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Frequently used terms

BM – Biomimicry

EBA – European Biomimicry Alliance – An official network of biomimicry experts who signed up The EBA collaborative commons proposal

EBC – European Biomimicry Community – An unofficial network of biomimicry enthusiasts and practitioners who work, study or live in Europe.

Introduction:

What is Biomimicry

Biomimicry (BM) is described as “the design and production of materials, structures, and systems that are modelled on biological entities and processes” (Oxford Dictionary, 2021). However, another more holistic version exists as described by American Janine Benyus in *Biomimicry* (1998). Since publication and world-wide recognition Dr Benyus has since set-up The Biomimicry Institute and Biomimicry 3.8 which act as the non-profit and profit branches respectively. Biomimicry 3.8 certification is as such an imported philosophy from the US. The key addition that 3.8 adds to the OED definition is the concept of reconnecting with nature and quietening our human intelligence and seeing nature as the source of intelligence (Benyus, 1997). This philosophy can be distilled to seeing nature as a model, to copy, a measure, of what is sustainable, and a mentor, to act as a source of knowledge.

The Value of Biomimicry

Biomimicry in a practical capacity has been used for product innovation for many years and has several very famous examples including Velcro, train modifications and swimsuits and adhesives (Mestral, 1955; Chatard and Wilson, 2008; Jin et al., 2014; Foo, Omar and Taib, 2017). More recently the Biomimicry institute has generated many lower profile products such as protein based dyes, self-healing concrete, Butterfly Inspired paint and shrimp inspired material (Biomimicry Institute, no date). The benefit of inspiration from nature is that many organisms are highly evolved for specific tasks using only very abundant materials. An example of this is seen in the worlds biomass, the majority of which is cellulose, lignin and chitin, all of which are derived from Carbon oxygen and hydrogen (Deniro and Epstein, 1981; Banwell *et al.*, 2021). As most adaptations in nature are created under ambient conditions, they are valuable forms of inspirations from a sustainability perspective as natural processes very infrequently damage their local environment. The abundance of natural inspirations means using Biomimicry as an innovation methodology creates more intellectual property at a lower energy cost than conventional innovation methods (Kennedy and Marting, 2016). As biomimicry can use a systems perspective to compare cities to ecosystems it has also been increasingly used in the built environment (Klein, 2009). The interest in Biomimicry has created estimation that by 2028 the value of Biomimicry technologies could reach \$18.5 billion (US) (BIS Research, 2018). This potential value encouraged many European Biomimicry organisation to form.

The inception of a European Biomimicry Alliance

the European Biomimicry Alliance was set-up in an effort to allow the biomimicry organisation of Europe to work together and become more profitable whilst also pushing the sustainable brand of biomimicry. The EBA was initially envisaged by local partners across Europe from the organisations of Biomimicry Germany, Biomimicry NL, Biomimicry Switzerland, Biomimicry Europa (France), Biomimicry Iberia, Planet Nature Inspired (Italy), University Zadar (Croatia) and Bionik network (Germany). This is described in *European Biomimicry Alliance: Towards a collaborative common* by Codrin Kruijne in 2014. Using the momentum and valuation that Biomimicry had received it hoped to leverage collaboration between national alliances. Alliances would act as “Guilds of professionals” to “cross pollinate” and allow for resource sharing “to create a sustainable society through the development of Biomimicry”. The mechanisms were widely described as outreach, education and facilitation. This would manifest as teaching in formal and informal contexts including within organisations. A master’s programme could also be developed which would allow students to move between alliance members to encourage coworking. The organisation would generate funds through

levies charged for using co-created materials. Organisation and distribution of resources would occur at a national level and the overall direction decided at the pan-European level with members being both representatives of, and reporters to, the EBA. This bottom up meets top-down approach would aim to encourage self-organisation whilst providing direction. The EBA attracted approximately 50 signatures and formed a group which then went on to unsuccessfully apply for Erasmus funding.

What is the current state of Biomimicry (BM) in Europe?

Over the course of the follow years (2014 – 2021) the EBA became less active and at present (2021) the Biomimicry Community to many exists only as generation of key players and their networks with little overall cohesion or organisation. However, in the wake of COVID-19 a community may be more necessary than ever, with 38% of communities growing quicker than normal and 56% of communities being valued as more essential (Cass et al., 2021).

Biomimicry is still practiced throughout Europe and within European institutions from a purely practical act sometimes referred to as bionics to a purely philosophical perspective that can be referred to as using nature's principles. There are currently BM courses hosted at many prestigious higher education institutes and it is widely appreciated in an academic capacity ([7Vortex](#)). There are additionally a host of private organisations who sell their own biomimicry courses ([7vortex](#)). However, many bio-mimics and Biomimicry organisations are small, headed by only a few people and in various states of activity. Additionally, there are many individual actors who practice functional biomimicry without being associated with the wider BM community. To be an effective network of networks this needs to change.

Research outlook

The following has endeavoured to uncover; how biomimicry users view the biomimicry community, what value they would like from the network and how they would like to be involved with the network. This research has been generated by interviews from the biomimicry community and cross examined by theories on network and community management and suggest a BM network is ready to emerge if the right function and mechanism are found. Possible mechanisms could involve European Wide Biomimicry certification, a shared market-network platform and a joint committee on funding application.

Methods

Step 1. Identifying Biomimicry organisations:

In order to do a stake holder analysis, Biomimicry Organisations were first Identified. Using [Biomimicry.org](https://biomimicry.org) global network 8 Biomimicry organisations were identified (Figure 1).

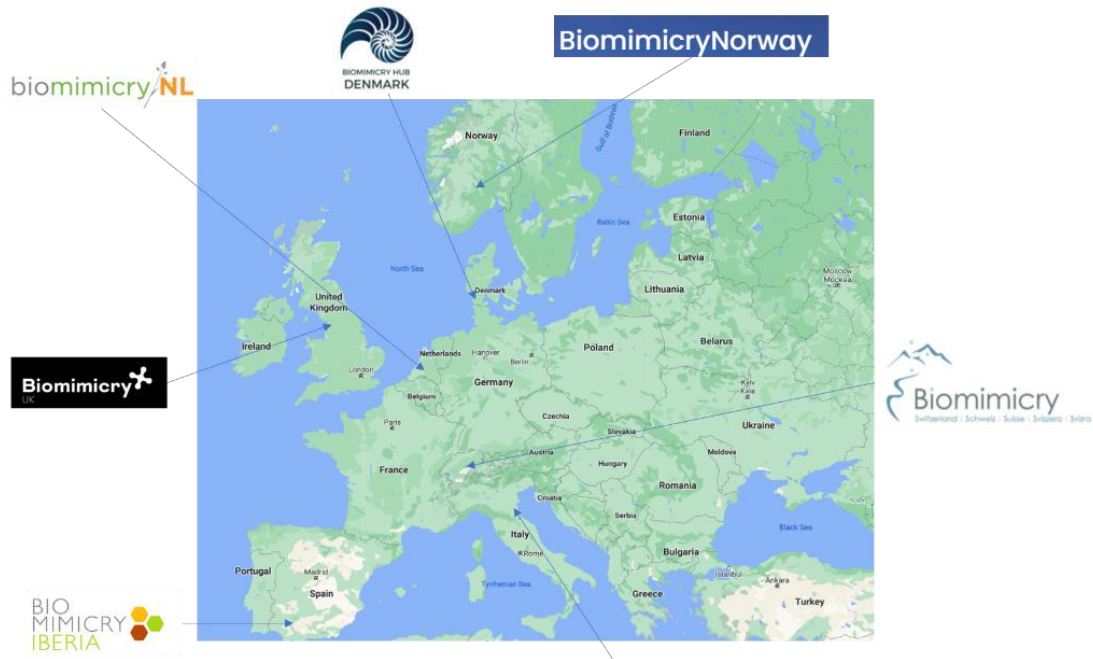


Figure 1. The eight European Biomimicry Organisations according to the Biomimicry Institutes. Network map available at: <https://biomimicry.org/global-networks/>

In addition to these organisations, there are many more organisations set up by people not associated with the biomimicry institute (Figure 2). There are also many higher education institutes that have some degree of BM education (appendix 2)

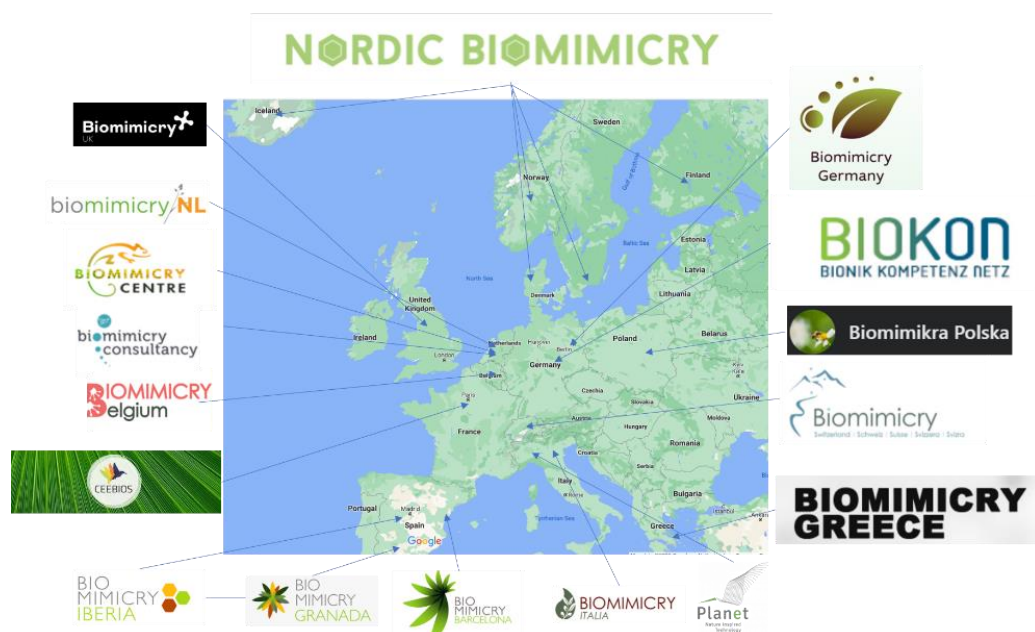


Figure 2. European Biomimicry Organisations in Europe found in search.

Step 2: Identifying bio-mimics in Europe to speak to

Outreach for Biomimicry experts was filtered based on whether they could provide insight to the European biomimicry context (Figure 3). This was decided by whether they worked in a European context, had been in the EBA1.0, were in a Biomimicry organisation currently or had graduated from



Figure 3. Systemic decision flow for reaching out to bio-mimics for information on the European Biomimicry community.

one. During the interview processes stakeholder would also recommend people to talk to. These were identified as people of interest and attempts were made to reach out to them. Not all outreach was successful and only a fraction of those who were contacted replied (Figure 4).

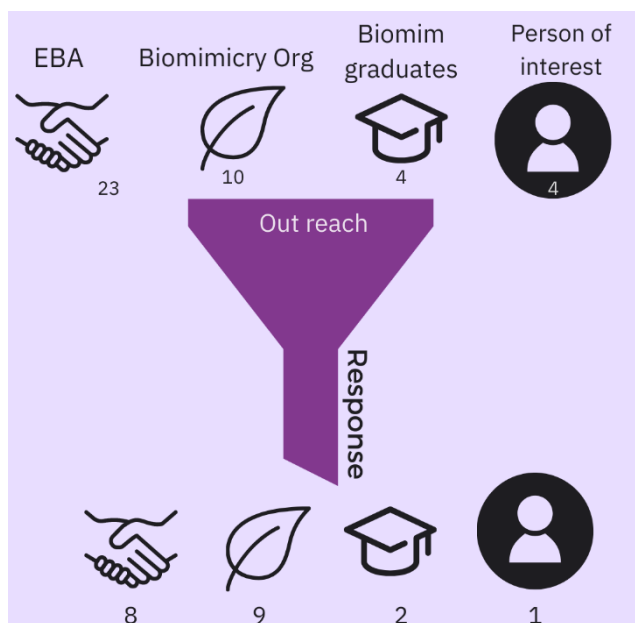


Figure 4. Response funnel from different stakeholders who were reached out to. These came from the EBA1.0, Biomimicry organisations or were Graduates of Biomimicry or were people of interest. Numbers at the mouth of the funnel represent how many people were contacted. The numbers at the base of the funnel represent how many people responded from each group.

Step 3: Stake holder analysis of biomimicry Professionals:

Interviews were conducted with those who responded to outreach (Figure 4). 20 interviews were performed all of which were with people from different organisations. This includes 5 University lectures, 9 BM organisation founders, 5 project managers and a student. This provided a perspective of what vision biomimicry-professionals have for the future of the European biomimicry Community. The purpose of this was to understand how they consider themselves positioned within the network, what value the network has to them and how it should evolve to create more value within the community. Moreover, answers of the interviews were used to find insights on why the EBA had failed to be more proactive. This would help identify a strategy to invigorate the community. A semi structured virtual interview technique was used and the responses were collected by a single interviewer (Table 1). Every question had a certain purpose for the biomimicry community (Table 1). For individual interview summaries see appendix 1. Some details in interviews are omitted for privacy of individuals.

Table.1 – Interview questions and purpose from semi-structured interviews with members of the biomimicry community.

Questions	Purpose
What is the role of your organisation and how does it link into the wider Biomimicry community?	Defining how they see their organisation within the context of the wider Biomimicry Community. Enables the motivation of their organisation to be ascertained.
In your practice do you use biomimicry tightly or incorporate other sustainability practices?	Understanding what tools their operation typically uses in order to understand how they see biomimicry fitting into the sustainability movement. Understanding if they would want a community of only bio-mimics (purist) or a mixed group (pragmatist).
Having canvassed the landscape do you find Biomimicry companies or companies that use biomimicry	Allows them to speak about their opportunities working with other organisations.
How do you see the EU Biomim-community, what value does it have to you and what would you like to see it evolve in to?	Understanding their perspective of the BM community. Understanding what the community, and a new/ invigorated community, should provide for them to increase their activity. Understanding their perfect / envisioned version of the Biomimicry community.
What do you see your role in that?	Understanding if they would like to be involved in further projects. Understanding if they see themselves as having an active role in the community.
Do you envisage a more national or international Biomim community	Understanding how they see the European community and whether it should be an organised organisation or a consortium. Where they see the strength to be.
Would you like to be involved with any larger projects that go forward through COBIOM	Getting people onboard with any new European Biomimicry Alliance and seeing if they are willing to commit resources (time) into the development of the new network / project.
Additional insights or thoughts on the movement.	Allowing them to fill any gaps in my questions with their own perspectives on the community.

Results

Observations of the Biomimicry Community.

Through semi-structured interviews with 20 members of the European Biomimicry Community (EBC) a broad canvass of the EBC was created. Insight was gained into the EBC's needs, what forms the community took and how it would like to see network evolve. The following results are a summary of the broad range of perspectives on this matter. For interview summaries please see the Appendix.

Most organisations are involved with Education, Showcasing and Consultancy:

Most organisations within the community see their role as helping others to do Biomimicry, mainly via education, consultancy and facilitation. Some organisations report their role as showcasing whereby they act as a focal point to show the BM space is active and successful. Larger organisations within the EBC also endeavour to network with other sustainability professions and create a nexus of sustainability practices. Some higher education institutes believed their role was more in the standardisation or verification / validating. What all these organisations have in common is their desire to propagate Biomimicry and use it to increase sustainability and reconnection with nature.

Biomimicry is one of many tools:

A surprising insight was that many BM organisations are using a wide range of sustainability methodologies. 4 / 20 asserted they only used Biomimicry but the 16 tailored their sustainability approach to their clients. Even the most conservative organisations, such as 3.8 have been influenced by other more recent philosophies and technological advances such as bio utilisation. In the words of one interviewee "True innovators use whatever tools work".

What Biomimicry often came back to with the organisations was the principle of nature being a measure and bearing in mind 'life's principles' with 18/20 mentioning the principles. Nature as a model, either through biomimetics or bio-utilisation was also for used for 19/20 and especially for those involved in product design.

Biomimicry is being up taken but some organisations don't like the term:

Speaking to consultancies in the BM space, they reported that companies are starting to use BM at a model level or in the bionics space and 17/20 said they see some level of adoption within companies. Some companies did not use the term Biomimicry per se, but rather used terms such as bio-innovation or natural inspiration. 4/20 interviewers felt as though biomimicry had a stigma attached in their countries or that it wasn't valued as a philosophy. One way this manifests within BM organisations is an altering of the emphasis of different biomimicry principles dependant on client. As a result, materials may be referred to as natural inspiration rather than Biomimicry. One perspective gained from this is that there are many research groups and businesses who use BM who might not be aware of the BM community and what value it could have for them if they became known. Targeting these individuals to join the community could be useful for increasing the technological and product development side of BM creating a stronger presence.

The current EBC:

The current European biomimicry community is fragmented but friendly, driven but dormant. Mostly residing in Western Europe the European biomimicry community exists in different forms. From one perspective it is a professional network of change makers who see nature derived design as key for improving sustainability. From another perspective it is a group of friends with a shared philosophy

of change but without the resources or initiatives to powerfully exert their beliefs. One perspective that bisects this boundary is a slight tension between those who use follow Biomimicry dogmatically and those who use it liberally. 6/20 interviewees explicitly mention this tension existed when the European Biomimicry Alliance (EBA) was attempting to be formed for several reasons, foremostly the definition of what Biomimicry meant. This led to a slower shared vision being formed and disagreement. Secondly what Biomimicry certifications were valid and whether the Biomimicry 'DNA' was being eroded. This relates to an intrinsic difficulty within this community: how to be an open and inclusive whilst also trying to preserve the Biomimicry 'brand'.

One group which doesn't fit as strongly with this mould are those within the academic institutions. Academic institutions focussed on creating relationships for students to gain experiences and so members of this group had broader relationships with a strong academic focus rather. This contrasts private BM organisations which have to focus on profitability to maintain themselves. An interesting dynamic this adds is that the institutions are able to supply BM organisations with inexpensive interns which allows the interns to enter the community. Those who have a positive experience within an organisation are then able to join in to the inclusive BM atmosphere. What may prevent graduates staying within a BM organisation is that very few BM organisations are profitable enough to hire a full paid position as many are volunteer and NPO organisations.

16/20 of those interviewed suggested that they wanted to work together more but 8/20 felt as though they lacked a defined reason to collaborate, except on individual projects. Most members suggested that working towards the EBA had failed due to a lack of (collaborative) projects. Interestingly, many of the members felt information exchange is a valuable exchange for the community. Information exchange allowed the groups to see what each other were doing and can act as inspiration or motivation. This typically had been via the various shared groups, such as social media groups, but becomes difficult as the social media platforms become dormant. The dormancy issue is partially fed by the lack of fiscal value in the information that is shared. Lack of fiscal value in shared information means there is little benefit for busy professionals to spend their time looking at what areas others in the field are innovating. This means that the network has a value to them in the form of sharing information, but a lack of fiscal value means that small private organisations don't have the time or resources to invest in sharing and staying up to date with the EBC.

An interesting interplay that existed within the European Biomimicry Community is between national, international and transatlantic relations. Typically, those who had gained certification from The Biomimicry Institute in the US had a more transatlantic perspective as well as a European network. Those from countries where Biomimicry was more established, typically had a stronger national professional network. One perspective common to interviewees from all countries was that any European community needs to have connections both nationally and across Europe to be strong.

How do Europeans in the Biomimicry space see the community developing?

Members of the EBC would like to see greater connection but stated any further European wide organisation would require a defined function and mechanism of working together. Projects and spaces like the EBDC on COBIOM were mentioned as focal points to start gathering the community. Perspectives on how to build the community differed, with 5 of 13 of those commenting on the structure suggesting it needs to happen organically in a self-organised mechanism. The other 8 who commented on the structure suggested that a top-down organisation would speed up the processes and increase the voice of biomimicry throughout Europe. Through creating a define organisation, strategic oversight could be developed and using a rotating leadership would ensure all regional BM groups had an influence.

Top-down perspectives suggested each national organisation would act like an antenna to communicate to the other national organisation and then within each national organisation was a local network. In either perspective, the information exchange needs to continue and accelerate to increase the feeling of connectivity. The network should also meet regularly to allow new members to meet and as a medium of information exchange. One idea was that those who are willing to make the full commitment to the community should be able to help form it but those who weren't as committed would have less of a voice. This problem exists due to the aforementioned difference in certification that exists and some members being more part time.

Some saw a formal organisation into a network as an outcome of a more productive community and stronger national or regional actors, whilst others saw an organised formal network, such as the EBA, as a mechanism to increase productivity. The network first perspective stated that a stronger European community would create the appearance of greater professionalism and push BM to the front of the agenda. Collective bargaining may also increase attention from larger political bodies.

What all the interviewees had in common was a desire to become more integrated but found it a struggle to find a mechanism that would be suitable.

Concluding remarks on the current community and their perspectives.

The European Biomimicry community as it exists today is entering a 2nd generation. After an initial spreading of Biomimicry in Europe there has been a slight dormancy where only a few of those in the community have been able to reach full time productivity and make a living through biomimicry. Now the community is beginning to become more active with initiatives being set up and proposals being drawn. Focal points such as COBIOM have been mentioned as being able to draw members together again. The uptake of BM in institutions has led to an increase in scientific and professional bio mimics. The inclusion of other sustainability principles within BM has increased its flexibility and diversity. The proliferation of bio mimics through education materials, consulting and facilitation has enabled people from a range of disciplines to become biomimicry users. This proliferation is enabling it to permeate into other sectors where it is becoming more recognised. Members of the Biomimicry community now want to increase their voice further and collaborate to have greater impact. In order to form a community, they need shared purpose and mechanisms¹ to do so. Any mechanism should be inclusive but defined, share a 'DNA' but be locally attuned. Ultimately to receive high uptake any mechanism will need to be profitable, whilst sticking to the sustainability focussed approach.

¹ A mechanism is any mode of working or action that can take place. Examples of mechanisms are provided in the third section of the report.

Discussion:

Form to Function: Suggested mechanisms for galvanising a community.

Community building can be defined as activities which foster positive interactions between people, organisations, groups and other entities (Weil, 1996). Communities expert Stan Garfield suggests that people join communities for a few key reasons. These reasons include innovating, learning and collaborating with one another and sharing ideas (Garfield, 2014a). The Biomimicry community is no different and is driven by an urge to share biomimicry best practices and projects so that the community can thrive. However, research on modern communities shows that problems with valuation in community is common. According to CMX community industry report (2021) 45% struggle to quantify the value of their community. This section will focus on what makes communities successful with examples from other communities and will also suggest some options on how mechanisms or forms that could be used to create a stronger, more valuable, European Biomimicry Community (EBC).

Generic principles of Community building

Usually, to form an effective community it is valuable to create a set of shared ideals and values. Shared values are considered paramount and without which communities cannot form (Gardner, 1994). This is a fractious issue as some from the biomimicry community some have argued the biomimicry values have already been described by The Biomimicry Institute. A non-aligning perspective is that a European context demands a more European perspective and so biomimicry should be adapted. One methodology to deal with this would be to take a similarities approach. Despite stark differences, similarities between alternative cultures can be as high as 80% aligned and this can create pan-cultural value hierarchies (SCHWARTZ and BARDI, 2001). This could potentially be applied to the biomimicry community to enable a hierarchy of joint values within the different biomimicry subcultures.

A more long-term approach would be to engage in dialogue. Dialogue in this context involves a reduction in defensiveness and allowing of all members to speak rather than the loudest voices. It is more of an effort to understand each other than convince each other (Kirk and Shutte, 2004). The advantage of this method is people are more likely to come together and accept a level of uncertainty (Klein, Gabelnick and Herr, 1998).

A key component of any community is its leaders (Weil, 1996). Good leaders should promote ownership, understand the group and be able to strategize, organise and implement campaigns and projects (Staples, 1990; Weil, 1996). Sociocultural leaders can differ from stereotypical charisma leaders and be local leaders due to their context within the local ecosystem (Kirk and Shutte, 2004). Effective communities also require intermediary structures which provide critical appraisal of larger structures and can help implement policy at a local level (Weil, 1996). Local communities can have their own targets and agenda, but this should feed into the larger structure (Gardner 1994). These groups could be self-evident in the BM community due to the national BM organisations. There is an interplay also between leaders and groups, where leaders can help intermediary groups solve their local problems or find new opportunities (McNeely, 1996). In the BM community this can be seen when leaders from developed BM organisations contribute towards less developed BM organisations in other countries. This should come in the form of empowerment where collaboration can build capacity in local groups and help them enter into networks of their own (Simon, 1994). Empowerment aims to avoid an issue of dependency on the overarching structures which could occur if a national BM community is new and inexperienced (Kirk and Shutte, 2004).

One way to build community ties is through group participation in activities. The investment in a task creates stronger bonds in members of the community and can act as an information exchange (Gardner, 1994). If tasks are done in person it adds face to face interaction which can go on to create a value exchange (Gardner, 1994). When tasks are completed and ownership is generated it creates a sense of both responsibilities and belonging (Hamdi, 2010). This enables those who have participated to be more invested in the outcomes of their labour and so have a vested interest in the community project succeeding. The involvement in joint tasks can also change the balance between a member of a group feeling marginalised or mattering. People tend to feel important, central and that they matter when people start to rely on them. This importance extends when there is also appreciation of their efforts (Schlossberg, 1989). Clearly this has been identified as one of the issues in the EBC as few organisations have projects to work on together. Therefore, there will be a need to recommend alternative coworking strategies.

Rituals and ceremonies can be an effective mechanism to incorporate individuals into a community and putting on conferences is a mechanism that the BM community has co-worked on in the past. In introduction rituals or ceremonies individuals are highlighted as different, go through an act that everyone else has performed and come out of it as part of the group (Schlossberg, 1989). Ceremonies can have a range of functions including showcasing values, creating bonds within groups and even building useful competencies (Dandridge, 1986). 'Bees' in frontier settlements in the US involved stints of difficult work amongst neighbours and created a sense of community (Dandridge, 1986). The benefits of these bonding exercises in groups are also seen in academic environments, where those who take part in rituals have been found to be more supportive of peers and peer learning and moves the classroom towards a community-of-practice (Olitsky, 2006). Therefore, it could be useful to the EBC to periodically initiate new members into the wider community. Cautionary advice in ceremony suggests that if inappropriate initiation or ceremonial practices are observed it can also decrease cohesion (Raalte *et al.*, 2007).

Diversity in communities is a valuable asset that could help shift the impasse of different perspectives on what biomimicry is. Diversity can lead to different perspectives and different enclaves of power / influence within a group preventing over concentration of power in one place (Parekh, 2001). Additional benefits of diversity are listed by Parekh (2001) as creating a more encompassing view of values and allowing greater self-consciousness and self-critique over the strengths and weaknesses of one's own values. Diversity also relates to prosocial behaviours (Nai *et al.*, 2018). Nai *et al.* (2018) found that people in more diverse countries were more likely to have helped a stranger in the last month and this could be related to greater identification with humanity.

Another benefit of diversity is it attracts more members who identify with minority perspectives, this allows greater numbers to join your community (Talbert, 2015). This in turn has benefits as any community needs a critical mass in order to be effective (Garfield, 2014b). This is due to what is referred to as the 1% rule of communities whereby only 1% create content, 10% interact with content and 89% observe content passively (Arthur, 2006). According to research conducted on behalf of Deloitte, there is a much stronger increase in posting and activity after 200 members and this could be considered a critical mass. This also encourages increase responsiveness and is more valuable to those involved (Romero, 2014).

In conclusion, communities form around shared values and purpose and use the community to be fulfilled in some way. These shared values as well as bonds can be created by co-working on projects which in turn builds a sense of community. Some sense of shared value can be instilled artificially through the use of ceremonies to increase a sense of belonging. For newer groups with less experience co-working, leaders from other groups can help build capacity and enable start creating

more of their own projects. Finally, a successful group will incorporate diversity, making it a more open society that includes more members. If a European biomimicry community was determined to form it could use these principles to help it grow.

Case studies of successful communities:

Case studies can be very helpful for inspiration to what works or how to bring added value.

Habitat for humanity is an NPO house building association in the US that became one of the largest builders of affordable housing stock in the US. Their operations model relies on community members fronting small loans for the costs of building the housing and then uses volunteers to physically build the houses. The homeowners then pay back the loaners their money, plus a bit extra to pay for the next housing operation. When whole communities are built like this it creates a shared sense of joint ownership and active participation (Weil, 1996). This model ties into the biomimicry model which is often run partially through volunteers. This model reiterates that co-working builds community and suggests that small contributions to a larger project can spread the cost of building something bigger.

Another example of a successful community is The Women's bank of Sri Lanka. This is a successful community banking co-operative group which spread rapidly through simple rules and resource pooling. At first women would pool together the small amount of resources they had and elect a local leader to decide on investment strategies. As of 2010 the bank attracts over 7 million in investment per year. First 'branches' are set up locally and allowed to grow until they reach a critical mass. The maximum allowed in a group is 80 after which it must split into a smaller group. A branch is more of a network than an institution or a building and the members can meet anywhere. Meeting attendance is a necessity for those who want to decide what *their* money is used for. By being involved in local development the members also become more involved in their local communities. (Hamdi, 2010). This model has implications in the biomimicry for how it should scale up, using smaller local groups which can be incorporated into the larger strategic perspective when they have significant mass. It also shows the importance of staying local and integrating with the local community. In the Biomimicry context this could mean being more integrated with local sustainability groups or [innovations hubs](#).

The Atlassian community is a very successful and recognised SaaS² community. They exist as an online community, a community events committee and a social care team. It works on the basis of connect globally, meet locally. This is very relevant to the biomimicry community, which is also spread thin but thrives during conferences. The community events committee and online discussion threads are able to synergise which lets them add more value to their community. Atlassian has identified a few key elements to their success which include investing financially in the community, focus on the business impact and start with the community you already have before trying to scale (Cass, 2021). Given the existence of the EBA this could be very relevant to the EBC and any community which formed around biomimicry could use the pre-existing dormant community. This can also mean upgrading community champions with titles and responsibilities, validating them and increasing engagement (Spinx, 2021). New users of Atlassian products are onboarded through the online community and so become aware of it immediately and engage with it more. This reduces dropout by 2-3x (Cass, 2021). This could translate as getting recently trained BM users to get involved in the various social media channels that exist for biomimicry.

² Software as a service

The CEEBIOS (Centre Européen d'Excellence en Biomimétisme de Senlis) is a French BM community. The CEEBIOS has successfully promoted biomimicry in France, ensuring BM recognised nationally as a design methodology. They initially promoted BM through acquisition of grants for BM academic groups and this enabled them to have a level of oversight into the community whereby they became the de facto source of authority on the actions of the wider French community. This has meant groups reach out to The CEEBIOS when they want to know about biomimicry or use biomimicry, further securing their place as a source of knowledge. This canvassing and funding methodology is described as federating, a process that allows the 'archipelago' of biomimicry groups to work together and become aware of each other. To propagate knowledge, they host events which act as a 'lagoon' where BM practitioners from different 'islands' can share their ideas. Initially funding was provided by subscriptions to articles and information from the BM space but after becoming a source of authority they are now receive 80% of their funding from consultancy. Where the CEEBIOS differs to most of the privately run BM organisations in Europe is that they did not set out to be a consultancy or educator. The organisation was created to help the community of BM practitioners become more connected and through this activity became a source of authority which enabled it to teach others and become a consultancy. They had a purpose; this created a business⁶. This emergent business case has interesting implications for the rest of the biomimicry community and suggests simply being a hub of information and developing partnerships could be a better way to grow the community than working on individual projects. (Appendix – [The CEEBIOS interview](#))

In conclusion, the Biomimicry community could learn from the principles found in these case studies to try and reinvigorate itself. Trying to create shared values, whilst accepting diversity, and finding its own leaders to help push the mechanism through. Most importantly, the community should be purpose driven. If invigorating the community can help with the very common issue of poor engagement and the EBC is able to run effectively, it could be hugely profitable. Some successful communities are currently being worth over \$500,000 (Cass et al., 2021). That would be a significant increase in productivity amongst European BM organisations.

Suggestions for mechanisms that can help the biomimicry in Europe

The European biomimicry community can use some tips and insight in how to generate more commitment, and a network. This section aims to provide some suggestions and a few mechanisms that could help generate more of a network within the European Biomimicry Community. This draws on standard community building theory and the examples provided above. Ultimately the mechanisms are only suggestions, and the biomimicry community will have to decide how they are implemented.

BM Wide Certification.

The dichotomy of the Biomimicry community is a wish to connect with each other and be open whilst also wanting to protect the biomimicry brand. A mechanism that could help alleviate this problem is by co-creating a certification of BM that could be recognised in Europe.

This mechanism will allow all organisation that offers BM training in Europe to come together and co-create. Co-creation fulfils the needs of the community who want projects together and implements the community building practice of co-working. At the same time, the co-creation can be a chance for value exchange and dialogue to take place. This can allow a common framework on defining biomimicry to be made more concrete through sharing values. This gives a space for all perspectives to be heard. Co-creation then increases the responsibility of all the members to the new system and ensures they try to propagate it.

Being led by the most active members of the community only those who are willing to put resources into the process will be involved. This will decrease the influence of those less invested in the debate whilst simultaneously creating a future standard to allow the following generations of bio-mimics to receive similar levels of training, securing the brand. Checks and balances such as a disputes or advisory board could be implemented to try to increase the democracy aspect.

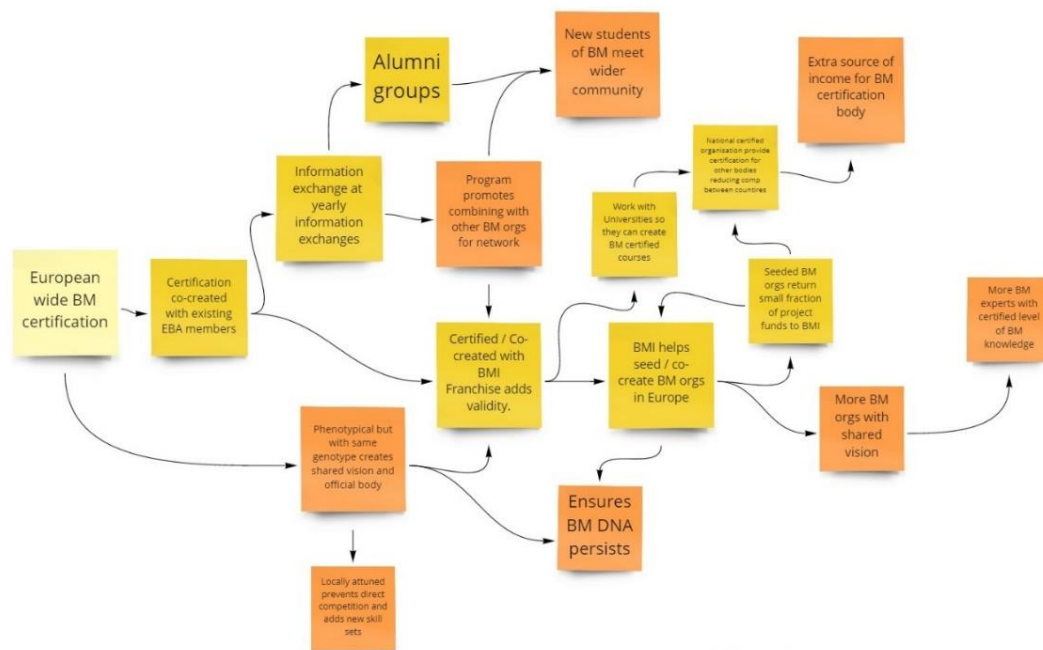


Figure 3. Idea 1 for helping reform the biomimicry community in Europe. Idea in beige, mechanisms in yellow, benefits are in orange.

The biomimicry institute has a vested interest in preventing brand dilution and so could be a part of the discussion. The Biomimicry institute could increase its influence by using a franchising method

with potentially some of the income derived from certification going back to them. Similarly, using the large resources and international reputation they could help seed new BM organisations in Europe through a combination of European BM certified and US BM certified actors. From the institutes perspective this would enable them to have a greater stake in the European context and from the European perspective it would ensure capacity building within European organisations.

Using BM wide certification would allow a widely accepted base layer of BM training creating a biomimicry DNA, however, allowing each organisation to specify according to their local ecosystem will create a 'biomimicry DNA', which will persist through Europe, but allowing there to be phenotypically different expressions of BM. The advantage of this is that it prevents direct competition between BM organisations as they attract slightly different practitioners with different specialisations. Diversity of skills, locations and cultures will strengthen BM community.

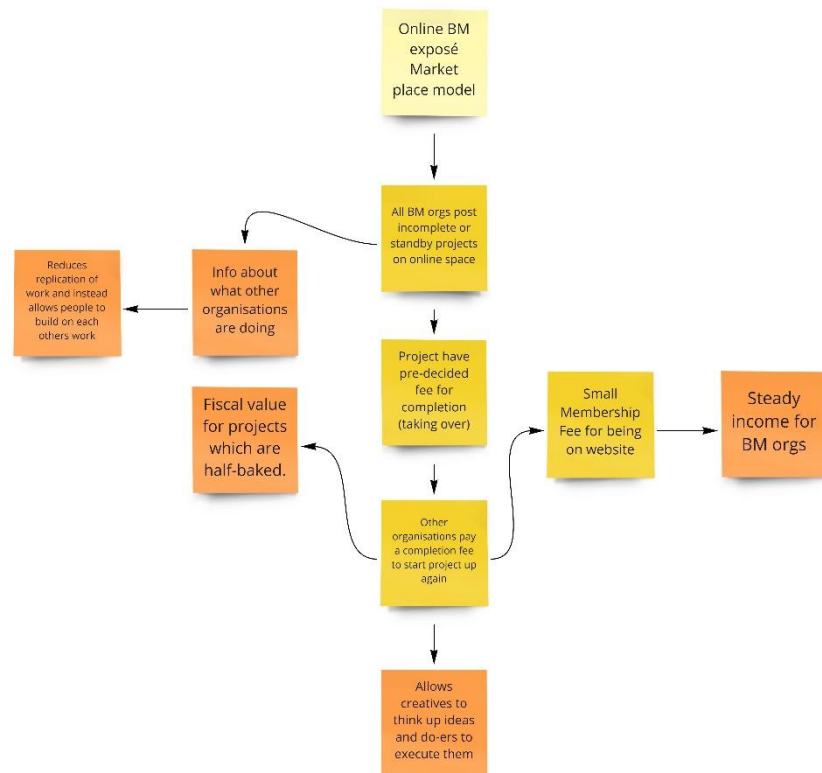
One key aspect that bio-mimics wanted from their new community, which has also been identified as good practice in case studies, is physically meeting and information exchange. The certification process could also initiate ceremonial meetings or a conference with the joint graduates of the various certified courses in Europe. Ceremonies have been shown to increase the feelings of identify in a group and increase participation. Moreover, by seeing other student-projects information exchange would occur. Additionally, this would be an opportunity for the new graduates to meet the other biomimicry actors and integrate themselves into the European wide community. This could be increased further with recommendations of transfers between biomimicry courses or other forms of co-working. Further integration between 'generations' of the Biomimicry committee could help move the BM community from a network of what some describe as friends into a larger professional community.

The certification business model has increased value with more actors on board, BMI recognition and meet ups. This could make more organisations want to get onboard and receive certification. A snowball effect occurs when more organisations have certification and it becomes the norm to obtain it leading further institutions to buy into the certification (Kolk, 2013). Certification could be performed by local or national BM organisations and so could be the injection of value that BM collaboration projects require. Methods of payment and certification could range from a fee to remain certified to providing a certified course which extracts fees for use. This [7vortex](#) map depicts how many BM courses are being taught in Europe from higher education institutes, which could all be potential targets for selling certification.

Online Biomimicry Market place

Biomimicry is a multi-discipline perspective that attracts people from a range of backgrounds including those who are interested in art, design, robotics and architecture to name a few disciplines. Difference in discipline may mean that some groups are more able, or less able to complete projects due to different available resources. This leads to project duplication and many low Technology readiness level ideas being left on paper. At the same time, discussion with BM leaders shows they are interested in information exchange, but don't have time to use lots of social media channels to keep up to date with what others are doing. One mechanism to prevent people working in parallel but isolation and create more value to keeping up to date with other's projects is an online biomimicry marketplace.

Idea 2. Online Biomimicry marketplace visualisation. Idea in beige, mechanisms in yellow, benefits are in orange.



The marketplace would be an opportunity for students or fledgling bio-mimics to present their research and ideas online if they are unable to take them further themselves. They could decide a buy in price based on how much effort was in the idea, what technology readiness level it had reached and its potential for the market. Other organisations can then pay the fee if they see value in it. Like any marketplace sellers could have ratings to let buyers know what sort of value had been created from this sellers' ideas in the past. This creates fiscal value to biomimicry projects and this website then acts as a focal point for biomimicry innovation. This could potentially work as a magazine with a paid for subscription to allow funds to enter the community as a whole. A chance to gain value increases the other members of the biomimicry communities' interests in the site and thus more information exchange happens. If groups see value in an idea, they could also collaborate on it with the owner, creating more group projects. Institutions can share the ideas of their students so that further iterations of students can develop the idea further in cycles of research and innovation. Similar platforms for open innovation exist in the pharmaceutical industry (Carroll *et al.*, 2017) as well as through tech and fast moving consumer goods (Hossain and Islam, 2015). This has the potential to grow as a place to sell learning materials and be a space for the whole community to interact. This can be seen in Market Networks, where multiple buyers and sellers exist in a transactional space where your profile is as important as your product (Currier, 2015).

This idea has the potential to fit into the certification model as students who go through the graduation ceremony could submit their plans to the BM online marketplace. This would ensure periodic idea generation.

Joint committee on Biomimicry funding

One issue held by the biomimicry community is difficulty securing funding for their organisations. Conversations with BM organisations have shown they are typically small and so cannot afford to pay a member for several weeks whilst they write up proposals for funding. In addition to this, small numbers per organisation means their individual voice is small. One mechanism to get around this could be to spread the cost of writing proposals with the BM groups.

Mechanistically, a group or committee of several experienced BM professionals could be assigned a budget which would be supplied from the other BM groups. They would read drafts of funding proposals from different members of the community. If a draft was approved the applicant would receive a small amount of funding whilst they wrote the proposal. This money from a successful proposal would then be fed back into the community.

The main advantage of this committee would be its ability to allow distribution of risk amongst the BM community and give it a louder voice as a combination of many BM organisations and their collective skills and resources. Having a rotated committee would also mean it could bring together BM practitioners who might not usually interact. This would also act as information exchange due to proposals being sent to the committee, allowing them to know what groups were researching.

Funding for sustainability incentives is increasing. Very visibly there is the Green New Deal incentives, Horizon, The European Innovation Centre and the European Institute of Innovation and technology to name a few. By professionalising the application process the BM community would access more funds.



Idea 3 for EBC co-working. Committee on joint application. Idea in beige, mechanisms in yellow, benefits are in orange.

In conclusion, any community that forms will need to do so by its own volition. The EBC can use a range of mechanisms to try and increase connection, information sharing and importantly fiscal value within the community. By coworking and co-creating they should be more able create a defined sense of self. Each mechanism has pros and cons (table 2) but ultimately it will be their execution, and the commitment from the community that dictates their success.

Table 2 – Pros and cons table of different mechanism described to enable the biomimicry community to work together.

Idea	Pros	Cons
European Wide certification	Create a defined sense of what biomimicry is.	Creates some division or discrimination between courses and their deliverers which could increase division.
	Created by those who are committed to BM.	Lose out on interesting and diverse perspective from busy / experienced people.
	Has opportunity for ceremonies and greeting events.	Exclusionary for those who can't attend.
	Generate shared content to help bind the community	Has an initial time and resource commitment which could provide to be unfulfilling.
Biomimicry Online marketplace	Allows sharing of BM ideas to people who can do something	Potential for exploitation of those with resources.
	Prevents duplication of work and especially research.	High uptake and the uploading of historic projects may be needed to get a full picture.
Joint committee on Biomimicry funding	Distributed risk and distributed rewards enrich the whole community without causing any individual organisation to feel the strain	Requires an initial investment from the community for both the committee and the stipend of the draft writers.

Closing thoughts and future prospectives

The European Biomimicry community is filled with people with excellent ideas who want to make an impact. The mechanisms described in this report are only suggestions for how the community can be brought closer together, from a projects and co-working perspective. Closer collaboration will lead to a degree of connectivity but is unlikely to initiate a larger overall organisation as an emergent property. Any effort to create a larger organisation could follow a model that is seen with The CEEBIOS, the biomimicry network of France, who started small and expanded the network, rather than trying to create a network everywhere all at once.

Appendix: Stakeholder Interview summaries.

Disclaimer: All interviews were conducted and summarised by the interviewer in English. Due to the diverse range of participants interviewed and cultural differences related to this, it is possible some perspectives were misrepresented, despite every attempt to clarify details. If you feel you have been mis-represented, please get in touch with edwardpaddon156@googlemail.com and changes will be made to the transcript.

Stakeholder 1: Biomimicry UK – Richard James MacCowan

Richard described the role of his organisation to be consultancy and outreach to promote biomimicry (BM). This mostly focusses on highly polluting industries such as urbanisation, manufacturing and agriculture. He is pragmatic preferring to use “Whatever works to increase sustainability” from 3.8 methodology to bio utilisation.

He sees the network as underdeveloped including many ‘part timers’ who don’t rely on it for their main source of income. This creates a professional divide between idealists and pragmatists and prevents a working definition of biomimicry being reached. He wants to develop it by only focussing on people in a position to help the community full time and fund high technology readiness level projects. It should also ignore low TRL. His research suggests many organisations use BM without explicitly referring to it as such but could contribute to the network. The network needs to work on multiple levels if a project is more location based it should utilise a more national network and equally international projects should leverage the international network.

Key insight – Any new community would need to focus on professionals and be led by people committed to the cause.

Stake holder interview two:

BM organisation is a small volunteer run organisations whose main focus is promoting biomimicry, especially in educational institutions. This promotes people experiencing nature in a tangible way, specific to their own background / life stage. A wide definition of BM is used, and other sustainability practices are used to avoid missing out on roles, especially in Spain where BM is not widely utilised or recognised.

The biomimicry community is currently very fragmented. There is a divide between the 3.8 users and the casual users that prevents a definition of biomimicry being used. There is also competition between different organisations to get limited opportunities. The breakdown occurred approximately 3 years ago (2018) when an Erasmus grant was denied preventing further development of the EBA programme. In the future they would like to see a more generous value exchanging community. We need an international community for the bigger projects, but it always has to start with a community. Having already had a successful career, they see their role as a mentor, teaching and helping others to make a change. They are also involved in conference planning to hopefully get people together.

Key insight – BM is perceived differently across Europe and broader sustainability definitions can attract greater numbers of clients. Additionally, failed projects can significantly dishearten attempts to form a community and so a well-thought-out proposal is required. Physical meetings help strengthen the community.

Stakeholder interview 3:

Biomimicry is both a philosophical and practical tool. The role of their university is to teach the philosophical and allows a connection with nature to be formed. The organisation allows them to use it practically and showcase biomimicry and increase efficiency in business. When dealing with business alternative methods are also used such as circular economy or use life's principles rather than the biomimicry methodology. Many organisations use BM as a tool and even the purist BM's still use additional tools.

The biomimicry community have not met now for years despite some really great physical sessions. Not a clear way to work together despite shared interest. No clear collaborative projects to work on or money to valorise. However, they would like to see the community work more together but it's not clear how. Projects should come from collaborating and the community built up in a self-organising manner. They are willing to contribute towards such projects but don't see themselves leading or organising a wider community. National organisation such as CEEBIOS allows a lot of strength but becomes limited and an international community can do much more.

Key insights: The community doesn't provide each other fiscal value. Physical meet ups are considered a measure of harmony and an opportunity to take the relationship further. Biomimicry is restrictive and difficult and so other tools have to be used in addition.

Stakeholder interview 4:

Company was built as a social enterprise and its role was to help poor tea farmers, however it the business case demanded it become a luxury wine product for and that prevented it going forward. BM was followed tightly at first but became impossible to be a feasible business case and that made us lose faith despite being really hopeful about the promise of BM. BM doesn't fit with everything and so a range of other sustainability frameworks have to be used.

The network is full of helpful well-intentioned people but doesn't provide fiscal value. More of a community of friends than colleagues. To evolve it they would like to be involved with projects, perhaps as a representative of the business industry. It needs to be quite international to reflect how Europe does business.

Key insight: Possibility to become disenchanted with biomimicry process when it doesn't fit. A wider sustainability definition would provide more flexibility. Some organisations / industries are very stuck in their ways which prevents use of BM.

Stake holder interview 5:

Company works to develop sustainably communities which evolve over time and exchange value. This uses biomimicry 3.8 as a basis but goes more into bio inspired innovation. Lots of the independent work they do is with new up-takers of BM who need mentoring. This empowers them to solve their own problems.

The community is sporadic and not filled with a defined purpose other than often proliferating BM. It doesn't hold much value to them. An evolved BM community would have a symbiosis and value exchange; a reason for members to be incentivised to join. This would occur at a local level first and move up as a nested system. They will contribute to this by leading projects in tandem with the community, not pushing it.

Key insights: Any community in Europe will be locally attuned, this is beneficial for value exchange especially where skills are concerned. A purpose is needed for a community to form around.

Stakeholder interview 6:

Company showcases BM working to solve complex problems. By using BM and a range of environmental science principles a humble systemic approach is created. This also includes users from other disciplines to BM as this creates a more innovative perspective. This may include BM users who do not identify with BM movements.

The EBC has a strong relationship in the foundation fostered by people with a shared vision who became friends. Overall, it lacked a defined enough purpose to thrive. The broadness and inherent inter-disciplinary made it difficult to create a broadly expected definition of the organisation and BM, driven partially by the friction between casual users and 3.8 users. It also fails to recognise the differences between countries and their own BM backgrounds, Germany is more bionics based for instance. The value of the EBC is information exchange but to become more valuable it must start increasing its funding for projects and generating business cases which form start-ups and propagate the movement. This is generation 2 of the EBA. *Me and My company* work to bridge a gap between academic and business society and hope to be an inspiration and mentor to other business that want to do the same. To build a strong international community there has to be a strong national community which has an antenna which acts to report the information back to the central international community.

Key insights: A community needs a defined purpose or shared project to stay tightly formed. A broad definition of BM and different sub-cultures within BM make it difficult to be completely inclusive to everyone's views. The new generation of the European BM network can be formed by financing and initiating start-ups.

Stakeholder interview 7:

The role of Utrecht University is to create a scientific approach to BM that also helps standardise it. It will generate scientifically minded BM professionals and so create more prestige to the movement. The secondary node is that the NL and Utrecht can act as a BM hub or node for internationals to come to. They use BII to encapsulate a wider sustainability perspective than just BM. They also see this in companies where BM is used to varying degrees and from different perspectives. Due to its inter-disciplinary nature, it attracts people from a range of disciplines other than BM too.

The EBC is one of value driven enthusiasts where teamwork is promoted. They are able to send out students into the other BM organisations and so we develop strong relationships with them. The value of our community is internship opportunities and expertise. Despite the different approaches in the BM community, it should evolve into what appears to be a unified front to the outside world. Internal perspectives are important too, but a shared overall vision could unify the community. An international community can provide a top-down standardisation and also provide help from the stronger national communities to the weaker communities. This would also increase ties between organisations.

Key insights: Due to lack of standardisation and varying levels of funding and organisation of BM organisations it can be difficult to guarantee quality learning experiences. This prevents the university engaging with some BM groups. By providing scientists into this space, we can help increase the validity of the practice.

Stakeholder meeting 8:

They uses a range of BM forms to teach a design course, as they are an associate professor, they also responsible for forming future materials which allows them to shape utilise BM and include it in the curriculum. For outreach I am also involved with spreading BM through work with NFP. BM is sustainability driven but other forms such as bio inspired innovation can be superficial as they don't use the principles of nature. However, a range of Bio design formats are useful to be more widely applicable.

The Biomimicry community has lost touch with central Europe leading them to feel uninvolved. More physical meetings and conferences should be used to increase the community. A Shared depository of BM activities and projects could be developed between educational institutes so people could pick up on each-others' ideas. This would also allow cross-collaboration. This should occur in both an international way to allow for different perspectives and cultures.

Key insights: The Biomimicry Community is mostly focussed on the connections that exist in western Europe and is underdeveloped in eastern Europe.

Stakeholder 9:

They propagate BM in Austria whilst also suggesting generating their own methods of Nature inspired Design. In their experience innovative people use whatever works.

The BM community in Europe has been a poor experience for them. People within the community didn't adhere to BM and some were too abrasive and raw to have a pleasant discussion with. I am mainly interested in the 3.8 network who share common values and want to use BM for good, not for profit or marketing purposes.

Key insights: A few abrasive characters can create an unpleasant environment when a joint vision needs to be created. Professionals further along in their career or that are working within institutions have less necessity to use BM economically.

Stakeholder 10:

Involved in the formation of Biomimicry Academy and Biomimicry Germany to create a Biomimicry network and enable professionals to seed BM into their own organisations. This tailored the BM from 3.8 into a more European version. The course has progressively encompassed other philosophies like human centric design to make it more applicable.

The EBC is very scattered at the moment. Mostly individuals have on and off phases which prevents a consistent BM movement existing. Often exchange occurs passively through reading about what others are doing when they exhibit it. We need it to involve into more think/do tank, use hybrid approaches and become more action orientated. I see my own role in this as overall strategy and moderation but needs the organisation and mentoring to be supported by others who have more time. This network can be supported by the trans-Atlantic organisations to create an overall aligned strategy.

Key insights: The old EBA used a lot of organisations which slowed everything down. A new organisation should be based firstly on action and projects and then co-ordination. The old EBA met every quarter which allowed lots of knowledge exchange.

Stakeholder interview 11:

Runs a national BM organisation from where they try to shape the global and European community through actions such as the COST proposal, this is meant to create a more official community which will also provide funding for meeting and travelling. The organisation also uses other sustainability practices.

The current BM community is still trying to get to know each other and work on their own challenges. The value of the community to me is increasing the presence and bargaining power for their own activities. The community will evolve into a structured consortium of national representatives which will create a 5-year strategy plan.

Key Insights: There is already an attempt to form a top-down BM organisational body. Making a more official body will be valuable for bargaining.

Stakeholder interview 12:

The role of the organisation is to sensitise people to biomimicry through showcasing ideas. By seeing Biomimicry from a systems level, they are able to use many other sustainability perspectives including regenerative economy.

The EBA is fractured and wants, as well as needs to meet more. There is currently little communication between hubs. There is a big opportunity for bridges between France and the Netherlands as the two more developed / mature BM organisations in Europe. They gain value by collaborating with people in other countries because Belgium, from where they operate, is moving slowly and so to create connections and value creations they must look elsewhere. The evolution of the BM community should move towards being more of an information exchange. Working on projects together across borders to bring best practices and experiences back into their own community is a useful method to achieve this. This is a cross pollination and feeds each other. Once we have a more united front we should start connecting more with other networks. Their role within this is to showcase projects and work on projects, collaborating with people and building ties.

Key insights: Some of the places where BM is thriving have green political people and so these should be targeted as places to try and begin collaborative projects. A more multi-discipline approach is required so we need people from very different expertise doing BM.

Stakeholder Interview 13:

Is a graduate from the BMA. They used BM amongst other sustainability practices to work on societal based challenges. By moving to Britain, they have a perception of both national BM movements (UK/GERMANY) including through her university which contains a BM module for engineers.

They see the community as being open and friendly and wish they could be more involved but have too much to do for my studies to pursue the projects they were a part of. Despite this they have been contacted by EBC people which increases a feeling of inclusiveness. There is an occasional under current of science superiority which can be disheartening. Their current value is from inspiration and passive knowledge exchange. The community is already developed, and they would simply like to be more involved.

Key insights: Biomimicry qualifications are a great way to enter the community but do not necessarily equip an individual with the skills to start actively using BM independently.

Stakeholder interview 14:

The founder of one of the founding organisations for the EBA and worked for the NPO organisation 'The Biomimicry Institute'. Their organisation works as a convening space for the members of the national BM community to come together (a network hub). They come together to produce materials and awareness and so act as a thinktank. This can then train multi-disciplinary people in the methods of BM to increase the spread of BM. The Biomimicry Institute works to produce entrepreneurial BM and create resources for the international community to use (Ask Nature / Taxonomy). The philosophy the Biomimicry institute uses has not changed a great deal since its inception and is still firmly grounded in the description provided by Janine Benyus. However it now recognises other methodologies such as bio utilisation as 'cousins' of biomimicry.

As a product developer they also help small start-ups which have a biomimicry focus or are formed on BM principles but also helps and consults with BM users in larger companies.

As both a member of the EU and US BM community they can see that Europe is good with top-down directives but poorer at company formation and so seeding organisations may be more useful. At the moment the EU orgs are not having a strong enough national foundation to work effectively internationally and so focus should be aimed at strengthening national alliances. How the BMI can help with this is keep acting as a hub for information and mapping. It also has the ability to bring people to the table and so can work as a franchising model. The BMI can also support starting organisation and potentially levy fees from other organisations like Greenpeace model for instance. This could work in a pay it forward or backward mechanism.

Key insights: The BMI exists as a potential source of financing and help for European organisations. European organisations respond to top-down organisation. Models of franchising can create validity.

Stakeholder Interview 15:

They are from a prominent BM org based in NL. Their role is 4-fold, Inspiration through showcasing, Education at multiple levels, facilitation and brokerage of BM and leverage of knowledge in other countries. Their org uses a tight definition of BM which can be altered slightly depending on the client or education level.

One perception of current EBA is that it doesn't really exist or that they are not part of it. It exists within some people who enjoy a relationship and lots of correspondents but doesn't see much action or exist so formally. A formalised network would be useful in speeding up the process of creating new organisations, self-organisation would work but slowly. However, any formalised network would require a genuine function. Once this was established a rotating leadership mechanism could be used that drives the EBA committees. It could also apply for schemes with group funding. Some people would currently see any BM org as a sentimental project rather than practical. There are many nested levels of Biomimicry networks with some people acting nationally, some inter-continently and it could be limiting to only act within the European space.

Key insights: Nature uses form to function and so should we. To do this we need a defined function. A committee on scheme application could be produced that pooled together small amounts of resources from BM organisations which could pay those who write applications for funding schemes etc.

Stakeholder interview 16:

They work for an academic organisation where they are doing a professorship in generating biomimicry methodologies. The purpose of this is to allow wider use of BM for organisation and turn it from a design philosophy to a practical mechanism to allow its wider use. This professorship relies on co-creating with stakeholders and so also makes BM more visible, this works on different levels of abstraction to generate value to different stakeholders.

The European biomimicry community as a group of excellent intended people who want to make an impact that struggle to deliver on biomimicry whilst earning a living. They provide value to each other in information exchange rather than project co-operation. The community feels slightly on stand-by, and we want to go forward and collaborate with each other more. A common platform to see what was going on would also be useful as a mechanism to keep up to date.

Key insights: There is a strong value on information exchange and physically meeting, a common platform where different projects are shown, past and present, will be useful for letting people know what each other are up to. Due to a split interest between being part of a community and getting your own work done there sometimes needs to be an opt out option.

Stake holder interview 17:

Stakeholder 17 works in Germany as an independent consultant having done the Biomimicry Pro course. Due to the broad range of projects they work on they doesn't limit herself to biomimicry but uses it as a tool and a perspective which can work as an undercurrent for her other tools. they highlight the uptake of biomimicry as being slow due to few BM organisations being able to showcase their work, typically focussing more on story telling.

They feel as though there isn't really a European Biomimicry community and it isn't using the right strategies for replication. The lack of coherent joint perspective prevents a unified outlook which in turn prevents further collaboration. Due to not feeling a part of it, they didn't feel inclined to comment on its evolution.

Key insights: A repetition of stakeholder 8 who was uninterested in the wider BM community

Stakeholder Interview 18:

Stakeholder 18 works in Germany for an active BM organisation which acts as a focal point for BM and as a business focussed hub. This helps to propagate the meme. It uses BM loosely and incorporates other tools to help with sustainability. Sees BM as part of the sustainability movement not a replacement for it.

He sees the BM community as something in which very few people are active but sees the organisation he is part of as fixing that and acting as a locomotive of progress. The current EBC is a series of overlapping initiatives with a shared interest rather than value. The value of the community is being able to reach out for experts and mentors for educational projects that are run, this creates cohesion but not financial gains. He sees the community evolving technologically first, getting together some form of website to help propagate themselves and become more official. This could also act as a mechanism to centralise knowledge so that we had greater information flow. One way this could be done is through initiatives like the EU COP or through conferences.

Any organisation should exist of locally attuned and locally affecting groups. These groups can be related to a wider EBC but need to be existing locally first, perhaps at the level of the city scape. As a result, the EBC itself shouldn't be a power structure but should emerge out of active groups.

Key insights: National assemblies might be too broad; most people live in urban environments and can be part of grass roots movements there.

Stakeholder 19:

Stakeholder 19 works for The CEEBIOS and provided his perspective on their growth of the movement. CEEBIOS focuses on helping a transition to societal problems by biomimicry and making BM a subject in France. It sees BM as the central perspective and you find other sustainability practices fit into BM. CEEBIOS gathers Academics, Civic society, research institutions and other stakeholders in biomimicry, 'we are not experts, but we gather experts. This first happened at SENLIS at military base which would be the biggest BM centre in Europe. At first BM seemed too interdisciplinary so didn't have any support and finance and grants because it didn't fit into journals or pre-established fields. Mechanistically CEEBIOS helped write grants. This was strongly helped by our Leader who has lots of empathy and never puts herself first and finds people who are interested and networks them together.

Federate – background was always about putting strong academic fields in biomimicry and gathering biomimicry experts as numbers show it's a field of interest. This then became recognised in biomimicry fields. The CEEBIOS community is not like a normal community. What helped was the BiomimExpo – this is the lagoon assembly. People who had a subscription to the CEEBIOS could come to the seminars and expos. This is also supported to the online community which is their public community. Stay linked to the rest of Europe and we still have lots to do in France. More about giving the key to success to other places then expanding itself. Could create a tool kit. About to design a European project

Council – how should one develop material research papers. Seminars for research. Help write grants. Offer them tools to develop activities. Allow them to communicate with each other. Helping them recognise they are part of the same community Reveal what is there. Archipelago community.

The value – we create knowledge, and it is really up to date so that's the value of subscription. For people who are close we have a huge network so we can connect them to stuff and ideas. People need us to help with consultancy (80% of the budget). But we are becoming more institutionally funded.

Key insights: You can't make projects – it doesn't work, see what is there and how can help. Find the purpose first and then the business case. Information flow will help for

Stakeholder 20

Stakeholder 20 runs a small consultancy in Scandinavia that helps business and local government achieve circularity through BM. Here it is used as a mental perspective rather than with direct methodology. In the Scandinavian space there are few BM organisations, but it is becoming more known.

They see the BM community as still in its infancy, especially in the Scandinavian/ Nordic countries. The Nordic community is collectivising more through Nordic biomimicry. Org and hopes to start hosting their own events soon. The wider European group doesn't provide value through projects but does provide access to a community of professionals and know how which enables the access of other experts. They see the community evolving through greater connections and more knowledge sharing to help create a bigger voice and increase how well BM is known. This will be important especially in the international community, which is important for the smaller Scandinavian countries.

Stakeholder 21:

In the Nordic Biomimicry collaboration but also has their own practice. They see their role as sharing BM and sharing how it can inspire and be a teacher. They use a range of mechanisms including writing books, partnerships with museums and nature guiding. This can also include other sustainability practices. Through their research they have found there are a number of organisations who are using biomimicry without calling it biomimicry. This may be due to the fact that biomimicry is a very deep processes that can take years to fully understand.

They see the current biomimicry network as distributed, the EBA was not able to collective the individuals. This however is in line with nature which is emergent and allows connection to occur if they are built up over time and not through a top-down organisation. They see the community as incredibly valuable 'allows me to survive'. This is through having people that understand me and with whom I can connect. This is a sort of spiritual recognition.

Appendix 2:

In addition to professional education, certified higher educational institutes also describe themselves as having a Biomimicry or Bio Inspiration module or course. Fields that are using Biomimicry, include design, computing (AI), engineering, medicine and architecture, amongst others. Through this research I have identified 51 higher education institutes in Europe which are either hosting biomimicry courses or have biomimicry research groups which can be found in this work in progress map ([7vortex](#))

Higher education institutions were searched using to following schema:

Step 1: Boolean search including the words Biomimicry (Or biomimetics Or Bio+Inspired+Innovation)

Step 1.2: Find other surveys of higher education institutes doing BM.

Step 2: Assess whether BM still takes place

Step 2.1 Is lecture program still occurring?

Step 2.2 Is research field still active? (Post since 2020)

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