

INTELLECTUAL PROPERTY AND PHYSICS: TRANSFORMING REVENUE STREAMS IN 20TH CENTURY AMERICA

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Abstract

Abstract: This study delves into the evolving landscape of scholarly communication in the field of physics during the twentieth century, marked by significant historical events like World War II and the Cold War. While prior research has explored shifts in the physicist community and scholarly societies, it has largely overlooked the intricate dynamics of pricing mechanisms that funded the dissemination of research and their transformation amid changing research funding and intellectual property contexts. Drawing on archival records from the American Institute of Physics (AIP), this paper traces the trajectory of pricing mechanisms. It commences with the legitimization of page charges in the 1930s, followed by the decline in revenue from this source in the 1960s. The scholarly society's response to copyright law changes in the 1970s is examined, leading to a discussion of the revised copyright law of 1976 and the AIP's corresponding policies. Specifically, the paper investigates how the AIP aimed to generate new revenue streams by capitalizing on copyright ownership during a period when traditional revenue sources, like author page charges and reader subscriptions, were diminishing. Furthermore, this paper sheds light on the pivotal role played by the Copyright Clearance Center (CCC) in the post-1976 Copyright Act era, despite its limited revenue contribution. Ultimately, it becomes evident that the CCC laid the groundwork for the AIP to achieve substantial revenue generation in the electronic age of scholarly communication.

Introduction:

As is documented by Kevles (1995) and Kaiser (2002), in the twentieth-century there were events such as World War II and the Cold War that led to an alteration in the number of physicists and the amount and type of research they conducted. Consequently, as documented by Scheiding (2009), the scale and scope of the scholarly society infrastructure for physicists and the financing and organization of research journals in the discipline changed as well. Absent in the history of physics literature, however, is an extensive discussion of how the pricing mechanisms used to finance the scholarly communication process in physics changed as the source and magnitude of research funding changed and the intellectual property environment was altered. As will be demonstrated in

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this paper, the American Institute of Physics (AIP), through the ownership and management of the copyright, sought to create a new source of revenue in a time when there was decreased revenue from author page charges and reader subscriptions. Relying on the archival records of the AIP, this paper begins with a discussion of the legitimization of the page charge pricing mechanism by the AIP in the 1930s, the erosion of revenue from this source in the 1960s, and the reaction of the scholarly society to changes in the copyright law in the 1970s. This paper then outlines the revised copyright law passed in 1976 and the policies the AIP adopted around this revised law to potentially capture revenue from selling access to the scholarly article. This paper concludes with a discussion of the role served by the Copyright Clearance Center (CCC) in the years immediately after the 1976 Copyright Act. What becomes clear is that although the CCC delivered insufficient revenue to the AIP, it set the stage for the AIP to collect significant revenue in the electronic era of scholarly communication.

From the Page Charge to Changes in the Copyright:

Physicists and research funding agencies in 1932 jointly created an umbrella organization, the AIP, that in the interwar period worked to unify academic and applied physicists while simultaneously accommodating specialization.¹ The AIP, initially consisting of the American Physical Society (APS), Optical Society of America, Acoustical Society of America, Society of Rheology, and the American Association of Physics Teachers, allowed physicists to continue to be members of their chosen scholarly society while the AIP pursued cost efficiency in publishing journals on behalf of the scholarly society.

The AIP made possible a collective effort to accommodate the increase in publication volume that would occur after World War II. According to Hodes (1967), whereas in 1933 the AIP published two journals that it owned and six journals on behalf of member scholarly societies with a total of 28,000 pages and \$100,000 in publication expenses, by the end of the 1960s the AIP was publishing 37 journals for a total of 110,000 pages and \$8.2 million in expenses. Hodes (1967) also noted that the number of pages published by the AIP grew at a 15% annual average growth rate (excluding translation journals) such that by 1966 there were 53,040 pages of research across 16 journals and three bulletins. The translation program of the AIP had also grown such that by 1966 it had published 21,750 pages of Chinese and Russian research. The primary purpose of the AIP was to publish the journals of the scholarly societies in physics and financed this activity by charging individual scholarly societies the actual expense to publish the journal issue plus a 15% handling fee. The journals themselves were financed with the traditional pricing mechanism of the reader subscription charge as well as with an innovative pricing mechanism known as the author page charge. The page charge, a per page charge invoiced to the author and paid for by the author's research funding agency, was critical to the AIP being able to finance an expanded scholarly communication process after WW II.

According to AIP (1949), although subscription and membership due income charged by individual scholarly societies and remitted to the AIP increased from \$121,453 in 1946, to \$140,342 in 1947, and to \$174,351 in 1949, this was primarily due to a higher number of members and subscribers rather than an increase in dues and subscription prices. And we see from AIP (1952) that the \$60,000 in page charge revenue captured in 1951, while significant in magnitude, represented less than 20% of the revenue generated by subscriptions and dues. In 1957, after the successive increases in the page charge in 1950, 1952, and 1956, the revenue generated by reprints and page charges was nearly \$320,000 and represented nearly 75% of the revenue generated from subscriptions and memberships (AIP 1958). By 1959, page charge and reprint income of nearly \$520,000 represented over 85% of the revenue that was captured from subscriptions and memberships (AIP 1960).

The growth in scholarly literature in physics throughout the 1960s was financially facilitated by the increased honoring of a page charge that was ever-larger in size. As the 1950s came to a close, optimism within the AIP

about the page charge pricing mechanism was high because every significant research patron (public or private) in physics had accepted the legitimacy of the pricing mechanism for one reason or another. In 1961, the Federal Council for Science and Technology standardized the criteria that had to be satisfied for payment of the page charge by the government: that the journal is published by a not-for-profit publisher and that payment be voluntary (have no bearing on the acceptance decision) (Barton 1963). Burton Adkinson, Director of the Office of Scientific Information for the National Science Foundation (NSF), remarked that the government's payment of the page charge was its preferred method of subsidizing the scholarly communication process because it directly linked publication support to research support (Adkinson 1963).

The page charge honoring rate for AIP journals reached nearly 90% in the early 1960s for many journals (Barton 1963). The page charge for a journal such as *Physical Review* continued to increase throughout the 1960s, after rising from \$40 to \$45 in 1962, \$50 in 1963, \$60 in 1964, and \$75 in 1969. By 1962, page charge revenue represented nearly 90% of subscription income for the AIP (Hutchisson 1964). In 1963, page charge revenue became the most significant source of revenue – a trend that would continue through the rest of the decade.ⁱⁱ The increased honoring of the page charge amount by the public research patron throughout the 1960s was due, in large part, to the AIP explicitly matching page charge revenue to pre-run costs (editing, engraving, and editorial office operational costs) and communicating the matched revenue to expenses to the major research funding agencies.

Although both public and private research patrons remained committed to the page charge, the public research patron over time began to express a desire for more accountability. In 1970, the Committee on Scientific and Technical Communication of the National Academy of Sciences recommended that those journals imposing a page charge submit financial data to the NSF and that there be a continual reassessment of the criteria for the payment of the charges by the government (Capital Systems Group 1976). In 1975, Congress also expressed concern over the fact that the government's subsidization of the scholarly communication process had increased from \$37 million in 1960 to \$141 million in 1975 (slightly over \$67 million after taking into account inflation). This near doubling of the subsidy after inflation prompted Congress to recommend the formation of a federal agency to manage this subsidy. By 1976, the increased attention placed by the government on page charge expenditures culminated in a series of NSF-sponsored studies where a resistance to using the page charge to finance the production and distribution of the journal was expressed and the adoption of cost-saving technologies that would permit subscription prices across the disciplinary landscape to be lowered was promoted (Strawhorn 1979). As the 1960s came to a close, there was a higher level of resistance of authors to honoring the page charge. While the AIP and the scholarly societies still firmly believed in the appropriateness of the page charge pricing mechanism, the reduction in page charge revenue was replaced temporarily with enhanced institutional subscription revenue. In 1969, with the ability of the AIP to raise the non-member subscription price after changes to the postal code, subscription revenue quickly surpassed page charge revenue. By 1970, subscription revenue of \$3.6 million for the AIP was nearly \$250,000 greater than page charge revenue (AIP 1971). This trend would continue in the coming years with the gap between these sources of revenue growing to \$1.6 million by 1974, \$5 million by 1978, and \$8.4 million in 1984 (AIP 1975, AIP 1978, and AIP 1985). From 1970 until 1978, the amount of page charge revenue of \$3 million (in nominal terms) was relatively constant as was the page charge amount.ⁱⁱⁱ Government research funding agencies signaled throughout the 1970s that they were willing to continue subsidizing the scholarly communication process through the page charge. There was, however, a growing realization within the AIP that taxation and postal authorities within the government were unwilling to allow the not-for-profit AIP to characterize the pricing mechanism as a voluntary payment for a service. In the 1970s what

was known was that author-sourced revenue (page charges) was going to be increasingly difficult to capture. What was unknown was how to capture revenue from readers. While subscriptions were one possible path, revenue from the sale of intellectual property within the scholarly article was another potential path the AIP pursued in the 1970s.

The copyright law in twentieth-century America was dictated for nearly seven decades by the 1909 revision to the law initially articulated in the Constitution (Gorman 1978). The 1909 Copyright Act allowed the publisher to copyright all of the contents of the journal issue once the issue was published and notice was filed with the copyright office. The 1909 Copyright Act placed copyright protections on a work only when it was published and when it had a copyright notice attached to it. If something was published with no copyright notice, this work was considered part of the public domain. The revision of the copyright law began in earnest after the US agreed to participate in the Universal Copyright Convention in 1955. Throughout the 1960s, just as commercial publishers were rising in influence and the government was reconsidered its financial support of scholarly communication through the page charge, the US Congress was debating and revising the Copyright Act.

In the late 1960s, officials within the AIP began to encounter more conversations where concern was expressed over ownership of the copyright. One such example occurred in 1968 when the Atomic Energy Commission inquired as to whom the legal owner was of government author published work. Wallace Waterfall, Secretary of the AIP, wrote to Bill Koch, Executive Director of the AIP: I don't ever recall ever hearing of any specific case in which some kind of serious flap developed because of the presence in a copyrighted journal of paper by a Federal employee reporting on work done in a Government laboratory.^{iv}

This statement reflected both a dismissal at the time by the AIP of the monetary value of the intellectual property at the time as well as a desire not to antagonize the federal research funding agency who was funding the scholarly communication process. At the same time, the AIP was unwilling to relinquish control over the distribution of scholarship. Koch in 1968 wrote to Hubert Sauter, Director of the Clearinghouse for Federal Scientific and Technical Information:

Your letter announced a new policy with regard to the sale of reprinted and back number sales...Your sale of reprints to the public without prior approval and payment of royalty to the copyright owners is a violation of copyright to which the AIP lodges this protest...Our policy has always respected the right of government contractors to submit reprints of journal articles...We have also freely granted the government the unrestricted use for its own internal purposes of articles in our copyrighted journals resulting from research work of government agencies or contractors. This has been a reasonable policy in view of the payment by the agency or contractor of the publication charges...However, even when publication charges are paid, it is still necessary for us to sell subscriptions and to sell back numbers of the journals in order to maintain a viable publication program...Therefore, we register our strong protest against your selling reprints to the public from the copyrighted journals of the AIP without specific permission from the AIP under a royalty agreement.^v

Thus Koch, and many within the AIP, were content to let government officials distribute government-authored research, but were opposed to the government distributing scholarship authored by others.

The restriction on the distribution of research at the time was articulated not as one to capture revenue, but instead to prevent the manipulation of the article. On February 23, 1968, Hugh Wolfe, AIP's Director of Publications, stated so much when he said that:

The copyright costs \$6 per issue and has no financial value to AIP. We use it only to protect the rights of the author...^{vi}

The complaint the AIP had lodged against the government copying and distributing scholarship was rekindled and pursued more aggressively by the commercial publisher Williams & Wilkins.

Williams & Wilkins sued the National Institutes of Health on February 27, 1968, for copyright infringement when photocopies were made.^{vii} Neither the National Institutes of Health nor the National Library of Medicine disputed the facts: single photocopies of scholarly articles were being made and distributed to others. The government believed these photocopies were justified because, in part, the article was written with a research grant that permitted the research funding agency (the government) to photocopy, the photocopy represented a „fair use' of the material, and the author had never formally transferred the copyright to the publisher. Williams & Wilkins on July 6, 1971, stated that they were okay with photocopying so long as compensation was made. The coverage of these costs would keep the journals financially viable and in so doing, permit the broad dissemination of research. The publisher stated:

We do not wish in any way to curtail photocopying since we consider it a desirable means of utilizing the articles we publish. We believe that arranging for photocopying to bear its fair share of costs will not in the long run curtail photocopying. In contrast, however, the failure to do this will in the long run jeopardize scientific journals with the result that scientific research will be the ultimate loser.^{viii}

Scholarly societies like the American Chemical Society in chemistry and the AIP in physics joined Williams & Wilkins in arguing that photocopying by libraries should be compensated. The AIP, in a letter to Davies, Hardy, Ives, and Lawther, stated a desire to file an *amicus curiae* brief in support of Williams & Wilkins and remarked: Our brief should favor the Williams and Wilkins position. As you are well aware, AIP is a non-profit organization committed to the dissemination of research results but we cannot continue to disseminate without adequate financial protection and that means we need copyright protection.^{ix}

While the Williams & Wilkins matter was working through the courts, Koch took actions that reflected his belief that revenue from ownership over the intellectual property in the journal was going to become increasingly valuable. The AIP described its interest in the copyright on November 15, 1973, as "...control of rights means control of the options by societies to barter, sell, or give away physics articles in a matter that will optimize the dissemination of physics."^x The AIP continued on to state that "Without a copyright position, our societies will be robbed of their property rights while being thanked by the organization taking those rights who will charge us for their rights."^{xi} Koch on April 17, 1973, wrote to the AIP Executive Committee a rationale for why the AIP should be involved in secondary services. Koch wrote:

The printed primary journal with input from, and sold only to, a single science community is outmoded – rapidly decreasing subscriptions to AIP and society journals of up to 12% per year are proving this point. The response of all publishers is that sale of the basic intellectual content of the journals to other sciences and engineering, to other countries, and to other institutions in as many different forms and formats as needed.^{xii}

That the AIP took such an outward stance on the ownership of the copyright in the early 1970s and attempted to monetize this ownership was not embraced by all scholarly societies in physics. The AIP had sought a uniform statement for all AIP journals and wanted it to be effective January 1, 1974. Moreover, this is even though those within the AIP believed in 1973 that the entire journal program was only seen as having \$8 million in property rights.^{xiii} On November 15, 1973, the AIP Executive Committee remarked:

AIP proposes that we and our member societies take a definite and consistent position on journal copyrights...A definite and consistent position should be taken by AIP and each member society so that we can ensure the free, or page-for-page, abstract-for-abstract bartering that are basic to a free interchange of information. Without such

a position, our societies will be robbed of their property rights while being thanked by organizations taking those rights who charge us for their rights.^{xiv}

The APS wrote to the AIP on June 25, 1973, that they had decided not to adopt the AIP copyright policy. The APS believed that articles are the property of the author and the author's research funding agency.^{xv}

The APS was reluctant to adopt AIP's policy and expressed the belief that the AIP had been drawn away from its original mission which was to be the joint publishing house for its founder societies.^{xvi} The APS remarked to the AIP on October 23, 1973, that:

There is no doubt that commercial publishers are in business to make a profit and they must feel the loss of income from copyright infringement greater than the AIP...I do not feel that it is desirable for the AIP to invest a lot of money and manpower in pursuing the copyright problem at the present time, even though there appears to be substantial loss of income.^{xvii}

Just as the AIP and the scholarly societies were engaged in conversation over how intellectual property would be handled in the early 1970s, the US Court of Claims in the Williams & Wilkens matter had sided with the National Institutes of Health on the basis that photocopying constituted fair use. The Supreme Court reiterated the Court of Claims decision when it was decided in February 1975. Thus, the law of the land was that photocopying needed to be compensated, but that there was a fair use exception for librarians.

The Supreme Court decision and long-simmering conversations all fueled the revision to the copyright law in November 1976. With this law passed, Koch indicated that the attention now needed to be devoted to achieving general agreement among the scholarly societies. Koch noted that the AIP would now need to get ownership of the author's title, abstract, and article to be able to bundle it into secondary products.^{xviii} When the copyright law was passed, Charles Lieb in his role as lawyer to the AIP, wrote to Koch on January 25, 1977 that ownership of the author's scholarship could be acquired either by the AIP commissioning the article as a work made for hire (in which case the AIP would be the author) or by requiring the written transfer.^{xix} Lieb authored the AIP's recommended AIP policy and stated bluntly that "...in the absence of an agreement expressly so providing, AIP would not have the exclusive right of publication; nor could it include the contribution of different journal or other collective work, nor authorize translations, computer or other uses of the material, nor adapt it for other uses. Moreover, it is not entirely clear that unless expressly so agreed, AIP would have the right to license information services or end users to engage in multiple or systematic copying."^{xx}

Concerning the copyright law and Lieb's suggestions, Koch observed in February of 1977 that the copyright law: "...is designed to inhibit systematic reproduction and photocopying. It is the goal of the AIP to design our procedures to encourage photocopying and systematic reproduction and still protect the financial interests of the publisher and the professional interests of the authors."^{xxi}

With agreement within the AIP that a copyright policy needed to be in place, the desire then was to align the AIP's actions with other scholarly societies and with authors. By May of 1977, the Governing Board of the AIP had approved that the AIP capture the intellectual property and establish standardized wording for the transfer of the intellectual property from the author. By October of 1977, the AIP was requesting that the member societies adopt similar policies for their journals and that the AIP be designated as the negotiating agency on copyright license agreements. The AIP then engaged in a campaign to convince authors to transfer their copyright. James Krumhansl, a member of the governing board of the AIP, wrote in *Physics Today* in September 1977 under the title of "Contribute your Copyright" that the copyright law protected authors. Krumhansl(1977) wrote:

In summary, although the new situation complicates our lives somewhat, it is not only essential to the well-being of the journals, but also is a distinct advantage to authors desiring wide distribution of their work, to transfer copyright so that we may continue to disseminate physics broadly, and promptly.^{xxii}

Krumhansl's argument to authors did not cite the revenue that would potentially flow to the publisher. Instead, Krumhansl both to authors and to Koch emphasized the broader distribution benefits. Krumhansl wrote to Koch on March 5, 1977:

The physics community must face the facts of life that a.) reproduction and secondary services now provide a useful and important channel for dissemination beyond primary publication b.) that specific new copyright laws have been written in regard to threats. It is now necessary, therefore, to establish specific policies under which AIP and the authors may operate effectively and legally.^{xxiii}

By November of 1977, a year after the copyright law passed, over 90% of the authors submitting articles to AIP-owned journals were transferring their ownership.

Not only was the AIP getting the intellectual property, but the organization was also working to design a center that would centralize permission requests and collect payments for the copyright owner.

Despite having a law that clarified what was intellectual property in the article, who the owner of the property was, and emboldened the capture of revenue by the owner, the AIP faced challenges in having copyright royalty revenue rival revenue received from other sources in decades past. With inadequate technology for the distribution of research, the CCC became the primary vehicle the AIP used to capture royalty payment revenue.

The AIP as the Owner of the Copyright and the Creation of the Copyright Clearance Center:

When the 1976 Copyright Act went into effect on January 1, 1978, the law made it clear that although permission would be needed to photocopy, there was no desire by the Congress to turn back the clock technologically and make photocopying difficult. The United States Senate „recommended' that authors and publishers in the wake of the law develop workable clearance and licensing procedures. These procedures were encompassed in the CCC. The idea of the CCC was born in the early 1970s during the Williams & Wilkens trial. In the lead up to the Supreme Court Case, the AIP, American Association of Publishers, authors league, and Williams & Wilkens met in April of 1972 to discuss possible solutions to the National Library of Medicine making copies of articles, but not making royalty payments.^{xxiv} A.L. Batik of the American Society for Testing and Materials suggested that a copyright clearinghouse be set up whereby every article would have a barcode, and the photocopier would scan the barcode and calculate royalty payments. The librarians expressed some interest in Batik's proposal for a clearinghouse but felt that such a system would be complicated to set up and administer.

The 1976 Copyright Act fueled the creation of the CCC. The CCC was intended to have no role in the fee-setting process nor would it set price guidelines. Each article would have an object number and be attached to a journal's ISSN number. In an initial study of photocopies, publishers ascertained that for the 110 million photocopies made in 1976, ½ of the eligible photocopies came from 5% of the journals and ¼ of the total photocopies made would have generated a royalty payment.^{xxv} The CCC was to be in operation by January 1, 1978. It was believed in 1977 that the CCC would need an initial subsidy, that these funds would come from the publishers who stood to benefit from the CCC, and that the organization would eventually need to become self-supporting. If the CCC was not supported and failed, Koch warned that the alternative would be a government clearinghouse that would adversely affect both publishers and copyright owners.^{xxvi}

The AIP contributed significant resources to the creation and sustainment of the CCC. Koch, who had long served as the Director of the AIP, agreed to serve on the Board of Directors of the CCC. Koch had communicated to the AIP Executive Committee that the AIP make a contribution to cover the initial expenses of the CCC.^{xxvii} The

CCC had an estimated budget of \$100,000 annually and a fundraising goal of \$200,000. While the AIP Executive Committee initially discussed providing a no interest loan, Koch convinced the AIP to provide a \$5,000 contribution. After two fundraising rounds, the CCC collected \$37,727 from commercial publishers, \$34,450 from scholarly societies, \$13,000 from commercial users, and \$10,750 from university presses.^{xxviii} Although the expectations for the CCC upon formation were high, in the first year of CCC there was only 5% of the volume that would have been needed to make the organization self-sustaining. Moreover, ten users (primarily corporate libraries) were accounting for 80% of the reported copies.^{xxix}

Koch characterized these initial dismal results as reflecting the divide between publishers and librarians caused by the difference between the publisher's sales and the use of the scholarship at the site of the library.^{xxx} Although Koch was unable to quantify the loss of subscriptions due to illegal copying, he stated that the CCC usage statistics demonstrated that libraries were not necessarily complying with the copyright law.^{xxxi} Besides librarians not identifying copies as eligible for royalty payments, the CCC was hobbled by the non-participation of publishers. The CCC throughout 1978, 1979, and 1980 was averaging approximately 16,000 copies a month for 8,000 articles. The requests were overwhelmingly from corporations (libraries making less than 10% of the requests), and the volume was only ¼ of what was needed to sustain the CCC.^{xxxii} Although more than half of the publishers initially allowed the AIP to retain royalty payments to fund the CCC, this generosity quickly wore thin.

Among the first publishers to remove their support for the CCC was Plenum. Martin Tash, President of Plenum, wrote to Michael Harris, Chairman of the Board of Directors at the CCC, on November 21, 1978, and remarked that Plenum through 1977 and 1978 had been a supporter of the CCC and had previously permitted the CCC to retain copyright fees.^{xxxiii} Tash had become frustrated with the CCC's structure and concluded by stating that ...any service organization that can survive only by keeping the revenues of those it serves to support itself is drastically deficient at some basic level. Perhaps the CCC is not the right medium to defend the property rights of copyright holders, especially since it is simply a collection agency and is not providing the mechanisms for litigating on behalf of copyright holders.^{xxxiv}

The frustration Plenum felt was experienced by other publishers as well. The CCC communicated that lawsuits would soon be filed for non-compliance with the copyright law and that non-compliance was significant given that it was estimated in 1976 that there would have been 400,000 copies a month that would have needed permission.^{xxxv} The CCC, while reducing expenses and delaying payments, also encouraged publishers to be patient with the slowness of libraries to comply with the law. Harris wrote:

Perhaps no one should be surprised at the length of time it is taking for those making photocopies of copyrighted works to begin paying for what they have been used to doing without payment or much regard for what the old law meant.^{xxxvi}

This belief was reiterated by David Waite, President of the CCC, in a letter to publishers on July 10, 1980:

I urge you not to be discouraged if you find your CCC returns disappointing. Publishers need to first provide the means (e.g. CCC's system) in order that users needing instant photocopies have a way of complying with permission requirements. It is apparent that the task of educating users to permission requirements now explicit in the new law needs to continue and CCC is investing in that effort. Further, successful litigation by copyright owners against violators may be needed to increase compliance motivation.^{xxxvii}

The low volume of copies was caused by the fact that although libraries were making many photocopies, these copies were being classified as being made under the fair use exception in the copyright law. This led Koch, in comments he made on October 8, 1980, for a Public Hearing on the Effects of Section 108 of the 1976 Copyright Act (the fair use exception clause used by libraries), to claim that librarians needed to act like republishers where

„fair compensation is the rule, and fair use is the exception.“^{xxxviii} Koch went on to say that when a librarian takes on the role of republisher they "...must also accept the implied obligation of ensuring that payments of the royalties established by primary publishers are made.“^{xxxix} Despite this admonishment, librarians continued to classify their copies in a way that required no royalty payments.

The ownership stake exerted by the AIP and the use of the CCC to capture revenue also caused divisions within physics. David Lazarus, Editor-in-Chief of *Physical Review Letters*, on June 4, 1981, commented that the fees collected have been mainly retained by the CCC and that the AIP had only received 10% of the payments owed. Lazarus concluded from this that the CCC experiment had failed and should be eliminated. Lazarus wrote:

Where the exigencies of the publishing business interfere with our primary purpose – such as making enough money to survive – we have to set our journal prices high enough to keep going. However, that is all. We should not try to do anything additional if it can in any way inhibit the free dissemination of research. What is sound policy for APS in this regard, is equally sound for AIP. We are both dedicated only to physics....I understand Bill's concern for his own baby (CCC); he is a long time away from the active physics community and emotionally close to commercial publishers.^{xl}

Lazarus, in a letter to Norman Ramsey on July 7, 1981, remarked that though Koch is a friend, that the APS is indebted to the AIP, and that Koch is a reasonable person, there is a distinction between archival journals and commercial publications. Whereas commercial publishers made a significant financial investment in the journal and needed the copyright to maximize the return from their investment, the journals published by scholarly societies are already paid for out of page charges and subscriptions. Lazarus noted that the author seeks the broadest possible distribution and the publisher should not use the copyright to limit this distribution. Lazarus remarked:

No one will ever persuade me that charging for photocopies, as opposed to permitting them to be made at no charge, will enhance the dissemination of a paper....We have no obligation to aid and abet for-profit trade journals in maximizing their income. We are copyright „owners“ only in the legal sense; morally, we are trustees for the dissemination of the work of our authors.^{xli}

Lazarus went as far in the letter to Ramsey to proclaim in a postscript that the material handed out by Koch at the APS Executive Committee was "...uniformly unpersuasive and self-serving. Indeed, I am almost persuaded that CCC is an evil which we should help to eradicate!“^{xlii} In a reply to Lazarus on July 21, 1981, by C.B. Duke of the Executive Committee of the Governing Board of the AIP, Duke agreed that the CCC was highly imperfect, but that it should be retained.

In fact, Duke replied that "I personally believe that the present AIP copyright policy is the best of the admittedly not very attractive alternatives to achieve this end.“^{xliii} The AIP had to work hard to align each of the scholarly society's copyright policies with the larger organization.

If the dissension of a growing number of publishers to the CCC was not enough to undermine the organization, the CCC was further hobbled by the decision of the Internal Revenue Service to define it as a for-profit entity.^{xliv} The IRS viewed the CCC as a fee collection agency organized by the publishers who sought "profitable exploitation of copyrights." The CCC, on the other hand, described their purpose as the facilitation of photocopying and serving a broad public purpose as it carried out the implementation of the Senate's recommendations for the creation of such a center when the 1976 Copyright Act became effective. On November 15, 1982, the Tax Court ruled that the CCC not be exempt and specifically ruled that the "...petitioner was organized and operated for the „substantial' nonqualifying purpose of profitable exploitation of copyrights, and this purpose was not merely incidental..."^{xlv} While the court agreed that the CCC did charitable things, there were

also nonqualifying reasons where the CCC was trying to meet needs of the publisher. In a solicitation for funding that was sent to publishers and not to users, the CCC made it clear to the Tax Court that within the organization: ... the founders were preoccupied with ... procedures and facilities by which permission or licenses to reproduce may be obtained by copyright owners and through which license fees may be made to copyright owners and that it appears that the potential for a substantial private profit was the driving force behind the organization and operation of the center.^{xxlvi}

Although the CCC lost the case and became defined as a for-profit organization, there was little financial consequence to this due to the fact the CCC was unable to return royalty payments to publishers in full and still sustain itself.

In the first nine years of the CCC being used by the AIP to collect royalty payments, there were 125,205 copies made of AIP articles and a collection of \$181,363 in royalty payments. Yet, the AIP received in that first nine years only \$73,552 in a piecemeal fashion and only after many years of delay.

Year	Transactions	Copies	Fee Collected on Behalf of AIP	Net Income Due AIP	Payment to AIP	Amount Due AIP	Amount Due AIP
1978				1,340.60	\$37.28	\$688.42	\$688.42
1979				8,857.80	\$5,543.12	\$5,314.60	\$6,183.10
1980	11,629	18,169	\$15,515.95	12,942.55	\$5,624.15	\$7,128.40	\$13,301.50
1981	10,970	17,746	\$17,316.89	11,566.39	\$2,602.44	\$4,969.95	\$22,065.45
1982	9,340	17,167	\$20,036.71	27,584.60	\$2,738.46	\$24,806.14	\$47,091.59
1983	12,787	18,129	\$31,104.50	21,521.65	\$0.00	\$21,521.65	\$68,613.04
1984	18,565	23,455	\$37,110.35	30,213.10	\$0.00	\$30,213.10	\$98,626.14
1985	14,568	21,809	\$35,887.65	20,178.45	\$12,909.46	\$30,178.45	\$106,095.13
1986	5,613	8,730	\$12,359.05	14,680.40	\$45,542.74	\$14,480.40	\$75,012.79

Figure 1: H. William Koch archival papers, box 47, folder 25

The AIP found itself unwittingly subsidizing the CCC – a situation other publishers found themselves in as well. The CCC at the time was unable to capture the actual level of royalty payments due. The selfreported nature of the payments subsequently caused other publishers to not participate in the CCC.

Had the story ended here, the AIP may have abandoned ownership claims over the intellectual property or continued to pit librarians against the publisher by demanded more royalty payments. With the introduction of the page charge five decades earlier, the AIP was fortunate to have research funding agencies that generally supported the use of the pricing mechanism. With the copyright royalty payment, the CCC was ill-equipped to deliver enough revenue to replace declining page charge and subscription revenue. Fortunate for the AIP, the organization continued to invest in electronic publishing technology. This technology would yield greater royalty payments for the AIP in the decades after the passage of the 1976 Copyright Act.

Concluding Remarks:

The trajectory that the financing and distribution of scholarship would take in the closing decades of the twentieth century and opening decades of the twenty-first century had roots in the passage of the 1976 Copyright Act. With the 1976 Copyright Act and the AIP subsequently creating consistent policies in the late 1970s, the stage was set for the AIP and member scholarly societies to capture royalty payments from the scholarly article distributed separately from the entire journal issue. The AIP after the 1976 Copyright Act was eager to replace the drastically falling revenue that came from the page charge and the uncertain revenue that came from subscriptions held by institutions. The AIP's eagerness was embodied in the creation of the CCC whereby libraries could make use of their existing photocopier technology and voluntarily identify the articles they copied, the voluntary nature of the reporting however translated into under-reporting of copies and low payments to publishers. However, the CCC was unwittingly a useful transition vehicle. As networking and storage technology improved and electronic databases became accepted among scholars, the voluntary nature of honoring the royalty payment ceased to exist. Without the CCC, the AIP may have been delayed in creating a consistent copyright policy, may have permitted scholarly societies to have their own policies, or may have sided with the APS and created a copyright policy that left the scholarly society emptyhanded. Although the CCC was unable to deliver significant income to the AIP in the 1970s or 1980s, the ownership of the intellectual property at the dawn of the twenty-first century allowed the AIP to capture significant revenue from the electronic distribution of scholarship.

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A definitive history of the AIP's founding is Scheiding (2013).

In the annual reports of the AIP throughout the 1960s, the page charge was identified in balance sheets as a "contribution for dissemination." The AIP in the 1960s also extended its collection of author charges to a voluntary abstract charge.

Despite rampant inflation, these rates were kept low because of price controls imposed by President Richard Nixon. In real terms, both page charge revenue and the amount of the page charge declined.

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