

AMENDED Exhibit 997

PLAINTIFFS' OMNIBUS OPPOSITION TO DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

Case No.: 4:22-md-03047-YGR

MDL No. 3047

In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation

**EXPERT REPORT OF
SETH NOAR, Ph.D.**

May 16, 2025

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I. Executive Summary of Opinions

1. I am a Distinguished Professor of Health Communication in the Hussman School of Journalism and Media at the University of North Carolina at Chapel Hill. I have studied the effects of health messages for more than 20 years. One area in which I have particular expertise is the use of warnings. Warnings are a particular class of messages that are used to alert people to a hazard, with the primary goal to affect behavior and therefore reduce harm. Warnings have been used for decades in the domain of tobacco, an area that represents perhaps the most studied warnings topic in the US and globally. Warnings have also been used and studied across many consumer products, resulting in a robust literature on principles and standards for effective warnings. Warnings on internet-based platforms can apply dynamic warning systems that are more timely, relevant, and impactful than more traditional static warnings.

2. I understand that other experts have opined that use of social media platforms, including specific features, can cause adolescent addiction and problematic use; negative appearance comparisons and body image dissatisfaction; eating disorders; depression; anxiety; self-harm, suicidal ideation, and suicide; and child sexual exploitation and abuse, including exposure to child sexual abuse material (D. Christakis Expert Report (April 18, 2025), G. Goldfield Expert Report (April 18, 2025), A. Lembke Expert Report (April 18, 2025), R. Mojtabai Expert Report (April 18, 2025), S. Murray Expert Report (April 18, 2025), E. Telzer Expert Report (April 18, 2025), J.M. Twenge Expert Report (April 18, 2025)).

3. In my opinion the Defendant Social Media companies should have but did not provide to adolescent users and their parents effective warnings about these harms that can result from using their platforms.

4. Specifically, the Social Media Defendants should have but did not provide to adolescent users and their parents effective warnings that their platforms pose a risk of the following harms to adolescent users:

- a. Addiction/Problematic Use
- b. Body Image Dissatisfaction
- c. Risk of Eating Disorders
- d. Depression
- e. Anxiety
- f. Self-Harm, Suicidal Ideation, and Suicide
- g. Adult Predators Targeting Kids for Child Sexual Exploitation and Abuse, including Child Sexual Abuse Material (CSAM)

5. In my core opinion, the Social Media Defendants should have followed well-established principles and standards for providing effective warnings on these harms, which include large, prominently placed warnings; rotating messages communicating specific harms of social media use; and imagery to most effectively communicate these harms. The Social Media Defendants should have pre-tested the warnings—and optimized these warnings for maximum engagement with users as the companies routinely do in other aspects of their business—and implemented them on their platforms.

6. Specifically, the Social Media Defendants should have followed these well-established principles and standards for effective warnings:

a. The Social Media Defendants should have implemented large, prominently placed warnings to inform adolescent users about the harms of using their platforms.

b. The Social Media Defendants should have used rotating messages communicating to adolescent users the specific harms of social media use.

c. The Social Media Defendants should have used imagery to better communicate to adolescent users the harms of using their platforms.

d. The Social Media Defendants should have pre-tested the warnings before implementation, on the platforms that they alone control, and should have optimized those warnings for maximum engagement with adolescent users, as they routinely do in other aspects of their business.

e. The Social Media Defendants should have designed and implemented a warnings strategy for parents.

f. If the Social Media Defendants had developed, pretested, implemented, and monitored a warnings strategy that was based on well-established principles and standards, it would have been highly effective and many of the harms that children and adolescents have suffered as a result of using Defendants' social media platforms would have been reduced or avoided.

II. Introduction

7. Health and safety warnings can have meaningful effects, but only if designed to do so. Small text-only statements that result in little to no exposure have very limited — if any — effects on consumer knowledge, beliefs, and behavior. Warnings that are designed using established principles and standards from the literature, including larger size, prominent placement, and use of imagery, can have meaningful effects on consumer knowledge, beliefs, and behavior. Using warnings in technology contexts offers several opportunities to enhance warnings beyond what is possible in non-technology contexts. Overall, for warnings to work, they need to be designed according to well-established principles and standards that have been developed over decades of research on this topic.

8. I have been retained as an expert witness by the Plaintiffs to provide my expert opinions on communication, specifically the use of warnings in social media. To inform my opinions in this case, I drew upon my extensive experience in communication, warnings, and digital media; I conducted searches of the scientific literature to examine scientific studies about warnings and social media; I examined numerous internal documents of and deposition testimony from Meta, Snapchat, TikTok and YouTube (referred to as the “Social Media Defendants” or “Defendants” throughout this report); and I reviewed various reports from other experts identified by Plaintiffs.

9. All of my opinions are held within a reasonable degree of scientific certainty. I reserve the right to amend my opinions or add new opinions if new information becomes available.

10. In this report, I begin by discussing my background and credentials, the methodology I employed, and an overview of methods for studying warnings. I next discuss standards for effective warnings, including tobacco and a series of other consumer products, followed by a discussion of warning pre-testing and how technology affordances can enhance warning effects. Then, I discuss the role of parents, and the need for parents to be provided with complete and easily understandable information about the risks of social media to children, in order to be equipped to make fully informed decisions about media choices for their children. Finally, I describe my opinions in detail, discussing how Social Media Defendants failed to warn adolescent users and their parents about the multitude of harms that could result from using social media platforms. I go on to describe in some detail what Social Media Companies should have done to effectively warn adolescents users and their parents about the many harms that can result from social media use. I conclude that many of the harms that children and adolescents have suffered from as a result of using Defendants' social media platforms would have been avoided had the Social Media Defendants developed, pre-tested, implemented, and monitored a warnings strategy that was based on well-established principles and standards for warning effectiveness.

III. Background and Credentials

11. I received a Bachelor of Science degree in 1995, a Master of Arts degree in 1998, and a PhD in Social Experimental Psychology in 2001, all from the University of Rhode Island. I was awarded a grant for my dissertation research from the Society for the Psychological Study of Social Issues and was awarded the Peter Merenda Prize for Statistics and Methodology upon graduation, an award given to the top methodologist who graduates from the University of Rhode Island's Psychology program each year.

12. I am the James Howard and Hallie McLean Parker Distinguished Professor in the Hussman School of Journalism and Media at the University of North Carolina at Chapel Hill (UNC), where I have worked since 2011. The Hussman School of Journalism and Media is a leading nationally accredited professional journalism and communication school. The school offers undergraduate degrees in media and journalism as well as advertising and public relations. The school also offers master's degrees in journalism, strategic communication, and visual communication, as well as doctoral degrees in media and communication.

13. I am a member of UNC's Lineberger Comprehensive Cancer Center (the Cancer Center)—one of the leading cancer centers in the nation. It is one of only 51 National Cancer Institute-designated Comprehensive Cancer Centers, and it has received an 'exceptional' rating from the National Cancer Institute. The Cancer Center brings together professors and physicians from across UNC's campus to investigate and improve the prevention, early detection and treatment of cancer. The mission is to reduce cancer incidence, morbidity, and mortality in North Carolina and the nation through research, treatment, training, and outreach.

14. My area of expertise is health communication, a sub-field of the communication field that lies at the intersection of communication and health. I teach a graduate course on health communication, which examines how we can use messaging and communication campaigns to improve behaviors that prevent disease. I teach a graduate course on eHealth (electronic health), which is focused on how digital tools, such as websites, apps, and social media, can be used to improve health. I also teach a graduate course on meta-analysis, which is a methodological technique that is applied to synthesize all quantitative studies in an area of inquiry. Finally, I teach an undergraduate course on social marketing, which is the application of marketing techniques to promote pro-social behaviors.

15. As a faculty member at UNC, a significant portion of my time is spent conducting research. I collaborate extensively on interdisciplinary grant-funded research projects administered by the Cancer Center, involving faculty members in departments such as public health, psychology, and medicine, and involving students from the Hussman School and Gillings School of Global Public Health.

16. My research studies involve a range of methodologies, including surveys, experiments, meta-analyses, content analyses, interviews, and focus groups. The studies I have led or collaborated on have reached thousands of participants, including youth, young adults, and adults. I also interact with youth through a youth advisory board (YAB) of seven youth that we created in one of our grant-funded projects. In that project, we met several times with the YAB to garner feedback on message concepts and messages designed to prevent vaping among youth. We also garnered feedback on text-messaging, which was the channel through which these messages were to be delivered.

17. Also, as a faculty member I spend a considerable portion of my time mentoring and advising students on research in health communication. Over the past ten years, I have worked with, trained, or advised more than 50 master's and doctoral students. I work with students in various capacities, most notably when they work for me as research assistants on projects or when I chair, co-chair, or serve as a member of their master's or doctoral committees. I teach and train students extensively both inside and outside of the classroom, especially on research studies related to health communication or message effects. Most of the student research projects involve studying the effects of health-related messages on outcomes such as knowledge, attitudes, beliefs, intentions and behavior, in efforts to understand what messages and message features do and do not affect those outcomes.

18. In addition to teaching and research, I spend a considerable amount of time devoted to service to the university. I currently chair the promotion and tenure committee and I have served on the graduate admissions committee for the Hussman School. I have also served on committees for the Cancer Center, including the cancer prevention and control program leadership team and the research protocol review committee. For both the Hussman School and the Cancer Center, I have served on search committees to bring new faculty members to campus. For the university itself, I have served on a committee to advise the Chancellor on COVID policy and on the committee for appointments, tenure, and promotion for the university, which provides oversight to university faculty hires, tenure cases, and promotions.

19. I also devote a significant amount of time to service in the field. I am a member of and Fellow in the International Communication Association, and I am a member of the Society for Research on Nicotine and Tobacco. I typically attend these organizations' annual conferences, and I also present papers at, and review abstracts and papers for, these conferences. I have served as secretary of the health communication division of the International Communication Association. I also attend, present at, and review abstracts for, the Kentucky Conference on Health Communication, an important health communication conference in the field. In addition, I extensively conduct reviews for a whole range of peer-reviewed journals. I am (or have been) a member of several editorial review boards for peer-reviewed journals, including Health Communication, Journal of Health Communication, Communication Monographs, Journalism and Mass Communication Quarterly, and Social Science and Medicine. I also have co-edited special issues of journals, such as a special issue of Communication Methods and Measures (focused on health communication campaigns) and a special issue of Health Communication (focused on communication and tobacco regulatory science).

20. I have served on a number of advisory committees for national health communication research and programmatic initiatives. I have twice served on an Expert Scientist Panel to give input on the Office of National Drug Control Policy's National Youth Anti-Drug Media campaign, one focused on Media Message Design and the other on Campaign Evaluation. I have served on several invited panels for the National Cancer Institute, including Computerized Tailored Interventions Workgroup on Dissemination, Emerging Research on Tobacco Product Warnings: Advancing Theory and Methods, and Strategies for Preventing Tobacco-Related Misinformation and Misperceptions. I have served on the Centers for Disease Control and Prevention's National Tobacco Education Campaign: Evaluation Stakeholder Panel and the National Institutes of Health's invited panel on E-cigarette Prevention and Cessation in Youth and Young Adults. Most recently in 2022 and again in 2024, I was a speaker for two national meetings organized by the Food and Drug Administration (FDA), both focused on Digital Media Campaigns Targeted to Youth.

21. My research interests are centered on how we can most effectively use communication to change behavior and improve health. While much of my early work focused on HIV/AIDS prevention, my more recent work has focused on cancer communication and prevention, especially tobacco prevention and control. My colleagues and I undertake studies that commonly examine the effects of messages—such as warning labels or video advertisements—in attempts to understand what messages and message features have the most impact on knowledge, beliefs, intentions, and behaviors. By its very nature, my work is interdisciplinary, and I frequently collaborate with colleagues from public health, medicine, and psychology, among other disciplines. My studies have been published in a wide array of peer-reviewed journals in the field, including very high-impact journals, such as JAMA Internal Medicine, JAMA Pediatrics, JAMA Dermatology, Tobacco Control, Nicotine & Tobacco Research, and Psychological Bulletin.

22. One area in which I have focused significantly over the past several years is studying the effects of cigarette warnings. I led the first meta-analysis of experimental studies of pictorial warnings, synthesizing the effects of 37 studies with a total of 33,613 participants.¹ That study revealed that pictorial warnings were superior to text-only warnings on most

outcomes, and it was published in the tobacco field's top journal, Tobacco Control. I also collaborated on the first large-scale randomized controlled trial testing the effects of pictorial warnings when placed on smokers' cigarette packs.² In that study, our research team (led by Dr. Noel Brewer) randomized 2,149 smokers to have their cigarette packs labeled with either a pictorial warning or a Surgeon General's text-only warning for 4 weeks, and we conducted weekly surveys of participants. Results revealed that those who received the pictorial warnings were significantly more likely to strengthen their intentions to quit smoking, to make quit attempts, and to quit smoking entirely as compared to those who received the Surgeon General's text-only warnings. That study was published in a top medical journal, JAMA Internal Medicine.²

23. An area in which I am currently focusing extensively is communicating with youth about the risks of e-cigarettes. I have led studies examining the use of text-messaging to communicate with adolescents about e-cigarette risks;³ studied how risk statements about e-cigarettes are received by adolescents;^{4,5} and examined how risk communication videos from the Food and Drug Administration (FDA) The Real Cost e-cigarette prevention campaign impact adolescents' risk beliefs and intentions to vape.^{6,7}

24. I have been a Principal Investigator, Co-Principal Investigator, or Co-Investigator on more than \$50 million in research grants from the National Institutes of Health (NIH) and the FDA. These grants are extremely competitive and in a given cycle it is typical for only about the top 10% of grant proposals to be funded. I was a Co-Investigator and Communication Core Associate Director of a Tobacco Center of Regulatory Science (TCORS), a center that was funded by a \$19.4 million grant from 2013–2019. During the 6 years of this grant, we conducted and published more than 100 studies examining various aspects of communication about tobacco product risk. I also was Co-Principal Investigator on a \$2 million supplemental grant from 2015–2018. That grant funded our meta-analysis and systematic reviews of cigarette pictorial warnings and the randomized controlled trial on pictorial warnings described earlier in this report.

25. Currently, I am Principal Investigator or Co-lead on large grants on youth tobacco prevention. The first is a \$3.3 million grant funded by the National Institute on Drug Abuse (NIDA) and the FDA. In that project, we are developing, implementing, and evaluating risk messages – delivered via text message – to deter adolescents from using e-cigarettes and vaping. The second is an 18.6 million dollar center grant – called TCORS – funded by the National Institute on Drug Abuse (NIDA) and the FDA from 2023–2028. On that grant, I co-lead a project focused on understanding the elements of effective e-cigarette prevention video ads. I am also currently a Co-Investigator on an NIH Research Project Grant that is developing and testing pictorial and text-only health warning messages for display on waterpipe tobacco packaging and in hookah cafes.

26. I have published extensively in peer-reviewed journals. To date, I have published 222 peer-reviewed articles. I have published work in a wide array of top peer-reviewed journals in communication, health communication, public health and behavioral medicine, and tobacco control, including JAMA Internal Medicine, JAMA Pediatrics, JAMA Dermatology, Tobacco Control, Nicotine & Tobacco Research, Tobacco Regulatory Science, Addictive Behaviors, Preventive Medicine, American Journal of Preventive Medicine, Social Science & Medicine,

Annals of Behavioral Medicine, Journal of Behavioral Medicine, Health Psychology, PLoS One, BMC Public Health, Health Communication, Journal of Health Communication, Human Communication Research, Journalism and Mass Communication Quarterly, Communication Methods & Measures, and Psychological Bulletin. I have published 31 book chapters, 29 non peer-reviewed articles, two co-edited books (one on digital health applications), and two co-edited special issues of peer-reviewed journals.

27. My work has been heavily cited in the field. My Google Scholar profile indicates that my articles have been cited nearly 25,000 times. I have been formally named a highly cited researcher multiple times by several groups that track academic citations (Thomson Reuters, Clarivate, Web of Science Group, ScholarGPS), indicating that I have been in the top 1% most-cited social science and journalism researchers in the world. My work also has been cited by government agencies. For instance, in the FDA's proposed rulemaking for pictorial warnings, issued in August 2019, seven of my studies were cited, while in the FDA's final rule for pictorial warnings, released in March 2020, four of my studies were cited. In addition, in the 2025 Surgeon General's Advisory on Alcohol and Cancer Risk, one of my warnings studies was cited.

28. I have been an author on 289 peer-reviewed presentations at professional conferences, and I have presented at scores of health communication and tobacco control conferences. I have given invited presentations to the Centers for Disease Control and Prevention, the National Cancer Institute, the FDA Center for Tobacco Products, and at FDA Tobacco Regulatory Science Conferences. I have given invited presentations at several universities across the country.

29. I have received several national awards for my research in health communication. In 2016, I was awarded the Outstanding Health Communication Scholar Award from the National Communication Association. That same year, I was awarded the Lewis Donohew Outstanding Health Communication Scholar Award from the Kentucky Conference on Health Communication. In 2017, I was awarded the Mayhew Derryberry Research Award from the American Public Health Association. In 2023, I was named a Fellow of the International Communication Association. In 2025, I was awarded the Charles Atkin Award for Translational Health Communication Research from the DC Conference on Health Communication.

30. My Curriculum Vitae, which includes a comprehensive list of my publications, is attached to this report as Exhibit A.

31. Exhibit C includes my compensation rates in this case, and Exhibit D includes a list of cases in which I have testified during the last four years. My compensation in this case is not dependent on the outcome or whether my opinions support either or neither party.

IV. Assignment

32. I was asked to provide opinions related to social media companies and warnings about the risk of physical, mental, and emotional harms that their platforms posed to adolescents, whether social media companies had in the past effectively warned about the risk of physical,

mental, and emotional harms that their platforms posed to adolescents, and the methods, principles, standards, and technology which were available to provide effective warnings.

V. Methodology

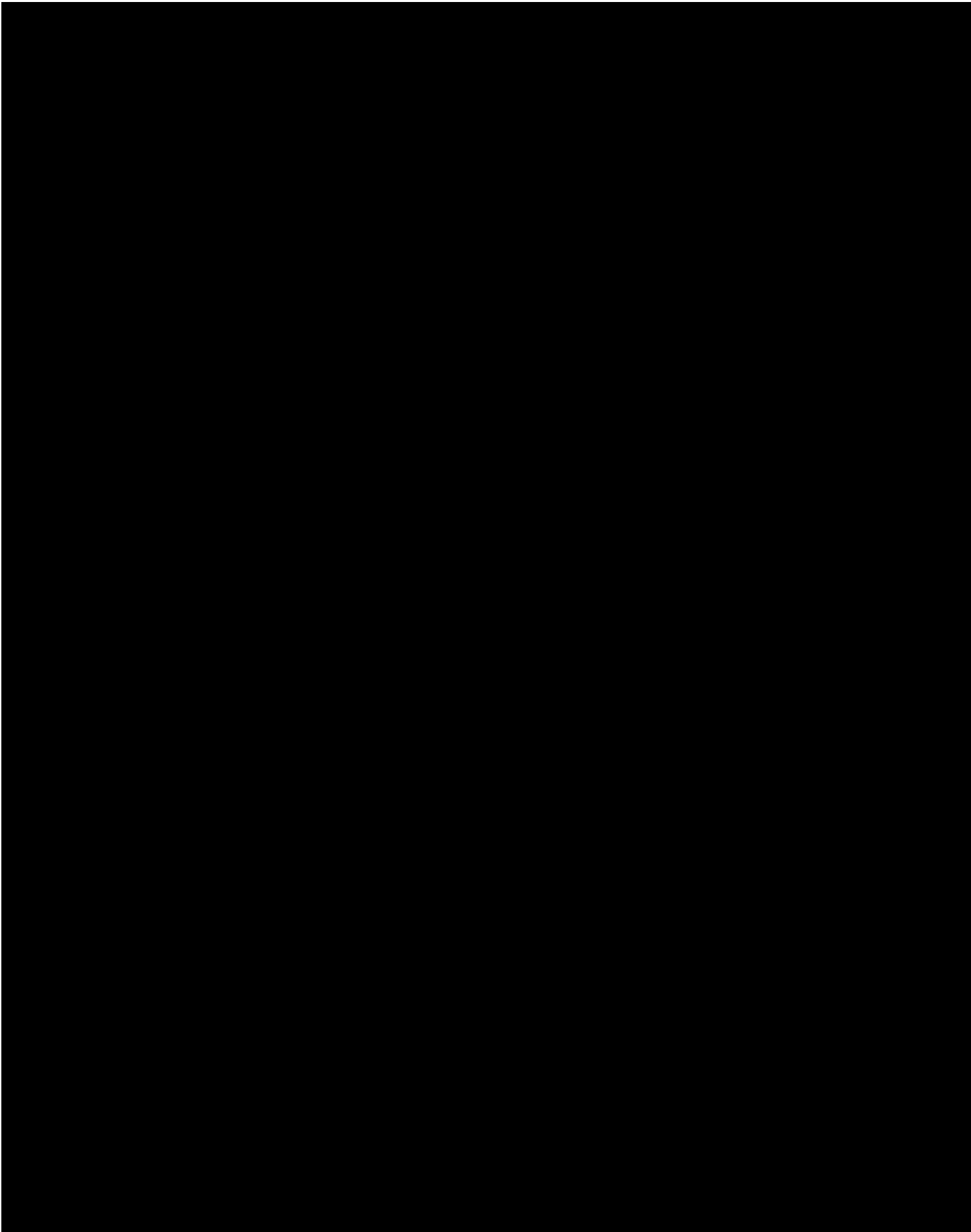
33. My entire career spanning over twenty years has been in the field of health communication. I have taught, written and conducted scores of research studies in health communication and authored numerous peer-reviewed studies. I am aware of and have also reviewed hundreds of articles in this field as part of my professional career. The communication and health communication fields apply a wide range of scientific methods ranging from qualitative techniques (such as interviews and focus groups) to quantitative techniques (such as content analyses, meta-analyses, surveys, and experiments). In this case, I drew upon my extensive knowledge and experience in communication, warnings, and digital media; I conducted searches of the scientific literature to examine scientific studies about warnings and social media and reviewed and cited relevant peer-reviewed literature; and I examined numerous internal documents of and depositions and accompanying exhibits from the Social Media Defendants, and reports of other experts in preparing my opinions. In arriving at my opinions as described in this report, I evaluated and considered the weight and totality of the evidence. The methodology I used to form my opinions involves the same kind of analysis and methodology I would use and have used in my research and teaching. Referenced throughout this report and in the attached Exhibit B are the materials I considered in forming my opinions.

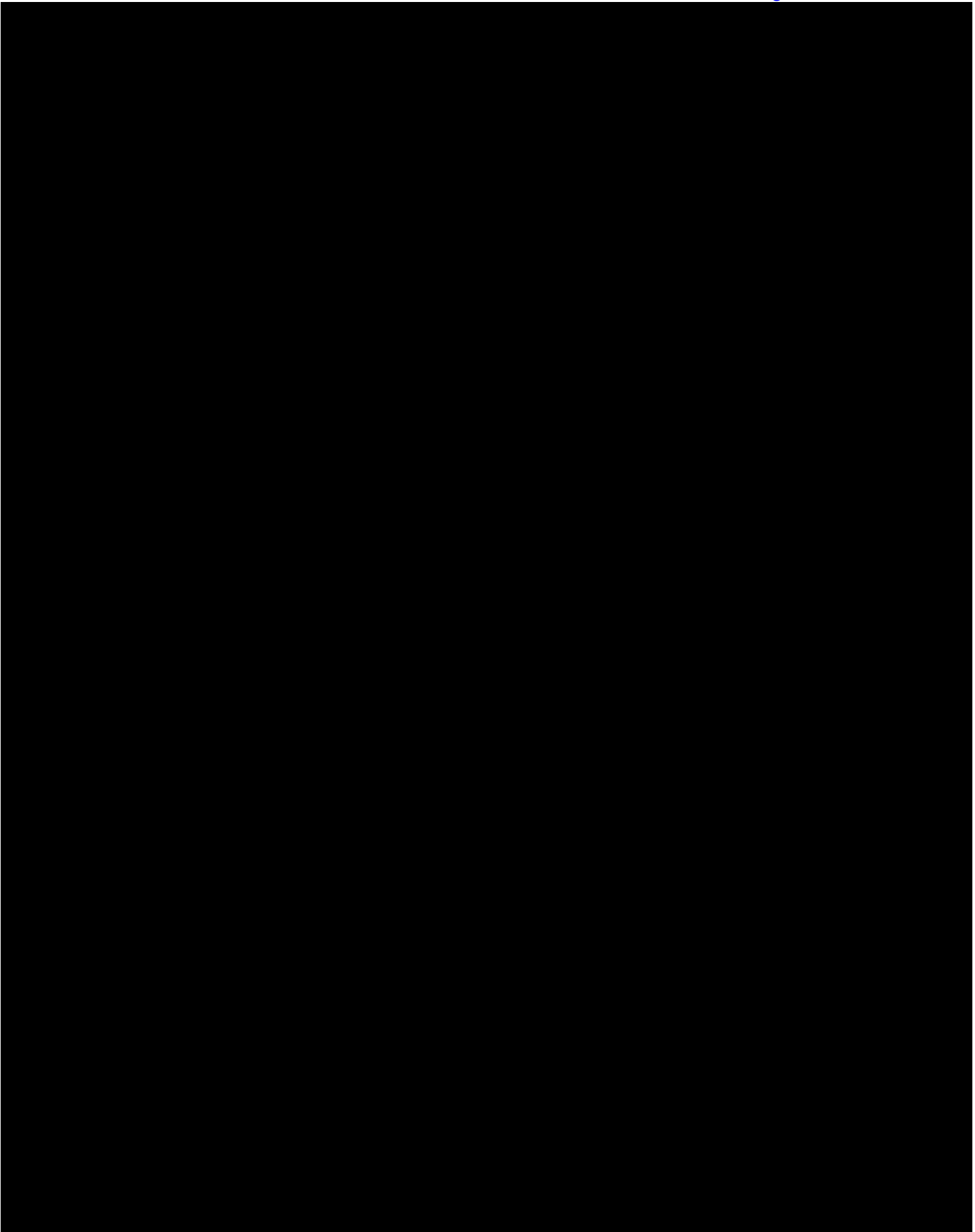
VI. Methods for Studying Communication and Warnings

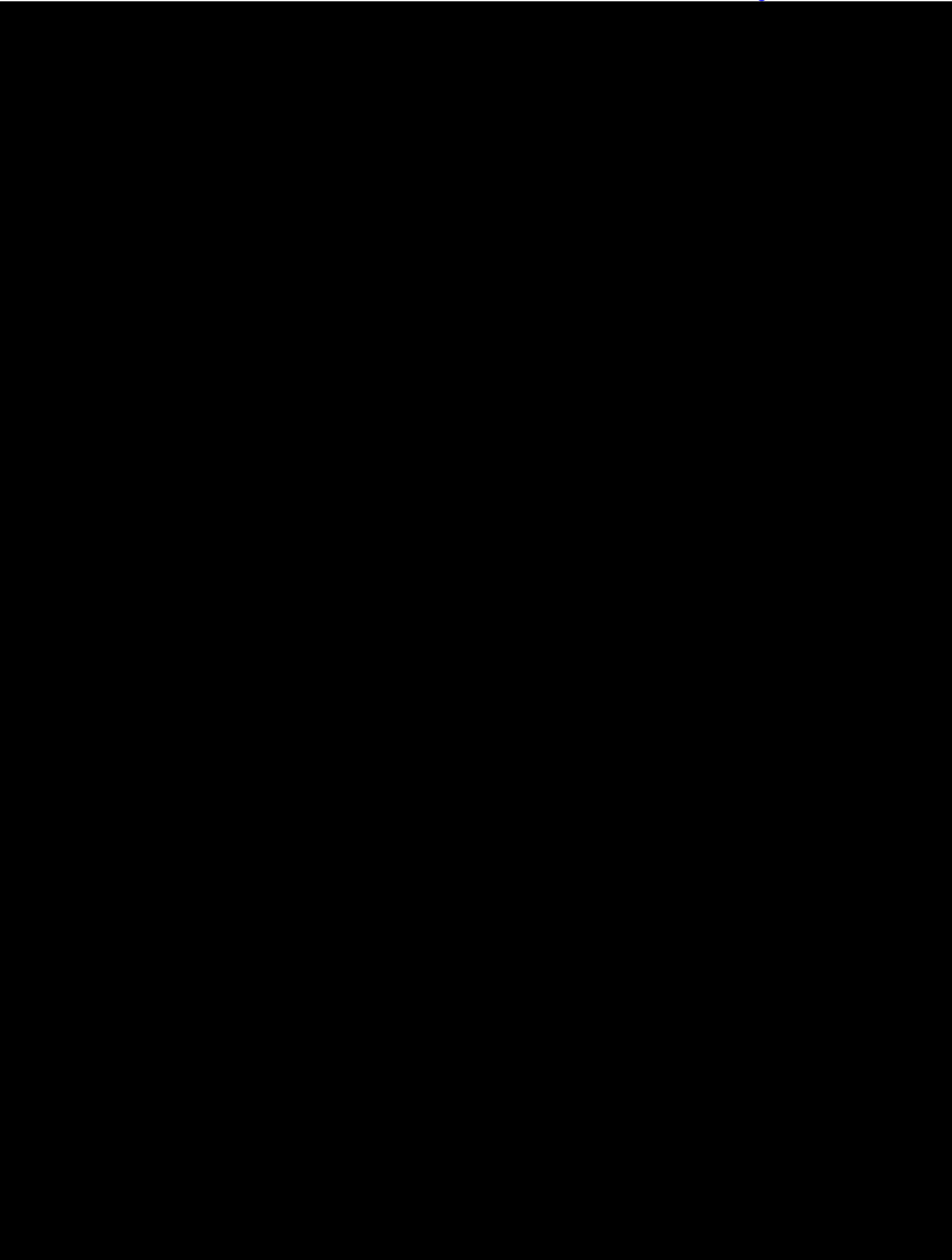
34. The communication and health communication fields apply rigorous scientific methods to answer empirical questions. The fields use a wide range of methods, from qualitative techniques (such as interviews and focus groups) to quantitative techniques (such as content analyses, surveys, and experiments).

35. Two of the principal areas of inquiry within the fields are “information processing” and “message effects.”

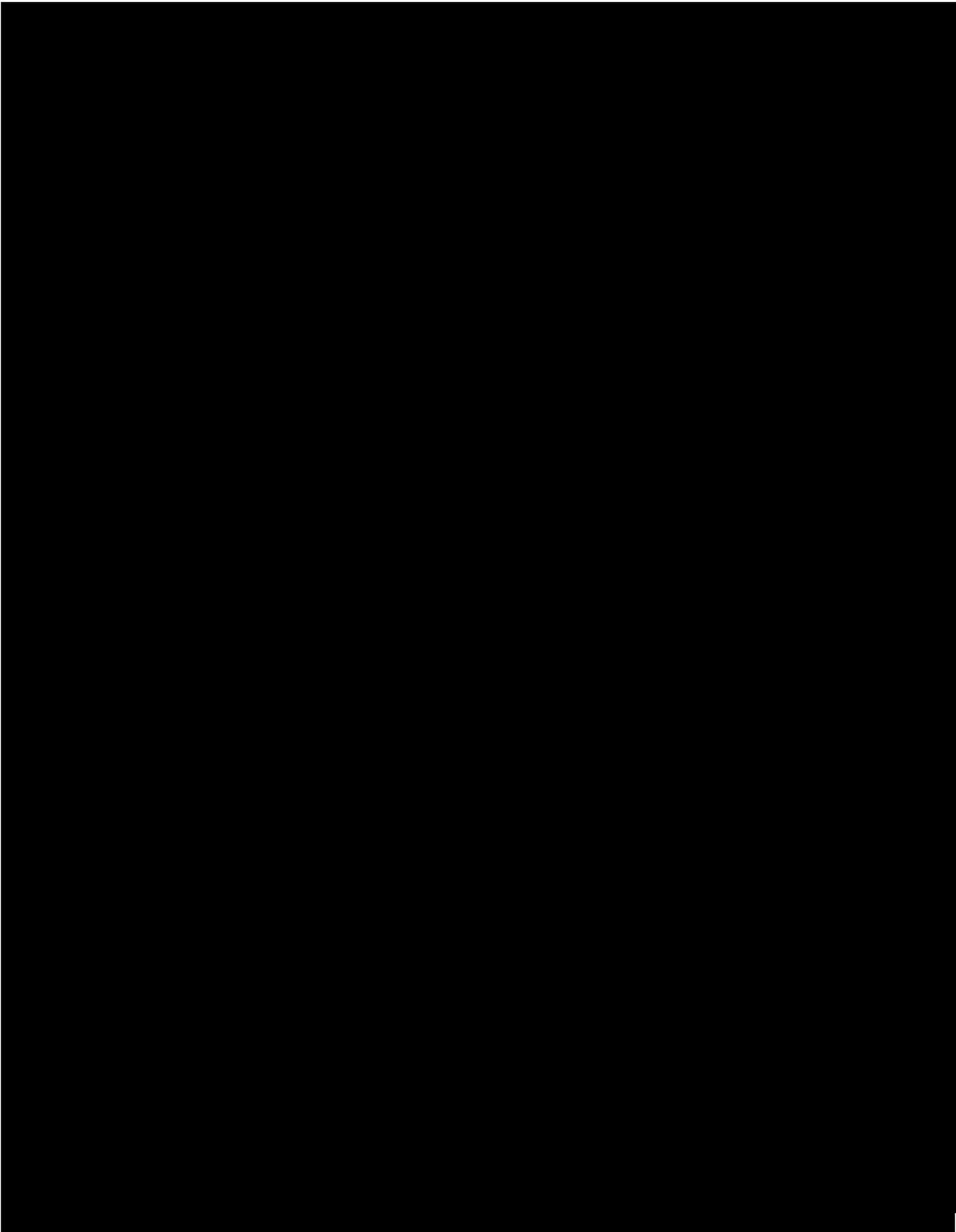
36. Information processing and message effects studies are commonly undertaken to understand how messages are processed and the impact that they may have. In the tobacco realm, studies examine topics such as effects of televised messages for vaping prevention among youth⁷ and pictorial warnings to motivate adult smokers to quit smoking.^{8,9} These kinds of studies are also commonly used to study the effects of warnings for a whole range of topics, including alcohol, diet, medication, construction, and equipment safety.¹⁰⁻¹² These two areas of research are complementary,¹³ as information processing work focuses on the earliest stages of communication (e.g., noticing, attending, remembering), while message effects work concerns the later stages of communication (e.g., attitude and belief change, behavior change).¹⁴ While some studies—and some theories—in the communication field focus solely on information processing or message effects, some include both given that these areas together represent the full process of how communication operates.

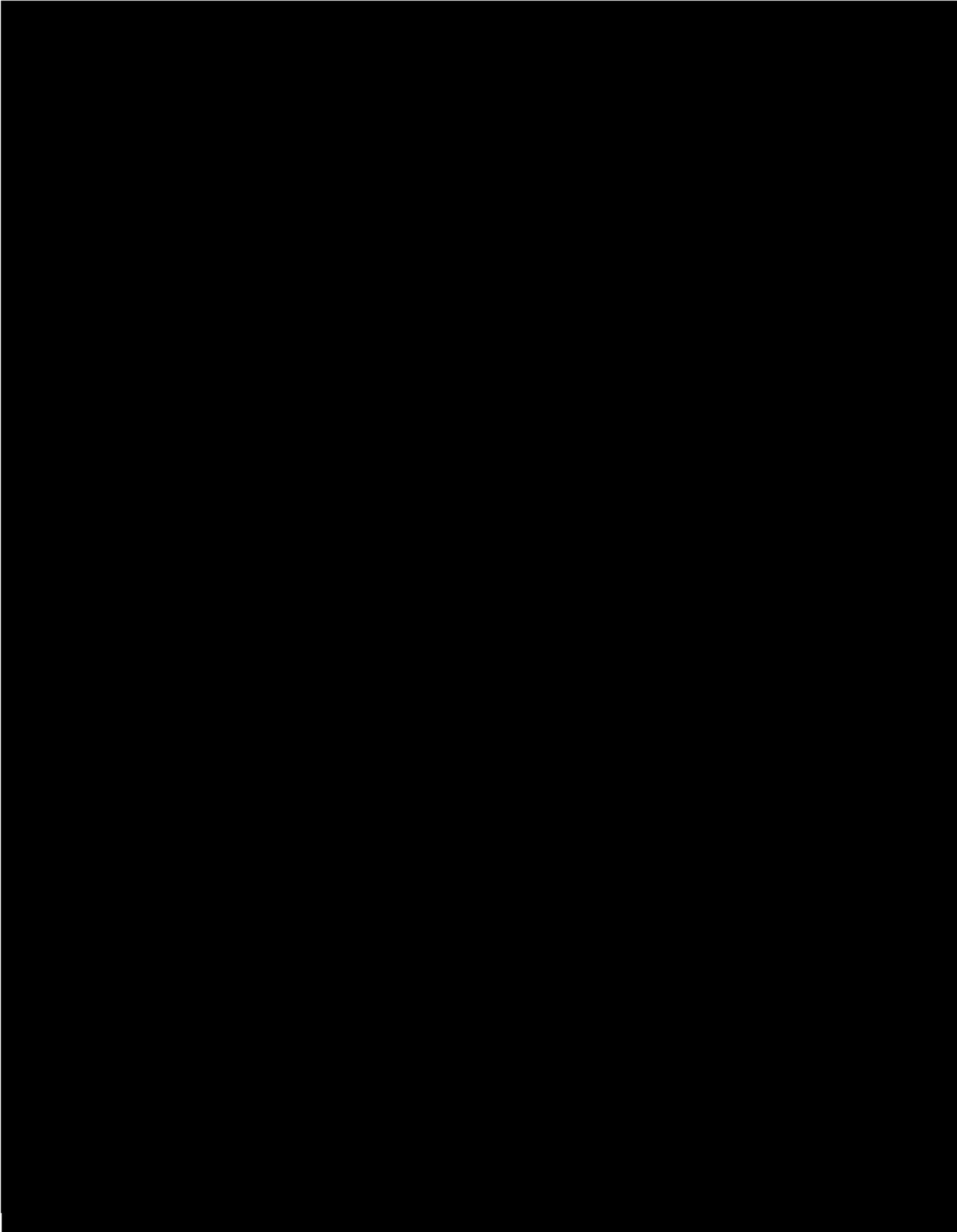


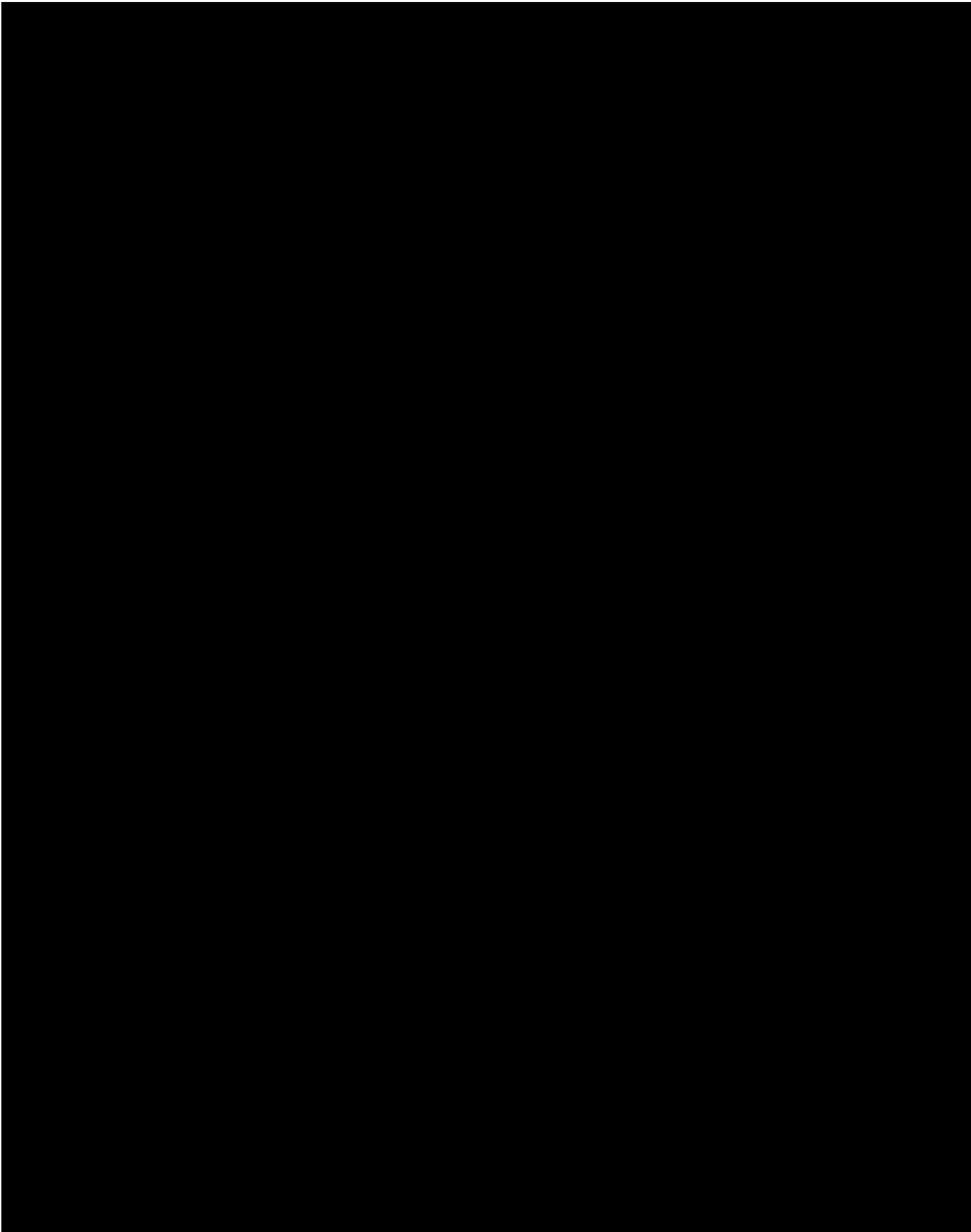


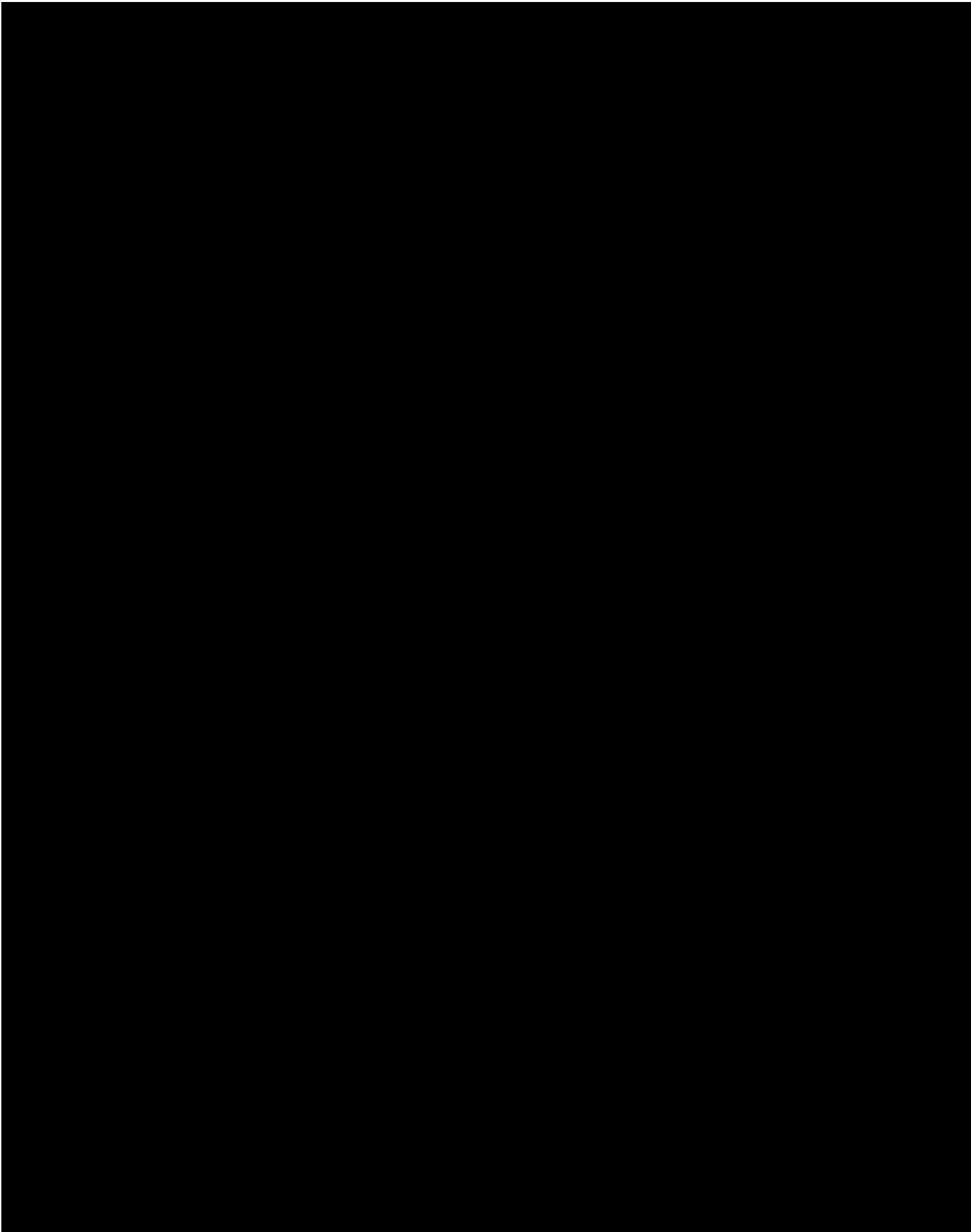


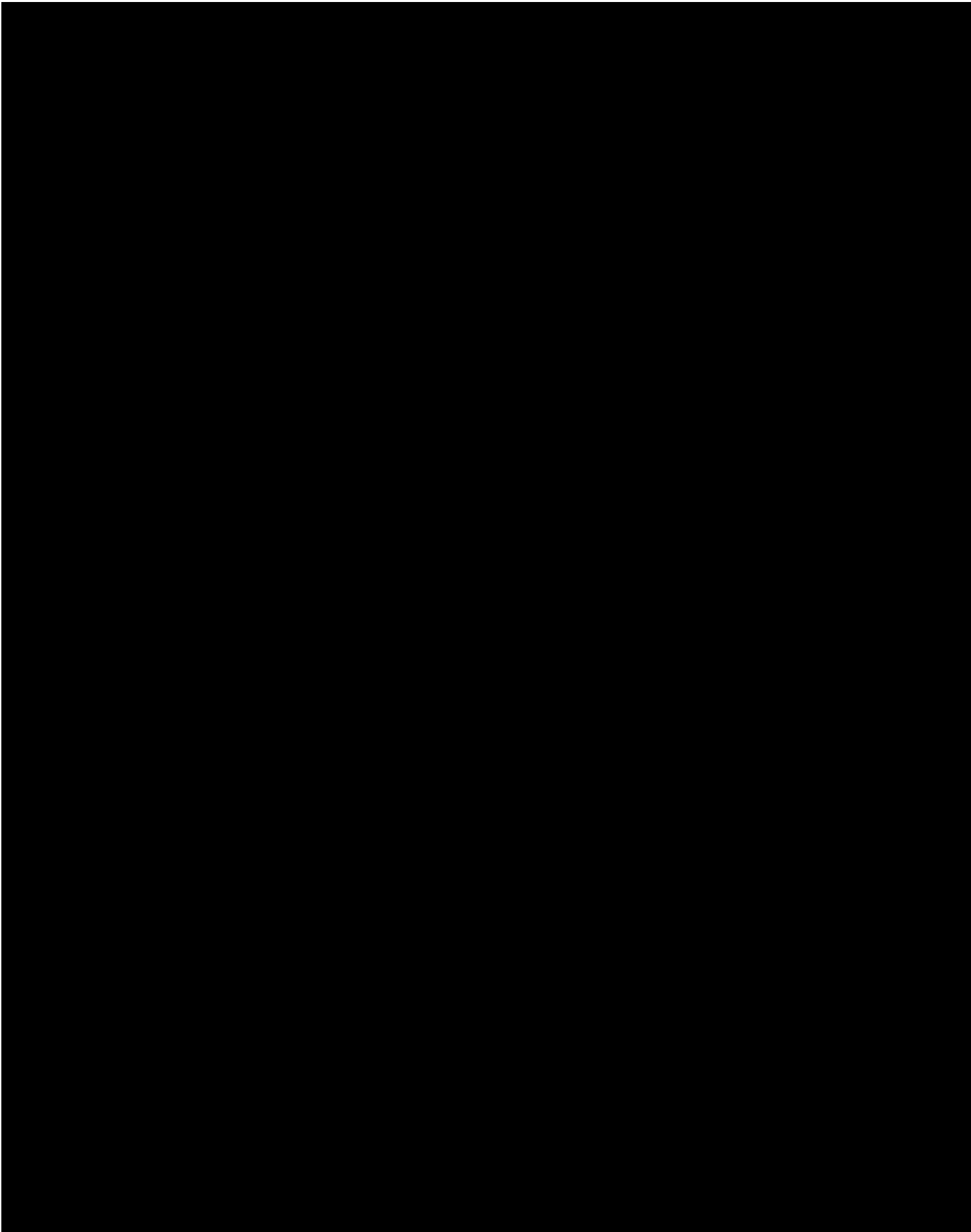
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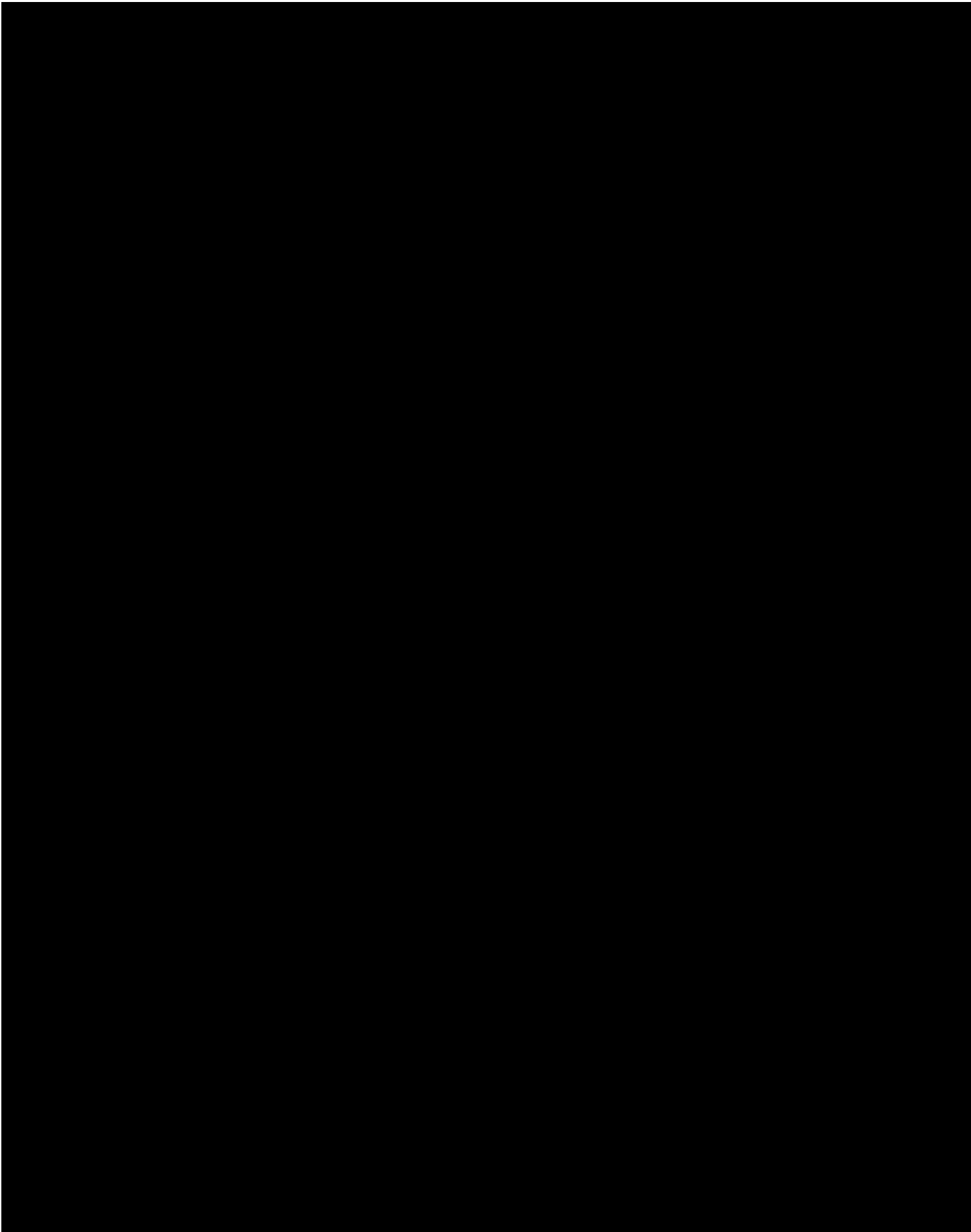


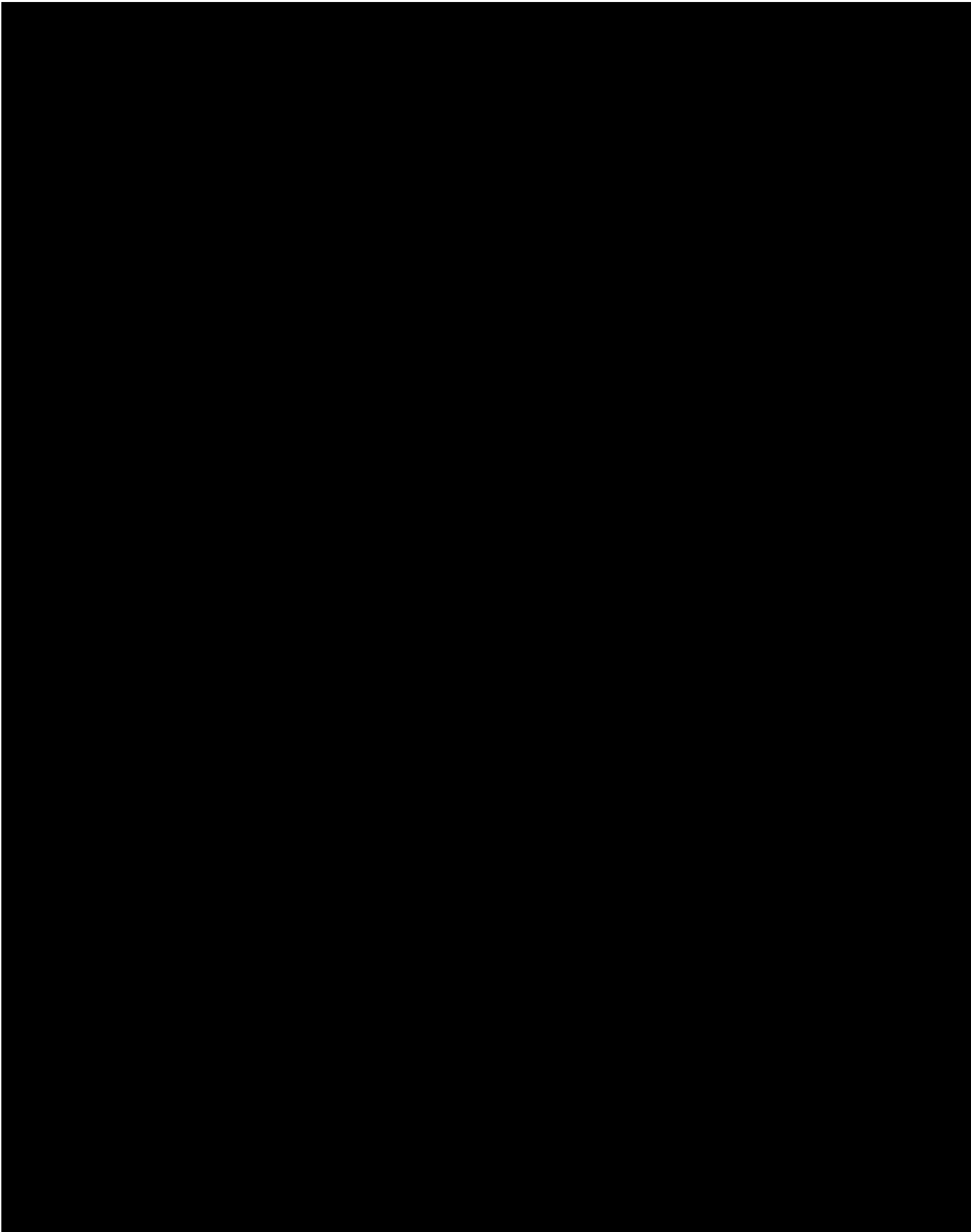


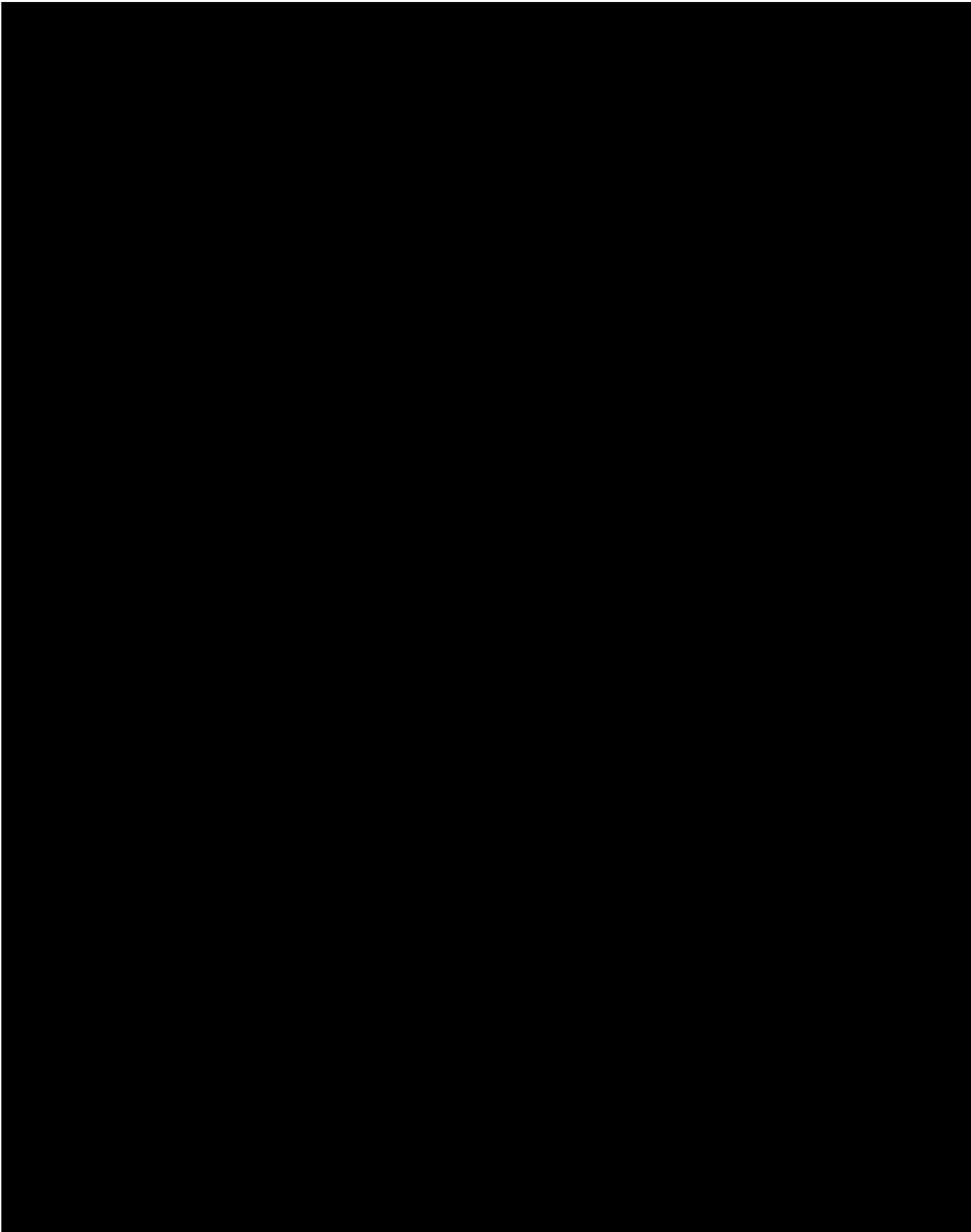


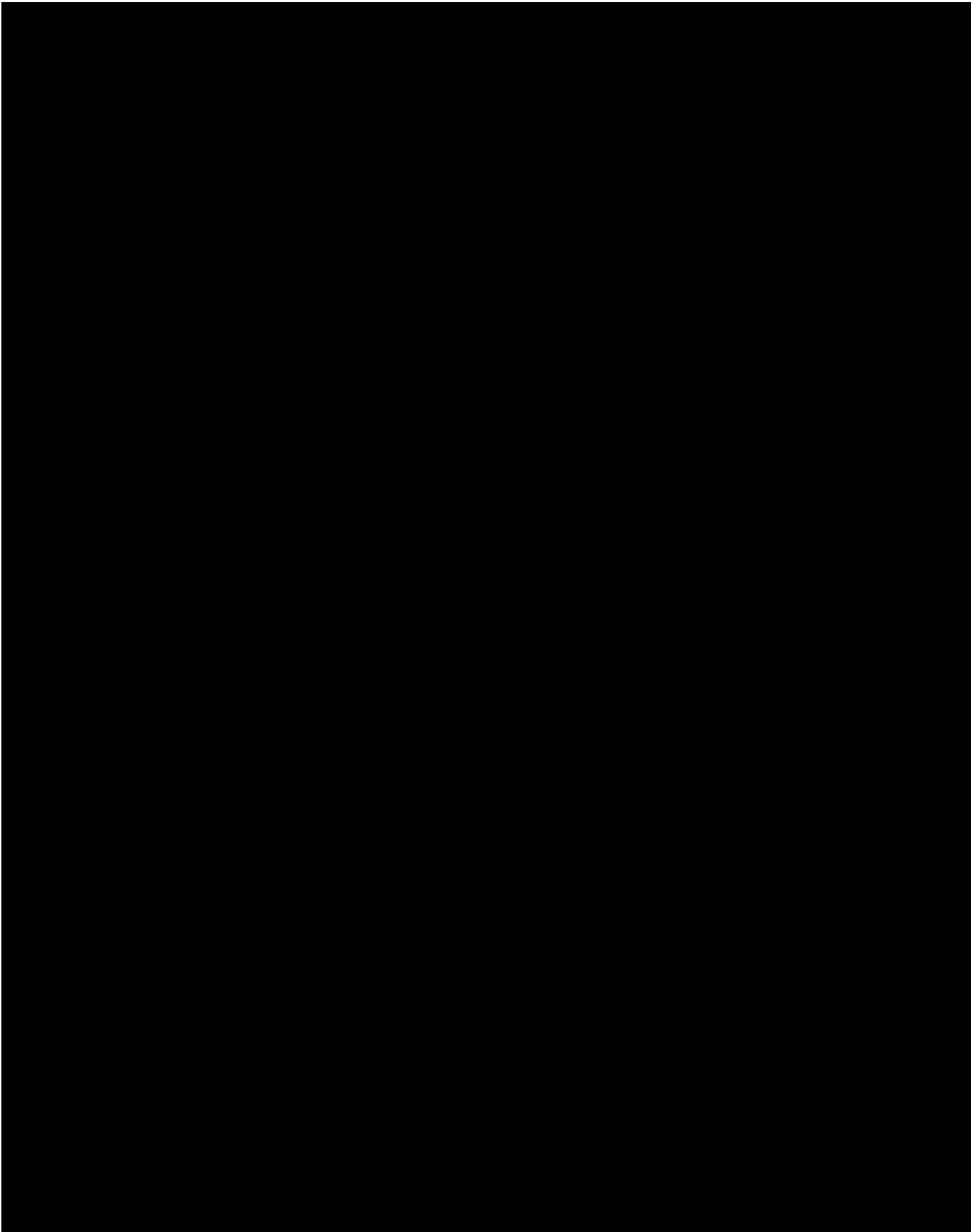


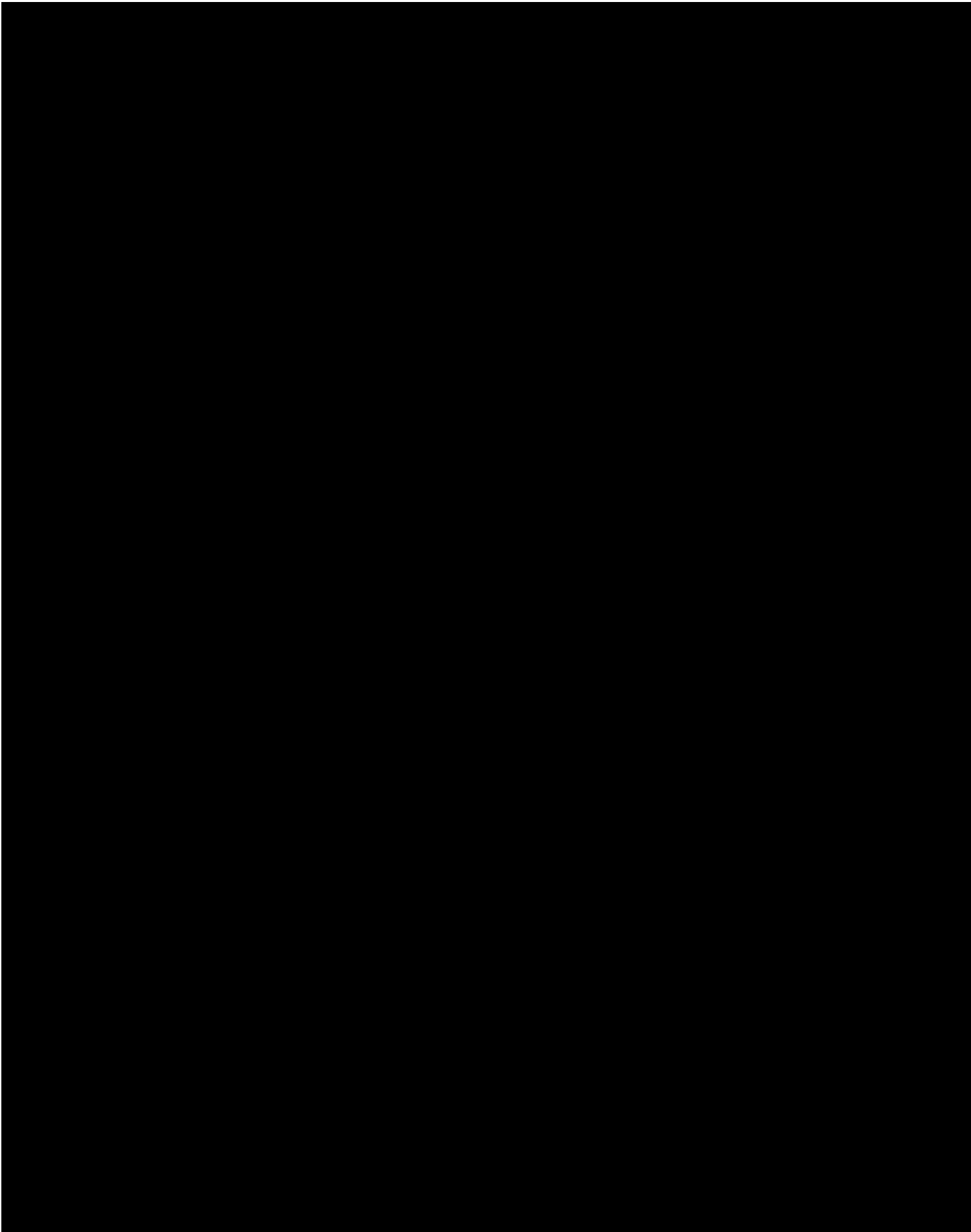


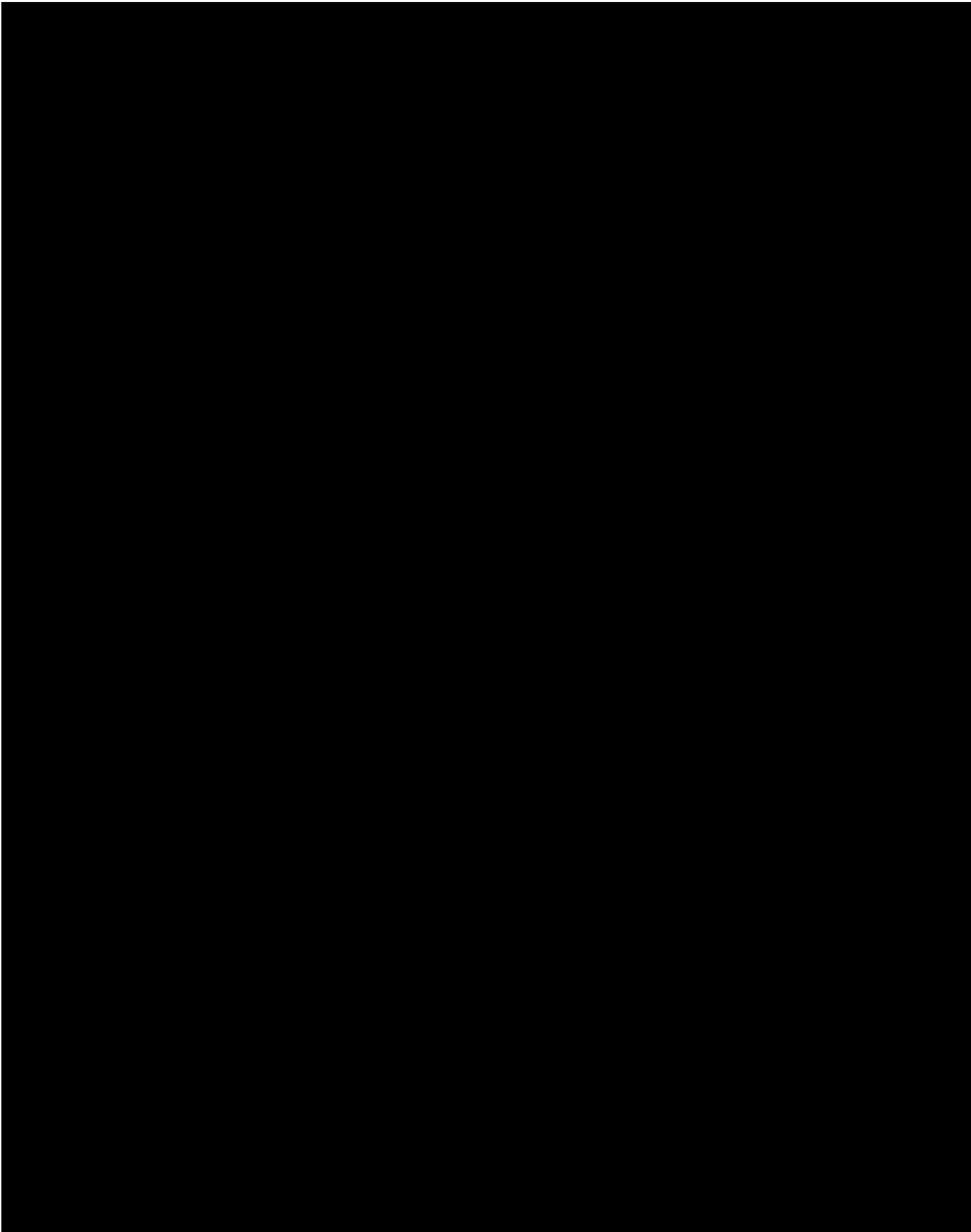


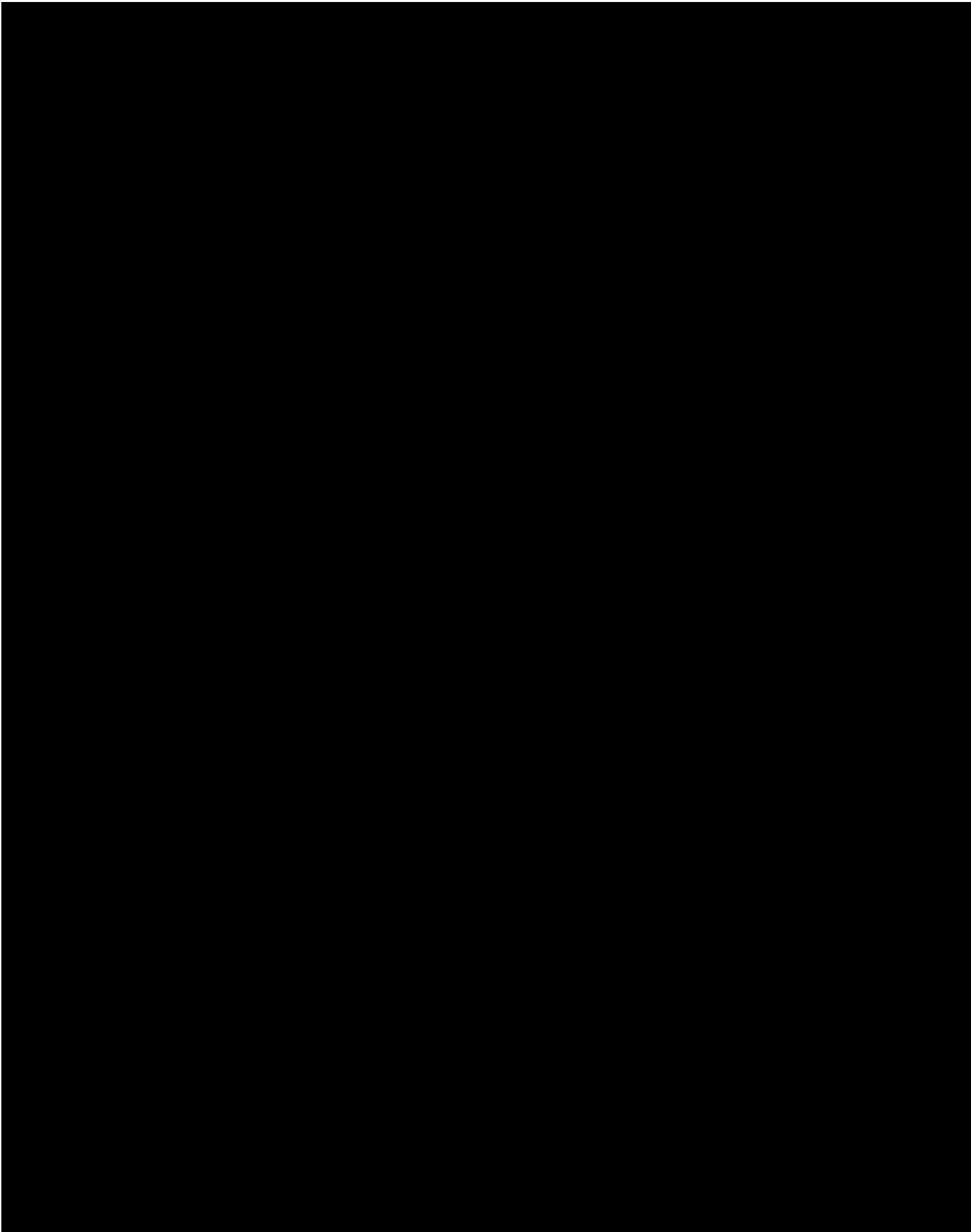


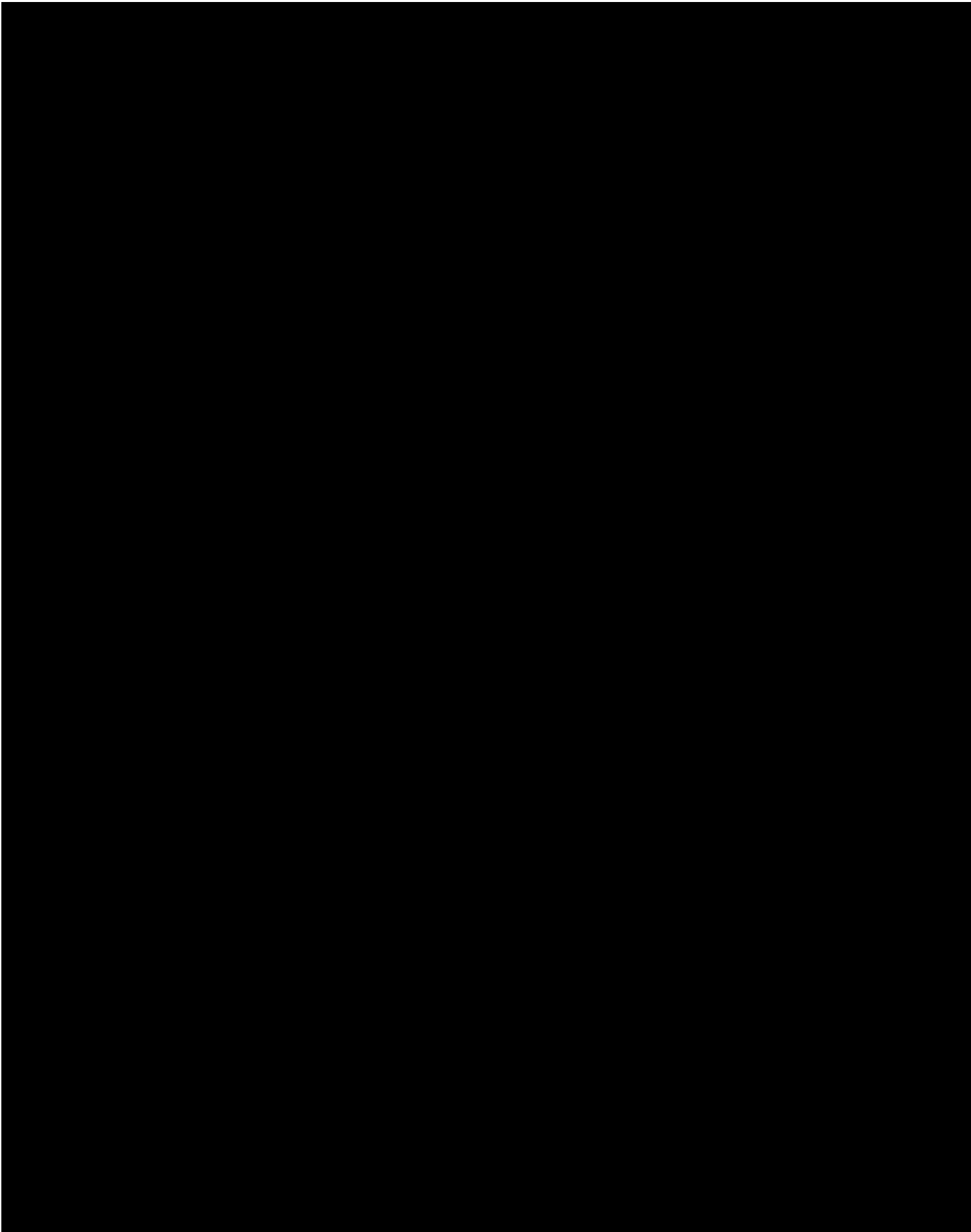


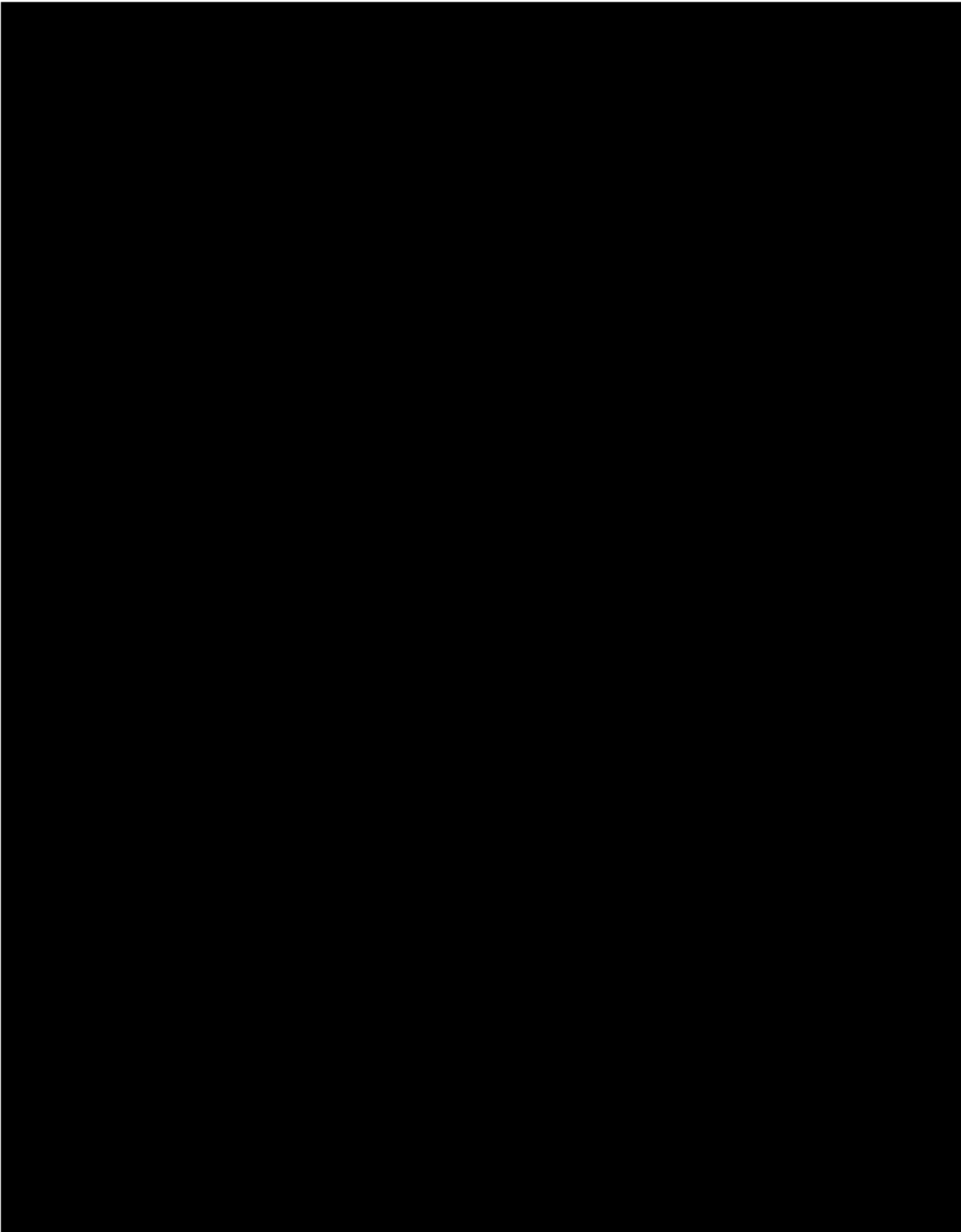


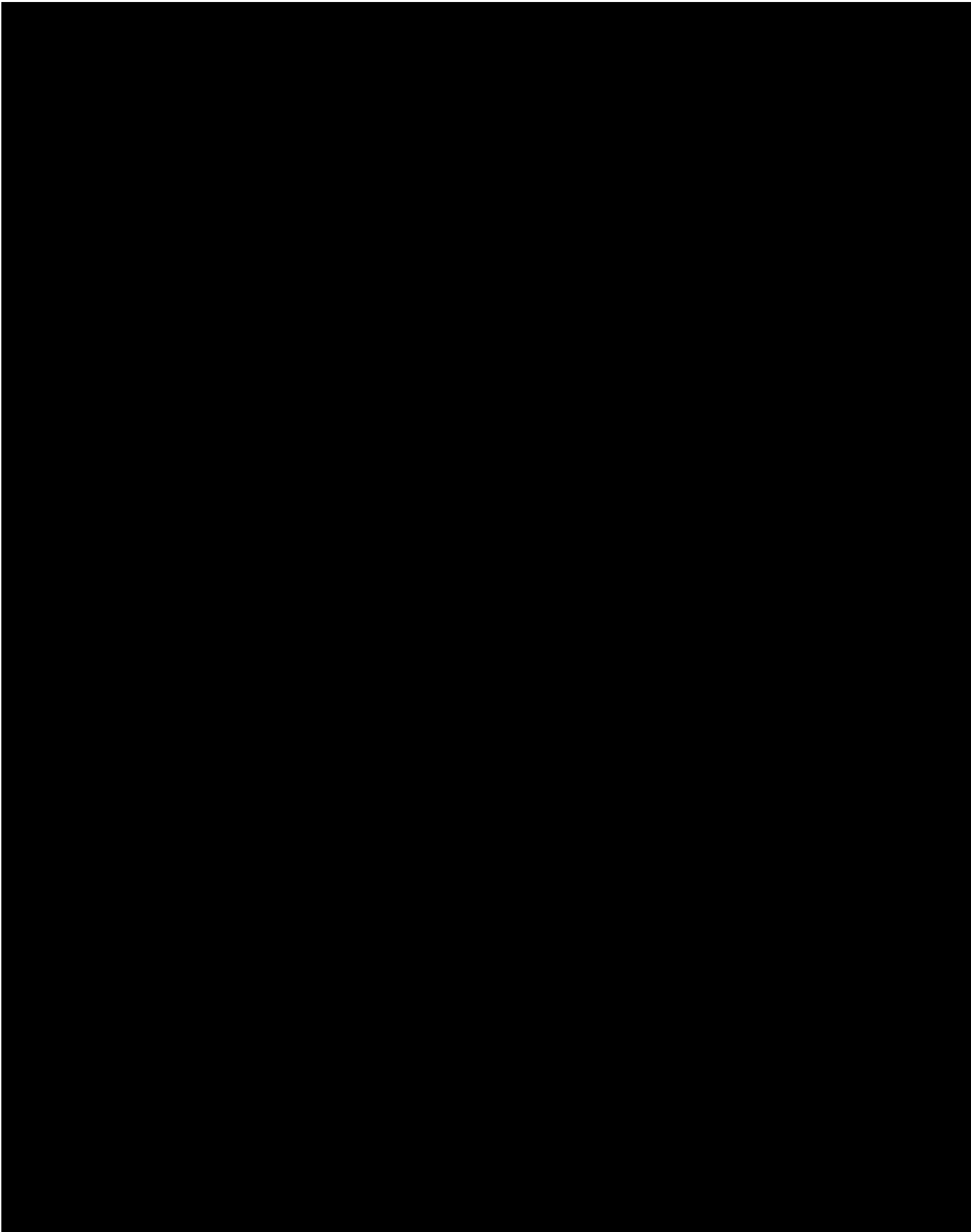


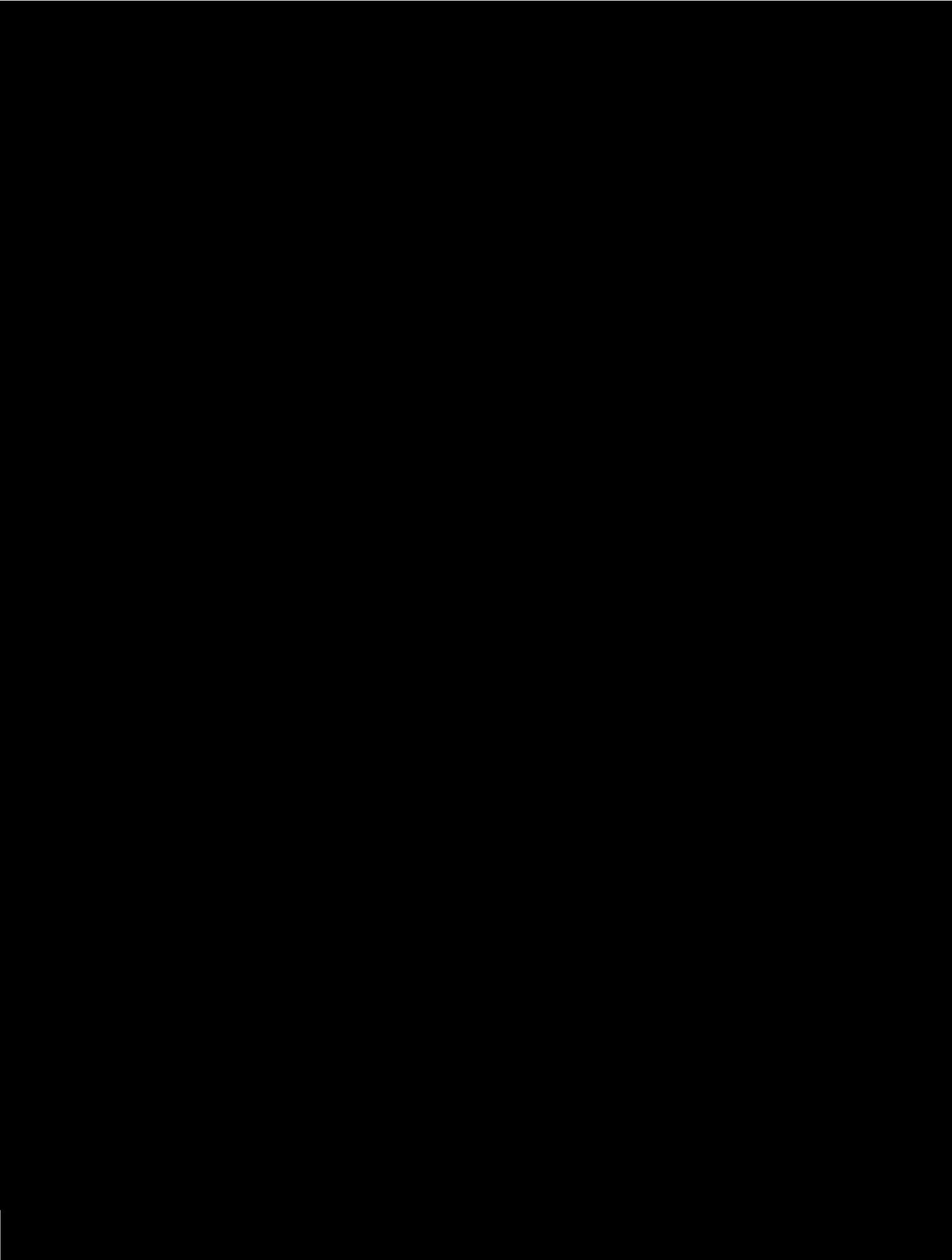


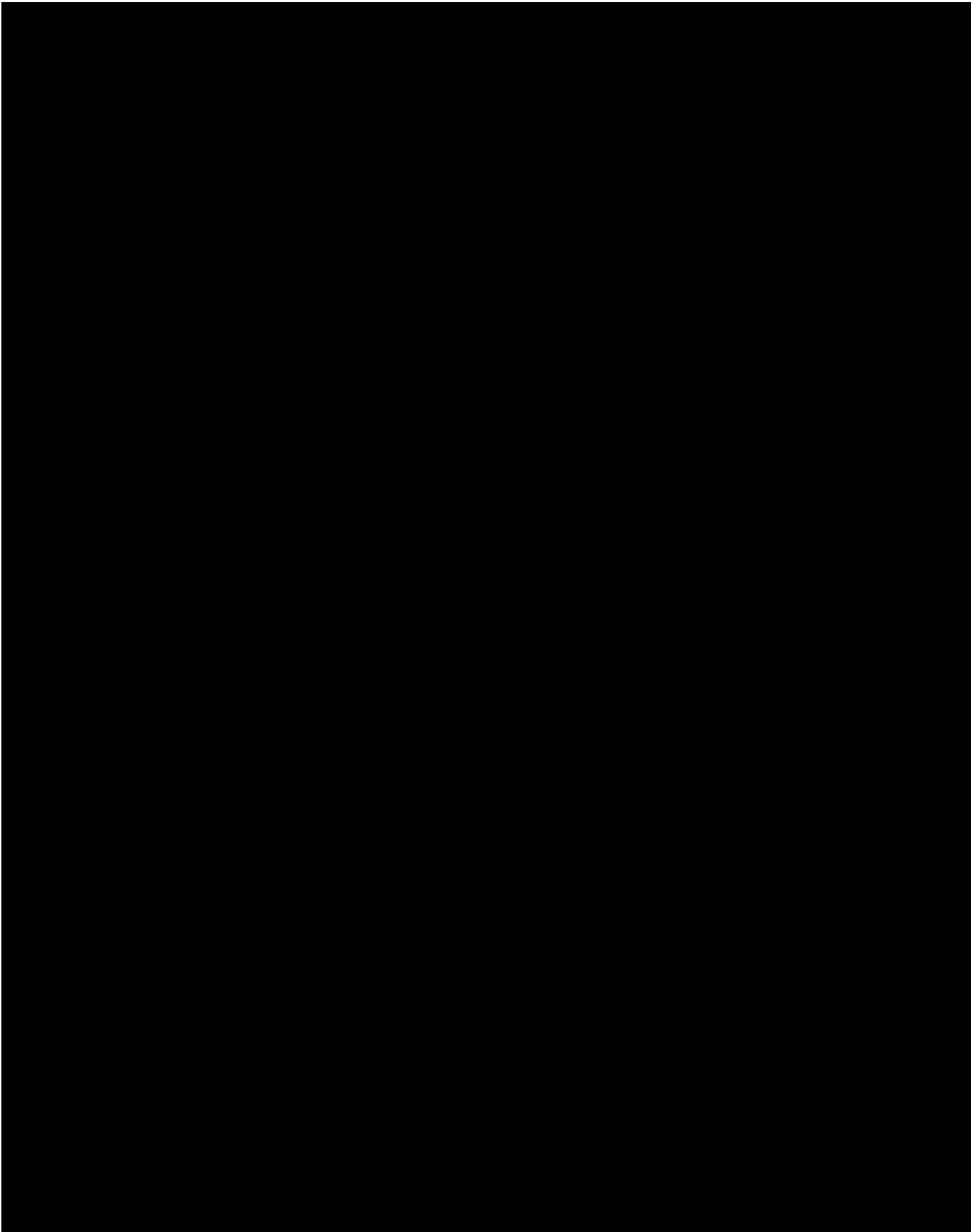


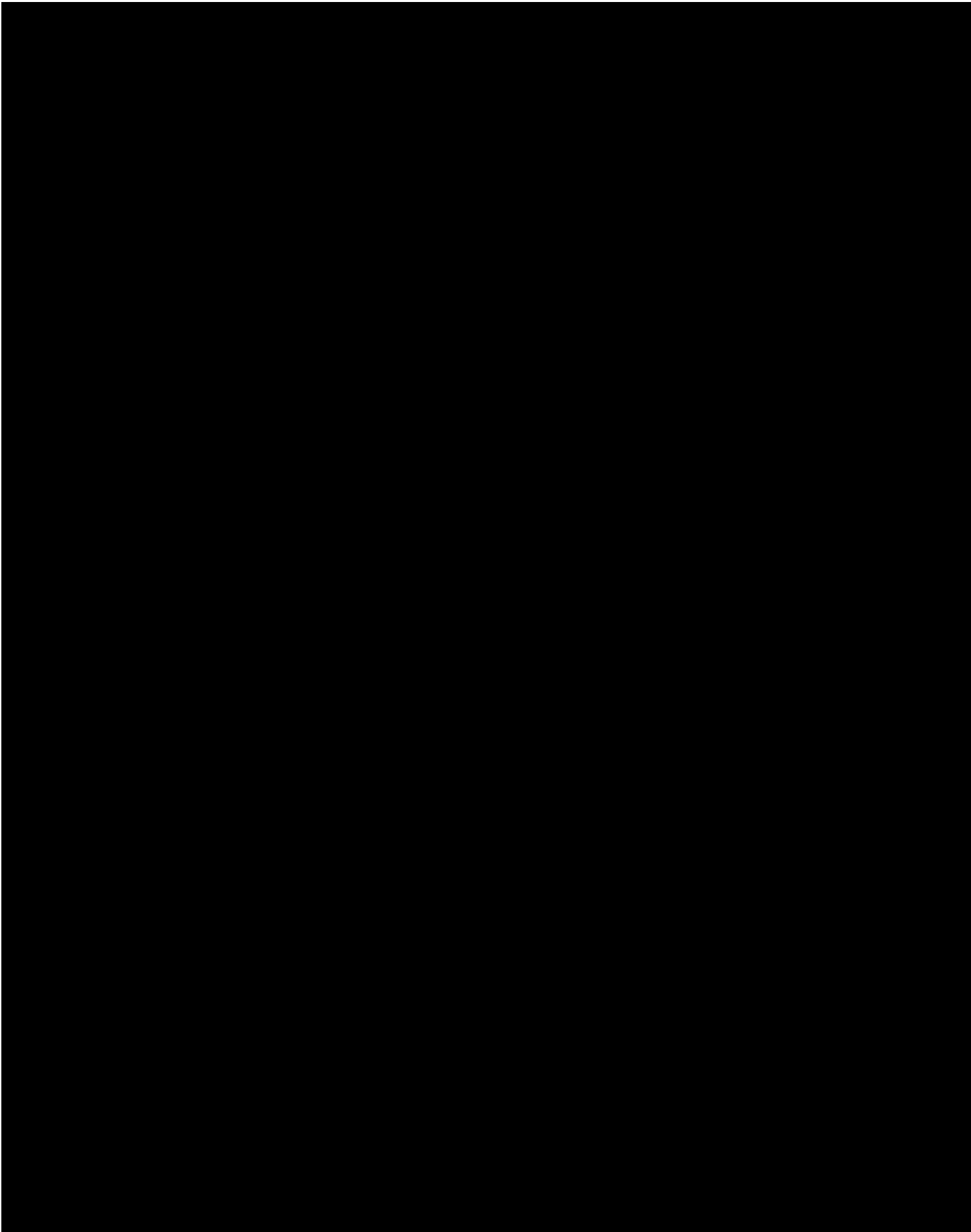


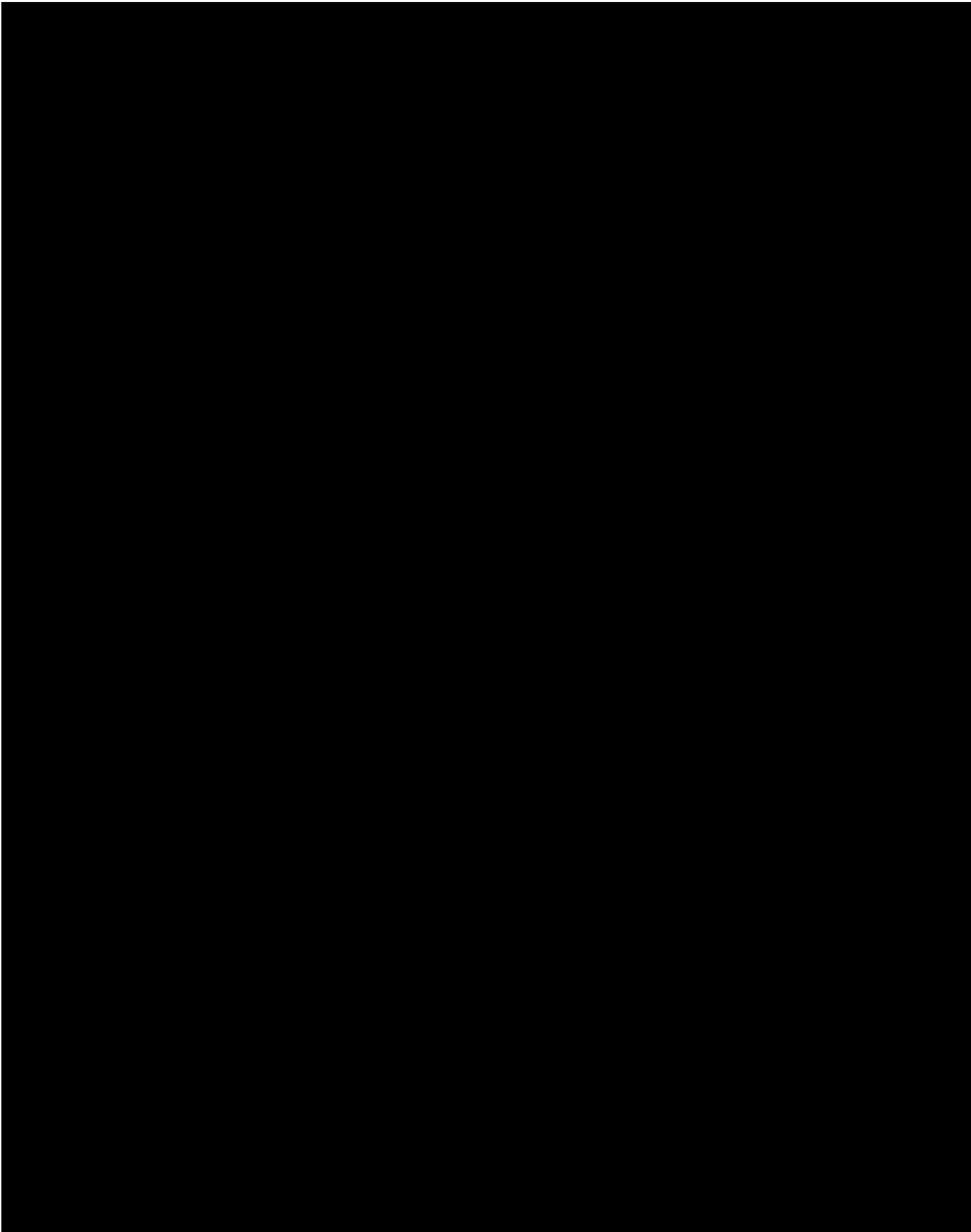


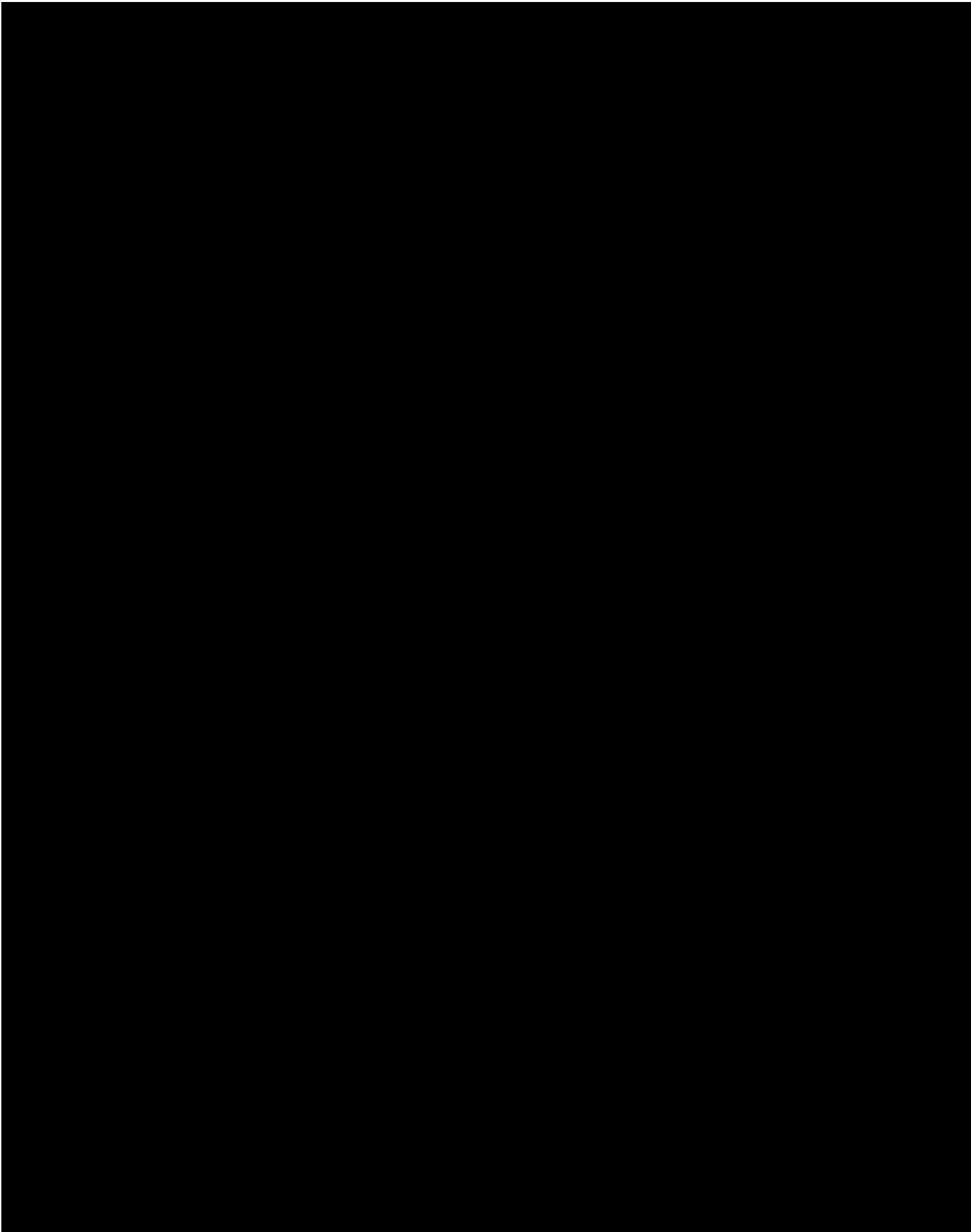


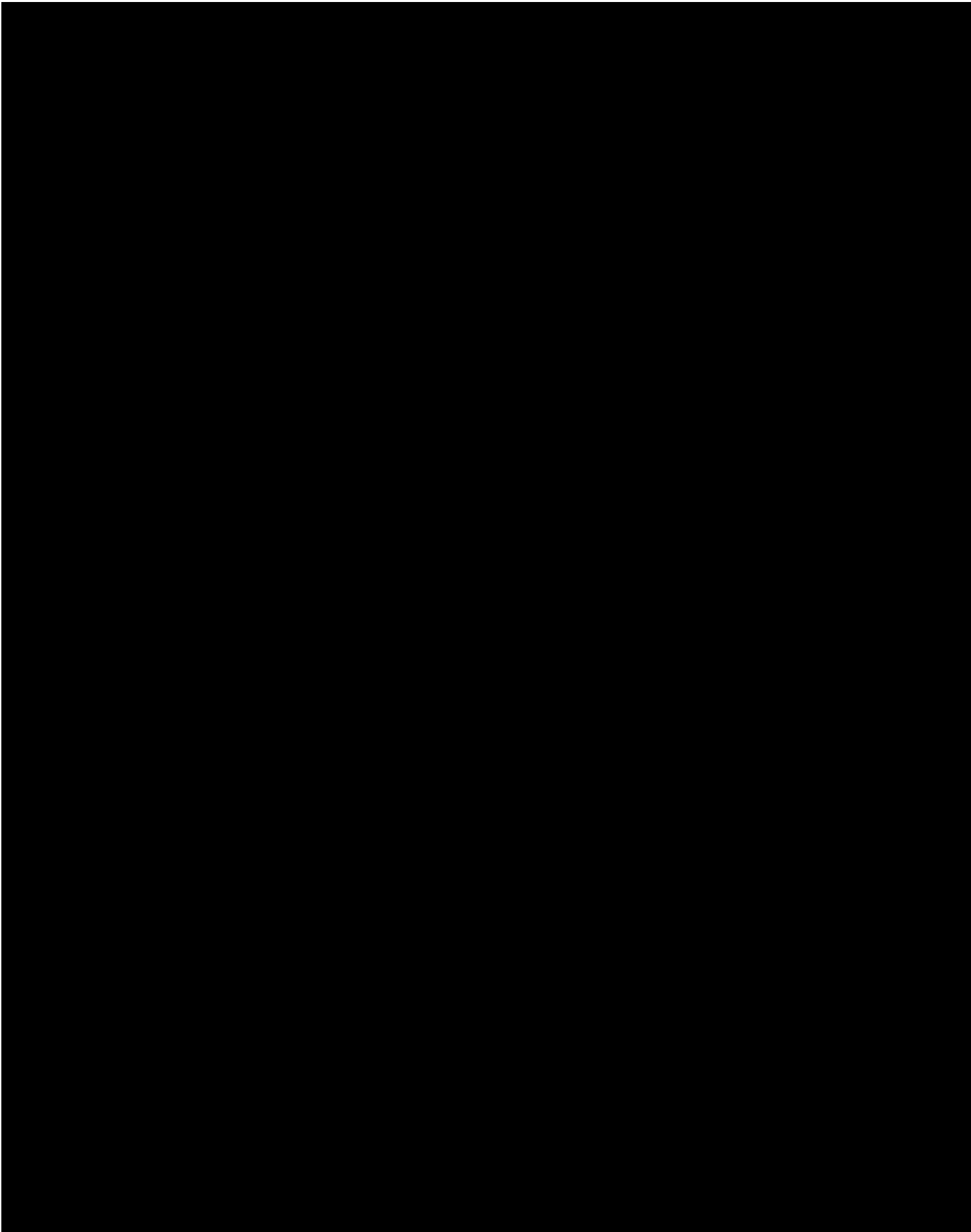


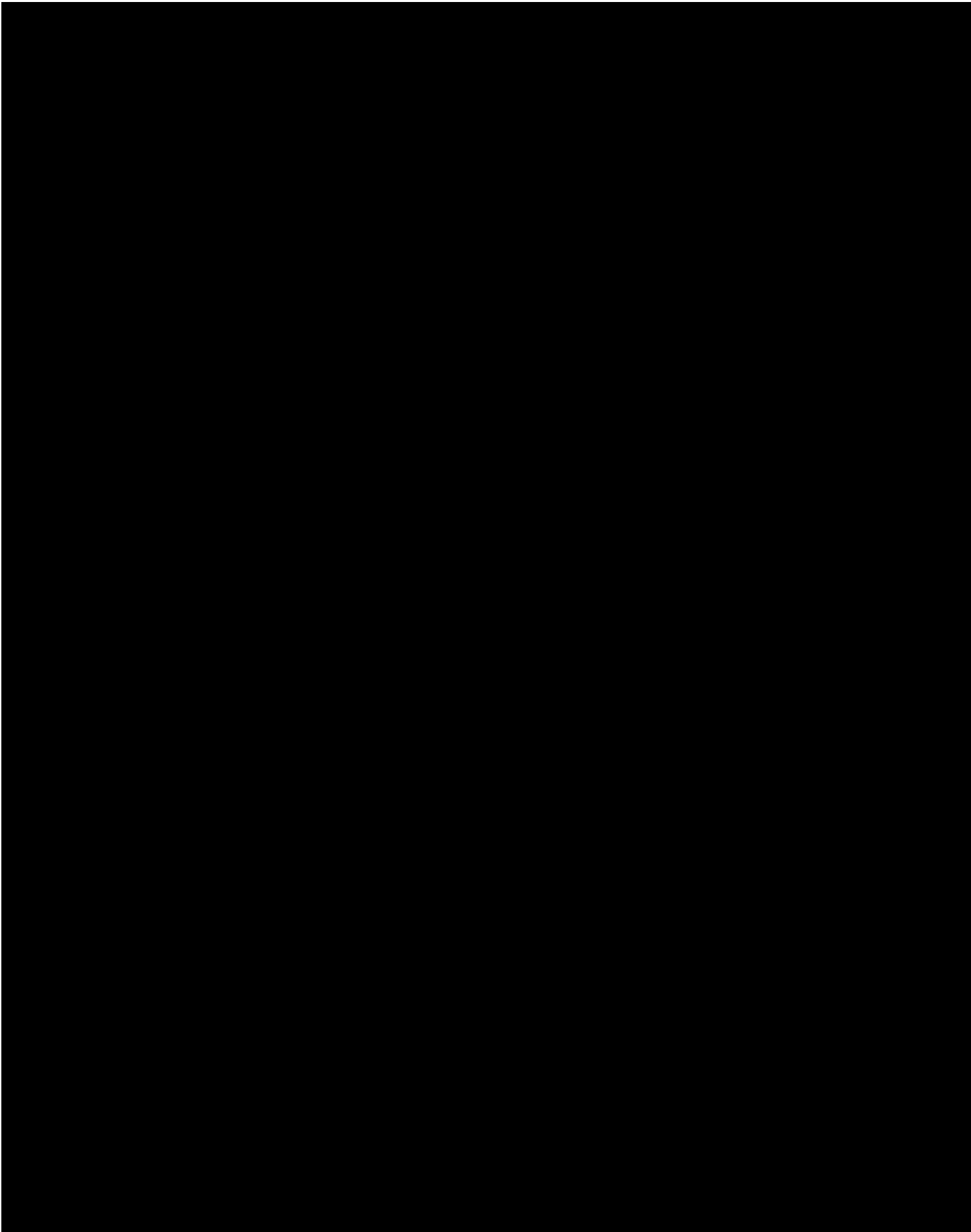












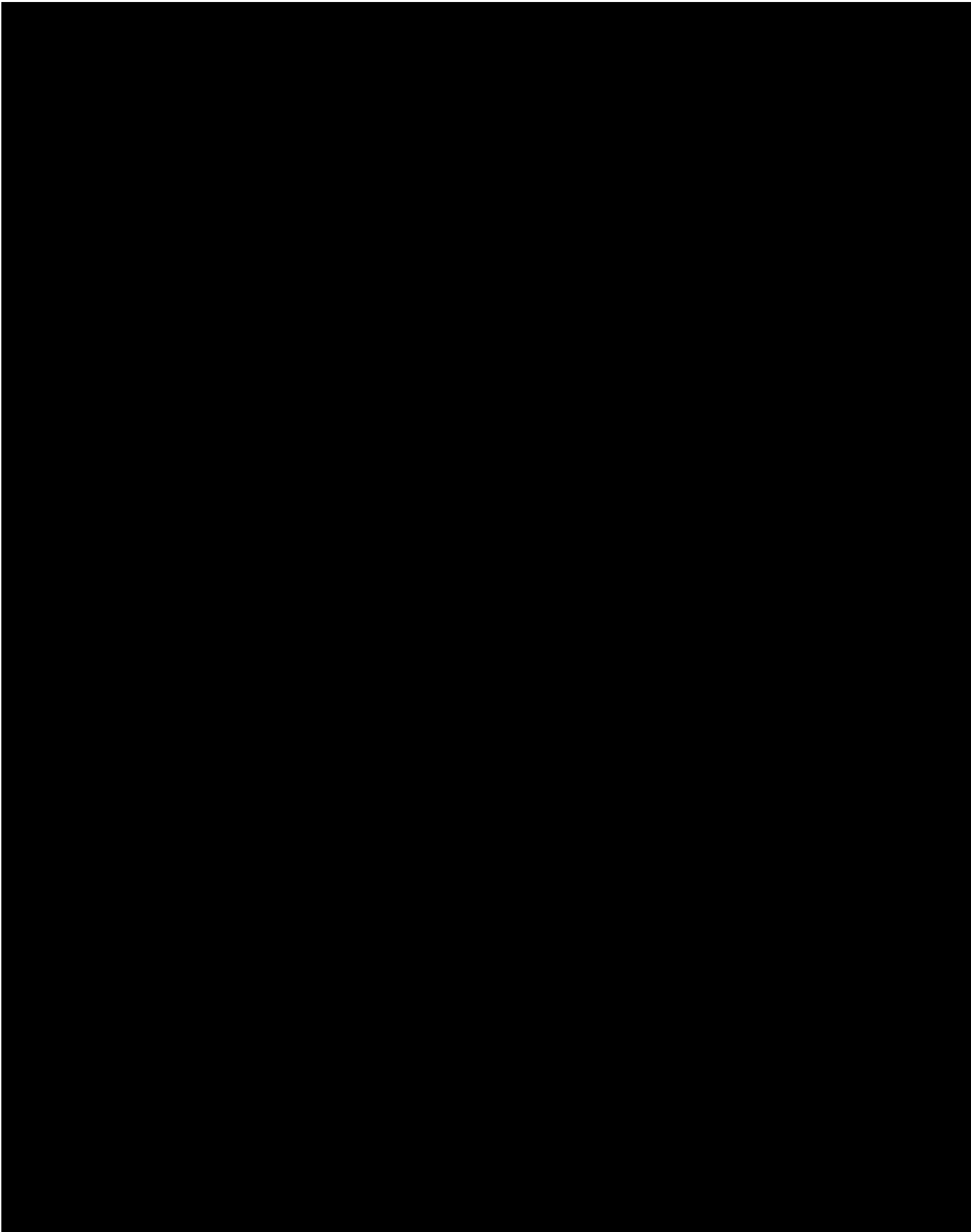
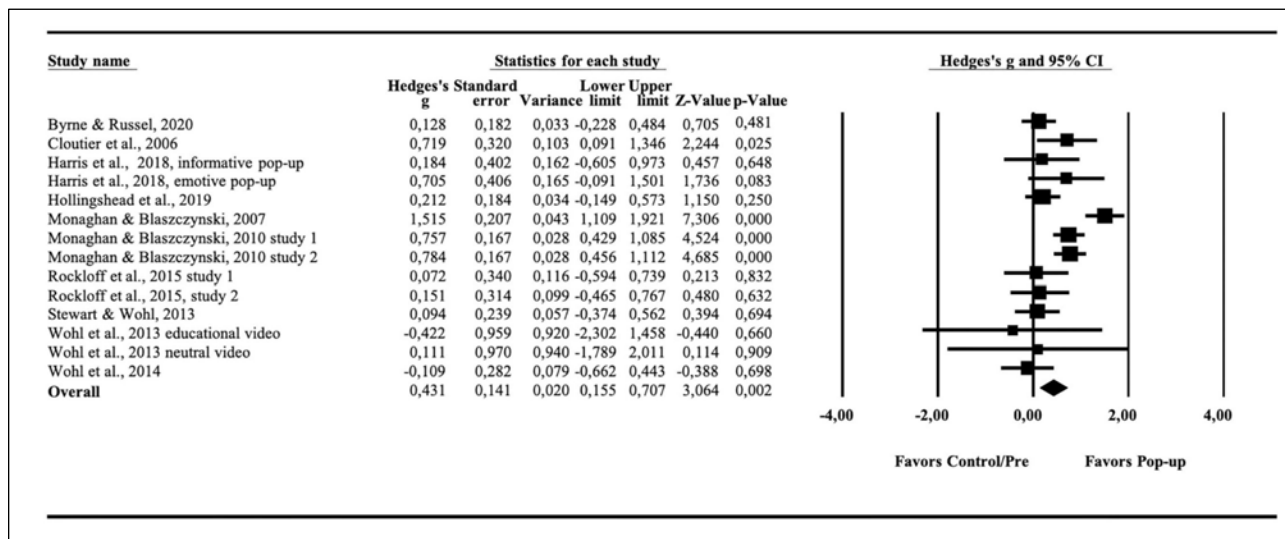


Figure 25. Effects of Pop-up Warnings for Online Gambling on Behavioral Outcomes⁷⁶



132. The authors of the meta-analysis⁷⁶ concluded, “The results showed that RG [responsible gambling] pop-up messages had a moderate effect on gambling behaviors and cognitions, using interventions which should be considered as highly cost-effective.” (p. 16)

133. From the extensive evidence about warnings above, we can derive a set of principles and best practices to maximize the effectiveness of warnings for social media platforms.

134. Warnings for social media platforms should:

- a. Use a signal word that is commensurate with the harms that can result from using social media platforms – i.e., WARNING.
- b. Use imagery to better capture attention and communicate the potential for harm.
- c. Be explicit about each of the specific harms that can result from social media use.
- d. Indicate ways to reduce risk or avoid the harms altogether.
- e. Be of sufficient size and prominent placement to be seen multiple times. Warnings should be read, comprehended, and potentially acted upon.
- f. Be placed when and where they are needed.

g. Use dynamic warning features that detect individuals at risk of particular harms, respond with tailored pop-up warnings in platform, and consider use of sound and haptics to attract attention and communicate risk to the user.

135. As these examples illustrate, and consistent with my own knowledge and understanding, the ability to provide impactful warnings was technically feasible for these social media companies who had some of “the most accomplished people in the world at creating products and features that people want to use.” (Bejar Dep. 88:15-20; 429:7-11).

VIII. Helping Parents Make Informed Decisions about their Children’s Technology and Media Use

136. Beyond disclosure and warning messages for adolescent users themselves, parents also have a role to play in their children’s technology and media use. That is, since many social media users are under the age of 18, they are minors under the care of their parents or guardians.

137. Research demonstrates that parents are concerned about negative effects of use of media on their children,^{77–80} including social media,^{81,82} and they believe that one of their roles is to protect their children from harmful media effects.^{83–85}

138. Two-thirds of parents believe parenting is harder than it was 20 years ago, and many hold this view because of digital technology and the rise of social media.⁸⁶ Parents sometimes struggle with their unfamiliarity with the digital technology that their children are using.⁸⁷

139. A large Pew Research Center study found that the vast majority of parents – 81% – support social media companies requiring parental consent for minors to use their platforms.⁸⁸ That same study found that 71% of parents support requiring minors to verify their age before using social media sites, and 69% favor limits on how much time minors can spend on social media platforms.

140. Parents are also overwhelmingly in favor of parental consent and age verification for social media,⁸⁸ indicating that they want more information about and restrictions on what media their children are using. Research from movie and video game ratings demonstrates that parents find information in warnings useful in making decisions about their children’s media use.⁸⁹

141. For these reasons, the Social Media Defendants should provide parents with warnings as a part of obtaining parents’ informed consent and provide parents with notification and accompanying warnings when their child establishes a social media account or downloads the app.

IX. The Social Media Defendants Did Not Provide Effective Warnings to Adolescent Users and Parents about the Risks and Harms of Social Media Use

142. Having reviewed numerous materials including internal company documents, discovery responses, deposition testimony and third-party studies, I have not found any indication that the Social Media Defendants ever developed and deployed any meaningful and effective warnings consistent with an evidence-based comprehensive warnings strategy as I outline in this report.

143. In recent years, the Social Media Defendants have added certain types of labeling or designs on their platforms purportedly to address problematic use. Broadly speaking, such labeling or designs were introduced late, were not widely used or adopted (in some cases apparently due to platform implementation decisions such as not to activate a warning-type feature by default but instead require the user to opt-in to use it) and were not part of a comprehensive warning strategy consistent with well-established principles and standards. With the exception of a very few labeling or designs, the vast majority of these features were not introduced until after this litigation was underway.

144. In fact, various current and former employees of the Defendants have testified that the companies did not warn young users or their parents about the multiple harms that could result from use of Defendants' platforms. Examples of that testimony include the following:

A. Meta.

145. Vaisnavi. Jayakumar testified that "Meta did not warn parents or kids about the specific types of risks within the product." (Jayakumar Dep. at 66:12-22). Meta did not warn its user base that Instagram could be addictive. (Jayakumar Dep. at 136:1-4). Even as late as December 2022, Meta did not warn parents that Instagram did not have an age-appropriate recommendation algorithm, although Meta could have warned the public if it wanted to do so. (Jayakumar Dep. 120:1-121:4).

146. Former employee Arturo Bejar testified that Meta did not warn the public, including kids or their parents, that there is an increased use of addiction or problematic use from the use of Instagram, (Bejar Dep. 144:6-15; 436:16-22), and effective warning systems were feasible at Meta (429:10-10).

147. Another former employee of Meta, [REDACTED], testified: "I was not aware of any efforts by Facebook to warn users of the potential impact on them of Facebook's ranking model design. This was something that I explicitly talked about with, for example, Margaret Stewart in the context of Facebook's responsibility to vulnerable users in particular, to warn them about different risks on the site, and that was one of the motivating forces behind the work on principles that Margaret and I did together, and to my knowledge, that work was not embedded in the product design process at Facebook." ([REDACTED] Dep. 125:18-126:10).

148. Certain of Meta's labeling or designs, including things Meta contends are in the nature of warnings, have been sharply criticized by certain former employees for various reasons, including that the information is unhelpful and/or misleading. See, for example, Deposition of Arturo Bejar: (Information provided in Meta's "Transparency Center" about harms on Instagram misleading (222:14-23); Prevalence of harm information misleading to

parents (332:3-9; 340:15-25; 365:16-366:24; 341:14-342:23; 368:10-369:21; 205:4-19; 370:10-371:3; 401:4-402:1; 421:3-422:9);

B. Snapchat.

149. Witness Nona Yadegar acknowledged that Snap should warn minor users if part of its platform is posing a risk to minor's safety. (Yadegar Dep. at 133:1-14). If Snap is aware of a safety issue, it has an obligation to educate the community and give them tools to help users control their experience, and educating the community of Snap's users "can absolutely consist of a warning." (Yadegar Dep. at 135:19-136:11).

150. Snap has not provided warnings to users that use of Snap's beautification lenses or filters may lead to body dysmorphia or eating disorders (Jennifer Stout Dep. at 306:20-309:21) or warnings to teens that they were spending too much time on the app. (Jack Brody Dep. at 102:23-103:12).

C. TikTok.

151. TikTok witness Eric Ebenstein testified that he could not recall a time since he began working for the company where TikTok ever told the public that use of the platform could be addictive for teens, or that it could lead to increased risk of compulsive use, anxiety, depression, body dysmorphia, eating disorders, self-harm, suicide, or being sexually abused. (Ebenstein Dep. 494:25-498:8). (See also Matthew Tenenbaum Dep. at 459:23-461:1)

152. Other TikTok witnesses agreed. Amy Ulucay testified that TikTok did not warn users or parents that the app could lead to compulsive behaviors such as addiction to the platform, anxiety, depression, eating disorders or self-harm (Ulucay Dep. at 314:23-315:8; 371:9-24; 372:2-13). TikTok witness Reagan Maher was unaware of "any communications from TikTok to parents about anything, including whether it is addicting and harmful." (Maher Dep. at 109:21-110:6).

D. YouTube.

153. Erin Turner testified that she had no knowledge of YouTube ever warning parents that the volume of YouTube videos their children watched could impact them (Turner Dep. at 272:21-273:4). Sharon Stovezky knew of no warning provided to youth users or their parents that if a child watched a recommended video that had a potentially negative impact on their health, there was a 45 percent chance that the YouTube algorithm would recommend more of these potentially negative impact videos to the user (Stovezky Dep. at 156:10-157:4).

154. Likewise, YouTube did not warn young users or their parents that if they watched a potential negative impact VIBE video related to social comparisons or social aggressions, there was a 45 percent chance the YouTube algorithm would expose them to even more videos that were similar, which YouTube's consulting experts had determined could be harmful to users' mental health. Stovezky Dep. at 161:24-162:9).

155. As noted above, I understand that other experts have opined that use of social media platforms, including specific features, can cause adolescent addiction and problematic use; negative appearance comparisons and body image dissatisfaction; eating disorders; depression; anxiety; self-harm, suicidal ideation, and suicide; child sexual exploitation and abuse through unwanted interactions from child predators who groom children, including exposure to child sexual abuse material (D. Christakis Expert Report (April 18, 2025), G. Goldfield Expert Report (April 18, 2025), A. Lembke Expert Report (April 18, 2025), R. Mojtabai Expert Report (April 18, 2025), S. Murray Expert Report (April 18, 2025), E. Telzer Expert Report (April 18, 2025), J.M. Twenge Expert Report (April 18, 2025)). The Social Media Defendants did not provide effective warnings to adolescent users and their parents about these risks and harms. Effective warnings would have materially affected behavior and therefore reduced harm.

156. Based on the above, my opinions are as follows:

157. **Opinion #1:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Addiction/Problematic Use from Using their Platforms.

158. I understand that other experts have opined that use of social media platforms can cause addiction and problematic use (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 41-47, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 9, 11; G. Goldfield, Expert Report, April 18, 2025, at 18, 22-30, 143-144; A. Lembke, Expert Report, April 18, 2025, at 2, 8-13; R. Mojtabai, Expert Report, April 18, 2025, at 1, 21-23; S. Murray, Expert Report, April 18, 2025, at 5; E. Telzer, Expert Report, April 18, 2025, at 5, 75-79, 126, 172-174, 189).

159. I also understand that other experts have opined that use of particular social media features can contribute to addiction/problematic use, such as:

160. Push notifications (D. P. Cingel, Expert Report, April 18, 2025, at 32-33; G. Goldfield, Expert Report, April 18, 2025, at 18; E. Telzer, Expert Report, April 18, 2025, at 49, 77; D. Christakis, Expert Report, April 18, 2025, at 62, 96-97, 101-103, 139, 171, 174);

161. Likes and comments (S. Murray, Expert Report, April 18, 2025, at 6, 69, 124, 141, ; D. P. Cingel, Expert Report, April 18, 2025, at 38-39; D. Christakis, Expert Report, April 18, 2025, at 94; G. Goldfield, Expert Report, April 18, 2025, at 18; R. Mojtabai, Expert Report, April 18, 2025, at 1, 76; E. Telzer, Expert Report, April 18, 2025, at 5, 77-79, 172-174);

162. Infinite scroll and autoplay (S. Murray, Expert Report, April 18, 2025, at 124, 148; D. Christakis, Expert Report, April 18, 2025, at 97-98; D. P. Cingel, Expert Report, April 18, 2025, at 29-31; G. Goldfield, Expert Report, April 18, 2025, at 18, 27-28; E. Telzer, Expert Report, April 18, 2025, at 49, 172-174);

163. Ephemeral messages (D. P. Cingel, Expert Report, April 18, 2025, at 49-50);

164. Recommender algorithms (D. Christakis, Expert Report, April 18, 2025, at 96-97; D. P. Cingel, Expert Report, April 18, 2025, at 35-36; G. Goldfield, Expert Report, April 18, 2025, at 27-28; R. Mojtabai, Expert Report, April 18, 2025, at 76; E. Telzer, Expert Report, April 18, 2025, at 5, 80-82, 172-174);

165. Filters (S. Murray, Expert Report, April 18, 2025, at 6, 84, 92-99, 137-139, 148-150, 152).

166. The Social Media Companies' internal documents demonstrate their platforms had the potential to cause addiction/ problematic use. Meta's own research documented the problem of addiction/problematic use on Instagram (A. Mosseri Dep. Exhibits 29, 42, 83) and Facebook (A. Mosseri Dep. Exhibit 14, 45; V. Jayakumar Dep. Exhibit 68; K. Jin Dep. Exhibit 35). In fact, one internal Meta document stated that people rated problematic use on Facebook higher than all other social media platforms (K. Jin Dep. Exhibit 35). That same document described triggers for problematic use on Facebook, and listed notifications, videos (and auto-play), algorithms, fear of missing out, recent posts/comments, and timebound content (also known as ephemeral messages; K. Jin Dep. Exhibit 35). Tiktok's internal documents also show the issue of addiction/problematic use on its' platform (TIKTOK3047MDL-005-00325851; TIKTOK3047MDL-002-00101574; TIKTOK3047MDL-002-00091634; TIKTOK3047MDL-002-00102517), as does Snapchat's internal documents (SNAP0404286; SNAP0755817; SNAP5553072; SNAP0896563; SNAP1117208).

167. The Social Media Companies failed to warn adolescent users and their parents about the risk of addiction/problematic use from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

168. **Opinion #2:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Body Image Dissatisfaction from Using their Platforms

169. I understand that other experts have opined that use of social media platforms can cause or contribute to negative appearance comparisons and body image dissatisfaction (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 140-144, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 11, 60-62, 66; G. Goldfield, Expert Report, April 18, 2025, at 48-52, 95-97, 108-109; R. Mojtabai, Expert Report, April 18, 2025, at 1, 43-44; S. Murray, Expert Report, April 18, 2025, at 5, 69-80; E. Telzer, Expert Report, April 18, 2025, at 6, 57, 88-95, 131).

170. I also understand that other experts have opined that use of particular social media features can contribute to negative appearance comparisons and body image dissatisfaction, such as:

171. Beauty filters (S Murray, Expert Report, April 18, 2025, at 6, 84, 92-99, 137-139, 148-150, 152; D. Christakis, Expert Report, April 18, 2025, at 98-99; D.P. Cingel, Expert Report, April 18, 2025, at 44-45; G. Goldfield, Expert Report, April 18, 2025, at 86-88; E.

Telzer, Expert Report, April 18, 2025, at 131);

172. Likes and comments (D. Christakis, Expert Report, April 18, 2025, at 94-95; S. Murray, Expert Report, April 18, 2025, at 6; E. Telzer, Expert Report, April 18, 2025, at 131);

173. Recommender algorithms (G. Goldfield, Expert Report, April 18, 2025, at 95-96; S. Murray, Expert Report, April 18, 2025, at 6; E. Telzer, Expert Report, April 18, 2025, at 93, 131).

174. The Social Media Companies were aware that their platforms had the potential to cause or contribute to body image dissatisfaction. Internal documents reveal that Meta was aware of the problems of negative appearance comparisons and body image issues on Instagram and Facebook from their own research (A. Bejar Dep. Exhibits 9, 83; A. Mosseri Dep. Exhibits 42, 45, 59, 78, 83, 97; ██████████ Dep. Exhibit 56; A. Lee Dep. Exhibit 11) and other work (A. Mosseri Dep. Exhibit 15). Meta found in their BEEF study that 21.4% of 13-15 year olds reported feeling worse about themselves because of other people's posts on Instagram (A. Bejar Dep. Exhibit 050). An internal document from Meta stated that 1 in 4 people think Instagram makes social comparison worse, and that that's particularly true for teen girls (A. Bejar Dep. Exhibit 17). One internal document from Meta stated that social comparison is "common" on Instagram (██████████ Dep. Exhibit 56), while another internal document about Instagram stated, "We make body image issues worse for 1 in 3 teen girls" (A. Mosseri Dep. Exhibit 83). Tiktok was aware of the possible negative impact of beauty filters on users (TIKTOK3047MDL-117-04509578; TIKTOK3047MDL-054-LARK-00552309; TIKTOK3047MDL-054-LARK-00552309; TIKTOK3047MDL-006-00326005; TIKTOK3047MDL-056-00987598), and Snapchat was also aware of the negative impacts of its' lenses on users (SNAP0078233; SNAP0525938; SNAP0933724; SNAP0525939).

175. The Social Media Companies failed to warn adolescent users and their parents about the risk of body image dissatisfaction from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

176. **Opinion #3:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Eating Disorders from Using their Platforms

177. I understand that other experts have opined that use of media platforms can cause or contribute to eating disorders (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 140-144, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 11, 60-62, 69-70; G. Goldfield, Expert Report, April 18, 2025, at 58-66, 95-97; R. Mojtabai, Expert Report, April 18, 2025, at 1, 24, 42-43; S. Murray, Expert Report, April 18, 2025, at 5, 69-80).

178. I also understand that other experts have opined that use of particular social media features can contribute to eating disorders, such as:

179. Beauty filters (S. Murray, Expert Report, April 18, 2025, at 6, 84, 92-99, 137-139, 148-150, 152; D. Christakis, Expert Report, April 18, 2025, at 98-99);

180. Likes and comments (S. Murray, Expert Report, April 18, 2025, at 6);

181. Recommender algorithms (G. Goldfield, Expert Report, April 18, 2025, at 95-96; S. Murray, Expert Report, April 18, 2025, at 6; E. Telzer, Expert Report, April 18, 2025, at 93).

182. The Social Media Companies were aware that their platforms had the potential to cause or contribute to eating disorders. Internal documents reveal that Meta was aware of the problem of eating issues from use of Instagram from their own research (A. Mosseri Dep. Exhibits 83, 97) and other work (A. Mosseri Dep. Exhibit 15). One of Meta's studies found that 18% of Instagram users had seen content that was promoting eating disorders or unhealthy weight loss in the past 7 days, revealing the prevalence of this across Instagram's various surfaces (A. Bejar Dep. Exhibit 9). Tiktok was aware of the possible negative impact of beauty filters on users (TIKTOK3047MDL-054-LARK-00552309), and Snapchat was also aware of the negative impacts of its' lenses on users (SNAP0933724).

183. The Social Media Companies failed to warn adolescent users and their parents about the risk of eating disorders from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

184. **Opinion #4:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Depression from Using their Platforms

185. I understand that other experts have opined that use of social media platforms can cause or contribute to depression (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 184-187, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 11, 56-57, 65-70; G. Goldfield, Expert Report, April 18, 2025, at 18, 23, 32-40, 108-109; A. Lembke, Expert Report, April 18, 2025, at 2, 79-87; R. Mojtabai, Expert Report, April 18, 2025, at 1, 24, 28-29; S. Murray, Expert Report, April 18, 2025, at 5, 100-108; E. Telzer, Expert Report, April 18, 2025, at 6, 67-68, 130, 189; J. M. Twenge, Expert Report, April 18, 2025, at 1).

186. I also understand that other experts have opined that use of particular social media features can contribute to depression, such as:

187. Push notifications (D. Christakis, Expert Report, April 18, 2025, at 99-100);

188. Likes and comments (E. Telzer, Expert Report, April 18, 2025, at 171-172; Christakis, Expert Report, April 18, 2025, at 94-95);

189. Filters (D. P. Cingel, Expert Report, April 18, 2025, at 10, 46-49; S. Murray, Expert Report, April 18, 2025, at 105-107);

190. Recommender algorithms (E. Telzer, Expert Report, April 18, 2025, at 171-172; D. Christakis, Expert Report, April 18, 2025, at 190, 203-204, 208).

191. The Social Media Companies were aware that their platforms had the potential to cause or contribute to depression. Internal documents reveal that Meta was aware of the risk of depression from use of Instagram and other Meta platforms from their own research (A. Mosseri Dep. Exhibits 83, 97; M. Zuckerberg Dep. Exhibit 76), as well as the risk of depression from general social media use (A. Mosseri Dep. Exhibits 14). One internal document from Meta stated that “Teens blame Instagram for increases in the rates of anxiety and depression among teens.” It goes on to say that “This reaction was unprompted and consistent across all groups” (A. Lee Dep. Exhibit 11). That same document stated that “Teens who struggle with mental health say Instagram makes it worse” (A. Lee Dep. Exhibit 11). Tiktok was also aware of the risk of depression from using its’ platform (TIKTOK3047MDL-080-LARK-02552741).

192. The Social Media Companies failed to warn adolescent users and their parents about the risk of depression from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

193. **Opinion #5:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Anxiety from Using their Platforms

194. I understand that other experts have opined that use of social media platforms can cause or contribute to anxiety (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 209-213, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 11, 58-59, 65-70; G. Goldfield, Expert Report, April 18, 2025, at 18, 23, 32-40, 108-109; R. Mojtabai, Expert Report, April 18, 2025, at 1, 24, 28-29; S. Murray, Expert Report, April 18, 2025, at 5, 118-124; E. Telzer, Expert Report, April 18, 2025, at 6, 67-68, 189).

195. I also understand that other experts have opined that use of particular social media features can contribute to anxiety, such as:

196. Push notifications (D. P. Cingel, Expert Report, April 18, 2025, at 32);

197. Likes and comments (D. Christakis, Expert Report, April 18, 2025, at 94-95, 139; E. Telzer, Expert Report, April 18, 2025, at 171-172);

198. Ephemeral messages (D. P. Cingel, Expert Report, April 18, 2025, at 49)

199. Filters (S. Murray, Expert Report, April 18, 2025, at 137);

200. Recommender algorithms (E. Telzer, Expert Report, April 18, 2025, at 171-172).

201. The Social Media Companies were aware that their platforms had the potential to cause or contribute to anxiety. Internal documents reveal that Meta was aware of the problem of anxiety from use of Instagram and other Meta platforms from their own research (A. Mosseri

Dep. Exhibits 83, 97; M. Zuckerberg Dep. Exhibit 76). One internal document from Meta stated that “Teens blame Instagram for increases in the rates of anxiety and depression among teens.” It goes on to say that “This reaction was unprompted and consistent across all groups” (A. Lee Dep. Exhibit 11). That same document stated that “Teens who struggle with mental health say Instagram makes it worse” (A. Lee Dep. Exhibit 11). Tiktok was also aware of the risk of anxiety from using its’ platform (TIKTOK3047MDL-024-LARK-00043038; TIKTOK3047MDL-080-LARK-02552741; TIKTOK3047MDL-004-00137151).

202. The Social Media Companies failed to warn adolescent users and their parents about the risk of anxiety from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

203. **Opinion #6:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Self-Harm, Suicidal Ideation, and Suicide from Using their Platforms

204. I understand that other experts have opined that use of social media platforms can cause or contribute to self harm (D. Christakis, Expert Report, April 18, 2025, at 3, 21, 213-220, 353-354; D. P. Cingel, Expert Report, April 18, 2025, at 11, 57-58, 67; G. Goldfield, Expert Report, April 18, 2025, at 52-57, 98, 108-109; R. Mojtabai, Expert Report, April 18, 2025, at 1, 24; S. Murray, Expert Report, April 18, 2025, at 5, 109-118; J. M. Twenge, Expert Report, April 18, 2025, at 1).

205. The Social Media Companies were aware that their platforms had the potential to cause or contribute to self harm. Internal documents reveal that Meta was aware of the risks of self-harm across their platforms from their own research (V. Jayakumar Dep. Exhibit 68; A. Lee Dep. Exhibit 11; A. Mosseri Dep. Exhibits 42, 59, 97; M. Zuckerberg Dep. Exhibit 76) and from models of how social media use may lead to self harm and suicide (A. Mosseri Dep. Exhibit 14). Meta found in their BEEF study that 8.4% of 13-15 year olds had seen someone harm themselves (or threaten to do so) on Instagram in the past 7 days (A. Bejar Dep. Exhibit 50). Another Meta survey of Instagram users found that 17% of teens (versus 10% of adults) had seen someone on Instagram that might hurt themselves or commit suicide in the past 7 days, revealing the prevalence of this across Instagram’s various surfaces (A. Bejar Dep. Exhibits 9)

206. The Social Media Companies failed to warn adolescent users and their parents about the risk of self harm from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

207. **Opinion #7:** The Social Media Defendants Failed to Warn Adolescent Users and their Parents about the Risk of Child Sexual Exploitation and Abuse, including Child Sexual Abuse Material (CSAM), from Using their Platforms

208. I understand that other experts have opined that use of social media platforms can cause or contribute to child sexual exploitation and abuse through unwanted interactions from child predators who groom children (D. Christakis, Expert Report, April 18, 2025, at 257, 284)

209. The Social Media Companies were aware that their platforms had the potential to cause or contribute to child sexual exploitation and abuse. Internal documents reveal that Meta was aware of the problems of unwanted sexual advances (A. Mosseri Dep. Exhibits 58, 59, 60; A. Bejar Dep. Exhibit 83) and lack of child safety (A. Mosseri Dep. Exhibits 34, 35, 48; A. Bejar Dep. Exhibits 9; M. Zuckerberg Dep. Exhibit 76) on Instagram from their own research. Meta found in their BEEF study that 13% of teens reported receiving unwanted sexual advances on Instagram in the past 7 days (A. Bejar Dep. Exhibit 50). That same internal document stated, “There is still no way for a teenager to indicate when this happens in product. Without inappropriate contact data, how can the issue be understood and addressed” (A. Bejar Dep. Exhibit 50, underline in original document). In addition, a letter from the National Center on Sexual Exploitation sent to Meta ahead of a planned meeting with them pointed to recent research that found that 13% of children aged 9 – 17 reported an online sexual interaction on Instagram with someone they believed to be an adult, with 16% saying they had an online sexual interaction that included being asked to send a nude photo or video (V. Jayakumar Dep. Exhibit 35). That same letter cited data from the Human Trafficking Institute indicating that Facebook and Instagram were the top 2 social media sites where child sex trafficking victims were recruited (V. Jayakumar Dep. Exhibit 35).

210. The Social Media Companies failed to warn adolescent users and their parents about the risk of child exploitation and abuse from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

211. I understand that other experts have opined that use of social media platforms can cause exposure to child sexual abuse material (Expert Report of Brooke Istook, May 16, 2025).

212. The Social Media Companies were aware that their platforms had the potential to cause or contribute to exposure to child sexual abuse material. Internal documents reveal that Meta was aware of the problem of highly sexualized content on Instagram from their own research (A. Mosseri Dep. Exhibits 19, 42, 59; V. Jayakumar Dep. Exhibit 45; A. Lee Dep. Exhibit 11), nudity and sexual activity violations on Instagram (A. Bejar Dep. Exhibits 9, 25) and child sexual abuse material on Meta’s platforms, such as Facebook and Instagram (M. Zuckerberg Dep. Exhibit 76). One of Meta’s studies revealed the prevalence of nudity across Instagram’s various surfaces (A. Bejar Dep. Exhibits 9). Another internal document on the topic of sexualizing comments on pictures of minors on Facebook and Instagram stated, “We do not enforce against certain concerning behaviors at scale across FB / IG.” (V. Jayakumar Dep. Exhibit 45).

213. The Social Media Companies failed to warn adolescent users and their parents about the risk of exposure to child sexual abuse material from using their platforms. In the documents I reviewed, I saw no evidence that The Social Media Companies warned adolescent users or their parents about this risk.

X. The Social Media Defendants Should Have Developed and Implemented an Evidence-based Warning Strategy for Adolescent Users of their Platforms and Parents

214. **Opinion #8:** The Social Media Defendants should have implemented large, prominently placed warnings to inform adolescent users about the harms of using their platforms, and their failure to do so fell below well-established principles and standards.

215. Warnings can be highly effective, and using warnings on social media platforms was recently recommended by Vivek Murthy in his role as Surgeon General of the United States.⁹⁰

216. To be effective, warnings must be seen by users. Social Media Defendants should have used several strategies to ensure that all users were sufficiently exposed to warnings about the harms of using their platforms.

217. First, at sign-up, since all prospective users fill out information to register on a particular social media platform, Social Media Defendants should have used this opportunity to warn users about harms that could result from using their platforms.

218. Examples of sign-up screens for Facebook and TikTok are shown in Figure 26. To ensure that users saw the warnings, Social Media Defendants should have required users to view the warnings after initial sign-up screens but before completing the registration process.

219. Each warning should have been displayed on a separate screen – one-by-one – during the sign-up process. Users should have been required to click an arrow forward after reading each warning.

220. Importantly, warnings should not have simply been listed below the sign-up screen where links to items such as “Term of Service” are shown, as viewing that information is optional and may not be viewed.

Figure 26. Sign-up Screens for Facebook⁹¹ and TikTok⁹²

The figure displays two side-by-side screenshots of social media sign-up screens.

Facebook Sign-up Screen (Left): The screen features the Facebook logo at the top. Below it, the heading "Create a new account" is followed by the subtext "It's quick and easy." The form includes input fields for "First name" and "Last name", a "Birthday" section with dropdowns for month (Feb), day (23), and year (2025), a "Gender" section with radio buttons for "Female", "Male", and "Custom", a "Mobile number or email" field, and a "New password" field. At the bottom, there is a green "Sign Up" button and a link "Already have an account?".

TikTok Sign-up Screen (Right): The screen has the heading "Sign up for TikTok" followed by the subtext "Create a profile, follow other accounts, make your own videos, and more." Below this, there are four buttons: "Use phone or email" (with a person icon), "Continue with Facebook" (with the Facebook logo), "Continue with Google" (with the Google logo), and "Continue with Apple" (with the Apple logo). At the bottom, there is a link "Already have an account? Log in".

221. Second, because a single exposure to warnings is likely to be inadequate, users should also have been exposed to warnings intermittently while using the platform.

222. Intermittent display of warnings would:

- a. allow users to see the warnings again, increasing opportunities for impact.
- b. communicate about harms that users may have forgotten about since sign-up.
- c. provide warnings closer to when the risk of harm is greatest (e.g., after more time on the platform).
- d. potentially take advantage of features such as sound (all devices) and haptics (mobile device only), which may better draw attention to warnings.

223. Third, users should have been exposed to dynamic warnings. Dynamic warnings use detection systems to assess when to display a particular warning.

224. Dynamic warnings should have been used in several cases, such as for:

- a. Excessive time on the platform
- b. Use of the platform late at night or during school hours
- c. Extensive use of particular platform features (e.g., beauty filters)

225. **Opinion #9:** The Social Media Defendants should have used rotating messages communicating specific harms of social media use, and their failure to do so fell below well-established principles and standards.

226. Warnings that use short, explicit messages about the harms of using a product are most effective, as described previously in this report.

227. When use of a product can result in several harms – which is the case here – rotating warnings are the strategy of choice.

228. The longstanding area of tobacco warnings uses rotating warnings in dozens of countries around the world, including the US, as described previously in this report. That is, since tobacco can result in multiple harms, a series of warnings that use short statements and are rotated on packages and advertisements are used.

229. A rotating warning strategy ensures that 1) users are exposed to short, easy-to-understand statements, and 2) across all of the statements, users are informed about each of the harms of using the product.

230. A rotating warnings strategy is also compatible with intermittent display of warnings. When different warnings are displayed intermittently, the text can rotate, ensuring that users are exposed to each of the warnings over time.

231. Given the many possible harms from social media, The Social Media Companies should have used a series of rotating warning statements, such as:

a. Addiction/Problematic Use

232. *WARNING: Use of this social media platform can lead to addiction or problematic use. To reduce your risk, limit your usage.*

233. *WARNING: This social media platform uses features that can lead to addiction or problematic use, such as push notifications, likes and comments, infinite scroll, autoplay videos, and targeted algorithms. To reduce your risk, limit your usage.*

b. Body Image Dissatisfaction

234. *WARNING: Use of this social media platform can cause body image dissatisfaction. To reduce your risk, limit your usage.*

235. *WARNING: This social media platform uses features that can cause body image dissatisfaction, such as beauty filters, likes and comments, and targeted algorithms. To reduce your risk, limit your usage.*

c. Eating Disorders

236. *WARNING: Use of this social media platform can cause eating disorders. To reduce your risk, limit your usage.*

237. *WARNING: This social media platform uses features that can cause eating disorders, such as beauty filters, likes and comments, and targeted algorithms. To reduce your risk, limit your usage.*

d. Depression

238. *WARNING: Use of this social media platform can cause depression. To reduce your risk, limit your usage.*

e. Anxiety

239. *WARNING: Use of this social media platform can cause anxiety. To reduce your risk, limit your usage.*

f. Self-Harm, Suicidal Ideation, and Suicide

240. *WARNING: Use of this social media platform can cause self-harm. To reduce your risk, limit your usage.*

241. *WARNING: Use of this social media platform can cause suicidal ideation. To reduce your risk, limit your usage.*

242. *WARNING: Use of this social media platform can cause suicide. To reduce your risk, limit your usage.*

g. Childhood sexual exploitation and abuse

243. *WARNING: Use of this social media platform can put you at risk of child sexual exploitation, abuse and exposure to child sexual abuse material. To reduce your risk, beware of direct messages from unknown contacts.*

244. **Opinion #10:** The Social Media Defendants should have used imagery to better communicate harm, and their failure to do so fell below well-established principles and standards.

245. Warnings are more effective when they use imagery, as described previously in this report.

246. Warnings that use imagery are more effective because they 1) better capture attention, 2) better facilitate comprehension of the warning; and 3) are better recalled.

247. The Social Media Defendants should have used imagery in each of their warnings about the harms of social media. Each image should have been congruent with the harm that was described in the warning statement. To leverage the benefits of imagery with social media platform dynamics, the Social Media Defendants should have also considered short form video warnings.

248. Candidate images should have been identified for each warning and paired with the text statements to create pictorial warnings. Pre-testing (described next) should have been used to make final selections as to what imagery to use.

249. **Opinion #11:** Social media companies should have pre-tested the warnings before implementation, on the platforms that they alone control, and should have optimized those warnings for maximum engagement with adolescent users, as they routinely do in other aspects of their business, and their failure to do so fell below well-established principles and standards.

250. The Social Media Defendants should have pre-tested warnings using the standards established in the literature.^{37,55-57} Pre-testing is part of the standard development process for warnings as described previously in this report.

251. The Social Media Defendants should have extensively reviewed the published literature and worked with subject matter experts for information and advice to inform text warning statements and accompanying imagery. After development and refinement of the statements and imagery, the Social Media Defendants should have pre-tested the warnings using qualitative and quantitative research methods.

252. The published literature and subject matter experts provide a wealth of evidence-based information to help create draft warnings based on warning principles and standards, which were described previously in this report. Subject matter experts can also help refine warning statements so they are appropriate for and understandable to youth audiences.

253. The Social Media Defendants are very familiar with using research studies and subject matter experts to inform possible changes to their platforms.⁹³⁻⁹⁹ Use of research studies and subject matter experts by the Social Media Companies is illustrated in several deposition exhibits (A. Bejar Dep. Exhibits 009, 017, 050, 082, 085; ██████████ Dep. Exhibits 15, 35; M. Gould Stewart Dep. Exhibits 6, 10; V. Jayakumar Dep. Exhibit 68; ██████████ Dep. Exhibits 14, 16, 21, 26, 27; K. Jin Dep. Exhibits 31, 35; ██████████ Dep. Exhibits 9, 19, 21, 25, 26, 56, 58; A. Lee Dep. Exhibits 6, 8, 10, 11, 17, 18, 25, 28; Zuckerberg Dep. Exhibits 011, 014, 015, 029, 031, 038, 040, 044, 045).

254. Once text statements were drafted, qualitative approaches such as focus groups should have been used to understand how youth responded to the draft warnings (i.e., text statements and accompanying imagery).

255. During focus groups, questions about the size, placement, timing, and other factors such as use of sound or haptics to support warning effectiveness should have been explored.

256. Focus groups should have been guided by questions such as the following:⁵⁵

- a. **Attention** – Will youth notice and be engaged by the warnings? What warning dimensions are most noticeable and engaging for youth?
- b. **Communication** – Do youth understand what the warnings are saying? What message do the warnings convey to youth?
- c. **Identification** – Do youth see the warnings as relevant to them? How could relevance be enhanced?
- d. **Effect** – What effects do youth think the warnings will have? What changes could be made to the warnings to enhance their effectiveness?

257. Results from the focus groups should have been used by The Social Media Defendants to make changes and refinements to the draft warnings, maximizing their noticeability, understandability, relevance, and potential for effectiveness.

258. The Social Media Defendants are very familiar with using qualitative research studies – such as focus groups and interviews – to inform possible changes to their platforms (██████████ Dep. Exhibits 14, 21, 26, 29, 30; ██████████ Dep. Exhibit 19; A. Lee Dep. Exhibits 6, 8, 11, 18; Zuckerberg Dep. Exhibit 014, 040).

259. Once the Social Media Defendants had searched the research literature, engaged with subject matter experts, conducted focus groups, and refined the draft warnings, they should have then tested the warnings on their platforms. Given that the Social Media Defendants control their platforms, only they are capable of testing warnings directly on their platforms.

260. The Social Media Defendants should have tested the warnings on their platforms using methods such as AB testing. AB testing involves exposure of different groups to different alternatives (A and B) to determine which works better. The Social Media Defendants should have tested warning variations – which may include variations in size, placement, timing, use of sound, video, or haptics, and other factors – in order to understand which warning variations are most effective.

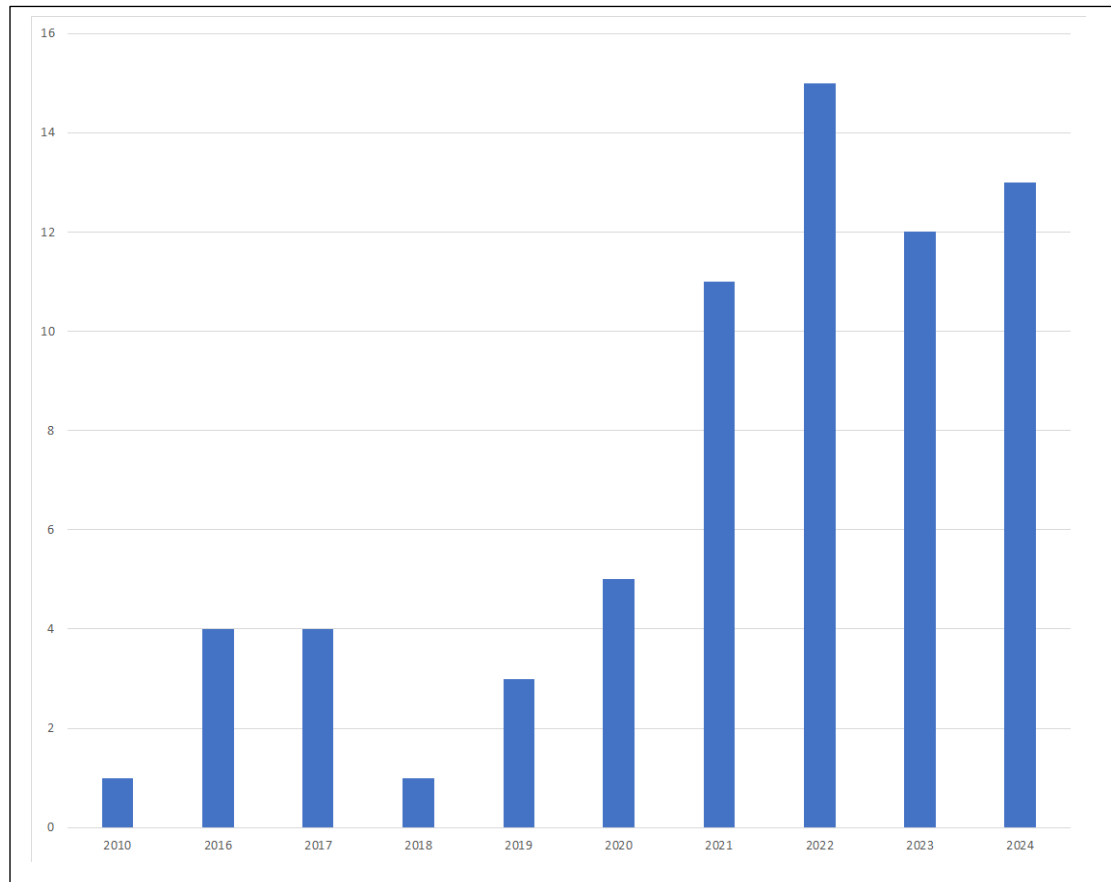
261. The Social Media Defendants are very familiar with gathering test data on platform features.^{94,96,100–105} In his deposition, ██████████ (a Meta employee) described the process of “AB testing” on Instagram as a process that tests whether a potential new feature will have a positive, negative, or no impact on metrics of interest (██████████ Dep. at 62:2 – 63:23). He went on to say that before a safety feature would be proposed to other teams, they would run AB tests to evaluate the impact of the feature on metrics, stating “everyone has to do that” (██████████ Dep. at 63:14). Several deposition exhibits also provide examples of The Social Media Defendants gathering test data on platform features (A. Bejar Dep. Exhibits 012, 019; ██████████ Dep. Exhibits 15, 29, 31; K. Jin Dep. Exhibit 22; ██████████ Dep. Exhibits 8, 57; ██████████ Dep. Exhibits 1, 6).

262. Once testing was complete, the Social Media Defendants should have implemented the warnings on their platforms.

263. After implementing the warnings on their platforms, the Social Media Defendants should have monitored the extent to which the warnings were useful and effective over time, and made additional changes and updates to the warnings as needed. The Social Media Defendants already do this type of monitoring with respect to user engagement. For example, the companies commonly monitor use of platform features and user behaviors and make changes and updates to features on their platforms.^{95,100,101,103,106–109} Several deposition exhibits provide examples of the Social Media Defendants monitoring use of platform features and user behaviors (A. Bejar Dep. Exhibit 017, 025; ██████████ Dep. Exhibits 15, 35; M. Gould Stewart Dep. Exhibit 6; V. Jayakumar Dep. Exhibits 68, 71; ██████████ Dep. Exhibits 21, 25; K. Jin Dep. Exhibits 22, 35; ██████████ Dep. Exhibits 9, 12, 13, 14, 15, 17, 19, 24, 25, 27, 41, 42, 43, 56; A. Lee Dep. Exhibits 5, 25, 26, 27; ██████████ Dep. Exhibits 4, 6, 7; Zuckerberg Dep. Exhibits 025, 026, 027, 060, 063, 079). Following a similar approach, the Social Media Defendants should have changed, updated, or added new warnings to their set of rotating warnings.

264. It is not uncommon for the Social Media Defendants to make changes to their platforms, nor is it uncommon for the Social Media Defendants to use the methods described above when doing so. For example, a webpage from Meta lays out a timeline of changes made to “tools, resources, and features to help support teens and parents,”¹⁰⁶ with 69 press releases between 2010-2024 announcing platform changes.¹⁰⁶ A simple count of these press releases shows that they have become increasingly common over time.¹⁰⁶ In fact, while there were only 18 press releases between 2010-2020 announcing platform changes, there were 51 press releases between 2021-2024 announcing platform changes (Figure 27).

Figure 27. Number of Press Releases from Meta on Platform Changes for Teens and Parents by Year, 2010-2024 (original figure created using data from¹⁰⁶)



265. **Opinion #12:** The Social Media Defendants should have designed and implemented a warnings strategy for parents, and their failure to do so fell below well-established principles and standards.

266. In calling for warnings on social media platforms, Surgeon General Vivek Murthy wrote, “It is time to require a surgeon general’s warning label on social media platforms, stating that social media is associated with significant mental health harms for adolescents. A surgeon general’s warning label... would regularly remind parents and adolescents that social media has not been proved safe.”⁹⁰

267. The Surgeon General Vivek Murthy also wrote, “These harms are not a failure of willpower or parenting; they are the consequence of unleashing powerful technology without adequate safety measures, transparency, or accountability.”⁹⁰

268. Further, the Surgeon General Vivek Murthy wrote, “The moral test of any society is how well it protects its children.... We have the expertise, resources and tools to make social

media safe for our kids. Now is the time to summon the will to act. Our children's well-being is at stake."⁹⁰

269. In addition to adolescent users, parents should also have been warned about the risks that their adolescent children faced when using social media.

270. First, during the sign-up process, the warnings that adolescents saw should have also been sent to their parents. To ensure that parents saw the warnings, the Social Media Defendants should have required parents to view the warnings and acknowledge that they had done so during their child's sign-up process. This should have been a required step before their child was allowed on the social media platform.

271. Second, because a single exposure to warnings is likely to be inadequate, the warnings should have been sent to parents on a regular basis. This would ensure that parents remained informed about risks of social media use that their child might encounter.

272. Third, parents should have been provided dynamic warnings. Dynamic warnings use detection systems to assess when to display a particular warning. Parents should have been alerted via dynamic warnings in circumstances such as the following:

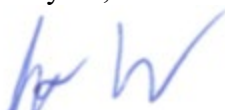
- a. (1) Their child was spending excessive time on the platform;
- b. (2) Their child was using the platform late at night or during school hours;
- c. (3) Their child was extensively using particular platform features (e.g., beauty filters).

273. Parents also should have been regularly kept informed of their child's usage, and been provided with easy-to-use parental controls, via parental dashboards and similar features.

274. **Opinion #13:** If the Social Media Defendants had developed, pretested, implemented, and monitored a warnings strategy that was based on well-established principles and standards, it would have been highly effective and many of the harms that children and adolescents have suffered as a result of using Defendants' social media platforms would have been reduced or avoided.

The undersigned hereby certifies their understanding that they owe a primary and overriding duty of candor and professional integrity to help the Court on matters within their expertise and in all submissions to, or testimony before, the Court. The undersigned further certifies that their report and opinions are not being presented for any improper purpose, such as to harass, cause unnecessary delay, or needlessly increase the cost of litigation.

Dated: May 16, 2025



Seth Noar, Ph.D.

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