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Resolving conceptual conflicts through voting

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Abstract:

Scientific activities strongly depend on concepts and classifications to represent the world in an orderly and workable manner. This creates a trade-off. On the one hand, it is important to leave space for conceptual and classificatory criticism. On the other hand, agreement on which concepts and classifications to use, is often crucial for communication and the integration of research and ideas. In this paper, we show that this trade-off can sometimes be best resolved through conceptual governance, in which scientific institutions set a collective conceptual standard, and that voting can be a reasonable way to implement that governance. Voting is a means to simultaneously aggregate among conflicting values, preferences and priorities that often underpin conceptual or classificatory debates, all while signaling ongoing disagreement. We also discuss how the legitimacy of the voting process and its outcome can be ensured.

Keywords:

Concepts – Classifications – Governance – Voting – Taxonomy - Values

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Introduction

Scientific work depends in many ways on concepts and classifications that mediate our interaction with the world. Concepts and classifications are vital to bring order among the many objects science has to deal with, to build accessible representations of relevant aspects of reality, and to allow efficient communication across scientific communities. A rather extreme example of that can be found in biology, which has a full-fledged subdiscipline, taxonomy, focused exclusively on getting a grasp on the daunting diversity of living organisms by conceptualizing and classifying it. By searching the globe for unknown forms of life, and by organizing them in a hierarchical system of taxa, taxonomists aim to provide biologists with neatly defined objects to study, and an orderly representation of biodiversity. It is through that premade representation that most biologists access the diversity of life (e.g. Lagomarsino & Frost, 2020; Wheeler et al., 2012).

However, the work of taxonomists comes with many challenges. Taxonomy is hampered in its role of supporting the biological sciences by many disagreements, both on fundamental principles, such as on the concept of species, and on many particular classificatory issues (Thiele et al., 2021). For example, there are four global checklists of bird species, that all have authority, and all are commonly used across biological communities, but between which there is up to 25% disagreement about which groups of organisms should be recognized as species (McClure et al., 2020; Neate-Clegg et al., 2021). This confuses the users of these checklists: taxonomic checklists constitute conceptual backdrops against which research, data, and policies are structured, and the co-existence of multiple such frameworks complicate communication and coordination among them. For example, with regard to biodiversity conservation, such taxonomic disagreement creates confusion on which kinds of life there actually are to be conserved (Agapow et al., 2004; Franz & Peet, 2009; Mace, 2004).

This reality has led some in taxonomy to advocate what they call ‘taxonomic governance’, the idea that taxonomies should to a certain extent be standardized by some sort of international cooperative body, rather than simply be published by individual researchers or authorities, without any coordination (Conix, 2019b; Garnett et al., 2020; Garnett & Christidis, 2017). It is argued that such governance is warranted, exactly because of the supportive function of taxonomy for other disciplines, which necessitates standardization and unification. While there are also critics of taxonomic governance, who typically see it as an attack on academic freedom (e.g. Raposo et al., 2017; Thomson et al., 2018), it is currently being explored to solve the problem of the existence of four incompatible global checklists of bird species. Under the banner of the International Ornithologists’ Union (IOU), a Working Group on Avian Checklists (WGAC) was established to produce a single checklist that should replace the four current checklists.

Interestingly, the WGAC tries to do so in a very democratic manner. Its 'taxonomic team', that does the actual taxonomic work, is composed of representatives of the four existing checklists and of renowned avian taxonomists, and tries to resolve all conflicts between the existing lists by discussing them and eventually voting on a solution. A simple majority, provided a quorum is reached, suffices for a solution to be adopted. This ambitious undertaking – over 1000 conflicts are to be resolved – and the way in which it is tackled, is philosophically interesting. Some might argue that the seemingly 'political' manner in which conflicts are resolved, eventually by putting them to a vote, is unlikely to appease the critics of taxonomic governance. Likewise, it may not convince the stakeholders involved in the many disagreements, particularly if their position ends up being voted against. For the WGAC experiment to become a success, it is important that the new list has sufficient authority so that it can effectively replace the four existing lists, rather than becoming a fifth list among them. The WGAC experiment is not the first case in which voting is used to settle conceptual or classificatory conflicts, and examples from the past show that ensuring legitimacy is not evident. For example, in a much mediatized episode dating from 2006, the International Astronomical Union (IAU) voted on a definition for the term 'planet', and the subsequent demotion of Pluto to the status of dwarf planet, but both the process of voting, and its outcome were heavily contested, and critics explicitly stated that they would not follow it (Hogan, 2006b, 2006a; Zachar & Kendler, 2012).

In this article, we argue that nonetheless, there are cases in which 'conceptual governance' to solve conceptual or classificatory disagreements can be warranted, and in which majority voting constitutes a legitimate instrument to implement such governance, provided sufficient measures are taken to ensure legitimacy and acceptance. First, we elaborate on the case of taxonomy and some other popular examples of the use of voting to settle conceptual problems, and analyze the nature of the controversies that are voted upon, to show why the need for conceptual governance is sometimes felt, and how it can be justified. Then, we explore why majority voting can be the preferable instrument to execute such governance, rather than for example deliberative processes, and we reflect on strategies to maximize legitimacy and authority. By means of conclusion, we return to the WGAC experiment and some expectations it raises. Importantly, our analysis only concerns voting on conceptual and classificatory issues, and thus ignores the use of voting in other steps of the scientific process, such as those related to the distribution of resources, or to policy advice.

Species, planets, diseases and epochs

Voting is typically used to settle conceptual or classificatory conflicts if the conflict is sharp, and the need for a solution for some reason urgent. The fact that the conflict is deep makes it unlikely that natural convergence on the matter will occur in the near future, and the fact that a solution is for some

reason urgently required makes that that natural convergence cannot be waited for. At some point, it is found that the need to resolve the conflict outweighs the value of the ongoing debate, and a voting procedure is used to settle the matter, at least temporarily. Voting typically appears to be used for pragmatic reasons, because it can provide a fast and definitive settlement of controversies.

Interestingly, the foundational role played by concepts and classifications in science generates both the possibility of conflict and the need for a solution. On the one hand, given the importance of concepts and classifications in structuring scientific work, it is important that the best concepts and classifications are used, and allowing criticism and debate about them is vital to that. On the other hand, the coordinating role of concepts and classifications implies that the efficiency of science as a collaborative effort depends on everyone speaking the same language. This means that there is a trade-off between the value and importance of conceptual and classificatory debates, and the need for standardization and unification in the structuring of scientific work.

This is exemplified by the case of taxonomy. On the one hand, taxonomists have the ambition to circumscribe species that somehow represent real units in nature, typically units that are somehow 'evolutionary independent' from other such units, and many disagreements on species classifications relate to different interpretations of evolution and evolutionary patterns, both in general and regarding the particular organisms on the table (Conix, 2018, 2022; de Queiroz, 2007). These debates are legitimate, and their outcome can have important consequences, for example for conservation. On the other hand, if they remain unresolved, they do hamper the use of taxonomic work in structuring and coordinating the work of other biological research, and, indeed of conservation. Often, it appears to be difficult to accommodate both legitimate conceptual or classificatory debates, and the need for clarity and stability.

This is also illustrated by another landmark example of conceptual governance through voting. In 1973, the American Psychiatric Association (APA) organized a vote on whether homosexuality should be considered a mental disorder or not. Until then, homosexuality was included as a mental disorder in the APA's *Diagnostic and Statistic Manual of Mental Disorders* (DSM), an influential classification of mental illnesses first published in 1952. However, this situation was increasingly criticized, and eventually the APA decided that it was necessary to resolve the matter (Zachar & Kendler, 2012). Here too, one could argue that in a way the debate is very important. Whether homosexuality is treated as a mental disorder, or not, has serious consequences for many people. And here too, one could argue that settling the question in a relatively short time frame was also important, to appease tensions, to ensure clarity across the medical world, and to preserve the authority of the DSM.

Initially, the issue was to be settled by the APA's Committee of Nomenclature and Statistics. However, opponents of the normalization of homosexuality were of the opinion that that committee was biased in its composition. For that reason, they founded an *Ad Hoc Committee against the Deletion of Homosexuality*, and argued for a more balanced committee to settle the final matter. Meanwhile, Robert Spitzer, leading the effort for normalization, believed that the Committee of Nomenclature and Statistics would not adopt the proposal, and tried to bypass it by bringing it directly before the Board of Trustees. In 1973, the Board of Trustees effectively decided to remove homosexuality from the DSM. Yet, the opposition of the *Ad Hoc Committee* remained strong, now questioning the composition of the Board, and they launched a petition to demand a membership referendum on the question. That referendum was eventually held, in which 58% voted in favor of removal. However, the turnout being only 25%, the legitimacy of the referendum was again questioned by those opposing the decision for removal (Bayer, 1987; Zachar & Kendler, 2012).

Similar turmoil occurred with regard to the Pluto controversy. Before the 2006 decision, there was no universal definition of a planet, nor a definite list of planets, and views of what a planet was, and which celestial objects should be recognized as such, had varied strongly across the history of astronomy. However, the canonical list of nine planets which had crystalized throughout the 20th Century was increasingly questioned, because of different apparent inconsistencies. For example, the discovery of Eris, first seen in 2003 and confirmed in 2005, which was thought to be of greater size and mass than Pluto, raised the question of whether either Eris should also be recognized as a planet, or whether Pluto should be demoted (Bokulich, 2014). Different, competing definitions for the class 'planet' were proposed to settle the confusion, and no natural agreement was found. In 2004, the International Astronomic Union (IAU) founded a Working Group on the Definition of a Planet, to reflect on the question, but this working group could not find consensus.

The chair of the Working Group then forced a vote. However, the Working group was completely divided: seven members voted for Pluto to remain a planet, seven voted against, and seven voted for a compromise, recognizing multiple subcategories of planets. For that reason, the issue was scheduled at a 2006 IAU conference in Prague, where a majority voted for the demotion of Pluto. Yet, critics heavily questioned the whole process (Hogan, 2006b, 2006a). They claimed that the preparation for the vote was deeply chaotic, including last minute changes to the proposed definition. Moreover, the critics took issue with the composition of the initial Working Group, and with the low turnout of the membership vote, which was held at the end of the conference when many people had already left. Consequently, several astronomers claimed they would not accept the new definition.

Yet another interesting case of voting in conceptual governance is the formal process concerned with the recognition of the Anthropocene as a geological chronostratigraphic unit by the International Commission of Stratigraphy (ICS). In the early 2000s, a proposal was launched to recognize a new geological period, symbolizing the enormous impact of mankind on the earth system by naming it the Anthropocene (Crutzen, 2002; Crutzen & Stoermer, 2000). This proposal quickly gained traction in several scientific disciplines, and also within the environmentalist movement. However, the formal recognition of chronostratigraphic units is in principle the privilege of the International Commission for Stratigraphy (ICS), part of the International Union of Geological Sciences (IUGS). Indeed, in 2009, the Subcommission of Quaternary Stratigraphy (SQS) of the ICS started a Working Group on the Anthropocene to explore whether the Anthropocene should be recognized and how (Zalasiewicz et al., 2017). This Working Group has to vote on a proposal, which is subsequently to be voted upon by the SQS. Later another vote is required at the level of the ICS, after which it must be ratified by the IUGS itself.

Here, conceptual governance and the use of voting are much more entrenched, and the process used for the debate on the recognition of the Anthropocene is well-established, and has been tested in many other cases of stratigraphic decision-making. However, the matter of the Anthropocene brings additional challenges to the system, because it is much more politically and emotionally charged than other stratigraphic issues. Several stratigraphers indeed oppose the proposal because they feel it is guided by other than purely stratigraphic considerations. While they acknowledge the magnitude of global change, they are skeptical as to whether it is (already) sufficiently recognizable in a separate rock stratum, which they see as necessary for its recognition as a chronostratigraphic unit (Autin & Holbrook, 2012; Finney & Edwards, 2016).

Recognizing and defining a chronostratigraphic unit under the ICS is done by defining a so-called Geological boundary Stratotype Section and Point (GSSP), which represents the boundary between two strata with an actual physical marker at a type location. While enthusiasts of the Anthropocene as a separate chronostratigraphic unit want to proceed fast, many stratigraphers stress the importance of setting a GSSP with care. The task of the Working Group, and subsequently of the SQS and the ICS itself is to check whether there is indeed sufficient stratigraphic evidence to recognize the Anthropocene as a new chronostratigraphic unit, and if so, to set a GSSP. Currently, the Working Group has found agreement on the fact that the Anthropocene should be recognized, more precisely as an Epoch, and is now reviewing candidate GSSP's, to make a full proposal to the SQS (Zalasiewicz et al., 2017). Whatever the outcome will be, all involved levels within the ICS will face the challenge of defending the legitimacy and ensuring the acceptance of their decision, both among environmentalists, and among critical geologists.

Governance and conceptual engineering

Conceptual governance, such as in the examples discussed above, can also be seen as an institutionalized form of conceptual engineering. The philosophical framework of conceptual engineering revolves around the idea that concepts – and this includes classifications – should not be taken for granted, but should rather be seen as cognitive devices that can be designed and managed to optimally serve the objectives for which they are used (Chalmers, 2020). One could argue that the concepts in the cases discussed above are indeed engineered, in an institutional setting. While each case has its peculiarities, the conflicts and debates surrounding them then are conflicts or debates on possible conceptual designs, either because the concepts are used in function of different objectives, or because there is disagreement on the best design for a given objective. These conceptual designs are then actively and explicitly discussed and decided upon.

The concept of planet, for example, is used in various contexts, and the different stakeholders who propose definitions to solve the 'planet problem' are in themselves conceptual engineers, trying to sell a different design for this concept, that they think will best serve the epistemic and other goals for which it is used. For example, as Bokulich (2014) illustrates, part of the discussion was whether the definition of planets should be solely based on intrinsic properties of its putative members, such as its shape or its mass, or whether it could be based on relational properties, such as whether it orbits a star, or whether it has cleared its orbit from other objects. Arguments for focusing on intrinsic properties often come from planetary geologists, interested in these very properties, while arguments for focusing on relational properties often come from so-called dynamicists, interested in how putative planets fit in the broader picture. This shows how what is an optimal conceptual design also depends on the exact objectives one has.

Thus, from the viewpoint of conceptual engineering, conceptual conflicts such as the 'planet problem' primarily represent a competition of different conceptual designs that claim a monopoly on the concept of a 'planet'. On one side of things, this shows how conceptual engineering always comes with an 'implementation challenge': it is one thing to design or redesign a concept, but logically a conceptual engineer also wants that her design is used as widely as possible. This might not always be evident: it can be a substantial challenge to convince people to change often long-held and rigid semantic habits, and to adopt new conceptual designs (Fischer, 2020). A fact that is confirmed by empirical evidence: experimental work has pointed out that the implementation of conceptual engineering is possible, but difficult (Landes & Reuter, 2023). If there are competing designs on the conceptual market, that obviously adds an extra dimension to that implementation challenge. On the other side, institutionalizing conceptual engineering, and giving a single authority such as a scientific institution

the privilege of setting a conceptual design, allows to hijack that competition and bypass part of the implementation challenge. Of course, in practice, as the examples discussed above illustrate, these authorities face their own implementation challenge, inasmuch as they have to ensure their own authority or legitimacy.

Some have argued that institutionalized conceptual engineering, and therefore, conceptual governance, presents dangers. Individuals or institutions that can implement conceptual engineering on a large scale, and 'by force', possess a powerful tool, which could easily end in aberrations. For instance, if one is capable to implement alternative designs of concepts such as 'democracy' or 'freedom' in function of one's own interests, one could easily hijack political systems (Queloz & Bieber, 2021). While it is rather unlikely that the scientific institutions considered here have dark political ambitions, critiques that stress the importance of academic freedom, for example against governance in taxonomy, deserve a fair hearing. According to Queloz and Bieber, centralized control on the implementation of conceptual engineering is in principle incompatible with the principles and values of liberal democracy and politics, which include academic freedom. However, they do allow exceptions. In some specific professions, or societal spheres, the advantages of centralized conceptual engineering exceed the disadvantages. For example, in medical practice or in legal settings, where using the same concepts and the same conceptual designs is crucial.

Whether such exceptions can also be allowed in scientific settings ultimately depends on the trade-off that was described above, between the importance of using the best possible concepts and the value of the debates needed for that, and the importance of conceptual standardization and stability to ensure communication and collaboration. On the one hand, as illustrated, concepts are used in different contexts, and can favor different designs in different contexts. On the other hand, concepts play a role in coordination, within contexts, and even between contexts. Ultimately, every scientist could design their own tailor-made concepts, that maximally fit their research objectives, but that would make communication and collaboration very difficult. In some cases, there might be reasons to agree on one single design, even if that probably means that that standardized design is not optimal for each and any context.

As said, this trade-off is very apparent in the case of biological species. It has been shown that cross-cutting taxonomies often result from different emphases, for example on ecological versus evolutionary aspects, each relevant in their own contexts (Cuypers et al., 2022). This might be seen as an argument for a position called taxonomic pluralism, where the coexistence of different taxonomies is allowed, and even encouraged. On the other hand, one could also argue that it is still best to agree on one standardized taxonomy. For example, to structure conservation efforts, from science to policy,

it is important to provide a maximally clear catalogue of species that could require protection. That is difficult if a variety of cross-cutting catalogues exists. In a similar way, pluralism may not be the way out of conflict in other cases. It would probably be of little use to have multiple geological timescales, recognizing different units or different boundaries.

In science, it is typically also not an option to simply keep the concept vague. As Putnam (Putnam, 1970, 1975) has argued, ordinary language can typically function well with a vague definition and understanding, for example of what water is, what lemons are, or what a planet is. But for science, concepts often need to be maximally clear, both with regards to their intension, and with regard to their extension. For example, whichever taxonomy is selected by biologists, it must provide clear and well-defined boundaries. But it is this need for semantic detail that particularly puts differences between conceptual designs to the fore. Take again the case of the Anthropocene. For environmentalists, a vague concept of the Anthropocene is sufficient to press their message that we live in a different world because of the scale of anthropogenic global change. Little further clarification is needed. For scientists, however, such clarification is necessary, for instance in terms of an exact starting date and a characterization of rock layers linked to the Anthropocene. Yet, within the relevant scientific communities, apart from the question whether the Anthropocene should be recognized or not, there is debate on what that starting date should be. Some propose to let the Anthropocene start with the neolithic revolution, others with the industrial revolution, and still others with the 'great acceleration' after the second world war. Thus, even the clarification of one element – a beginning date – can engender conflict. For stratigraphy itself, the concept requires even more clarity: it needs to be ranked in the chronostratigraphic chart, it needs to be linked to rock strata, its boundary needs to be defined by a GSSP, and so on. The more a concept requires detailed definition, the more disagreement it may give rise to.

While Putnam believes that the clarification of concepts to a level sufficient for their use in science is largely a matter of empirical research and theory formation, the examples discussed above show that the matter is more complex than that: while within a context, within a given objective, fixing the best conceptual design might largely be an empirical matter, choosing between competing designs that stem from different contexts, is also a matter of objectives and values, for example to prioritize between objectives and the concepts linked to them (Conix, 2019a). Indeed, it is increasingly stressed that many concepts used in science are value-laden, as are for example so-called 'thick concepts', concepts that join a descriptive and a normative component (e.g., Alexandrova & Fabian, 2022). Conceptual engineering and governance have to take this value-ladenness into account: resolving conflicts will often require resolving trade-offs and conflicts between various epistemic and non-epistemic values and preferences.

The interests involved might vary across cases. In the case of taxonomy, practical issues such as classificatory stability play a role, while in the case of the delisting of homosexuality as a mental disorder, the stakes were clearly ethical. However, despite these differences, the structure of the issues at hand is broadly similar: a choice needs to be made between different conceptual designs, and that choice typically involves other than purely scientific considerations and other than purely epistemic values. We believe disagreements on such considerations are probably less likely to dissolve in natural consensus than purely epistemic disagreements. This might explain in part why there are so many enduring conceptual conflicts, and why conceptual governance is sometimes needed. When that is the case, cannot be decided a priori, and should be decided on a case-by-case basis. On the one hand, it requires a judgement on how progressive conceptual debates are, and whether they relate to empirical issues underlying conceptual designs in function of a given objective, or whether they relate to value-laden issues, such as conceptual priorities and various kinds of values. If debates crystallize, and the same disagreements keep being repeated, the (opportunity) costs of debates can exceed their value, and there might be reason for collective settlement.

As argued, in practice, conceptual governance or institutionalized engineering are typically applied when resolving a conceptual debate is for some reason urgent. Of course, what counts as urgent, and why, can also vary across cases and across scales. Whether resolving a conflict is urgent, is part of the context-specific reflection that is required on the possible need for conceptual governance. There could be various reasons for perceiving urgency. In the case of taxonomy, for example, the urgency to settle disputes can be grounded in the urgency of the biodiversity crisis, and the fact that taxonomic disputes can hamper the elaboration and implementation of conservation measures. In a case such as the status of homosexuality as a mental disorder, urgency stemmed from the fact that the conceptual status quo was experienced as harmful by many people involved. Even in more societally disinterested research programs, we believe there can be forms of urgency, if enduring conceptual debates excessively jeopardize their progressiveness.

As one reviewer pointed out, in policy literature it is often stressed that there is or ought to be a shift from urgency politics, to politics of preparedness. It is argued that problems ought not to be tackled through ad hoc arrangements and crisis management, when they have become urgent. Rather, problems ought to be anticipated, and resilience should be proactively built (e. g., Medd & Marvin, 2005). In the same way, one could raise the question whether conceptual engineering should only intervene as a form of 'crisis management', when lingering conceptual uncertainty is already wreaking havoc, or whether conceptual governance too should anticipate problems, and aim to work proactively. On the one hand, we do believe that scientific disciplines would do well to aim for what one could call 'procedural preparedness'. If structures and procedures for conceptual governance are

ready, once an issue arises, tackling that issue will go faster and smoother. Indeed, the aim of this article is to incite a general reflection on the possible need for conceptual governance, and the structures need for that, and is therefore aimed at promoting this kind of preparedness. Also, as the examples discussed above show, and as will be detailed below, procedural improvisation tends to do great harm to the legitimacy of conceptual governance. On the other hand, we are unsure whether something as 'material preparedness' can be conceived of, whether conceptual issues and conflicts themselves can be anticipated. That depends on whether it is realistic to do proactive conceptual engineering, or whether concepts can only be engineered in the light of actual practical problems. A reflection on that falls outside the scope of this article.

Conceptual governance through majority voting

If and when conceptual governance, or institutionalized conceptual engineering is warranted, it should be done in the best possible manner. Arguably, the (quasi-)political nature of such governance, and its importance for many stakeholders, suggests that it should be done with a system that is more or less democratic. However, there are many ways to conceive, ground, and operationalize democratic processes. For example, there is considerable debate on what exactly makes democratic decisions legitimate: input, procedural aspects, or simply the quality and further success of the output. Similarly, there are discussions on whether democracy should proceed through deliberation and consensus-building, the tenet of deliberative democracy, or through some system aggregating different opinions, as argued for example by social choice theory, although both frameworks are being seen less and less as mutually exclusive: probably deliberation and voting are instruments each to be used at the right moment (Dryzek & List, 2003). The best instrument for democratic conceptual governance is likely to be matter for debate. While we defend a role for (majority) voting, others do defend a deliberative and consensus-based approach to collective conceptual engineering (Alexandrova & Fabian, 2022).

When it comes to conceptual governance, there are two discussions to be solved. There is the first-order discussion, on which conceptual design is best. Additionally, there is the second-order discussion, on whether conceptual governance is warranted. Which democratic instrument is best, can vary for both discussions. In the cases such as those above, there typically has already been substantial debate on the first-order question, on what the best conceptual design is, suggesting that more deliberation is unlikely to lead to a solution on that level. However, there has often not yet been substantial debate on the second-order question, whether conceptual governance is warranted. Hence, deliberation may possibly still play a role there, and it might be useful to steer the debate away from the first-order question, to the second-order question, in terms of the trade-off described above. Allowing a space for deliberation concerning the second-order question is also likely to increase the legitimacy of

conceptual governance, should it indeed be applied. This is very much in line with the basic principle of deliberative democracy, namely that the power and value of democracy rests on the capacity of a collective to come to rational decisions through deliberation. Moreover, the deliberative democracy-frameworks contends that everyone accepts the decision made as rational exactly because it resulted from deliberation. This fits very well with how the functioning of science is usually perceived, which means that arguably deliberation should be tried first.

Ideally such deliberation leads to consensus, but if it does not, we believe a stalemate on the second-order question should be avoided by a voting procedure, that is a vote on whether to vote. Here, voting has the clear advantage in that it may force a decision instantaneously. Note that the decision on whether conceptual governance is warranted in a given context can be made for each case separately, or for a whole set of cases as one, such as in the case of the WGAC, where it has been decided at once to settle all taxonomic conflicts related to birds, or in the case of the ICS, where the conceptual governance of chronostratigraphic units has been long established. One problem here is that positions in the second-order debate might be influenced by how people perceive their chances of their position in the first-order debate being adopted. Those who believe they will lose from the governance process, will probably argue against it. This reality should be taken in mind, and a deliberative step might help to force stakeholders to underpin their case with arguments.

For the first-order question, the actual decision on which conceptual design to adopt, as argued, deliberation seems to be much less an option. This for the simple reason that when the need for taxonomic governance is felt, it usually concerns issues on which there has already been much debate, but without issue. For example, on the majority of issues in bird taxonomy there is consensus, but the voting concerns those cases for which such consensus does not arise. Therefore, a more formal mechanism of aggregating opinions appears to be needed. In that sense, voting offers a swift settlement of the matter here too. But that is not the only reason to use voting. Again, voting should not be seen as a way to find the single, objectively best conceptual design that maximally fits all objectives for which the concept in question is used. Rather, voting is necessary here as a tool for optimally aggregating the multitude and disparity of values, preferences, and interests among stakeholders. That is emphasized by the framework of social choice theory. Social choice theory argues in a way against the optimism of deliberative democracy by stating that conflicts between values and preferences will always exist, that for that reason in many cases consensus cannot necessarily be expected, and that in some cases the only way forward is to come to a most optimal aggregation of values and preferences, through voting. As we have argued, conceptual conflicts often stem to a great extent from conflicts between values, preferences and interests, and the logic of social choice theory

applies well to that. Here, voting is not only a way to come to a swift settlement, but also justified by the fact that natural consensus might never be reached.

Let us add to this two additional considerations. In situations where a decision is required in a short time frame where the decision is made to settle the matter collectively, dangers linked to deliberation – illegitimate influences, coercion – increase. If a consensus is forced, for example with a deadline, authoritative or experienced figures might eventually be followed. Voting, particularly with secret votes, allows to limit this problem. Second, it can be argued that there is no better way to measure disagreement in an epistemic context of uncertainty, than through voting. Indeed, a forced consensus does not reveal the actual disagreement in the way that a split vote does. Signaling this disagreement seems highly important in a scientific context (Beatty, 2006). As Beatty and Moore (2010, 198) put it: "The existence of a persistent minority suggests that at least one decent alternative was considered, and that a case had to be made for rejecting it in favor of the majority's position." Moreover, in the case of conceptual engineering, it also signals to non-scientists that this decision was not settling a purely factual matter, but rather tried to solve a value-laden issue on which scientists can disagree. So, another advantage of voting is that it simultaneously settles a question, and signals and quantifies ongoing disagreement on the issue.

Ensuring legitimacy and acceptance in conceptual governance

We have now argued that voting can be a legitimate tool to settle conceptual or classificatory disputes that for some reason require an urgent solution. However, that should be done in a manner that ensures maximal legitimacy and acceptance of the eventual decision. Indeed, democratic processes, particularly those involving voting, exist by grace of so-called loser's consent: they are only sustainable if the losing side accepts the process and its outcome (Anderson et al., 2005). Just as in games, in democracy, it is the behavior of the losing side that determines whether a game continues, and whether there will be future games. Both in the case of the definition of planets and the status of Pluto, and in the case of the delisting of homosexuality as a mental disorder, this was an important problem: the losing side did not accept the outcome.

Democratic processes are vitally dependent on the positive attitudes of those they affect, both the winners and the losers. This applies in particular to democratic processes held by scientific institutions, given that they have little power to enforce their decisions and authority. This raises the question of how actual and perceived legitimacy can be fostered, concerning particular voting processes, but also concerning those institutions in which they are embedded. Indeed, legitimacy is usually studied at the level of democratic institutions, rather than at the level of individual democratic processes within them, and it seems fairly evident that the legitimacy of the institution affects the legitimacy of the

individual governance process. In conceptual governance, this is illustrated by the case of stratigraphy: the International Commission for Stratigraphy has a tradition of using votes in several cases, apparently with success, so that the use of voting is much less contested there than in the cases of the status of Pluto, and the delisting of homosexuality as a mental disorder, where voting processes were established ad hoc. We do not argue that the International Astronomical Union or the American Psychiatrists Association did not have legitimacy in general, on the contrary, but arguably they had insufficient legitimacy as democratic institutions for conceptual governance.

Political theory has identified several potential sources of democratic legitimacy. For example, there is 'input legitimacy', linking legitimacy to a democratic system being responsive to signals and demands from those involved, 'output legitimacy', linking legitimacy to a democratic system producing beneficial outcomes for those involved and to aspects of implementation and enforcement, and 'throughput' legitimacy, linking legitimacy to the internal functioning of democratic processes, focusing on values such as efficiency, accountability and transparency (Schmidt, 2013). Whichever of these sources of legitimacy turns out to be the most important is ultimately an empirical question. However, in the context of democratic processes used for conceptual governance, output legitimacy, is relevant mostly on the long term. As we have argued, voting is to be used in enduring contentious cases, so that the output will, in the early stages, per definition not please part of those involved: the challenge of losers' consent, as argued, is an important reality in the cases discussed here. This means that output legitimacy cannot be counted upon in the short term. It can in the long term depending on the productiveness of the eventual concepts: if the ICS produces a chronostratigraphic cart that proves productive for geological research, future additions and modifications, however contentious, are more likely to be accepted.

Input legitimacy is to a great extent related to agenda-setting. As such, it relates mostly to the second-order debates as discussed above, debates on whether conceptual governance is warranted. As we have argued, the meta-question of when conceptual governance and voting is warranted is as important as the content of the voting process itself, and decisions on these second-order matters should be legitimate as well. This raises the question of who can place potential cases of conceptual governance on the agenda. Should institutions like the ICS be responsive to calls from for example environmentalist movements? And should the Working Group on Avian Checklist come to a unified checklist of bird species, how can proposals for changes, for example based on new taxonomic research, be tabled? Here too, trade-offs can arise, for example between the value of stability and responsiveness to calls for change, so that the input-side of the matter merits full consideration. This also relates to the issue of when and how an issue that has been subject to a vote can be tabled for a new vote, for example when new data have become available, or new considerations have become

relevant. As one reviewer pointed out, once an issue is set through voting – for example once a new list of birds is published – pleading for change will probably not be evident. A careful balance will need to be found between preserving stability and openness for change.

Throughput legitimacy focuses on the organization of the governance process within the system. This happens once issues are tabled and independent from the eventual outcome. It consists in traditional values or qualities such as efficacy, transparency and accountability, but also in participation. For instance, who needs to be involved in the process, and how. In the specific context of conceptual governance within scientific institutions, this often comes down to the question of whether votes should be held within institution boards or specialized expert committees, or among the whole membership of that institution. Additionally, in some cases, it might be important to involve not just these internal stakeholders, but also, for example, non-scientific users of concepts.

Both in the case of Pluto, and in that of homosexuality, the matter was first brought before a specialized committee. Subsequently, this treatment was criticized, after which a membership vote was rather hastily organized. This in turn led to new criticism, for example because of low turnout. Compare this to the ICS, where committee votes are held at different levels. We believe that there is no a priori best alternative here. In some cases, there appear to be reasons to prefer a vote within an expert committee. Putnam (1970) argues that it is not necessary that everyone is fully aware of every detail concerning the intension and extension of concepts: there can be conceptual or semantic division of labor. Indeed, not every member of the International Ornithological Union is able to make a well-reasoned judgement on any conflict of bird taxonomy, or has time to do so. Similarly, setting a GSSP for a chronostratigraphic unit is a complex and time-consuming matter, and it is unlikely that a vote by all geologists would increase the quality of the outcome. Conceptual engineering requires expertise, and experts have the best factual knowledge, and the best understanding of the advantages and disadvantages of conceptual designs, so that they are best place to judge, even if that does not mean that other stakeholders cannot be consulted.

On the other hand, if the contention is primarily one of conflicting values and preferences, one could argue that that should not be settled by aggregating the values and preferences of a small number of committee members, but by aggregating the values and preferences of the relevant scientific community as a whole, and perhaps beyond. That warrants at least a membership vote. For example, in the case of homosexuality, a membership vote might have been the best alternative from the onset. For such a sensitive and value-laden issue, any committee-based process might have raised legitimacy issues.

Particularly when conceptual decisions strongly affect non-scientific stakeholders, it might be desirable to involve them in the governance process as well. For example, it has been argued that classifications and characterizations of mental disorders can only be done in a reasonable manner if experience-based expertise is considered as well (Tekin, 2022). Similarly, Alexandrova and Fabian (2022) argue that concepts which are used in policies that affect stakeholders should be engineered with reference to the professional expertise of policymakers and the lived expertise of the stakeholders. Clearly, in cases such as that of homosexuality and the DSM, hearing stakeholders is important. However, in principle, we do believe that scientific communities should retain the right to vote to members only, as ultimately the voting is on scientific concepts, intended for scientific use. It remains up to non-scientific users to determine whether they want to use scientific concepts for their purposes, or adopt yet other concepts. Concerning legitimacy, Caby and Frehen (2021) argue that the inclusion of a broader group of stakeholders can increase throughput legitimacy. Still, they also point out that such involvement comes with risks as the damage to legitimacy will be greater, should the process fail. Involving more stakeholders, as they argue, does not necessarily make it easier to solve a conflict, and can perhaps paradoxically lead to stricter top-down decision-making in practice.

Who exactly should be able to vote – an expert committee, an institution's membership, or stakeholders –ultimately depends on the specific context. However, what seems important, is that it is discussed and settled in advance: procedural improvisation such as in the cases of planets and Pluto, and of homosexuality and the DSM is by all means harmful. Of course, combinations can also be imagined. It might, for example, be an option to let a larger group decide on whether the Anthropocene should be recognized as a chronostratigraphic unit, while a committee decides on the exact modalities, such where the GSSP is set. This also relates to the issue of (procedural) preparedness, as discussed above.

Next to participation, transparency, although used in the right way, is another vital requirement for throughput legitimacy (De Fine Licht et al., 2014). Any governance process is unlikely to be trusted if it is not transparent. Quite trivially, transparency on the results of voting is necessary for voting to function as a measurement of disagreement and uncertainty, as was argued above. Furthermore, any institution involved in conceptual governance must actively communicate on why such governance is needed, on which procedure is followed, and which interests and arguments are considered throughout the entire process. The cases studied here show that there is room for improvement on this matter. Conceptual governance, and voting as tools are sufficiently controversial, so that they should be proactively justified. This means not just making as much data available, but also developing a communication strategy aimed at justifying the process and its outcome. Should geologists decide that current designs for the concept of Anthropocene are bad, or that the concept is flawed in its basic

meaning, communication with for example the environmental movement will be important. Conceptual governance through voting, as we have tried to show, can be justified, but that justification needs to be made explicitly.

Conclusion

The Working Group on Avian Checklists has de facto resolved the trade-off between conceptual criticism and communicability in favor of the latter, and is now exploring voting as a means for governance and a way out of many taxonomic conflicts. As we have argued, resolving that trade-off in one way or another is entirely up to the avian taxonomic community itself, and only up to them. Moreover, the governance of bird taxonomy through a democratic process seems a better way forward than de facto governance by single authorities. Currently, authorities, such as biodiversity databases, conservation authorities such as the IUCN, or policymakers, can choose a taxonomy in function of their own interests, and it has been argued that a taxonomic community can increase its leverage by setting a standard itself (Cuypers et al., 2022).

However, to really gain that leverage, and drawing authority to itself, the WGAC will need to take significant steps to ensure legitimacy and acceptance. This includes active communication on why it exists, and on how it functions. Most importantly, transparency on the outcomes of voting is required. The WGAC will need to find a balanced way to signal ongoing uncertainty and disagreement as emerging from the many votes that are held, all while preserving the authority of the eventual decisions. Similarly, it will need to strike a balance between guarding the authority of taxonomy as a discipline and involving and listening to the various relevant stakeholders, for example in conservation, so as to ensure acceptance among them. Many lessons can be drawn from past examples where voting has been used in conceptual governance, and the WGAC experiments will add new insights to that. Of course, many topics of further study remain. For example, our analysis focuses on the use of majority voting, but many other voting procedures exist, each with their advantages and disadvantages.

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