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What's in a name? Taxonomic and gender biases in the etymology of new species names

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As our inventory of Earth's biodiversity progresses, the number of species given a Latin binomial name is also growing. While the coining of species names is bound by rules, the sources of inspiration used by taxonomists are an eclectic mix. We investigated naming trends for nearly 2900 new species of parasitic helminths described in the past two decades. Our analysis indicates that the likelihood of new species being given names that convey some information about them (name derived from morphology, host or locality of origin) or not (named after an eminent scientist, or for something else) depends on the higher taxonomic group to which the parasite or its host belongs. We also found a consistent gender bias among species named after eminent scientists, with male scientists being immortalized disproportionately more frequently than female scientists. Finally, we found that the tendency for taxonomists to name new species after a family member or close friend has increased over the past 20 years. We end by offering suggestions for future species naming, aimed at honouring the scientific community's diversity and avoiding etymological nepotism and cronyism, while still allowing for creativity in crafting new Latin species names.

1. Introduction

Completing the inventory of life on Earth, i.e. finding, characterizing and naming living species, has long been a central goal of biology [1]. The inventory is near complete for some taxa like birds and mammals, whereas it is far from it for most invertebrate phyla. The latter is certainly true for parasitic organisms, as evidenced by multiple assessments of known versus unknown parasite biodiversity for various regional parasite faunas [2–4] or parasite taxonomic groups [5,6], as well as across all taxa on a global scale [7,8]. Yet, more new parasite species are being found and described per year than ever before [8,9], indicating that parasite discovery and taxonomy are active research areas not lacking in new material.

The last, but by far not the least important step in the process of describing a new species is to give it a name [10]. New animal species must be designated with a unique Latin binomial in adherence with the rules of the International Code of Zoological Nomenclature, or ICZN (https://www.iczn.org). While at first, they may appear to be strict and restrictive, these rules still allow for creativity and originality. The ICZN recommends names that are compact, memorable, easy on the ear and not offensive to anyone. Taxonomists have used various sources of inspiration to name new species [11]. These range from distinctive morphological features of the new species, to honouring eminent researchers or celebrities, with sometimes humorous results [12].

The naming of parasite species has often taken the conservative route of dubbing a species based on its particular features [13]. However, many parasite species have eponymous names, i.e. they are named after a person, place, institution, etc. For instance, many well-known parasites of medical or veterinary concern are named after the scientist who discovered them, e.g. *Giardia* after

Alfred Mathieu Giard, *Babesia* after Victor Babes, *Leishmania* after William Leishman and *Schistosoma mansoni* after Sir Patrick Manson; for other examples, see the online dictionary of medical eponyms Whonamedit? (http://www.whonamedit.com/). Lesser-known parasites of wildlife have also sometimes been named after leading parasitologists, such as *Bobkabata kabatabobbus*, named after the eminent Polish-Canadian expert on parasitic copepods Zbigniew (Bob) Kabata [14]; or after famous non-scientists such as the avian louse *Strigiphilus garylarsoni*, named after the American cartoonist Gary Larson [15].

It remains unclear, however, whether the inspiration for new species names follows as yet unrecognized patterns driven by the peculiarities of certain parasite taxa, the people studying them, or temporal fads. For instance, a lack of noteworthy morphological features among parasite species within a higher taxon may result in few species in that taxon being named after their unique appearance. Alternatively, names given to parasite species may reflect the imagination, preferences or idiosyncrasies of individual taxonomists, or groups of taxonomists, working on particular parasite taxa. Sources of inspiration for new species names may also change over time, with some types of names becoming more fashionable while others lose their appeal.

Here, we analyse naming trends for new parasite species over the past two decades. We focus on the five major groups of parasitic helminths: trematodes, cestodes, monogeneans (all phylum Platyhelminthes), nematodes (phylum Nematoda) and acanthocephalans (phylum Acanthocephala). We first establish and define the main categories of new species names based on their etymology, and provide examples for each of them. Secondly, we conduct a quantitative analysis of taxonomic and temporal patterns in the frequency at which different types of names are used for newly discovered parasite species. Thirdly, we test for gender bias among the many scientists honoured by having their name immortalized in a new species Latin binomial. Finally, in light of these results, we make some suggestions for future practice in naming newly discovered parasites.

2. Methods

(a) Data compilation

We extracted information from each new species description of trematodes, cestodes, monogeneans, nematodes and acanthocephalans published between 2000 and 2020, inclusively, in the following eight journals: *Acta Parasitologica* (data from 2000 to 2005 missing for this journal), *Comparative Parasitology, Folia Parasitologica*, *Journal of Helminthology*, *Journal of Parasitology*, *Parasitology International*, *Parasitology Research* and *Systematic Parasitology*. Although helminth descriptions are also published in other journals, these eight journals capture a large proportion of published descriptions, and provide a large enough sample for analysis. In many cases, new genera were also erected and named; however, we only focused on the etymology of species names, since there are many more of them.

For each species description, in addition to the Latin binomial name of the new species, we recorded the following basic information: (i) the higher taxon to which the parasite belonged (trematodes, cestodes, monogeneans, nematodes or acanthocephalans); (ii) the host taxon it parasitized (invertebrates, mammals, birds, reptiles, amphibians or fishes including elasmobranchs); (iii) the country or oceanic area where it was found; (iv) the year of publication; (v) the names of all authors of the description; (vi) the journal in which it was published; and (vi) the explanations given by the authors for their choice of species name.

Based on those explanations, we then assigned each species name to one of the following five etymological categories:

(i) *named based on morphology* ($n = 601$): species named after its overall size or shape, or the size and shape of certain anatomical features, or for something they resembled;
(ii) *named after the host* ($n = 550$): species named after either the Latin or common name of the type host in which it was found;
(iii) *named after the locality of collection* ($n = 616$): species named for the type locality where it was found, i.e. a geographical feature (lake, river, island), nearby city, country, broader geographical area or continent;
(iv) *named after an eminent scientist* ($n = 596$): species named after a scientist, usually a contemporary, considered by the authors to have made significant contributions to science, usually in research on the particular parasite or host group. We accepted the authors' assessment without question that the person honoured this way had made significant contributions to science; when a species was named after a scientist for their mentorship or supporting role rather than for their scientific contributions, this was assigned to the category below. The gender of the scientist honoured in this way was also recorded; this was treated as a binary variable (male or female) based on the use of pronouns (he/she, his/her) by the authors in describing the contribution of the scientist, or on the fact that many of these scientists are known personally to one of us (R.P.). We recognize that gender is not in fact binary; we are simply treating this variable as best as possible given the available information. Our approach is not intended to disrespect the gender self-identity of any scientist; and
(v) *named for something else* ($n = 528$): species name has an origin different from the above main categories. These were classified into a dozen subcategories; see table 1 for a list of subcategories and examples (further examples in the electronic supplementary material, table S1).

(b) Data analysis

Our main analysis tested for taxonomic or temporal patterns in the etymology of parasite names. For this, we grouped the five main etymological categories into those that convey some information about the parasite (name derived from its morphology, its host or its locality of origin) and those that do not (named after an eminent scientist, or for something else). These two larger categories were treated as a binomial response variable in a generalized linear mixed model (GLMM) with logit link, using the *lme4* package [41] in the R computing environment [42]. The fixed factors or predictors were the parasite's higher taxon (five levels: trematodes, cestodes, monogeneans, nematodes and acanthocephalans), the host taxon (six levels: invertebrates, fishes, amphibians, reptiles, birds and mammals), and the year of publication (2000 to 2020; ordered variable). Interactions were left out of this and other models (see below), as the number of possible combinations was too large for meaningful interpretation. The journal in which the new species was described was included as a random factor.

Second, we determined what factors influenced the gender bias in the choice of eminent scientists after whom parasites are named. For this, using only the 596 parasite species named after scientists, we used their gender (male or female) as a binomial response variable in a GLMM with logit link. The fixed factors were again the parasite's higher taxon, the host taxon

Table 1. Etymological subcategories for parasite species names that are not derived from their morphology, host, type locality, or named after an eminent scientist. (Examples are given for each subcategory, without unduly singling out particular authors with personal details. Explanations are taken directly from the original articles (further examples in the electronic supplementary material, table S1).)

subcategory	parasite species	etymological explanation	reference
named for collector/provider of the type material ($n = 58$)	*Dendromonocotyle lotteri*	named after Mr Paul Lotter, Director of Large Exhibits, Atlantis public aquarium, Dubai, who collected the original material	[16]
	Quasithelazia pearsoni	name named after the late Prof. J. C. Pearson who collected the material	[17]
named for person who provided technical or logistical assistance ($n = 143$)	*Ruhnkecestus latipi*	named for Captain Latip Sait, without whose trawling vessel and fishing expertise the collection of fresh specimens of this species would not have been possible	[18]
	Uvulifer pequenae	named after Tatiana Z. Pequeno Saco who provided invaluable assistance in organizing the field collecting in the Cordillera Azul	[19]
named for institution or infrastructure related to the research ($n = 26$)	*Pedibothrium puerobesus*	named after the reliable Darwin Fisheries research vessel, *Fat Boy*, which was used for all nurse shark collections conducted in the Northern Territories during the course of this study	[20]
	Phyllodistomum inecoli	name refers to the Instituto de Ecología (commonly known as INECOL), a research centre dedicated to the study of Mexico's natural resources, conservation and biodiversity	[21]
named for philanthropist or influential academic administrator ($n = 24$)	*Pseudodactylogyrus kamegaii*	named for Mr Shunya Kamegai, the former Director of the Meguro Parasitological Museum, Tokyo, who passed away on 5 February 2001	[22]
	Paracreptotrema blancoi	named in honour of Roger Blanco, Associate Director of Area de Conservacion Guanacaste (ACG), for his untiring efforts to ensure that ACG remains one of Costa Rica's premier biodiversity conservation area and a vital natural laboratory	[23]
named after organ of infection, pathology or epidemiological aspect ($n = 39$)	*Urocleidoides naris*	name derived from Latin (naris = nostril, nose) refers to the site of infection of this species	[24]
	Tarantobelus arachnicida	name refers to the fact that this species kills spiders	[25]
named after notable incident or reaction associated with species discovery ($n = 13$)	*Phoreiobothrium perilocrocodilus*	named for a somewhat frightening (Latin, peril = danger) encounter with saltwater crocodiles (Latin, crocodilus = crocodile) experienced by the senior author during collection of the hosts of this species, at night in crocodile-infested waters of Buffalo Creek, Australia	[26]
	Siphoderina territans	name (Latin, territo = frightening) refers to the numerous sharks patrolling the reefs where this species was recovered	[27]
named for local culture or cultural icon, past or present ($n = 28$)	*Saccocoelioides olmecae*	named in reference to the Olmecs, a Mesoamerican civilization that lived among the Gulf of Mexico between 1400 and 1200 BCE	[28]
	Stilestrongylus kaaguyporai	name from Ka-águy póra, according to the Guaraní ethnic group, the protector of the forests. In honour of the Guaraní people, first walkers of these forests	[29]
named for famous personality (dead or alive) from history, politics, arts or pop culture ($n = 13$)	*Constrictoanchoratus lemmyi*	named in honour of 'Lemmy' Kilmister (1945–2015), leader of the heavy metal band Motorhead, of whom the senior author is a big fan	[30]
	Aberrapex sanmartini	named after Jose de San Martin, one of the leaders of South America's successful struggle for independence from Spain	[31]
	Baracktrema obamai	named in honour of Barack Obama, 44th President of the USA	[32]

(*Continued*.)

Table 1. (*Continued.*)

subcategory	parasite species	etymological explanation	reference
named after fictional or mythological character or creature ($n = 8$)	*Hemirhamphiculus krabsi*	name (krabsi) was chosen because of the similar body shape of the species to that of Eugene H. Krabs (Mr Krabs), a cartoon character in the children's animated television series *SpongeBob SquarePants*	[33]
	Parapharyngodon politoedi	name derived from the fictional character named 'Politoed', a frog-type Pokémon from the Pokémon Universe	[34]
	Rhabdias glaurungi	named after the fictional character 'Glaurung', the first of the Dragons from J.R.R. Tolkien's mythopoeic collection *The Silmarillion*	[35]
named for mentor or personal supporter of the authors ($n = 22$)	*Pseudopecoeloides engeleri*	named for Beat Engeler, whose biology lessons inspired the first author to pursue a research career in marine science	[36]
	Acanthobothrium jamesi	named in honour of Brian James, University of Wales, for introducing the wonderful world of marine parasites to the second author during her PhD project	[37]
named for spouse, parent child, other relative, pet or close friend ($n = 140$)	*Rhinebothrium corbatai*	named after 'Corbata', the Welsh terrier dog of the first author	[38]
miscellaneous ($n = 14$)	*Thysanotohaptor rex*	name from Latin, rex = king, royalty	[39]
	Microcotyle visa	name visa, refers to the joy of the first author when she obtained her visa from the French administration after a long period of uncertainty	[40]

and the year of publication, with the journal in which the new species was described included as a random factor.

Finally, considering only the 528 parasite species named for 'something else', we tested whether the tendency to name a species after a close personal friend or relative followed temporal or taxonomic patterns. For this, we grouped the subcategories in table 1 into those that honour someone close to the author (two subcategories: parasite named for spouse, parent, child, other relative, pet or close friend, or for mentor or personal supporter of the author) and those that do not (all other subcategories). These groupings were treated as a binomial response variable in a GLMM with logit link, using the same fixed factors and random factor as in the analyses above.

We did not consider the country or oceanic area where a species was found as a factor affecting the choice of the species' Latin name, since the authors of the species description were often based in different countries. Similarly, we did not consider the identity of the authors of the species description as a factor, since different individuals join forces to describe different species, resulting in a huge number of distinct author combinations; it is impossible to determine which of them, if any, was most influential in choosing a species name.

3. Results

Our dataset included 2891 parasite species described between 2000 and 2020 in the eight target journals. The parasite taxa accounting for most new species were nematodes, followed by monogeneans and trematodes, whereas the host group by far the most often involved was fishes (electronic supplementary material, table S2). The numbers of new species described annually ranged from 85 species in 2002, to 178 in 2007. The journals that published the most new species descriptions during the 2000–2020 period were *Systematic Parasitology* and *Journal of Parasitology*, with 907 and 719 descriptions, respectively; and the ones that published the fewest were *Parasitology International* and *Journal of Helminthology*, with 144 and 136, respectively. In all GLMMs, the percentage of variance accounted for by journal identity as a random factor was less than 5% (see the electronic supplementary material, tables S3–S5), indicating no strong differences among journals in the etymological roots of the new species whose names they first published.

Our first analysis revealed no change over time in the frequency at which new parasite species are given names that convey some information about them (name derived from morphology, host or locality of origin) or not (named after an eminent scientist, or for something else) (table 2). However, the analysis uncovered some significant differences among parasite or host taxa. For example, trematodes and particularly cestodes are significantly less likely than other helminth taxa to receive a name that gives information about the species (figure 1). Looking at the patterns more closely, acanthocephalans and monogeneans appear more likely to be named based on their morphology, especially compared to nematodes, whereas cestodes are rarely named after their host. Parasites found in fish hosts are also more likely to be named after their morphology, but not as frequently named after an eminent scientist as parasites found in different host taxa.

Our second analysis revealed no taxonomic or temporal patterns in whether a male or female scientist was chosen in cases where new parasite species are named after eminent

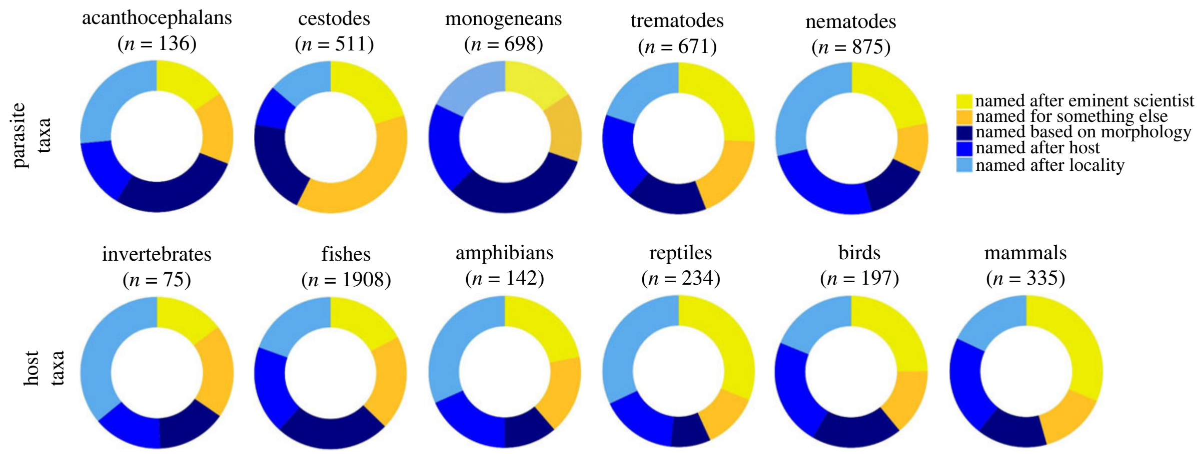

Figure 1. Usage frequency of the five main etymological categories for parasite species names among helminth taxa (top row) and host taxa (bottom row). Those that convey information about the parasite (name derived from its morphology, its host, or its locality of origin) are in blue colours, and those that do not (named after an eminent scientist, or for something else) in yellow-orange colours. The numbers of parasite species for each taxonomic group in our dataset are also shown. (Online version in colour.)

Table 2. Results of the GLMM with whether or not the species name conveys information about the parasite as the response variable, showing the effects of the main predictors, including the ANOVA table. (Significant effects shown in italics. Acanthocephalans (parasite taxon) and amphibians (host taxon) are included in the intercept. The percentage of the remaining variance accounted for by the random factor 'Journal ID' was 2.1%.)

fixed factors	estimate	s.e.	*z*-value	*p*-value
(intercept)	5.856	3.469	1.688	0.0914
parasite taxon (cestodes)	*−1.086*	*0.209*	*−5.188*	*<0.0001*
parasite taxon (monogeneans)	−0.054	0.208	−0.259	0.7959
parasite taxon (nematodes)	0.145	0.207	0.701	0.4833
parasite taxon (trematodes)	*−0.579*	*0.203*	*−2.847*	*0.0044*
host taxon (birds)	0.441	0.237	1.859	0.0630
host taxon (fishes)	*0.416*	*0.190*	*2.187*	*0.0287*
host taxon (invertebrates)	0.004	0.303	0.013	0.9892
host taxon (mammals)	−0.061	0.211	−0.289	0.7723
host taxon (reptiles)	−0.069	0.222	−0.312	0.7549
year of publication	−0.003	0.002	−1.549	0.1213
factor		χ^2	**d.f.**	***p*-value**
parasite taxon		*122.85*	*4*	*<0.0001*
host taxon		*19.98*	*5*	*0.0013*
year of publication		2.40	1	0.1213

scientists (electronic supplementary material, table S3). Across all 596 parasite species named after an eminent scientist, 111 (18.6%) were named after women. This proportion has remained about the same over the past two decades (figure 2), and did not vary significantly among parasite or host taxa.

Finally, among the 528 parasite species that do not fit in any clear etymological category and are instead named for 'something else', there was some weak effect of the parasite or host taxonomic group on whether or not a parasite species was named after a mentor, close personal friend or relative of the authors (table 3). For instance, parasites from bird hosts are less likely to be named after friends or relatives of the authors than parasites from other host groups (electronic supplementary material, figure S1). More importantly, there was a strong temporal trend (figure 3), with the proportion of parasite species named for a close personal friend or relative of the authors increasing over the past two decades. Although influenced by the zero value for the year 2000, the trend persists when the point is excluded (electronic supplementary material, table S4).

4. Discussion

The naming of a newly discovered species provides researchers with an opportunity to express their creativity and stamp their own preferences on the new life form they have uncovered. Latin binomial names serve as unique identifiers of species; they are not necessarily meant to convey any

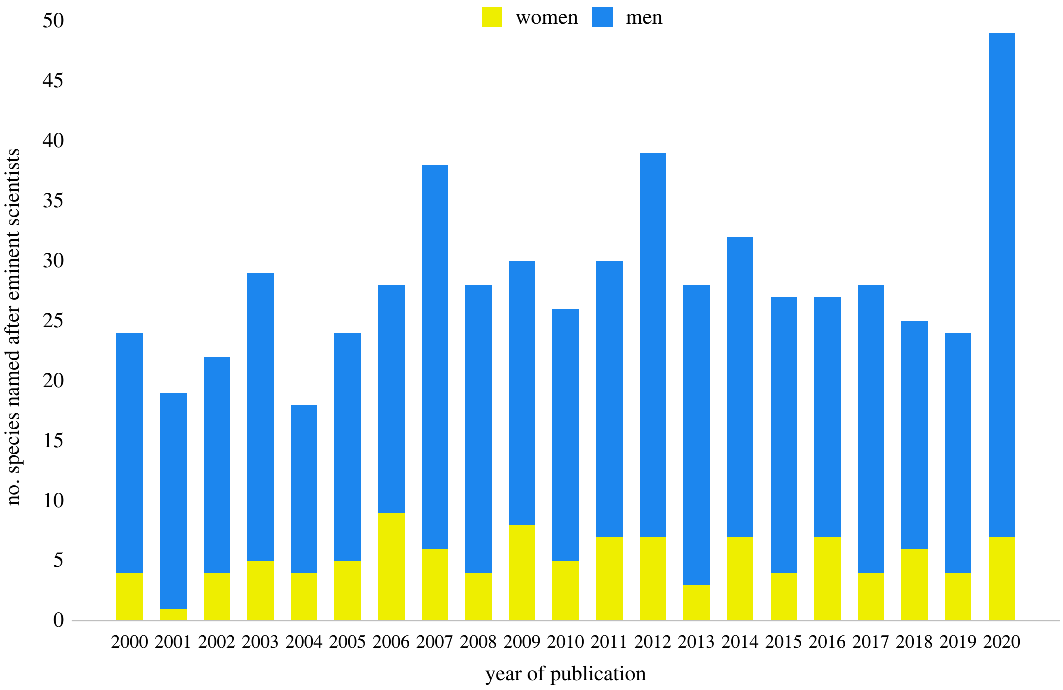

Figure 2. Number of parasite species named after an eminent scientist, shown separately for male and female eminent scientists, in the years 2000 to 2020. (Online version in colour.)

Table 3. Results of the GLMM with whether or not the species name honours a person close to the author (relative, close friend, personal mentor, pet) as the response variable, showing the effects of the main predictors, including the ANOVA table. (Significant effects shown in italics. Acanthocephalans (parasite taxon) and amphibians (host taxon) are included in the intercept. The percentage of the remaining variance accounted for by the random factor 'Journal ID' was 3.3%.)

fixed factors	estimate	s.e.	*z*-value	*p*-value
(intercept)	*−37.449*	*3.592*	*−10.426*	*<0.0001*
parasite taxon (cestodes)	0.637	0.553	1.150	0.2500
parasite taxon (monogeneans)	−0.253	0.590	−0.429	0.6677
parasite taxon (nematodes)	−0.014	0.634	−0.023	0.9818
parasite taxon (trematodes)	0.487	0.564	0.864	0.3874
host taxon (birds)	*−1.475*	*0.728*	*−2.026*	*0.0428*
host taxon (fishes)	−0.456	0.494	−0.924	0.3557
host taxon (invertebrates)	0.010	0.721	0.014	0.9886
host taxon (mammals)	−0.970	0.578	−1.677	0.0935
host taxon (reptiles)	−0.186	0.609	−0.305	0.7603
year of publication	*0.018*	*0.002*	*10.498*	*<0.0001*
factor		**χ^2**	**d.f.**	***p*-value**
parasite taxon		*10.869*	*4*	*0.0281*
host taxon		7.368	5	0.1947
year of publication		*110.213*	*1*	*<0.0001*

information about the species, the formal description serves that purpose. Therefore, taxonomists have the freedom to draw their inspiration from wherever they want. However, our analysis of nearly 3000 species names given to parasite species discovered and described in the past two decades reveals some differences in the sources of inspiration used depending on the taxonomic group to which parasites or their hosts belong, as well as temporal trends suggesting changes in naming preferences over time. Beyond shining a light on practices within the field of parasite taxonomy, our results also lead to some suggestions for the future naming of new species, whether parasitic or not.

Our classification of parasite names into categories and subcategories is roughly in line with earlier attempts to categorize species names [11]. These categories include some where the species name is informative and some where it is

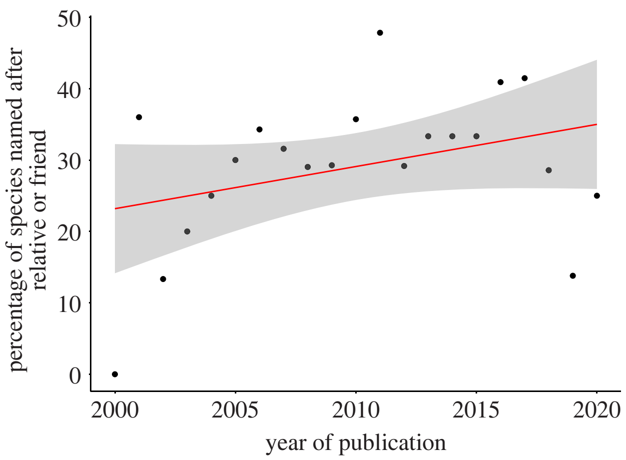

Figure 3. Percentage of parasite species named after a mentor, close friend or family member of the authors of the species description, as a function of the year in which the descriptions were published. The shaded area represents the 95% confidence interval around the line of best-fit. Note: the data include only the 528 parasite species named for something other than their morphology, their host, their location of origin, or an eminent scientist. (Online version in colour.)

not. Although they do not have to convey information about the species, Latin names that do so achieve the dual purpose of providing a unique label for the species as well as giving clues to what it looks like, what animal it lives in, or where in the world it may be found. Therefore, naming a new parasite species after its morphology, host species or type locality is a simple and conservative approach that directly relates to the species itself. Future records of a species often reveal that its name does not capture its full geographical distribution or the main host species that it infects; nevertheless, based on what is known at the time of its description, an informative name still tells us something relevant about the species. Our analysis reveals that the use of informative versus non-informative names for new parasite species depends on what taxonomic group the parasite or its host belongs to. One explanation for this finding may be that certain parasite taxa may not lend themselves to informative names. For instance, perhaps nematodes generally lack the kind of remarkable morphological features that would inspire a taxonomist, whereas species of monogeneans and acanthocephalans frequently display striking features that distinguish them from their relatives. Alternatively, the observed pattern in the use of informative versus non-informative names may be explained by 'cultural' divergence among the groups of taxonomists that specialize on different parasite and/or host taxa. Cultural differences in the use of electron microscopy, genetic analyses and other tools to describe species have already been documented among taxonomists working on different parasite taxa [9]. In particular, the idiosyncratic preferences of a few influential researchers can shape etymological traditions within groups of specialists. For instance, out of 36 cestode species described from bird hosts in our dataset, 18 (50%) involved the same taxonomist (Dr Boyko Georgiev), and out of 154 nematode species described from reptile hosts, 77 (50%) involved the same taxonomist (Dr Charles Bursey). These are just two examples out of many: over-representation of one or a few individual researchers among species descriptions is a common pattern for all combinations of parasite and host taxa. Although prolific taxonomists collaborate with different colleagues to describe (and name) different species, it is not inconceivable that their influence accounts for some of the differences in etymological choices we found among host and parasite taxa.

Our results also revealed that women researchers are under-represented among species named after eminent scientists. This is true across all parasite or host taxa, with the gender bias showing no evidence of improving over time in the past two decades. Furthermore, among scientists whose name is immortalized in the Latin name of two or more parasite species, only eight out of 71 are women. The gender bias extends to the most frequently honoured researchers: all eight scientists whose name is an eponym for six or more parasite species are men. The over-representation of male scientists honoured in a species name is not unique to parasites; in one of the rare analyses comparable to ours, Figueiredo & Smith [43] found species in the plant genus *Aloe* named for male scientists outnumber those named for women scientists by more than ten to one. This gender bias is no different from the one documented with respect to which scientists receive major awards, funding and prestige [44–46]. It is not possible to determine whether the gender of the authors of a species description influences who they name a parasite after, since most species are described by a team of authors of mixed genders. It is also difficult to determine whether the proportion of women among the taxonomic workforce corresponds to the proportion of species named after women scientists, since the gender of authors is often unknown. Nevertheless, a rough estimate suggests that well over one-third of authors of species descriptions are women, which exceeds the 18.6% of species named after women scientists. The gender bias observed is certainly not owing to a shortage of excellent female taxonomists after whom species could be named. The repeated naming of multiple new species after a small group of senior male parasitologists indicates a form of inertia, a 'usual suspects' effect, whereby the same people may be honoured time and time again because their names come to mind first.

Finally, our results indicate that when taxonomists do not name a new species after its morphology, host, type locality or an eminent scientist, the tendency to name it after a mentor, close personal friend or relative has increased in the past two decades. The tendency to name a parasite after a relative or friend also varied among different taxonomic groups of parasites or hosts. Both these patterns possibly again reflect cultural divergence among groups of taxonomists working on different taxa, or the influence of a few prolific individual researchers whose naming preferences have spread over time.

How should new species be named in the future? Although such judgements are somewhat subjective, many species names in our dataset are difficult to pronounce, spell and/or remember. The ICZN already recommends euphonious and memorable names, therefore taxonomists should aim for simple names. Beyond previous advice on how best to follow proper grammatical rules when Latinising words from various origins [13,47,48], here we offer further suggestions inspired by our empirical assessment of current practices.

First, when choosing to name a species after an eminent researcher in the field, one should aim for inclusivity with respect to gender, ethnicity, or any other facet of human diversity. Scientists, especially taxonomists, rarely receive

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the recognition they deserve, therefore honouring them by dubbing new species after them is a just reward. However, this practice must lead to a fair representation of the scientific community. In particular, there is no justification for repeatedly naming species after the same individual; certainly, a researcher whose name is already immortalized in the Latin name of two or three species does not need further eponymous recognition.

Second, although it is not done often, naming new species after celebrities such as politicians, athletes or artists should be done with caution, if not avoided altogether. This practice can attract media coverage and draw public attention to the importance of species discovery and biodiversity. However, unlike scientists, celebrities already achieve fame and global recognition without their name being immortalized in a new species. Furthermore, the ICZN recommends that species names as far as possible should not cause offence. It is unlikely that a famous politician or artist will appeal to everyone among cultures, across generations or socio-political divides, or over time. One person's hero is another's villain, and even celebrities that are widely acclaimed today can fall from grace tomorrow, leading to 'nomenclatural regret' for those who immortalized their name in a species [12]. The same arguments apply to eminent scientists, whose views or ethics may later come into question and whose reputation may later be tarnished for professional or personal reasons. However, most scientists get so little recognition for the major contributions they make to knowledge, that naming a new species after an eminent researcher seems more appropriate than naming it after a famous artist, athlete or politician.

Third, naming a new species after the child, spouse, parent or other family member of the authors, as well as naming it after a close friend with no connection to the discovery or description of the new species, should be discouraged. This practice is reminiscent of the favouritism granted to relatives (nepotism) or friends (cronyism) in other areas. Although not strictly disallowed by the ICZN, self-naming, i.e. naming a species after oneself, would be so severely frowned upon that it is simply not done. Naming a species after a relative or close friend seems like only a small step away from self-naming, and should therefore be avoided. Admittedly, in many cases, a family member or close friend may have provided indirect support to the author, allowing the latter to conduct the research leading to the discovery of new species, in which case naming a species after them would be appropriate. Ideally, this should be explicitly stated in the etymological explanation accompanying the species description. Intriguingly, when species are not named after their morphology, host, type locality or an eminent scientist, the tendency to name them after a relative or close friend has increased in the past 20 years, making it timely to reconsider this questionable practice. The case of species named after technicians, assistants, collectors, or local native helpers, whether or not they are friends of the authors, is of course different. These individuals have directly contributed to the discovery or description of the new species, but without being included as co-authors; they are too often given no credit for the work they do behind the scene, and have earned the right to be recognized eponymously.

The above suggestions are not meant to stifle inspiration, but instead to channel it towards practices that capture the spirit of the ICZN rules, honour the diverse scientific community regardless of gender or ethnicity, cause no offence, and avoid etymological nepotism and cronyism. As should be clear from the examples provided here (table 1; electronic supplementary material, table S1), there are many ways to be creative when naming species without straying from the above suggestions. With a vast biodiversity of parasites yet to be discovered [8], there will be ample opportunities for taxonomists to express their creativity as we progress towards the completion of the inventory of Earth's biodiversity.

Data accessibility. The full dataset is available from the Dryad Digital Repository: https://doi.org/10.5061/dryad.q573n5tk9 [49]. Information is also included in the electronic supplementary material [50].

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All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

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