potency and act. Indeed, Aristotle answers the question 'when is a being a man in potency?' with 'the seed is not yet potentially a man; for it must be deposited in something other than itself and undergo a change. But when through its own motive principle it has already got such and such attributes, in this state it is already potentially a man; while in the former state it needs another motive principle, just as earth is not yet potentially a statue (for it must first change in order to become brass)'.[22] Here the difference is evident between the sperm, which is not yet a man in potency, because in itself it is not yet capable of becoming a man, and the embryo, the seed deposited in the uterus and transformed into an embryo following union with matter (today we would say with the ovum), which instead is explicitly said to be already a man in potency, because, if no external impediments intervene, it is already capable of becoming a man in itself, by its own virtue. But if the embryo is already a man in potency, it must already possess in acto, as 'first act', a form, a set of capabilities, i.e. the intellectual soul, which is proper of the human species, even though it does not yet exercise all its capabilities (which would be, in the language of scholasticism, the 'second act'), but exercises only the vegetative ones.

On the contrary, 'fulfilment' as Martha Nussbaum says a propos of the Aristotelic notion of happiness (*eudaimonia*), is reached by a man who is learned and, why not, happy, a man who has achieved full development and who will thus be able to lead a *flourishing life*.[23]

[22] Aristotle, *Metaphysics*, IX 7, 1049 a 14-18.

[23] M.C. Nussbaum, Nature, Function and Capability: Aristotle on Political Distribution, in G. Patzig (ed.), *Aristoteles' "Politik"*, Göttingen, Vandenhoek & Ruprecht, 19.

A SOLELY HUMAN ASPECT OF EXISTENCE: THE EXPERIENCE OF BEAUTY

FRANCO CHIEREGHIN

In the history of thought there is probably no philosophy that has posited the question about man with the intensity, extensiveness and centrality equal to those present in Kant's philosophy. It is well-known that in his last work, *Logik*, which appeared as edited by his student Jaesche, but reviewed by Kant himself, he sums up the three fundamental questions which guided him throughout the elaboration of his own thought ('What can I know?', 'What ought I do?', 'What can I hope for?'), in the one, fundamental question, into which every other question flows: 'What is man?'. In each of his works there come to light aspects of the humanity in man which circumscribe to man, in an ever more precise and essential way, a proper and irreducible character. In this way of approximation to the being of man, the experience of beauty comes to have a singular place.

If we, in fact, look at what Kant states in the *Critique of the Power of Judgment*, the contemplation and the production of beauty depend exclusively upon characteristics that only man possesses and that thus allow him to be ontologically distinguished from all other beings which differ from him. According to Kant, we judge beauty beginning from the feeling of what is agreeable and disagreeable. If we consider the ways in which our representations refer to that feeling, we see three different experiences that spring forth: that of 'pleasant', which can also be true for the simple animals; that of 'good' which is true for rational beings in general (and thus true for those not affected by the limitations imposed by sensitivity) and finally that of 'beautiful'. 'Beauty' affirms Kant '[is valid] only for human beings, i.e., animal but also rational beings, but not merely as the latter (e.g., spirits), rather as beings who are at the same time

animal'.[1] What therefore surprisingly happens is that the peculiar intertwining of animality and rationality, which in other fields of actuation of the human faculties imposes severe limitations upon thought and action, in the experience of beauty is redeemed from those limits and transfigured into an experience which, as I hope to be able to show, originates from freedom.

If we concentrate our attention not so much on the Kantian treatment of the beautiful in general, but rather upon the beauty of a work of art, this shows itself to have, both in its internal organization and in the means of its production, characteristics which do not permit going back to a mechanistic model of comprehension. It is well-known that the third Kantian *Critique* has as its theme, in the two parts of its division, the experience of beauty in the 'Critique of the Power of Aesthetic Judgment' and the characteristics of natural organisms in the 'Critique of the Power of Teleological Judgment'. It deals with two apparently heterogenous classes of beings, brought together in reality by the same characteristic of not being able to be fully comprehended according to the mechanism of efficient causes.

What in the work of art contrasts to its mechanistic reduction is constituted by many characteristics which place it in an intermediary position between the human techno-practical production, on the one hand, and the way in which nature produces the organized beings, on the other. 'In a product of art' affirms Kant 'one must be aware that it is art, and not nature; yet the purposiveness in its form must still seem (*aussehen*) to be as free from all constraint by arbitrary rules as if it were a mere product of nature'.[2] In the production of beautiful art there is the discipline of rules, there is the concept of the object to be produced, there is the directed intention towards the actuation of an objective, there is the material which waits to be formed, and yet everything must be composed and flow with that sovereign, unintentional 'naturalness' which does not betray with the slightest trace 'that the rule has hovered before the eyes of the artist and fettered his

[1] I. Kant, *Kritik der Urteilskraft*, Ak. Ausg. V, § 5, p. 210 (*Critique of the Power of Judgment*, edited by P. Guyer, translated by P. Guyer and E. Matthews, Cambridge University Press, Cambridge 2003, p. 95). Cited hereinafter with *KU*. As far as the modern studies are concerned, according to which the possibility to attribute a sensitiveness to beauty even to the animals is effective, I don't think it would be too difficult to find the source of this sensitiveness in what Kant calls 'pleasant', the experience of which doesn't attain that strong concept of beauty that finds its expression in the 'judgment of taste'.

[2] *Ivi*, § 45, p. 306 (p. 185).

mental powers'.[3] Now this can happen because the rule that organizes the work of art as a completed whole (not the rules which can be learned technically, but the rule which confers beauty to the work) has a wholly peculiar character. Before the act of production it does not exist, no one knows about it, not even the artist: it is all done in the deed, it is made in its making and for this reason it can be recognized as 'original'. It has never appeared before and is not repeatable afterwards. 'The rule' says Kant 'must be abstracted from the deed'[4] and this means that it has life and value uniquely in that deed. It can only organize that determined product and it is not possible to lay a finger upon its generating principle in order to imitate it or to mechanisticly reproduce it.

The inventions or ideations which are the basis for the originality and the beauty of the work of art, those which Kant calls 'aesthetic ideas', are not in control, as to their origins, of the artist who brings them into being. They would not exist without him, yet they are not even intentionally willed by him. Certainly they spring forth from the creative force of his imagination, disciplined by the energies of rationale, but the artist knows not from where they come nor how they come upon him, entirely dominating him. If they derive from an 'intention of beauty' completely determinable through concepts, then there would be no one better than their author to explain in an exhaustive and definitive way their contents that he wished to express as well as the rule of their organization. Not only does he not succeed in doing this, neither is anyone else capable if not by asymptotic process, which can never come close to comparing to the inexhaustible irradiant power of the work.

If we ask ourselves then, what the source might be upon which these prerogatives of the work of art depend, Kant's answer may seem disarming in its simplicity: at the origin of the creation of beauty there is a particular proportion in which the power of the imagination and the discipline of the intellect play freely with each other. As you can see, Kant uses the same elements as the basis of 'common sense'. In man there is an original accord between three heterogenous faculties: imagination, as the faculty of intuitions, intellect, as the faculty of rules, and reason, as the faculty of ideas. Belonging to a world of 'common' sense would not be possible if in each of us were not present and reciprocally finalized, the capacity to intuit indi-

[3] *Ivi,* § 45, p. 307 (p. 186).
[4] *Ivi*, § 47, p. 309 (p. 188).

vidually, addressed to sensitivity, and the capacity to conceive of the universal. This is the primary inheritance, shared by the common man and the genius, which makes it possible to express oneself, to communicate and comprehend each other. But in the creator of the work of art this common inheritance is present as a singular, inimitable proportion, from which is derived the originality, the exemplarity, the unintentionalness of the workings of the genius. Such are the gifts of this 'favorite of nature', whose capacity 'is apportioned immediately from the hand of nature' and which 'thus dies with him, until nature one day similarly endows another, who needs nothing more than an example in order to let the talent of which he is aware operate in a similar way'.[5] This proportion of the capacities of the mind is the 'rare phenomenon',[6] through which nature is capable of giving the 'rule to art',[7] a talent which may be improved, formed, developed, yet never learned nor, through some artifice, taught or imitated.

Another aspect which takes the work of art away from a physico-deterministic consideration is constituted by that complex of characteristics which makes it related to the beings organized by nature. In speaking of the work of art as something which is 'living' it is not only a generous metaphor. It signifies that the work, considered in its objective existence, exhibits properties which are extremely similar to those of organisms. And in the work, considered as whole, every part is bound to every other part in such a way as to be mutually each to the other the cause and effect of their form; furthermore, every part of the work exists only *through* all of the others and its existence makes sense inasmuch as it is in view of the others and of the whole. This is similar as to how in a melody, taken as a unitary whole in its temporal articulation, each note exists in view of each of the others and at the same time, as it is embedded in the melodic development, it exists only through all of the others. And so it is the finality inside of the principle that permits comprehension of the peculiar organization of the work of art. Kant does not linger on these possible analogies of structure between the work of art and the organism. Nevertheless I believe that they help us to insert also the work of art in that peculiar dialectic between mechanicism and finalism that Kant develops in the 'Critique of the Power of Teleological Judgment', and that may help to clarify in what sense the experience of beauty evades a mechanistic interpretation and has its roots in freedom.

[5] *Ibid.*
[6] *Ivi*, § 49, p. 318 (p. 196).
[7] *Ivi*, § 46, p. 307 (p. 186).

It is well-known that for Kant 'it is quite certain that we can never adequately come to know the organized beings and their internal possibility in accordance with merely mechanistic principles of nature'.[8] This insufficiency of a mechanistic explanation nevertheless does not authorize us to pose the finalistic perspective as the only plausible one. The distinction, worked out by Kant, is methodologically and epistemologically of great subtlety. Affirming that *all* generation of material things is possible only according to mechanistic laws or that *some* generations are not possible according to that law is a completely different thing from affirming that, in evaluating the events of material nature, I must use the principle of mechanism insofar as it is possible, while I can bring into play the principle of finality as soon as phenomena which I cannot understand without it present themselves. In the first case I formulate determinant judgments which are contradictory to each other precisely because they claim to say in themselves how natural things are constituted; in the second case I formulate reflective judgments compossible to each other, because through them I take on 'maxims' of evaluation that are 'regulative' to my way of knowing objects and not 'constitutive' of their way of being.

From this point of view the work of art is exposed, as with every other naturally organized being, to the same dialectic which arises from a mechanistic interpretation, on the one hand (today we might speak of naturalistic reduction), which attempts to conquer as much ground as possible, and on the other hand a finalistic perspective, which attempts to protect its own indispensability.[9] In the age of Kant a naturalization in the mechanistic sense of the work of art would have probably appeared nonsensical, whereas today this is a real project. It aims for an even more ductile and exhaustive actuation of the naturalization, because it knows how to render functional to itself even those theoretical perspectives which have placed the mechanistic paradigm itself in crisis. Just think of the impetuous development that has happened in recent years with that branch of aesthetics which tries to apply the results of the most recent neurological research to the area of production and enjoyment of the work of art. This is not the place to go into the present debate about neuroaesthetics, which has all of

[8] *Ivi*, § 75, p. 337 (p. 663).

[9] If we were to rewrite today the antinomy of the teleological judgement, in the 'thesis' we would not express the mechanistic perspective more uniquely, but we would speak more expansively of 'naturalization' in all of its forms, of which mechanism is only a particular case.

the semblances of attempting an integral naturalization to the experience of beauty. But it is worth remembering that the first part of the *Critique of the Power of Judgment* itself was placed at the center of attention as an exemplary reference text for this work of naturalization.

I think of the example of an essay by Kawabata and Zeki, which appeared in 2004 in the *Journal of Neurophysiology*, with the significant title 'Neural Correlates of Beauty'.[10] Here the authors, after alluding to the platonic dialogues in which the theme of beauty is discussed (*Hippias Major*, *Phaedrus*, *The Banquet*), come to a halt with the 'Critique of the Power of Aesthetic Judgment', asking exactly the same questions as Kant as to the presuppositions which confer validity to our aesthetic judgment and about the conditions of possibility of the phenomenon of beauty. But, while Kant looks for the answers traveling, so to speak, the path upwards, towards the a priori structures of subjectivity, Kawabata and Zeki propose answering by experimentally traveling the path downwards, looking for the existence of specific neural connections, subject to the experimentation of the phenomenon of beauty, and asking themselves whether one or more cerebral structures in their workings, condition the formulation of the judgement of taste. The research, conducted upon a significant number of subjects using fMRI (functional magnetic resonance imaging) demonstrated that every pronouncement of an aesthetic judgment corresponded to the activation of a set of specific cerebral areas (the medial orbito-frontal cortex, the anterior cingulate, the parietal cortex and the motor cortex), operating interconnectedly, even though their quotients of activity were differentiated according to the type of experience.

The relevance of this research certainly cannot be denied: especially as regards the visual arts, and they have already attained highly significant results,[11] demonstrating how important or, better, necessary it is to recognize the neural structures active in the aesthetic experience in order to understand how much the characteristics of the perceptive processes might influence and condition both the creation and enjoyment of beauty. Nevertheless it is legitimate to ask: is this side of research, in addition to being recognized as necessary, sufficient enough to explain the artistic phenomenon? Is the process of naturalization or, in Kantian terms, the way of

[10] H. Kawabata and S. Zeki, Neural Correlates of Beauty, *Journal of Neurophysiology*, 91 (2004), pp. 1699-1705.

[11] See, for example, S. Zeki, *Inner Vision. An Exploration of Art and the Brain*, Oxford University Press, Oxford-New York 1999.

mechanistic understanding capable of exhausting the entire realm of the experience of the beautiful? It is precisely here that the Kantian teaching on the dialectic of teleological judgment continues to manifest its efficacy.

The quoted authors are particularly careful and critically attentive, but it is right to remember that – in general – in those concerned with the mind-brain relationship, it is possible to notice a continual, significant lexical oscillation: those which are initially presented as neurally 'correlated', as substratums or 'involved' neural processes, 'subtended' or 'associated' with the experience of beauty, are transformed insensitively or with brusque passages (with no forewarning as with those of the authors) into neural processes that 'generate' aesthetic judgment, 'determine the creation' of the work of art, 'originate' the fundamental properties of the conscious experience of the beautiful.

It would seem to be a useless redundancy (though evidently it is not) to remember that being associated or correlated with something is very different from the generation or creation of that with which it is correlated and that taking for granted the equivalency of significant terms does not bring about a true and proper *metabasis eis allo ghenos*. In reality, in the passage from one linguistic level to another, we lay a finger upon that which Kant would call the transformation of a reflective judgment (regulative) into a determinant principle (constitutive) of the aesthetic experience. The maxim, on the basis of that which we 'evaluate' the involvement of the activation or the deactivation of the determinant cerebral areas when experiencing the beautiful, is in principle transformed into an exhaustive 'explanation' of the same. In this way though, we finish by taking for granted exactly what we are trying to explain and that is to say as it happens that the movements induced by electrochemical reactions, through which our nervous system codifies environmental interactions (listening to music, looking at a painting etc.), are then decodified, interpreted and expressed in a judgment of taste.

The reflective judgment, which evaluates a neural configuration in its concomitance with an aesthetic experience, knows very well that what it has before its eyes is a spacial distribution of nervous activity and that this is still separated by an abyss from the processes of interpretation or decodification with which a significant aesthetic is conferred to the neural sequences. If we turn the reflective judgment into determinant judgment either we don't perceive the problem or we take for granted that the intepreter coincides with the interpreted, identifying himself with it. Knowledge of the way in which the information contained in our sensorial

receptors is codified in nervous impulses and how these are distributed at a cortical level is certainly necessary for the global comprehension of the aesthetic phenomenon. Nevertheless, in order that these processes of codification and distribution alone also be sufficient for the explanation of the phenomenon, it means surreptitiously bringing them to coincide with the activity of decodification and interpretation. And this is not at all taken for granted, rather is it one of the points in which our ignorance becomes denser. It is in fact not infrequent to find among the more attentive experts of this delicate passage the frank acknowledgement that the way in which 'the distribution of nervous impulses at the cortex level and in the successive phases of elaboration is decodified *is unknown*'.[12]

So, we can say, continuing to follow the Kantian suggestions, that even the work of art finds itself collocated inside a characteristically dialectical situation, in which two mutually irreducible perspectives nonetheless perform a positive function for its comprehension: one tends toward the naturalistic reduction of the aesthetic experience, the other tends to take away the finalized level to the interpretation and to the discovery of the sense. But, from the moment that both of the perspectives refer to the same object and find in the object itself sufficient reasons for existing one alongside the other it is legitimate to ask oneself if the unit, with which the work of art is presented, does not accede to a deeper principle, from which the two perspectives, given their irreducibility, spring forth as from a single root. In other words, we place the problem as to whether in that which remains unknown to us in the passage from one perspective to the other there is not hidden a foundation of their unity, inside of the nature of the work of art.

As we are reminded above, according to Kant the work of art comes from an original accord of the faculties common to all men and which renders possible the expression, the communication and the understanding of each other. But in the experience of the beautiful the original accord is configured like a game which has freedom as its constitutive character. That for Kant the production and the enjoyment of beautiful art have their first and last source in an experience of freedom is demonstrated by the rich mass of expressions with which he characterizes not only the enjoyment of the beautiful in general, but also, specifically, in the work of the genius. The agreement between the imagination and the higher rational faculties,

[12] L. Maffei and M. Fiorentini, *Arte e cervello*, Zanichelli, Bologna 1995, pp. 24-25 (my italics).

which is at the root of the aesthetic experience in its globality, does not only have the character of a game disinterested and released from cognitive or practical purposes, but in the game *free* from presupposed rules, a game that invents the rules as it is played: neither the enjoyment nor the creation of the finality of the form of beautiful art could exist without this original experience of being free from the restrictions of prefixed rules which are the basis for the judgment of taste. When we then pass from a simple 'evaluation' of the work of beauty to its 'production', then something more is necessary: the intervention must take place of the 'natural endowment of a subject for the *free* use of his cognitive faculties' which belongs only to the genius and to his capacity to create 'a new rule by which the talent shows itself exemplary'.[13]

In conclusion, a free use of the cognitive faculties is the specific experience of freedom which is the basis of the work of art and that, opening the access to the beautiful, allows for the actuation of a way of being that only man can experience.

[13] *KU*, § 49, pp. 318 (p. 455).

SCIENCE AND THE MIND-BODY PROBLEM

THOMAS NAGEL

The relation of mind to the physical world is something we do not at present understand, except superficially. Pursuit of more fundamental understanding faces difficult questions about reductionism, and about the scope and limits of natural science in its present form.

The modern Mind-Body problem arose out of the scientific revolution of the 17th century. Galileo and Descartes made the crucial conceptual division, by proposing that physical science should provide a mathematical and quantitative description of objective reality (consisting of the primary qualities like shape, size, and motion), while subjective appearances and the secondary qualities like color – how the physical world appears to human perception – were assigned to the mind. It was essential to *leave out* or *subtract* subjective appearances and the human mind from the physical world in order to permit a certain kind of objective spatio-temporal conception of physical reality to develop.

But this exclusion of everything mental from the scope of modern physical science was bound to be challenged eventually. We humans are parts of the world, and the desire for a unified world picture is irrepressible. It seems natural to achieve it by extending the reach of physics and chemistry, in light of their great successes in explaining so much of the natural order. This has been accomplished so far by reduction (to basic elements governed by mathematically expressible laws) followed by reconstruction to show how they combine to yield the complexity we observe. Now it has become clear that our bodies and central nervous systems are parts of the physical world, composed of the same elements as everything else. And molecular biology keeps increasing our knowledge of our own physical composition, operation, and development. Finally, so far as we can tell, our mental lives and those of other creatures, including subjective experiences, are strongly connected with and perhaps strictly

dependent on physical events in our brains and on the physical interaction of our bodies with the rest of the physical world.

What are the options for including all these facts in a single world view? We know that Descartes thought they couldn't be unified. His theory is called Dualism: mind and matter are both real and irreducibly distinct, though they interact. Physical science remains defined by the exclusion of the mental from its subject matter. But there are two familiar ways of unifying mind and matter in a single world picture: roughly, by reducing matter to mind or by reducing mind to matter.

The first strategy dominated European philosophy in the 18th, 19th, and early 20th centuries, under the name of *Idealism*. Mind is the ultimate reality and matter is in some way reducible to it. This attempt to overcome the division from the direction of the mental extends from Berkeley, who rejected the primary-secondary quality distinction and held that physical things are ideas in the mind of God – to the logical positivists, who analyzed the physical world as a construction out of sense data. For reasons I don't fully understand, idealism was largely displaced in later 20th-century analytic philosophy by attempts at unification in the opposite direction, starting from the physical.

Physicalism is the view that only the physical world is irreducibly real, and a place must be found in it for mind, if there is such a thing. This would continue the onward march of physical science, through molecular biology, to full closure by swallowing up the mind in the objective physical reality from which it was initially excluded. The assumption is that physics is philosophically unproblematic, and the main target of opposition is Descartes' dualist picture of 'the ghost in the machine'.

One strategy for making the mental part of the physical world picture is conceptual behaviorism, offered as an analysis of the real nature of mental concepts. This was tried in various versions. Mental phenomena were identified variously with behavior, behavioral dispositions, or forms of behavioral organization. In another version, associated with Wittgenstein and Ryle, mental phenomena were not identified with anything, either physical or nonphysical; instead, mental concepts were explained in terms of their observable behavioral conditions of application – criteria or assertability conditions rather than behavioral truth conditions. All these strategies are essentially verificationist, i.e. they assume that the content of a mental statement consists in what would verify it to an observer. So they reduce mental attributions to the externally observable conditions on the basis of which we attribute mental states to others. If successful, this would

obviously place the mind comfortably in the physical world. And it is certainly true that mental phenomena have behavioral manifestations, which supply our main evidence for them in other creatures.

Yet as analyses, all these theories seem insufficient because they leave out something essential that lies beyond the externally observable grounds for attributing mental states to others, namely the aspect of mental phenomena that is evident from the first-person, inner point of view of the conscious subject: for example the way sugar tastes to you or the way red looks, which seems to be something more than the behavioral responses and discriminatory capacities that these experiences explain. Behaviorism leaves out the inner mental state itself.

In the 1950s an alternative, non-analytic route to physicalism was proposed, one which in a sense acknowledged that the mental was something inside us, of which outwardly observable behavior was merely a manifestation. This was the psycho-physical *Identity Theory*, offered by U.T. Place and J.J.C. Smart not as conceptual analysis but as a scientific hypothesis. It held that mental events are physical events in the brain. $\Psi = \Phi$ (where Ψ is a mental event like a pain or a taste sensation and Φ is the corresponding physical event in the central nervous system). This is not a conceptual truth and cannot be known a priori; it is supposed to be a theoretical identity, like Water = H_2O, which can be confirmed only by the future development of science.

The trouble is that this raises a further question: What is it about Φ that makes it also Ψ? Clearly physicalists won't want to give a dualist answer – i.e. that Φ has a nonphysical property. So defenders of the identity theory tended to be pulled back into different kinds of analytical behaviorism, to analyze in nondualist terms the mental character of brain processes. But this time a causal element was added to the analysis: 'the inner state which typically causes certain behavior and is caused by certain stimuli'. This was required by the need to explain the two distinct references to the same thing that occur in a nonconceptual identity statement. The point is to explain how 'pain' and 'brain state' can refer to the same thing even though they do not mean the same, and to explain this without appealing to anything nonphysical in accounting for the reference of 'pain'. But all these strategies are unsatisfactory for the same old reason: Even with the brain added to the picture, they seem to leave out something essential. (And notice, what they leave out is just what was left out of the physical world by Descartes and Galileo in order to form the modern concept of the physical, namely subjective appearances.)

Another problem was subsequently noticed by Saul Kripke. Identity theorists took as their model for $\Psi = \Phi$ other theoretical identities like Water=H_2O or Heat=Molecular Motion. But those identities, he claimed, are necessary (though not conceptual and not a priori), whereas the Ψ/Φ relation appears to be contingent. This was the basis of Descartes' argument for dualism. He said that since we can clearly conceive of the physical body without the mind, and vice versa, they can't be one thing.

Consider Water=H_2O, a typical scientifically discovered theoretical identity, nonconceptual, at least when first discovered. It means that water is *nothing but* H_2O. You *can't have* H_2O without water, and you don't need anything *more* than H_2O for water. It's water even if there's no one around to see, feel, or taste it. We identify water by its perceptible qualities, but our experiences aren't part of the water. The intrinsic properties of water, its density, liquidity between 0 and 100 centigrade, etc. are all fully explained by H_2O and its properties. The physical properties of H_2O are *logically sufficient* for water.

So if Ψ really is Φ in this sense, and nothing else, then Φ by itself, in its physical properties, should be similarly logically sufficient for the taste of sugar. But it doesn't seem to be. It seems conceivable, for any Φ, that there should be Φ without any experience at all. Experience of taste seems something further, contingently connected with the brain state. And this suggests not identity, but dualism, at least of properties. The same intuition makes it seem conceivable (to you) that I could be a completely unconscious zombie, with no mental life, though behaviorally and physically identical to my actual body.

These various dead ends suggest the Ψ/Φ dualism introduced at the birth of modern science may be harder to get out of than many people have imagined. It has even led some philosophers to eliminativism – the suggestion that mental events, like ghosts and Santa Claus, don't exist at all. But if we don't regard that as an option and still want to find an alternative to dualism, my view is that a unified world picture requires something much more radical than physicalism.

I think we have to reject conceptual reduction of the mental to physical. But the appearance of contingency in their relation may be an illusion. The relation may in fact be a necessary but nonconceptual identity, but it may be concealed from us by the inadequacy of the concepts we now have to describe both Ψ and Φ. Both may be partial descriptions of a deeper underlying reality that manifests itself in these different ways when observed from inside (as a state of oneself) and from outside (as a state of the physical brain). Perhaps there is something we have no conception of, which is

logically sufficient for both Φ and Ψ, and without which there can't be either. This would be a form of Monism (like Spinoza's) that is neither idealist nor materialist.

Most major scientific advances involve the creation of new concepts, postulating unobservable elements of reality that are needed to explain the necessity of natural regularities that appear accidental. The evidence for the existence of such things is precisely that if they existed, they would explain what is otherwise incomprehensible. Certainly the mind-body problem is difficult enough so that we should be suspicious of attempts to solve it with the concepts and methods developed to account for very different kinds of things. Instead, we should expect theoretical progress in this area to require a major conceptual revolution. I believe current physics, chemistry, and molecular biology will not by themselves produce an understanding of how the brain gives rise to the mind. This will require a change at least as radical as relativity theory, the introduction of electromagnetic fields into physics – or the original scientific revolution itself, which can't result in a 'theory of everything', but must be seen as a stage on the way to a more general form of understanding. We ourselves are large-scale complex instances of something both objectively physical from outside and subjectively mental from inside. Perhaps the basis for this identity pervades the world.

SCIENCE AND THE SEARCH FOR A NEW ANTHROPOLOGY

JÜRGEN MITTELSTRASS

1. There have always been two different approaches in determining what a human being, what Man is: a scientific approach and a philosophical one (in a broad sense, including religious and humanistic approaches). Thus, since antiquity, in the European tradition, a distinction has been made between the biological and the cultural nature of Man: between what is natural to him in a physical and biological sense, and what pertains to him culturally, what is his 'cultural essence'. This, however, does not mean that both 'essences', the physical and the cultural, fall asunder, and that therefore Man disintegrates into two 'essences'.

In fact, Man is a natural being, who can live only as a cultural being and can find his purpose only as such. *Descriptively*, within the context of biological systematics, mankind is a sub-species of the species *homo sapiens*, namely *homo sapiens sapiens*, and is the only recent member of the genus *Homo*. But this definition includes only the empirico-physical side of Man, not that which makes up the essence of humanity *ascriptively*, namely its form of self-description and (not conclusively established) self-determination. This latter was described classically as the *animal rationale*, a being endowed with and determined by reason, or as a being lying between animal and God. Newer philosophical anthropologies (after Friedrich Nietzsche) capture this notion in the concept of a *nicht festgestelltes*, i.e., a not-yet-determined being (both biologically and culturally). One makes a category mistake, if one interprets our actions and thoughts as the products of natural processes whereby even the act of interpreting becomes part of nature, a 'natural fact'. But we fall into a new form of naiveté if we oppose this interpretation with a claim that scientifically discovered facts have no influence, or at least ought to have no influence, on the self-determination of Man. Thus it is a matter of adopt-

ing a scientifically informed and philosophically considered position, one which is beyond mere *biologism* and *culturalism*, which in other words is beyond an absolute distinction between biological and cultural explanations, and which refers to both the lives that we lead, and the laws that we obey. Such a position should neither reduce Man to (pure) nature, nor to the (absolute) spirit he aspires to be.

2. Modern philosophical anthropology mirrors this situation. It takes its point of departure from two opposing conceptions: that attributed to Max Scheler and that of Helmut Plessner.[1] According to Scheler, philosophical anthropology is nothing but the quintessence of philosophy itself. According to Plessner it follows the methodology and achievements of the empirical sciences of Man in the form of an 'integrative' discipline. Scheler hearkens back to traditional determinations of Man as *animal rationale*; Plessner embraces the orientation of biological, medical, psychological, and, in the extended sense, social-scientific research, and he does this with the conceptual goal of a structural theory of Man. Common to both thinkers in the characterisation of Man is the concept of *world-openness*, which includes the aspect of the openness of human development.

According to Scheler, 'Man' is the 'X that can behave in a world-open manner to an unlimited extent'.[2] According to Plessner, 'Man' is characterised by an 'eccentric positionality',[3] whereby his eccentric existence, that possesses no fixed centre, is described as the unity of mediated immediacy and natural artificiality. Accordingly, Plessner formulates three *fundamental laws of philosophical anthropology*: (1) the law of natural artificiality, (2) the law of mediated immediacy, and (3) the law of the

[1] For a more detailed analysis of what follows see J. Mittelstrass, Philosophy or the Search for Anthropological Constants, in: U. Staudinger and U. Lindenberger (Eds.), *Understanding Human Development: Lifespan Psychology in Exchange with Other Disciplines*, Dordrecht: Kluwer Academic Publishers, 2003, pp. 483-494, and The Anthropocentric Revolution and Our Common Future, in: W.-K. Raff *et al*. (Eds.), *New Pharmacological Approaches to Reproductive Health and Healthy Ageing* (Symposium on the Occasion of the 80th Birthday of Professor Egon Diczfalusy), Berlin and Heidelberg and New York: Springer, 2001 (Ernst Schering Research Foundation. Workshop Supplement 8), pp. 57-67.

[2] M. Scheler, *Die Stellung des Menschen im Kosmos*, Darmstadt: Otto Reichl, 1927, p. 49.

[3] H. Plessner, *Die Stufen des Organischen und der Mensch: Einleitung in die philosophische Anthropologie*, Berlin and Leipzig: de Gruyter, 1928, p. 362ff.

utopian standpoint.[4] Similarly, Arnold Gehlen states a thesis, that Man is by nature a cultural being,[5] whereby his cultural achievements are seen as compensation for organs, and 'Man' is defined as a creature of lack (*Mängelwesen*).[6] For Nietzsche, as mentioned before, 'Man' is the not-yet-determined animal,[7] and science is seen as the expression of human endeavour 'to determine himself'.[8] Furthermore one of the reasons for the difficulty of saying what is Man lies in the fact that Man is the (only) creature that possesses a reflective relationship with itself. That Man, as Heidegger says, is the creature 'which in its being, relates understandingly to its being'.[9] This opens up a broad horizon of possible self-interpretations of Man, and to this extent a broad horizon for an answer to the question, what a human being, what Man is. The only thing that is clear, is what, with regard to the essential openness of Man, can be called the *anthropologically basic condition*.

This openness affects all phases of human development, both from an ontogenetic and from a phylogenetic point of view. There is no 'natural' fate in the becoming of Man, as an individual or as a species, that might be definitely determined by biological laws, even though of course the 'schema' of this development is prescribed by certain biological regularities. Thus, there is no adulthood before childhood, no reverse ageing, no Achilles who is young until he dies. In psychological terminology: the architecture of human ontogeny is incomplete,[10] and not merely in earlier stages, but throughout a lifetime.

It is especially in the opposed but complementary concepts, *nature*, or causal relation, and *culture*, or institutional relation, that in this context

[4] H. Plessner, *op. cit.*, pp. 309-346. See K. Lorenz, *Einführung in die philosophische Anthropologie*, Darmstadt: Wissenschaftliche Buchgesellschaft, 1990, pp. 102f.

[5] A. Gehlen, *Anthropologische Forschung: Zur Selbstbegegnung und Selbstentdeckung des Menschen*, Reinbek: Rowohlt Taschenbuch Verlag, 1961, p. 78.

[6] A. Gehlen, *Der Mensch: Seine Natur und seine Stellung in der Welt* [1940], 9th ed., Wiesbaden: Akademische Verlagsgesellschaft Athenaion, 1972, p. 37.

[7] F. Nietzsche, *Jenseits von Gut und Böse* [1886], in: F. Nietzsche, *Werke: Kritische Gesamtausgabe*, ed. G. Colli and M. Montinari, vol. VI/2, Berlin: de Gruyter, 1968, p. 79.

[8] F. Nietzsche, *Nachgelassene Fragmente Frühjahr 1881 bis Sommer 1882*, *Werke*, vol. V/2 (1973), p. 533.

[9] M. Heidegger, *Sein und Zeit* [1927], 14th ed., Tübingen: Max Niemeyer, 1977, pp. 52f.

[10] P.B. Baltes, On the Incomplete Architecture of Human Ontogeny: Selection, Optimization, and Compensation as Foundation of Developmental Theory, *American Psychologist* 52 (1997), pp. 366-380.

(in the framework of human ethology) make clear the different, but in the anthropological context, indelibly reciprocal approaches to analysis. 'Causal and intentional regularities constitute strictly distinct ranges of objects that must be studied by the disciplines of natural science and cultural science with different scientific methods. Causal regularities are constrained by initial conditions. Intentional regularities are determined by goal representations which, due to their social mediation, normally do not become conscious. The disputed question of whether, and to what extent socio-cultural behaviour is naturally and biologically determined or vice versa, is actually a dispute about whether or not some empirically observed behaviour is to be taken as "natural" (belonging to nature) or as "cultural" (belonging to culture)'.[11]

From this, it is also clear what kinds of tensions are involved in all forms of philosophical anthropology. These, correctly, all see themselves (inside and outside philosophy) as fundamental, but in an integrative sense (similar to Plessner's approach) that takes the knowledge of Man acquired by other (empirical) disciplines into account. Thus, even within philosophy science has its day.

3. Today we are promised great gains above all from the developments of the 'new biology', for example, in medicine. But there are great risks as well; for instance, in the thoughtless or irresponsible application of bioengineering. This is nothing fundamentally new. Discoveries and inventions that point to the future have throughout human history come saddled with dangers and risks of abuse of a new and usually unimagined order. What may be new in the case of modern biology is that developments in biological knowledge now appear to place Man in the unique position of being able to change his own nature, and that this development has ethical consequences. Man intervenes ever more powerfully in evolution, even his own, and he changes the measures by which he previously described and shaped his fate, the human condition itself.

We have known since Darwin that Man, not only from the point of view of philosophy and culture, but also biologically, has no fixed essence. Even though this understanding is imperceptible to the individual and only recognisable to science over great periods of time, nevertheless, he is subject to fundamental changes. That Man can intervene in these changes

[11] K. Lorenz, *op. cit.*, p. 23.

himself has only become clear in the light of the new biology – an ability to deliberately change his own genetic constitution and that of his progeny. In fact, the *conditio humana* itself is changing: in the sense that now even Man's biological foundations are at his disposal. This creates a completely new and consequential situation in the domain of ethics.

There are various consequences that have been drawn from this situation. One is the call for a *bioethics code*, an applied ethics that deals specifically with biological states of affairs. Such a code would prescribe watchfulness and particular measures in certain fields as well as certain applications that could be formulated as rules for an ethics of responsibility. Such rules if applied to developments in genetic technology might include a careful checking for possible undesirable results and also a rule of caution, permitting choice of the option that offers the greatest security of prognosis and the least expected harm. However, the debate over the ethical problems of biology extends far beyond bioethics into the direction of *environmental ethics*, which attempts to change the foundations of ethics itself.

The point of departure of such a concept of ethics is often an argument about *going against nature*. According to this position, genetic engineering and interventions in human reproductive processes do something that is the business of nature alone; they intervene in a regulatory manner in a self-regulating nature. Gene transfer may cross species boundaries, and thus infringe on the 'identity of species'[12] and disturb the (relative) stability of ecological balances.[13] In arguments of this kind, we find biological uncertainty – what is then the 'identity of species'? – coupled with ethical unclarity – what does ethics have to say about the order of species, that is, about biological classifications, or even about nature as a whole, however that is imagined? Those who think (and write) this way are confusing the empirical (biological states of affairs) with the domain of the normative and commit the naturalistic fallacy, that is, they infer what ought to be from what is; they derive norms from facts.

This is precisely the case in the well-known arguments of Hans Jonas. He declares the natural to be the highest norm and views any intervention into these natural processes as an offence against 'naturally' given norms. For Jonas, the technology of cloning is in 'contradiction to the dominant

[12] G. Altner, *Naturvergessenheit: Grundlagen einer umfassenden Bioethik*, Darmstadt: Wissenschaftliche Buchgesellschaft, 1991, p. 214.

[13] G. Altner, *op. cit.*, p. 217.

strategy of nature'[14] and thus cannot be justified. The natural – here in the form of a natural reproduction – consequently appears here as something not to be interfered with and as something that pursues its own goals, with strategic means and that by these means makes itself the highest normative authority. As a matter of fact, the attempt is made repeatedly to construct an ecological ethics on the basis of an inference from facts to norms (which usually reveals a concealed naturalism) and to then oppose this new ethics in the form of *physiocentrism* to the *anthropocentrism* that has long dominated ethics and which is now (in many aspects erroneously) declared to have been a basic error. For the anthropocentric position – both in questions of ethics and of nature – Man is the point of departure of all arguments, and nature has no intrinsic moral value. For the physiocentric position, nature is characterised by its own (absolute) intrinsic value, which at the same time implies duties of Man toward nature. To be more precise, we can distinguish between *pathocentrism* (all sensible creatures have a moral value), *biocentrism* (all living creatures have a moral value) and *radical physiocentrism* which, as just mentioned, makes all of nature the bearer of moral value. Common to all these variants is that values, which in fact are always the result of valuations, are declared to be a part of nature itself.

The expansion of a bioethics (a sub-area of applied ethics) to biological ethics in the form of, or against the background of physiocentrism, is thus based on a misunderstanding. This expansion not only makes ethics dependent on a particular view of the world, but also leads by its naturalistic premises to a new (ethical) *biologism*. Biology is expected to be an advisor and also a legislator in ethical affairs. And this in turn involves both a philosophical and a biological misunderstanding, since the new biology teaches us how permeable the boundaries are between the natural and the artificial, that is, those processes determined by Man. The appeal to nature in ethical questions, which made sense in archaic cultures, no longer makes sense here.

One more point: the notion that moral conduct as a particular form of social behaviour is itself the product of evolution or can be given an evolutionary explanation leads one astray if it is understood in an absolute

[14] H. Jonas, Laßt uns einen Menschen klonieren: Von der Eugenik zur Gentechnologie, in: H. Jonas, *Technik, Medizin und Ethik: Zur Praxis des Prinzips Verantwortung*, Frankfurt: Insel-Verlag, 1985, p. 179.

sense as a foundation of ethics. Whereas in the first case of a biological ethics, natural relations are to be taken as the standard of ethics, in the second case, ethics would be a product of these relations, and thus our ethical deficits would not be due to the failings of reason, but to an evolution that was unfinished and unable to cope adequately with Man. An *evolutionary ethics* would in this sense be a convenient excuse for tasks unaccomplished in Man's dealing with himself, and with nature. However, nature gives no ethical lessons, neither in the form of physiocentrism nor in the form of evolutionary ethics. Nature only reminds us when harm is caused – think of environmental problems – of the unfinished tasks of rational ethics.

4. Here it is appropriate to remind ourselves of Immanuel Kant's concept of a rational ethics that is both *normative* (not evolutionary or biologistic) and *universal* (not particular or relativistic); that is, the principles of which are universalistic. According to Kant, this concept does not derive its validity from nature or from the values of certain (particular) cultures, but rather from a general will that is best expressed in the so-called end-formula of the categorical imperative: 'Act in such a way that you always treat humanity, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end!'[15] Only the 'rational' being exists as 'an end in itself'.[16] This is why for Kant only rational beings have 'dignity'. The concept of a universal ethics, just as the underlying idea of *universal reason*, is often said to be typically 'European', determined by the ideas of Christianity and the Enlightenment, and therefore, at least if seen from the outside, to be particular, i.e. not universal. Yet this is a misunderstanding. After all, its expressions of a corresponding ethical universality are, for instance, the concept of human rights and in connection with them, the concept of human dignity.

In other words, as in Kant, anthropological arguments are linked to ethical arguments – and to scientific arguments so far as Kant distinguishes between two worlds, the natural world constituted by natural laws (which is also phenomenal), and the moral world constituted by (universal) reason (which is also noumenal). Man is a citizen of both

[15] I. Kant, *Grundlegung zur Metaphysik der Sitten* B 66f. (*Groundwork of the Metaphysics of Morals*, ed. H. J. Paton, New York: Harper & Row, 1964, p. 96).

[16] *Op. cit.*, B 65 (*Groundwork*, *ibid.*).

worlds, and this is why, as I said before, he cannot be reduced either to (pure) nature or to the (absolute) spirit that he aspires to be.

5. In an unpublished manuscript 'On truth and lie in an extra-moral sense', Nietzsche made the following comment: 'What does Man actually know about himself? ... Doesn't nature conceal almost everything from him, even concerning his body, in order ... to drive him and enclose him within a proud and magical consciousness! She [nature] threw away the key'.[17] Although this remark is hardly up to date from a biological point of view, it remains quite current from the anthropological one. The human condition is still characterised by a need for self-determination. And for this very reason we should not be looking for a lost key. There is no such key. Self-determination is not just the fate of the individual, but it is also the fate of humanity itself, it belongs to the essence of humanity. When one overlooks this, for instance when we search for *the* biological or *the* philosophical answer, we are threatened on the one hand by biologism (Man is only a biological species) and on the other by ideological dogmatism (Man is lost in his own ideologies). So, even in the face of a steadily growing body of biological knowledge and a biological nature that is increasingly at our disposal, it is still essential that Man take (reasonable) control of his own ascriptions, of his self-definition and of his designs.

This means, again, that he must determine a measure for himself: that he must strive against both the threat of scientism and of ideology. For Man has always tried to draw an image of his future perfection – as individual apotheosis or as in social utopia – and has repeatedly turned from this icon in horror, or in boredom. This shows that the human condition in which we describe our particular essence is in a sense not to be optimised. Such an optimisation threatens to dissolve our condition precisely because this condition is the essence of humanity. What would remain would be either gods or machines, and neither of these share in what makes us human – our warmth, our odour, our happiness and our pain.

This does not mean that we ought not work to change our essence, to alter that human condition that defines the space between the available and the unavailable, between happiness and pain, between god and beast. On the contrary, this is precisely our task. A task that is served both by

[17] F. Nietzsche, Über Wahrheit und Lüge im außermoralischen Sinne, *Werke*, vol. III/2 (1973), p. 371.

ethics and by science, not in separate worlds, but in a single one. For not only science learns when ethics learns, in that it measures its own actions against ethical standards; but ethics also learns when science does, in that it takes account of scientific states of affairs, as in the biological-empirical essence of humanity.

OUR DEEPEST BELIEFS ABOUT OURSELVES

PETER VAN INWAGEN

Here is a list of beliefs – fairly common beliefs – about human beings:

> Human beings are rational animals, in a sense of 'rational' in which no other terrestrial animal is rational.
>
> Because human beings are rational animals, they are more important (more important in the great scheme of things, one might say) than dogs or dolphins, just as dogs and dolphins are more important than snails and clams; that they have an objective moral value that exceeds that of any other terrestrial species.
>
> The behavior of human beings is subject to moral constraints, objectively correct moral constraints, and human beings are capable of recognizing this fact.
>
> Human beings have free will.
>
> Human beings do not come to an end with death.
>
> There is a supernatural order – that the natural world is not all there is, but rather exists within a 'surround' of personal and invisible powers – and that the existence of this supernatural order is not a matter of practical and not merely theoretical or intellectual interest for human beings.

These are examples of the kind of belief to which my title refers: 'our deepest beliefs about ourselves'. They are examples of our deepest beliefs in this sense: that for a person who has them to give them up (to give any of them up) would involve a radical change – a change as radical as any change could be – in the way that person thought about human beings. And, of course, if someone did not have these beliefs and then acquired any of them, *that* would involve a radical change in the way that person thought about human beings. Those who reject these beliefs would agree that they are in this sense deep: such people think of themselves has having come to a radically different (and of course superior) view of human

beings from those who have them. The beliefs in my list of examples are, of course, traditional or perennial beliefs. I do not mean the description 'our deepest beliefs about ourselves' to apply only to perennial beliefs like the ones in my list. I mean their denials – the belief that human beings are not all that different from other animals; the belief that 'the cosmos is all there is or was or ever will be' – also to fall under this description.

The topic we have been asked to address is 'our knowledge of a human being'. The knowledge I wish to discuss is scientific knowledge. I want to ask whether science – physics, cosmology and astronomy, geology and paleontology, biology, neuroscience – can confirm or refute any of our deepest beliefs about ourselves. It will be my contention that science has not told us whether any of our deepest beliefs about ourselves is true or false, and that in fact (unless science does something radically different from anything science has done so far) science *cannot* do this, cannot radically alter our view of ourselves. In saying this, I do not mean to deny the obvious. I do not mean to deny that the discoveries of science have *caused* radical alterations of many people's deepest beliefs about human beings. My thesis is that that they *shouldn't* have: that these alterations were not *rational* responses to the discoveries of science. Owing to limitations of space, I will discuss only the question whether science has refuted any of our traditional or perennial deep beliefs about ourselves, beliefs like the ones I have listed.

Let me present an analogy. In the year 1300, most people (most people who had any beliefs at all on the matter) believed that the earth was at the center of the universe. In the light of the subsequent discovery that the earth revolved around the sun, people had to stop having that belief; they had in fact to start having the belief that the earth was *not* at the center of the universe. But consider another belief that people had in the year 1300: their belief in the alternation of day and night. We have not had to stop having *that* belief. In virtue of a certain scientific discovery, people have come simply to accept a new account of the celestial kinematics and geometry that lies behind the alternation of day and night. It is my position that our deepest beliefs about ourselves – both the traditional beliefs and their starker, more up-to-date rivals – are like the belief in the alternation of day and night in at least this respect: they are not the sort of belief that can be confirmed or refuted by new information. (Of course some of them are rather more *controversial* than the belief in the alternation of day and night).

I am not saying that every important, widespread belief about human beings is immune to refutation by scientific discovery. The Greco-medieval theory of humours has been refuted by science, and the belief in

a psychology of humours was certainly an important belief about human beings. But it wasn't one of anyone's deepest beliefs about human beings: a belief about ourselves can be important without being one of our deepest beliefs about ourselves.

It is not my purpose to dispute any scientific discovery or thesis. Some of the theses I shall dispute are indeed theses *about* science, but they are not themselves scientific theses. They are not theses like 'The particles that carry the color-force are themselves subject to the color-force' or 'Many important properties of water are due to hydrogen bonding'. They are not theses such that you would fail your doctoral qualifying exam in physics or paleontology or molecular biology if you got them wrong. The theses I shall dispute are *philosophical* theses about science, about what science has done or can do.

It is not my purpose to contend that science is of no philosophical relevance. That would be simply false. (Kant, for example, believed that he had shown that it was impossible for human reason to treat the physical world as it treats, say, the moon: as a single, unified object. I take the modern science of cosmology to have shown that he was mistaken). I contend only that *certain* philosophical conclusions cannot be drawn from any actual scientific discovery or scientific theory: conclusions concerning the truth or falsity of our deepest beliefs about ourselves.

It is not my purpose to depreciate the accomplishments of science. Science tells us how the physical world works. To say that it is not the business of science to answer every question that we might want to ask about ourselves is not to belittle science.

I do not claim to be able to demonstrate from first principles that science cannot adjudicate the truth or falsity of our deepest beliefs about ourselves. After all, we human beings are parts of the very physical world that science explains the workings of (at any rate, I'll stipulate this; and it is in fact something I believe). It might therefore be that in the course of explaining how we 'work' and how the workings of the physical world have produced beings like ourselves, science will tell us everything there is to know about ourselves. But if it is not self-evidently false that science can do this, neither is it self-evidently true.

My argument is a posteriori, not a priori. It pertains to the attempts (all failures, I judge) that have actually been made to deduce from actual scientific discoveries propositions about ourselves that are of deep philosophical consequence – and not to any *possible* arguments from any *possible* scientific discoveries. (For who am I to speculate about what science

may accomplish in the future?) I must defend this conclusion by considering examples, and I can consider only a few – and even those much more briefly than they deserve.

If one wishes to show that science has refuted some traditional deep belief about ourselves, there are two general strategies one might follow. First, one might try to show, for some belief that is certainly one of the traditional deep beliefs about ourselves, that science has shown this belief to be false. Secondly, for some traditional belief about human beings that science has certainly shown to be false, assert that this belief was a 'deep' belief.

Here are two familiar examples of first strategy at work: 'The Darwinian theory of evolution shows that human beings do not have a divine creator'; 'The fact that human beings share almost all their DNA with various primate species shows that there the supposed radical gulf between human beings and other terrestrial animals is an illusion'.

These two claims on behalf of science are empty. The Darwinian theory of evolution does not show that we do not have a divine creator. For suppose that the world we live in is a Darwinian world – that all mutations are due to chance (to genetic copying errors, for example) and that all taxonomic diversification is due to some mixture of chance and the culling of gene pools by natural selection. Since this world of ours is actual, it is possible. And God is by definition omnipotent. If he is omnipotent, he is able to create *any* possible world and is therefore able to create *this* possible world, this Darwinian world we inhabit. I should perhaps point out, parenthetically, that I am not saying that science has never refuted any religious beliefs (any beliefs held on religious grounds). That would be demonstrably wrong. Science has, for example, refuted the belief that the world was created in six days six thousand years ago. My position is rather that any religious belief that science has refuted was not one of our deepest beliefs about ourselves. Let us turn to the second example. It is a scientific fact that we share 98.7 percent (or something close to that; I've seen various numbers quoted) of our genetic material with chimpanzees. But this fact does not demonstrate the falsity of the perennial belief that a vast gulf separates human beings from all other terrestrial animals. It can't demonstrate the falsity of that belief because that belief is not false. The vast gulf is like the alternation of night and day: there it is, and there's no getting round it. I once saw a cartoon that makes this point nicely. A hostess is introducing a man and a chimp at a cocktail party: 'You two will have a lot to talk about', she says, 'you share 99 percent of your DNA'. Perhaps we should regard it as puzzling that there should be a vast phe-

notypic difference between two species whose genomes are so similar, but the world is full of puzzles.

Now the second strategy. Here is an example of the application of this strategy: assert that the belief that we human beings live at the geometrical center of a small cosmos of recent origin was at one time one of our deepest beliefs about ourselves; point out that science has shown this belief to be false.

But this belief was never one of anyone's deepest beliefs about human beings. Consider first the size of the Greco-medieval cosmos. The Greeks and the medievals knew that the result of measuring the angle between two fixed stars was independent of latitude and longitude and the time of day. They knew, that is to say, that, in comparison with the hypothetical sphere of the fixed stars, the earth could be treated as a dimensionless point. And they knew that this 'dimensionless point' was in reality about eight thousand miles in diameter. They were, by the nature of the case, unable to calculate the radius of the stellar sphere, but one medieval work of science fiction gives it a radius of (in modern terms) something like 50 light-minutes. The radius of the Hubble universe, present-day astronomers tell us, is about 12 billion light-years. The ratio of 12 billion years to 50 minutes is a big number (about 1.26 x 10 exp 14), but both universes beggar the human imagination. (What the medieval science-fiction writer actually said was that a trip by fast horse to the stellar sphere, if it were possible, would take 40,000 years). Whether we live in the medieval *mundus* or the modern Hubble universe, we inhabit a tiny island in the midst of an unimaginable vastness.

Consider next the fact that, as we now know, we do not live at the center of the universe – for the very good reason that the universe has no center. Many modern writers seem to suppose that the medievals believed we lived at the center of the universe because they believed that our existence was a part of the central purpose of creation and that showing that we do not live at the center of the universe therefore shows that our existence is not a part of the central purpose of creation. I do not perhaps need to point out that this reasoning is logically invalid; I do want to make the point that it has a false premise. The medievals (like the pagan Greeks before them) believed that we were at the geometrical center of the cosmos for empirical reasons (that, is, after all, how things *look*) and for philosophical reasons: since (their physics told them) we are made of a particularly gross kind of matter whose *telos* is to fall, to *sink*, naturally we find ourselves near the lowest place, near the center. The higher sorts of material things – the highest being the stellar sphere – are at the highest place in the literal sense of

the word. The highest material objects in the metaphorical sense, those that best imitate God, are at an immense height – millions of miles *up*. In short, the medieval belief that we live near the center of the universe was due neither to Christian theology nor to any of the medievals' deepest beliefs about themselves. The modern discovery that the universe has no center did not, therefore, as some suppose, 'de-center' humanity in any sense but the most literal, geometrical sense; and this literal sense is irrelevant to our deepest beliefs about ourselves.

Consider finally the age of the universe. The medievals would have been astonished to learn that some among us think that they would have resisted the idea that the physical universe was billions of years old. The philosophically significant alternatives, the medievals would have said, were that the age of the universe is infinite (as Aristotle and most medieval atheists held) or that it's finite. They believed, or at least Thomas Aquinas did, that human reason cannot answer the question whether the universe had a beginning in time, and held that divine revelation provides our only reason for believing that the universe had a beginning. They would have been delighted to learn that they were wrong about this and that human reason would eventually show that the universe had a beginning in time. And, not having been literalists about Genesis (that kind of literalism was a product of Reformation and Counter-reformation politics), they would have been willing to accept any given figure as to its age.

There are, as I have said, many other applications of both strategies, all of them, in my view, failures. The various applications of the two strategies have to be examined individually, each on its own merits – which, I insist, invariably turn out, upon examination, to be non-existent. I do not, therefore, claim to have refuted the proposition the science can adjudicate the truth or falsity of our deepest beliefs about ourselves. I have made it clear that I think that science has not done this, and I hope that, implicit in my examples, you will find reasons for thinking that – unless it should in the future do something radically different from what it has done in the past – science *cannot* do this. But these theses cannot be adequately defended in a brief paper like this one. I have tried only to say enough to open a conversation on the subject.

IMAGO DEI AND SEXUAL DIFFERENCE

JANET MARTIN SOSKICE

In a city like Rome there is no shortage of artistic portrayals of the human condition – Byzantine apses, Romanesque side-chapels, even bridges spanning the Tiber bear portraits of men and women redeemed and transformed. Sometimes, more darkly, we find men and women distressed and disordered – skewered and shovelled by devils into the pit.

'Man' (used as the collective here) is a Protean race. It is not just that within our species we can find a pick-pocket and a Virgil, but individually each one of us can be small and great. This is true physically, for we all begin as babies, but also spiritually for each sinner has the capacity to become a saint.

Within Christian anthropology a better word than 'protean' for this open-endedness is 'eschatological': human beings are eschatological and teleological. The baby has its *telos* in the woman or the man, and the sinner has her *telos* in the saint. By contrast to the secular and social scientific discipline of the same name, 'Christian' anthropology understands our human nature not only in terms of what we are but of what we may be. We have the potential to become what we are not yet, or are not fully.[1]

Christian anthropology, a name I prefer to 'the Christian doctrine of Man', is not a member of that list of sciences which includes entomology, rodentology, and ornithology. The extension to that list which covers our species is 'primatology'. To include Christian anthropology in the list would be a category error.[2] Christian anthropology is not a branch of the natural

[1] This is not a view only to be found in Christian anthropology. It is a central plank, for instance of that of Jean-Paul Sartre. I am indebted to one of my doctoral students, Fr. Stephen Wang, for directing me to the similarities in the anthropologies of Sartre and Aquinas.

[2] And one I suspect is sometimes made by crude invocations of 'natural law' theory which proceed as though the human good can be read directly off our animal nature.

or the social sciences, although it may make use of all of them, but a division of *sacra doctrina*, or holy teaching, and its kindred disciplines are Christology, ecclesiology, pneumatology and soteriology – the Christian understanding of the Christ, of the Church, of the Spirit, of salvation.

Each of these 'scientia' are predicated to some degree on revelation, but Christian anthropology needs very little to get started – sufficient to say that Christian anthropology depends upon saying that we are creatures. We are creatures in the strong sense – that is, we are created. But this implies a Creator and, in Christian, Jewish and Muslim thought, a Creator understood to be good.

Christian anthropology is closely related to two other scientia – the first is 'theology', a term we use generally to cover all manner of religious thought but which I use here to mean 'the doctrine of God'. Christian anthropology is close to theology not because we are God-like,[3] but because we are created by God and our destiny – the destiny of all reasoning creatures, according to Aquinas – is to share in the Triune life of God. Augustine puts the same point in a different way – 'Our hearts are restless until they rest in Thee'. This is a creaturely *telos* as real for Augustine and Aquinas, as that of the acorn to grow to an oak.[4]

Human beings are growing, changing things – destined to become what they are not yet. But human beings are also in Christian (and Jewish and Muslim) teaching 'made in the image of God' (*Genesis* 1.26-7). Theologians have puzzled over the centuries over this mysterious claim. How can it be so? It cannot be by virtue of our physical bodies since God does not have a body. Might it be in virtue of rationality or mind? This is the favoured settlement, although some Jewish writers have argued that to say man is in the image of God is to say that man lacks an essence, since God has no essence – an extreme form of the 'Protean' view. Some Orthodox theologians suggest, to my mind convincingly, that to say 'man is in the image of God' is to say that 'man is mystery', because God is mystery.[5] One consequences is that we do not know who or what we are – pos-

[3] 'What a piece of work is man! How noble in reason! how infinite in faculties! in form and moving, how express and admirable!' is, after all, uttered by Hamlet in despairing mode. I am grateful to Greg Seach for pointing out the context.

[4] God is complete fullness of Being, abundant, out-pouring life whereas we are seeking, questing creatures. Put metaphysically, in God there are no accidents. Put positively from our point of view, we are designed to grow physiologically, morally and spiritually.

[5] Andrew Louth has used this to good effect in arguments about manipulation of embryos in reproductive technology.

itively as well as negatively. 'Know thyself' is, after all, a pagan and not a Christian injunction.[6]

Much has been made of the negative aspects of 'not knowing who we are' but this teaching has a positive register, too, and one at the heart of faith: 'Beloved, we are God's children now: what we will be has not yet been revealed. What we do know is this: when he is revealed, we will be like him…' (I *John* 3.2-3).

And this brings us to the second of that list of theological subdivisions (ecclesiology, pneumatology) to which Christian anthropology is nearly related, and it is Christology, which also brings me onto the topic of sexual difference.

Around the main door of Bologna's Cathedral, the Basilica di S. Petronio, run a series of carved stone tablets: on the left the creation of Adam and of Eve, the temptation of the serpent, expulsion from the garden; on the right the manger, the visit of the shepherds, and of the Magi. The whole magnificent series, executed by Jacopo della Quercia between 1425 and 1438, shows our human history: the first creation on the left of the portal, and our new creation in Christ on the left. But it is to della Quercia's representation of the creation of Eve that I wish to draw attention.

Adam is asleep on the left, turned away from the centre of the carving where God – clearly the Triune God since He has a triangular halo – is drawing Eve out of Adam's side. It is a very statuesque 'Eve'. Although not yet risen to her full height, it is clear that when Eve does so she will be exactly the same height as God. Indeed she has the same distinctive aquiline nose as God, the same lips and much the same hair. She has fem-

[6] Contrast this maxim of ancient philosophy with Augustine in the Confessions. As a brash and successful young rhetorician he thinks he knows himself. It is only when he embraces Christian faith that he has painfully to admit that he is, and remains, a mystery to himself. With good Biblical precedent, viz St. Paul, 'For I do not do the good I want, but the evil I do not want is what I do'. (*Romans* 7.19). Or Cranmer's beautiful expression of the Pauline sentiment:

> We have followed too much the devices and desires
> of our own hearts.
> We have offended against thy holy laws.
> We have left undone those things
> which we ought to have done;
> and we have done those things
> which we ought not to have done;

Both accounts are clearly psychologically recognizable.

inine and more youthful versions of God's eyes and God's mouth. She is fully in the image of God.

The artist has brought together two *Genesis* texts – *Genesis* 1.26-7 ('Then God said, "Let us make humankind in our image, according to our likeness, and let them have dominion..." So God created humankind in his image, in the image of God he created them; male and female he created them'); and *Genesis* 2.18-23 where having created the earth, the plants and 'Hadam', the earth creature, God sees that that it is not good for Hadam to be alone. God then creates the animals and birds and, when Hadam fails to find one amongst them to be his partner, at last from 'woman' from the man's side ('ishshah' from 'ish' in the Hebrew).

Della Quercia's carving captures the moment before Adam wakes to say 'this at last is bone of my bone and flesh of my flesh'. Adam sleeps soundly on while still Eve and her Creator enjoy a quiet, dawn of creation, *tete à tete*, and God delights in this, 'His' newest creature.

Philosophical theologians, at least Catholic ones, do not characteristically treat the first books of *Genesis* as historical or scientific fact. Even St. Augustine in his *Literal Commentary on Genesis* conjectured that by six days the *Genesis* text could not mean six units of 24 hours, not least because the first 'days' take place before the sun and the moon, whose movements describe days and nights, were created. Those who compiled *Genesis* did not mean to give an account of the first seconds of the Universe. The origins that concerned them more concerned relations – the relation of God to humankind, of God to Abraham, and to the Israelites who descended from him, and so on. *Genesis* is thus consulted not as science but as a source for certain primitive Christians beliefs, 'primitive' not because they are naïve, but because they are basic. Amongst these are that God created all that is; that 'all that is' is good, that the human being is created in the image of God. None of these need conflict with anything science can tell us, although equally science could not even conceivably be called upon to demonstrate them. They play a regulative role in Christian thought and practice – for instance, the belief that each one is made 'in the image of God' is substantially the basis for Christian respect for each human life, and one reason why we go to extremes to save the lives of very disabled human babies but do not spare the lives of intelligent and healthy pigs.[7]

[7] For a tirade against this privileging of human as opposed to animal life as based on the, to their mind, groundless (because theological) notion of man as made 'in the image of God' see Peter Singer and Helga Kuhse, *Should the Baby Live?*, a forthright

The *Genesis* text also speaks about sexual difference. It is constitutive of human beings, and it is good. It is not good for man to be alone.

Contemporary biblical critics believe that the stories of the creation of man of *Genesis* 1 and 2 arise from two different sources which fed into the final text of the book, and they do not nowadays spend much time trying to resolve their inconsistencies. It was not so for the Fathers for whom any apparent contradiction had to be resolved.

One might have thought the Fathers with their Biblical conservatism would give priority to the narrative of *Genesis* 1 if only because it is the first, but overwhelmingly they preferred to discuss the second creation narrative where Eve is made from Adam's side. *Genesis* 1.27 on its own certainly is puzzling. What can it mean that God created man in His own image, male and female? Early theologians canvassed the idea of a primal androgyne which, or who, was subsequently supplanted by the later creation of two persons of different sexes, but this reading was soon dropped in favour of concentration on the second story.[8] However it was the story of *Genesis* 2 read in a particular way – a way which fitted better the accepted order of things – man was alone first and God created Eve for *him* as a companion and an helper.

Unlike *Genesis* 1, where male and female together comprise the 'imago', *Genesis* 2 can be, and has been, read as saying that Adam on his own was virtually sufficient. He could do everything, so it seems, except reproduce. Eve is made as a 'helper', but 'helper' was routinely understood by the early theologians as a subordinate – leaping over the fact that elsewhere in *Genesis* God Himself is described as 'helper' using the same Hebrew word.[9] Woman was routinely thought of as lesser, almost an afterthought. And how could it be any other way, given the position of women in the late antique Hellenistic culture now reading these ancient Jewish texts as their own, Christian texts?

argument for infanticide. Singer and Kuhse, it seems to me, are well-warranted in thinking our privileging of human life (which he regards as species-ist) is historically grounded in the Jewish and Christian teaching from *Genesis*.

[8] See Wayne A Meeks, 'Image of the Androgyne: some uses of a symbol in earliest Christianity', *History of Religions* 13 (1974), pp. 165-208.

[9] Some exegetes have pointed out that reading 'Eve' as God's afterthought goes against the general pattern of the *Genesis* creation narratives in which the more perfect creatures are those made last – sea and dry land are followed by sun and moon, birds and beasts, man and – finally – woman.

What kind of helper? Augustine famously surmised that for help in the fields another man would have been more useful, and for conversation another man more interesting and this, he concluded leaves procreation as the one thing man cannot do by himself. Man is whole and complete on his own. The woman adds nothing new to the genius of the human race, otherwise complete in itself, except affording it the capacity to reproduce.

This picture of man (the male) as able to do everything, except reproduce, has informed theological anthropology down the modern period. It is, in its way, a kind of egalitarianism in which women bring nothing other to the table but reproductive capacity and 'man' (here meaning 'male') is the default position for humanity. Thus when we speak of 'man' we include everyone, except when dealing with matters peculiar to females such as pregnancy, childbirth and abortion. But this is not simply a matter of language. In Catholic theological anthropology, for instance sexual 'monoculture' persists right into the texts of *Gaudium et Spes* and beyond.[10] Sexual difference, rightly or wrongly, is largely a matter of indifference, and women are to be treated just like 'men' except where they have different problems, for instance in questions of reproduction or, in *Gaudium et Spes* and more recent encyclicals, in women's freedom to work, or to marry without force, or to avoid exploitation and so on.

This sexual monoculture is in one sense praiseworthy for it rests on the conviction that women as well as men are fully in the image of God – a matter which was not uncontested in the early Church. Paul's puzzling injunction in I *Corinthians* 11.7: 'For a man ought not to have his head veiled, since he is the image and reflection of God: but woman is the reflection of man' could be and was read by some as suggesting that women were not fully in the image of God. More to the point, Paul's comment on veiling had to be reconciled with his statement later in the same letter that 'The first man (*anthropos*) was from the earth, a man of dust: the second man is from heaven. As was the man of dust, so are those who are of the dust: and as is the man of heaven, so are those who are of heaven. Just as we have borne the image of the man of dust, we will also bear the image of the man of heaven' (I *Corinthians* 15.47), and with *Colossians* 1.15, 'He is the image of the invisible God, the firstborn of all creation: for in him all things in heaven and on earth were created ... all things have been created through him and for him'.[11]

[10] The Pastoral Constitution on the Church in the Modern World, promulgated in 1965.

[11] See also *Romans* 8.29-30. In I *Corinthians* Paul here conflates *Genesis* 1 and *Genesis* 3, for mention of men and women made in the 'image' comes only in the former, and the man of dust in the latter.

The Christological texts weighed heavily with the early theologians. If Jesus Christ, unquestionably male, is the image of the invisible God, and we will all bear the image of this man of heaven then it seemed reasonable to conclude that women will be resurrected as men. Some Christian theologians said as much.[12] Augustine to his lasting credit said 'no' – those who hold the woman's sex to be a defect or something necessitated only by the Fall are quite wrong. Women will be resurrected as women in heaven, although without inciting lust. In saying this Augustine sought to avoid the inference that woman, on her own, could not be in the image of God. The female sex is not an afterthought to compensate for the disastrous effects of the Fall.

We find ourselves to this very day pulled between two positions which are each compelling but seem at the same time incompatible. We must say that, Christologically-speaking women and men cannot be different for 'all will bear the image of the man of heaven'. But we must also say that sexual difference is not, or should not be a matter of theological indifference. Sexual difference has something to tell us, not just about human beings, but about God in whose image they are made. The unresolved question then is – where, why and how does sexual difference make a difference?[13]

It is now forty years since the Catholic Church received the 'Pastoral Constitution on the Church and the World' known as *Gaudium et Spes*. One of this document's most striking features then, as now and noted by Cardinal Scola in his introduction to a new printing, is its Christocentric anthropology. It is a vision of man as everywhere related to Jesus Christ. Rereading it now with a view to sexual difference is an interesting experience.[14]

The document is visionary in anticipating the changing perceptions by women and of women before feminism had made much of an impres-

[12] See Kari Vogt, '"Becoming Male": one aspect of early Christian anthropology' in *Women: Invisible in Church and Society*, ed. E. Schüssler Fiorenza and Mary Collins, *Concilium*, No. 6, 1985. Reprinted in eds. Janet Soskice and Diana Lipton, *Feminism and Theology* (Cambridge: Cambridge University Press, 2003), pp. 49-62.

[13] That it does on the ground, and in actual matters of life and death is altogether evident from the findings of the United Nations, Aid agencies and other NGOs over the last two decades. Poverty and its handmaiden, war, effect women, the elderly and children disproportionately. Female morbidity figures outstrip male in all but the most affluent countries (see Amartya Sen's seminal work). The poorest of the poor are, overwhelmingly, women, and their status as 'the poor' is not separable from the burdens they bear and the disadvantages they face as women. These fact don't need to be rehearsed here.

[14] Especially in the new English translation of the text which studiously avoids inclusive language and uses 'man' generically throughout, except when women are being particularly discussed.

sion in any of the Christian churches. Women, *per se*, are mentioned relatively rarely but come up where the document addresses the social tension between men and women (§8), their claim for equality (§9), the sexual traffic in women (§27), their lack of freedom, in some parts of the world, to choose their husband (§29), and the dignity of the conjugal pact (§47). The document says even less about men, *per se*, because when 'man' is the default position it is hard to tell when males specifically are under discussion, and when human beings in general. In the key presentations of its Christological anthropology 'man' (*homo*) is meant to include everyone.[15] The section on 'the Dignity of the Human Person' drives home the point that man is made in the image of God, male and female; that on 'the Community of Man' reinforces the teaching of Christ is the true image ('All men have a rational soul and are created in God's image; they share the same nature and origin; redeemed by Christ, they have the same divine vocation an destiny; so it should be more and more recognized that they are essentially equal') (§28). This line of argument reaches a crescendo in 'The Concerns of Man in the World at Large' where we read,

Only God, who created man in his own image and redeemed him from sin, provides the full answer to these questions through revelation in Christ his Son made man. Whoever follows Christ, the perfect man, himself becomes more of a man (§41).

This is the implication of the Biblical teaching, already called to mind in §21, that Christ 'became truly one of us, like us in everything except sin' and that the Christian, whether male or female, is to be 'conformed to the image of the Son who is the first-born among many brethren (*Romans* 8.29; *Col*. 1.18)'.

At the heart of this document, and at the heart of New Testament itself, is an anthropology in which,

> The mystery of man becomes clear only in the mystery of the incarnate Word. Adam, the first man (*primus homo*), was a type of the future, that is of Christ our Lord. Christ, the new Adam, in revealing the mystery of the Father and his love, makes man fully clear to himself, makes clear his high vocation (§22).

[15] So for instance the concluding sentence of the introduction reads 'In the light of Christ, the image of the invisible God, the first-born of all creation the Council means to address itself to everybody, to shed light on the mystery and man and cooperate in finding solutions to the problems of our time' (§10).

The unanswered question is 'does Christ make woman fully clear to herself?' The Latin of the instruction uses the more inclusive *homo/homine*, but the patterning is upon Adam and Christ, both male. What can it mean for women, for me, to say with *Gaudium et Spes* and the scriptural witness that 'Whoever follows Christ, the perfect man, himself becomes more of a man' §41 (*Quicumque Christum sequitur, Hominem perfectum, et ipse magis homo fit*). Do those aspects in which I am to become perfected or 'more of a man' include only those aspects I share with males, like my intellect and my life of virtue, or do they also include my mothering, my loving, my sense of my own embodiment which must be different from that of a man? Is Christ the fulfilment of female 'men', as well as male 'men', and if so, how?[16]

The text of *Gaudium et Spes* contrasts strikingly with that of letter 'On the Collaboration of Men and Women in the Church and in the World' sent to the Catholic bishops in the summer of 2004. Whereas the former almost elides sexual difference, the latter speaks of sexual difference as 'belonging ontologically to creation', an expression which is hard to construe but which fortunately falls short of saying that there is an 'ontological difference' between men and women. That would indeed be odd, for one can see an ontological difference between a stone and a human being, but it would be difficult to see an ontological difference between a man and a woman, unless one also said there could be an *ontological* difference between any two individuals. One can say this, but it is somewhat vapid.

A more serious problem with this emphasis on 'ontological difference' is not philosophical but theological. Too strong a stress risks putting the 2004 letter at odds, not only with *Gaudium et Spes*, but with Scripture itself if it suggests that a woman cannot say that, in every significant sense, Christ is like me except without sin. It is for this reason that we must insist that, Christologically-speaking, men and women *cannot* be different.

But is sexual difference without theological import? Can we return to our tradition of sexual monoculture, of sexual 'indifference'? I think not, and perhaps della Quercia's creation of Eve can hint the way forward. *Genesis* 1.27, with its suggestion that male and female together comprise the *imago dei* has yet to be fully explored by theology.[17]

[16] The Biblical allusion seems to be to *Ephesians* 4.13 which reads 'Till we all come in the unity of the faith, and of the knowledge of the Son of God, unto a perfect man, unto the measure of the stature of the fullness of Christ' (the King James Version retains 'perfect man' in translation of *andra* in the Greek).

[17] The idea that human beings are made in the image of God is only expressed in *Genesis* 1, where it is said they are made in God's image, male and female – the 'Adam's

It is notable that della Quercia's God, from his triangular halo, is clearly a triune God. God is three in one, unity in difference. Human beings in their createdness mirror this divine procession of love in being more than one, male and female. Christian theology must affirm that all human beings are *in imago dei and* that women are different from men. This means that women were not *made for men* any more (or any less) than men were *made for women*. The as yet unsung glory of *Genesis* 1.27-27 is that the fullness of divine life and creativity is reflected by a humankind which is male and female, which encompasses if not an ontological then a primal difference.

The fecundity of creation in the *Genesis* narrative comes from difference, the difference of light and dark, of sea and dry land.

In the midst of his *Speeches on Religion to its Cultured Despisers* Friedrich Schleiermacher provides, without explanation, this brief 'midrash' on *Genesis*:

> Let me disclose to you a secret that lies concealed in one of the most ancient sources of poetry and religion. As long as the first man was alone with himself and nature, the deity did indeed rule over him; it addressed the man in various way, but he did not understand it, for he did not answer it; his paradise was beautiful and the stars shone down on him from a beautiful heaven, but the sense for the world did not open within him; he did not even develop within his soul but his heart was moved by a longing for a world, and so he gathered before him the animal creation to see if one might perhaps be formed from it. Since the deity recognized that his (the deity's) world would be nothing so long as man was alone, it created for him a partner, and now, for the first time, the world rose before his eyes. In the flesh and bone of his bone he discovered humanity, and in humanity the world; from this moment on he became capable of hearing the voice of the deity and of answering it, and the most sacrilegious transgression of its laws from now on no longer precluded him from association with the eternal being.[18]

Schleiermacher never identifies the 'flesh of Adam's flesh' as woman. His point is not that man needs woman, but that to be human we need

rib' narrative of *Genesis* 2 says nothing of the 'imago'. Paul makes the conflation of Adam and the 'imago', and it may be that other Jewish writers of his time did the same.

[18] Schleiermacher, *Speeches on Religion to its Cultured Despisers*, trans. Richard Crouter, p. 119-20.

others – who are different from ourselves. Scheiermacher realises, as did Wittgenstein, that were Adam alone in the garden he would not only be unable to reproduce, he would be unable to speak. Speech is a pre-eminently social possession. And without speech there would be no praise, no prayer, no 'world'. We become ourselves through being with others.

God is Love. We learn love through the reciprocity of our human condition, through being in relation to others who are different from ourselves – mothers, fathers, brothers, husbands, and wives. Within sexual difference is a primordial difference, a template for the fruitfulness that can come not when two are the same, but when they are different. For human creatures, as for sea and dry land, light and dark, fecundity is in the interval. And this is why sexual difference is not just instrumental to marriage or even to the family. It is good in itself.

'Beloved, we are God's children now: what we will be has not yet been revealed. What we do know is this: when he is revealed, we will be like him …' (I *John* 3.2-3).

We stand to learn a great deal in the years to come as women begin to do theology. Will they write the same things as men? It remains to be seen. But we will never know what Man is until we can say, as Irenaeus obviously intended, 'the glory of God is woman fully alive'.

PHILOSOPHY, SCIENCE, FAITH

MARCELO SÁNCHEZ SORONDO

A Philosophical Prologue for Every Human Being

There can be no doubt that for every human being philosophy is a primary pathway of the spirit. During the course of history, through philosophical reflection, men and women have acquired knowledge about the absolute quality of their being. This quality has emerged, and emerges, through perceiving, and becoming aware of, the *differences* between being and not being, between what is true and what is false, between what is good and what is evil, and between what is just and what is unjust, which give rise to the diversities of the principal human praxes, which refer back to the theoretical, ethical and political sciences. This philosophy demonstrates the space of the encounter of man with the world and society, and sheds light on the tension between life and death, between dreaming and being awake, between normality and abnormality, between male and female, between youth, adulthood and old age, between the individual and society, and between the virtual and the real. It is through the dialectical approach that philosophy demonstrates such differences and contrasts, that a free decision is made possible and that commitment to action in both the theoretical and practical fields is stimulated. Indeed, there is a sphere of being that man finds in himself from the maternal womb onwards and outside himself from birth onwards, as a gift from the Creator which opens up to him the pathway of an adventure in time. This is a freely-given gift which forms the foundation of the capacity of the human being to become himself in relation to the world of nature and society, and above all else in relation to God. This is a gift, therefore, that constitutes the human being in his own capacity to act, even *capax* of God, *capax Dei*. The world and society make up the space and time in which every human being finds himself from birth onwards, and where the possibilities of choice arise and present them-

selves, the differences of life projects or kinds of life are perceived, the various human praxes are held up, through contrasts, and the various possible vocations are indicated. To be in the world for a human being is the being and the becoming of the self, or of oneself, in tension, to become oneself with others or oneself as another, in transparency 'before God', who is man's First Principle.

At a practical level, therefore, apprehension of the 'world', or of the presence of nature and society, is the first atmosphere of life in which the human being finds himself 'thrown' (Heidegger) or rather, and to express the point better, in which he finds that he is a gift of God and can move forward with the light of intelligence and the guidance of revelation – if he accepts it – until his final goal.

A Christian knows that the point of departure is not amorphous chance or the whims of destiny or the work of a powerful deceiver (Descartes), as atheists, sceptics, relativists and sceptics of all ages and hues maintain. A Christian knows that he owes his origin to the First Principle, who by an act of love conferred on him a privileged position so that he could know God and love Him and then attain immortality.

This had already been envisaged by philosophers before Christianity to the point of seeing man as the 'progeny of God' and God as near to men, He who gives them life, movement and being. We also know this from the speech that St. Paul made to the philosophers of the Areopagus of Athens.[1]

A Brief Scientific Prologue for Every Human Being

In addition to philosophy, there can be no doubt that another theoretical path privileged by the human being is that of science, which has developed above all else during modernity and has offered man immense knowledge and advantages, as we can all observe. I believe that nobody would be prepared to return to certain pre-scientific conditions. Few people or nobody would like to forgo the achievements of science. Who, for example, does not appreciate its advances, which have made life expectancy longer and the quality of life greater?

The relativist, atheist and nihilist outcome of a part of modern philosophy, which Benedict XVI has strongly denounced, has been matched by the return of the ethical, metaphysical and theological appeal of con-

[1] *Acts*, 17:22 ff.

temporary science. Today, science is undergoing a stage of unforeseen and unforeseeable development. The success of the studies of particles, designed to analyse the structure of matter at its fundamental level, have been especially spectacular. And the pathway of science, which until less than a century ago seemed unimaginable, is in constant expansion. The recent developments in astrophysics have been particularly surprising and represent a further confirmation of that great unity of physics that is clearly expressed every time one manages to achieve a deeper level of comprehension of reality.

The 'wonder' that stimulated the first philosophical and scientific reflection on nature, far from diminishing with new discoveries, has constantly grown to be transformed, in the most profound spirits, into a kind of amazement of the creature that increases our awareness of the complexity of reality. The extreme nearness that seems to be created between the primary forces of the cosmos and the ultimate particles of matter indicates that by now man finds himself, as a body, a participant in the creation, of which he, too, in his earthly adventure, is an element and a moment – both in the complex structures of the laboratories of science and in the humble events of daily life. The spectacle of the heavens, which, as Aristotle observed, was the origin of science, is no less wonderful, like the flight at the rate of light years of galaxies that expand the universe beyond what it is possible for our imaginations to conceive. One may say that man, who has set foot on the moon and continues to explore the other planets, has just moved out of the confines of the globe and entered a kind of cosmic infinity.

The greatness and the complexity of contemporary science at the level of its knowledge about the nature of the elementary particles and the fundamental energies of physics, and the molecular structures of forms of life, has an immediate relevance for man. It is man himself who, immerging himself in the presence of the mystery of the infinite, can expand without limits the project of his being, as indeed was perceived by Heraclitus with the Logos and by Aristotle who saw the intellect as being 'able to become and to do everything'.[2]

One can thus understand why the luminaries of contemporary science halt in front of this 'new world' which is in constant expansion, with an aware wonder at being faced with the immensity of the unknown, which

[2] *De Anima* III, 5, 430 a 14-16.

seems to expand and grow deeper with each new discovery of new winners of the Nobel Prize. And they, too, experience the presence of God, as is borne witness to, for example, by Enrico Fermi, according to the testimony of the famous mathematician Luigi Fantappié.[3]

Thus if we know how to read the signs of the times, just as Hellenic philosophy, which Pope Benedict XVI sees as a part of revelation,[4] leads us to the existence of God, so contemporary science today tells us that we are not the children of chaos.[5] This was the reading of the times of the Popes, and especially Pius XI and Pius XII, during the twentieth century. They asserted that science leads us to a kind of new realism that can open the horizon

[3] M. Micheli, 'Enrico Fermi e Luigi Fantappié. Ricordi personali', *Responsabilità del Sapere*, XXXI (1979), vols. 131-132, pp. 21-23.

[4] *Address at Regensburg*, especially the part against de-Hellenisation.

[5] To demonstrate how the limitation of reason to what can be experienced and measured is not only full of negative consequences, but is also self-contradictory, J. Ratzinger – Benedict XVI concentrates his attention on the structure and the presuppositions of scientific knowledge, and in particular on the position that would like to make of evolutionary theory the universal explanation, at least potentially, of all reality. A fundamental characteristic of scientific understanding is, in fact, the synergy between mathematics and experience, or between mathematical hypotheses and their experimental verification: this synergy is the key to the enormous and constantly growing results obtained through the work and use of technologies in operating with nature and placing their immense energies at the service of man. But mathematics as such, at least in part, is a creation of our intelligence, a pure and 'abstract' result of our rationality. The correspondence that cannot but exist between mathematics and the real structures of the universe – because otherwise scientific forecasts and technology would not obtain these effective results – thus poses a great question: it implies that the universe itself is structured in a rational manner, such that there exists a profound correspondence between our subjective reasoning and the reason embodied in nature. It thus becomes inevitable to ask oneself under what conditions such a correspondence is possible, and concretely, if there must not exist a primordial intelligence that is the common source of nature and of our own rationality. Thus, precisely in reflecting upon the development of the sciences, we are brought back to the creating Logos, and there is a reversal of the tendency to accord primacy to the irrational, to an amorphous evolution, to chance and necessity, and the tendency to reduce to these even our own intelligence and freedom (cf. the addresses in Verona and Regensburg, in addition to *Faith, Truth, and Tolerance: Christianity and the Religions of the World*', published in Italian by Cantagalli, Siena, 2003, pp. 188-192). And furthermore, even on the philosophical level (and not only scientific) the creating Lógos is not the object of an apodictic demonstration, but remains 'the best hypothesis', an hypothesis that demands that man and his reasoning 'renounce a position of dominion and risk the position of humble listening' (for a detailed explanation of the thought of Pope Ratzinger see Cardinal Camillo Ruini, *Verità di Dio e verità dell'uomo*, Cantagalli, Siena, 2007, pp. 15-45).

of transcendence in a new way.[6] This perception lay behind the renewal of the Pontifical Academy of Sciences.[7]

A logic exists that underpins the universe. This logic is based on three groups of 'building blocks' called 'families' of elementary particles and four fundamental forces. Each family consist of two 'quarks' and two 'leptons'; the total number of building blocks is therefore 12. These 12 fundamental 'blocks' are to be imagined as 'spinning' with the smallest amount of 'spinning' motion. The interaction between these spinning objects is controlled by four fundamental forces which are the gravitational, the electromagnetic, the sub-nuclear 'weak' and the sub-nuclear 'strong' forces. The electromagnetic and the weak forces are mixed and therefore the number of fundamental forces of nature is often quoted as being three. These forces act all over space and time. But the most impressive component of the logic is the existence of the three fundamental constants of nature; they are identical in all regions of space and of time. For example, if one observes the light that is emitted by the most distant galaxy (electromagnetic radiation can also arrive in the form of radio waves), which has taken twelve milliard years to arrive here, it is exactly identical to our light. These fundamental constants are the minimum amount of 'action', called Planck's constant; the maximum speed with which we can send messages, the velocity of light in vacuum; and the Newton gravitational charge which establishes the strength at the origin of the formation of stars and galaxies. No one can ever change the smallest detail in this logic. The smallest change would not be compatible with the existence of the world where we live and of which we are an infinitesimal component. Despite being a very small part of the world, we are the only known form of living being which is able to discover the logical structure of nature. The existence of this logic is the most significant proof there is against chaos being our 'father'. Another important detail is that the most significant steps in discovering this logic have always been totally unexpected, thereby continuing the experience of wonder that was at the origin of science and philosophy. No one ever imagined the exis-

[6] Cf., for example, Pius XII, 'The Proofs for the Existence of God in the Light of Modern Natural Science', in *Papal Addresses to the Pontifical Academy of Sciences and to the Pontifical Academy of Social Sciences* (The Pontifical Academy of Sciences, Scripta Varia 100, Vatican City, 2003), pp. 130-142.

[7] Cf., for example, Pius XI, Motu Proprio, which led to the refoundation of the Pontifical Academy of Sciences, in *Papal Addresses to the Pontifical Academy of Sciences and to the Pontifical Academy of Social Sciences*, p. 19 f.

tence of this logic of nature, which has been discovered at different stages by science in all its fascinating rigorous details.[8] This is the great message of science in which all great scientists believe. The phrase of Einstein, 'God does not play dice with the universe', here immediately comes to mind.

The greatest project of modern science is the reduction of all physical phenomena to the same origin: a fundamental force. Perhaps one day this single force will be found from which this universe derives with all its peculiarities, which, indeed, cannot be altered.

However, this is not only the problem of the existence of a fundamental force of nature from which the whole world with its structures originates; the crucial problem is why there is something rather than nothing. This question, according to the mathematician and philosopher Gottfried Wilhelm Leibniz, is the fundamental question of philosophy, or, according to the philosopher Martin Heidegger, the 'wonder of wonders': 'Why lastly, being rather than nothing'.[9] This is the famous 'to be or not to be', the question of questions, in relation to which the scientist, who beyond the empirical horizon is no longer competent, can no longer provide an answer. Here we are not dealing with a God of the Gaps: this is not a 'lack' in the process or pathway but the absolute beginning. Here man comes up against the original secret of reality. This is the problem of an original relationship of the world as participated being with a primary cause as Being by essence. This is an original 'support' and an original task of the participated being which is presented not only to the scientist at the limits of science but to the philosopher as his task proper, and, rightly, to every man, in that he wishes to know about his dignity as a human being. I mean that 'accursed' (as Dostoevsky called it) question which appears at the extreme horizon of our spatial-temporal experience as a great question, at the beginning as at the end, but also in the middle of the pathway of our lives. This is the question that centres round that original principle of reality that the Greeks began to call God (θεός – Theós), and which Jews, Christians, Muslims, and the faithful of other religions still designate with the same – perhaps misunderstood – name of God.

[8] Cf. A. Zichichi, 'Totally Unexpected Discoveries: A Personal Experience', in *Paths of Discovery* (The Pontifical Academy of Sciences, Acta 18, Vatican City, 2006), p. 130-153; 'Scientific Culture and the Ten Statements of John Paul II', in *The Cultural Values of Science* (The Pontifical Academy of Sciences, Vatican City, 2003), pp. 288-324.

[9] M. Heidegger, *Was ist Metaphysic?* (Frankfurt M., 1975), pp. 42, 47.

The Universality and Transcendence of the Sacred

The statement that we find in St. John, 'No one has ever seen God',[10] clearly indicates to us the transcendence of the sacred as regards our capacity to reach it. Because of our intellective imperfection, divine realities, which are to the utmost intelligible in themselves, are not evident for us. Indeed, Aristotle says: 'as the eyes of the bat behave during daylight, thus also the intelligence that is in our souls behaves towards things that, by their very nature, are the most evident of all'.[11] Therefore, we are not immediately able, from the outset, to know the various levels of transcendence of the divine: we have to attain to what is most knowable and primary in itself through a process of phenomenological-metaphysical elevation in an ascending spiral, beginning with the beings that are m1ost knowable for us but which in themselves are less consistent and evident.

'All men are convinced of the existence of the gods'[12] declared Aristotle, and this is also confirmed by the contemporary philosophy of religion, with the help of modern ethnology: 'There are no atheist peoples. There was no form of atheism at the beginning of history. Religion can be found always and everywhere'. Ludwig Feuerbach also noted in the first lines of his most important work, *The Essence of Christianity*, that 'animals have no religion'.[13] Anthropologists agree in recognising that human beings have practiced some form of religious activity ever since their first appearance on the horizon of history.[14] For this reason, African people, who claim that they were the forbears of humanity, celebrate their continent as being the cradle of religion as well. And this is the dimension what we may refer to as constituting the universality of the religious phenomenon.

[10] *Jn* 1:18.

[11] *Metaph.*, II, 1, 993 b 9-11.

[12] *De Coelo*, I, 3, 270 b 5.

[13] G. van der Leeuw, *Phänom. der Religion* (Leipzig, 1935), p. 570.

[14] Of relevance here is the recent declaration by C. Lévi-Strauss, one of the theorists of cultural differences. He states that the lesson that ethnology has derived from peoples that do not know how to write is that 'they are at one in making man a receiving subject and not a master of the creation'. Thus 'only this way of seeing man could gain the assent of all civilisations. Ours first of all because the concept that emerges from these people is that same as that of Roman consul-jurists, who bore many Stoic influences, who defined natural law as a set of general relations established by nature amongst all living beings for their common preservation; that of the other great Eastern civilisations, based on Hinduism and Buddhism' (*La Repubblica*, 15.VI.2005, p. 47).

However, today, after the journey of the philosophy of modernity and of the comparative history of religions, we may discern, next to this acknowledged and observed universality, from both the phenomenological and the metaphysical viewpoint three levels or spheres of transcendence of the divine which make themselves present in our awareness of the experience of the sacred. These spheres of transcendence define and characterise religions and correspond to the great stages of the history of humanity on its pathway towards the 'fullness of time':[15] the cosmic sacredness of the whole (whose symbol is the city of Benares); the religion of natural man (represented by Athens and pre-Colombian Mexico); and the historical reality of Judeo-Christian revelation (with Jerusalem and Rome as its centres).

We may thus observe that there are three spheres or forms of transcendentality (and of consequent immanence) of the sacred, which coincide with God's path towards man or 'epochs of salvation', on the one hand, and, on the other, with the main stages of the suffered path that the human being has walked in order to rise to God.

The cosmic sacred of the whole is the spontaneous perception, accessible to everyone, of something immense and infinite which dominates the world and envelops everything in the mystery of being, causing in us amazement and admiration. This is the *Mysterium ultimum et ineffabile* that envelops our existence and the existence of the cosmos. This phrase is employed at the beginning of the declaration of the Second Vatican Council on the relationship between the Catholic Church and non-Christian religions (*Nostra Aetate*) and expresses the greatest question that poses itself to our religious consciousness. Perhaps this refers in particular to the sacred as it has been manifested in the East (and the Far East).

The religion of rational (natural) theology rose to a higher level with an explicit perception of God (the θεός – theós of Xenophanes, Heraclitus and Aristotle) as the first Intelligence and the first Love, the Cause of the world, of both material and spiritual beings, who attracts everything to Himself as an object of love (κινεῖ δὴ ὡς ἐρωμένον, κινούμενα δὲ τἆλλα κινεῖ),[16] and this requires from man an answer of friendship and justice, through his fellow (*Nicomachean Ethics*) as well.[17]

[15] *Gal* 4:4.

[16] *Metaph.*, XII, 7 1072 b 3 s. Cf. the important reflection of Benedict XVI on this question in *Deus Caritas Est*, n. 9.

[17] Aristotle, *Ethica Nicomachea*, books VIII and IX.

Lastly, Christian religion rose to the extreme definitive moment and presented God in His most complete truth, both eternal and historical, which He has communicated to us both through the initial revelation to Moses and the Prophets and by the much more complete revelation of Jesus Christ. This last drew upon God's intimate life which is expressed in the communication (relationships) of the three divine Persons – the Father, the Son (the Word) and the Holy Spirit – in the Incarnation of the Word which effected the reconciliation of man with God by making man enter into communion with His life. This constitutes the gift of grace as participation in the life itself of God (deification),[18] whose fulfilment is eternal life: this is where, therefore, in the sphere of the sacred, man makes a 'leap in quality', through faith as πίστις, the other theological virtues and the gifts of the Holy Spirit.[19]

Transcendence in Christian Religion

St. Paul's speech at the Areopagus,[20] as observed in *Fides et Ratio*, marks the meeting point and also the clash between Greek thought and Biblical Revelation in relation to the decisive points in the story of salvation, and seeks to bring out the diversity of, and the continuity in, the divine plan during the centuries that preceded the conclusive manifestation of the Word made Flesh or the 'fullness of time'. This was an announcement of the definitive solution of the subject of God both in His cosmic horizon of Eastern religion and in His anthropological horizon of Greek religion.

In the prologue to his speech St. Paul greeted the assembly by calling it 'singularly religious', thus acknowledging that human reason has its own pathway in gaining knowledge about God. He also did this in his Letter to the Romans (1:19-20), which links up to the Book of Wisdom (13:1). The phrase 'unknown God' is singular but the Apostle makes it his starting point to breach their consciousness and to invite them to a full

[18] For a more detailed investigation see M. Sánchez Sorondo, *La gracia como participación de la naturaleza divina* (Buenos Aires, Letrán, Salamanca, 1979), esp. p. 125 ff.

[19] For a more detailed investigation see M. Sánchez Sorondo, 'The Various Transcendent Levels of the Sacred in History: The East, Natural Religion and Revealed Religion', in *The Sacred*, Doctor Communis, fasc. 1-2 (The Pontifical Academy of St. Thomas Aquinas, Vatican City, 2006), pp. 69-82.

[20] *Acts*, 17:22 ff.

knowledge of God the Saviour. This proclamation of his is akin to that of God to Moses on Mount Sinai in the Old Testament and that to be found in the Prologue to the Gospel of St. John in the New Testament: 'The unknown God you revere is the one I proclaim to you'.[21] And it is God pure spirit, one in Himself and good in Himself, the maker of the world and of man: 'The God who made the world and everything in it is himself Lord of heaven and earth, he does not make his home in shrines made by human hands. Nor is he in need of anything, that he should be served by human hands; on the contrary, it is he who gives everything – including life and breath – to everyone'.[22]

He is the unique, personal and creator God who envelops with His power the entire universe, has granted the human being a privileged position, and has given him a special presence of continuous providence: 'It is in him that we live, and move, and exist'.[23] This thought will not have displeased those thinkers to whom the Apostle gave, in homage, the gift of a quotation from a philosophical tradition that was well-known to them: 'as indeed some of your own writers have said: "We are all his children"'.[24] As is known, this text is attributed to the poet Haratus (310-240 BC), who, in his poem *Phenomena*, begins with an invocation to Zeus: 'We need Zeus in everything, all of us who are members of his progeny'.[25] To this same speculative tradition belongs the well-known *Hymn to Zeus* of the Stoic Cleant, which celebrates the paternity and universal government of the first Principle in relation to the world and the lives of human beings. One could also say that this belongs to the 'seeds of the Word' to which Clement of Alexandria refers. Something similar can also be found in the philosopher-slave Epictetus who, in Christian times, but going back to Socrates, wrote: 'If what philosophers say about the family relationship between God and men is true…the most important and universal society is that formed by men and by God, since they alone by their nature participate in the divine communion, being tied to God through reason: why does man not say that he is a citizen of the universe? And why does he not say that he is a son of God?'[26]

[21] *Ibid.,* 17:23.
[22] *Ibid.,* 17:24 ff.
[23] *Ibid.,* 17:28.
[24] *Ibid.,* 17:28.
[25] A. Wikenhauser, *Atti degli Apostoli* (Brescia, 1968), p. 272.
[26] *Diatribe*, I, 9, 6.

The existence of God, therefore, is demonstrated by the dependence that is shown by both material and immaterial creatures on an absolutely first, good, just, almighty etc. Principle who is presented by the Bible and natural philosophy. Indeed, corrupted by idolatrous imaginings, the human being was partly and with difficulty retrieved by philosophy which at its best moments, and as a result of the most representative geniuses, formulated the most basic statements on the existence and the Providence of God and the spirituality and the immortality of the soul, as demonstrated by St. Thomas Aquinas when discussing Plato and Aristotle.[27] This is what was termed, with a profound phrase, the *preparatio evangelica*, of which there are also some echoes in pagan literature (the *IV Eclogue* of Virgil, the references of the Sybils…).

However, the state of the search for God has not ceased to be and to remain arduous and complex in the reality of existence and has been (almost) insoluble without the contribution of Revelation and Faith. For Pope Benedict XVI as well, in concrete terms, especially within the contemporary cultural climate, man with his own forces alone is not able to make completely his own this passage of the affirmation of the existence of God or 'best hypothesis' of the existence of the Logos (as Benedict XVI calls it). For the Pope, contemporary man remains, in fact, a prisoner of a 'strange penumbra' and of the impulse to live according to his own interests, leaving God and ethics aside. Only revelation, the initiative of God who manifested Himself to man in Christ and calls him to draw near to him, makes us fully capable of overcoming this penumbra.[28]

The Need for Faith

It is thus providential for divine clemency to come to our help on the pathway of reason and for faith at a certain point to intervene to facilitate the reflection of reason and thereby to enable 'everyone to participate easily in divine knowledge'[29] without falling into the doubts and the errors experienced by paganism. The recourse to faith is not therefore injurious or

[27] *De Substantis separatiis*, chap. 4.

[28] Cf. *L'Europa di Benedetto nella crisi delle culture* (Cantagalli, Siena, 2003), pp. 59-60, 115-124, and his address at Regensburg.

[29] Cf. St. Thomas Aquinas, *Summa contra Gentiles*, book I, chap. 4.

illicit but indispensable and liberating with respect to a subject that is so important for spiritual life.[30]

As regards our knowledge about God, this is not a matter of having recourse to an immediate 'sense of the divine', as the 'philosophers of intuition' (Schleiermacher) claim. It has to be recognised that there is a close alliance between reason and faith which is not and should not be a passive mutual dependence: reason must carry out its own task and faith must do the same. Faith and reason thus encounter each other in a relationship of 'complementariness' and 'circularity', as *Fides et Ratio* well observes. Reason is autonomous in the order of nature, i.e. it is autonomous in order to know the existence and the natural attributes of God, and it is what we call natural religion. The independence of reason and faith in their respective fields, and the indispensable value or task of faith in its own specific sphere, were suggested by St. Paul, even though he was brought up in the Jewish religion. This independence between reason and faith lies in the distinction between their subjects: created reality or finite reality is the subject of reason and non-created reality or divine life is the subject of faith. The former (reason) underpins and guides natural life, which is the relationship of the self with the world; the latter (faith), with supernatural help, brings to fulfilment the aspiration to divine life and provides it with the means to achieve that life. These are means that are proposed and assured to us by the coming of Christ.

We should thus recognise that Christ, now, is for man the only teacher of the truth that leads to eternal life, which has become accessible to all of us and not the privilege of a fortunate few because we are endowed with higher intellectual powers.[31] Here we encounter the exis-

[30] '*Ad ea etiam quae de Deo ratione humana investigari possunt, necessarium fuit hominem instrui revelatione divina. Quia veritas de Deo, per rationem investigata, a paucis, et per longum tempus, et cum admixtione multorum errorum, homini proveniret, a cuius tamen veritatis cognitione dependet tota hominis salus, quae in Deo est*', i.e. 'Even as regards those truths about God which human reason could have discovered, it was necessary that man should be taught by a divine revelation; because the truth about God such as reason could discover would only be known by a few, and that after a long time, and with the admixture of many errors. Whereas man's whole salvation, which is in God, depends upon the knowledge of this truth' (St. Thomas Aquinas, *S. Th*., I, q. 1, a. 1).

[31] '*Nullus philosophorum ante adventum Christi cum toto conatu suo potuit tantum scire de Deo et de necessariis ad vitam aeternam, quantum post adventum Christi scit una vetula per fidem*' i.e. 'no philosopher before the advent of Christ with all his endeavour was able to know God and the means designed to achieve eternal life as much as an old woman through her faith' (St. Thomas Aquinas, *Expositio in Symbolum Apostolorum*, Prooemium).

tential paradox from which faith begins: it is accessible to all men but at the same time transcends all the natural capacities of man and angels.[32] Grace is a gift extended to the human person by God that makes us participate in divine life and thus, above all, enables us to know eternal truths.[33] The existential paradox of man consists in the fact that what in itself for natural reason is most difficult (faith) also becomes accessible to the simple and pure of heart.[34] Faith, according to Christian philosophy, becomes an indispensable help to man in drawing upon the divine life and thus the only means by which to accept and live the supernatural life of grace as children of God already here on the earth. And in addition faith itself is converted into a help for reason in knowledge about God and the human being in his most profound dimension. This is the famous statement of St. Thomas: 'The gifts of grace in this way are added to those of nature which take nothing away from them; indeed they complete them; thus the light of faith, which is infused into us gratuitously, does not annul the light of natural knowledge that is congenital to us; indeed it strengthens it'.[35]

The Circularity between Faith and Reason

Thus faith, in the dynamism of philosophy open to revelation, transcends the sphere of natural reason by two means. First of all at the level of contents, in that it expands reason and makes it capable of under-

[32] '*Vita aeterna est quoddam bonum excedens proportionem naturae creatae, quia etiam excedit cognitionem et desiderium eius*' (St. Thomas Aquinas, *S. Th*., I-II, q. 114, a. 2).

[33] Cf. M. Sánchez Sorondo, *La gracia como participación de la naturaleza divina*, p. 143 f.

[34] Atheism is more a moral phenomenon than a speculative one. St. Thomas alludes explicitly to this fact in his late comment on psalm 13 which begins with the statement of the impious: '*Dixit insipiens in corde suo non est Deus*' (v. 1). The denial of the existence of God depends on malice: 'that man does not have God in his heart is the principle of malice': '*Quod homo ergo non habeat Deum in corde, principium malitiae est*'. Human beings have a natural but imprecise knowledge of God: 'And this can also explain why simple and uneducated people can have knowledge and belief about the existence of God' (*In Psalmum XIII*, ed. Parm., tom. XIV, p. 183 b).

[35] '*Dona gratiarum hoc modo naturae adduntur quod eam non tollunt, sed magis perficiunt; unde et lumen fidei, quod nobis gratis infunditur, non destruit lumen naturalis rationis divinitus nobis inditum*' (*Super Boetium De Trinitate*, pars 1, q. 2 a. 3 co. 1). Also: '*Fides praesupponit cognitionem naturales, sicut gratia naturam et ut perfectio perfectibile*", i.e., 'for faith presupposes natural knowledge, even as grace presupposes nature, and perfection supposes something that can be perfected' (*S. Th*., I, q. 2, a. 2 ad 1).

standing the new truths that are communicated to man through the higher magisterium of divine revelation. Secondly, because faith confirms and illuminates reason itself in the acceptance of natural truths which otherwise in the non-specialist would remain enveloped in the fog of approximate and confused notions. In this way philosophy open to faith draws upon and participates in both worlds, that is to say the world of nature and the world of grace.

From human nature, faith pre-supposes first of all intelligence and its use, because adherence to faith itself takes place by an act of intelligence and postulates its employment, 'for if faith is not thought, it is nothing', as St. Augustine said energetically.[36] The act of faith, however, is not the fruit of a syllogism; nor is it the necessary consequence of a rational process. The whole of Biblical and Christian tradition, although emphasising the rational aspect of faith, attributes it to the interior touch of the Spirit of God (*instinctus Dei invitantis*)[37] which solicits the dynamism of the will. Then man, according to a statement of the Second Vatican Council to be found in the Constitution *Dei Verbum* on Divine Revelation, 'commits his whole self freely to God (*se totum libere Deo committit*), offering the full submission of intellect and will to God who reveals, and freely assenting to the truth revealed by Him'.[38]

From nature, philosophy open to faith then takes the questions and issues of ordinary life concerning birth and death and applies them analogically to supernatural life, as well as those questions that concern violence and freedom and above all good and evil, and truth and error, justice and injustice.

From faith, man draws enlightenment about the new value that these terms obtain in the personal relationship of God with the world and, as a consequence, of the personal relationship of man with God as a son of the Father, and of the relationship of 'I' with 'You', which gives resonance and splendour to the divine symphony of the psalms and sacred liturgy. In addition, the mysteries of faith, in particular the central mystery of the Holy Trinity in its unity and personal diversity, illuminate the life of man as an

[36] *De praedestinatione sanctorum*, II, 5.

[37] '*secundum quam (pietas) cultum et officium exhibemus Deo ut Patri per instinctum Spiritus Sancti*', i.e. 'since it belongs properly to piety to pay duty and worship to God as father as an instinct of the Holy Spirit' (St. Thomas Aquinas, *S. Th*., II-II, q. 121, a. 1).

[38] Constitution *Dei Verbum,* n. 5.

individual and as a social being which has its roots in the sacrament of marriage, an image of the union of Christ with the Church and of the unity and diversity of the persons of the Trinity.[39]

The Proof of Philosophy Open to Faith

Philosophy open to faith acts at the intersection between reason and faith and thus at the encounter between nature and grace, which is the sphere that comes to existing man thanks to Biblical revelation. They coexist with reciprocal influences but they do not become mixed up. A specifically philosophical rational movement belongs to the nature of the human being as a movement that goes from the bottom up, from the evidence acquired by internal belief about the existence of the invisible. Differently from the particular physical sciences, each one of which is 'closed' within the specialisation of its own specific subject, philosophy has the task of opening and strengthening the horizon of transcendence, beginning with the two pillars of the existence of God and the immortality of the soul.[40] This order can be changed: one can move from the soul to God, and this is

[39] 'There are two reasons why the knowledge of the divine persons was necessary for us. It was necessary for the right idea of creation. The fact of saying that God made all things by His Word excludes the error of those who say that God produced things by necessity. When we say that in Him there is a procession of love, we show that God produced creatures not because He needed them, nor because of any other extrinsic reason, but on account of the love of His own goodness. So Moses, when he had said, "In the beginning God created heaven and earth", subjoined, "God said, Let there be light", to manifest the divine Word; and then said, "God saw the light that it was good", to show proof of the divine love. The same is also found in the other works of creation. In another way, and chiefly, that we may think rightly concerning the salvation of the human race, accomplished by the Incarnate Son, and by the gift of the Holy Spirit'. (St. Thomas Aquinas, *S. Th.*, I, 32, 1 ad 3).

[40] 'The approach of first philosophy about truth behaves in a way that is different from that of the other particular sciences. Whereas each of the particular sciences considers certain truths about specific kinds of beings…, but first philosophy considers the universal truth of beings. Thus it belongs to metaphysics to consider how man refers to the knowledge of truth': '*Aliter autem se habet consideratio philosophiae primae circa veritatem, et aliarum particularium scientiarum. Nam unaquaeque particularis scientia considerat quamdam particularem veritatem circa determinatum genus entium, ut geometria circa rerum magnitudines, arithmetica circa numeros. Sed philosophia prima considerat universalem veritatem entium. Et ideo ad hunc philosophum pertinet considerare, quomodo se habeat homo ad veritatem cognoscendam*' (St. Thomas Aquinas, *In II Metaphysicam*, lect. 1, n. 1).

the ascending process of an Aristotelian or modern kind, or from God to the soul to God, and this is the descending process of an Augustinian Biblical kind. 'Philosophy open to faith' follows its own synthetic method: it acts with the first natural principles of reason but moves them within the transcendent reality of God the Creator and of the soul as a spiritual free subject.[41] Thus experience and science are fused in their respective functions and consistencies and a 'breach' of movement is made towards the limit that always keeps the consciousness of a person alert and in movement.

This movement is present in the experience of anybody who reflects at the various objective levels of consciousness: for example, the sense experience of the quality of nature and the concrete experience of the facts of history, the great contribution (and approach) of science to human culture, the formal experience of the abstract processes of logic and mathematics. As I argue below, the ethical personal experience expresses the point of convergence of all these praxes because it proposes the path that leads to the ultimate end and constitutes the specific task of the existential approach of the person. Indeed, the 'quality' of the person, as a moral subject, depends on his approach towards the two pillars of transcendence which St. Augustine proposed, namely 'God and the soul', which had already been announced in the Gospel, where it is stated that 'No one has seen God'.[42] However, the Word made Flesh presented them to us. Thus the soul, too, lies hidden in the innermost part of every person, but it attests to its presence through acting, of which the self is the beginning and the end.

[41] 'The principle of human knowledge is in the sense, however it is not necessary for all that is known by man to be subject to sense, immediately, by a sensible effect, since the intellect itself understands itself through an act which is not subject to the senses': '*principium humanae cognitionis est a sensu; non tamen oportet quod quidquid ab homine cognoscitur, sit sensui subiectum, vel per effectum sensibilem immediate cognoscatur; nam et ipse intellectus intelligit seipsum per actum suum, qui non est sensui subiectus*' (*De malo*, q. 6, a. un. ad 18). This is a decisive point because St. Thomas also states that 'we would not be able to obtain knowledge about separate intellectual substances either though reason or through faith, unless our soul knew on its own to be an intellectual being': '*Cum enim de substantiis separatis hoc quod sint intellectuales quaedam substantiae cognoscamus, vel per demonstrationem vel per fidem, neutro modo hanc cognitionem accipere possemus nisi hoc ipsum quod est esse intellectuale, anima nostra ex seipsa cognosceret*' (*Summa contra Gentiles*, III, 46). Thomas also accepts that is it because of the spiritual soul that the human intellect can raise itself to God: 'the soul itself, through which the human intellect ascends to knowledge of God': *'etiam ipsa anima per quam intellectus humanus in Dei cognitionem ascendit*' (*Ibid*., I, 3).

[42] *Jn*, 1:17.

Hence the observation about the constructive originality of this sphere of praxis in which 'philosophy open to faith' acts. This pre-supposes the first theoretical and moral principles and fundamental facts such as the existence of the world and the self, of nature and of other men and women. It encounters them at every step of consciousness as conditions, to express the point in Kantian terms, of its possibility. The originality of this dimension of praxis is the completely original fundamental situation which we may call 'the capacity to act freely'. Thus, in this sphere, as is attested to by the fundamental part of ethical reflection, is to be found the protagonist of selfhood and the self, that is to say the human subject. In this capacity, philosophy open to faith finds its authentic meaning and the solid bases of perspectives by which to actuate the person. The reality of the person is an achievement of Christian thought which appeared in history after the message of Christ and was then stimulated by faith.

We can thus say that attraction to good, to perfection and to justice has priority over all the other approaches of consciousness. St. Thomas read this in the *Eudemian Ethics* of Aristotle, which speaks explicitly about a divine instinct, or a 'starting point of motion (ὀρμή)' from God.[43] The inclination to good thus constitutes in man the absolute beginning in the ethical sphere. 'Man has an inclination to good, according to the nature of his reason, which nature is proper to him: thus man has a natural inclination to know the truth about God, and to live in society'.[44] This inclination constitutes a natural impetus to know the truth about God and is at the same time the primordial dynamic for the achievement of social life. We can thus conclude that in the existential sphere, which is the sphere of the person in act in different praxes, the fundamental questions concerning God and the soul do not present special difficulties but emerge spontaneously in the consciousness in its first contacts with the real.

Thus these two fundamental truths of the existence of man have a special metaphysical status of immediacy which rises above the need for analytical demonstration, which thus demonstrates and requires its own and original metaphysical status. We can, in fact, state that the existence of

[43] *Eth. Eudem.*, VIII, 14, 1248 a 20 ff, ed. F. Susemihl (Leipzig 1884). Available on the Internet: http://www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus:text:1999.01.0049:book=8:section=1248a. Cf. C. Fabro, 'Le "liber" de bona fortuna chez Saint Thomas', *Revue Thomiste,* 1988, p. 356 ff.

[44] *S. Th.*, I-II, q. 94, a. 2.

God, as the absolute Principle of thinking, and the instinct to search for the foundation of acting in social life and justice, come forward on their own as a result of the immediate impetus of man's collective nature. Both have a specific meaning in the human consciousness as foundations: one for the setting in motion of metaphysical and scientific thought, the other for the beginning of moral, social and political life. Through metaphysical thought, consciousness takes on the first speculative principles that support the edifice of science, whereas the principle of morality of doing and pursuing good and avoiding evil organises and defends ethical activity and social and political practice.

Thus science, metaphysics and morality are distinct without being separate: the principle of contradiction in the speculative sphere supports the search for the truth of knowledge at the different theoretical levels (physical, biological, mathematical, metaphysical), whereas the first principle of practical reason (do good and avoid evil) is built into the existential pathway of the person and a society of persons. They are, in their fields, two principles that are after a certain fashion indecipherable: they participate in the original propulsion of the person to know truth and do good and to live well (and to 'be' well), in line with friendship, justice and concord with others. General reflection on praxis embraces them both in order to achieve responsible personal action, as is required by philosophy open to Christian faith.

Why have I dwelt in detail upon this question of the original structure of ethics, of good and justice, and on how they are different to the purely theoretical sciences? Not only to bring out the plurality of human praxes and to contextualise non-theoretical activities but also to prepare the ground for the discussion of interferences, examples of overlapping, and conflicts over boundaries and spheres of competence which today bring into question the status of the human being during the age of science, that is to say our daily knowledge about the human being in a world that is increasingly conditioned by scientific knowledge. Man is in effect the only being that demonstrates varied praxes (if not all praxes): the theoretical, the technical, the moral, the juridical and the political. He is the being of the intersection of praxes, the being of many faces, as the Greeks used to say.

Knowledge about Man: the Circularity of Science and Knowing Yourself

There was no great problem between the different domains of knowledge until a border was drawn between nature understood as having a soul or surrounded by a soul, and a soul which was in itself characterised by an

end: this was the age of Aristotelian physics and natural ethics. This border was drawn at the end of the Renaissance, which had not assimilated the originality of the thought of St. Thomas.

The problem became acute when nature became the subject of a science based on pure observation, mathematical calculation, and experimentation. This was the meaning of the Galileian and Newtonian revolution, as Kant (1787) defined it.[45] The human mind thought that it did not have access to the principle of the production of nature in itself or in something other than itself, what Aristotle called form or the formal principle as principle of operation: 'every essence in general is called "nature", because the nature of anything is a kind of essence'.[46] Therefore one can only gather natural gifts made known through their appearance in space and time and try to 'save the phenomena' (τὰ φαινόμενα σώζειν), as Plato himself suggested, who in this was Galileo's mentor. This is no minor endeavour given that the field of observation is so unlimited and that the imaginative ability to form hypotheses with a mathematical formula, to enlarge and replace models, to vary the character of models, and to invent procedures of verification and falsification, is so powerful. This is no minor endeavour, also, because mathematics, which is in part a construction of the mind of the human being, corresponds to the quantity that indeed constitutes the specific matter of every individual and expresses in bodies the realisation of individuality through the parts of such material structure. There is quantity in the mind of man and in the corporeal structure (atoms and sub-atomic structures, molecules, cells, organs, etc.). Thus, although there is not the ancient correspondence between the mind and reality through the notion of form, there is the modern correspondence through quantity – something that has been pointed out on more than one occasion by Benedict XVI in his recent Magisterium.

However, as regards phenomena relating to human beings, this asceticism of hypotheses, of the creation of models, and of experimentation, is in part compensated for by the fact that we have partial access to the production of certain phenomena that can be observed through philosophical self-reflection (and of course, for believers, through faith). Thus we are dealing with what in the praxes that are different from this scientific theory and tech-

[45] Kant, Immanuel, *Critique of Pure Reason*, Preface to the second edition (1787). Available on the Internet: http://etext.library.adelaide.edu.au/k/kant/immanuel/k16p/k16p2.html.

[46] Aristotle, *Metaph*., 5, 1015 a 12 f.

nologies can be deemed the genetics of action that belong to fundamental anthropology and to ethics. Reflection on praxes expresses the point of convergence because it indicates the path that leads to the end, i.e. perfect human work as fullness of the act. The success of work (ἔργόν) can only be observed in the perfection of praxis itself (ἐνέργεια) in relation to its end.

Thus the action shows that man proceeds for an end and thus that he himself is the principle of action. In the vast field of activity, the human being considers himself responsible for his own action. This means that he can go back from the observable effects of his actions to the intention that gives them meaning and even to the mental acts which create finalities that generate the intentions and the observable results. Thus the action not only exists to be viewed from the outside, like all the natural phenomena of which it is part: it exists to be understood beginning with expressions that are at one and the same time the effects and signs of the intentions that give meaning to it and with the acts that create meaning that at times sometimes produce such intentions. It follows from this that man's knowledge is not a matter of a single plane or level – that of external observation, explanation, and experimentation (as a reproduction of phenomena): this knowledge develops in the interface between the observation of nature and reflective understanding. The human being is contemporaneously an observable being, like all the beings of nature in which he participates, and a being who interprets himself, (a 'self-interpreting being' to employ the phrase of Charles Taylor). On this point we find an illuminating text in the Encyclical *Fides et Ratio* which declares: 'Metaphysics should not be seen as an alternative to anthropology, since it is metaphysics which makes it possible to ground the concept of personal dignity in virtue of their spiritual nature. In a special way, the person constitutes a privileged locus for the encounter with being, and hence with metaphysical enquiry'.[47]

This statement on the various objective levels of knowledge and of the science of knowledge, or epistemology, and to begin with on the different levels of knowledge and self-awareness of the human being, can provide an answer of reconciliation and pacification to the question raised by the status of the human being in the age of science, as long as, that is, positivist ideology does not claim the right to abolish the border between the sciences of nature and the sciences of man and to annex the latter to the former.

[47] *Fides et Ratio*, § 83.

Conflicting Loci: the Biological Sciences

Three conflicting loci should be considered here in order to achieve a real comparison between the objective or naturalistic approach of science and the approach of the ethical philosophical approach and an anthropology that we can term 'ontological' (in line with *Fides et Ratio*). These three controversial loci are the framework of biology concerning states at the beginning and end of human life, the field of the neurosciences, and, finally, the fields of genetic mutations and the sciences of heredity whose point of arrival are the theories of evolution.

Of course in these three fields I will only outline the conditions for a reasonable expression of the two analyses of man, that of the sciences and that of anthropological and ethical philosophy.

In terms of the biological sciences, the scientist is expected to seek at the cellular level the correlation between the observable cell and the beginning of actual human life. The biologist affirms that the first embryonic stem cell, which is made up of a male and female genetic heritage, already has DNA (deoxyribonucleic acid), i.e. the macromolecule which contains and transfers genetic characteristics in all living organisms beginning with a genetic code that is the same genetic code that the individual will have throughout his life. Indeed, as Nicole Le Douarin, has observed, the point of departure of embryology is the following: 'each one of us began our lives as a cell, an ovum…a tiny corpuscle of living matter'. From this comes the fundamental question of embryology: 'how can it be that from this single *isolated* cell come the parts of the body of an adult, made up of various billions of harmoniously ordered cells to form various and complex organs such as the brain, the limbs, the eyes and the face?'[48] A biologist observes a living cell that is all potential and then begins to have quantitative and qualitative changes directed by that specific genetic code. This cellular behaviour of the human being, which for that matter is matched by the cellular behaviour of higher animals, is inscribed, so to speak, and reference is no longer made to the genetic code or to DNA but to the same subject who has an internal principle of development or self-genesis beginning with an active potentiality that reaches a mature reality that is also the same physical and biological subject with the same genetic code during the whole

[48] N. Le Douarin, *Des chimères, des clones et des gènes* (Editions Odile Jacob, Paris, 2000), p. 15.

time of his existence from the beginning until death. With respect to humans, it is not the case that the embryonic cell is a kind of mini-man. Instead, the genetic code is a project of development, a 'programme', that contains a collection of information which means that the same subject progressively organises himself so as to form, one after the other, the various organs that make him up, to the point of arriving at the complete individual who emerges at the moment of birth.

We find here a dualism of language that should not compromise the unity of the reality in question. The biologist speaks of a cell or group of cells with a great potential that has or have a dynamic development; the philosopher and the expert in theology can speak of a single subject who, from the start, is what he is and becomes what he is. Therefore when a subject is a genetic stem cell we refer to a non-developed human being. Therefore the corollary of an interdisciplinary anthropological vision, that is to say that which takes into account both languages and approaches which explain the same reality, is that such a stem cell cannot be seen as a pure genetic material, which can be used or exploited even for good purposes, to cure another human being, because every human person from the beginning until the end of his life is an end in himself and cannot be a means or an instrument of another person, according to the various ethics that the West has produced from Aristotle to Kant, passing by way of the golden rule of the Gospel: 'do not do unto others what you would not have them do unto you'.

Something similar happens at the other extreme of life, namely the state of death. The specialist, the neurologist, speaks of brain death as an irreversible fact in the life of a higher living being and in particular of a human being. The brain does not give signs of life and thus does not carry out its own function, and does not even give unity to the other vital systems. It thus does not allow the existence of natural life. The philosopher, on the contrary, speaks of the death of the human being. Since the body is no longer capable of receiving life from the soul, the soul (or vital principle) has separated from the body. Thus, this body, since it is no longer informed by the soul, is in actual fact a body in an equivocal sense, and it is for this reason that we call it a 'cadaver', even though there may be manifestations of life in the heart. Let us think, for example, of a person who has been beheaded in a road accident: at the time of the accident, when the head is severed from the body, the person of course dies, but the heart (and other organs) may still 'live' because of a mechanical movement or because of an artificial instrument, the ventilator, which enables the heart to continue

functioning for a certain period of time, perhaps for a period of time that is sufficient for a transplant to be carried out. The medical neurologist declares that the death of the brain is an irreversible fact for the life of a human being; the philosopher and the moralist declare that the death of a person takes place with the separation of the soul from the body. Therefore two moral ills must be avoided in this field by scientists: the bringing forward of death (euthanasia), even for altruistic reasons, for example conserving the life of another person through a transplant, and trying to keep a cadaver living at all costs, which is what we term aggressive medical treatment (dystanasia).[49]

The Neurosciences and Self-understanding

As regards the neurosciences, the scientist is expected to seek at the cortical level the correlation between the observable structures and the functions where the structures are the bases, the supports, the nervous material or whatever we may want to call it. The scientist only observes quantitative and qualitative changes, the ever more complex hierarchies of observable phenomena; but the meaning of the function which corresponds to the structure is understood only by the speaking subject who says that he perceives, that he imagines, and that he remembers. These oral statements, together with behavioural signs that the human being shares to a large extent with the higher animals, fall within a type of analysis where there is no mention of neurons, synapses etc. but reference is made to impressions, intentions, dispositions, wishes, choices, ideas etc. We again find here a certain semantic dualism, if we can use this phrase, which does not, however, jeopardise the absolute nature of the human being. An important corollary of such semantic dualism lies in the fact that we speak in similar terms of the body, of the same body, in both analyses: there is the body-object, of which the brain is the guiding force with its marvellous architecture, and the body proper, this body that is the only one that is mine, that belongs to me, which I move, which I suffer; and there are my organs, my eyes 'with' which I see, my hands

[49] For a detailed analysis of the concept of brain death as a definition of death see *The Signs of Death. The Proceedings of the Working Group 11-12 September 2006* (Pontificia Academia Scientiarum, Scripta Varia 110, Vatican City, 2007), esp. 'Why the Concept of Brain Death is Valid as a Definition of Death. Statement by Neurologists and Others', pp. XXI-XXIX.

'with' which I grasp. And it is on this body proper that all the architecture of my powers and my non-powers is built: the power to do and not to do; the power to do this or that; the power to speak, to act, to attribute to myself my own actions, given that I am their real author, and thus free.

There is thus raised the question of the relationship between the two analyses – that of the neurologist and that of the philosopher and metaphysician. And it is here that the analyses cross over without ever dissolving each other. The scientist and the philosopher can agree on calling the body-object (and its marvel, the brain), the 'reality without which we cannot speak, or think or decide or feel or live or act'. The scientist can continue to profess a kind of materialism in his analysis which enables him to work without metaphysical scruples. The philosopher speaks about the brain in terms of recipient structure, of support, of substrata, of basis, of potency, of encephalic matter, of part of the person. It must be accepted that, for the moment, we do not have a third analysis where there is awareness that this brain-body and my living body are one and the same being. However, the analysis of the brain-body must have a certain opening towards the analysis of my living body and vice versa, namely that while the analysis of my living body gives to me in itself my experience and philosophical reflection, it must be open or enable indirectly or per accidens the analysis of the mind-body and vice versa.

We notice here that we do not have direct access to the very origin of the being that we are, in other words we do not have a sort of self-transparency of ourselves and of our selfhood and, starting from this centre, a self-transparency also of all of our actions. In this sense we cannot understand ourselves immediately through our being and essence by essence. On the contrary, our being attests to its existence in the concrete and current exercise of our life. In a realistic vision, St. Thomas indicates this clearly: 'For one perceives that he has a soul, that he lives, and that he exists, because he perceives that he senses, understands, and carries on other vital activities of this sort' ('*In hoc enim aliquis percepit se animam habere, et vivere et esse, quod percepit se sentire et intelligere et alia huiusmodi opera vitae exercere*').[50] For this reason Aristotle declares: 'We sense that we sense, and we understand that we understand, and because we sense this, we understand that we exist'.[51] In the perception of our praxis or activity there is the co-perception of the beginning:

[50] St. Thomas Aquinas, *Q. d. De Veritate*, q. 10, a. 8.
[51] Aristotle, *Ethica Nicomachea*, IX, 9, 1170 a 30.

'from a perception of the acts of the soul we perceive the principle of such acts' ('*perceptis actibus animae, percipitur inesse principium talium actum*')'.[52] St. Thomas assures us that our soul, since it grasps universals, perceives (*percepit*) that is has a spiritual form; he argues that we are aware of the very becoming of the universal in the soul and even that the very light of intelligence makes its presence known to us by means of the soul. This signifies affirming in an explicit manner a perception proper to the spiritual reality in a positive way but by means of the spiritual operation of implementing the intelligible: 'And we know this by experience, since we perceive that we abstract universal forms from their particular conditions, which is to make them actually intelligible' ('*Et hoc experimento cognoscimus, dum percipimus nos abstrahere formas universals a conditionibus particularibus, quod est facere actu intelligibilia*').[53]

The ultimate originality of this perception of our spiritual reality is the absolutely original fundamental situation which we may call the genetics of the act or 'the emergence of freedom' as a move from potency to the act or the capability to act or the capability of acting or of non-acting and our awareness of it. Quite rightly Christian thought, long before, and with more precision than, the moderns, when considering this reality of the spiritual subject called freedom the '*motor omnium*' of the activity of the person, and the protagonist of the person, the 'I', the self (selfhood), the human subject that we discover through praxis. This perception is so radical that it is more than an opinion and it is prior to every science, whether theoretical or practical; indeed it is converted into the principle of the foundation of the different praxes.

Brain, Mind, Soul and Being

Aware of the lack of a direct and self-transparent knowledge of such a founding origin, scientists and philosophers should aim to seek an increasingly precise adjustment between a neuroscience which is increasingly

[52] St. Thomas Aquinas, *Q. d. De Veritate*, q. 10, a. 9.

[53] St. Thomas Aquinas, *S. Th.*, I, q. 79, a. 4. Available on the Internet: http://www.corpusthomisticum.org/sth1077.html – 237k He also states: 'The human soul understands itself through its own act of understanding, which is proper to it, showing perfectly its power and nature' i.e. '*Anima humana intelligit seipsam per suum intelligere, quod est actus proprius eius, perfecte demonstrans virtutem eius et naturam*' (*Ibid.*, I, q. 88, a. 2 ad 3; available on the Internet: http://www.corpusthomisticum.org/sth1084.html – 226k).

expert in material architecture and phenomenological and anthropologic descriptions centred on human operations (seeing, understanding, living well, acting) where praxis is subject to philosophical analysis. In Aristotle, the act that achieves a human praxis is clearly dissociated form the act of movement: 'Since no action which has a limit is an end, but only a means to the end, as, e.g., the process of thinning; and since the parts of the body themselves, when one is thinning them, are in motion in the sense that they are not already that which it is the object of the motion to make them, this process is not an action, or at least not a complete one, since it is not an end; it is the process which includes the end that is an action. E.g., at the same time we see and have seen, understand and have understood, think and have thought; but we cannot at the same time learn and have learnt, or become healthy and be healthy. We are living well and have lived well, we are happy and have been happy, at the same time; otherwise the process would have had to cease at some time, like the thinning-process; but it has not ceased at the present moment; we both are living and have lived. Now of these processes we should call the one type motions, and the other actualisations. Every motion is incomplete – the processes of thinning, learning, walking, building – these are motions, and incomplete at that. For it is not the same thing which at the same time is walking and has walked, or is building and has built, or is becoming and has become, or is being moved and has been moved, but two different things; and that which is causing motion is different from that which has caused motion. But the same thing at the same time is seeing and has seen, is thinking and has thought. The latter kind of process, then, is what I mean by actualisation, and the former what I mean by motion'.[54] What makes this text remarkable is that the disjunction between action and movement is upheld by a criterion that involves a phenomenology of a metaphysical character, namely the possibility of saying, 'at the same time', we are seeing and we have seen, we are living well and have lived well, we are happy and we have been happy. If this kind of praxis transcends pure movement it is because it is a more perfect kind of act, that is to say it has all the perfection of the act of movement but its imperfection is not linked to the succession of matter.[55]

[54] Aristotle, *Metaph.*, IX, 6, 1048 b 18-35.

[55] Cf. Paul Ricoeur, 'Tenth Study: What Ontology in View?', in *Oneself as Another* (Chicago-London, 1992), pp. 302-308; 'Que la science s'incrit dans la culture comme "pratique théorique"', in *The Cultural Values of Science* (The Pontifical Academy of Sciences, Vatican City, 2003), pp. 14-23.

This connects the investigation of the being of the self to the interpretation of one of the four primordial meanings of being, which Aristotle placed under the distinction of act and of potency.[56] It is essential – for a deep ontological understanding of human action – that the examples taken from this final sphere of human perfection appear in turn as central and decentred. Let me explain this: if *energeia-dynamis* were simply another way of saying praxis, the lesson of ontology would have no bearing; it is instead by extension that *energeia-dynamis* irrigates fields of application other than human action and its fecundity becomes manifest. In Aristotle, *dynamis-energeia* is sometimes applied to explain the intellect in the act of intellection, to say that the intellect in potency cannot be understood as matter but in a different way. Thus, it is essential in an ontological understanding of the self to decentre praxis – both upwards and downwards – thanks to which *energeia-dynamis* points toward a foundation of being, at once potentiality and actuality where human action has its basis. In others words, it appears equally important that human action be the place of readability *par excellence* of this meaning of being as distinct from all the others and that being as act and as potency has other fields of application than human action alone. The central character of action and its decentring (or better 're-centering') in the direction of a foundation of act and potency are two features that equally and conjointly constitute an ontology of selfhood in terms of actuality and potentiality. In other terms, if finding a being of the self is possible or if an ontology of selfhood is possible, this is in conjunction with a foundation starting from which the self can be said to be acting.[57]

Indeed, being, the mode of being, is revealed by operating, that is to say by the mode of operating. Thus from the point of view of the *via inventionis* one can say: *esse sequitur operari*. Now the soul knows the truth in itself and tends to good in itself, which is perfect and limitless: hence the unquenched thirst for knowledge and happiness. Thus the soul, in knowing and willing (thereby achieving that kind of praxis that Aristotle describes as perfect), draws on the absolute and does not depend on the body or stop at material realities: it aspires to science and perfect knowledge and to ultimate reality. This emergence or independence in operating reveals independence in being so that the *esse* (*actus essendi*) does not belong to the body but specifically to the intellective soul as a subsistent form in itself.

[56] Aristotle, *Metaph*., V, 7 and 12; and IX, 1-10.

[57] This is the pathway that Aristotle employed to define the soul as: 'the first act of a natural body having life in potency' (*De Anima*, II, 1, 412 a 27 f.).

Therefore, neuronal and philosophical centrality in acting and decentring in the direction of a foundation of act and potency are equally and jointly constitutive of an ontology of the human being in terms of act and potency. Therefore only the human being has this double legibility: the external objective reading, common to all the beings of nature, which is the subject of the sciences (*epistémé*), and the approach of auto-reflection, which belongs to philosophy (*sophia*), according to the Socratic precept 'know yourself', which understands being as an act of an active potency which we call the 'soul'.[58] Thus only a human being is able to create a circularity between this double legibility, seeing, so to speak, externally, the functioning of his brain with new sensors that portray it in film-like fashion, and interpreting from the inside this film-like portrayal starting from auto-reflection on himself.

There is nothing that is more ours than our brain yet there is nothing that we know less about. The ancients thought that the heart was the centre of life because it beats constantly like a pump and tells us 'I am here'.[59]

[58] Saint Thomas Aquinas, *Q. d. De Spiritualibus Creaturis*, a. 1.

[59] Indeed, St. Thomas says: '*Secundum igitur quod anima est forma corporis, non potest esse aliquid medium inter animam et corpus. Secundum vero quod est motor, sic nihil prohibet ponere ibi multa media; manifeste enim anima per cor movet alia membra, et etiam per spiritum movet corpus*' (*Q. d. De Spiritualibus Creaturis*, a. 3 co.). Also: '*unumquodque operatur in remotiora per id quod est maxime proximum. Sed vires animae diffunduntur in totum corpus per cor. Ergo cor est vicinius quam ceterae partes corporis; et ita mediante corde unietur corpori*' (*Q. d. De Anima*, a. 9, arg. 13). Also: '*cor est primum instrumentum per quod anima movet ceteras partes corporis; et ideo eo mediante anima unitur reliquis partibus corporis ut motor, licet ut forma uniatur unicuique parti corporis per se et immediate*' (*Q. d. De Anima*, a. 9, ad 13). Again, from a general point of view: '*cum anima rationalis sit perfectissima formarum naturalium, in homine invenitur maxima distinctio partium propter diversas operationes; et anima singulis earum dat esse substantiale, secundum illum modum qui competit operationi ipsorum. Cuius signum est, quod remota anima, non remanet neque caro neque oculus nisi aequivoce. Sed cum oporteat ordinem instrumentorum esse secundum ordinem operationum, diversarum autem operationum quae sunt ab anima, una naturaliter praecedit alteram, necessarium est quod una pars corporis moveatur per aliam ad suam operationem. Sic ergo inter animam secundum quod est motor et principium operationum et totum corpus, cadit aliquid medium; quia mediante aliqua prima parte primo mota movet alias partes ad suas operationes, sicut mediante corde movet alia membra ad vitales operationes: sed secundum quod dat esse corpori, immediate dat esse substantiale et specificum omnibus partibus corporis. Et hoc est quod a multis dicitur quod anima unitur corpori ut forma sine medio, ut motor autem per medium. Et haec opinio procedit secundum sententiam Aristotelis qui ponit animam esse formam substantialem corporis. Sed quidam ponentes secundum opinionem*

On the contrary, the brain was, so to speak, the great silence or the sealed box of our body.[60] Today however the brain opens itself up and shows itself, in part because of the neurosciences, as being the centre of the body, and this may turn out to be a turning point for a new beginning where external experience can be joined to internal experience and science can be joined to philosophy, each in their respective functions and consistencies and in their mutual circularity. This was not present in ancient philosophies, or in Medieval, modern or contemporary thought, and if the human being is analysed, he is analysed from a formal point of view without these dynamic and circular links with scientific knowledge and auto-reflective knowledge of my body and my brain. In truth, it is not that I am my body, not even its masterpiece, the brain: I am neither my brain nor my body; I have a brain and a body but – as I have tried to show – in order to understand my 'being' I must know what to have a brain means, to have a body means, through that knowledge of them that experience and science offer to me.

Platonis animam uniri corpori sicut unam substantiam, alii, necesse habuerunt ponere media quibus anima uniretur corpori; quia diversae substantiae et distantes non colligantur, nisi sit aliquid quod uniat eas. Et sic posuerunt quidam spiritum et humorem esse medium inter animam et corpus, et quidam lucem, et quidam potentias animae, vel aliquid aliud huiusmodi. Sed nullum istorum est necessarium, si anima est forma corporis; quia unumquodque secundum quod est ens, est unum. Unde cum forma secundum seipsam det esse materiae, secundum seipsam unitur materiae primae, et non per aliud aliquod ligamentum' (*Q. d. De Anima*, a. 9 co.).

[60] However, Saint Thomas had already acutely observed the absolute necessity, for the working of the mind, of the state of perfection of the body: '*naturale est animae quod indigeat phantasmatibus ad intelligendum; ex quo tamen sequitur quod diminuatur in intelligendo a substantiis superioribus. Quod autem dicitur, quod anima a corpore praegravatur, hoc non est ex eius natura, sed ex eius corruptione, secundum illud Sapient. IX: corpus quod corrumpitur aggravat animam. Quod vero dicitur quod abstrahit se a nexibus corporalibus ut se intelligat, intelligendum est quod abstrahit se ab eis quasi ab obiectis, quia anima intelligitur per remotionem omnis corporeitatis; non tamen ab eis abstrahitur secundum esse. Quinimmo, quibusdam corporeis organis laesis, non potest anima directe nec se nec aliud intelligere, ut quando laeditur cerebrum*' (*Q. d. De Spiritualibus Creaturis*, a. 2 ad 7). Also: '*Hanc igitur oportet esse dispositionem corporis cui anima rationalis unitur, ut scilicet sit temperatissimae complexionis. Si quis autem considerare velit etiam particulares humani corporis dispositiones, ad hoc inveniet ordinatas, ut homo sit optimi sensus. Unde, quia ad bonam habitudinem potentiarum sensitivarum interiorum, puta imaginationis et memoriae, et cogitativae virtutis, necessaria est bona dispositio cerebri. Ideo factus est homo habens maius cerebrum inter omnia animalia, secundum proportionem suae quantitatis; et ut liberior sit eius operatio habet caput sursum positum; quia solus homo est animal rectum, alia vero animalia curva incedunt*' (*Q. d. De Anima*, a. 8 co.).

Evolution and Human Nature

In the same spirit we can reconcile another controversial locus – that of science and genetic mutations or heredity, which, although (and let us not forget the point) they were discovered by the Augustinian monk G. Mendel (1822-1884), were after Darwin (1809-1882) frequently linked to the theories of evolution. No external limit can be imposed on the hypothesis according to which random variations, given changes, have been established and reinforced in order to ensure the survival of a species, and thus of the human species as well. Of course hitherto this has been a hypothesis, or more than a hypothesis, to quote John Paul II, which the experimental sciences will have to ascertain more decisively with the rigour of the Galileian method of mathematical formulae (in this case in relation to life) and the reproduction of the hypothesis in a concrete and factual experiment. We are not against evolutionism in this sense but we have the right to request scientific proof in order for this not to be a mere scientific 'belief'.

Philosophy, in turn, and not philosophy but also the social sciences, are open to knowledge that derives from biology, but they must not engage in the battle, which is lost from the beginning, to establish the facts. Philosophy should ask itself how it can find a meeting point with the naturalistic point of view, starting from the position according to which the human being is already a speaking, questioning being (there is a road in Santiago de Compostela named '*preguntorio*' to commemorate this practice of questioning which is typical of students and characterises the human being). Thus, starting from his questions, the human being has given himself some answers that speak of his domain of freedom in relation to given nature. While the scientist follows the descending order of species and brings out the uncertain, contingent and improbable aspects of the result of evolution, philosophy starts from the self-interpretation of man's intellectual, moral and spiritual situation and goes back through the course of evolution to the sources of life and of being that man himself is. The starting point can still be the original question, which has existed from the beginning and has always been latent with a sort of self-referentiality of principle. Freedom is what Hegel calls 'the essence of the spirit'.[61] But for Hegel, in the full maturity of modern thought, the concept of the universal

[61] *Enzyklop. d. philos. Wiss.*, § 482.

and the radical, in the sense of the original nucleus of the dignity of every man as free man, entered the world only with the message of Christ.[62]

John Paul II began his pontificate with a statement from Vatican Council II, according to which 'Christ the Redeemer fully reveals man to himself'.[63] He said that 'This is the human dimension of the mystery of the Redemption. In this dimension man finds again the greatness, dignity and value that belong to his humanity'.[64] The Pope, therefore, was convinced that faith in Christ the only begotten son of God, can suggest, stimulate, and fully discover man and can offer perfection in knowledge about, the carrying out or the fullness of all the praxes of the human being. Indeed, the reality of the person is also, according to *Fides et Ratio*, an achievement of Cristian philosophy, as is the notion of the participated act of being in which the person finds his foundation, which, in turn, is based on the act of being by essence of God. John Paul II was convinced that the *habitus* of faith, informed by the love of Christ, when present in a powerful and creative mind, manages to discover new objective and subjective worlds. He observed on this point that 'Galileo feels in his scientific research the presence of the Creator, who stimulates him, inspires and helps his intuitions, acting in the deepest recesses of his spirit'.[65]

So, reason helped by faith, once it recognises that man is characterised by his freedom, can legitimately ask itself how the human being came to be in animal nature. Thus the gaze is retrospective and retraces the chain of mutations and variations. This gaze meets the other, progressive, gaze, which descends the river of the progeny of the human being – man and woman. The two gazes intersect at a point: the birth of a symbolic and spiritual world where achieved freedom defines the humanity of man. The confusion that has to be avoided lies in the two meanings of the term 'origin': the meaning of genetic derivation and the meaning of ontological foundation.

[62] Cf. loc. cit.

[63] *Redemptor Hominis*, n. 10, and *passim*.

[64] *Ibid*.

[65] Address to the PAS of 10 Nov. 1979, in *Papal Addresses to the Pontifical Academy of Sciences and to the Pontifical Academy of Social Sciences*, p. 242. With regard to the invention of the telescope, Galileo wrote at the beginning of his *Sidereus Nuncius*, recalling some of his recent astronomical discoveries: *'Quae omnia ope Perspicilli a me excogitati divina prius illuminante gratia, paucis abhinc diebus reperta, atque observata fuerunt'*, that is to say 'All these things have been discovered and observed in recent days using the telescope which was invented by me, previously illuminated by divine grace' (Venice, 1610, fol. 4).

One refers to the origin of species in the succession of space and time beginning with an already originated datum; the other poses the question of the appearance of its participated being beginning with the Being by essence. This is the first origin of the being that is the 'passage' of the being from nothing to being which is not properly a passage but the primary origin of the being that emerges from nothing thanks to the act of participated being: '*Ex hoc quod aliquid est ens per participationem, sequitur quod sit causatum ab alio*'.[66] Hence the complete formula of the creation as participation (passive in the creature and active in God): '*Necesse est dicere omne ens, quod quocumque modo est, a Deo esse*'.[67] The essential in this origin is the analogical decentering towards the profound, or the self, of each person, and the analogical recentering towards the other, namely God, as was also observed by St. Thomas in his late work: '*Deus est et tu: sed tuum esse est participatum, suum vero essentiale*'.[68] In contemporary philosophy, Kierkegaard has a similar expression of origin when he finds the foundation of the self, which Kant had theorised for the first time[69] but closed up within the horizon of time, in transcendence, that is as the theological self in transparency in He who established it.[70] And here I return to what I said at the outset in relation to the philosophical and scientific prologue for today's man in the light of dialogue with science.

Brief Epilogue

One could, therefore, conclude by saying that God has loved (in the sense that He loves eternally) us twice,[71] in the creation of natural being and in the recreation of the being of grace, and both from the cosmic negative

[66] St. Thomas Aquinas, *S. Th.*, I, q. 44, a. 1 ad 1.

[67] *Ibid.*, *S. Th.*, I, q. 44, a. 1.

[68] *Ibid.*, *In Psalmum XXXIV*.

[69] Kant, Immanuel, *Critique of Pure Reason*, § 16. Available on the Internet: http://etext.library.adelaide.edu.au/k/kant/immanuel/k16p40.htlm.

[70] Cf. S. Kierkegaard, *The Mortal Illness*, notion of the self, *passim*.

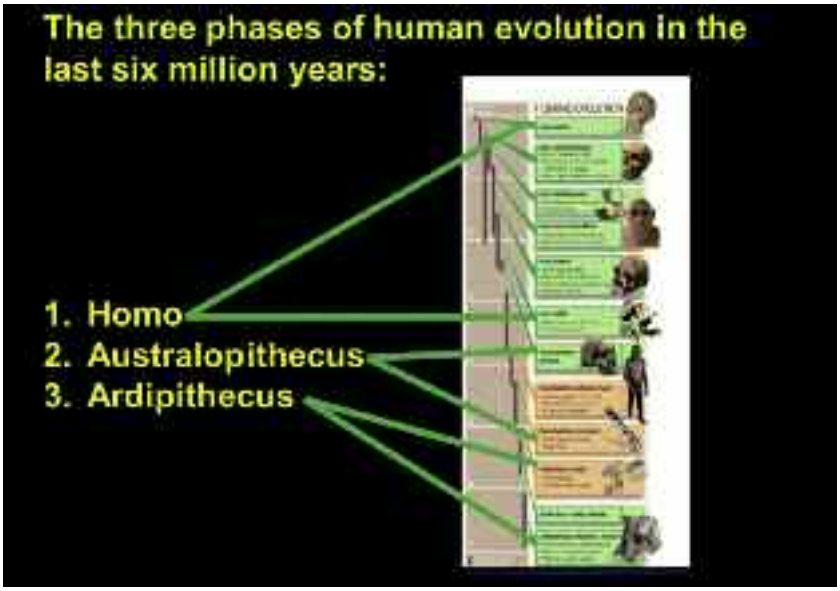
[71] 'When the term Love is taken in a notional sense it means nothing else than to spirate love; just as to speak is to produce a word, and to flower is to produce flowers. As therefore we say that a tree flowers by its flower, so do we say that the Father, by the Word or the Son, speaks Himself, and His creatures; and that the Father and the Son love each other and us, by the Holy Spirit, or by Love proceeding': '*Secundum quod notionaliter sumitur, sic diligere nihil est aliud quam spirare amorem; sicut dicere est producere verbum, et florere est producere flores. Sicut ergo dicitur arbor florens floribus, ita*

of nothing, then from the free negative of sin. But God, in creating from nothing and redeeming man, lost nothing of His divinity and in redeeming man from sin conserved man's freedom. Indeed, He formed a society of spiritual beings that freely sing His glory. One could say, with a phrase that is rather empirical but based on a text in Sirach, that God 'overflowed' Himself not to increase Himself but to communicate His love, demonstrating first the power of love in the creation and then revealing the mercy of love in the redemption. This is the infinite paradox of infinite transcendence which is expressed with the dual participation of the natural being of nature and of the human being made in the image of the Trinity, and with the supernatural being of grace and glory, with which God, love and loving, associates man with the participation of His life so as to introduce him into

dicitur Pater dicens Verbo vel Filio, se et creaturarum: et Pater et Filius dicuntur diligentes Spiritu Sancto, vel Amore procedente, et se et nos' (*S. Th.*, I, q. 37, a. 2). Also: '*Amor enim est causa gaudii: unusquisque enim gaudet de re amata. Deus autem se amat et creaturam, praecipue rationalem, cui infinitum bonum communicat. Christus ergo de duobus ab aeterno gaudet: scilicet de bono suo et Patris. Item de bono creaturae rationalis, idest, in hoc quod communicor filiis hominum: et de his gaudet ab aeterno*' (*Super Evangelium Ioannis*, chap. 15, lect. 2, Marietti, Taurini, 1952, nro. 2004, p. 378). In the same Trinitarian sense: '*"Pater et Filius diligunt nos Spiritu sancto', hoc verbo 'diligere' potest sumi essentialiter et notionaliter, et utroque modo vera est locutio. Si enim sumatur essentialiter, tunc in verbo dilectionis designabitur efficientia totius Trinitatis, et in ablativo designante personam Spiritus sancti, designabitur ratio efficientiae, non ex parte efficientis, sed ex parte effectorum, quorum ratio et origo est processio Spiritus sancti, sicut et verbum; quamvis proprie verbum sit ratio creaturarum, secundum quod exeunt a Deo per modum intellectus. Unde dicitur, quod Pater dicit omnia verbo vel arte sua. Sed Spiritus sanctus est ratio earum, prout exeunt a Deo per libertatem voluntatis; et ideo dicitur proprie diligere creaturarum Spiritu sancto, et non verbo. Si autem sumatur notionaliter; tunc est vera etiam locutio, sed habet aliam rationem veritatis; quia verbum dilectionis non importabit ex principali intentione habitudinem efficientiae respectu creaturae; sed principaliter denotabit rationem hujus efficientiae ex parte effectorum, et ex consequenti dabit intelligere habitudinem efficientiae, et tunc est sensus: Pater diligit creaturam Spiritu sancto, id est, spirat amorem personalem, qui est ratio omnis liberalis collationis factae a Deo creaturae'* (*In I Sent*., d. 32, q. 1, a. 3, Mand. I, p. 750). Because 'knowing' and 'wise' in God are only essential terms one could not say that the Father is wise or that He knows the Son, whereas '*diligere sumitur non solum essentialiter, sed etiam notionaliter. Et secundum hoc possumus dicere quod Pater et Filius diligunt se Spiritu Sancto*' (*S. Th*., I, q. 37, a. 2 ad 1). Thus '*Cum dicitur quod Spiritus Sanctus est amor Patris in Filium, vel in quidquam aliud, non significatur aliquid transiens in alium; sed solum habitudo amoris ad rem amatam*' (*Ib.*, 1 ad 2). For a more detailed investigation see M. Sánchez Sorondo, 'Il Padre e il Figlio amano se stessi e noi per lo Spirito Santo (*Sth* I 37 2)', in *Doctor Communis*, fasc. 2 (Vatican City, 2003), pp. 41-57.

an interpersonal relationship with the Son, the Holy Spirit, and the Father. Two absolute emanations of the essential love of God that provoke two emanations of created love: the first to transcend nothing and open the world in beauty, the second to restore the communication interrupted by sin and raise man to 'divine commerce' with the Persons of the Trinity. This is the marvellous reality of the Love of freedom, an inseparable plexus of absolute immanence and total transcendence. Such is the first paradox of the creation consigned to philosophy and science. Such is the second paradox of the recreation that took place through the kenosis of the eternal Word in the Incarnation and the descent of the Holy Spirit at Pentecost, which animates the Church until the end of time: this is the paradox that is nearest to the mystery of God and His Trinitarian life which, like the Church, is consigned to faith and revealed theology. This is why today we are called to renew reason and faith alike, as *Fides et Ratio* points out.

TABLES



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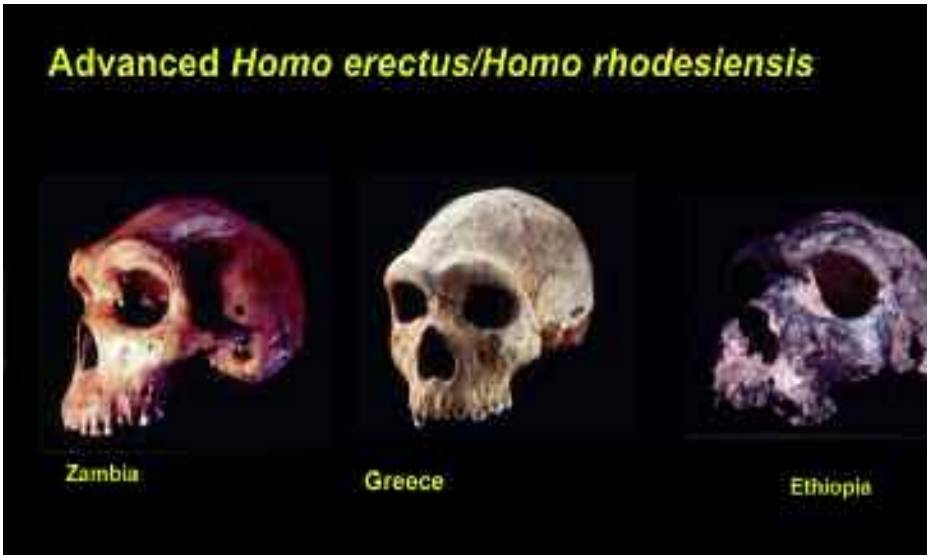

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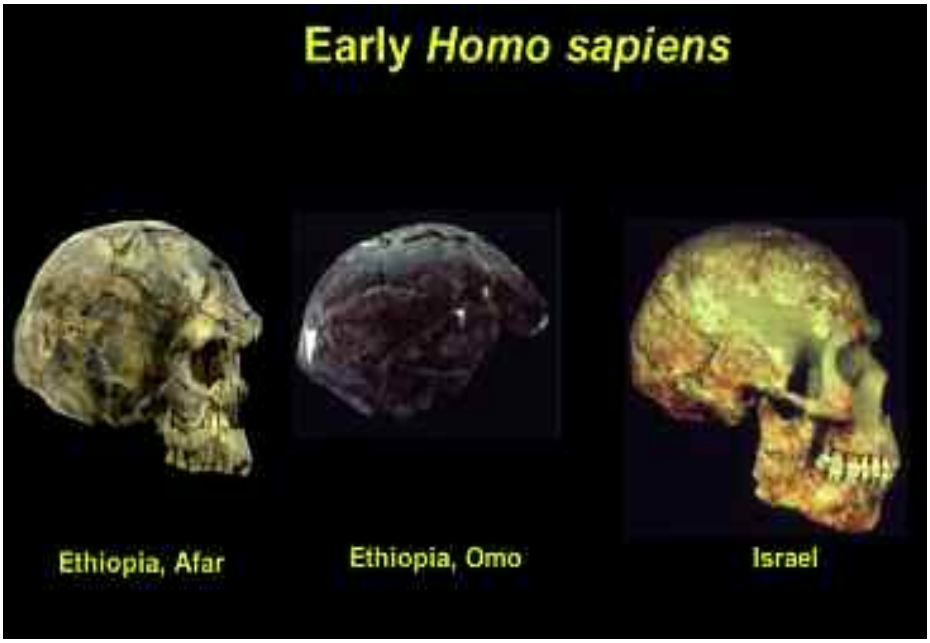

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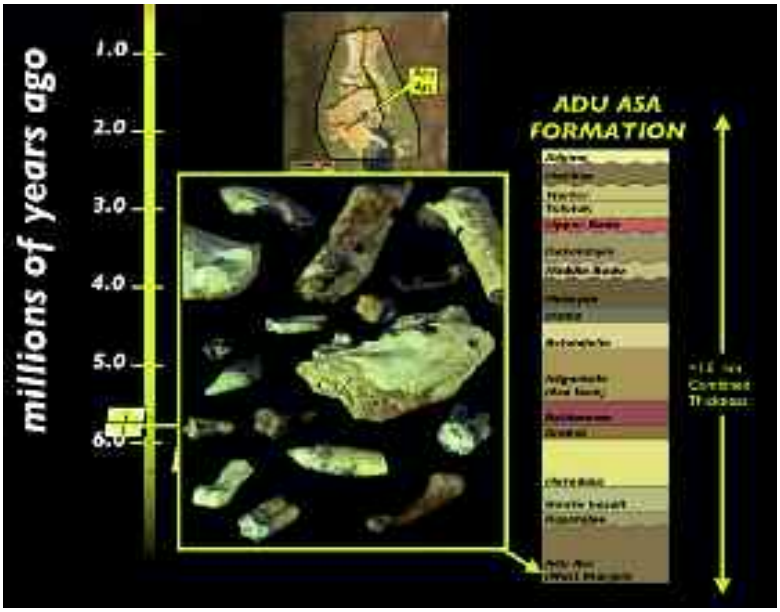

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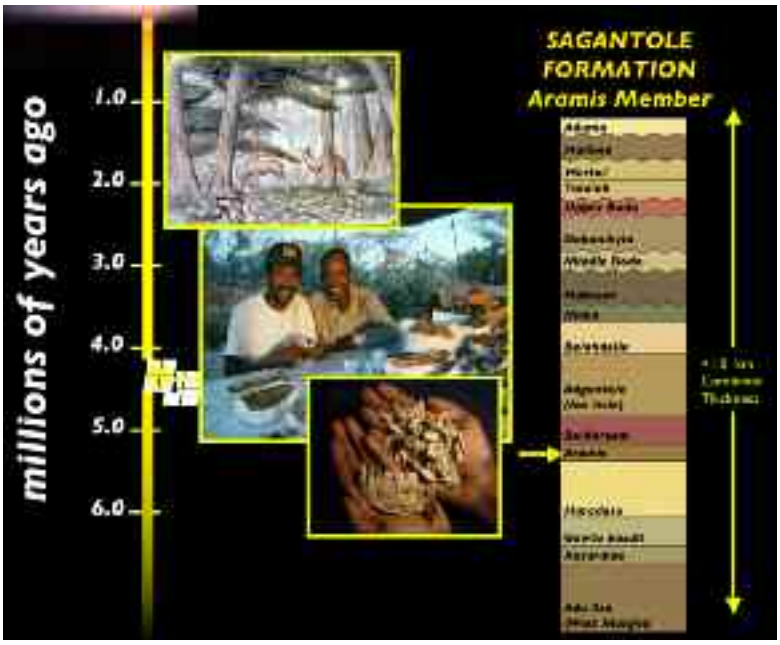

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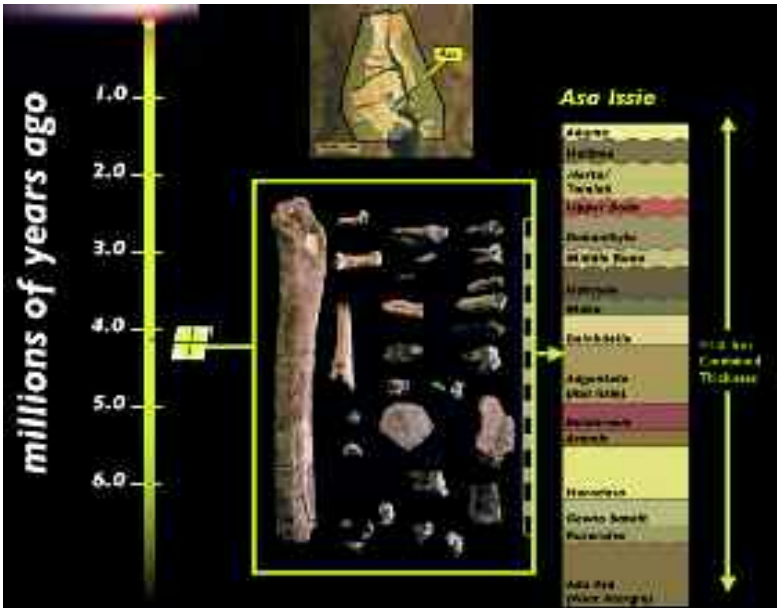

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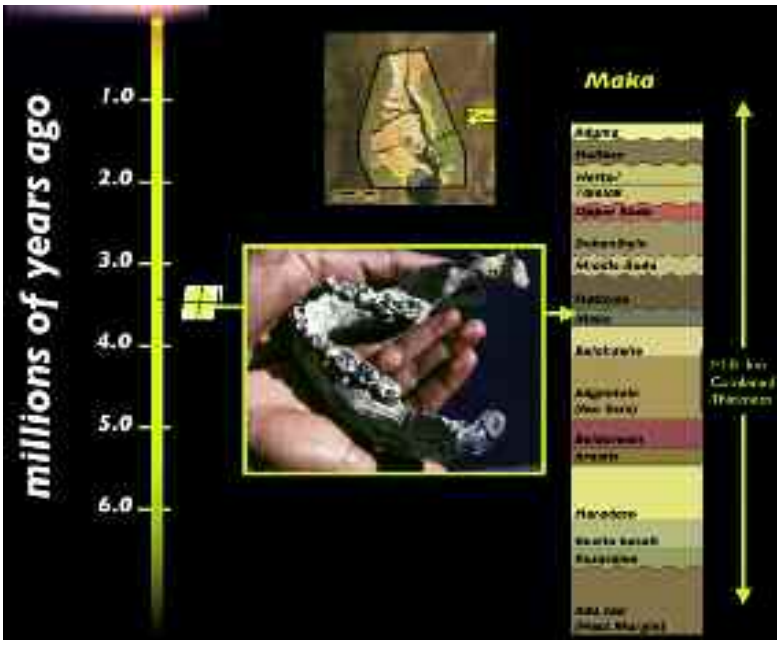

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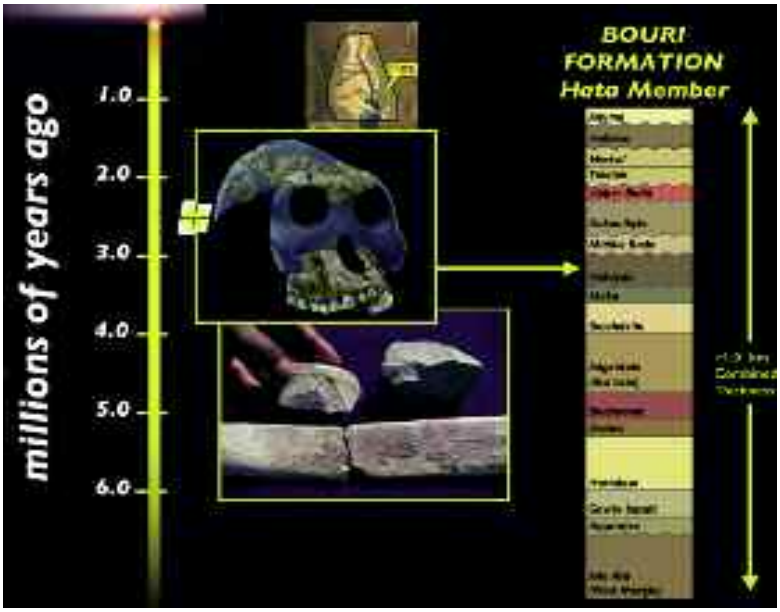

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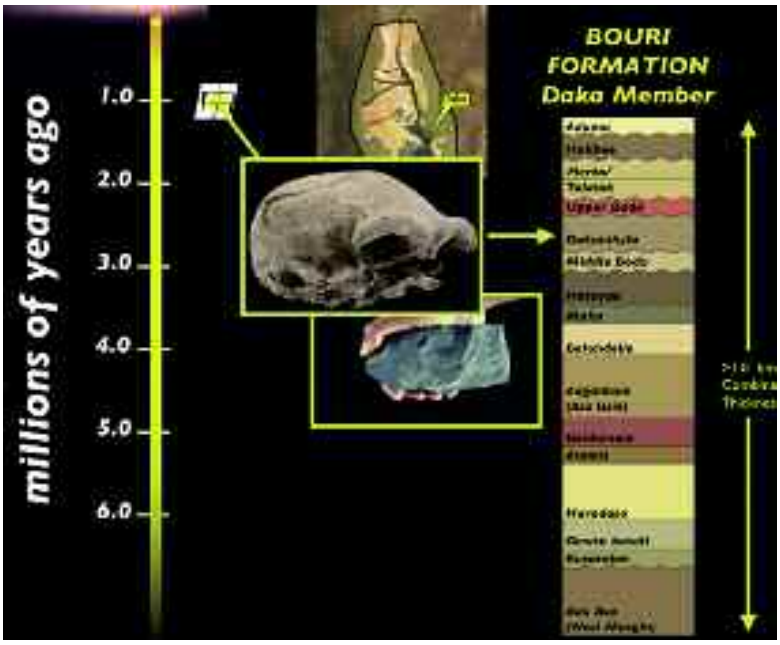

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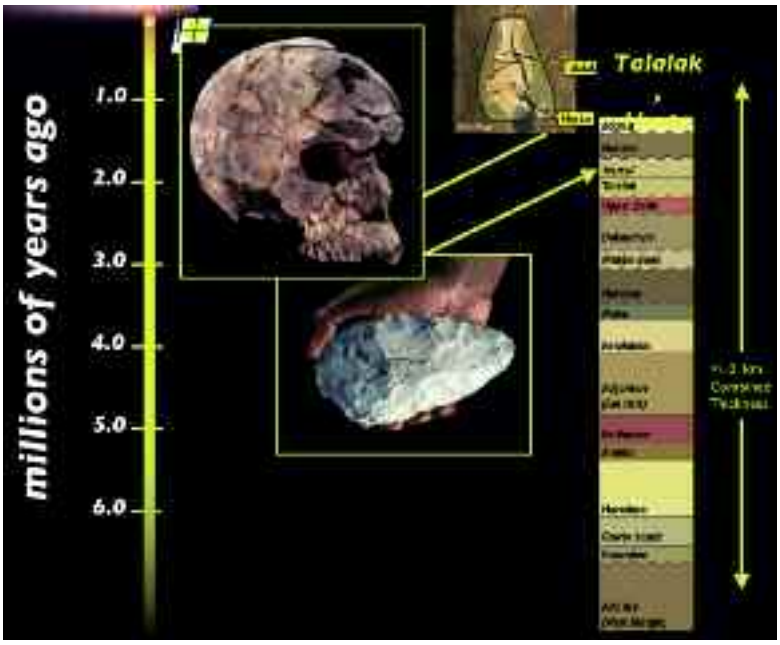

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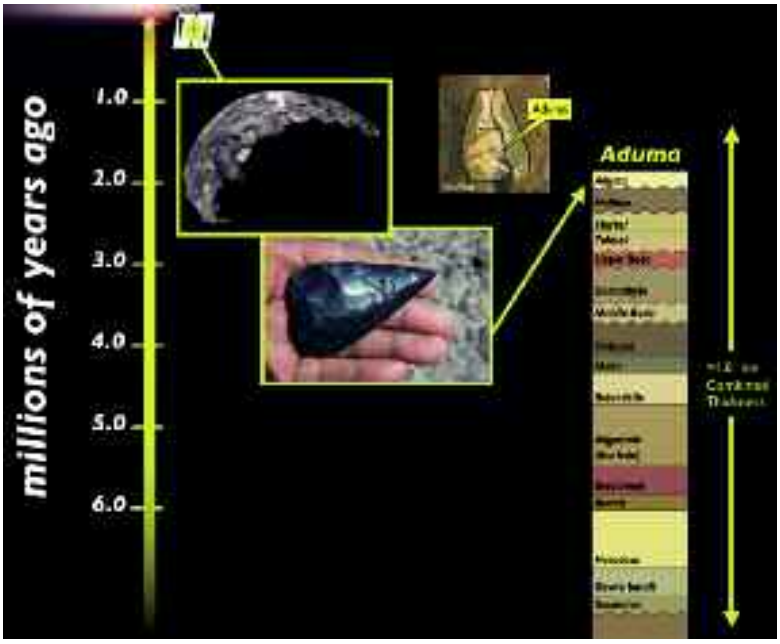

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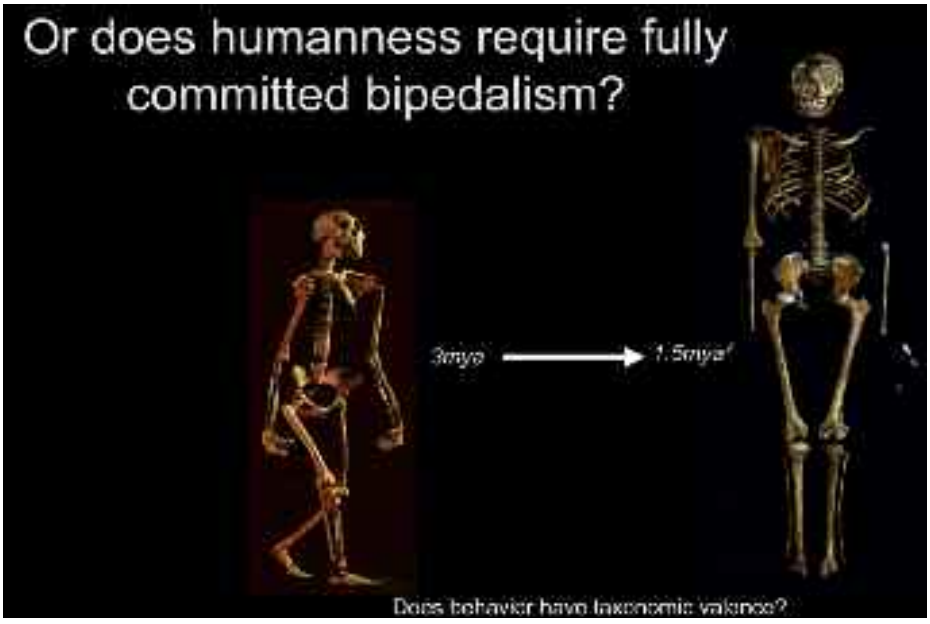

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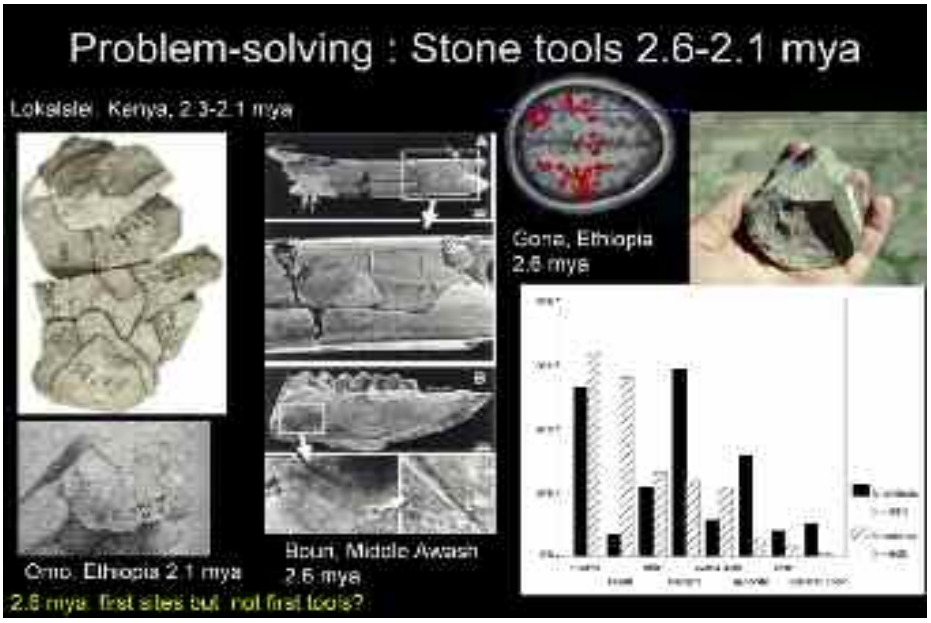

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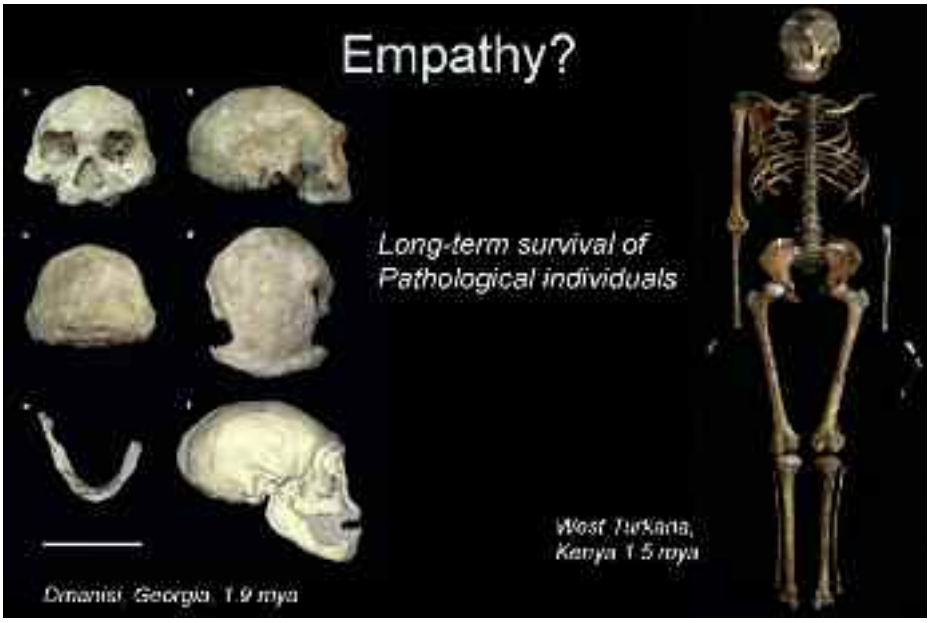

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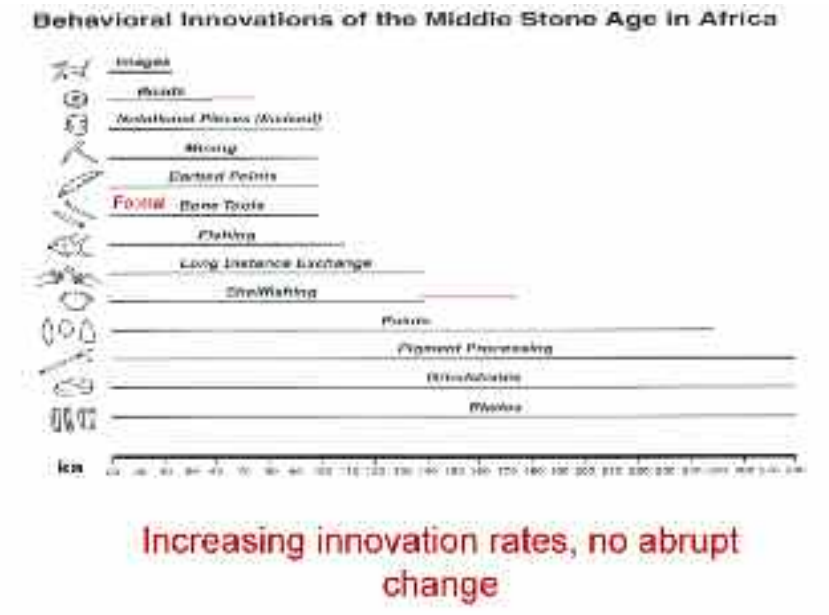

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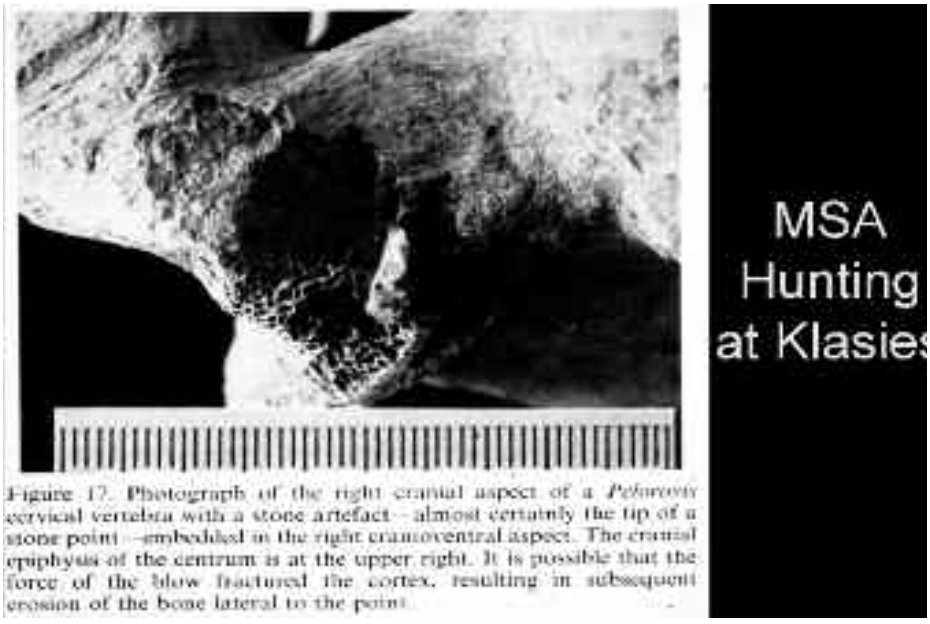

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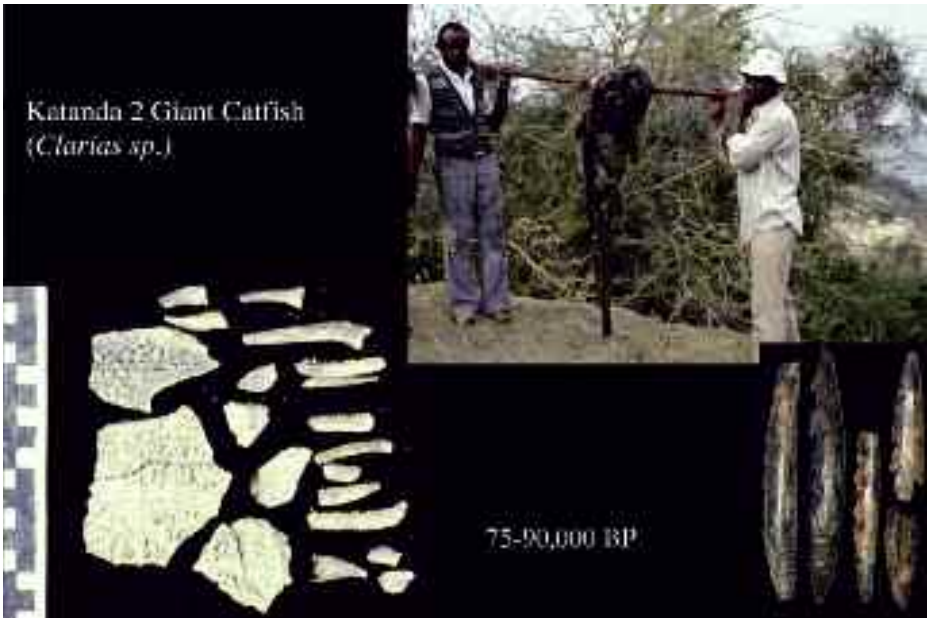

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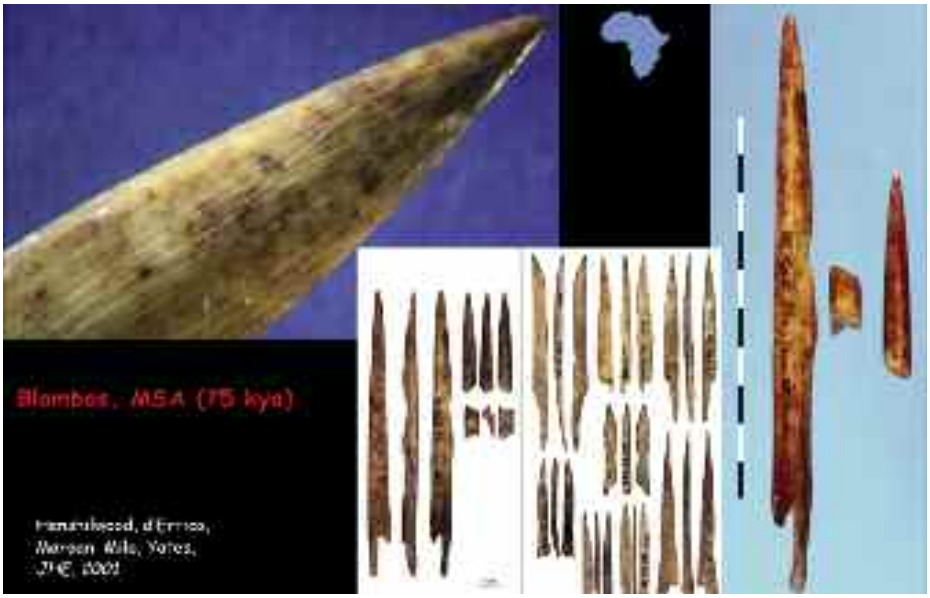

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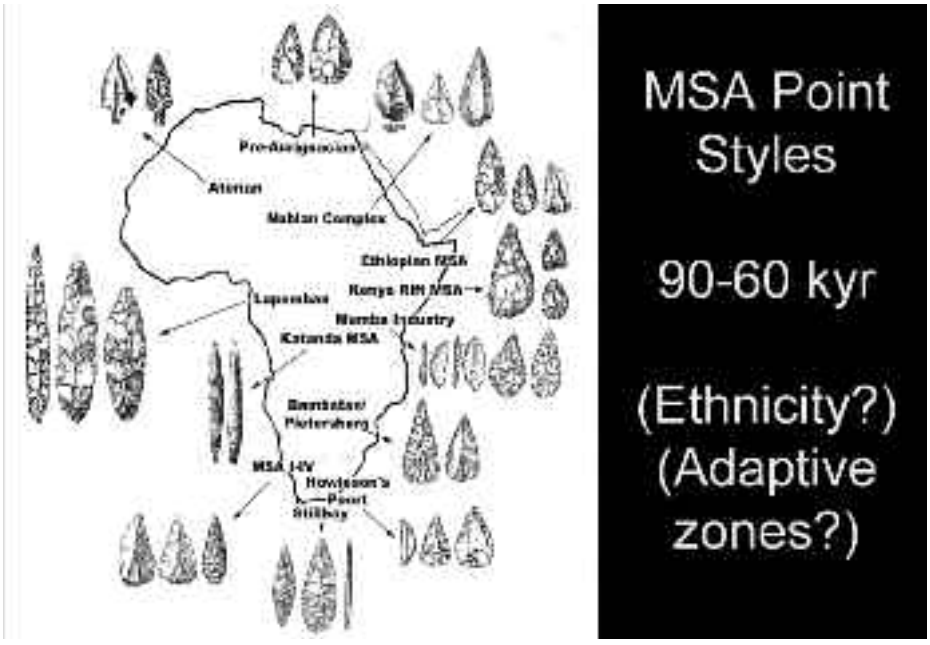

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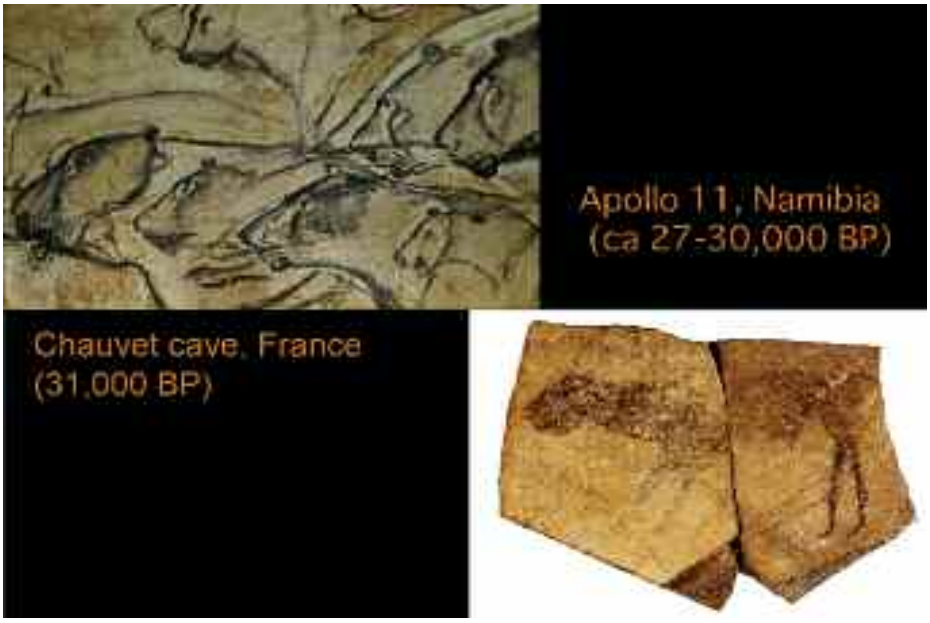

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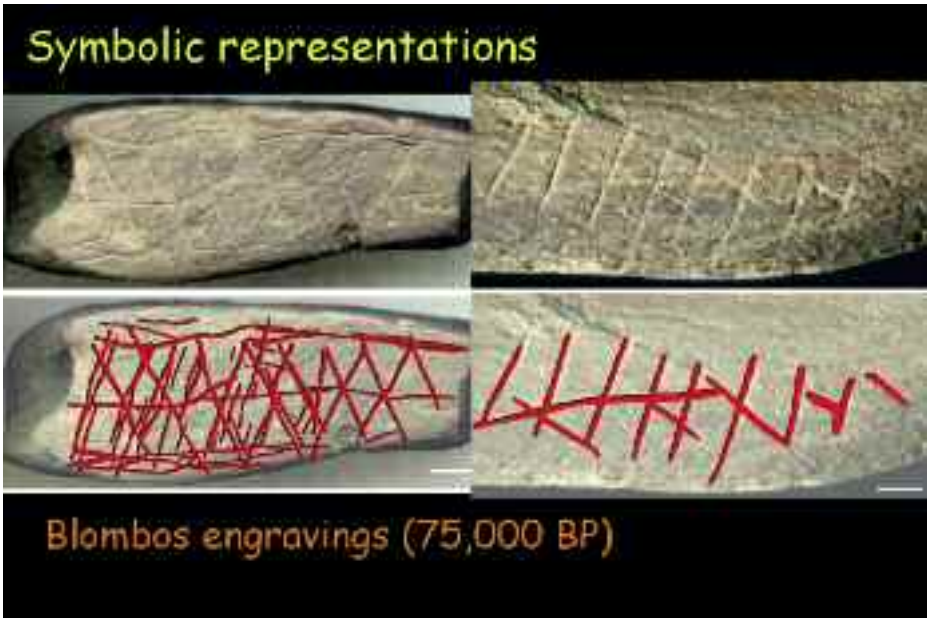

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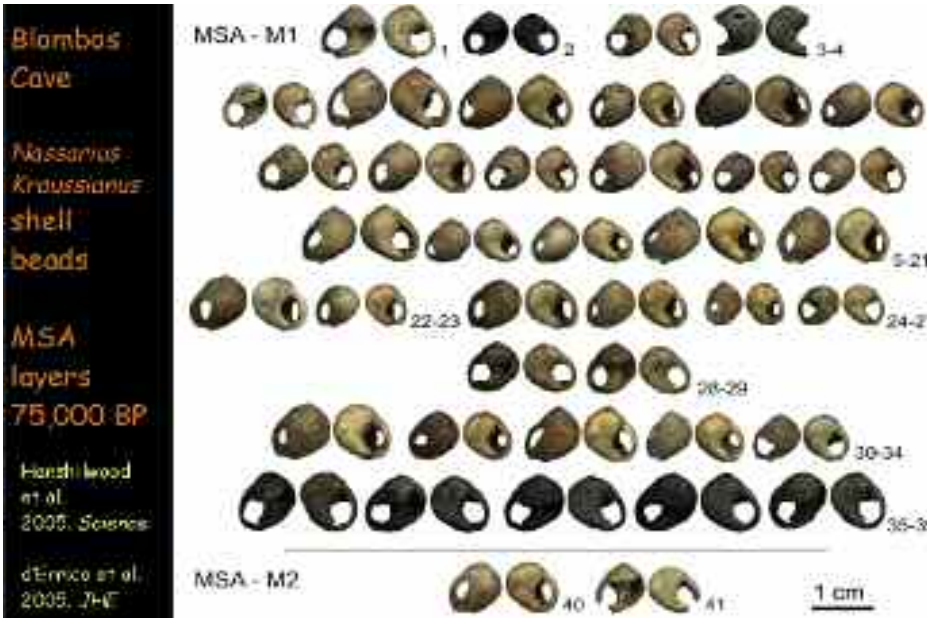

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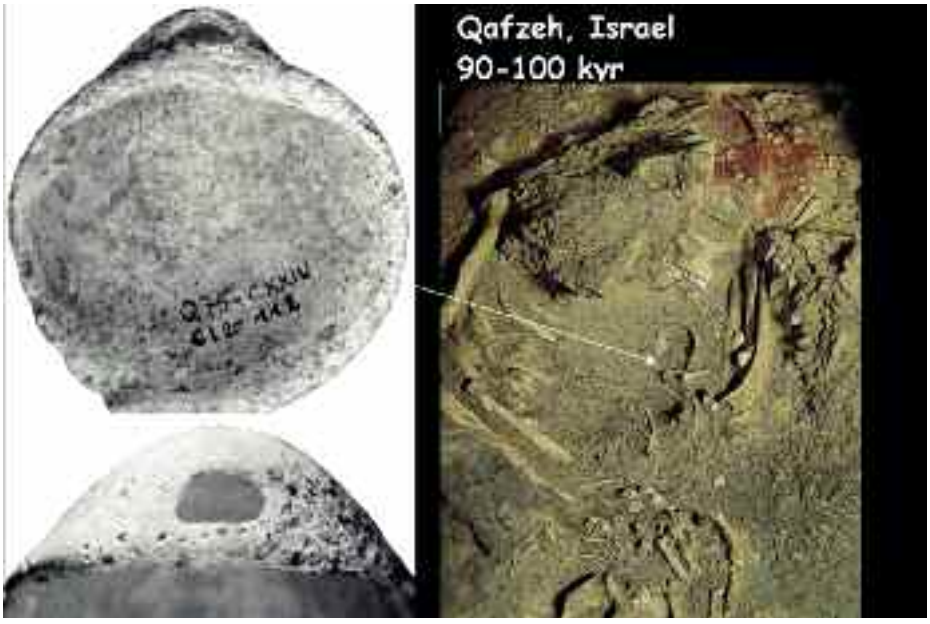

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