Relationships among Cost, Citation, and Access in Journal Publishing by an Ecology and Evolutionary Biology Department at a U.S. University

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Background. Optimizing access to high-quality scientific journals has become an important priority for academic departments, including the ability to read the scientific literature and the ability to afford to publish papers in those journals. In this contribution, we assess the question of whether institutional investment in scientific journals aligns with the journals where researchers send their papers for publication, and where they serve as unpaid reviewers and editors.

Methods. We assembled a unique suite of information about the publishing habits of our department of ecology and evolutionary biology, including summaries of 3540 journal publications by 35 faculty members. These data include economic costs of journals to institutions and to authors, benefits to authors in terms of journal prestige and citation rates, and considerations of ease of reading access for individuals both inside and outside the university. This dataset included data on institutional costs, including subscription pricing (rarely visible to scholars), and "investment" by scholars in supporting journals, such as time spent as editors and reviewers.

Results. Our results highlighted the complex set of relationships between these factors, and showed that institutional costs often do not match well with payoffs in terms of benefits to researchers (e.g., citation rate, prestige of journal, ease of access). Overall, we advocate for greater cost-benefit transparency to help compare different journals and different journal business models; such transparency would help both researchers and their institutions in investing wisely the limited resources available to academics.

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2 **Journal Publishing by an Ecology and Evolutionary**
3 **Biology Department at a U.S. University**

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Abstract

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35 **Results.** Our results highlighted the complex set of relationships between these factors, and
36 showed that institutional costs often do not match well with payoffs in terms of benefits to
37 researchers (e.g., citation rate, prestige of journal, ease of access). Overall, we advocate for
38 greater cost-benefit transparency to help compare different journals and different journal

39 business models; such transparency would help both researchers and their institutions in
40 investing wisely the limited resources available to academics.
41

Introduction

43 Recent decades have seen major transformations in scholarly publishing practices,
44 particularly in fields like ecology and evolutionary biology. Major recent milestones have
45 included commercialization of most journals in the field, and consequent increases in
46 subscription prices (McGuigan 2008). In response, researchers at many institutions organized
47 high-profile boycotts of particular publishing enterprises (Goveas et al. 2022; Heyman et al.
48 2016), created rights-retention open access policies at the level of departments or institutions
49 (Xia et al. 2012), and explored new publishing models (e.g., journal "membership"; Binfield
50 2013; Else 2018). More recently, many journals have shifted from subscription-based access,
51 with publishing in most cases free to authors, to open access publishing with funding coming
52 from "article processing charges" (APCs) to authors (Peterson et al. 2019a). These latter
53 changes have indeed broadened reading access to journal-published papers around the
54 world, but have simultaneously closed publishing access to potential authors who often cannot
55 afford APCs (Larios et al. 2020; Mekonnen et al. 2022; Nabyonga-Orem et al. 2020; Peterson et
56 al. 2013).
57 These seismic changes in the scholarly publishing universe have led to a series of
58 challenges for researchers. The first challenge was how to ensure that the full, worldwide
59 community of researchers would be able to access (and cite) other researcher's work, a
60 challenge that gave rise to the open access movement. Even with expansions in open access,
61 many university-based researchers have seen significant erosion of access to the subscription-
62 based journals at their libraries: rising subscription costs have led most university libraries to cut
63 subscriptions to increasing numbers of journals (SPARC 2021). More recently, new challenges
64 center on how our community of researchers can afford the APCs instituted by an increasing
65 numbers of journals in the field to fund open access publication (Peterson et al. 2013; Solomon
66 & Björk 2012).
67 Despite these sweeping changes in scholarly publishing and scholars' roles in the
68 scholarly publishing "ecosystem," few or no analyses have examined publishing practices by
69 researchers (but see Aczel et al. 2021), particularly as a reflection of how their institutions spend
70 their limited resources. Here, we present a first analysis of the peer-reviewed, journal-based
71 scholarly publishing practices of a single academic department—the Department of Ecology and
72 Evolutionary Biology at the University of Kansas, which is a relatively large and reasonably
73 productive department, ranked #66 among peer departments in a recent summary
74 (Research.com 2023). Although our analysis indeed covers only a single department, trends
75 and relationships in the broader phenomenon of where researchers publish (and why) are of
76 general importance across ecology and evolutionary biology and more broadly. Our goal is to
77 characterize the journals in which faculty researchers publish their work, and analyze those
78 choices in relation to the cost of particular journals (i.e., subscriptions, APCs), benefits to the
79 researcher (e.g., citation rates for individual papers, Clarivate's Journal Impact Factor™ (JIF™),
80 and the work and time that the researchers donate to the journals (e.g., by reviewing and
81 editing).
82

Materials & Methods

Data compilation

The analyses presented in this paper are built upon a detailed compilation of data about publication, reviewing, and editing activities of department members, as well as data about the journals themselves. Our focus was on peer-reviewed, journal-published scholarly publications, not out of disregard or lack of appreciation for other forms of scholarly publication (e.g., monographs, books, book chapters, blog posts), but rather in view of the fact that, in ecology and evolutionary biology, peer-reviewed journal papers are the principal currency by which faculty are evaluated for promotion, tenure, and general achievement and advancement. We focused on journals in which University of Kansas Ecology and Evolutionary Biology (henceforth "EEB") faculty (all faculty members combined) had published at least twice (i.e., we eliminated journals in which EEB faculty had published only a single paper).

EEB faculty publications.—We derived a complete catalog of papers published by EEB faculty members during their careers. We first searched for individual "scholar profiles" on Google Scholar (https://scholar.google.com/) for each of the 38 then-current EEB faculty members (9 December 2022; no effort was made to include past EEB faculty in this search). Six EEB faculty members did not have Google Scholar profiles at the time of our original derivation of data for this study, in 2020, so we requested that they create profiles. We interviewed a number of EEB faculty members about their maintenance of their Google Scholar profiles, and none indicated any filtering or biasing behavior regarding including papers in their profiles; the only maintenance activity that was mentioned by any of the faculty members was that of "synonymizing" multiple versions of papers that had entered in the profile. In the end, 35 of 38 EEB faculty members had profiles; two of the three individuals who did not were not highly research-active. Journals represented at least twice among the pool of journal publications across all of these profiles were the basis for all our data analyses.

We used customized scripts written in R (R Core Team 2020) and the package "scholar" (Keirstead 2016) to "scrape" publication lists for each EEB faculty member (see EEB faculty scholar IDs and scripts available in http://hdl.handle.net/1808/32587). We isolated from these data records the year, journal name, and total number of citations for each paper. For each individual publication, we calculated the average number of citations per year since publication as [total citations / (2023 – publication year)]. We restricted our analyses to journals that are peer-reviewed, to the best of our knowledge, although we were unable to separate out publications in peer-reviewed journals that were nonetheless not peer-reviewed (e.g., book reviews).

EEB faculty reviewing and editing activities.—EEB faculty members are required to submit annual reports to the department, which include information about their service activities. Certain data elements are extracted from these reports by department personnel, and are made available to the broader community for general information without identification of individual faculty members. From this information, we tallied the total number of manuscript reviews provided to each journal by EEB faculty over the period 2015-2018. From these same annual reports, we also derived a summary of average number of EEB faculty editor-years for each journal during the period 2015-2018.

Journal characteristics.—For clarity in reference to journals, we added ISSN codes for each journal in which EEB faculty published papers via consultation of http://portal.issn.org and

127 https://www.ncbi.nlm.nih.gov/nlmcatalog. When multiple ISSNs were available for a journal,
128 used the newer version or the "online" version. Finally, when doubt existed owing to multiple
129 journals with similar or identical names, we searched the actual title of paper on Google
130 Scholar, accessed the paper online, and then identified the journal that published the paper(s) in
131 question.
132   We next summarized the characteristics of each journal in multiple dimensions, via
133 queries to a series of information sources. JIF™ numbers were obtained for 2019 via queries to
134 Web of Science (https://wos-journal.info/). Whether journals were open access or not was
135 obtained from the Directory of Open Access Journals (DOAJ) 16 December 2022 public data
136 dump (https://doaj.org/docs/public-data-dump/). Note that our focus is on fully open publication
137 of papers, such that the final published version is what is available; as such, we do not
138 emphasize so-called "green" open access solutions, in which the author leverages their ability to
139 post pre-publication copies of papers online, often in institutional repositories. For open access
140 journals, we obtained costs of publication in the form of article processing charges (APCs) from
141 the same source, in a few cases supplemented via direct consultation of journal web pages.
142 Open access journals that do not charge APCs (i.e., "platinum" open access journals) were
143 counted as having an APC of $0. We also evaluated journal "friendliness" to open access via
144 the SHERPA/RoMEO site (https://v2.sherpa.ac.uk/romeo/), recording journals as "yes" (i.e., can
145 post immediately) "wait" (i.e., can post, but after an embargo period), "$" (i.e., only via paying an
146 open-access fee), "funder" (i.e., only under a funder mandate), or "no" (i.e., cannot post) for
147 posting final published version, author's last version (i.e., post-review), or the submitted version
148 (i.e., submitted version). For this latter information, we assumed that open-access journals in
149 which authors retain copyright, or in which content is served under a CC-BY license, would be
150 "yes" under all three categories.
151   Finally, only for the purpose of illustration, we obtained what we term a "cost of
152 openness" for each journal. This quantity is the APC in the case of open access journals, but is
153 the hybrid open access fee in the case of subscription journals. The APC was obtained as
154 described above, whereas the hybrid fee was obtained via direct consultation of journal web
155 pages. We note that the potential for self-archiving of papers published in many journals (i.e.,
156 so-called "green" open access) is not considered in this "cost": rather, we focus on the costs
157 associated with full and open access to the final, published version of each paper.
158   *Journal characteristics at the University of Kansas.*—We obtained information on the
159 2019 subscription price (paid annually) by means of searches of publisher websites, journal by
160 journal. For the remaining journals, KU Libraries personnel were able to check journal
161 subscription costs from internal sources. Note that this price information refers to subscriptions
162 to closed-access journals only, such that we do not include this information for open access
163 journals. Finally, via publishers' COUNTER Code of Practice, Release 4, data provided to KU
164 Libraries, we obtained data information on journal usage (access counts) during 2018-2022;
165 COUNTER is an information source used by publishers to inform libraries about their journal
166 usage.
167
168 *Data harmonization, improvement, and analysis*
169   We next invested considerable time and effort in standardizing journal names, to ensure
170 that information from individual journals was not duplicated across name variations. Although

171 Google Scholar records presented some journal naming issues (e.g., spelling, duplications),
172 these complications were much more challenging when harmonizing data among sources (e.g.,
173 Google Scholar, Web of Science, DOAJ, SHERPA/RoMEO, EEB annual reports, etc.).
174   The final dataset was then subjected to a series of exploratory analyses, mainly bivariate
175 plots and regression analyses, designed to detect patterns. All statistical analyses were carried
176 out in R. The full, final dataset is available via the University of Kansas's digital repository, KU
177 Scholarworks, at XXXXXX.
178

179 **Results**
180 *Basic characteristics*
181   In all, the 35 EEB faculty members published a total of 5916 items that were listed in
182 their Google Scholar profiles. Those profiles, however, included many items that were not peer-
183 reviewed publications (e.g., abstracts), not journal publications (e.g., book chapters), or that
184 duplicated other entries in profiles. As such, when we quality-controlled and cleaned the
185 dataset, the total number reduced to 3540 journal publications.
186   Summarizing the data by journal instead of by faculty member, the number of EEB
187 publications in journals that we analyzed ranged from 2 (see above) to 81 (*Molecular*
188 *Phylogenetics and Evolution*). Other journals seeing frequent EEB publication included *Zootaxa*
189 (76), *Journal of the Kansas Entomological Society* (76), *PLoS One* and *ZooKeys* (74), and
190 *Evolution* (61) (Figure 1). The journals with the fewest EEB publications were either journals in
191 other fields, in which EEB researchers were often co-authors as part of early research
192 experiences or out-of-field collaborations, or small and regional journals in which EEB faculty
193 have published only occasionally.
194

195 *KU EEB investment in and contribution to journals*
196   Over a recent 4-year period, EEB faculty contributed over 110 reviews to single journals
197 (*Evolution*, *Trends in Ecology and Evolution*) (Figure 1), but far fewer in other journals where
198 they nonetheless publish their research frequently (e.g., *PLoS ONE*, *Proceedings of the Royal*
199 *Society B*). EEB faculty editorships were focused in journals of modest publication activity (e.g.,
200 *Systematic Biology*, *Zootaxa*, *Oecologia*)—that is, some EEB faculty dedicate significant
201 editorial time to some journals in which they do not often publish. Although both reviewing
202 activity and editorships related positively and significantly to number of EEB papers published
203 (Table 1), researchers' investment of time as reviewers or editors was not related directly to
204 annual subscription price either (Figure 2).
205

206 *Costs and benefits*
207   A first consideration is the relationship between various measures of journal quality and
208 journal price—i.e., are academic libraries and (less directly) university-based scholars getting
209 their money's worth when they pay for expensive journals? The relationship between JIF^{TM} and
210 annual subscription price showed a relatively strong, positive relationship (R^2 = 0.220, P < 0.05).
211 However, the positive slope of this relationship was a consequence only of *Science* and *Nature*,
212 statistical outliers for JIF^{TM} and both relatively high as far as price. Removing these two journals
213 reduced the R^2 by 83.1% to 0.0372 (Figure 3). The relationship between JIF^{TM} and numbers of
214 EEB publications was positive, but not strong: the overall regression had R^2 = 0.0236; removing

215 two outlier journals (*Science* and *Nature*) reduced the strength of the relationship, to R^2 =
216 0.0036; in only the former case was the relationship statistically significant (Figure 3).
217   Journal usage at the University of Kansas showed a positive relationship to annual
218 subscription price (R^2 = 0.1054, P < 0.05). Again, however, the relationship was a consequence
219 of the inclusion of *Science* and *Nature* and not a more general trend: removing those two
220 journals eliminated the positive slope of the relationship and reduced the R^2 dramatically,
221 effectively to 0, and the relationship was no longer statistically significant (Figure 3, Table 1).
222 Benefits to researchers in terms of citation rate, however, showed no relationship to annual
223 subscription price. Overall, the relationship was weak (R^2 = 0.0429, P > 0.05; Figure 3). Papers
224 published in *Science* and *Nature* did not show any marked elevation in citation rate compared to
225 other journals, such that the relationship did not change with their inclusion (R^2 = 0.0167, P >
226 0.05; Figure 3, Table 1).
227   For open access journals, EEB faculty published as many as 81 papers in single
228 journals (*PLoS ONE*). The APCs for publishing in open access journals ranged from $0 (i.e.,
229 "platinum" open access journals) to $5300 (*PLoS Biology*). EEB faculty did not tend to publish
230 more in free journals or in expensive journals (Figure 4), but rather these publication choices
231 appeared to be unrelated to APCs (R^2 = 0.003, P > 0.05).
232   The relationship between JIF^{TM} and APCs was decidedly positive, with few or no
233 platinum open access journals being accorded JIF^{TM} ratings (= indexing in Web of Science).
234 Indeed, JIF^{TM} increased by ~2 for every $1000 of increase in APCs (R^2 = 0.679, P < 0.05;
235 Figure 4, Table 1). Numbers of citations that individual papers received showed a positive
236 relationship to APCs (R^2 = 0.1083, P < 0.05; Figure 4, Table 1).
237   Finally, the cost of openness in journals in which EEB faculty published showed some
238 rather impressive sums. That is, for two journals (*Nature Ecology & Evolution*, *Nature Plants*),
239 the cost of making a published paper open access was above $9000. In another seven journals,
240 costs of making a published paper open access were above $5000. Simply for the purposes of
241 illustration, the total cost of publication, the sum of numbers of papers multiplied by the cost of
242 openness for each journal where EEB faculty published their work is above $900,000.
243

Discussion

245   We are not aware of datasets or analyses similar to what we present here, although one
246 recent study calculated the value of peer review that is donated by scientists to the publishing
247 industry (Aczel et al. 2021). That is, we have assembled a suite of novel pieces of information,
248 including where academics publish their work; how much those publications cost the academics
249 (APCs), their institutions (e.g., institutional support for paying APCs, subscription charges), or
250 their funders; how much those publications benefit the academics (e.g., in terms of citation rate
251 or journal impact factor ratings, or download rates within the institution); and how academics
252 choose to support journals via unpaid editing and reviewing activities. Assembling this
253 information required scraping algorithms for harvesting data from Google Scholar, by-hand
254 summary of data in annual reports and online databases, and careful consultation with
255 University of Kansas Libraries personnel as regards annual subscription prices and download
256 rates. Exploration of this dataset therefore can inform about important, yet often unperceived,
257 relationships.
258

259 *Getting your money's worth*
260   To what degree are institutional investments of scarce financial resources "paying off" in
261 the currencies of importance in academia, such as research impact, prestige, and citation rates?
262 The extent to which impact factors are (or should be) of importance in judging academic
263 excellence is hotly contested (Anonymous 2016; Saha et al. 2003; Seglen 1997). Our analyses
264 revealed that, without the outliers *Nature* and *Science*, three metrics that may be seen as
265 assessing payoff or benefit to researchers (i.e., JIF™, citation rate, journal usage by readers),
266 show no relationship to subscription costs—that is, expensive journals do not "pay off" in greater
267 return to the researcher. *Nature* and *Science* rank among the most expensive of all KU EEB-
268 related journals and represent outliers in several of our analyses. Similarly, those two journals
269 (plus *Scientific Reports* and *Proceedings of the National Academy of Science USA*) are used at
270 KU much more than the usage-price relationship among the remaining journals (Figure 3).
271 Undoubtedly, this effect might be attributed to the multi-disciplinary nature of these journals,
272 whereas most of the rest are limited to ecology and evolutionary research dimensions. With or
273 without those few, highest-profile journals, the relationship between number of publications by
274 EEB faculty and impact factor was positive, but quite weak and not statistically significant.
275   Curiously, though, when one focuses on numbers of citations accrued by individual
276 publications ("citation rates") instead of journal-level impact factors, relationships change
277 dramatically (Neylon & Wu 2009), both for subscription-based and open access journals.
278 Overall, citation rates per year were only slightly positively related to subscription costs. Among
279 subscription-based journals, the standout journals were *Ecography*, *Ecological Modelling*, and
280 *Nature*, each with modest subscription prices, or sufficiently high numbers of citations that a
281 higher subscription price was possible. Similarly, among open access journals, citation
282 "winners" were *Ecography* (in transition from subscription-based to open access), *Science
283 Advances*, *Royal Society: Open Science*, and *Nature Communications*. Note that this
284 calculation omits the so-called platinum open access journals, which have no APCs—journals
285 with highest citation rates in this category include *Emerging Infectious Diseases*, *Revista
286 Mexicana de la Biodiversidad*, *Journal of Librarianship and Scholarly Communication*, *Revista
287 da Sociedade Brasileira de Medicina Tropical*, and *Biodiversity Informatics*. These contrasts
288 between citation rates and impact factors as a basis for valuing journals have been pointed out
289 in other contexts (Galligan & Dyas-Correia 2013; Vanclay 2009), but suggest that the current
290 shift toward article-based valuation metrics may lead to consequent shifts in emphasis on
291 different sets of journals as "winners."
292   Journal impact factors (IFs) are a proprietary, journal-level metric calculated and
293 published annually by Clarivate Analytics (Clarivate 2021). In brief, this index is a proprietary
294 and not-reproducible function of the mean number of citations in a given year of citable articles
295 over the previous two years. Although impact factors were devised by a librarian and
296 bibliometrician, who intended it primarily as a tool for use by librarians in collection development
297 and management (Garfield 1972), they have since been taken up by a commercial enterprise.
298 JIF™ has been the subject of numerous critiques of both its inherent nature and its (mis)use
299 (Baldwin 2017; Juyal et al. 2019; McVeigh & Mann 2009; PLoS Medicine Editors 2006). Garfield
300 himself stated "that you should not use JIF to evaluate a person or department" (Kim 2000), a
301 sentiment that was underlined in 2012 with the signing of the San Francisco Declaration on

302 Research Assessment (DORA) (DORA 2012). DORA was subsequently signed by >20,000
303 individuals and organizations in 148 countries (as of Oct. 2021).
304 Article impact is more appropriately assessed through article-level metrics, such as
305 numbers of citations or citation rates, as well as by a number of so-called "alternative" metrics
306 ("alt-metrics"), such as views and downloads, social media attention, and news reporting on an
307 article (Altmetric 2021). Of course, the best assessment of the quality of an article is to *read* the
308 article, but this can quickly become unwieldy for evaluators such as those on hiring, promotion,
309 and funding committees. Of course, article-level metrics also have limitations and must be used
310 appropriately, but they do address the article rather than the venue of publication, and therefore
311 represent a more suitable set of tools than impact factors of any sort for assessing quality,
312 impact, and merit of individual publications. These ideas are underlined by the results of this
313 study, in which the "best-value" journals for researchers and academic institutions are nuanced
314 and subtle in the qualities that distinguish them.
315
316 *Investing time and energy in the right journals*
317 One can imagine diverse motivations for scholars to invest their time in particular
318 journals: keeping current with the literature, supporting a particular field, allegiance to a scientific
319 society, and the prestige of reviewing or holding an editorial position at a high-profile journal. KU
320 EEB faculty reviewed manuscripts with particular frequency for journals such as *Evolution* and
321 *Trends in Ecology and Evolution*, in which they published frequently, but also for prestigious
322 journals like *Current Biology*, where KU EEB publication is not as frequent. Similarly, KU EEB
323 editing effort was focused in journals such as *Systematic Biology*, *Zootaxa*, and *Oecologia*,
324 which were not particularly high in frequency as publishing venues for KU EEB faculty.
325 KU EEB "investment" in journals was also not related to price. One might expect that
326 such a relationship might be positive, if price were a good indicator of value or prestige, or that it
327 would be negative, if KU EEB faculty were investing their time and effort in journals that are
328 good bargains for them and the university. In fact, the relationship was not at all clear, such that
329 we suspect that numerous other priorities and motivations direct how faculty dedicate their time
330 and effort. This set of motivations would seem to represent an interesting and fruitful area for
331 future research.
332
333 *Perspectives for the future*
334 The landscape of scholarly publishing is continuing its rapid shift. Older, subscription-
335 based models are clearly decreasing in number, with journal after journal "going open" (e.g.,
336 Araújo et al. 2019), notwithstanding the mixture of good and bad consequences from those
337 changes (Peterson et al. 2019a). This shift mirrors the earlier, massive-scale commercial
338 investment in academic publishing and its effects. Once again, commercial interests (i.e., profit,
339 market share, prestige) frequently outweigh the academic motivations of communication and
340 access, leading to discords and mismatches between the publishing and academic communities
341 and their respective interests (Buranyi 2017).
342 Journal-level metrics are heavily used by committees conducting job searches or
343 evaluation junior faculty for promotion and tenure. Our data show that, at least for the case of
344 KU EEB, the most expensive journals are not necessarily those most cited or even, excluding a
345 few outliers, those with highest impact. Our results clearly highlight that, for individual

346 researchers, investment in service to certain prestigious and expensive journals makes dubious
347 sense. What to do then? The idea that impact factors should be used to assess individual
348 productivity has been so strongly criticized (Schimanski & Alperin 2018; Vanclay 2012) that we
349 wonder why it continues being used. Better ways to evaluate academic productivity have
350 already been suggested, particularly in the form of article-level quality metrics (Schimansky and
351 Alperin, 2018).
352   A consequence of these evolving publishing modes and outcomes has been the broad
353 exploration of new models of subscription and payment—in effect, business models for
354 academic publishing. Significant experiments include the "Public Library of Science," and its
355 exploration of not-for-profit open access journals (which nonetheless have high APCs)
356 (Bernstein et al. 2003); another novel business model is the subscription-based *PeerJ* (which
357 also ends up charging the equivalent of significant APCs) (Binfield 2013). Another force in this
358 academic publishing world has been that of open access mandates, particularly by funding
359 agencies (e.g., Suber 2008), and so-called "green" open access, in which individual researchers
360 make versions of their research open and available. This opening of access absent financial
361 return to the journals, regardless of annual subscription prices or APCs, was originally feared to
362 bankrupt academic journals; however, in the case of the largest funder mandate to date in the
363 United States, it did not result in noticeable changes in viability and survival of journals in the
364 fields that were most affected (Peterson et al. 2019b). Indeed, in some cases, changes forced
365 on journals by commercial publishing enterprises have led to mass resignations of editorial
366 boards, exemplifying the priority contrasts between the different stakeholders in the academic
367 publishing world (Peterson et al. 2019a).
368

Conclusions

370   Academics play a curious role in a world with many stakeholders and interests:
371 academics produce the journal publications that are the currency of that world, and need access
372 to the totality of journal publications for both publishing and reading. Nonetheless, those same
373 academics are subject to changing university budgets and commercial interests that affect the
374 publishing world directly. This paper has summarized the outcome of myriad influences and
375 interests, in terms of how they translate into publishing patterns, for one department of ecology
376 and evolutionary biology, in this case at the University of Kansas. The degree to which these
377 patterns are unique to this department *versus* more broadly representative will paint an
378 intriguing picture of how scholars publish in the 21st century.
379

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385

386

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Figure 1

Number of papers published, numbers of reviews, and average editorships per year, for different journals by ecology and evolutionary biology faculty.

Total number of reviews (2015-2018) and average number of editorships per year (2015-2018) are shown as color ramps from 0 (white) to maximum value (red). Numbers of papers in the same set of journals are shown in the histogram, excepting journals with <20 papers published by the group of faculty under analysis.

Number of papers

Mol. Phylo. Evolution	
Zootaxa	
J. Kansas Entomol. Society	
ZooKeys	
PLoS One	
Evolution	
American Museum Novitates	
Journal of Melittology	
Proc. Nat. Acad. Sciences USA	
Ecology	
Proc. Royal Soc. London B	
Ecology Letters	
Nature	
Cretaceous Research	
Journal of Biogeography	
Journal of Ecology	
Proc. Entomol. Soc. Wash.	
New Phytologist	
Journal of Paleontology	
Oecologia	
Trans. Kansas Acad. Sci.	
Systematic Biology	
Ornithology / Auk	
American Journal of Botany	
Molecular Ecology	
American Naturalist	
Systematic Entomology	
Genetics	
Current Biology	
Science	
Herpetologica	
Entomologist's Monthly Mag.	
Diversity and Distributions	
Ecological Modelling	
Ecology and Evolution	
Ichthyol. and Herpetol.	
Bull. Zool. Nomenclature	
Molecular Biology and Evolution	
Bull. Brit. Ornithol. Club	
Novitates Paleoentomologicae	
Global Ecology and Biogeography	
Oikos	
Revista Mexicana de Biodiversidad	
Apidologie	
Trends in Ecology and Evolution	
Journal of Human Evolution	

Editorships (0-1.6 per year)

Total number of reviews (0-116)

Figure 2

Two metrics of faculty investment in journals (numbers of reviews and editorships), as a function of 2019 subscription price.

Blue trendline shows a simple linear regression including all journals, whereas the red trendline shows the relationship when the outlier journals *Science* and *Nature* are excluded from the analysis. Journals falling well away from the main cloud of journals (i.e., additional outliers) are labeled for discussion in the text.

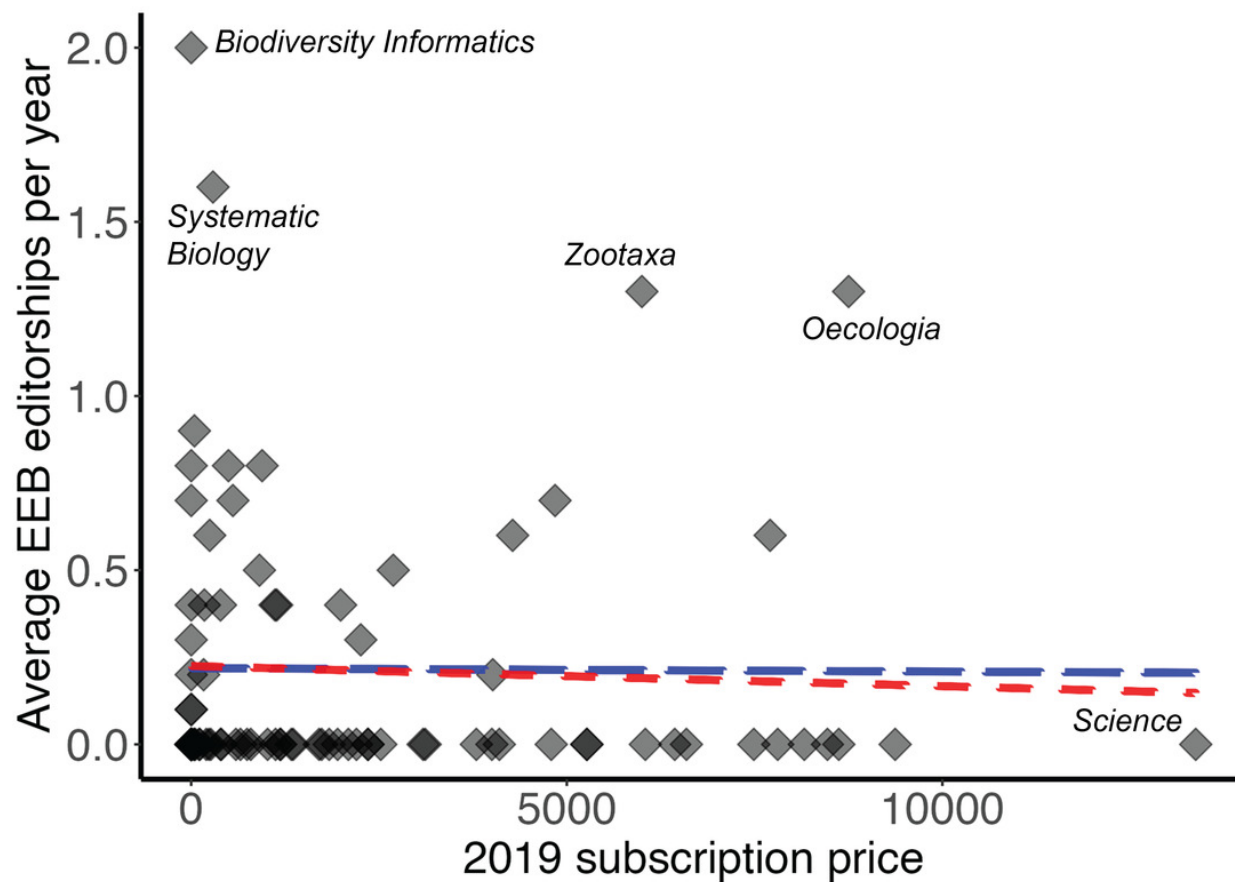
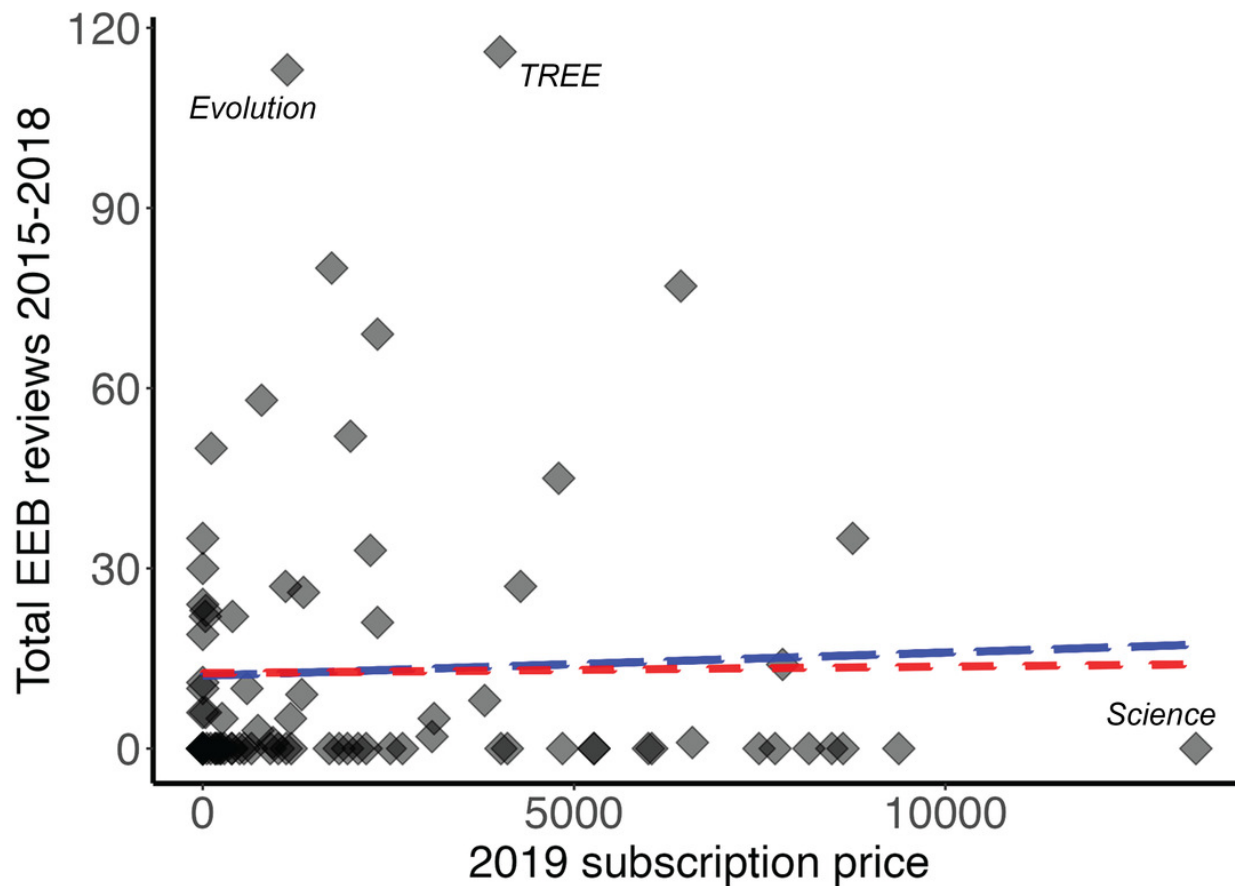



Figure 3

Number of papers published, plus three metrics of payoff to faculty for publishing in journals (Journal Impact Factor™, average citations per year, average usage in the University of Kansas Libraries system), as a function of 2019 subscription

Blue trendline shows a simple linear regression including all journals, whereas the red trendline shows the relationship when the outlier journals *Science* and *Nature* are excluded from the analysis. Journals falling well away from the main cloud of journals (i.e., additional outliers) are labeled for discussion in the text.

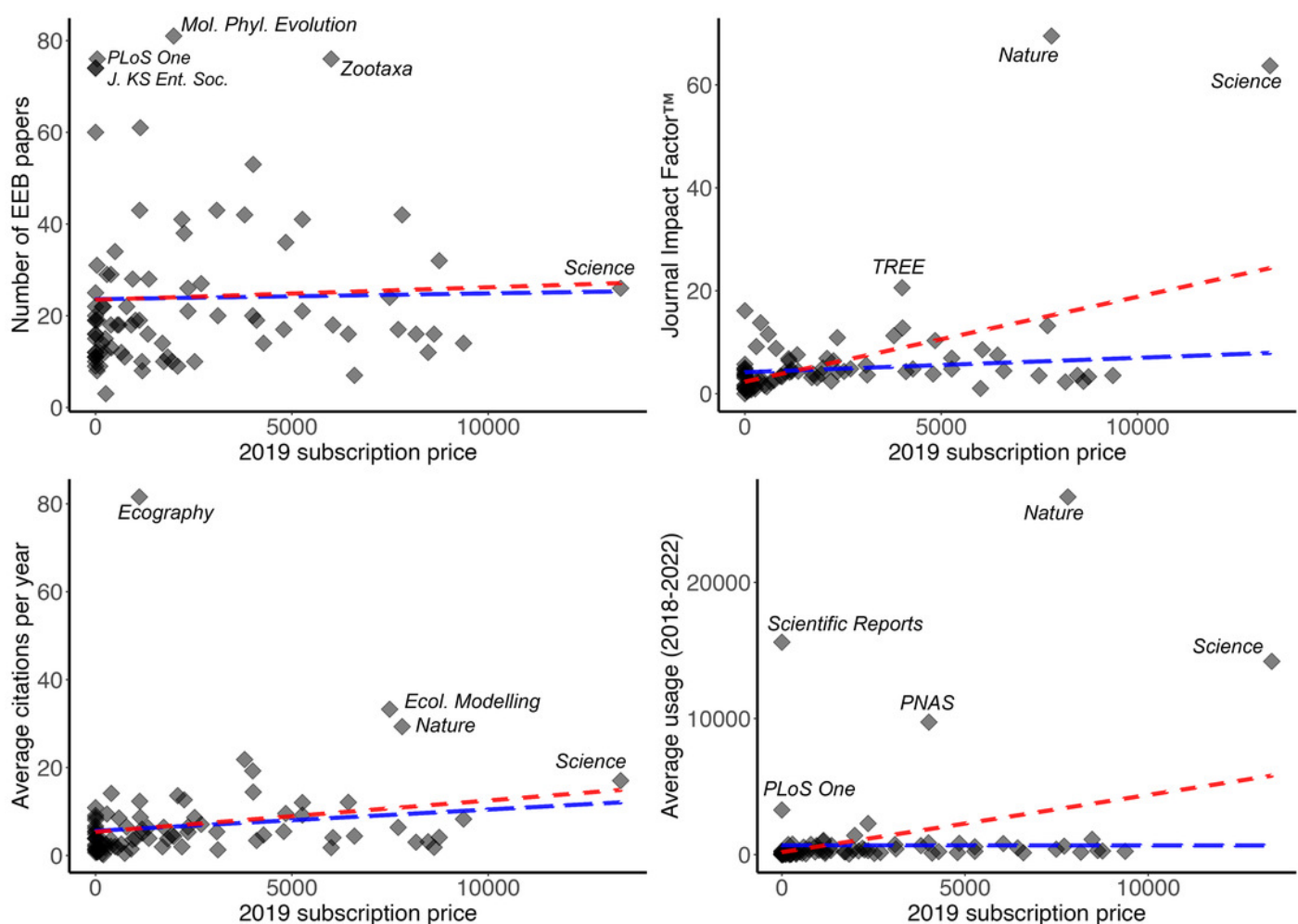
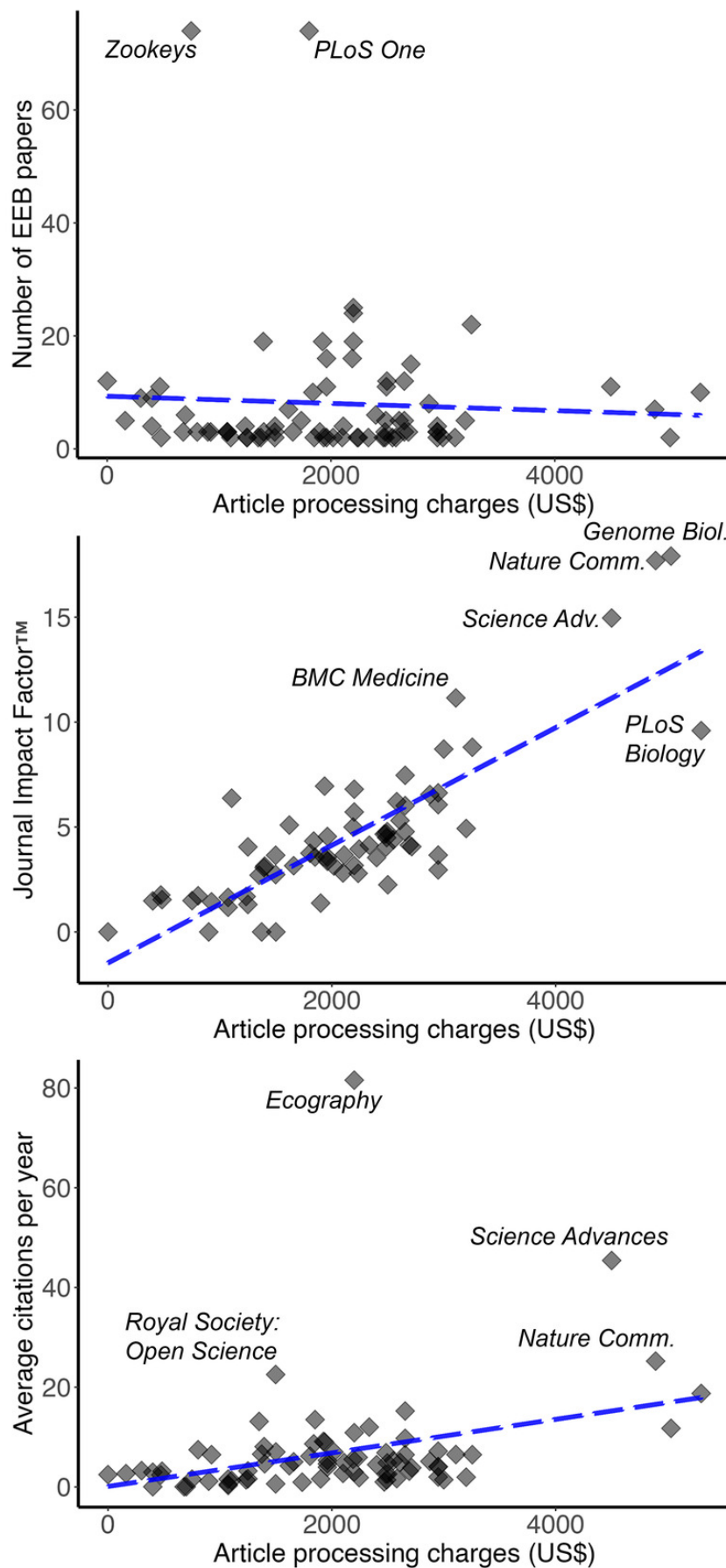



Figure 4

Number of papers published and two metrics of payoff to faculty for publishing in open-access journals (Journal Impact Factor™, average citations per year), as a function of article processing charges (in US$).

Blue trendline shows a simple linear regression including all journals, whereas the red trendline shows the relationship when the outlier journals *Science* and *Nature* are excluded from the analysis. Journals falling well away from the main cloud of journals (i.e., additional outliers) are labeled for discussion in the text.

Summary of relationships between independent (columns) and dependent (rows) variables in analyses of relationships among variables related to publishing by ecology and evolutionary biology faculty.

For each cell in the matrix, "+" indicates positive-slope relationships, and "-" indicates negative-slope relationships. Boldface indicates relationships for which the slope is significantly different from zero, and the R^2 value is given in parentheses in all cases.

	Number of EEB papers	2019 subscription price	Article processing charges (US$)	Cost of openness (US$)	Average EEB editorships per year	Total EEB reviews 2015-2018	Journal Impact Factor™	Average citations per year	Average usage (2018-2022)
Number of EEB papers		+ (0.0021)	- (0.0031)	+ (0.0005)	**+ (0.1669)**	**+ (0.1042)**	**+ (0.0236)**	**+ (0.0132)**	**+ (0.0684)**
		+ (0.0004)	- (0.0031)	+ (0.0005)	**+ (0.1734)**	**+ (0.1044)**	+ (0.0036)	+ (0.0082)	**+ (0.0489)**
2019 subscription price	+ (0.0021)		+ (0.0331)	**+ (0.1237)**	- (0.0018)	+ (0.0002)	**+ (0.2198)**	+ (0.0429)	**+ (0.1054)**
	+ (0.0004)		+ (0.0331)	**+ (0.1237)**	- (0)	+ (0.0017)	**+ (0.0372)**	+ (0.0167)	- (0)
Article processing charges (US$)	- (0.0031)	+ (0.0331)		**+ (0.1033)**	- (0.0437)	+ (0.0028)	**+ (0.6793)**	**+ (0.1083)**	**+ (0.0612)**
	- (0.0031)	+ (0.0331)		**+ (0.1033)**	- (0.0437)	+ (0.0028)	**+ (0.6793)**	**+ (0.1083)**	**+ (0.0612)**
Cost of openness (US$)	+ (0.0005)	**+ (0.1237)**	**+ (0.1033)**		- (0.0082)	+ (0.0021)	**+ (0.0351)**	**+ (0.0141)**	- (0.0017)
	+ (0.0005)	**+ (0.1237)**	**+ (0.1033)**		- (0.0082)	+ (0.0021)	**+ (0.0351)**	**+ (0.0141)**	- (0.0017)
Average EEB editorships per year	**+ (0.1669)**	- (0.0018)	- (0.0437)	- (0.0082)		+ (0.009)	- (0.0029)	+ (0.0001)	+ (0.0021)
	+ (0.1734)	- (0)	- (0.0437)	- (0.0082)		+ (0.009)	- (0.0031)	+ (0.0001)	+ (0.0114)
Total EEB reviews 2015-2018	**+ (0.1042)**	+ (0.0002)	+ (0.0028)	+ (0.0021)	+ (0.009)		**+ (0.0122)**	**+ (0.0264)**	+ (0.0016)
	+ (0.1044)	+ (0.0017)	+ (0.0028)	+ (0.0021)	+ (0.009)		**+ (0.0235)**	**+ (0.0259)**	+ (0.0017)
Journal Impact Factor™	**+ (0.0236)**	**+ (0.2198)**	**+ (0.6793)**	**+ (0.0351)**	- (0.0029)	**+ (0.0122)**		**+ (0.1453)**	**+ (0.4772)**
	+ (0.0036)	**+ (0.0372)**	**+ (0.6793)**	**+ (0.0351)**	- (0.0031)	**+ (0.0235)**		**+ (0.1583)**	**+ (0.0674)**
Average citations per year	**+ (0.0132)**	+ (0.0429)	**+ (0.1083)**	**+ (0.0141)**	+ (0.0001)	**+ (0.0264)**	**+ (0.1453)**		**+ (0.0581)**
	+ (0.0082)	+ (0.0167)	**+ (0.1083)**	**+ (0.0141)**	+ (0.0001)	**+ (0.0259)**	**+ (0.1583)**		**+ (0.0271)**
Average usage (2018-2022)	**+ (0.0684)**	**+ (0.1054)**	**+ (0.0612)**	- (0.0017)	+ (0.0021)	+ (0.0016)	**+ (0.4772)**	**+ (0.0581)**	
	+ (0.0489)	- (0)	**+ (0.0612)**	- (0.0017)	+ (0.0114)	+ (0.0017)	**+ (0.0674)**	**+ (0.0271)**	