Faith and Science: The Case of Human Ecology

Pietro Ramellini[*]

"*A human ecology is an imperative need*".
Pope Benedict XVI[1]

Introduction

The concept of human ecology was introduced in the Catholic pastoral documents by Pope John Paul II, in his 1991 encyclical *Centesimus annus*. Afterwards, both John Paul II and Benedict XVI made ample reference to human ecology, as the opening quotation shows, urging mankind to change its way of dealing with our planet and its human inhabitants.

Now, human ecology is an exquisitely interdisciplinary field of enquiry, involving in particular scientific, ethical and religious dimensions. So, I haven chosen it as a case study in the faith and science dialogue, to disclose some aspects of the relationship of the God of the Universe to the Laws of Nature.

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[*] MD in Biology and in Natural Sciences. Postgraduate Specialization in Epistemology, Philosophy and History of Science. Teacher in Italian Public High Schools. Invited lecturer at the Pontifical Athenaeum *Regina Apostolorum* in Rome (Italy). Email: ramellini.pietro@inwind.it.

[1] This sentence is contained in the address of Benedict XVI to six new ambassadors held in the Vatican City on 9 June 2011.

1. Faith and Science: Some Models of Relationship and Interaction

In this first part I will address the following question: what are, or better what may be, the relationship and the interaction between faith and science? Which is the link between the experiential faith in the God of the Universe and the experimental science of natural laws?

I will make use of an ecological imagery to advance some possible models of this relationship, deliberately leaving apart the usual reference classifications (e.g. in Peacock 1981, Polkinghorne 1998, Gould 1999, Barbour 2000). Imagine that in the vast landscape of human life and experience we have two fields, respectively, faith and science[2]. Hence, let us make some interdisciplinary research «in the field», namely, in these two fields; however, though we can talk about the (conceptual) relationship between faith and science, we can only feign that they (actually) interact: it is the scientists and the faithful who can interact (be it through a personal interior dialogue, or in the public discourse), and not the disciplines in themselves.

According to a first model, between the two fields there is no link whatsoever; this absence of relationship could be even marked by a deep, insurmountable abyss, some sort of epistemic and experiential canyon not to be crossed or trespassed.

This possibility makes me feel uneasy, for why should things stand like that? How could two fields of the same human dwelling have no principle, content or method in common? Even if I were a strong partisan of one side or the other, I would recognize with Publius Terentius Afer (died 159 BC) that *Homo sum, humani nihil a me alienum puto*[3].

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[2] This choice implies that the following considerations will take in account a two-dimensional space. Obviously, the reader is free to adapt them to any number of dimensions, to grasp a better conception of the multifarious axes involved in such a complex question as the relationship between disciplinary spaces.

[3] "I am a man, hence I consider nothing that is human alien to me". This idea has been applied various times to the relationship between faith and science; take for instance the rhetorical question posed by historian Marc Bloch, about how could "Pascal, the mathematician, and Pascal, the Christian, [be] strangers to each other?" (Bloch [2010]: 125); or consider the observation advanced by epistemologist Georges Canguilhem, according to whom "religion and art are no less expressly human departures from simple life than is science" (1965: 10, my transl.).

A historical example of this canyon model has been, in some past spirituality, the temptation to look at the scientific endeavour as a *vana curiositas*: science is an idle curiosity, absolutely detached and all considered pointless –if not frankly deceiving– in the effort to save one's own soul. On the other side, we constantly witness an attempt to rule out faith from the horizon of human reason: faith gets relegated within a metaphysical, irrational and antiscientific sphere, which must be set apart from science, lest it could contaminate true knowledge.

A second possibility is to say that faith and science are separated by a river, we can build a bridge across. Here also there is a gap in between the fields, but now we have more floor to be the pontiffs, etymologically the bridge-builders, of the situation.

And yet, also this suggestive role of *pontifex* leaves me unsatisfied, since it still rests on a separation between faith and science.

Notable examples of this bridge model are given by those rare people who, bringing with them all the expertise previously acquired in one field, cross the interdisciplinary bridge to gain a thorough experience in the opposite one. More frequently, though staying in one's own field, there are people who occasionally make travels and acquaintances in the other one, in the attempt to meet with novel ideas and deepen their knowledge.

Often, our relationship has been depicted in terms of a boundary between the two fields, with the implicit invitation to "honour thy boundary", and not to invade each other's territory.

But sooner or later, the well-known ontological question of the ownership of the boundary will spring up, possibly leading to pernicious border conflicts[4].

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[4] Let me briefly recapitulate the question of owned vs. unowned boundaries (Varzi 2004; see also Ramellini 2010 for a discussion on biological boundaries). Take a state boundary like the famous Mason-Dixon line separating Pennsylvania from Maryland (as well as free and slave states around the Civil War period): which state owns the boundary? If we say that the boundary belongs to both Pennsylvania and Maryland, we would violate the principle according to which two adjacent states cannot have any parts in common. If we then say that the boundary is owned by only one of the states, we would privilege one state over the other, with no apparent sound reason. Finally, if we say that the boundary belongs neither to Pennsylvania nor to Maryland, it would constitute a third territory, with novel boundaries with the two former states, and a *regressio ad infinitum* would start.

As an example of such conflicts, take what happens with those words and concepts which lie at the boundary of science and faith, being shared by both, like substance, time or death. Obviously, these items are conceived of in different ways in the two fields (and often within each of them), so that questions of conceptual «copyright», of chronological priority and of correct usage are raised: each specialist, with sound reasons from his or her viewpoint, claims to use the concepts in *the* right way, leaving to the other disciplines the mere choice between the accusation of misunderstanding and a passive submission to disciplinary dictates.

More relaxed than a precise and defined boundary, a frontier could then constitute a fourth possibility. Depending on their history and functions, frontiers have also been called borderlands, outback, marches or buffer zones; be as it may, a frontier is a territory at the edge of a settled area, something of a no man's land, a *hic sunt leones* area.

The problem with this frontier model is that the empty space between the fields strongly invites possible bellicose inhabitants of one field to make forays in the buffer zone, if not true *Strafexpeditionen* against their neighbours; in this case, the frontier would possibly become a wasteland[5].

This sometimes happens when a group of non-specialists, dwelling between the tribes of the scholars and experts in the two fields, try to understand the *status quaestionis* of, say, ecclesiology or cosmology. In this case, the temptation of colonising these unschooled people may be very strong, leading to the improper use of rhetorical devices and *captationes benevolentiae* to gain consensus; though these efforts are usually made in good faith, there is a high risk of spurring irritation and counterattacks in the opposite field, which leave the poor and innocent victims between hammer and anvil.

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[5] The obliged reference is to Thomas S. Eliot's, *The Waste Land* (1922). I particularly love this poem for the (still partial) solution the poet gives to the problems raised by the international crisis of European culture after World War I, through its abundant use of intercultural references, quotations from literatures in languages other than English, and interdisciplinary links of any kind. Later, this way of dealing with contemporary problems led Eliot to the transcendent vision and religious hopes of his last works.

Some years ago, technological fashion would have dictated that the relationship between two different fields had to be straightforwardly designed as an interface, be it a man-machine interface (MMI) or a human-computer interface (HCI), and often taking an overtone of graphical user interface (GUI).

Actually, I have never succeeded in understanding what, speaking of interfaces rather than of connections, adds to a proper comprehension of the relationship of a human to a computer; maybe it suggests, through the image of the face, a two-dimensional device like a screen; anyway, in my opinion little is gained for our purpose.

A positive aspect is that interface talk usually takes place when faith and science thinkers have a strong desire to communicate and interact face to face; unfortunately, the interface can become a glass window, as much transparent as it is insurmountable.

Another possible model is that of a ladder connecting our two fields, which are obviously conceived on different floors.

Here, conflict arises when one starts thinking of which field lies on the ground and on the first floor, implying judgements of value as to which field is axiologically or epistemologically superior. Though I find persuasive reasons both for the superiority of the first floor (in terms of its being higher, more rational, nearer to the divine, far away from Chthonian powers, and so on) and for the ground floor (in terms of its being more stable, conceptually deeper, at the very foundation of a theoretical building, and the like), our Aristotelian heritage undoubtedly confers an ontological advantage to what is superior, analogously to the position of our head in respect to the rest of the body, or of skies compared to our sublunary sphere.

The classical situation where this ladder model is at play is when one discipline is considered as the *ancilla* of another one, promptly stimulating a surge of disciplinary pride in those who fear to be downgraded to the role of handmaids. Personally, I do not find an ancillary role embarrassing or shameful; on the contrary, I think that every discipline performs an ancillary function in respect of the others, in some sense and from different viewpoints. A case in point is the fecund interchange of metaphors and similes around the concept of organism between physiology and ecclesiology; true, as pioneering cyberneticists Arturo Rosenblueth and Norbert Wiener claimed (1950), the price of

a metaphor is eternal vigilance[6], but we cannot give up the abundant fruits of a conscious use of the powerful tools of analogy.

Again, a link between faith and science could be modelled as a crossroads, a point of intersection between two main roads.

However, this kind of interaction appears to me as a fleeting encounter in a public place, with no past and at best a poor future, a mere moment of greetings followed by a new separation.

An example of this crossroads model is when faith and science happen to involuntarily bump into one another, due for instance to a new scientific discovery which raises novel theological questions. Then, a surge of encounters and discussions follows, but since it does not lead to more solid interaction, after a while the roads again diverge, everyone goes his or her way, with a sense of regret for what could have ensued but did not, or at best a bitter-sweet nostalgia for that chance meeting.

An eighth and last model would be the absence of any separation and limit between the two fields, which would then merge with each other, much like a fused alloy between different metals. Maybe, in times of liquid modernity like ours (Bauman 2000), this model could be particularly tempting.

The problem is, in my opinion, that conceptual fusions have an alarming tendency to rapidly turn into confusions, leaving the thinker in a mist where all cows are black, being difficult to extricate oneself from polysemies, bad metaphors and grey conceptual zones.

An example of this alloy model is given by any easy concordism, which tries to make peace between conflicting views by simply avoiding problems, stretching words and concepts beyond any reasonable limit, or scotomizing and hiding difficult questions under the carpet.

Now that we have set forth these different models of the relationship between faith and science, the reader will be free to make his or her choice, as well as to advance different and original models.

Given that, as the reader will have noticed, I am not wholly satisfied with any of them, I too will propose a different view, this time based not on a theoretical reflection, but on my personal experience.

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[6] Not many years afterwards, media theorist Marshall McLuhan claimed that "The price of eternal vigilance is indifference" (McLuhan [2001]: 33); putting the two ideas together, we obtain that even the brightest metaphors are bound to «die», as epistemology has abundantly shown (Lakoff & Johnson 1980).

And, as I told before, actual interactions do not take place between abstract disciplines, but between persons, or inside a person who is simultaneously a faithful and a scientist.

What was my way of dealing with the intriguing relationship between my experience of faith and my scientific work in the field of entomology, ecology and theoretical biology?

When I ponder it over, I find a lot of difficulties in clearly expressing it: it is something so deeply entrenched in my life and history that it is hard to bring it to conscience, to thematise it, to disentangle the many hidden dimensions of this relationship.

It is a good tactic, when one deals with something obscure and intricate, to take a historical route, harking back the present situation to its origins and developments. In my case, like for any other person, both faith and science came to me as a heritage; that is, I received the good news of the faith from my relatives, my friends and my companions in the travel of life: *fides ex auditu*[7]; similarly, I acquired my scientific notions first from relatives and school teachers, and then from my university professors: in particular, these last transmitted to me a lot of scientific 'received views', as epistemologists call them.

Once become autonomous in my studies, I gradually found myself endowed with two corpuses of knowledge, as well as two bunches of faith experiences and scientific experiments. During this personal development, the two fields started to relate to, and to interact with, one another. Again, an image will help me to express such relationship and interaction[8].

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[7] The chain of transmission of faith, here presented through Romans 10:17, is also clear in the Jewish tradition; take for instance sentences like Isaiah 38: 19: "The living, the living give you thanks, as I do today. Fathers declare to their sons, O God, your faithfulness". In Islam we find the traditionists, whose function was to transmit the words and deeds of the prophet (leaving the content of faith exclusively to the Koran); so, when biographer Ibn Ishaq (704-767) refers how Khadija, Muhammad's (peace be upon Him) first wife, accepted Islam, he writes: "Hisham ibn Urwa told me on the authority of his father Urwa ibn al-Zubayr from Abdullah ibn Jafar ibn Abu Talib that the apostle said, 'I was commanded to give Khadija the good news of a house of *qasab* (hollowed out pearls, P. R.) wherein would be no clamour and no toil' " (Guillaume [2002]: 111; note that I have chosen a passage also referring to the theme of the house, namely, the paradisiacal home Khadija was to receive).

[8] Being based on "what humans currently do, know how to do, are trained, groomed, and inclined to do", the following model can be qualified as praxeomorphic (Bauman 2008: 4).

My model is given by the well-known Catalan *Castell*, which has been declared on November 16, 2010, a Masterpiece of the Oral and Intangible Heritage of Humanity by UNESCO. Here, a human tower is built in traditional festivals, by a group of *castellers* arranged in up to ten tiers. In particular, the *Pilar* structure is built on one person per level: each participant has a *faixa*, i.e., a sash tied about his or her waist, which the following *casteller* uses as a foothold or handhold to climb up the tower.

Now, in my human and cultural growth, faith and science have played the role of such *castellers*: for instance, a recently acquired scientific notion acted as the ground-level base of the *Castell*; once in place, it raised a faith question, made me discover a new theological concept, or revise old religious notions; this novelty in my faith, grasping the *faixa* of the scientific notion and building on top of it, constituted the second tier of the *Pilar*. In its turn, this caused me to refine my scientific ideas, raising my scientific *Weltauffassung* to the third level of my inner *Castell*; hence, *casteller* upon *casteller*, both my knowledge and my experience improved in time, with a constant interplay of religious and scientific items; interestingly, this process can be seen at the same time as a raising, a deepening and an enlarging of my comprehension of reality, and as a «purification» of both my religious and scientific views.

In particular, two kinds of interaction proved very important, namely, problems and parallelisms.

On one side, though I think that there can be no principled contradiction between mature science and mature faith, in the course of one's own education the interaction between certain scientific and religious facts and interpretations can take the form of frictions, problems, conundrums, and so on. True, the way a teacher presents notions and arguments may be rather perplexing for the student; besides, sometimes religious or scientific didactics does not follow the golden motto of the *castellers*, that is, *"força, equilibri, valor i seny"* ("strength, equilibrium, courage and reason"). Yet, from a pedagogic vantage point we must not underrate the value of problematic, contradictory and puzzling situations; on the contrary, these very difficulties can be the springboard for a better understanding: *oportet difficultates esse*. After all, a whole corpus of pedagogy is based precisely on problem solving, while epistemologist Karl R. Popper (1999) claimed that to enjoy a long, fruitful

and serene scientific life one must choose a good problem, pamper it all life long, maybe solve it, only to discover that it implies novel and intriguing riddles.

On the other side, I have often realised that between science and faith lie a number of parallelisms, analogies, similarities, metaphorical exchanges, which can be really enjoyed and, furthermore, can enrich both fields[9]. Also in this case, a sound concept in theology can foster the comprehension of an analogous idea in a scientific discipline, and vice versa; for instance, the concept of organism pervades such diverse disciplines as Pauline theology, ecclesiology, sociology, bioethics, and general biology (Schlanger 1971).

Given all this, problems and parallelisms between faith and science act as reciprocal multipliers. That is, not only religious reflections act upon scientific ones, and vice versa, but they also seem to multiply the strength and the power of both fields. Or, at least, they act in a similar way to economic multipliers, that is, those factors of proportionality which give the measure of how much a change in some exogenous variable leads to a response in an endogenous economic one[10].

Now, how can we relate this *Castell* model with our initial two-dimensional landscape? I think that the notion of Riemann surface could prove useful.

To accomplish the task, let us leave apart the people-pyramid model, to turn to a more abstract model. In a three-dimensional Cartesian space, let S_0 be a plain figure (e.g., an ellipse) on the *(x y 0)*[11] plane, representing the scientific field. On the *(x y 1)* plane, let F_1 be another plain

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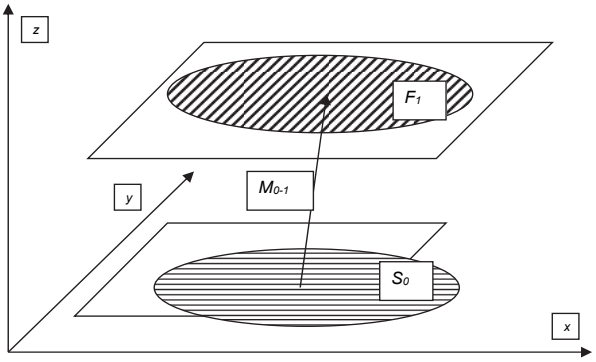
[9] The importance of parallelisms came to my mind on appreciating Chinese poetry of the T'ang Dynasty (618-907). Lyric poetry in this period was particularly marked by the search for parallels between seemingly separated fields; as such, it was not only a stylistic device, but a true way of discovering significant patterns in the world (Owen 1980). This reference to poetry implies that parallelisms are strongly akin to meditation and contemplation, that is, to the spiritual side of human life; for a survey on human ecology and contemplation, through the mediation of Biblical poetry, see Schökel 1987.

[10] In economy, the basic multiplier process occurs when an initial growth in real GDP (Gross Domestic Product) causes consumer spending to rise; this leads to a second growth in real GDP, hence to a second rise in consumer spending, and so on (Krugman & Wells : 651 ff.). Actually, there are many other kinds of multipliers, from Sun Tzu's warfare multipliers (Sun Tzu [1994]) to the multiplier fly reel in fishing.

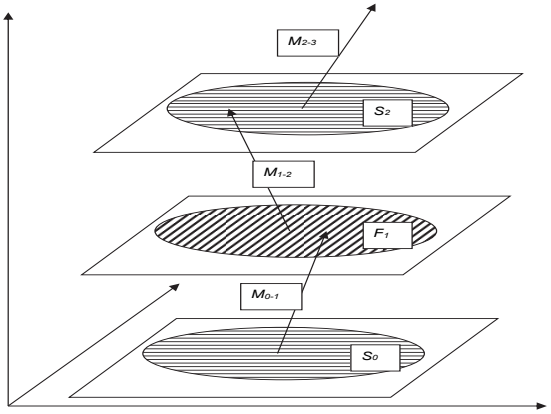
[11] I adopt this notation, partially derived from that used in crystallography, to refer to the plane including the *x* and *y* axes, with coordinate *z* being constantly zero.

figure (e.g., another ellipse with the same area than S_0), representing the faith field.

Let $M_{0\text{-}1}$ be a function mapping one or more points of S_0 to one or more points of F_1; let $M_{0\text{-}1}$ represent either a question posed by science to faith, or a parallelism between them, which will lead to an improvement of the faith field. Call $M_{n\text{-}n+1}$ an improving mapping.



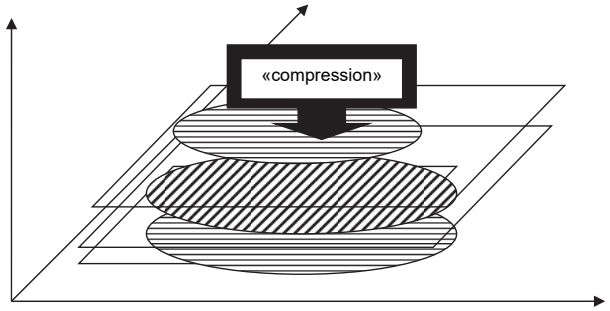
Let S_2, F_3, ..., S_{2n}, F_{2n+1}, be other ellipses on the successive parallel planes *(x y 2)*, *(x y 3)*, ..., *(x y 2n)*, *(x y 2n+1)*. Let then $M_{1\text{-}2}$, ..., $M_{n\text{-}n+1}$, be the successive improving mappings.



We thus obtain a model of the reciprocal improvement of faith and science, where the *z* axis obviously represents the temporal dimension. The model is, so far, three-dimensional (though, as we have already noted for the previous models, it can be easily extended to *n* dimensions, to account for the relationships and the interactions among different fields of human experience); this three-dimensionality, however, makes

the model difficult to reconcile with our preceding ecological landscape imagery.

And here comes the magic: we can «compress» all the parallel planes of faith and science, in their different temporal instants, «gluing» them together into one single plane, which becomes something like a Riemann surface[12].



In this way, we obtain - on a single flat landscape[13] - a plain figure which combines the properties of two disciplinary fields and of their relationships and interactions. That is, the two fields have been combined

[12] This concept was introduced by the great mathematician Bernhard Riemann (1826-1866) to represent a many-valued function, like the logarithm function, on a two-dimensional real surface. He thus thought to define the function on a domain which is a many-sheeted region, that was afterwards called a Riemann surface, or technically a one-dimensional complex manifold (Penrose 2005). Obviously, I am not maintaining that my model *is* a Riemann surface, but simply that I have drawn inspiration from it. Other mathematical entities could have been taken as a source of inspiration. In particular, it would be interesting to resort to Ėjzenštejn's use of the golden ratio as a principle of organisation in his films (Ėjzenštejn [1988]). On another level, my «Riemann surface» could be compared to the use of overlapping layers in the Geographic Information Systems (GIS); yet, my model suggests a more dynamic view of the interaction between faith and science, rather than simply piling up data layers. The merging of layers is a common technique in computer graphics, and it has been taken as an image of a future world culture's 'super flatness' by artist Murakami Takashi (Murakami 2000).

[13] This flat landscape must not mistaken for a two-dimensional Flatland, as in Abbott's celebrated novella (1884); actually, the apparent two-dimensionality of the *Castell* hides a rich variety and an indefinite number of planes, «compressed and glued» together. More generally, I wonder whether the difference between the models above presented lies in some iconic-organic (McLuhan 1964) character of the *Castell* and alloy models, versus some pictorial-mechanic character of the other ones; this would disclose my reflection on models onto other human senses: in particular, it would be tempting to reinterpret the flattened *Castell* in terms of a musical *contrapunctus*; however, if I were to choose a musical analogy, I would rather compare it to sound harmonics and wave superpositions.

into one single reality, or better, into one mapping of the relationships and interactions between some mental and extra-mental entities[14].

As to the temporal becoming of these relationships and interactions, also the axis *z* has been «compressed», shrinking into the origin of the Cartesian space. This is not a fault by itself: after all, it is better to avoid any spatialisation of time, though it can be represented on an axis; apart from this point, the fact is that the temporal dimension is hidden, rather than annihilated, in this «Riemannian *Castell*»[15]. In this respect, I would like to stress the importance of time for both the scientific endeavour and the (Catholic) development of faith (both for the single scientist and/or faithful, and for the scientific and/or ecclesial communities): on one side, though reality is given once and for all, science (partially and imperfectly) discovers it in an unending quest; on the other one, though the *depositum fidei* has been completed with the revelation of Christ, "when he comes, the Spirit of truth, he will guide you to all truth" (John 16, 12)[16].

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[14] The reader could find some resemblance between this plane, made of many planes, and Deleuze and Guattari's *Mille plateaux* (1980). I think however that their thousand plateaus map, as I got it, rests on a set of all-to-all, and mainly chance, relationships between entities of any kind; on the contrary, my model rests on a set of one-to-one causal relationships between points on the successive planes of faith and science. Thus, my model, contrarily to Deleuze and Guattari's rhizomatic nomadism, admits of genealogies, filiations, tracings and progress toward development.

[15] The hidden presence of time in the «Riemannian *Castell*» gives it a distinctive cinematographic savour, where the flat landscape becomes a sort of movie screen, on which we see science and faith improving as the film goes on. I do not know a better visualisation of the compression and gluing of images, sounds and shots into a single «Riemannian montage» than Godard's video project *Histoire(s) du cinéma* (1988-1998); and maybe one can here invoke Deleuze's notes on post-WWII cinema, as developing a time-image structure: that is, a structure which "goes beyond the purely empirical succession of time—past-present-future. It is, for example, a coexistence of durations, or of levels of duration; a single event can belong to several levels: the distinct sheets of past coexist in a non-chronological order" (Deleuze 1989, preface). Perhaps, it is time itself to be representable as a Riemann surface, gluing together past, present and future. On the contrary, my model differs from Bergson's (1907) cinematographic model of human thought in two important respects: first, Bergson claims that our *mental* activity decomposes and recomposes *extramental* movements in a cinematographic way, while I propose to model a *conceptual* activity through a *conceptual* model; second, cinematographic thinking as interpreted (and criticised) by Bergson is purely *kinematical*, being the result of an optical-eidetic illusion, while my model is *kinematical* and *dynamical*, since it refers to forces, or better, to causations and effects.

[16] All the biblical quotations are taken from *The New American Bible* (USCCB 2002).

The flat, but kinematical and dynamical, landscape thus obtained has a number of virtues:

- it preserves the difference between the fields, but without a sensible separation;
- it bridges the fields thanks to the mappings from one ellipse to the following;
- it does not raise problems of boundary ownership;
- it leaves no wasteland between the fields;
- it allows for both personal and social desires to communicate;
- it does not lead to questions of superiority among disciplines;
- it avoids the risks of confusion, though permitting a perfect overlapping of the fields;
- finally, it could even be consistent with the actual neurophysiology of human thought.

All these virtues, it must be admitted, are immanent only in a *representation* of faith-science relationship and interaction, and it is the task of actual people to implement them; yet, in comparing models, I think that this «Riemannian *Castell*» has some advantages[17]. And, at least in my case, this model has proved useful, allowing me to incur neither in disturbing problems of conscience nor in the adversities of contrasting loyalties.

A Case Study in Human Ecology

In this second part of my paper, I would like to tackle a particular case study, as it is offered by human ecology[18].

When I started my university course in ecology, I was deeply impressed by the simple observation made by Eugene P. Odum (1983) at

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[17] Among these advantages, one must not forget that this model can also be useful to represent relationships and interactions between fields other than faith and science. And actually, personally I have managed every other relationship and interaction between disciplines in a similar manner.

[18] Interestingly, the term 'human ecology' was coined by two Chicago School sociologists (Park & Burgess 1921); only later and somewhat reluctantly was this discipline tackled by ecologists and biologists; probably the first notable ecologist to write about human ecology was Paul Sears, in an invited paper for the Ecological Society of America (Sears 1954). For a general introduction to human ecology, see Marten (2001); for a deeper investigation see Miller et al. (2003); a more theoretical approach is to be found in Hawley (1986).

the very beginning of his celebrated manual of ecology: ecology and economics share the common etymological Greek root *οἶκος*, *oikos*, that is, house[19]. Ecology is the scientific study of our environmental house, while economics deals (or it should do that) with the good administration of various human «houses», from the microeconomics of families to firms, industries, markets and the macroeconomics of states or international trade.

What amazed me was an interdisciplinary link I had never suspected, the sense of warmth the concept of house raised within me, and the sense of responsibility and care involved in that ancestral but familiar linguistic root.

Undoubtedly, the house appears as something like a biological invariant or a cultural universal[20]; and it is easy to corroborate this interpretation with suitable references taken from all the quarters of mankind. To override the *embarras de choix*, I will simply offer a bouquet of some personal quotations. It would be tempting to assert that each of the following pieces *echoes* the others; however, apart from the impossibility that some of the quoted authors ever heard of one another, it would be wiser to acknowledge that their feelings are born from a common human ground. In particular, I have chosen to underline that particular feeling, if not a veritable *passion de l'âme*[21], that English speaking people express in the motto "home, sweet home"[22]; referring to both houses and their surrounding environment, the following passages are also

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[19] What is a house? We usually think of buildings made of bricks or concrete, and believe that houses of straw or wood will sooner or later be destroyed by Big Bad Wolf. Actually, the variety of human dwellings is really astonishing, from Cameroonian Musgum clay and grass houses to Inuit igloos, or from Italian trullos to Mesa Verde in-hill earth shelters (Schoenauer 2000). Another common myth is that to act ecologically one has to live in the countryside: on the contrary, it has been shown that town centres and particularly «green» skyscrapers may have a less per capita energy consumption than country houses (Lamster 2011).

[20] The implicit reference is, obviously, to the famous international colloquium held in the French Royaumont Abbey in 1972 on *L'Unité de l'Homme* (Morin & Piattelli Palmarini 1974).

[21] In his *Les passions de l'âme*, René Descartes analysed the passions of the soul, which differ to a certain degree from emotions, in the sense that a passion is passive, that is, it is suffered by the subject, while an emotion is more actively produced by him or her. As we will see, the feeling of being at home or far from it is usually more suffered than constructed.

[22] In Italian we put it in a slightly different way: "*Casa mia, casa mia, per piccina che tu sia, tu mi sembri una badia*" ("Home, my home, however small you are, you appear to me as an abbey").

selected for their link with the family environment, which is - according to the *Centesimus annus* - a privileged context for human ecology.

In a poem entitled 'The Return', T'ao Ch'ien (365-427) - a poet and writer of the China's Middle Period - tells us how, after a period of intense work as a magistrate, he longs for his little cottage; so, following his instinct for freedom, he takes the route back home. Here is a quotation:

> "To get out of this and go back home!
> My fields and garden will be overgrown with weeds - I must go back. [...]
> My boat rocks in the gentle breeze
> Flap, flap, the wind blows my gown;
> I ask a passerby about the road ahead,
> Grudging the dimness of the light at dawn.
> Then I catch sight of my cottage -
> Filled with joy I run.
> The servant boy comes to welcome me
> My little son waits at the door.
> The three paths are almost obliterated
> But pines and chrysanthemums are still here.
> Leading the children by the hand I enter my house
> Where there is a bottle filled with wine.
> I draw the bottle to me and pour myself a cup;
> Seeing the trees in the courtyard brings joy to my face.
> I lean on the south window and let my pride expand,
> I consider how easy it is to be content with a little space. [...]
> Back home again!"
> (Hightower 1970)

Similar feelings had been expressed some centuries earlier by the Roman poet Albius Tibullus (died 19 BC) in the first poem of his three books of Elegies; here, the idea of living in a little farm, far from warlike cries and terrors, is centred around the fireplace of the poet's home[23]:

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[23] Also the image of the hearth is often used to convey a sense of domestic warmth: take for instance the idea of Frank Lloyd Wright, the American architect, to arrange the building

"Give, if thou wilt, for gold a life of toil!
Let endless acres claim thy care!
While sounds of war thy fearful slumbers spoil,
And far-off trumpets scare!

To me my poverty brings tranquil hours;
My lowly hearth-stone cheerly shines;
My modest garden bears me fruit and flowers,
And plenteous native wines.

I set my tender vines with timely skill,
Or pluck large apples from the bough;
Or goad my lazy steers to work my will,
Or guide my own rude plough.

Full tenderly upon my breast I bear
A lamb or small kid gone astray;
And yearly worship with my swains prepare,
The shepherd's ancient way."
(Williams 1908)

And even in the icy lands of Melville Peninsula, in the Arctic Canada, an igloo may offer the same sensation of warmth, as described by the Danish polar explorer Knud Rasmussen (1879-1933):

"No joy equals that of building igloos, except perhaps that of entering them, when the oil lamps are lit on, and flashes of light shine on the white dome. I don't believe I will ever grow tired of the welcoming character of these primitive lodgings, of their warmth and their conviviality!" (Rasmussen [2011]: 46-47, my transl.)

I would close this too brief anthology with a passage from the celebrated *Souvenirs Entomologiques* by Jean H. Fabre (1823-1915); here, he tells us that after a long quest he has succeeded in acquiring a small parcel of the *harmas* (fallow ground) in Provence, where he arranges his entomological laboratory in the field; though aimed at an open space

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plan of his houses around the fireplace (Wright 1943), or the Christian movement called the '*Focolarini*' ('Hearth Movement').

rather than to Fabre's house within it, his feelings of joy are very similar to what we have read before; besides, they are particularly interesting for us, given their exquisite ecological savour:

"This is what I wished for, *hoc erat in votis*: a bit of land, oh, not so very large, but fenced in, to avoid the drawbacks of a public way; an abandoned, barren, sun scorched bit of land, favored by thistles and by wasps and bees. Here, without fear of being troubled by the passersby, I could consult the Ammophila and the Sphex [two digger or hunting wasps] and engage in that difficult conversation whose questions and answers have experiment for their language; here, without distant expeditions that take up my time, without tiring rambles that strain my nerves, I could contrive my plans of attack, lay my ambushes and watch their effects at every hour of the day. *Hoc erat in votis*. Yes, this was my wish, my dream, always cherished, always vanishing into the mists of the future.

And it is no easy matter to acquire a laboratory in the open fields, when harassed by a terrible anxiety about one's daily bread. For forty years have I fought, with steadfast courage, against the paltry plagues of life; and the long-wished-for laboratory has come at last. What it has cost me in perseverance and relentless work I will not try to say. It has come; and, with it - a more serious condition - perhaps a little leisure. I say perhaps, for my leg is still hampered with a few links of the convict's chain.

The wish is realized. It is a little late, O my pretty insects! I greatly fear that the peach is offered to me when I am beginning to have no teeth wherewith to eat it. Yes, it is a little late: the wide horizons of the outset have shrunk into a low and stifling canopy, more and more straitened day by day. Regretting nothing in the past, save those whom I have lost; regretting nothing, not even my first youth; hoping nothing either, I have reached the point at which, worn out by the experience of things, we ask ourselves if life be worth the living.

Amid the ruins that surround me, one strip of wall remains standing, immovable upon its solid base: my passion for scientific truth. Is that enough, O my busy insects, to enable me to add yet a few seemly pages to your history? Will my strength not cheat my good intentions? Why, indeed, did I forsake you so long? Friends have reproached me for it. Ah, tell them, tell those friends, who are yours as well as mine, tell them that it was not forgetfulness on my part, not weariness, nor

neglect: I thought of you; I was convinced that the Cerceris [a digger wasp] cave had more fair secrets to reveal to us, that the chase of the Sphex held fresh surprises in store. But time failed me; I was alone, deserted, struggling against misfortune. Before philosophizing, one had to live. Tell them that; and they will pardon me." (Fabre [2011])

What else could be added to this quotation?

The fact, simply and purely, is that the house is, first of all, a human right, as acknowledged by Article 25 of the 1948 Universal Declaration of Human Rights. And hence, the homeless undoubtedly belong in that category of specially vulnerable people addressed to by Article 8 of the Universal Declaration on Bioethics and Human Rights, adopted by acclamation by the General Conference of UNESCO on 19 October 2005. In fact, the ethical issues of biomedicine, this Declaration refers to, take in account also the dimension of human ecology (Article 1), promoting the improvement of the living conditions and of the environment of all human beings (Article 14).

Having thus examined the cultural, ethical and emotional value of the house, let us pass to the problems and parallelisms between the scientific aspects of the ecological concept of *oikos*, and the rich reflection around the religious idea of house.

Oikos *and the Laws of Nature*

What is the «house» of an organism? How can we represent its *sensu lato* environment, from a biological and ecological viewpoint?

Among various possibilities[24], here I will take a route that immediately leads us to the concept of natural law, and in particular of ecological law.

The starting point is the concept of state of a concrete system, e.g., an organism[25]. The 'state' of an organism at a given instant is the

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[24] I dealt with the concept of environment in a previous work (Ramellini 2007). Another possibility would be to tackle the concept of Hutchinsonian hypervolume niche (Hutchinson 1957). Obviously, one must refer environments and niches to organisms rather than species: as evolutionary biologist Ernst Mayr once put it, "There is no such thing as *the* ecology of a given species" (Mayr 1970: 341).

[25] I am indebted to Mahner & Bunge 1997 for the conceptual framework about state spaces and laws.

totality of its properties at that time. It can be represented by a point in the 'logically possible state space' of that organism, that is, an *n*-dimensional abstract space representing the set of logically possible states of our organism, endowed with its *n* properties.

Sooner or later, the value of some properties changes. So, the point representing the organism in its state space moves along a trajectory, its 'history'. In particular, the whole history of the organism is its 'life history'[26].

Now, since the essential properties of an organism do not come in a stray or lawless way, but are nomologically related to each other, they will take only some of their logically possible values, namely, those values which are compatible with the natural laws of that organism. Thus, a restricted subset of values for those properties is obtained, which is the really possible state space of the organism, that is, its 'lawful state space'.

Let us now apply this general frame to some ecological laws. For the sake of simplicity, we will deal with a two-dimensional state space, and in particular with an ecoclimogram called 'thermohygrogram'. It is a Cartesian plane, with relative humidity on the *x* axis and temperature on the *y* axis. The possible values of *x* range between 0% and 100%, while those of *y* range from 0K to huge values; however, we can take the range between 273K and 373K, that is, the melting and boiling points of water at sea level. We thus obtain the logically possible humidity-temperature space for our organism, which may be (again for the sake of simplicity) a rectangle on the Cartesian plane. Now, not all of its points are really possible for it, given the natural laws governing the life of that organism (i.e., its existence: *viventibus vivere est esse*) and of other organisms belonging to its species; the subset of the lawful humidity-temperature space is a smaller rectangle caged inside the first state space, limited as it is by the extreme values of humidity and temperature that organism can tolerate[27]:

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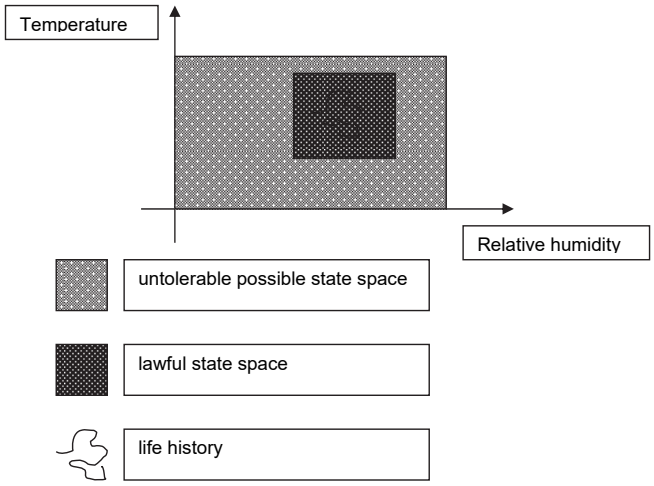
[26] Life histories are usually but rather misleadingly called 'life cycles'. Actually, for a single organism there is no such cycle, since once one is dead, one is forever dead (Ramellini 2009).

[27] It could be said that, during its lifetime, the needs of an organism change, and so do the limiting values of its properties (for instance, the physiological requirements of a caterpillar are very different from those of the imago of a butterfly); anyway, for the sake of simplicity we



In this way, we answer our initial question: this rectangle is *an* ecological «house» for our organism, as any other *n*-dimensional lawful state space would be. It is an abstract house, in an abstract state space, but it helps us to represent the lodging of an organism within a couple of its essential properties.

As long as the organism spends its life, the point representing its state moves along a trajectory inside this «house», the life history. But sooner or later the organism will die[28], either trespassing the walls of its «house» (for instance, due to an adverse period of unbearably low temperatures) or even remaining inside its lawful space (for instance, due to a disease that affects the organism, though humidity and temperature being optimal).

Ecologists compress these and other considerations into two natural laws[29]: the Law of the Minimum and the Law of Tolerance.

The Law of the Minimum states that the life of an organism is limited by the scarcest resource it requires, which thus acts as its limiting factor (Liebig 1840, Odum 1983). Discovered by Carl Sprengler

will take the extreme values of humidity and temperature that organism can tolerate during its *whole* life history.

[28] Actually, not all the organism end their life by becoming corpses; for instance, a bacterium may divide into two bacteria well before dying due to external causes (Ramellini 2009). I also take the opportunity to remember that there is a relationship between the state space and the situation of health or sickness of an organism (Canguilhem 1966).

[29] In what follows I will distinguish between a law, i.e., a constant relation between properties, and a law statement, i.e., a construct representing a law (Mahner & Bunge 1997: 13).

(1787-1859), it was refined by Justus von Liebig (1803-1873), who illustrated the law with the analogy of a barrel, whose staves are of unequal length: if filled with water, the highest level reached by water will be limited by the shortest stave. This law also holds for the growth of organisms and biopopulations.

Though very important in ecology, to my knowledge this law has not been formalised in ecological textbooks. So, let us put things straight, in the case of an organism's growth.

The relevant law statement holds that, given resources A and B, available in quantities $Q_A < Q_B$, the rate of growth G of an organism o is function of Q_A (as well as of other variables $v_1, v_2, ..., v_n$); for instance, if we take the increase of the mass m_o of o as a measure of its growth, we have:

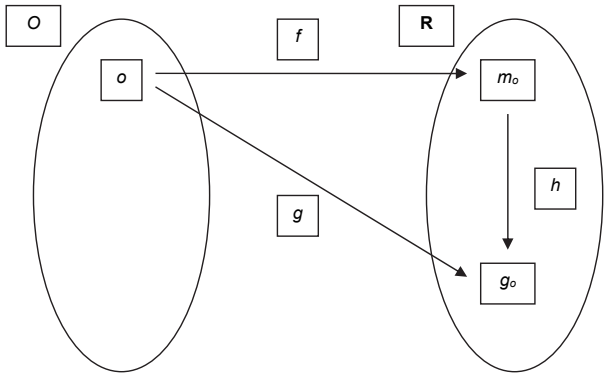
$$dm_o/dt = f(Q_A, v_1, v_2, ..., v_n)$$

This law statement can be made more explicit by finding out which variables are relevant, and what their precise mathematical relationship is; besides, suitable parameters (for instance, in the form of Michaelis-Menten coefficients) will put the general law statement in accordance with the particular circumstances of the organism's life, thus linking the pair ‹organism, environment› in the law statement.

The law statement can also be represented with the help of sets and functions[30]. To do that, let O be the set of all organisms, and $\mathbf{R}$ the set of real numbers; let then f be the mass function[31], h a limiting resource function, and g a growth function. We then have $g = h \circ f$:

[30] See Bunge 1983 for details.

[31] It may appear strange to speak of the mass function, rather than of mass *simpliciter*. Actually, however, this property can be represented as a function of the form m: $B \times F \times U_m \rightarrow \mathbf{R}^+$, where B stands for the set of all bodies, F for the set of all reference frames, and U_m for the set of all conceivable mass units.



As to the Law of Tolerance, its law statement holds that the life of an organism is limited by the qualitative and/or quantitative deficiency or excess in any one of the properties which may approach its limits of tolerance. It was discovered by Victor E. Shelford (1877-1968), and is considered as an expansion of the law of the Minimum, to account for both minimums and maximums in the tolerance for limiting factors. For instance, the humidity-temperature rectangle above reported is consistent with this law.

It could be objected that it is typical of human beings to circumvent biological and ecological limits by way of cultural innovations, like clothes or houses[32]. For instance, humans cannot possibly breathe underwater[33]. Now, so goes the objection, humans have invented scuba sets for underwater diving, thus bypassing our old ecological limits.

This is clearly true, but we must remember that humans still need to breathe air, or other suitable gaseous mixtures: even underwater, divers actually inhale a properly oxygenated gaseous medium, rather than water. We could even imagine a hyper-oxygenated water, allowing a human organism to inhale it and survive (apart from any other possible

[32] Exemplary in this sense was Goethe's Faust, imagining the erection of massive dams to reclaim land from the sea: "At once my plan was made! My soul shall boast / An exquisite achievement: from our coast / I'll ban the lordly sea, I'll curb its force, / I'll set new limits to that watery plain / And drive it back into itself again." (Goethe 1832 [1994]: Part II, Act IV, vv. 10227-10231). This Romantic titanism can be fruitfully contrasted against the biblical concept of divine limits imposed upon earthly creatures (see below).

[33] To be precise, the underwater partial pressure of oxygen is well below the minimum required by the law of tolerance for humans.

damages to their alveolar epithelium)[34]; also in this case, however, the concentration of dissolved oxygen would «by definition» fall within the limits set by the natural laws of that organism.

The same situation holds also within an evolutionary framework: as long as the organisms belonging to a given species change, also their natural laws do, and for any given organism in the *phylum* certain ecological limits will always hold.

Oikos *and the God of the Universe*

Oikos seems to constitute a universal theme in faith, too: just to mention the three Abrahamic faiths, we could remember how Jewish synagogues are known as "houses of assembly" or "houses of prayer"; how the term parish - used in various Christian Churches - means "near the houses"; and how Muslims also call the Kaaba "the Primordial House", "the Sacred House" or "the Forbidden House". More generally, taking faith in the restricted sense of fidelity, I cannot help quoting this passage from a celebrated historian's book (Bloch [2010]: 27), given its amazing ecological echoes:

"Now, wherever fidelity to a belief is to be found, all evidences agree to the fact that it is but one aspect of the general life of a group. It is like a knot in which are intertwined a host of divergent characteristics of the structure and mentality of a society. In short, a religious creed involves the whole problem of the human environment. Great oaks [the religions, PR] from little acorns grow. But only if they meet favorable conditions of soil and climate [the historic context at the beginning of those religions, PR]"

Now, we could wonder whether one can build a religious-scientific «Riemannian *Castell*» upon our previous ecological study. For instance, we could look for traces of limiting natural laws as those we have mentioned above inside the Bible.

And actually, the Scriptures are rich in passages stating natural limits set by the God of the Universe.

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[34] Actually, highly experimental techniques are being implemented with oxygen-rich liquids like perfluorocarbon, with mixed and controversial results (see e.g. Shaffer et al. 1992).

A first group refers to geographical limits, and traces back to the alliance established between God and Noah after the Great Flood (Genesis 9, 11; 15). The best quote is from the famous speech of God in answering to Job's accusations; here, God tells how He-She shut the roaring sea inside its earthly «house», reducing it to a babbling infant in need of domestic care:

> "And who shut within doors the sea, when it burst forth from the womb;
> When I made the clouds its garment and thick darkness its swaddling bands?
> When I set limits for it and fastened the bar of its door,
> And said: Thus far shall you come but no farther, and here shall your proud waves be stilled!" (Job 38, 8-11)

Similar passages are found here and there in the Wisdom and Prophetic Books:

> "You fixed the earth on its foundation, never to be moved.
> The ocean covered it like a garment; above the mountains stood the waters.
> At your roar they took flight; at the sound of your thunder they fled.
> They rushed up the mountains, down the valleys to the place you had fixed for them.
> You set a limit they cannot pass; never again will they cover the earth." (Psalm 104 (103), 5-9)
> "Should you not fear me, says the LORD, should you not tremble before me? I made the sandy shore the sea's limit, which by eternal decree it may not overstep. Toss though it may, it is to no avail; though its billows roar, they cannot pass." (Jeremiah 5, 22)

Other passages refer to the limits imposed on the life of the organisms. Again in Psalm 104 (103) we read how God established the limits of the ecological environments for wild beasts, and how the limiting resources made available by Him-Her decide for life or death:

> "The high mountains are for wild goats; the rocky cliffs, a refuge for badgers. [...]
> All of these look to you to give them food in due time.
> When you give to them, they gather; when you open your hand, they are well filled.
> When you hide your face, they are lost. When you take away their breath, they perish and return to the dust from which they came.
> When you send forth your breath, they are created, and you renew the face of the earth." (Psalm 104 (103), 18; 27-30)

Also human life has limits that no voluntary effort can infringe:

> "He said to (his) disciples, "Therefore I tell you, do not worry about your life and what you will eat, or about your body and what you will wear. For life is more than food and the body more than clothing. Notice the ravens: they do not sow or reap; they have neither storehouse nor barn, yet God feeds them. How much more important are you than birds! Can any of you by worrying add a moment to your lifespan? If even the smallest things are beyond your control, why are you anxious about the rest?" (Luke 12, 25; cp. Matthew 7, 27)

All these limits are to be contrasted against the unlimited power of God, for whose divine majesty no human house will ever be enough[35]:

> "Thus says the LORD: The heavens are my throne, the earth is my footstool. What kind of house can you build for me; what is to be my resting place?
> My hand made all these things when all of them came to be, says the LORD." (Isaiah 66, 1-2)

These and other passages seem to point to the existence of divine laws limiting the possibilities of the creatures. Hence, should we say

[35] Yet, a whole Kabbalistic tradition, dating back to Isaac Luria (1534-1572) and also welcomed by Christian exegetes (e.g. Ravasi 1995), speaks of *ṣimṣūm*, i.e., a process of contraction or constriction, by which God imposed a limit upon His-Her own divine light, for the universe to find its space of existence (Scholem 1960).

that the Bible is an ecological treatise *ante litteram*, or that the sacred author knew something like the Law of Tolerance, be it in an oceanographic or ecological version?

To tackle this problem, we should accomplish a preliminary twofold task: first of all, we should ask ourselves what precisely a natural law is, from an epistemological viewpoint; then, we should look for the epistemic and scientific background (if any) of the ancient Semitic world[36].

Such refinement of our knowledge would probably result in a caveat with respect to a straightforward concordism, and with regard to the alloy model of the relationship between faith and science. Instead, provided we can speak of the Bible as a singular work, one could say that it presents us with a vision of the universe as a *kosmos*, an ordered and intelligible system where God sets a general natural lawfulness, rather than a messy and incomprehensible *kaos*, or better a *tohu wa-bohu*[37].

This would be an interesting result, and a second, firm tier for our *Castell*[38]. That is, starting from a problem issued from ecology, and thanks to a thoughtful distinction between the Semitic background and the biblical content of the Scriptures, we would have gained a better comprehension of faith in general, and of the roots of Christian faith in particular. Then things could go on, for instance with the question, posed by faith to science, about the source of the lawfulness in the Universe. *Und so weiter...*

Let us summarise this process of refinement by way of a structured scheme:

S_0: there are some limiting laws in ecology; this raises a question:
$M_{0\text{-}1}$: are there comparable limiting laws in the Bible?

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[36] Note that this task involves disciplines other than science and Biblical theology, like epistemology or Semitic anthropology. In other words, the model I am proposing for science-faith relationships should be complicated to account for the relationship among various (and, mediately, all) disciplines. I even wonder if a complete model requires a «Riemann multidimensional space», rather than a «simple Riemann surface».

[37] On the biblical concept of the universe as a κόσμος see De Gennaro 1982.

[38] Obviously, I have here cut short a very long story, since it has taken centuries to realise that the Bible has to be tackled with critical exegetical tools. On the contrary, and precisely thanks to those tremendous secular efforts, today the personal education from a naive to a critical reading of the Bible may take only a little time to contemporary people.

F_1: though there are some suggestive passages, we can at most speak of a general lawfulness in Nature; this raises the question:
$M_{1\text{-}2}$: whence such natural lawfulness?
S_2: ...

Once examined the fecundity of *problems* in the building of our *Castell*, let us pass to a *parallelism* between ecology and faith, thanks to the concept of house. That is, just as in ecology, *oikos* pervades the Bible. So, we can again approach the Scriptures in search of the footprints of an *oikos*-thought and an *oikos*-experience.

To this we turn now.

Again, the harvest is abundant, so let me simply quote some «ecological» passages about the house, both in the sense of our common cosmic and earthly house, and with regard to single human dwellings.

First of all, it is God's will that the heavens and the earth be fit for habitation:

> "For thus says the LORD, The creator of the heavens, who is God, The designer and maker of the earth who established it, Not creating it to be a waste, but designing it to be lived in: I am the LORD, and there is no other." (Isaiah 45, 18)

God's people is, in its turn, a house made stable by the luxuriance of its youth:

> "May our sons be like plants well nurtured from their youth, Our daughters, like carved columns, shapely as those of the temple." (Psalm 144(143), 18)

Ecological metaphors are also used to depict the single house of a family, springing from a paterfamilias perspective and flowing into a social horizon:

> "Happy are all who fear the LORD, who walk in the ways of God. What your hands provide you will enjoy; you will be happy and prosper:

> Like a fruitful vine your wife within your home, Like olive plants your children around your table.
> Just so will they be blessed who fear the LORD.
> May the LORD bless you from Zion, all the days of your life That you may share Jerusalem's joy
> and live to see your children's children. Peace upon Israel!" (Psalm 128 (127), 3)

The sense of domestic peace and tranquillity is so strong that there is nothing worst than being far from home, a feeling we have already met in all world literature:

> "Like a bird that is far from its nest is a man who is far from his home." (Proverbs 27, 8)

A similar image is particularly evocative when applied to the spiritual pleasures of the Temple[39]:

> "How lovely your dwelling, O LORD of hosts!
> My soul yearns and pines for the courts of the LORD. My heart and flesh cry out for the living God.
> As the sparrow finds a home and the swallow a nest to settle her young, My home is by your altars, LORD of hosts, my king and my God!
> Happy are those who dwell in your house! They never cease to praise you." (Psalm 84(83), 2-5)[40]

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[39] It is interesting that, among the various kinds of natural reserves, there are also the so-called Wildlife Sanctuaries. For instance, in 1985 the UNESCO decided the inscription the former Manas Tiger Reserve in India on the World Heritage List as Manas Wildlife Sanctuary (WHC 1985).

[40] The Jewish longing for the Temple, as a proper house for the faithful, has also passed into the non-canonical Gospels, as we can read in this sapid and colourful quote from *The Book About the Origin of the Blessed Mary and the Childhood of the Saviour*: "After these things, her nine months being fulfilled, Anna brought forth a daughter, and called her Mary. And having weaned her in her third year, Joachim, and Anna his wife, went together to the temple of the Lord to offer sacrifices to God, and placed the infant, Mary by name, in the community of virgins, in which the virgins remained day and night praising God. And when she was put down before the doors of the temple, she went up the fifteen steps so swiftly, that she did not look back at all; nor did she, as children are wont to do, seek for her parents. Whereupon her parents,

Yet, any earthly house cannot be but a temporary dwelling, waiting for the world to come:

> "As they were proceeding on their journey someone said to him, 'I will follow you wherever you go.' Jesus answered him, 'Foxes have dens and birds of the sky have nests, but the Son of Man has nowhere to rest his head.'" (Luke 9, 57-58)

We could go on with other quotations, but now we can pause, having shown how much the *oikos* imagery abounds in the Scriptures.

Conclusions

After an analysis of some possible models for the relationship and interaction between faith and science, I have proposed the novel model of a «Riemannian *Castell*». In particular, problems and parallelisms can constitute the tiers of this curious «flat building», as I have shown in the case study of the *oikos*-house.

The house: human biological invariant, cultural universal, source of deep emotions, prompt for artistic masterpieces, context for human ecology, basic human right, ecological state space, powerful religious metaphor.

If I were to choose a name for my model, I would call it *oikos*, a common house for faith and science.

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each of them anxiously seeking for the child, were both alike astonished, until they found her in the temple, and the priests of the temple themselves wondered." (Roberts et al. 1886: 370-371). This book, which was probably written around the 6th century, is particularly important since it influenced many Medieval cycles of frescoes, as well as Renaissance miniatures, all around Europe.

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Summary: The concept of human ecology was introduced into Catholic pastoral documents by John Paul II, in his 1991 encyclical *Centesimus annus*. As an exquisitely interdisciplinary field of enquiry, human ecology involves a great many scientific, ethical and religious questions. Thus, it can be chosen as an appropriate case study in the dialogue between faith and science. After a review of the ways in which the relationships between faith and science have been addressed, an original model for their interaction is proposed. Then, this new model is tested in the specific case of human ecology, as well as in that of the relationship between the God of the universe and the laws of nature.

Keywords: Faith-science dialogue, human ecology, environmental ethics, conceptual models, natural law.

Sommario: Il concetto di ecologia umana è stato introdotto nei documenti pastorali cattolici da Giovanni Paolo II, nella sua enciclica *Centesimus annus* del 1991. In quanto campo di indagine squisitamente interdisciplinare, l'ecologia umana coinvolge varie questioni scientifiche, etiche e religiose. Quindi può essere preso come un interessante caso di studio nel dialogo tra fede e scienza. Dopo una rassegna delle modalità con cui sono stati affrontati i rapporti tra fede e scienza, viene proposto un modello originale della loro interazione. Successivamente, questo nuovo modello viene messo all'opera nel caso specifico dell'ecologia umana, nonché del rapporto tra il Dio dell'universo e le leggi della natura.

Parole chiave: Dialogo fede-scienza, ecologia umana, etica ambientale, modelli concettuali, legge naturale.