

# Print Books with Browsers

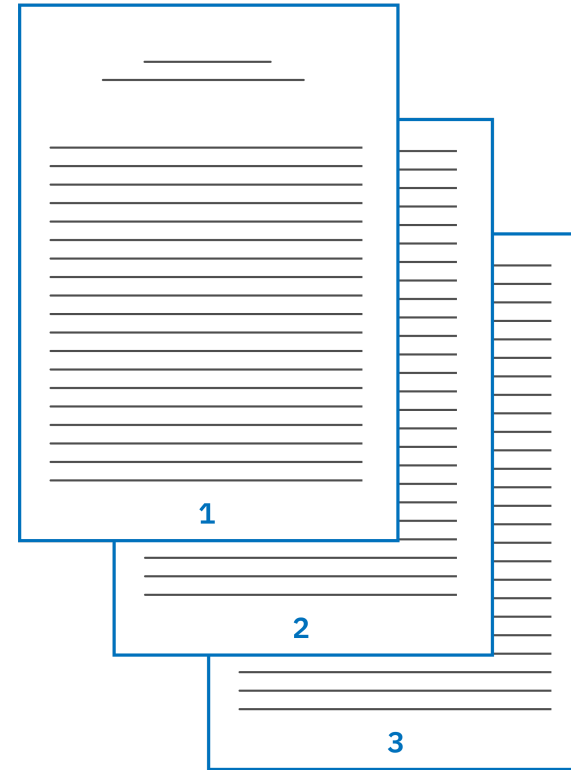
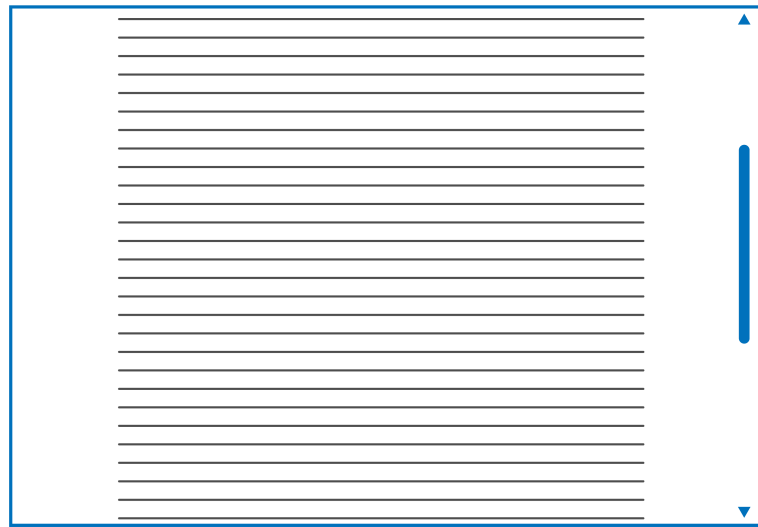
Designing books in browsers using Paged.js

Julie Blanc (@julieblancfr)

Digital Publishing Summit – May 26, 2019

Automated typesetting and pagination for print  
Make PDF outputs of HTML contents from browsers

# Flux → Pagination



# Paged Media

A blog which advocates for innovative approaches to making books in browsers.

*Flexible, accessible, adaptable, and even beautiful.*

PAGEDMEDIA

PAGED.JS

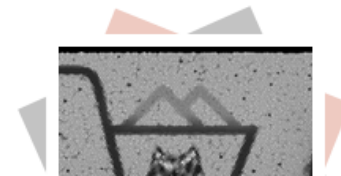
LIBRARY

ABOUT

By Dave Cramer, December 7, 2016

## **A Bag Full of Stories**

As we wander the internet, gathering images, videos and text to make stories, how do we carry them back to camp. how do we share them with our community?



<http://www.pagedmedia.org/>





Paged  
Media

PagedMedia Meeting, MIT Press (Cambridge), January 9th, 2018



Vivliostyle



pdfChip

pdfcrowd

Print with CSS  
**Prince**

ANTENNA HOUSE  
**F** *Formatter* V6

WK<html>TOpdf



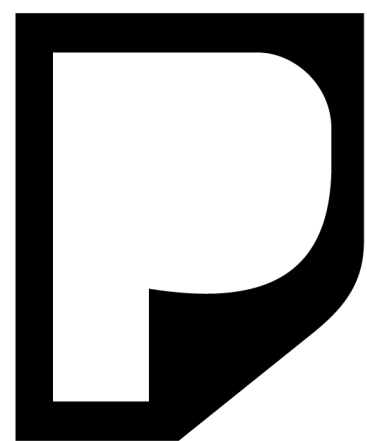
REALOBJECTS  
**PDFreactor**<sup>®</sup>

# Problems

- Proprietary vs. open-source
- (own) Rendering engines
- Non-standard properties
- No visual preview

# What we need

- Open and free tool(s)
- Based on web standards
- Visual preview
- Automated workflows



# paged.js

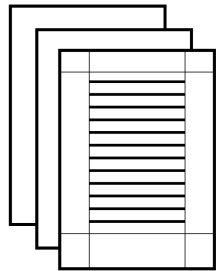
A free and open source JavaScript library that paginates content in browser to create PDF outputs from any HTML content

<https://pagedmedia.org/paged-js>

# Team

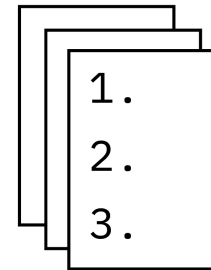
- Founder: Adam Hyde
- Core team: Fred Chasen, Julie Blanc, Julien Taquet
- Funding: Shuttleworth Foundation

# Standards (W3C)



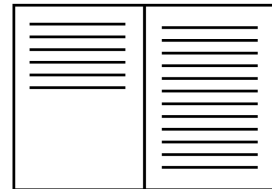
## **CSS Paged Media Module Level 3**

W3C Working Draft  
14 March 2013



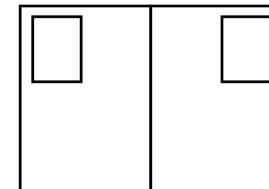
## **CSS Generated Content for Paged Media Module**

W3C Working Draft  
13 May 2014



## **CSS Fragmentation Module Level 3**

W3C Candidate Recommendation  
9 February 2017



## **CSS Page Floats**

W3C Working Draft  
15 September 2015






```
@page {  
    size: 148mm 210mm;  
    margin-top: 20mm;  
    margin-bottom: 60mm;  
}  
  
@page:left {  
    margin-left: 36mm;  
    margin-right: 12mm;  
  
    @bottom-left {  
        content: counter(page);  
        vertical-align: center;  
    }  
  
    @bottom-center {  
        content: string(title);  
        vertical-align: center;  
    }  
}  
  
h1#title {  
    string-set: title content(text);  
}
```

## CSS Paged Media (@page) - WD

Usage

% of all users  ?

Global

68.78% + 10.17% = 78.95%

CSS at-rule (**@page**) to define page-specific rules when printing web pages, such as margin per page and page dimensions.

Current aligned Usage relative Date relative Apply filters Show all ?

IE	Edge *	Firefox	Chrome	Safari	iOS Safari *	Opera Mini *	Chrome for Android	UC Browser for Android	Samsung Internet
			72						
			73	5.1	11.4				
	<sup>1</sup> 17	<sup>1</sup> 66	74	12	12.1				4
<sup>1</sup> 11	<sup>1</sup> 18	<sup>1</sup> 67	75	12.1	12.2	all	74	<sup>2</sup> 11.8	9.2
	76	<sup>1</sup> 68	76	13	13				
		<sup>1</sup> 69	77	TP					
			78						

Notes Known issues (1) Resources (6) Feedback

Currently no browsers appear to support the `marks` & `bleed` properties from the latest version of the specification.

<sup>1</sup> Does not support the `size` property

<sup>2</sup> Does not appear to have a way to print web pages



**Julien**

@John\_Tax

<Isn't polyfill the Greek word for hack?> —  
[@dauwhe](#)

 Traduire le Tweet

20:56 - 9 janv. 2018



How paged.js works ?

Fragmentation of the content (chunker)

Transformation of CSS declarations (polisher)

Preview (previewer)

div

CHAPTER 1.

## Loomings.

Call me Ishmael. Some years ago—never mind how long precisely—having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off—then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with me.

There now is your insular city of the Manhattoes, belted round by wharves as Indian isles by coral reefs—commerce surrounds it with her surf. Right and left, the streets take you waterward. Its extreme downtown is the battery, where that noble mole is washed by waves, and cooled by breezes, which a few hours previous were out of sight of land. Look at the crowds of water-gazers there.

div

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div class="page"

div

div

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## CSS before paged.js

```
@page {
  size: 148mm 210mm;
  margin-top: 10mm;
  margin-right: 20mm;
  margin-bottom: 25mm;
  margin-left: 15mm;

  @bottom-left {
    content: counter(page);
  }

  @bottom-center {
    content: string(title);
    text-transform: uppercase;
  }
}

h1#title {
  <!-- "Moby Dick" -->
  string-set: title content(text);
}
```

## CSS after paged.js

```
.pagedjs_page {
  --pagedjs-string-title: "Moby Dick";
  margin-top: 10mm;
  margin-right: 20mm;
  margin-bottom: 25mm;
  margin-left: 15mm;
}

.pagedjs_page .pagedjs_margin-bottom-left::after {
  content: string(title);
}

.pagedjs_page .pagedjs_margin-bottom-center::after {
  content: var(--pagedjs-string-title);
  text-transform: uppercase;
}
```

@top-left-corner	@top-left	@top-center	@top-right	@top-right-corner
@left-top	page area			@right-top
@left-middle				@right-middle
@left-bottom				@right-bottom
@bottom-left-corner	@bottom-left	@bottom-center	@bottom-right	@bottom-right-corner

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	2	MOBY DICK		

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		Once more. Say you are in the country; in some high land of lakes. Take almost any path you please, and ten to one it carries you down in a dale, and leaves you there by a pool in the stream. There is magic in it. Let the most absent-minded of men be plunged in his deepest reveries—stand that man on his legs, set his feet a-going, and he will infallibly lead you to water, if water there be in all that region. Should you ever be athirst in the great American desert, try this experiment, if your caravan happen to be supplied with a metaphysical professor. Yes, as every one knows, meditation and water are	
2	MOBY DICK	LOOMINGS	3

wedded for ever. Yes, as every one knows, meditation and water are wedded for ever. Yes, as every one knows, meditation and water are wedded for ever.			
But here is an artist. He desires to paint you the dreamiest, shadiest, quietest, most enchanting bit of romantic landscape in all the valley of the Saco. What is the chief element he employs? There stand his trees, each with a hollow trunk, as if a hermit and a crucifix were within; and here sleeps his meadow, and there sleep his cattle; and up from yonder cottage goes a sleepy smoke. Deep into distant woodlands winds a mazy way, reaching to overlapping spurs of mountains bathed in their hill-side blue. But though the picture lies thus tranced, and though this pine-tree shakes down its sighs like leaves upon this shepherd's head, yet all		Now, when I say that I am in the habit of going to sea whenever I begin to grow hazy about the eyes, and begin to be over conscious of my lungs, I do not mean to have it inferred that I ever go to sea as a passenger. For to go as a passenger you must needs have a purse, and a purse is but a rag unless you have something in it. Besides, passengers get sea-sick—grow quarrelsome—don't sleep of nights—do not enjoy themselves much, as a general thing;—no, I never go as a passenger; nor, though I am something of a salt, do I ever go to sea as a Commodore, or a Captain, or a Cook. I abandon the glory and distinction of such offices to those who like them. For my part, I abominate all honorable respectable toils, trials, and tribulations of every kind whatsoever. It is quite as much as I can do to take care of myself, without taking care	

InspecteurConsoleDébogueurÉditeur de style

Rechercher dans le HTML

<div class="pagedjs\_bleed pagedjs\_bleed-left"></div> flex<div class="pagedjs\_bleed pagedjs\_bleed-right"></div> flex&ltdiv class="pagedjs\_pagebox"> grid&ltdiv class="pagedjs\_margin-top-left-corner-holder"></div> flex&ltdiv class="pagedjs\_margin-top"></div> grid&ltdiv class="pagedjs\_margin-top-right-corner-holder"></div> flex&ltdiv class="pagedjs\_margin-right"></div> grid&ltdiv class="pagedjs\_margin-left"></div> grid&ltdiv class="pagedjs\_margin-bottom-left-corner-holder"></div> flex&ltdiv class="pagedjs\_margin-bottom" style="grid-template-columns: minmax(16.66%, 1fr) minmax(33%, 90.5405%) minmax(16.66%, 1fr);"> grid&ltdiv class="pagedjs\_margin pagedjs\_margin-bottom-left hasContent" style="white-space: normal;"> flex&ltdiv class="pagedjs\_margin-content">::after</div></div><div class="pagedjs\_margin pagedjs\_margin-bottom-center hasContent" style="white-space: normal;"></div></div>

Filtrer les styles

élément { inline}

.pagedjs\_pagebox { inline:142}box-sizing: border-box; width: var(--pagedjs-pagebox-width); height: var(--pagedjs-pagebox-height); position: relative; display: # grid; grid-template-columns: [left] var(--pagedjs-margin-left) [center] calc(var(--pagedjs-pagebox-width) - var(--pagedjs-margin-left) - var(--pagedjs-margin-right)) [right] var(--pagedjs-margin-right); grid-template-rows: [header] var(--pagedjs-margin-top) [page] calc(var(--pagedjs-pagebox-height) - var(--pagedjs-margin-top) - var(--pagedjs-margin-bottom)) [footer] var(--pagedjs-margin-bottom); grid-column: # sheet-center; grid-row: # sheet-middle;

\* { inline:1}margin: # 0; padding: # 0; line-height: var(--line-height);

Hérité de div#page-2

.pagedjs\_page.pagedjs\_left\_page { inline:1}margin-left: # 0; margin-right: # 0;

Mise en pageCalculéModification

Filtrer les styles

Styles navigateur

box-sizingborder-boxdisplaygridgrid-column-end sheet-centergrid-column-start sheet-centergrid-row-end sheet-middlegrid-row-start sheet-middlegrid-template-columns [left] 68.0333px [center] 400.633px [...grid-template-rows [header] 54px [page] 659.7px [footer]...height793.7pxline-height18pxmargin-bottom0pxmargin-left0pxmargin-right0px

Demo

# Page size and margins

```
@page {  
  size: 148mm 210mm;  
  margin-top: 54mm;  
  margin-bottom: 80mm;  
  margin-left: 20mm;  
  margin-right: 20mm;  
}
```

	this. I had been cutting up some caper or other—I think it was trying to crawl up the chimney, as I had seen a little sweep do a few days previous; and my stepmother who, somehow or other, was all the time whipping me, or sending me to bed
--	---

<p>supperless,—my mother dragged me by the legs out of the chimney and packed me off to bed, though it was only two o'clock in the afternoon of the 21st June, the longest day in the year in our hemisphere. I felt dreadfully. But there was no help for it, so up stairs I went to my little room in the third floor, undressed myself as slowly as possible so as to kill time, and with a bitter sigh got between the sheets.</p> <p>I lay there dismally calculating that sixteen entire hours must elapse before I could hope for a resurrection. Sixteen hours in bed! the small of my back ached to think of it. And it was so light too; the sun shining in at the window, and a great rattling of coaches in the streets, and the sound of gay voices all over the house. I felt worse and worse—at last I got up, dressed, and softly going down in my stockinged feet, sought out my stepmother, and suddenly threw myself at her feet, beseeching her as a particular favour to give me a good slippering for my misbehaviour; anything indeed but condemning me to lie abed such an unendurable length of time. But she was the best and most conscientious of stepmothers, and back I had to go to my room. For several hours I lay there broad awake, feeling a great deal worse than I have ever done since, even from the greatest subsequent misfortunes. At last I must have fallen into a troubled nightmare of a doze; and slowly waking from it—half steeped in dreams—I opened my eyes, and the before sun-lit room was now wrapped in outer darkness. Instantly I felt a shock running through all my frame; nothing was to be seen, and nothing was to be heard; but a supernatural hand seemed placed in mine. My arm hung over the counterpane, and the nameless, unimaginable, silent form or phantom, to which the hand belonged, seemed closely seated by my bed-side. For what seemed ages piled on ages, I lay there, frozen with the most awful fears, not daring to drag away my hand; yet ever thinking that if I could but stir it one single inch, the horrid spell would be broken. I knew not how this consciousness at last glided away from me; but waking in the morning, I</p>	<p>shudderingly remembered it all, and for days and weeks and months afterwards I lost myself in confounding attempts to explain the mystery. Nay, to this very hour, I often puzzle myself with it.</p> <p>Now, take away the awful fear, and my sensations at feeling the supernatural hand in mine were very similar, in their strangeness, to those which I experienced on waking up and seeing Queequeg's pagan arm thrown round me. But at length all the past night's events soberly recurred, one by one, in fixed reality, and then I lay only alive to the comical predicament. For though I tried to move his arm—unlock his bridegroom clasp—yet, sleeping as he was, he still hugged me tightly, as though naught but death should part us twain. I now strove to rouse him—"Queequeg!"—but his only answer was a snore. I then rolled over, my neck feeling as if it were in a horse-collar; and suddenly felt a slight scratch. Throwing aside the counterpane, there lay the tomahawk sleeping by the savage's side, as if it were a hatchet-faced baby. A pretty pickle, truly, thought I; abed here in a strange house in the broad day, with a cannibal and a tomahawk! "Queequeg!—in the name of goodness, Queequeg, wake!" At length, by dint of much wriggling, and loud and incessant expostulations upon the unbecomingness of his hugging a fellow male in that matrimonial sort of style, I succeeded in extracting a grunt; and presently, he drew back his arm, shook himself all over like a Newfoundland dog just from the water, and sat up in bed, stiff as a pike-staff, looking at me, and rubbing his eyes as if he did not altogether remember how I came to be there, though a dim consciousness of knowing something about me seemed slowly dawning over him. Meanwhile, I lay quietly eyeing him, having no serious misgivings now, and bent upon narrowly observing so curious a creature. When, at last, his mind seemed made up touching the character of his bedfellow, and he became, as it were, reconciled to the fact; he jumped out upon the floor, and by certain signs and sounds gave me to understand that, if it pleased me, he would</p>
---	--

<p>dress first and then leave me to dress afterwards, leaving the whole apartment to myself. Thinks I, Queequeg, under the circumstances, this is a very civilized overture; but, the truth is, these savages have an innate sense of delicacy, say what you will; it is marvellous how essentially polite they are. I pay this particular compliment to Queequeg, because he treated me with so much civility and consideration, while I was guilty of great rudeness; staring at him from the bed, and watching all his toilette motions; for the time my curiosity getting the better of my breeding. Nevertheless, a man like Queequeg you don't see every day, he and his ways were well worth unusual regarding.</p> <p>He commenced dressing at ten by donning his beaver hat</p>	<p>and that the street being very narrow, the house opposite commanded a plain view into the room, and observing more and more the indecorous figure that Queequeg made, staving about with little else but his hat and boots on; I begged him as well as I could, to accelerate his toilet somewhat, and particularly to get into his pantaloons as soon as possible. He complied, and then proceeded to wash himself. At that time in the morning any Christian would have washed his face; but Queequeg, to my amazement, contented himself with restricting his ablutions to his chest, arms, and hands. He then donned his waistcoat, and taking up a piece of hard soap on the wash-stand centre table, dipped it into water and commenced lathering his face. I was watching to see where</p>
--	--



# Symetric margins

```
@page:left {  
  margin-left: 18mm;  
  margin-right: 24mm;  
}
```

```
@page:right {  
  margin-left: 24mm;  
  margin-right: 18mm;  
}
```



winds from astern (that is, if you never violate the Pythagorean maxim), so for the most part the Commodore on the quarter-deck gets his atmosphere at second hand from the sailors on the forecastle. He thinks he breathes it first; but	seas where he rolled his island bulk; the undeliverable, nameless perils of the whale; these, with all the attending marvels of a thousand Patagonian sights and sounds, helped to sway me to my wish. With other men, perhaps, such things
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<p>would not have been inducements; but as for me, I am tormented with an everlasting itch for things remote. I love to sail forbidden seas, and land on barbarous coasts. Not ignoring what is good, I am quick to perceive a horror, and could still be social with it—would they let me—since it is but well to be on friendly terms with all the inmates of the place one lodges in.</p> <p>By reason of these things, then, the whaling voyage was welcome; the great flood-gates of the wonder-world swung open, and in the wild conceits that swayed me to my purpose, two and two there floated into my inmost soul, endless processions of the whale, and, mid most of them all, one grand hooded phantom, like a snow hill in the air.</p> <p>CHAPTER 2.</p> <h2>The Carpet-Bag.</h2> <p>I stuffed a shirt or two into my old carpet-bag, tucked it under my arm, and started for Cape Horn and the Pacific. Quitting the good city of old Manhatto, I duly arrived in New Bedford. It was a Saturday night in December. Much was I disappointed upon learning that the little packet for Nantucket had already sailed, and that no way of reaching that place would offer, till the following Monday.</p> <p>As most young candidates for the pains and penalties of whaling stop at this same New Bedford, thence to embark on their voyage, it may as well be related that I, for one, had no</p>	<p>idea of so doing. For my mind was made up to sail in no other than a Nantucket craft, because there was a fine, boisterous something about everything connected with that famous old island, which amazingly pleased me. Besides though New Bedford has of late been gradually monopolising the business of whaling, and though in this matter poor old Nantucket is now much behind her, yet Nantucket was her great original—the Tyre of this Carthage;—the place where the first dead American whale was stranded. Where else but from Nantucket did those aboriginal whalemén, the Red-Men, first sally out in canoes to give chase to the Leviathan? And where but from Nantucket, too, did that first adventurous little sloop put forth, partly laden with imported cobblestones—so goes the story—to throw at the whales, in order to discover when they were nigh enough to risk a harpoon from the bowsprit?</p> <p>Now having a night, a day, and still another night following before me in New Bedford, ere I could embark for my destined port, it became a matter of concernment where I was to eat and sleep meanwhile. It was a very dubious-looking, nay, a very dark and dismal night, bitingly cold and cheerless. I knew no one in the place. With anxious grapnels I had sounded my pocket, and only brought up a few pieces of silver,—So, wherever you go, Ishmael, said I to myself, as I stood in the middle of a dreary street shouldering my bag, and comparing the gloom towards the north with the darkness towards the south—wherever in your wisdom you may conclude to lodge for the night, my dear Ishmael, be sure to inquire the price, and don't be too particular.</p> <p>With halting steps I paced the streets, and passed the sign of “The Crossed Harpoons”—but it looked too expensive and jolly there. Further on, from the bright red windows of the “Sword-Fish Inn,” there came such fervent rays, that it seemed to have melted the packed snow and ice from before the house, for everywhere else the congealed frost lay ten inches thick in a hard, asphaltic pavement,—rather weary for</p>
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me, when I struck my foot against the flinty projections, because from hard, remorseless service the soles of my boots were in a most miserable plight. Too expensive and jolly, again thought I, pausing one moment to watch the broad glare in the street, and hear the sounds of the tinkling glasses within. But go on, Ishmael, said I at last; don't you hear? get away from before the door; your patched boots are stopping the way. So on I went. I now by instinct followed the streets that took me waterward, for there, doubtless, were the cheapest, if not the cheeriest inns. <p>Such dreary streets! blocks of blackness, not houses, on either hand, and here and there a candle, like a candle moving about in a tomb. At this hour of the night, of the last</p>	Inn:—Peter Coffin.”
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30	<p>dream; I never could entirely settle. The circumstance was this. I had been cutting up some caper or other—I think it was trying to crawl up the chimney, as I had seen a little sweep do a few days previous; and my stepmother who, somehow or other, was all the time whipping me, or sending me to bed</p>
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<p>supperless,—my mother dragged me by the legs out of the chimney and packed me off to bed, though it was only two o'clock in the afternoon of the 21st June, the longest day in the year in our hemisphere. I felt dreadfully. But there was no help for it, so up stairs I went to my little room in the third floor, undressed myself as slowly as possible so as to kill time, and with a bitter sigh got between the sheets.</p> <p>I lay there dismally calculating that sixteen entire hours must elapse before I could hope for a resurrection. Sixteen hours in bed! the small of my back ached to think of it. And it was so light too; the sun shining in at the window, and a great rattling of coaches in the streets, and the sound of gay voices all over the house. I felt worse and worse—at last I got up, dressed, and softly going down in my stockinged feet, sought out my stepmother, and suddenly threw myself at her feet, beseeching her as a particular favour to give me a good slippering for my misbehaviour; anything indeed but condemning me to lie abed such an unendurable length of time. But she was the best and most conscientious of stepmothers, and back I had to go to my room. For several hours I lay there broad awake, feeling a great deal worse than I have ever done since, even from the greatest subsequent misfortunes. At last I must have fallen into a troubled nightmare of a doze; and slowly waking from it—half steeped in dreams—I opened my eyes, and the before sun-lit room was now wrapped in outer darkness. Instantly I felt a shock running through all my frame; nothing was to be seen, and nothing was to be heard; but a supernatural hand seemed placed in mine. My arm hung over the counterpane, and the nameless, unimaginable, silent form or phantom, to which the hand belonged, seemed closely seated by my bed-side. For what seemed ages piled on ages, I lay there, frozen with the most awful fears, not daring to drag away my hand; yet ever thinking that if I could but stir it one single inch, the horrid spell would be broken. I knew not how this consciousness at last glided away from me; but waking in the morning, I</p>	<p>shudderingly remembered it all, and for days and weeks and months afterwards I lost myself in confounding attempts to explain the mystery. Nay, to this very hour, I often puzzle myself with it.</p> <p>Now, take away the awful fear, and my sensations at feeling the supernatural hand in mine were very similar, in their strangeness, to those which I experienced on waking up and seeing Queequeg's pagan arm thrown round me. But at length all the past night's events soberly recurred, one by one, in fixed reality, and then I lay only alive to the comical predicament. For though I tried to move his arm—unlock his bridegroom clasp—yet, sleeping as he was, he still hugged me tightly, as though naught but death should part us twain. I now strove to rouse him—"Queequeg!"—but his only answer was a snore. I then rolled over, my neck feeling as if it were in a horse-collar; and suddenly felt a slight scratch. Throwing aside the counterpane, there lay the tomahawk sleeping by the savage's side, as if it were a hatchet-faced baby. A pretty pickle, truly, thought I; abed here in a strange house in the broad day, with a cannibal and a tomahawk! "Queequeg!—in the name of goodness, Queequeg, wake!" At length, by dint of much wriggling, and loud and incessant expostulations upon the unbecomingness of his hugging a fellow male in that matrimonial sort of style, I succeeded in extracting a grunt; and presently, he drew back his arm, shook himself all over like a Newfoundland dog just from the water, and sat up in bed, stiff as a pike-staff, looking at me, and rubbing his eyes as if he did not altogether remember how I came to be there, though a dim consciousness of knowing something about me seemed slowly dawning over him. Meanwhile, I lay quietly eyeing him, having no serious misgivings now, and bent upon narrowly observing so curious a creature. When, at last, his mind seemed made up touching the character of his bedfellow, and he became, as it were, reconciled to the fact; he jumped out upon the floor, and by certain signs and sounds gave me to understand that, if it pleased me, he would</p>
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<p>dress first and then leave me to dress afterwards, leaving the whole apartment to myself. Thinks I, Queequeg, under the circumstances, this is a very civilized overture; but, the truth is, these savages have an innate sense of delicacy, say what you will; it is marvellous how essentially polite they are. I pay this particular compliment to Queequeg, because he treated me with so much civility and consideration, while I was guilty of great rudeness; staring at him from the bed, and watching all his toilette motions; for the time my curiosity getting the better of my breeding. Nevertheless, a man like Queequeg you don't see every day, he and his ways were well worth unusual regarding.</p> <p>He commenced dressing at ten by donning his headdress</p>	<p>and that the street being very narrow, the house opposite commanded a plain view into the room, and observing more and more the indecorous figure that Queequeg made, staving about with little else but his hat and boots on; I begged him as well as I could, to accelerate his toilet somewhat, and particularly to get into his pantaloons as soon as possible. He complied, and then proceeded to wash himself. At that time in the morning any Christian would have washed his face; but Queequeg, to my amazement, contented himself with restricting his ablutions to his chest, arms, and hands. He then donned his waistcoat, and taking up a piece of hard soap on the wash-stand centre table, dipped it into water and commenced lathering his face. I was rushing to see where</p>
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uncomfortableness, and seeing him now exhibiting strong symptoms of concluding his business operations, and jumping into bed with me, I thought it was high time, now or never, before the light was put out, to break the spell in which I had so long been bound.

But the interval I spent in deliberating what to say, was a fatal one. Taking up his tomahawk from the table, he examined the head of it for an instant, and then holding it to the light, with his mouth at the handle, he puffed out great clouds of tobacco smoke. The next moment the light was extinguished, and this wild cannibal, tomahawk between his teeth, sprang into bed with me. I sang out, I could not help it

Queequeg, look here—you sabbee me, I sabbee—you this man sleepe you—you sabbee?"

"Me sabbee plenty"—grunted Queequeg, puffing away at his pipe and sitting up in bed.

"You gettee in," he added, motioning to me with his tomahawk, and throwing the clothes to one side. He really did this in not only a civil but a really kind and charitable way. I stood looking at him a moment. For all his tattooings he was on the whole a clean, comely looking cannibal. What's all this fuss I have been making about, thought I to myself—the man's a human being just as I am: he has just as much reason to fear me, as I have to be afraid of him. Better sleep

<h2>  
(chap. 5)

with a sober cannibal than a drunken Christian.

"Landlord," said I, "tell him to stash his tomahawk there, or pipe, or whatever you call it; tell him to stop smoking, in short, and I will turn in with him. But I don't fancy having a man smoking in bed with me. It's dangerous. Besides, I ain't insured."

This being told to Queequeg, he at once complied, and again politely motioned me to get into bed—rolling over to one side as much as to say—"I won't touch a leg of ye."

"Good night, landlord," said I, "you may go."

I turned in, and never slept better in my life.

CHAPTER 4.

## The Counterpane.

Upon waking next morning about daylight, I found Queequeg's arm thrown over me in the most loving and affectionate manner. You had almost thought I had been his wife. The counterpane was of patchwork, full of odd little parti-coloured squares and triangles; and this arm of his tattooed all over with an interminable Cretan labyrinth of a figure, no two parts of which were of one precise shade—owing I suppose to his keeping his arm at sea unmethodically in sun and shade, his shirt sleeves irregularly rolled up at various times—this same arm of his, I say, looked for all the world like a strip of that same patchwork quilt. Indeed, partly lying on it as the arm did when I first awoke, I could hardly tell it from the quilt, they so blended their hues together; and it was only by the sense of weight and pressure that I could tell that Queequeg was hugging me.

My sensations were strange. Let me try to explain them. When I was a child, I well remember a somewhat similar circumstance that befell me; whether it was a reality or a dream, I never could entirely settle. The circumstance was this. I had been cutting up some caper or other—I think it was trying to crawl up the chimney, as I had seen a little sweep do a few days previous; and my stepmother who, somehow or other, was all the time whipping me, or sending me to bed

<h2>  
(chap. 4)

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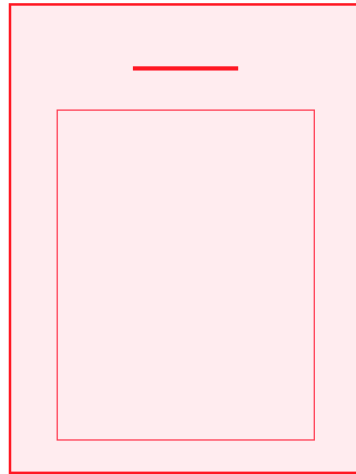
Now, take away the awful fear, and my sensations at

eyes, and began creaking and limping about the room, as if, not being much accustomed to boots, his pair of damp, wrinkled cowhide ones—probably not made to order either—rather pinched and tormented him at the first go off of a bitter cold morning. Seeing, now, that there were no curtains to the window,			
38	MOBY DICK	THE COUNTERPANE	39

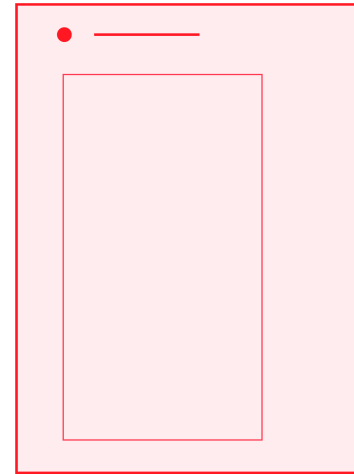
		CHAPTER 5.	
		<h1>Breakfast.</h1>	
		<p>I quickly followed suit, and descending into the bar-room accosted the grinning landlord very pleasantly. I cherished no malice towards him, though he had been skylarking with me not a little in the matter of my bedfellow.</p> <p>However, a good laugh is a mighty good thing, and rather too scarce a good thing; the more's the pity. So, if any one man, in his own proper person, afford stuff for a good joke to anybody, let him not be backward, but let him cheerfully allow himself to spend and be spent in that way. And the man that has anything bountifully laughable about him, be sure there is more in that man than you perhaps think for.</p> <p>The bar-room was now full of the boarders who had been dropping in the night previous, and whom I had not as yet had a good look at. They were nearly all whalemens; chief mates, and second mates, and third mates, and sea carpenters, and sea coopers, and sea blacksmiths, and harpooneers, and ship keepers; a brown and brawny company, with bosky beards; an unshorn, shaggy set, all wearing monkey jackets for morning gowns.</p> <p>You could pretty plainly tell how long each one had been ashore. This young fellow's healthy cheek is like a sun-toasted pear in hue, and would seem to smell almost as musky; he cannot have been three days landed from his</p>	
40	MOBY DICK	BREAKFAST	41

<p>Indian voyage. That man next him looks a few shades lighter; you might say a touch of satin wood is in him. In the complexion of a third still lingers a tropic tawn, but slightly bleached withal; <i>he</i> doubtless has tarried whole weeks ashore. But who could show a cheek like Queequeg? which, barred with various tints, seemed like the Andes' western slope, to show forth in one array, contrasting climates, zone by zone.</p> <p>"Grub, ho!" now cried the landlord, flinging open a door, and in we went to breakfast.</p> <p>They say that men who have seen the world, thereby become quite at ease in manner, quite self-possessed in</p>		<p>them—at the head of the table, too, it so chanced; as cool as an icicle. To be sure I cannot say much for his breeding. His greatest admirer could not have cordially justified his bringing his harpoon into breakfast with him, and using it there without ceremony; reaching over the table with it, to the imminent jeopardy of many heads, and grappling the beefsteaks towards him. But <i>that</i> was certainly very coolly done by him, and every one knows that in most people's estimation, to do anything coolly is to do it genteelly.</p> <p>We will not speak of all Queequeg's peculiarities here; how he eschewed coffee and hot rolls, and applied his undivided</p>	
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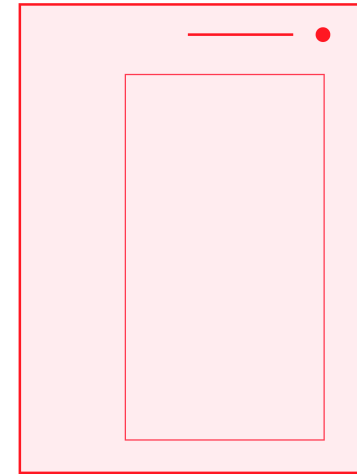
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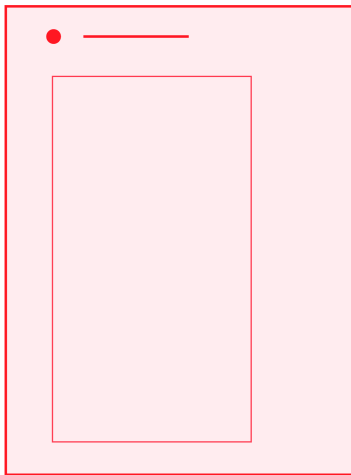
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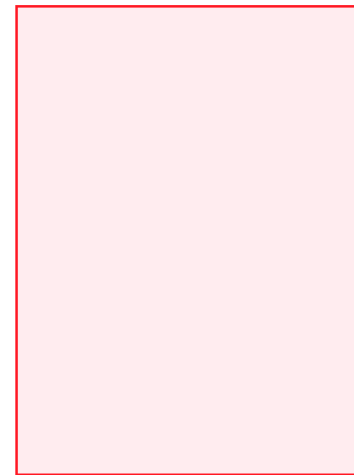
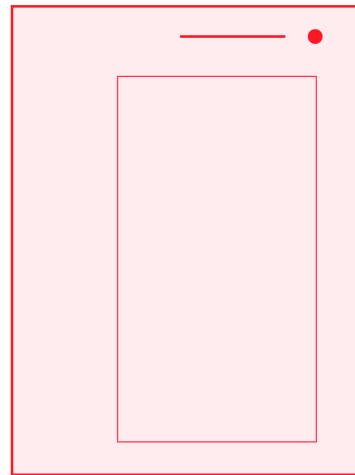
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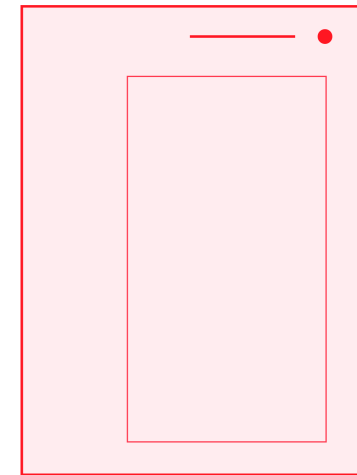
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38	39


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	<p>BREAKFAST</p>
	41

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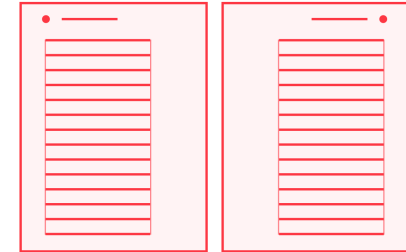
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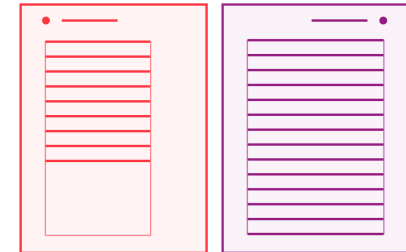
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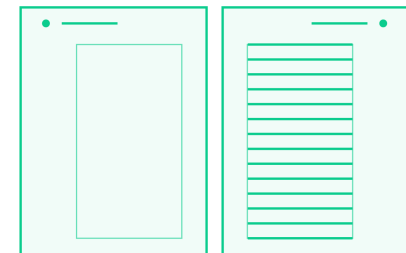
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Now, that Lazarus should lie stranded there on the curbstone before the door of Dives, this is more wonderful than that an iceberg should be moored to one of the			
14	MOBY DICK	THE CARPET-BAG	15

		<div>CHAPTER 3.</div> <div>The Spouter-Inn.</div> <div>Entering that gable-ended Spouter-Inn, you found yourself in a wide, low, straggling entry with old-fashioned wainscots, reminding one of the bulwarks of some condemned old craft. On one side hung a very large oilpainting so thoroughly besmoked, and every way defaced, that in the unequal crosslights by which you viewed it, it was only by diligent study and a series of systematic visits to it, and careful inquiry of the neighbors, that you could any way arrive at an understanding of its purpose. Such unaccountable masses of shades and shadows, that at first you almost thought some ambitious young artist, in the time of the New England hags, had endeavored to delineate chaos bewitched. But by dint of much and earnest contemplation, and oft repeated ponderings, and especially by throwing open the little window towards the back of the entry, you at last come to the conclusion that such an idea, however wild, might not be altogether unwarranted.</div> <div>But what most puzzled and confounded you was a long, limber, portentous, black mass of something hovering in the centre of the picture over three blue, dim, perpendicular lines floating in a nameless yeast. A boggy, soggy, squitchy picture truly, enough to drive a nervous man distracted. Yet was there a sort of indefinite, half-attained, unimaginable</div> <div>17</div>	
--	--	---	--

<div>sublimity about it that fairly froze you to it, till you involuntarily took an oath with yourself to find out what that marvellous painting meant. Ever and anon a bright, but, alas, deceptive idea would dart you through.—It's the Black Sea in a midnight gale.—It's the unnatural combat of the four primal elements.—It's a blasted heath.—It's a Hyperborean winter scene.—It's the breaking-up of the icebound stream of Time. But at last all these fancies yielded to that one portentous something in the picture's midst. <i>That</i> once found out, and all the rest were plain. But stop; does it not bear a faint resemblance to a gigantic fish? even the great leviathan himself?</div> <div>In fact, the artist's design seemed this: a final theory of my own, partly based upon the aggregated opinions of many aged persons with whom I conversed upon the subject. The picture is a <i>Good Hope</i> in the last stages of the</div>		<div>entered nigh the tail, and, like a restless needle sojourning in the body of a man, travelled full forty feet, and at last was found imbedded in the hump.</div> <div>Crossing this dusky entry, and on through yon low-arched way—cut through what in old times must have been a great central chimney with fireplaces all round—you enter the public room. A still duskier place is this, with such low ponderous beams above, and such old wrinkled planks beneath, that you would almost fancy you trod some old craft's cockpits, especially of such a howling night, when this corner-anchored old ark rocked so furiously. On one side stood a long, low, shelf-like table covered with cracked glass cases, filled with dusty rarities gathered from this wide world's remotest nooks. Projecting from the further angle of the room stands a dark-looking den—the bar—a rude attempt at a lighted booth. But behind it, in the next booth,</div>	
--	--	--	--

# Columns layout

```
.chapter-content {  
  columns: 2;  
  column-gap: 8mm;  
}
```

<div>12</div> <div>MOBY DICK</div>	<div> <p>atic visits to it, and careful inquiry of the neighbors, that you could any way arrive at an understanding of its purpose. Such unaccountable masses of shades and shadows, that at first you almost thought some ambitious young artist, in the time of the New England hags, had endeavored to de-</p> </div> <div> <p>through.—It's the black sea in a midnight gale.—It's the unnatural combat of the four primal elements.—It's a blasted heath.—It's a Hyperborean winter scene.—It's the breaking-up of the icebound stream of Time. But at last all these fancies yielded to that one portentous something in the pic-</p> </div> <div>THE SPOUTER-INN</div> <div>13</div>
<div> <p>ture's midst. <i>That</i> once found out, and all the rest were plain. But stop; does it not bear a faint resemblance to a gigantic fish? even the great leviathan himself?</p> </div> <div> <p>In fact, the artist's design seemed this: a final theory of my own, partly based upon the aggregated opinions of many aged persons with whom I conversed upon the subject. The picture represents a Cape-Horner in a great hurricane; the half-foundered ship weltering there with its three dismantled masts alone visible; and an exasperated whale, purposing to spring clean over the craft, is in the enormous act of impaling himself upon the three mast-heads.</p> </div> <div> <p>The opposite wall of this entry was hung all over with a heathenish array of monstrous clubs and spears. Some were thickly set with glittering teeth resembling ivory saws; others were tufted with knots of human hair; and one was sickle-shaped, with a vast handle sweeping round like the segment made in the new-mown grass by a long-armed mower. You shuddered as you gazed, and wondered what monstrous cannibal and savage could ever have gone a death-harvesting with such a hacking, horrifying imple-</p> </div> <div> <p>ment. Mixed with these were rusty old whaling lances and harpoons all broken and deformed. Some were storied weapons. With this once long lance, now wildly elbowed, fifty years ago did Nathan Swain kill fifteen whales between a sunrise and a sunset. And that harpoon—so like a corkscrew now—was flung in Javan seas, and run away with by a whale, years afterwards slain off the Cape of Blanco. The original iron entered nigh the tail, and, like a restless needle sojourning in the body of a man, travelled full forty feet, and at last was found imbedded in the hump.</p> </div> <div> <p>Crossing this dusky entry, and on through yon low-arched way—cut through what in old times must have been a great central chimney with fireplaces all round—you enter the public room. A still duskier place is this, with such low ponderous beams above, and such old wrinkled planks beneath, that you would almost fancy you trod some old craft's cockpits, especially of such a howling night, when this corner-anchored old ark rocked so furiously. On one side stood a long, low, shelf-like table covered with cracked glass cases, filled with dusty rarities gathered from</p> </div> <div>14</div> <div>MOBY DICK</div>	<div> <p>this wide world's remotest nooks. Projecting from the further angle of the room stands a dark-looking den—the bar—a rude attempt at a right whale's head. Be that how it may, there stands the vast arched bone of the whale's jaw, so wide, a coach might almost drive beneath it. Within are shabby shelves, ranged round with old decanters, bottles, flasks; and in those jaws of swift destruction, like another cursed Jonah (by which name indeed they called him), bustles a little withered old man, who, for their money, dearly sells the sailors deliriums and death.</p> </div> <div> <p>Abominable are the tumblers into which he pours his poison. Though true cylinders without—within, the villanous green goggling glasses deceitfully tapered downwards to a cheating bottom. Parallel meridians rudely pecked into the glass, surround these footpads' goblets. Fill to <i>this</i> mark, and your charge is but a penny; to <i>this</i> a penny more; and so on to the full glass—the Cape Horn measure, which you may gulp down for a shilling.</p> </div> <div> <p>Upon entering the place I found a number of young seamen gathered about a table, examining by a dim light divers specimens of <i>skrimshander</i>. I sought the land-</p> </div> <div> <p>lord, and telling him I desired to be accommodated with a room, received for answer that his house was full—not a bed unoccupied. "But avast," he added, tapping his forehead, "you haint no objections to sharing a harpooneer's blanket, have ye? I s'pose you are goin' a-whalin', so you'd better get used to that sort of thing."</p> </div> <div> <p>I told him that I never liked to sleep two in a bed; that if I should ever do so, it would depend upon who the harpooneer might be, and that if he (the landlord) really had no other place for me, and the harpooneer was not decidedly objectionable, why rather than wander further about a strange town on so bitter a night, I would put up with the half of any decent man's blanket.</p> </div> <div> <p>"I thought so. All right; take a seat. Supper?—you want supper? Supper'll be ready directly."</p> </div> <div> <p>I sat down on an old wooden settle, carved all over like a bench on the Battery. At one end a ruminating tar was still further adorning it with his jack-knife, stooping over and diligently working away at the space between his legs. He was trying his hand at a ship under full sail, but he didn't make much headway, I thought.</p> </div> <div>THE SPOUTER-INN</div> <div>15</div>

# Cross references

## 48 AURORÆ: THEIR CHARACTERS AND SPECTRA

nine days from change. About 11 o'clock part of the streamers appeared as if projected south of the zenith and looked like the pillars of an immense amphitheatre, presenting a most brilliant spectacle and seeming to be in a lower region of the atmosphere, and to descend and ascend in the air for several minutes. (This appears to have been the formation of a corona.) One streamer passed over Orion, but neither increased nor diminished its splendour (See Figure 3, p. 49).

'Recent Polar Voyages' contains a narrative of the voyage of Dr. Hayes, who sailed from Boston on the 6th of July, 1860, and wintered at Port Foulbe. He witnessed a remarkable display of the Aurora Borealis on the morning of the 6th January, 1861.

The darkness was so profound as to be oppressive. Suddenly, from the rear of the black cloud which obscured the horizon, flashed a bright ray. Presently an arch of many colours fixed itself across the sky, and the Aurora gradually developed.

The space within the arch was filled by the black cloud; but its borders brightened steadily, though the rays discharged from it were exceeding capricious, now glaring like a vast

overcomes the re  
subtle rays of vio  
the combined str  
flame, which mou



## HTML

```
<p>
```

```
About 11 o'clock part of the streamers appeared as if projected  
south of the zenith and looked like the pillars of an immense  
amphitheatre, presenting a most brilliant spectacle and seeming  
to be in a lower region of the atmosphere, and to descend and  
ascend in the air for several minutes. (This appears to have been  
the formation of a corona.) One streamer passed over Orion,  
<a class="ref-fig" href="#fig-3">but neither increased nor  
diminished its splendour</a>.
```

```
<p>
```

## CSS

```
.ref-fig::after{  
    content: ' (See Figure 3, p. ' target-counter(attr(href), page) ')';  
}
```

# Collection of scripts

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<b>1. <a href="#">Pre-digital era</a></b> .....	<b>p. 3</b>
1. 1. <a href="#">Manual typesetting</a> .....	p. 3
1. 2. <a href="#">Hot metal typesetting</a> .....	p. 3
1. 3. <a href="#">Phototypesetting</a> .....	p. 4
<b>2. <a href="#">Digital era</a></b> .....	<b>p. 5</b>
2. 1. <a href="#">SCRIPT variants</a> .....	p. 6
2. 2. <a href="#">SGML and XML systems</a> .....	p. 7
2. 3. <a href="#">Troff and successors</a> .....	p. 7
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<b>3. <a href="#">Other text formatters</a></b> .....	<b>p. 8</b>
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# External scripts

## AN EXPLICIT FORMULA FOR A WEIGHT ENUMERATOR OF LINEAR- CONGRUENCE CODES

TARO SAKURAI

**ABSTRACT.** An explicit formula for a weight enumerator of linear-congruence codes is provided. This extends the work of Bibak and Milenkovic [IEEE ISIT (2018) 431–435] addressing the binary case to the non-binary case. Furthermore, the extension simplifies their proof and provides a complete solution to a problem posed by them.

**KEYWORDS AND PHRASES.** weight enumerator, code size, linear-congruence code, exponential sum

August 29, 2018.  
2010 Mathematics Subject Classification: 94B40 (05A15, 11L15)  
Source: [https://arxiv.org/abs/1808.09365v1](https://arxiv.org/abs/1808.09365)

### INTRODUCTION

Throughout this article,  $n$  and  $m$  denote positive integers,  $b$  denotes an integer and  $\mathbb{Z}_q = \{0, 1, \dots, q-1\} \subset \mathbb{Z}$  for a positive integer  $q$ . We will use  $n$  for a code length,  $m$  for a modulus,  $b$  for a defining parameter of a code and  $\mathbb{Z}_q$  for a code alphabet.

**Definition.** Let  $\mathbf{a} = (a_1, \dots, a_n) \in \mathbb{Z}^n$  and  $b \in \mathbb{Z}$ . The set  $C$  of all the solutions  $\mathbf{x} = (x_1, \dots, x_n) \in \mathbb{Z}_q^n$  for a linear congruence equation

$$(1) \quad \mathbf{a} \cdot \mathbf{x} \equiv b \pmod{m}$$

is said to be a linear-congruence code where  $\mathbf{a} \cdot \mathbf{x} = a_1x_1 + \dots + a_nx_n$ . A linear-congruence code  $C$  is called binary when  $q = 2$ .

Several deletion-correcting codes which have been studied are linear-congruence codes; the Varshamov-Tenengol'ts codes, the Levenshtein codes, the Helberg codes, the Le-Nguyen codes, the construction  $C'$  of Hagisawa (for some parameters), the consecutively systematic encodable codes and the ternary integer codes in fall into this category (Table).

TABLE. Examples of linear-congruence codes			
Linear-congruence code	$q$	$(a_1, \dots, a_n)$	$m$ Constraints
Varshamov-Tenengol'ts code	2	$(1, \dots, 1)$	$n+1$
Levenshtein code	2	$(1, \dots, 1)$	$nm \geq n+1$
Helberg code	2	$(n_1, \dots, n_n)$	$n_i \geq 1, i \in \mathbb{Z}_n$
Le-Nguyen code	$q$	$(w_1, \dots, w_n)$	$nm \geq w_{n+1}, s \in \mathbb{Z}_n$
Construction $C'$	2	$(c_1, \dots, c_n)$	$n \neq 0, n(n+1)/2 \pmod{n}$
Consecutively systematic encodable codes	2	$(b_1, \dots, b_n)$	$2^{n-1} \leq b \leq 2^n, s \in \mathbb{Z}_n, 0 \leq n-s \leq$
Ternary integer code	3	$(t_1, \dots, t_n)$	$2^{n+1} \leq$

The following problem concerning the size of a linear-congruence code—the number of solutions for a linear congruence equation  $\{\mathbf{x} \in \mathbb{Z}_q^n : \mathbf{a} \cdot \mathbf{x} \equiv b\}$ —is posed by Bibak and Milenkovic.

**Problem.** Give an explicit formula for the size of a linear-congruence code. Finding an explicit formula would be a first step toward understanding the asymptotic behavior of the size of a linear-congruence code. Bibak and Milenkovic provide a solution to the problem for the binary case. In this article, we provide a complete solution to the problem with a simple proof, which improves the argument of Bibak and Milenkovic. Actually, what we will show is how the Hamming weights of the solutions for a linear congruence equation distribute. This immediately gives an expression of the size of a linear-congruence code involving exponential sums—Weyl sums of degree one.

To state the main theorem we need notation which will be standard.

**Definition.** For a code  $C \subset \mathbb{Z}_q^n$ , we define a polynomial  $W_C(x)$  by

$$W_C(x) = \sum_{\mathbf{x} \in C} x^{\text{wt}(\mathbf{x})} = \sum_{i=0}^n A_i(C) x^i,$$

where  $\text{wt}(\mathbf{x})$  denotes the Hamming weight and

$$A_i(C) = |\{\mathbf{x} \in C : \text{wt}(\mathbf{x}) = i\}| \quad (0 \leq i \leq n).$$

The polynomial  $W_C(x)$  is said to be the (non-homogeneous) weight enumerator of the code  $C$ .

Following custom due to Vinogradov in additive number theory,  $\epsilon(\mathbf{x})$  denotes  $e^{2\pi i \mathbf{a} \cdot \mathbf{x} / m}$  for  $\mathbf{x} \in \mathbb{Z}_q^n$ . Now we are in position to state our main theorem.

**Theorem.** Let  $\mathbf{a} = (a_1, \dots, a_n) \in \mathbb{Z}^n$  and  $b \in \mathbb{Z}$ . Then the weight enumerator  $W_C(x)$  of the linear-congruence code

$$(2) \quad C = \{\mathbf{x} \in \mathbb{Z}_q^n : \mathbf{a} \cdot \mathbf{x} \equiv b \pmod{m}\}$$

is given by

$$(3) \quad W_C(x) = \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \left(1 + x e\left(\frac{ja_i}{m}\right) + \dots + x e\left(\frac{ja_i(q-1)}{m}\right)\right).$$

With the same notation as above, the size of the code  $C$  is given by

$$|C| = \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \left(1 + e\left(\frac{ja_i}{m}\right) + \dots + e\left(\frac{ja_i(q-1)}{m}\right)\right).$$

### PROOF OF THEOREM

The only lemma we need to prove the main theorem is the following trivial one.

$$\frac{1}{m} \sum_{j=0}^{m-1} e\left(\frac{jb}{m}\right) = \begin{cases} 1 & \text{if } b \equiv 0 \pmod{m} \\ 0 & \text{if } b \not\equiv 0 \pmod{m}. \end{cases}$$

The proof is straightforward:

$$\begin{aligned} & \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \left(1 + x e\left(\frac{ja_i}{m}\right) + \dots + x e\left(\frac{ja_i(q-1)}{m}\right)\right) \\ &= \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \sum_{s_i=0}^{q-1} e^{s_i a_i j} e\left(\frac{ja_i s_i}{m}\right) \\ &= \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \sum_{(s_1, \dots, s_n) \in \mathbb{Z}_q^n} \prod_{i=1}^n e^{s_i a_i j} e\left(\frac{ja_i s_i}{m}\right) \\ &= \frac{1}{m} \sum_{j=0}^{m-1} e\left(-\frac{jb}{m}\right) \sum_{\mathbf{s} \in \mathbb{Z}_q^n} e^{j \mathbf{a} \cdot \mathbf{s}} e\left(\frac{ja \cdot \mathbf{s}}{m}\right) \\ &= \sum_{\mathbf{s} \in \mathbb{Z}_q^n} \left( \frac{1}{m} \sum_{j=0}^{m-1} e\left(\frac{j(\mathbf{a} \cdot \mathbf{s} - b)}{m}\right) \right) e^{j \mathbf{a} \cdot \mathbf{s}} \\ &= \sum_{\mathbf{s} \in \mathbb{Z}_q^n} e^{j \mathbf{a} \cdot \mathbf{s}} \quad (\text{By Lemma.}) \\ &= W_C(x). \end{aligned}$$

**Remark.** The original proof by Bibak and Milenkovic for the binary case uses a theorem of Lehmer, which states a linear congruence equation

$$\mathbf{a} \cdot \mathbf{x} \equiv b \pmod{m}$$

defined by  $\mathbf{a} = (a_1, \dots, a_n) \in \mathbb{Z}^n$  and  $b \in \mathbb{Z}$  has a solution  $\mathbf{x} \in \mathbb{Z}_m^n$  if and only if  $\gcd(a_1, \dots, a_n, m)$  divides  $b$ . Consequently, their result is stated depending on whether  $\gcd(a_1, \dots, a_n, m)$  divides  $b$  or not. By contrast, our result does not refer to  $\gcd(a_1, \dots, a_n, m)$  because our proof does not rely on the Lehmer theorem.



# Handlers

*// Chunker*

```
beforeParsed(content)
afterParsed(parsed)
beforePageLayout(page)
afterPageLayout(pageElement, page, breakToken)
afterRendered(pages)
```

*// Polisher*

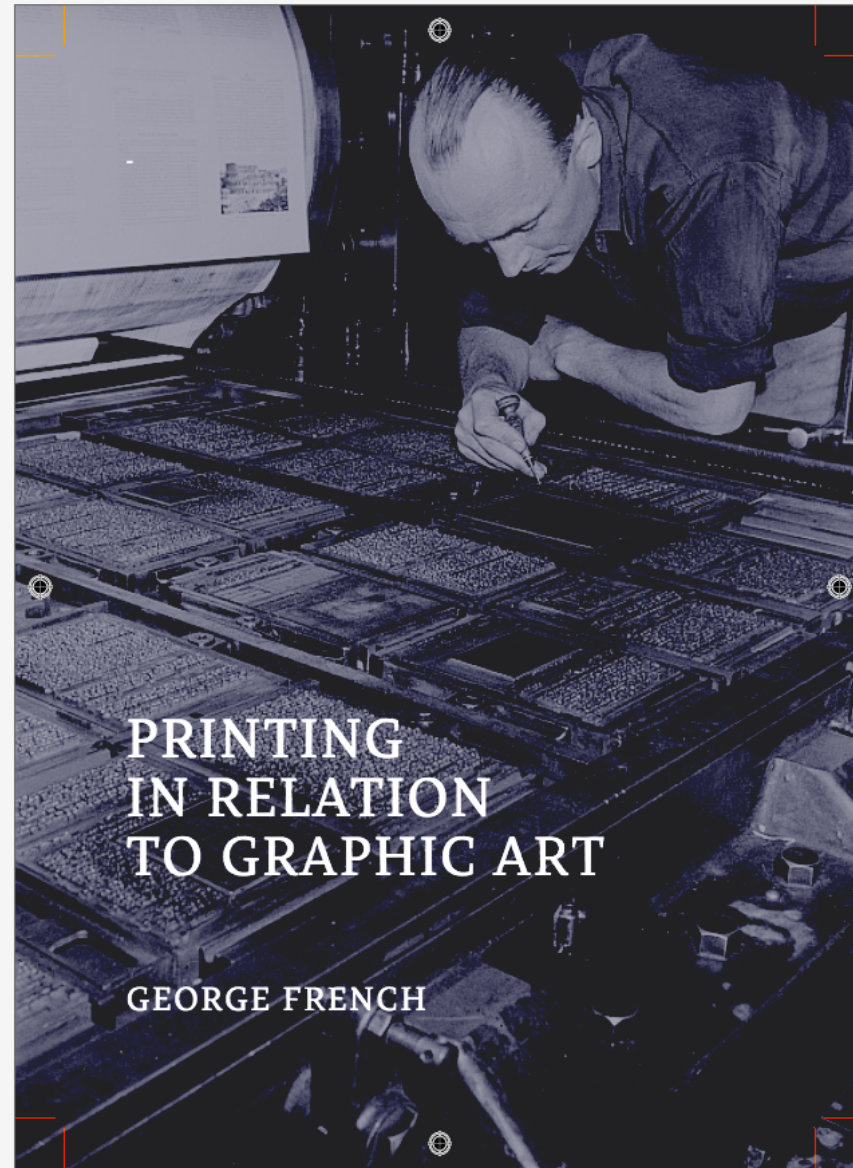
```
beforeTreeParse(text, sheet)
beforeTreeWalk(ast)
afterTreeWalk(ast, sheet)
onUrl(urlNode)
onAtPage(atPageNode)
onRule(ruleNode)
onDeclaration(declarationNode, ruleNode)
onContent(contentNode, declarationNode, ruleNode)
```

*// Layout*

```
layoutNode(node)
renderNode(node, sourceNode)
onOverflow(overflow, rendered, bounds)
onBreakToken(breakToken, overflow, rendered)
```

# Bleed and marks

```
@page {  
  size: 148mm 210mm;  
  bleed: 10mm;  
  marks: crop cross;  
}
```



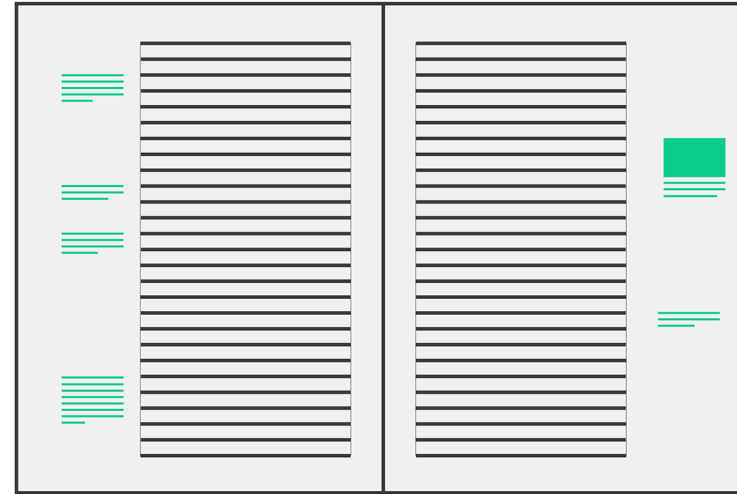
# Short live demo

[gitlab.pagedmedia.org/samples](https://gitlab.pagedmedia.org/samples)

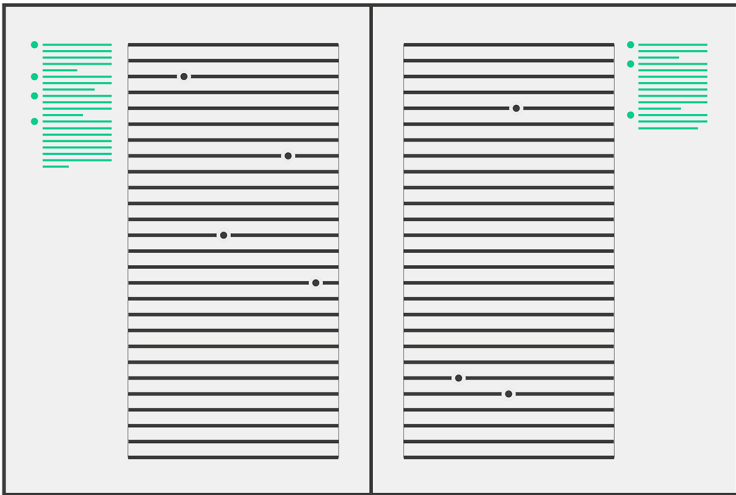
What next for Paged.js ?



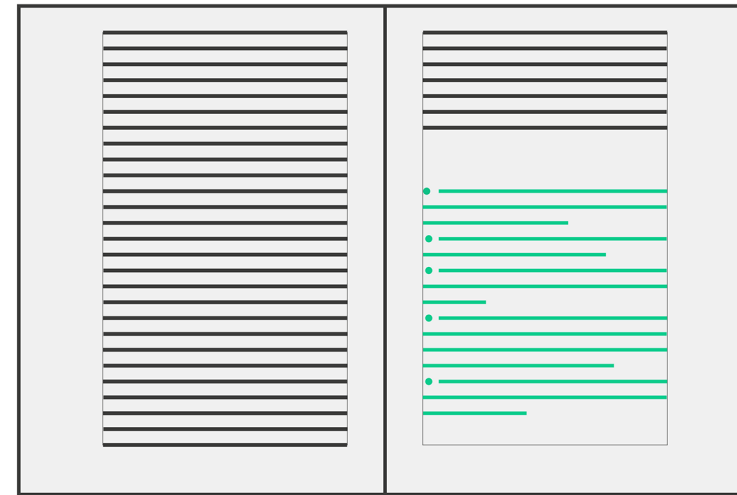
Footnotes



Margin notes



Side notes

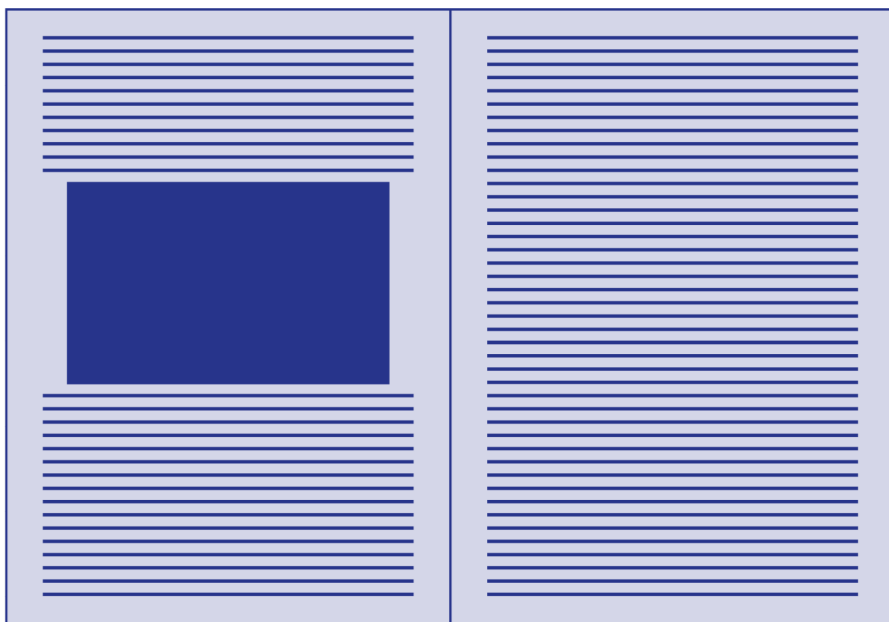


Endnotes

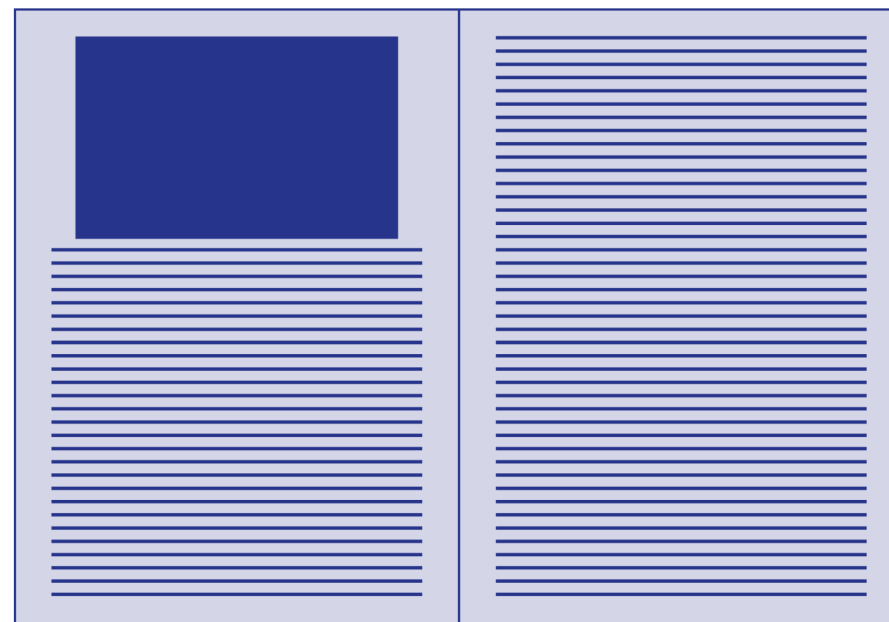
# Footnotes

```
@page {  
  @footnote {  
    float: bottom;  
  }  
}  
  
span.footnote { float: footnote; }
```

# Page floats



initial



with float (top)



Layout 1 column

initial

Layout multicolumn

initial

## Float reference values

float-reference: page | column | inline

float-reference: ☒ page ☐ column ☐ inline

## Float values

float: none | [<float-x> || <float-y>] | [<float-a> || <float-b>]

<float-y>

- ☐ none  
☒ top  
☐ bottom

<float-x>

- ☐ none  
☒ left  
☐ right  
☐ inside  
☐ outside

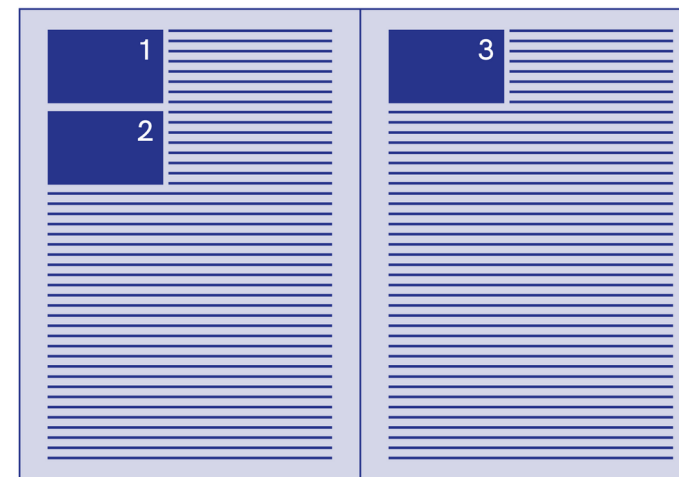
<float-a>

- ☐ none  
☐ block-start  
☐ block-end  
☐ inline-start  
☐ inline-end  
☐ snap-block()  
☐ snap-inline()

<float-b>

- ☐ none  
☐ inline-start  
☐ inline-end

```
elements {
  float-reference: page;
  float: top left
}
```



English like

writing-mode: horizontal-tb



[demos.pagedmedia.org/page-floats](https://demos.pagedmedia.org/page-floats)

# Automated workflows

# CLI version

<https://gitlab.pagedmedia.org/tools/pagedjs-cli>

## Generating a PDF

```
pagedjs-cli ./path/to/index.html -o result.pdf
```

## Options

<code>-h, --help</code>	output usage information
<code>-V, --version</code>	output the version number
<code>-i, --inputs [inputs]</code>	Inputs
<code>-o, --output [output]</code>	Output
<code>-d, --debug</code>	Show Electron Window to Debug
<code>-l, --landscape</code>	Landscape printing
<code>-s, --page-size [size]</code>	Print to Page Size [size]
<code>-w, --width [size]</code>	Print to Page Width [width]
<code>-h --height [size]</code>	Print to Page Height [weight]
<code>-m, --page-margin [margin]</code>	Print with margin [margin]
<code>-n, --hyphenate [lang]</code>	Hyphenate with language [language], defaults to "en-us"
<code>-hi, --hypher_ignore [str]</code>	Ignore passed element selectors, such as ".class_to_ignore, h1"
<code>-ho, --hypher_only [str]</code>	Only hyphenate passed elements selector, such as ".hyphenate, aside"
<code>-e, --encoding [type]</code>	Set the encoding of the input html, defaults to "utf-8"
<code>-t, --timeout [ms]</code>	Set a max timeout of [ms]

# Post Processing

- pdf-lib (parsing and editing the structure)
- hummus (visual updates)
- Ghostscript (images and color color management)

MIT licence

Documentation - Website

Community (Mattermost)

# What about the future ?

Advocate for better support of print-related standards  
in browser engines



# paged.js

<https://pagedmedia.org/paged-js>

[julia-blanc.fr/slides](https://julia-blanc.fr/slides)  
(@julia-blancfr)