Chapter 5

A Closer Look at Subjects

Before moving on to sideshows and leftovers, it may be interesting to look at narrower subject areas. As with the broad areas and subject groups, these assignments rely on my interpretation of the subjects in *DOAJ* itself and, in some cases, on my interpretation of a journal's title. I lack the expertise to divide Biology or Medicine into a reasonable number of smaller subjects, so I didn't attempt to do so.

Subject Snapshots

Tables showing 28 subject areas are inherently *big*, and even bigger—perhaps unworkably so—if the subject areas are grouped by broad areas and subject groups. To make this discussion more coherent, I'll show 2011–2014 publishing patterns for one broad area and its subjects at a time, following each broad area's table with a discussion of what the subject areas include and especially noteworthy aspects of the area. I include Miscellany and Megajournals along with Biomed since these are the areas that don't have narrower subjects. In looking at 2011–2014 figures, remember that 2014 includes only half a year, and much less than that for journals that appear only once a year (or have somewhat slow online processing). The number of journals for each year is the number of journals *that published articles that year*, usually lower than the overall number of journals.

Biomed, Miscellany, and Megajournals

Table 5.1 shows journals and articles in Biomed, Miscellany, and Megajournals.

Miscellany includes journals so broadly defined as to include most anything (including, for example, student research journals and some interdisciplinary journals) and some fields that I couldn't find a place for. It includes some but not all journals called "general works" in *DOAJ*. Any noteworthy aspects may not be meaningful, but this group averaged very low APCs ($82 per article) even though the percentage of

Table 5.1. Biomed, Megajournals, and Miscellany, year by year

Subject	**2014** (Jan–June)	**2013**	**2012**	**2011**
Miscellany	67	82	75	58
Articles	5,385	7,375	5,788	2,585
Megajournals	4	4	4	4
Articles	21,168	36,673	26,512	15,523
Biomed	1,855	1,996	1,900	1,736
Articles	70,460	128,035	115,595	98,393
Biology	303	331	314	282
Articles	14,938	24,127	22,999	20,738
Medicine	1,552	1,665	1,586	1,454
Articles	55,522	103,908	92,596	77,655

Table 5.2. STEM, year by year

Subject	**2014** (Jan–June)	**2013**	**2012**	**2011**
Earth & Life	694	804	783	728
Articles	19,758	41,865	40,213	35,053
Agriculture	264	298	290	268
Articles	7,471	16,880	15,209	13,622
Earth Sciences	155	182	181	173
Articles	3,598	7,109	6,245	5,423
Ecology	128	151	144	129
Articles	4,015	8,295	7,646	6,615
Zoology	147	173	168	158
Articles	4,674	9,581	11,113	9,393
Engin. & Tech.	334	371	348	294
Articles	15,985	29,024	22,365	14,939
Engineering	221	240	218	186
Articles	11,163	19,336	14,024	9,332
Technology	113	131	130	108
Articles	4,822	9,688	8,341	5,607
Math & Comp.	475	548	522	463
Articles	20,122	36,471	32,945	22,787
Computer Science	281	328	315	272
Articles	11,508	23,281	21,114	13,722
Mathematics	194	220	207	191
Articles	8,614	13,190	11,831	9,065
Science	328	364	340	295
Articles	18,547	33,864	29,919	25,614
Chemistry	121	131	119	102
Articles	6,297	12,258	11,444	9,244
Physics	111	122	115	105
Articles	5,863	10,509	10,101	9,634
Other Sciences	96	111	106	88
Articles	6,387	11,097	8,374	6,736
Total STEM	1,831	2,087	1,993	1,780
Articles	74,412	141,224	125,442	98,393

articles in free journals is the lowest outside of HSS subjects.

Megajournals are journals that publish in a wide variety of fields and had more than 1,000 articles in at least one of the four years. (There are other journals publishing more than 1,000 papers a year that fit within a narrower subject—and there are would-be megajournals that haven't achieved huge volume yet.)

Biology includes most everything that has *bio* as a leading part of its topic. These journals have the second-highest average cost per article in 2013 ($1,228); while it's the third-highest total 2013 article count, that count was less than one-quarter of Medicine (but two-thirds of Megajournals). Only 38 percent of OA Biology journals are free, by far the lowest percentage of any subject, and only 24 percent of 2013 articles appeared in the no-fee journals (but that's not *quite* the lowest percentage).

Medicine includes aspects of *human* health and exercise, including some aspects of nutrition. While the average cost per article ($816) is also considerably higher than the overall average—which it helps to define, with 28 percent of all 2013 articles—it's a little lower than Physics. Medicine includes more than four times as many articles as the next-highest specific area (Biology). It has the second-lowest percentage of free journals, but that's still very nearly half (49 percent), and at 36 percent, the percentage of

2013 articles in free journals is precisely average (and largely determines the average) and higher than six specific subjects.

Science, Technology, Engineering, and Mathematics

Table 5.2 shows STEM journals and articles.

Agriculture includes aquaculture, fisheries, and other aspects of raising and processing plants and animals, including food and some aspects of nutrition. The average cost per 2013 article ($336) is relatively low for STEM; the number of articles is third-highest for STEM. Percentages of free journals (58 percent) and articles (44 percent) are about midrange for STEM.

Earth Sciences include geography, geology, oceanography, some related fields—and astronomy. At $406, average cost per 2013 article is middling, and there are fewer articles in this mixed group than in any other STEM area. A high percentage of journals than is typical for STEM (73 percent) didn't charge fees in 2013, and nearly half of the articles (46 percent) appeared in those journals.

Ecology includes environmental fields. Average charges are a bit lower than Earth Sciences ($407), and there are more articles. The percentage of free journals is low (53 percent); the percentage of articles in those journals is *very* low (27 percent), fifth-lowest of any area.

Zoology includes veterinary medicine as well as marine biology.

Engineering journals were distinguished from Technology journals based on narrower subjects and journal titles. The distinction is fuzzy at best, with most questionable cases being assigned to Engineering. This area has the second-lowest average cost per article ($252) outside of HSS and the fourth-largest article volume of any subject in 2013. The percentage of free journals is relatively low (57 percent), and the percentage of 2013 articles in those journals is *very* low (26 percent). Notably, 40 journals with modest APCs account for nearly half of all articles in 2013.

Technology journals are, as noted in the preceding paragraph, a somewhat fuzzy group. It's a smaller group with somewhat higher fees (average $353 per 2013 article) and middling percentages of free journals (59 percent) and articles (49 percent).

Computer Science includes software, data processing, AI, robotics, and portions of what might be considered information science. This area has the lowest average cost per article ($241) of any subject outside of HSS—and the largest article volume of any STEM subject. The percentage of free journals is low (53 percent) and the percentage of articles in those journals is *extremely* low (24 percent). Of the many journals with modest APCs, 22 (with APCs between $50 and $250) with more than 100 articles each in 2013 account for more than 8,300 articles, more than a third of the total.

Mathematics includes statistics. The average cost per article ($508) is slightly lower than the overall average for this medium-sized group (fourth-largest volume among STEM subjects). There are a *lot* of no-fee Math journals; at 79 percent, it's the highest percentage outside HSS, although only 40 percent of 2013 articles appeared in no-fee journals.

Chemistry as a subject doesn't seem to require much clarification (noting that most biochem ended up in Biology). It's an expensive area ($713, second-highest in STEM) with medium volume (fifth-largest in STEM). A fairly typical (for STEM) 59 percent of journals are free, and those journals publish a fairly typical (for STEM) 30 percent of 2013 articles.

Physics includes optics. I had naively assumed that the success of ar×iv would mean that average price per article for Physics would be relatively low, but it's actually the highest ($870) of any STEM subject. Volume is middling; percentage of no-fee journals (53 percent) is low; at 31 percent, percentage of 2013 articles in no-fee journals is typical of STEM.

Other Sciences includes journals that cover many different sciences, including interdisciplinary journals that appear science-focused and attempts at mega-journals that haven't achieved high volumes. Cost per article is average ($586) and volume is middling, but the percentage of no-fee journals (51 percent) is the lowest of any subject outside of Biomed—and the percentage of 2013 articles in those journals (21 percent) is the lowest of *any* subject.

Humanities and Social Sciences

Table 5.3 shows journals and articles in the Humanities and Social Sciences. Relative to overall article volume, the breakdown here is unusually precise, but HSS covers a huge range of human endeavor and publishing. Most of these subjects have very low cost per article, fairly light volume, and very high percentages of free journals and articles.

Arts and Architecture includes most areas I'd consider to be in the fine arts (there are very few OA architecture journals). Fourth-lowest cost per article ($17); tied for second-highest percentage of free journals (95 percent) and for fifth-highest percentage of 2013 articles from free journals (84 percent).

History includes most aspects of cultural research focused on the past. The lowest cost per article ($10) and medium volume for HSS, this topic has the highest free-journal percentage (98 percent—only three fee-charging journals, one of the three actually requiring membership and one that could belong in medicine) and article percentage (also 98 percent).

Table 5.3. HSS, year by year

Subject	**2014** (Jan-June)	**2013**	**2012**	**2011**
Humanities	515	718	735	693
Articles	7,410	16,320	15,862	13,838
Arts & Architecture	103	130	144	135
Articles	1,191	2,647	2,742	2,275
History	87	126	123	116
Articles	1,308	2,739	2,927	2,721
Language & Literature	169	240	248	229
Articles	2,853	6,243	5,802	4,862
Media & Communications	56	75	72	68
Articles	914	1,667	1,378	1,207
Philosophy	56	85	84	84
Articles	466	1,409	1,438	1,266
Religion	45	61	63	60
Articles	678	1,603	1,555	1,493
Social Sciences	1,075	1,338	1,318	1,193
Articles	17,442	36,583	36,162	30,543
Anthropology	89	125	125	111
Articles	1,285	2,663	2,753	2,383
Economics	267	325	314	277
Articles	4,983	10,663	12,159	10,413
Education	256	306	298	269
Articles	3,422	7,332	7,243	6,047
Law	75	103	98	94
Articles	915	2,019	1,633	1,578
Library Science	61	72	75	71
Articles	644	1,363	1,433	1,304
Political Science	97	122	123	110
Articles	1,096	2,402	2,218	1,989
Psychology	62	71	69	64
Articles	1,539	2,926	2,320	1,952
Sociology	168	215	217	198
Articles	3,558	7,227	6,423	4,891
HSS Total	1,591	2,056	2,053	1,886
Articles	24,855	52,903	52,024	44,381

Language and Literature includes linguistics and a number of other fields, as well as author-specific journals and the like. The third-largest set of journals and articles in HSS. The average article charge ($62) is low but middling for HSS. Very high free-journal percentage (95 percent), but a relatively low percentage of articles (73 percent) in those journals.

Media and Communications includes film, performance, communication theory, and some related fields. Relatively high average article charge ($105) and modest volume. Decent free journal percentage (91 percent), but a relatively low percentage of articles (73 percent) in those journals.

Philosophy includes journals on specific philosophers and philosophies. It's another smallish group with middling price-per-article ($65). Very high free-journal percentage (95 percent) and high free-article percentage (90 percent).

Religion includes journals on specific religions (and religious figures) and aspects of religion or non-religion. Another small group (fewer journals but more articles than philosophy) that could plausibly

Table 5.4. Journals and articles by subject

Subject	Journals	% No-fee	Articles (2013)	% No-fee
Agriculture	309	58%	16,880	44%
Anthropology	132	86%	2,663	77%
Arts & Architecture	150	95%	2,647	84%
Biology	336	38%	24,127	24%
Chemistry	136	59%	12,258	30%
Computer Science	338	53%	23,281	24%
Earth Sciences	189	73%	7,109	46%
Ecology	153	53%	8,295	27%
Economics	345	69%	10,663	50%
Education	319	88%	7,332	80%
Engineering	245	57%	19,336	26%
History	136	98%	2,739	98%
Language & Literature	262	95%	6,243	73%
Law	106	95%	2,019	93%
Library Science	77	94%	1,363	92%
Mathematics	228	79%	13,190	40%
Media & Communications	79	91%	1,667	73%
Medicine	1,702	49%	103,908	36%
Miscellany	87	69%	7,375	38%
Philosophy	96	95%	1,409	90%
Physics	125	53%	10,509	31%
Political Science	129	91%	2,402	84%
Psychology	74	76%	2,926	52%
Religion	65	88%	1,603	47%
Other Sciences	118	51%	11,097	21%
Sociology	234	83%	7,227	63%
Technology	138	59%	9,688	49%
Zoology	178	57%	9,581	47%
Total	**6,490**	**65%**	**366,210**	**36%**

be combined with philosophy—except that religion shows *much* higher costs per article ($184, highest in the Humanities), considerably lower free-journal percentage (88 percent), and by far the lowest percentage of articles in free journals of any HSS subject, 47 percent, the only HSS subject below 50 percent.

Anthropology includes archæology and sports science. Middling average article cost ($110) and modest article volume are coupled with a moderately low free-journal percentage (86 percent) and middling free-article percentage (77 percent).

Economics includes most business topics. It's the largest set of journals and by far the largest article volume in HSS, with an average article cost ($122) higher than any other HSS subject. The lowest HSS percentage of free journals (69 percent) and second-lowest percentage of articles within those journals (50 percent).

Education is the second-largest set of journals and articles, and I could have tagged a number of STEM journals here. At $58, average cost per article is relatively low. Middling percentage of free journals (88 percent), strong percentage of articles from those journals (80 percent).

Law includes forensics. I didn't calculate average articles per journal by subject, but Law is certainly a contender for sparsest journals (Law articles tend to be long). Third-lowest average cost per article ($17), tied for second among highest percentage of free journals (95 percent), second-highest percentage (93 percent) of articles in free journals. (Note that until I added 2,200 mostly non-English journals to the dataset, there were *no* law journals with APCs.)

Library Science includes bibliography, archives and museums, and some aspects of information

Table 5.5. Average 2013 cost per article

Subject	$/Article	Articles
Megajournals	$1,353.52	36,673
Biology	$1,227.94	24,127
Physics	$869.79	10,509
Medicine	$816.25	103,908
Psychology	$811.77	2,926
Chemistry	$713.13	12,258
Total	**$630.05**	**366,210**
Other Sciences	$585.92	11,097
Mathematics	$508.05	13,190
Ecology	$420.43	8,295
Earth Sciences	$406.95	7,109
Technology	$352.59	9,688
Agriculture	$336.41	16,880
Zoology	$269.20	9,581
Engineering	$252.39	19,336
Computer Science	$240.76	23,281
Religion	$183.95	1,603
Economics	$121.84	10,663
Sociology	$121.73	7,227
Anthropology	$109.62	2,663
Media & Communications	$105.40	1,667
Miscellany	$82.17	7,375
Philosophy	$65.24	1,409
Language & Literature	$61.80	6,243
Education	$58.09	7,332
Political Science	$32.68	2,402
Arts & Architecture	$17.33	2,647
Law	$16.63	2,019
Library Science	$10.29	1,363
History	$10.09	2,739

science (that did not appear to be based on computer science). A smallish set of journals and the lowest article volume of any subject; second-lowest average article cost ($10.29, where History is $10.09), with high free-journal percentage (94 percent), and the third-highest free-article percentage (92 percent).

Political Science includes military and defense topics and most governmental affairs areas. Relatively few journals and articles, a low average article cost ($33), a free-journal percentage that's typical for HSS (91 percent), and a very high free-article percentage (90 percent).

Psychology includes relatively few journals and articles, but the $812 average cost per article is more than four times as high as the next-highest HSS subject, more in line with Medicine. (You could make the case for lumping Psychology in with Medicine.) A low percentage of free journals for HSS (76 percent) and the third-lowest free-article percentage for HSS (52 percent).

Sociology includes a range of social sciences that didn't fit elsewhere. It's the third-largest group of journals and articles in HSS, with an average article cost essentially the same as Economics ($121.73 for Sociology, $121.84 for Economics). Somewhat low free-journal percentage for HSS (83 percent) and the fourth-lowest free-article percentage for HSS (63 percent).

Overall Tables

Those are the snapshots. For readers who are comfortable with tabular information, table 5.4 shows, for each subject, journals in that subject, the number of 2013 articles, and the free percentage for both numbers. (Note that journal numbers will generally be higher than the 2013 column of tables 5.1–5.3.) Table 5.5 shows the average 2013 cost per article (total potential revenue divided by total articles including articles in free journals), arranged by decreasing average cost.