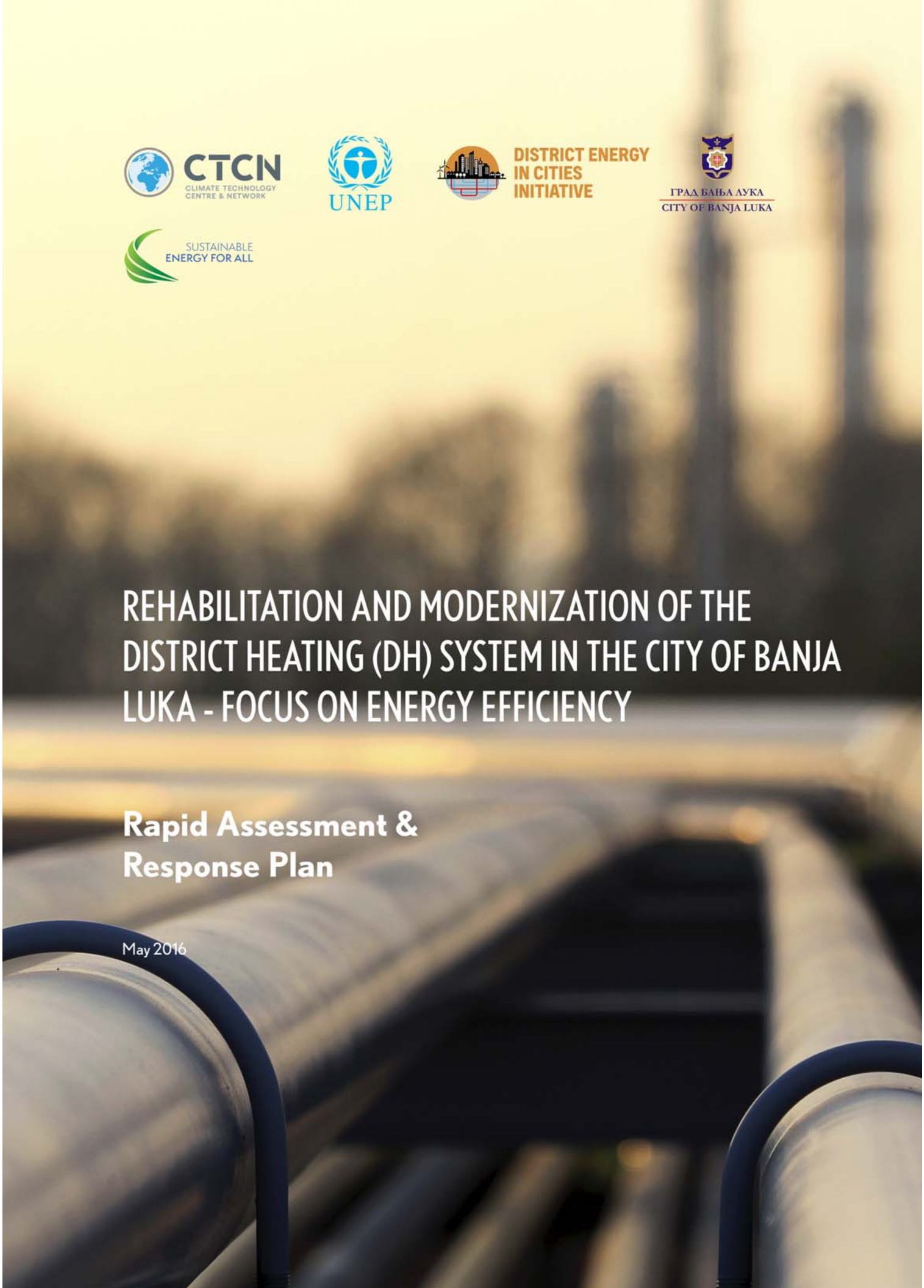

REHABILITATION AND MODERNIZATION OF THE DISTRICT HEATING (DH) SYSTEM IN THE CITY OF BANJA LUKA - FOCUS ON ENERGY EFFICIENCY

Rapid Assessment & Response Plan

May 2016

Document Details

Project title	**Rehabilitation and Modernization of the District Heating (DH) System in the City of Banja Luka – Focus on Energy Efficiency**
Project status	Rapid Assessments and Response plan
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Date	March, 2016

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LIST OF FREQUENTLY USED ABBREVIATIONS

BiH	Bosnia and Herzegovina
CPA	Consumer Protection Association
CTCN	Climate Technology Centre and Network
DH	District heating
EE	Energy Efficiency
EEAP	Energy Efficiency Action Plan
EnC	Energy Community
ESCO	Energy Service Company
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
FDI	Foreign direct investments
GDP	Gross domestic product
GHG	Greenhouse gas
HFO	Heavy fuel oil
kg	Kilogram
km	Kilometre
LC	Local Community
LEAP	Local Environmental Action Plan
LSG	Local Self-Governance
m	Meter
MALSG	Ministry of Administration and Local Self- Governance of RS
MH EPRS	Mixed Holding “Elektroprivreda Republike Srpske” a.d. Trebinje – holding company
MIEM	Ministry of Industry, Energy and Mining of RS
MoFTER	Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina
MOFWM	Ministry of Agriculture, Forestry and Water Management of RS
MSPCEE	Ministry of Spatial Planning, Civil Engineering and Ecology of RS
MW	Megawatt
MWh	Megawatt-hour
NDE	National Designed Entity
PPP	Public-Private Partnerships
RES	Renewable energy sources
RERS	Regulatory Commission for Energy of RS
RS	Republika Srpska
SEAP	Sustainable Energy Action Plan
SERC	State Electricity Regulatory Commission
UNFCC	United Nations Framework Convention on Climate Change
ηt	Boiler efficiency

1 EXECUTIVE SUMMARY

The City of Banja Luka is the political and administrative centre of Republika Srpska (RS), and is located in the north-western part of Bosnia and Herzegovina (BiH). The City covers an area of 1,239 km²and has a population of 199,191 inhabitants.

The district heating (DH) system in Banja Luka was established in 1970. The existing Joint Stock Company "Toplana" Banja Luka (the Company) was founded in 2003, and is the main heat supply company in RS which supplies the area of the City. The majority owner is the City of Banja Luka with 77% of shares, whereas the remaining 19% is owned by the Company and 4% by other shareholders. The DH system covers only a part of the City – there is a large number of residential buildings as well as commercial and public buildings not connected to the current DH network, in the current service area for district heating as well as outside of the area. The Company serves around 30% of households, commercial and administrative buildings in the City, whereas the rest of buildings are heated individually with coal, firewood and electricity.

An assessment of the Company operations has confirmed that nearly every aspect of DH operations is unfavourable which results in serious financial shortcomings for the Company. As a result of inadequate level of service, the Company has lost 13% of the customers since 2011. In addition, the DH system which uses HFO as fuel is a major polluter in the City.

Based on the identified need for investments for the reconstruction of the City's network, as well as the need for fuel substitution, the City of Banja Luka has requested the technical assistance of the Climate Technology Centre and Network in order to evaluate options for rehabilitating and modernizing its DH system.

Biomass fuelled district heating is considered to be the least cost heating solution for the City, but has to be substantially improved in order to be competitive against alternative heating solutions. The current costs for district heating could be substantially lowered by switching from HFO to biomass, but also by giving the customers the possibility to regulate their heat consumption and save energy.

The Priority Investment Program (PIP) has been developed taking into account the current capabilities of the Company and the possibilities for financing PIP measures. The PIP addresses the identified issues by proposing fuel switch from HFO to biomass as environmentally friendly, renewable, locally available and cheaper fuel; modernization and rehabilitation of the existing HFO boilers to cut costs of fuel and electricity; rehabilitation and priority replacements in the distribution network to cut heat and water losses; and switching to consumption based metering and billing for improved quality of services and customer confidence.

The proposed measures are aimed at improving the service level and decreasing DH costs in order to improve the competitiveness of district heating in relation to alternative heating sources. The measures have been designed taking into account technical, financial and environmental considerations, in order to secure environmentally, technically and financially sustainable DH operations in the City and to improve the quality of the service in order to ensure the return of the disconnected customers.

In terms of environmental impacts, the implementation of the proposed measures under PIP will inevitably lead to short-term impacts that are related to construction works and generally associated with infrastructure projects of any type. The significance of negative impacts during the replacement and reconstruction works has been assessed as minor. On the other side, the implementation of the mentioned measures will result in long-term positive impacts on air quality, more efficient consumption of natural resources (fuel and water consumption) and overall increase in energy efficiency of existing district heating system. In terms of significance, positive impacts have been assessed as major environmental benefits.

The recommended improvements to the DH system in the City of Banja Luka are in line with the strategic objectives of BiH, RS and the City of Banja Luka in this sector. There is no specific legislation regulating the DH sector; DH operations are governed by various pieces of legislation on energy efficiency improvement, use of renewable energy sources, spatial planning and environmental protection. Even though the existing legislation relevant to DH operations is still being developed, it is considered to provide an adequate framework for the suggested improvements to the DH system.

The financial analysis of the effects of the proposed PIP measures shows that the increase in the share of biomass in total fuel consumption would change the situation of the Company from a loss-making into a profitable enterprise. This achievement rests on a number of critical assumptions:

- The price of biomass and HFO remains at current levels;
- 80% of disconnected customers are reconnected to the DH network within 4 years;
- Consumption-based billing is introduced fully;
- The financing loan is approved for a ten year period, with a grace period of 1 year.

2 BRIEF INTRODUCTION

The City of Banja Luka has requested the technical assistance of the Climate Technology Centre and Network (CTCN) in order to evaluate options for rehabilitating and modernizing the district heating (DH) system. Banja Luka is the second largest DH system in Bosnia and Herzegovina (BiH). It experiences significant energy losses (in large part due to hot water leakages and heat losses) during transmission and end-use, thereby incurring major, avoidable costs to the City and the publicly owned Company, while also producing unnecessarily high amounts of greenhouse gas emissions.

The Company has identified the need for investments for the reconstruction of the City's network. The Company has also identified the need for fuel substitution and is considering conversion of the biomass or alternative cheaper energy sources (away from heavy fuel oil) for various parts of its operations.

The CTCN technical assistance and parallel work of the District Energy in Cities Initiative is intended to deliver an actionable evaluation of options with associated investment and policy development plan that will ensure the investment is a) attracted from private sector or other actors where required, b) does not deliver a technical solution without the policy framework that will ensure long-term sustainability of the DH system's business plan (e.g. building efficiency policies and tariff regulation).

Implementation of the Project is expected to increase the energy efficiency of DH operations in the City of Banja Luka, leading to reduction in the use and procurement of crude oil, helping the City of Banja Luka to reduce heat and financial losses, while encouraging the local economy and creating possibilities for local job development. Furthermore, the Project is expected to contribute to the improved operational efficiency of the Company, through the process of knowledge transfer and capacity building of the City and the Company representatives.

The evaluation of options will be focusing on (i) a report on the present status of the DH system in the City including the analysis of the DH Company, socio economic analysis of the City and the DH network, (ii) a draft short-term strategy for efficient sustainable DH operation that will include potentials for smart technologies and fuel switching, and that will define short term investment priorities, (iii) a financial analysis of the priority investments projects proposed in the short term-strategy, (iv) a rapid environmental assessment of proposed priority investment projects, and (v) a policy/regulatory gap analysis.

3 ASSESSMENT OF THE PRESENT STATUS OF THE DH SYSTEM

3.1 District Heating in Bosnia and Herzegovina

In Bosnia and Herzegovina, larger centralized DH systems emerged in the 1960s and 1970s of the last century. DH systems used to be in most cities with a population of 20,000 and above. Before the war, the number of DH companies was more than 30, but lacking maintenance and repairs resulted in big damages and eventually heat supply had to be stopped. DH in BiH served 120,000 flats, equivalent to 450,000 inhabitants or 10% of the population. In the urban areas, DH is still a significant heating option with about 39% of the households connected to the systems[1].

The Sarajevo DH system is the largest in BiH. Centralized DH system in Sarajevo started in 1968 under the umbrella of the local housing company by operating boiler facilities previously managed by tenants' council.

The DH system of the City of Banja Luka is the largest one in Republika Srpska. The centralized DH system was constructed in 1972.

Significant investments have been channelled into DH system rehabilitation over the last decade, following the war. These investments have in particular focused on eliminating the damages encountered during the war and reducing major heat and water losses, improving pipe insulation, upgrading valves, replacing heat exchangers, replacement of boilers and burners, and substation modernization.

Although this has improved system efficiency most DH systems face substantial continued investments in network improvement over the next decade. One of the reasons for this has been that many DH systems were out of operation for several years during and after the war, leading to serious corrosion of the network.

Most heat production units are using fuel oil for heat only boilers or coal for CHP plants. Natural gas is only available in a few places, primarily in Sarajevo.

Domestic hot water is predominantly produced in individual gas-fired or electric heaters. There are only few cases (mainly in Sarajevo) where the hot water is produced and distributed by the DH Company. This is an important potential for future expansion of DH to all-year operation (the system presently only operates during October-April) and would create a better basis for future production of combined heat and power and production based on biomass fuels and/or waste incineration.

There are only few cases of limited private sector participation in the DH sector (e.g. Livno, Gračanica, Gradiška) where biomass is used for heat production.

3.2 District Heating in Banja Luka

The Company[2] is the sole provider of district heating services in Banja Luka. According to the available data[3], it serves around 30% of households, commercial and administrative buildings in the city. The rest of buildings are heated individually. In private households, wood is usually used as the energy source for heating. The Company provides the thermal energy only for space heating, while the DHW is individually prepared in each household, usually by electric boilers.

The Company provides the thermal energy for space heating in Banja Luka only during the heating season, which usually starts on October 15th and lasts until April 15th. Thermal energy supply lasts in the average of 188 days. Heat is supplied from 6 h to 22 h on the daily basis during the season. During that time, it is intended to maintain the inner temperature of +21°C (+/- 1°C). However, maintaining continuous temperature under the current operating state of the district heating system is impossible due to very high losses and poor control possibilities. During the night, DH system operates under reduced regime. Analysis has shown that this type of operation is economically more efficient compared to complete shut off and start over in the morning, avoiding high peaks in fuel consumption.

[1] Statistical Office, Living Standard Measurement Survey in BiH
[2] A.D. – Joint stock company
[3] Održivi energetski akcioni plan Grada Banja Luke, 2010

3.2.1.1 Service Area for District Heating

The City of Banja Luka has an area of 24.25 km^2. Out of this area, DH system covers 10.7 km^2 or about 44%. District heating installations in City of Banja Luka consist of a heat source made up of three heating plants. Central plant for thermal energy production includes four heavy fuel oil boilers, each with a capacity of 58 MW. The central heating plant is located on the bank of the river Vrbas in the central part of the city. On the east and north of the plant is an industrial zone, while the residential area, the major consumer of heat from the plant, is located on southwest, west and northwest. In addition to the central heating plant, there are two new biomass boilers. One of the boilers has the capacity of 10 MW (hereinafter referred to as the heating plant Starčevica), while the other has the capacity of 6 MW (hereinafter referred to as the heating plant Kosmos). The heating plant Starčevica is located south of the central plant supplying heat to residential buildings in its vicinity, which are located east of the plant itself. The heating plant Kosmos is located within Kosmos Aviation Institute in Kočićev Vijenac neighbourhood.

The service area of the Company is shown in the following Figure.

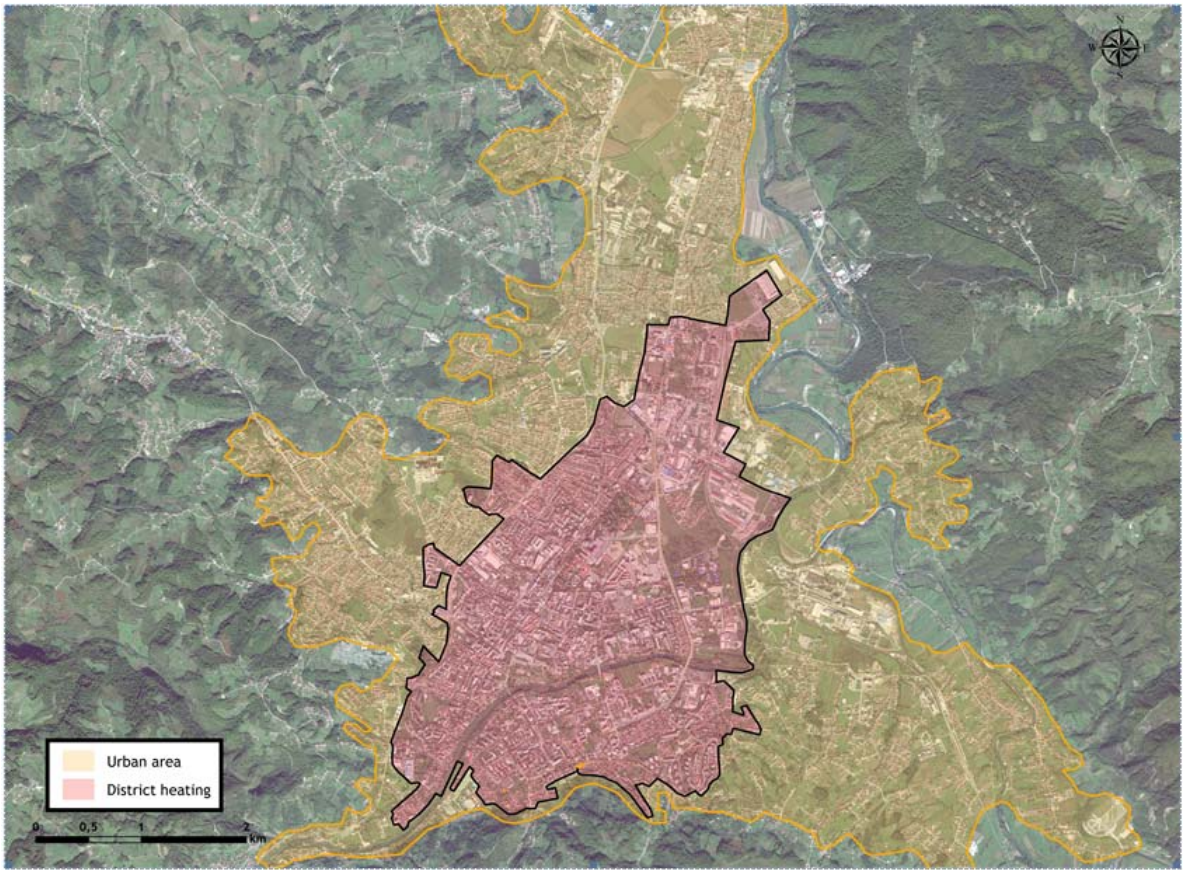


Figure 1: *District Heating Supply Area*

3.3 Location and Natural Environment

3.3.1.1 Geographical Location

Banja Luka is located in the north-western part of Bosnia and Herzegovina, in the centre of the western part of Republika Srpska. Banja Luka is surrounded by the mountains Manjača (1,338 m), Tisovac (1,172 m), Osmače (948 m) and Crni Vrh (548 m) from south and southeast, from the northwest by the mountain Kozara (421 m) and to the north by the Pannonia basin. The territory of the city covers an area of 1,239 km² and borders with the Municipalities of Gradiška, Laktaši, Čelinac, Mrkonjić Grad, Ribnik, Oštra Luka and Prijedor. The maximum distance between the northern and southern points of the territory of the city is 55 km, and 40 km between the western and eastern point.

The rural area of the city represents about 85% of the territory of the city Banja Luka. It consists of 40 settlements and two partial settlements: Agino Selo, Barlovci, Bistrica, Bočac, Borkovići, Bronzani Majdan, Cerići, Čokori, Dobrnja, Dragočaj, Dujakovci, Goleši, Kmećani, Kola, Kola Donja- dio, Krmine, Krupa na Vrbasu, Lokvari, Lusići, Ljubačevo, Melina, Motike, Obrovac, Pavići, Pervan Donji, Pervan Gornji, Piskavica, Prijakovci, Potkozarje (Ivanjska), Prnjavor Mali, Radmanići, Radosavska, Rekavice- dio, Slavićka, Stratinska, Stričići, Subotica, Šimići, Šljivno, Verići, Vilusi and Zelenci. The major part of the city is located in the Vrbas River basin, and a smaller part belongs to the Sana River basin.

The Company is located in the southern part of the urban area of the city, on the left bank of the river Vrbas, in the Local Community Borik 1. The Police Academy of Banja Luka is located in the proximity of 10 m of the location of the Company on the west side, and the University Campus of Banja Luka on the north side. Less than 5 residential buildings are located at about 20 m from the west and south side of the Company.

Figure 2: *Location of the Company*

(Source: Google Maps, 09/03/2016)

3.3.1.2 Climate

Banja Luka's climate is classified as warm and temperate. Banja Luka is a city with significant rainfall. Even in the driest month (August), there is 57.6 mm of rainfall. According to Köppen and Geiger, this climate is classified as Marine-Mild Winter (Cfb). The average annual temperature is 10.8°C and 17.2°C in the vegetation period from March to November. The monthly temperatures for most of the period are above 0°C, which shows that the area does not have long periods with very low temperatures. The highest average monthly air temperature is in July (20.7 ° C) and August (20.5° C), and the lowest in February (-1.4° C) and January (0.4° C).[4]

In 2015, the average annual temperature was 12.7°C, which shows that the temperature was higher compared to the general average annual temperature. The highest average monthly air temperature was in July (25.2° C) and August (24° C), and the lowest in February (2.4° C) and December (3.2° C), according to the Hydrometeorological Institute of Republika Srpska.

The vegetation period starts on March 15th and lasts until November 23rd, which is the period of daily temperatures above 5°C. The period with average daily temperature above 20°C is an average of 46 days. There are also days with tropical temperatures, i.e. periods when the temperatures are higher than 30°C.

The average annual amount of precipitation is 1,017 mm/m^2.The amount of precipitation increases in spring and autumn and decreases over the summer and winter periods.[5]

[4] Institute for Urban Development of RS, A.D. Banja Luka, Rural Development Strategy of the City of Banja Luka 2010 – 2015, Banja Luka, 2010

[5] *Ibid*.

Spatial distribution of annual precipitation indicates that the northern part of Banja Luka, in the lower course of Vrbas, has less precipitation (an average of 850 mm to 1,000 mm/p.a.) than the southern part, in the upper course of Vrbas River, with an average between 1,000 mm and 1,500 mm.[6]

The dominant winds are north – north-east and northwest-west winds. About 40% of the days per year are without wind, which is indicated by a high frequency of silence. The highest average wind speed amounts to about 2.9m/s in Banja Luka.

The average annual relative humidity is 78%, which means that the air above Banja Luka is moderately moist. The greatest value of relative humidity is in November and January. The foggiest days are in December, January and October, and the least foggy days are in April and June.

3.3.1.3 Land Use, Cultural Heritage and Nature Protection

The land where the DH facility is located belongs to the valley land types. The most important type of land in this group is fluvisol. This type of land is being converted to construction land, without adequate treatment of the surface humus layer.[7] The land on which the DH facility is located is categorized as urbanized land, according to the *Map for Urbanized Land and Constructed Units* from the Spatial Plan of the City of Banja Luka.[8]

Due to its long history, Banja Luka is rich in culture. There are several museums including the Museum of Bosanska Krajina, the Ethnographic Museum and the Museum of Modern Art of RS. One of the most famous cultural sites in Banja Luka is the cultural centre of "Banski Dvor" (Halls of the Ban) located about 2 km northwest from the DH facility. The mediaeval castle Kastel Fortress is located in the city centre, and is one of Banja Luka's main attractions. The fortress is located about 2 km west from the DH facility. All cultural attractions and objects (including sacral objects) are located about 2-3 km from the facility in the west, southwest and northwest direction.

There are no protected areas for conservation of nature or ecology in the city centre of Banja Luka, or in the proximity of the area where the facility is located. The closest protected areas are located in the rural areas of the city or out of the city, according to the *Local Environmental Action Plan for Banja Luka*.

3.3.1.4 Geomorphology and Geology

The area of Banja Luka belongs to the Pannonia rim and Inner Dinarides. General characteristics of the area are gradual rising of the relief from the Sava basin from the north to the south. The geomorphologic and geologic characteristics were analysed based on the *Geological Map* from the *Spatial Plan of the City of Banja Luka*[9] and based on the *General Geological Map of SFRY 1964-1969*.

The city is located at altitudes that range from 140 m a.s.l - coast of Vrbas - Zalužani to 1339 m a.s.l - Goli vis – Čemernica, while the central part of the city lies at an altitude of 163 m a.s.l. Banja Luka was developed on the southern edge of the Banja Luka valley, which extended into the southwest-northeast direction. The valley is surrounded by hills from the tertiary age. The valley is surrounded on the south side by the hill Starčevica (433 m), Ponir (589 m), Banj - brdo (403 m), Krčmarice (302m) and Šibovi on the southwest (333 m). Mountainous hills dominate the north, such as Motajica, Prosara, Kozara and between them is the Lijevće Field (90-100 m a.s.l). On the south-western and southern side of the territory of Banja Luka valley are the Manjača, Osmača, Tisovac and Čemernica mountains. Other geomorphologic forms in Banja Luka are: caves, abysses, etc. The Company is located on the left river terrace of Vrbas, and no other relevant geomorphologic forms are identified in the closer area.

The DH facility is geologically located on a lower terrace (t_1) formed during the Holocene geologic period. Other geologic forms in the near area are marlstones, clays and sandstones with melanopsis, and also flysch, breccias lime stones, marlstones and calci – rudites.

[6] *Ibid*.
[7] City of Banja Luka, Local Environmental Action Plan, Banja Luka, 2009
[8] Spatial Plan of the City of Banja Luka
[9] *Ibid.*

3.3.1.5 Ground Conditions

The ground conditions of the DH facility and the surrounding area consist of loose sedimentary soils that are mainly developed on lowland and flood plain deposits dominated by clay, sand stones and gravel.

3.3.1.6 Surface and Groundwater Quality

The territory of the city of Banja Luka is characterized by a hydrographical network of siliceous flysch terrain and karst hydrology. The hydrographical network consists of large and small rivers, and periodic and permanent streams that build two river basins: Vrbas and Sana.

Most of the area of the city belongs to the Vrbas River basin, which includes the eastern part with an area of 891 km², and a smaller part of Sana River basin, which includes the western part with an area of 342 km². The Vrbas River basin is the most important water resource in the western part of Republika Srpska, as three quarters of the city are located in its catchment area, and the longest tributaries of the region are Vrbanja and Suturlija. Vrbanja flows into the Vrbas River several hundred meters downstream from the location of the DH Company, from the south-east side.

The Vrbas River is characterized by three main areas:

- The upper course from the source to the city Jajce, with abrupt falls and relatively small flow, with the characteristics of a mountainous river stream and water quality of category I and II.
- Midstream from Jajce to Banja Luka, a deep limestone canyon with accentuated fall of the riverbed. Water quality is in the categories I and II.
- The lower course from Banja Luka to the estuary of the river flows through the alluvial flat land. It has the characteristics of lowland rivers, a small riverbed fall and a meandering course. Water quality of this part of the river belongs to the category II and III.

The Company is located in the area of the midstream of the river Vrbas, which means that the water quality of the nearest watercourse is in the categories I and II.

The area of Banja Luka is characterized by a large number of groundwater courses, which are pronounced during significant amounts of precipitation. However, no underground waters were identified at the location of the Company, but infiltration through alluvium deposits may cause contamination and change the water quality category.[10]

Based on the *Regulation on the Conditions for Discharging Wastewater into the Public Sewerage System*[11], the Company also undertakes measurements of water quality. The report on the results of measurements of physical and chemical features is shown in Table 1.

Table 1: *Report on the Results of Measurements of Physical and Chemical Features*[12]

Parameters	Established values	Reference value	Unit of measurement
pH	8.10	6.50-9.50	pH unit
$KMnO_4$	10.5	/	mg L^{-1}
Sediment after 0,5h sedimentation	0.3	≤5	mg L^{-1}
Total suspended solids	110	≤500	g m^{-3}
Electrical conductivity	404	/	µScm^{-1}
Ammonia	0.04	/	g m^{-3}
Nitrites	0.03	/	g m^{-3}
Nitrates	2.97	/	g m^{-3}
Manganese	<50	≤500	mg m^{-3}
Detergents	<50	≤10,000	mg m^{-3}
Lead, Pb	<10	≤500	mg m^{-3}
Cadmium, Cd	<10	≤50	mg m^{-3}
Arson, As	5	≤100	mg m^{-3}
Overall chrome, Cr	<10	≤1,000	mg m^{-3}

[10] City of Banja Luka, Local Environmental Action Plan, Banja Luka, 2009
[11] Official Gazette of RS, No. 44/01
[12] Measurements performed by the Institute of Public Health, Service for Sanitary Chemistry - laboratory for testing waste water

Parameters	Established values	Reference value	Unit of measurement
Sulphates	71.7	≤200	g m^{-3}

The established values of the parameters are within the referenced values, in accordance with the *Regulation on the Conditions for Discharging Wastewater into the Public Sewerage System*.

3.3.1.7 Air Quality

There is no continuous city-wide ambient air quality monitoring and measurement. Exceptions are measurements conducted for specific needs at certain locations. The most significant single source of air pollution in Banja Luka are the existing boiler houses at the facility, which is the reason why the Company undertakes regular measurements of pollutants, as shown in the tabular presentation of measured and calculated values of the process parameters and the concentration of pollutants and limit values of emissions for the measured emissions of air pollutants in accordance with the *Regulation on Measurements for Prevention and Reduction of Air Pollution and Air Quality Improvement*[13]. The measurements were undertaken in two boiler houses (boiler house 1 and boiler house 4).

The measurements in boiler house 1, were performed on 14 December 2015 between 12:22 and 12:28 hrs. During the measurement, fuel oil was used and the thermal power of the combustion chamber was 58 MW. The measured values are shown in Table 2.

Table 2: *Measured, Calculated and Threshold Values of the Concentration of Flue Gases for Boiler House 1*[14]

Pollutants					Emission thresholds for liquid fuels for large plants	
Compound	Chemical formula	Measurement unit	Measured concentration	Recalculated concentrations on 3% O_2	Official Gazette of RS, No. 3/15 and 51/15	
					Power of plant MW	ELV, mg/m^3
Oxygen	O_2	%	10.29	3		
Carbon dioxide	CO_2	%	8.10	-		
Carbon monoxide	CO	mg/m^3	5	8	≥50	
Sulphur dioxide	SO_2	mg/m^3	1,624	2,729	≥50	1,700
Nitrogen oxides	NO_x	mg/m^3	389	654	50-500	450

The measurements in boiler house 4, were performed on 14 December 2015 between 13:07 and 13:13 hrs. During the measurement, fuel oil was used and the thermal load of the combustion chamber was 58 MW. The measured values are shown in Table 3.

Table 3: *Measured, Calculated and Threshold Values of the Concentration of Flue Gases for Boiler House 4*[15]

Pollutants					Threshold values for liquid fuels for large plants	
Compound	Chemical formula	Measurement unit	Measured concentration	Recalculated concentrations on 3% O_2	Official Gazette of RS, No. 3/15 and 51/15	
					Power of plant MW	ELV, mg/m^3
Oxygen	O_2	%	11.37	3		
Carbon dioxide	CO_2	%	7.34	-		
Carbon monoxide	CO	mg/m^3	3	6	≥50	
Sulphur dioxide	SO_2	mg/m^3	1,470	2,746	≥50	1,700
Nitrogen oxides	NO_x	mg/m^3	385	720	50-500	450

The main pollutants emitted include nitrogen oxides (NO_x), solid particles (particulate matter (PM)) and sulphur oxides (SO_x).

[13] Official Gazette of RS, No. 3/15 and 51/15
[14] Report on Measurement of Emissions of Air Pollutants, measured by the Institute of Protection, Ecology and Informatics of RS
[15] *Ibid*.

In addition to air emissions from the Company, traffic and in particular burning of wood in private households contribute to poor ambient air quality in Banja Luka, particularly during the heating season. There are, however, no calculations or measurements available for emissions from transportation and private households.

Table 60 and Table 61 provide a detailed calculation of the current emissions of pollutants due to the operation of the Company. The proposed project, once implemented, is not expected to have any or have marginal negative impacts on air quality in Banja Luka. However, fully implemented, it should have a positive impact due to reduction of particularly SO_2 emissions. In addition, the greenhouse gas contribution will be reduced.

Pursuant to the *Law on Air Protection*[16], the Company undertakes regular measurements of ambient air quality, which is summarized in a report. The report lists the following average daily values of pollutants, measured between 17 and 18 December 2015.

Table 4: *Daily Average Concentration of Pollutants in location of Central Boiler House* [17]

Pollutant	Date	Minimum average daily concentration (µg/m^3)	Maximum average daily concentration (µg/m^3)	Daily average concentration (µg/m^3)	Threshold value(µg/m^3)	Tolerated value (µg/m^3)
SO_2	17-18 February 2016	15.19	96.91	32.68	125	125
NO_2	17-18 February 2016	12.15	38.48	22.26	85	119,28
CO	17-18 February 2016	493.72	1,253.76	851.89	5,000 (5 mg/m^3)	9,280 (9,28 mg/m^3)
O_3	17-18 February 2016	57.47	100.41	76.98	120	-
PM 10	17-18 February 2016	25.90	86.40	60.10	50	71.40

As shown in Table 4, the measured values do not exceed the threshold (limit) values.

Following is table with results of continues measurement of concentration of Pollutants in Borik settlement which is approximately 1,2 km away from central Boiler House. The table lists concentration of pollutants in December 2015.

Table 5: *Results of continues measuring of air pollution in location of Borik settlement in December 2015*[18]

Analysed pollutants	CO (mg/m^3)	SO_2 (µg/m^3)	O_3 (µg/m^3)	NO (µg/m^3)	NO_2 (µg/m^3)	NO_X (µg/m^3)	Char (µg/m^3)	P 2,5 (µg/m^3)	P 10 (µg/m^3)
Nr. of measurements	31	31	31	31	31	31	31	31	31
Average monthly concentration	2.727	31.987	41.585	23.042	42.983	66.026	23.963	28.490	47.484
Minimal average daily concentration	1.526	21.852	31.200	15.836	31.752	48.543	14.810	17.609	29.349
Maximum average daily concentration	4.092	42.127	55.261	32.589	57.080	88.020	34.580	41.248	68.747
Quality category	I	I	-	-	I	-	-	-	II

Taking in consideration proximity of Central Boiler House and Borik it is expected that air quality in Borik is significantly affected by emissions of pollutants from Central Boiler House.

[16] Official Gazette of RS, No. 53/02

[17] Report on Measurement of Emissions of Air Pollutants, measured by the Institute of Protection, Ecology and Informatics of RS

[18] http://www2.banjaluka.rs.ba/static/uploads/clanci/2016/02/aerozagedjenja.pdf accessed on 31/03/2016

3.3.1.8 Noise

The main noise sources in Banja Luka are road traffic, construction machinery used for public works, industry, machinery and vehicles for urban areas management, and sport activities, concerts, amusement parks, alarm systems, etc.[19]

Based on the *Regulation on Permissible Levels of Noise*[20], the Company undertakes regular measurements of noise. The testing of noise levels in the environment is carried out in locations within the immediate vicinity of the DH facility. The measured noise levels and the values are given in the table below, whereas the measurement points are shown on the map.

Table 6: *Measured Noise Levels and Allowed Values*[21]

Measurement parameters	Measurement point 1	Measurement point 2	Measurement point 3	Measurement point 4	Measurement point 5	Allowed values in accordance with the Law
Noise dB (A)	58.2	59.5	54.1	60.2	61.3	70 dB (A)

As shown in Figure 1: **District Heating Supply Area** and Figure 3: **Location of Noise Measurement Points**, the measured noise levels are below the threshold values.

Figure 3: *Location of Noise Measurement Points*[22]

3.4 Socio-economic Analysis

In order to determine the consumer affordability of the heating costs, it is necessary to review the main socio-economic parameters of the population and household consumption in the Banja Luka region. The affordability analysis will measure the extent to which households can afford to pay their heating bills after the implementation of all rehabilitation and modernization measures on the district heating (DH) system in the City of Banja Luka.

The socio-economic analysis is based on the official data provided by the Institute of Statistics of Republika Srpska, as well as the preliminary results of the Census of Population, Households and Dwellings in BiH 2013, issued by the Agency for Statistics of BiH, together with other data collected through desk - research/study.

[19] City of Banja Luka, Energy Strategy of Republika Srpska until 2030, Banja Luka, 2012
[20] Official Gazette of SRBiH, No. 46/89
[21] Records of Testing Noise Levels in the Environment Surrounding the Company, measured by the Institute of Protection, Ecology and Informatics of Banja Luka
[22] *Ibid*.

3.4.1.1 Population Analysis

According to the 1991 Census, the City of Banja Luka had 195,692 inhabitants. Based on the preliminary results of the Census of Population, Households and Dwellings in BiH 2013, the City has 199,191 inhabitants, 65,225 homes and 87,986 apartments. The City has 53 settlements, with a total area of 1,239 km^2. Given the area, as well as the number of inhabitants according to the preliminary results, the population density is 160.76 inhabitants per km^2.

The largest share of population, households and dwellings is concentrated in the urban area of Banja Luka, which is a part of the City of Banja Luka. Urban areas of Banja Luka are partly covered by the DH system. The share of population, households and dwellings in urban areas compared to the wider area of the City is presented in the figure below.

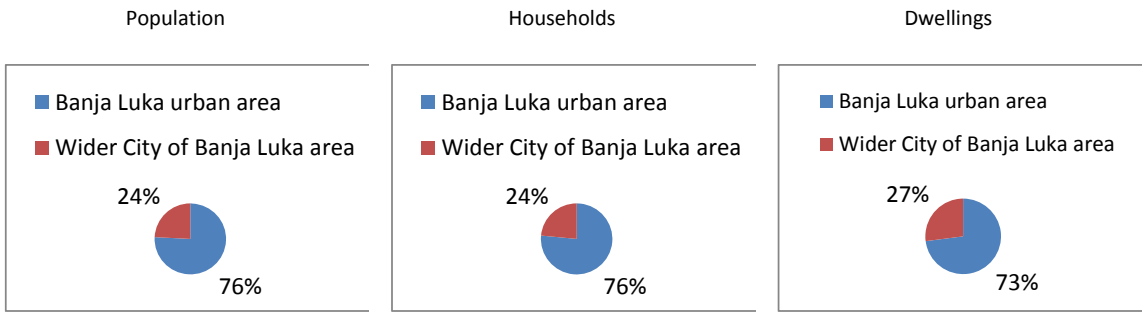


Figure 4: *Share of Population, Households and Dwellings in the Urban Areas of the City of Banja Luka in Relation to the Wider Area of the City*

The total population in the City increased in 2014 due to natural population growth (difference between birth rate and death rate) by 721 inhabitants in comparison with 2010.

According to available data provided by the Institute of Statistics of RS[23], Banja Luka has a greater number of immigrants than emigrants, and most of the migration movement was en route from other municipalities of RS to the City of Banja Luka. The total population of the City increased in 2014 due to migration (positive difference between immigrants and emigrants) by 4618 inhabitants in comparison with 2010.

Taking into account the population growth, migration balance, as well as the number of inhabitants in 2010 (deducted by natural increase and migration balance of total population in 2013), it is evident that the population of the City of Banja Luka increased in the period 2010 - 2014 at an average rate of 0.5%.

[23] Institute of Statistics of RS, Demographic Statistics, Bulletin 18, 2nd, corrected release, 2015

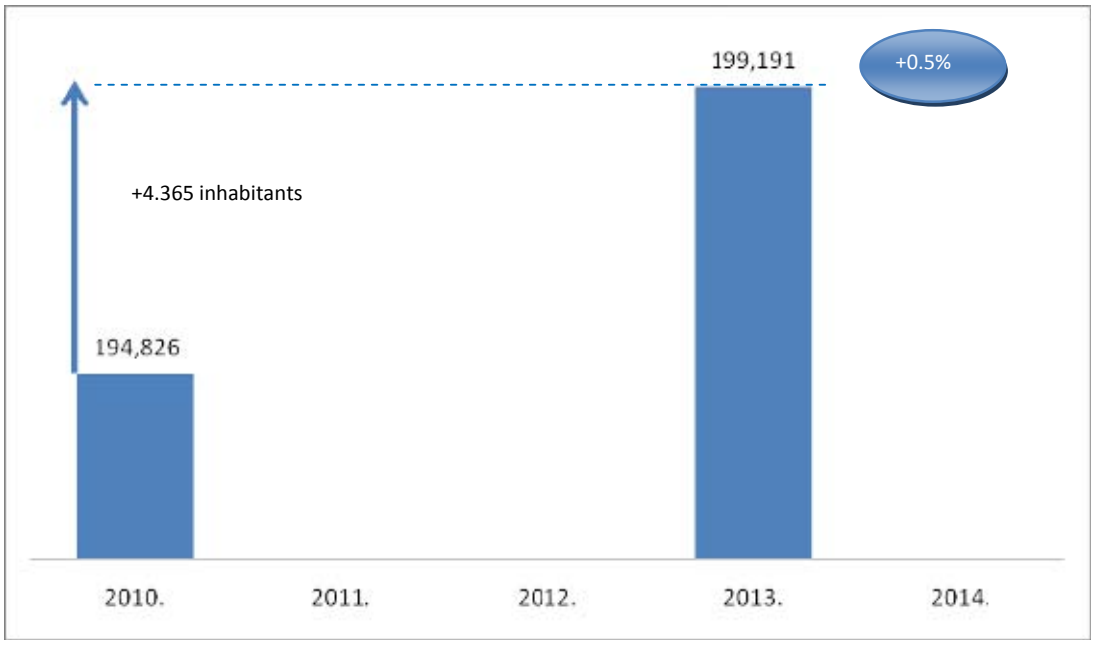


Figure 5: *Population Growth in the City of Banja Luka from 2010 to 2014*

According to the Development Strategy of the City of Banja Luka[24], the City should develop to accommodate a comfortable life for up to 300,000 people through:

- Balanced urban and rural development, as well as balanced development of the urban part of the City, and a housing shift from the city centre to the suburbs;
- Creating conditions for demographic renewal of the City in terms of a favourable age structure, which may only take place within the context of rapid economic development and revitalization of the entire area of the City, as an integral part of these processes;
- The settlement of rural areas with working age and reproductive age population;
- Enhanced relations of the City with the Diaspora;
- Continued development of human resources.

Given the average rate of population growth and other analysed demographical data, measures on rehabilitation and modernization of the DH system in the City of Banja Luka must be aligned with the stated rates and projected population growth.

3.4.1.2 Household Income and Expenditure Analysis

According to data published by the City of Banja Luka[25], the City had a total of 61,821 employed persons on 31/12/2014, whereas the number of unemployed persons was 17,598[26]. The average monthly net salary in the City in 2014 was 956 BAM, which is 15.8% higher than the average salary in RS.

Table 7: *Average Net Salaries in RS and the City of Banja Luka*

	2010	2011	2012	2013	2014
RS average	784	809	818	808	825
Banja Luka average	908	935	954	939	956

The size of the average household in the City is 3.05 household members.

[24] Development Strategy of the City of Banja Luka for 2007 – 2015, April 2008, pg. 54
[25] http://www2.banjaluka.rs.ba/static/uploads/clanci/2015/03/demografska_slika.pdf , accessed on 09/03/2016
[26] *Ibid*.

According to data from 2015, the consumer basket[27] for a family of four in RS amounted to 1.862,29 BAM[28]. The following table shows the percentage of monthly expenditures (including energy expenditures) and the rest (rural) areas in RS[29].

Table 8: *Average Expenses by Category of Expenses*

Category of expenses	Value (BAM)			Structure (%)		
	Total	Urban areas	Other areas	Total	Urban	Other
Total	1,381.46	1,510.48	1,299.38	100.0	100.0	100.0
Total – food and beverages	469.18	462.48	473.45	34.0	30.6	36.4
Total – non-food products	912.27	1048.00	825.93	66.0	69.4	63.6
Electrical energy, gas, water, other fuels	127.93	139.55	120.53	9.3	9.2	9.3

The above presented data show that that the average urban four-person household has an average monthly energy expenditure of 9.2%. According to estimates of the Institute of Statistics of RS[30], 19.5% of the population lives in relative poverty, and every sixth household is poor. The threshold of relative poverty is 416.40 BAM (212.9 EUR) of monthly income. According to the methodology of the World Bank (WB), 15% of households in BiH live below the absolute poverty line[31]. The threshold of absolute poverty is 235 BAM.

3.4.1.3 Consumer Affordability Analysis

Customer affordability is estimated in order to determine the financial capacity of households for payment of heating bills. As defined by the Organization for Economic Cooperation and Development (OECD), a household does not have the ability to pay bills for heating if the amount of the average bill payment would make a substantial impact on the ability of such household to buy essential foodstuffs and services (food, health, education). According to the general criteria used by international financial institutions for expenditure of households in Europe, households should not spend more than 10% of their average monthly income on heating bills[32].

The following table provides an overview of the elements of average monthly household income in the City of Banja Luka in 2014.

Table 9: *Average Monthly Household Income in the City of Banja Luka in 2014*

No.	Category	Amount
1.	Total amount of tenants	199,191
2.	Total amount of households	65,255
3.	Average number of household members	3.05
4.	Total number of employed persons	61,821
5.	Total number of pensioners	29,631
6.	Average net monthly wage (BAM)	956
7.	Average monthly pension (BAM)	342.68
8.	Average number of employed household members	0.94
9.	Average number of pensioners household members	0.45
10.	Average monthly income per household (BAM)	1,052.54

It should be noted that the above mentioned monthly household income does not include additional sources of revenue, including unofficial salaries of employees (service contracts, etc.), gifts, the grey market, etc. Considering that the calculation of the monthly income of households is based solely on official data, it may be expected that the real monthly incomes are higher than those presented in the table above.

[27] A sample of consumer goods and services used to track prices
[28] Federation of Labor Union RS
[29] Institute of Statistics of RS, Household Budget and Poverty Survey in RS in 2011, 3rd corrected release, 2013
[30] *Ibid*.
[31] Report on Progress of the Realization of Millennium Development Goals in BiH, UNDP, 2012
[32] Can poor consumers pay for energy and water? An affordability analysis for transition countries, Working paper No. 92, May 2005

In order to assess the consumer power in the City of Banja Luka, it is necessary to compare the average monthly household income with the monthly heating expenditures. Given that there are no data on household heat consumption; estimates were calculated on the basis of the average amount that consumers have been paying to the Company in 2015.

Table 10: *Estimated Consumption of Thermal Energy Delivered to Final Consumers Where the Payment Calculation is made per MWh and m^2*

Overview of estimated thermal energy consumption delivered to consumers, calculation made per MWh	
Number of consumers	4,277
Delivered energy per MWh	15,454
Total area per m^2	235,721
Average size of the apartment (m^2)	55.11
Consumption of thermal energy per m^2 (MWh)	0.065
Annual consumption per m^2 in BAM (excluding VAT)	7.50
Price of MWh in BAM (excluding VAT)	114.38
Average bill in BAM (with fixed charge and VAT)	58.86

Overview of estimated thermal energy consumption delivered to consumers, calculation made per m^2	
Number of consumers	14,802
Delivered energy per MWh	115,333
Total area per m^2	771,999
Average size of the apartment (m^2)	52.16
Consumption of thermal energy per m^2 (MWh)	0.15
Annual consumption per m^2 in BAM (excluding VAT)	16.92
Price of MWh in BAM (excluding VAT)	114.38
Average bill in BAM (with fixed charge and VAT)	103.75

The monthly costs for thermal energy per household in Banja Luka, presented as a percentage of average net household income, amounted to 5.59% for households where the calculation is made per MWh, and 9.86% at the upper limit of affordability for households where the calculation is made per m^2, respectively.

The segment of the population with a net monthly income lower than 235 BAM faces difficulties in paying the heating bills; hence, this issue has to be taken into account in the context of the social security system in the country. On the other hand, since the calculated household income does not include unofficial sources of income, it may be reasonably expected that the degree of accessibility is higher than presented in the table above.

3.5 Policy/Regulatory Framework for District Heating Operations

3.5.1 International Commitments of Bosnia and Herzegovina

3.5.1.1 United Nations Framework Convention on Climate Change (UNFCC) and the Kyoto Protocol

BiH signed the *UNFCCC* in 2000 and the *Kyoto Protocol* to the UNFCCC in 2008. As a non-Annex I country, BiH has general obligations under the UNFCCC, and should fulfil those general obligations to be eligible for technical and economic assistance.

BiH has to date fulfilled the following UNFCCC requirements:

- adopted the *Climate Change Adaptation and Low Emission Development Strategy for BiH* (2013),
- adopted the *Initial and Second National Communication on Climate Change* (2009 and 2013 respectively),
- established the Designated National Authority for implementation of the Clean Development Mechanism in the Kyoto Protocol, and
- prepared the First Biennial Update Report (FBUR) of BiH under the UNFCCC (2014),
- submitted in October 2015 to the Conference of the Parties its Intended Nationally Determined Contributions (INDC) towards achieving the objective of the Convention as set out in its Article 2.

The *Initial and Second National Communication on Climate Change* concluded that the major source of CO_2 emissions in BiH is the energy sector. The *Second National Communication on Climate Change* states that:

- The energy sector is responsible for more than 70% of total CO_2 emissions in BiH, and therefore has the greatest potential for GHG emissions reduction and climate change mitigation by improving energy efficiency in energy generation, distribution and end use, and by introducing technologies based on renewable sources of energy,
- In the majority of BiH, DH companies, heating plants and accompanying equipment are predominantly 25 to 30 years old. In Banja Luka (the second biggest DH system in BiH), the average age of boilers is close to 35 years old, and they will soon reach the end of their expecting operating lifetime. This places the modernization of Banja Luka's DH system among some of the major national priorities.

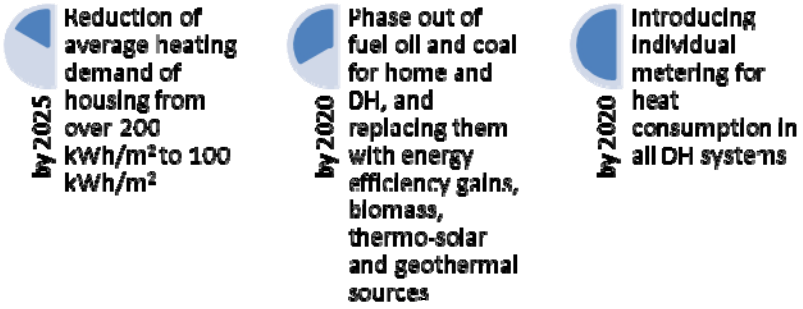
The *Second National Communication on Climate Change* also contains measures and priority actions for reducing CO_2 emissions from the DH sector in BiH for the period 2010-2025, which include:

- increasing the capacities of the existing DH system,
- improving the efficiency of the systems by optimizing their operations,
- expansion of heating networks.

Measures for improving the DH network infrastructure include pipeline repairs and replacement of old distribution networks in critical areas with insulated pipes, as well as reconstruction of steam pipes and heat and hot water pipelines.

According to the *Climate Change Adaptation and Low Emission Development Strategy for BiH*, 4 sectors were identified as priority sectors, among which are DH and energy efficiency in buildings. The Strategy states that maintenance and investment in the functioning DH has been low, leading to obsolete technologies, and low efficiency and large heat losses on the network. There is almost no regulation in this sector and only a few examples of individual heat metering in the country, while DH providers are struggling with many customers who are not paying their bills.

The Strategy also sets objectives for the DH sector for the period 2013-2025, among which are:



According to BiH's submitted INDC as mentioned above, in line with the trend of consumption and energy production growth, as a result of development of the country, total emissions also have an upward trend. According to the developed scenarios - their peak occurs in 2030; according to the baseline scenario (BAU) in 2030 expected emissions are 20% higher than the level of emissions in 1990. Emission reduction that BiH unconditionally might achieve, compared to the BAU scenario, is 2% by 2030 which would mean 18% higher emissions compared to the base year 1990. Significant emission reduction is only possible to achieve with international support, which would result in emission reduction of 3% compared to 1990, while compared to the BAU scenario it represents a possible reduction of 23%.

3.5.1.2 Energy Community (EnC)

BiH is a member of the EnC and a signatory of the EnC Treaty[33], thus required to adopt the core EU energy legislation.

[33] An international treaty signed in October 2005 by the EU on one hand, and countries from the South East Europe and Black Sea region on the other hand

The requirements set forth by *EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources* have been introduced into the EnC legislation through Decision 2012/04/MC-EnC of the EnC Ministerial Council, which stipulates the binding national targets to be achieved through the use of renewable energy in the electricity, heating and cooling, and transport sectors by 2020. BiH has a renewable energy target of 40 % by 2020 compared to 34 % of energy in 2009.

Furthermore, BiH was also required to submit its *National Renewable Energy Action Plan* (NREAP) to the EnC Secretariat by 30 June 2013[34]. However, BiH has not adopted its NREAP to date. FBiH and RS adopted their own Renewable Energy Action Plans (REAPs) in 2014. The Ministry of Foreign Trade and Economic Relations is currently preparing the NREAP which should include the REAPs of both entities and of Brčko District.

The relevant EU directives on energy efficiency introduced by the EnC include:

- *Directive 2006/32/EC on energy end-use efficiency and energy services* which strives for the adoption of an indicative energy savings target of 9% for the ninth year of application of this Directive, and the development of National Energy Efficiency Action Plans (NEEAPs),
- *Directive 2010/31/EU on energy performance of buildings* which provides the legal framework for setting minimum energy performance requirements for new and existing buildings,
- *Directive 2010/30/EU on the indication by labelling and standard product information of the consumption of energy and other recourses by energy-related products*,
- *Directive 2012/27/EU on energy efficiency* which sets binding energy efficiency targets and contains specific prescriptions related to the DH sector: by 30 November 2018, Contracting Parties must carry out and notify to the EnC Secretariat a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient DH and cooling. Contracting Parties must also ensure that final DH customers are provided with competitively priced individual meters that accurately reflect the end customers' actual energy consumption,
- *Directive 2001/80/EC of the European Parliament on the limitation of emissions of certain pollutants into the air from large combustion plants* which applies to combustion plants with nominal thermal input of 50 MW or more, regardless of the type of fuel (solid, liquid or gaseous). As of January 1, 2016, this Directive was superseded by *Directive 2010/75/EC on industrial emissions* – IE Directive or IED which integrates Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control, Directive 2000/76/EC of the European Parliament and of the Council on the incineration of waste, 2001/80/EC of the European Parliament and the Council on the limitation of emissions of certain pollutants into the air from large combustion plants, Directive 1999/13/EC of the European Parliament and the Council on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations, Council Directive 78/176/EEC on waste from the titanium dioxide industry, Council Directive 82/883/EEC on procedures for the surveillance and monitoring of environments concerned by waste from the titanium dioxide industry and Council Directive 92/112/EEC on procedures for harmonizing the programs for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry.

3.5.2 Policy Framework

There is currently no common energy strategy or policy (including the DH sector) at the level of BiH. According to the Constitution BiH, the entities are fully autonomous in defining their energy policies, regulations and procedures, and energy issues fall under responsibility of the two entities, while the state government institutions only coordinate this work including relationships with international and regional bodies and programs.

3.5.2.1 National Energy Efficiency Action Plan (NEEAP)

Following the requirements of the *Directive 2006/32/EC on energy end-use efficiency and energy services*, BiH prepared its first NEEAP, focusing on the period 2010-2018, providing the overall target for 2018 as well as intermediate targets for 2012 and 2015, but the NEEAP has not yet been adopted to date by national authorities[35].

[34] As required by Decision 2012/04/MC-EnC of the EnC Ministerial Council

[35] The draft NEEAP consists of entity level energy efficiency action plans (EEAPs). However, it could not be adopted to date as the draft EEAP of FBiH was not adopted due to the lack of a law on energy efficiency at FBiH level. NEEAP was

NEEAP establishes the national indicative targets on reduction of final energy consumption based on the baseline final energy consumption. A reduction of 9% of final energy consumption, its average value for the period 2006-2010, should be achieved by the end of 2018 (as required by Directive 2006/32/EC), which means that the country should ensure energy savings in the amount of 12.47 PJ, including 3.77 PJ energy savings for RS and 8.33 PJ for FBiH. Moreover, in order to implement the targets, NEEAP establishes a list of programs/measures to be implemented within the given period: among the measures for improvement of energy efficiency which will contribute to reach the indicative saving targets developed by NEEAP are also measures regarding energy efficiency in buildings and introduction of meters for consumers of DH services.

The level of energy savings in the residential sector in BiH expressed in energy units is shown in the figure below. It is expected to achieve energy savings of 5.25 PJ by the end of the period.

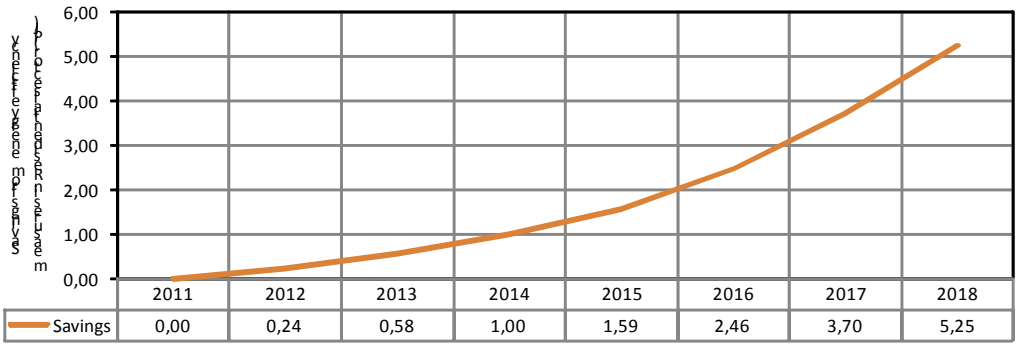


Figure 6: *Savings from Planned EE Measures (PJ) in the Residential Sector in BiH*

The level of energy savings in the residential sector in RS expressed in energy units is shown in the figure below. It is expected to achieve energy savings of 1.75 PJ by the end of the period.

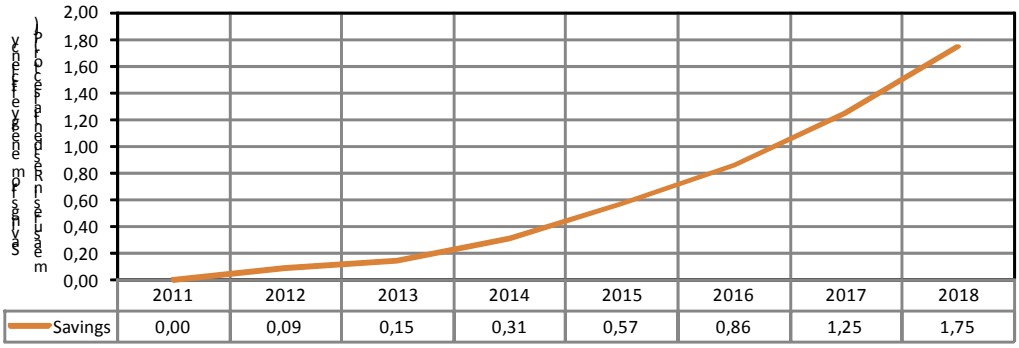


Figure 7: *Savings from Planned EE Measures (PJ) in the Residential Sector in RS*

Energy efficiency improvement measures in the residential sector are shown in the table below.

Table 11: *Overview of Energy Efficiency Improvement Programs and Measures in Households*

Title of the program/measure	Overall energy savings expected in 2012/ 2018 (PJ)		
	BiH	RS	FBiH
Minimum Equipment Energy Performance standards	0.012/0.26	0.04/0.09	0.08/0.17
Renovation of existing residential buildings and individual houses	0.084/1.84	0.032/0.64	0.052/1.20
Energy-efficient construction of new buildings	0.084/1.84	0.032/0.64	0.052/1.20
Energy-efficient heating systems	0.024/0.53	0.009/0.18	0.016/0.35

nevertheless considered in the framework of this analysis as it provides a basis for comparison of savings from planned EE measures at state level and RS level.

Title of the program/measure	Overall energy savings expected in 2012/ 2018 (PJ)		
	BiH	RS	FBiH
Compulsory division and calculation of heating costs in multi-dwelling and other buildings according to actual consumption	0.024/0.53	0.009/0.18	0.016/0.35
Domestic generation of renewable energy	0.012/0.26	0.04/0.09	0.08/0.17
Total for Residential Sector	0.24/5.25	0.09/1.75	0.16/3.43

3.5.2.2 Energy Development Strategy of RS until 2030

This Strategy was adopted by the National Assembly of RS in March 2012. According to the Strategy, DH plants in RS use out-dated and inefficient boilers and are in need of urgent renovation and reconstruction of the boiler houses. Network systems are not well maintained and experience high transmission and distribution heat losses. In addition to these technical issues, public enterprises owning and operating the DH plants are facing financial problems preventing them from investing in new technologies.

The Strategy states that the operation of the DH sector must be legally regulated in order to achieve economically sustainable position and financial stability of DH companies. In particular, the following issues must be regulated: general conditions of production, transmission, distribution and supply of heat energy, procurement of energy sources, planning and management of energy balances and security of supply of heat energy, introduction of measurement, control, management and charging of heat energy according to the actual consumption of individual consumer (leaving flat-rate calculation), which will stimulate increase of energy efficiency on the demand side.

The Strategy further states that the development of DH sector will be affected by gasification of RS. The development of highly-efficient gas cogeneration in Banja Luka is planned, as well as the gradual replacement of fuel oil with gas. The development of the DH system can take place within existing and future electricity distribution companies, as they represent well organized systems. Development of smaller gas cogeneration systems in urban areas are envisaged as well as the use of biomass and geothermal energy. The Strategy also contains measures for energy efficiency in buildings as a measure for decreasing the energy demand.

The building sector in RS (which includes households and the service sector) is the greatest consumer of final energy, with a total share of 51.8% of final energy consumption in 2005, i.e. 26.58 PJ (46.9% households and 4.9% service sector). The expected consumption in the sector without the implementation of EE measures would be 43.30 PJ in 2030, compared to 37.40 PJ with the implementation of such measures in residential and non-residential buildings. The successful implementation of EE measures in the building sector of RS will be based on:

- amendments of the legal framework and compliance with EU legislation,
- increase of the obligatory level of thermal protection of existing and new buildings,
- increase of the efficiency of heating, cooling, ventilation and air conditioning systems,
- increase of the efficiency of lighting systems and energy consumers,
- energy audits and energy management in existing and new buildings,
- setting the target value of total annual consumption of building per m^2 or m^3,
- introducing the energy certificate and adoption of an unified methodology for energy audits of buildings,
- education and promotion of measures to increase EE.

3.5.2.3 Action Plan for Use of Renewable Energy Sources of RS

The Action Plan[36] was developed and adopted by the RS Government in accordance with the *Law on Renewable Energy Sources and Efficient Co-generation*[37]. The Action Plan sets objectives for participation of energy from renewable energy sources (RES) in the gross final energy consumption by sector as well as the measures for achieving these objectives, including:

[36] Official Gazette of RS, No. 45/14
[37] Official Gazette of RS, No. 39/13, 108/13 and 79/15

- Specific measures for the fulfilment of the requirements of Articles 13, 14, 16 and Articles 17 to 21 of Directive 2009/28/EC,
- Support schemes to promote the use of RES in electricity,
- Support schemes to promote the use of RES in heating and cooling,
- Support schemes to promote the use of RES in transport,
- Special measures to promote the use of energy from biomass,
- Planned use of statistical transfers between countries and planned participation in joint projects.

The Action Plan also defines the amount of electricity generated from RES or in efficient co-generation facilities (quotas) from 2009 to 2020. Table 12 below presents the quotas of electricity to be produced from RES in RS from 2014 to 2020. Table 13 presents quotas of electricity produced in efficient co-generation facilities in RS from 2014 to 2020. Table 14 presents quotas of electricity produced from solar facilities and biomass plants according to the Action Plan from 2014 to 2020.

Table 12: *Amount of Electricity Produced from RES Eligible for Incentives according to the Action Plan for Use of Renewable Energy Sources of RS from 2014 to 2020*

	Amount of electricity produced from renewable sources of energy eligible for incentives according to the Action Plan for Use of Renewable Energy Sources of RS from 2014 to 2020.													
	2014		**2015**		**2016**		**2017**		**2018**		**2019**		**2020**	
	MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Hydro	**32.06**	**149.55**	**37.97**	**175.23**	**49.09**	**224.83**	**60.71**	**276.99**	**71.87**	**326.24**	**94.81**	**428.76**	**112.36**	**507.12**
< 1MW	3.00	13.50	4.70	21.30	6.86	30.90	9.60	43.20	11.95	53.78	14.90	67.20	17.88	80.50
1 MW - 5 MW	23.36	110.40	27.32	128.35	35.54	164.60	43.76	200.87	51.98	237.23	68.62	309.99	81.10	364.50
5MW - 10 MW	5.70	25.65	5.95	25.58	6.69	29.33	7.35	32.92	7.94	35.23	11.29	51.57	13.38	62.12
Solar photovoltaic cells	**3.00**	**3.60**	**3.25**	**3.90**	**3.45**	**4.14**	**3.65**	**4.38**	**3.85**	**4.62**	**4.05**	**4.86**	**4.20**	**5.00**
Wind	**30.00**	**60.00**	**35.00**	**70.00**	**45.00**	**90.00**	**55.00**	**110.00**	**65.00**	**130.00**	**85.00**	**170.00**	**100.00**	**200.00**
Biomass	**4.95**	**13.37**	**5.78**	**15.60**	**7.43**	**20.05**	**9.08**	**24.51**	**10.73**	**28.97**	**14.03**	**37.88**	**16.50**	**44.56**
-solid	3.00	8.87	3.50	10.35	4.50	13.30	5.50	16.26	6.50	19.22	8.50	25.13	10.00	29.56
-bio-gas	1.95	4.50	2.28	5.25	2.93	6.75	3.58	8.25	4.23	9.75	5.53	12.75	6.50	15.00
-bio-liquids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total RES	**70.01**	**226.52**	**82.00**	**264.73**	**104.97**	**339.02**	**127.44**	**415.88**	**150.41**	**489.83**	**196.35**	**641.50**	**233.06**	**756.68**

Table 13: *Amount of Electricity Produced in Efficient Co-generation Facilities Eligible for Incentives according to the Action Plan for Use of Renewable Energy Sources of RS from 2014 to 2020*

	Amount of electricity produced in efficient co-generation facilities eligible for incentives according to the Action Plan for Use of Renewable Energy Sources of RS from 2014 to 2020													
	2014		**2015**		**2016**		**2017**		**2018**		**2019**		**2020**	
	MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Fossil fuels	10.05	41.83	11.73	48.80	15.08	62.75	18.43	76.69	21.78	90.63	28.48	118.52	33.50	139.44
-solid	0.96	5.37	1.12	6.27	1.44	8.06	1.76	9.85	2.08	11.64	2.72	15.22	3.20	17.91
-gas	9.09	36.46	10.61	42.53	13.64	54.69	16.67	66.84	19.70	78.99	25.76	103.30	30.3	121.52
Landfill gas	2.70	3.55	3.15	4.14	4.05	5.32	4.95	6.50	5.85	7.68	7.65	10.05	9,00	11.82
Total	**12.75**	**45.38**	**14.88**	**52.94**	**19.13**	**68.07**	**23.38**	**83.19**	**27.63**	**98.31**	**36.13**	**128.57**	**42.50**	**151.26**

Table 14: *Amount of Electricity Produced in Solar Facilities and Biomass Plants Eligible for Incentives According to the Action Plan for Use of Renewable Energy Sources of RS from 2014 to 2020*

		Amount of electricity produced in solar facilities and biomass plants eligible for incentives according to the Action Plan for Use of Renewable Energy Sources of RS and their realization													
		2014		**2015**		**2016**		**2017**		**2018**		**2019**		**2020**	
		MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Electricity under incentives according to the Action Plan of RS (1)	**Solar facilities with the photovoltaic cells**	3.00	3.60	3.25	3.90	3.45	4.14	3.65	4.38	3.85	4.62	4.05	4.86	4.20	5.00
Entitled to incentives (2)	**Solar facilities with the photovoltaic cells**	0.47640	0.558877	1.07084	1.296702	0.82119	0.959877	0.82119	0.959877	0.82119	0.959877	0.82119	0.959877	0.82119	0.959877
Obtained preliminary entitlement to incentives (3)	**Solar facilities with the photovoltaic cells**	1.57	1.604972	2.84	3.801879	2.84	3.801879	2.84	3.801879	2.84	3.801879	2.84	3.801879	2.84	3.801879
Remaining amount of electricity which could be entitled to incentives (4)=(1)-(2)-(3)	**Solar facilities with the photovoltaic cells**	**0.9572**	**1.436151**	**-0.66**	**-1.20**	**-0.21**	**-0.62**	**-0.01**	**-0.38**	**0.19**	**-0.14**	**0.39**	**0.10**	**0.54**	**0.24**
Entitled to incentive, but waiting for	**Solar facilities with the**	0.00	0.00		1.1986	0.00		0.00	0.3818	0.00	0.1418	0.00	0.00	0.00	0.00

available amount of electricity under incentives	**photovoltaic cells**													
Electricity under incentives according to the Action Plan of RS (1)	**BIOMASS**	4.95	13.37	5.78	15.60	7.43	20.05	9.08	24.51	10.73	28.97	14.03	37.88	16.50	44.56
	-solid	3.00	8.87	3.50	10.35	4.50	13.30	5.50	16.26	6.50	19.22	8.50	25.13	10.00	29.56
	-bio-gas	1.95	4.50	2.28	5.25	2.93	6.75	3.58	8.25	4.23	9.75	5.53	12.75	6.50	15.00
	-bio-liquids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Entitled to incentives (2)	**BIOMASS**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-solid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-bio-gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-bio-liquids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Obtained preliminary entitlement to incentives (3)	**BIOMASS**	0.00	0.00	0.00	0.00	0.99	6.75	0.99	8.25	0.99	8.27	0.00	0.00	0.00	0.00
	-solid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-bio-gas	0.00	0.00	0.00	0.00	0.99	6.75	0.99	8.25	0.99	8.27	0.00	0.00	0.00	0.00
	-bio-liquids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
The remaining amount of electricity which could be entitled to incentives (4)=(1)-(2)-(3)	**BIOMASS**	**4.95**	**13.37**	**5.78**	**15.60**	**6.44**	**13.30**	**8.09**	**16.26**	**9.74**	**20.70**	**14.03**	**37.88**	**16.50**	**44.56**
	-solid	**3.00**	**8.87**	**3.50**	**10.35**	**4.50**	**13.30**	**5.50**	**16.26**	**6.50**	**19.22**	**8.50**	**25.13**	**10.00**	**29.56**
	-bio-gas	**1.95**	**4.50**	**2.28**	**5.25**	**1.94**	**0.00**	**2.59**	**0.00**	**3.24**	**1.48**	**5.53**	**12.75**	**6.50**	**15.00**
	-bio-liquids	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Entitled to incentives, but waiting for available amount of electricity under incentives	**BIOMASS**	0.00	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-solid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-bio-gas	0.00	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-bio-liquids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.5.2.4 Energy Efficiency Action Plan (EEAP) of RS

The EEAP for the period until 2018[38] was adopted in 2013 by the RS Government. It was prepared according to the *Law on Energy Efficiency*[39] by the Ministry of Industry, Energy and Mining and the Ministry of Spatial Planning, Civil Engineering and Ecology, in cooperation with the Ministry of Finance and the Environmental Protection and Energy Efficiency Fund of the RS.

The EEAP includes:

- an assessment of state of energy efficiency in the period immediately prior to the adoption of the EEAP,
- energy efficiency improvement measures,
- indicative energy savings targets,
- timetable for implementation of measures for achieving indicative targets,
- estimation of financial resources necessary for the implementation of the EEAP.

According to the EEAP, the overall energy savings target is 3.77 PJ / 90 ktoe (9%) to be achieved in 2018, with two intermediate targets: 0.2 PJ in 2012 and 1.4 PJ in 2015. The energy savings targets for the residential sector are 0.09 PJ by 2012, 0.57 PJ by 2015 and 1.75 PJ by the end of 2018.

The foreseen energy efficiency improvement measures in the residential sector are presented in the table below.

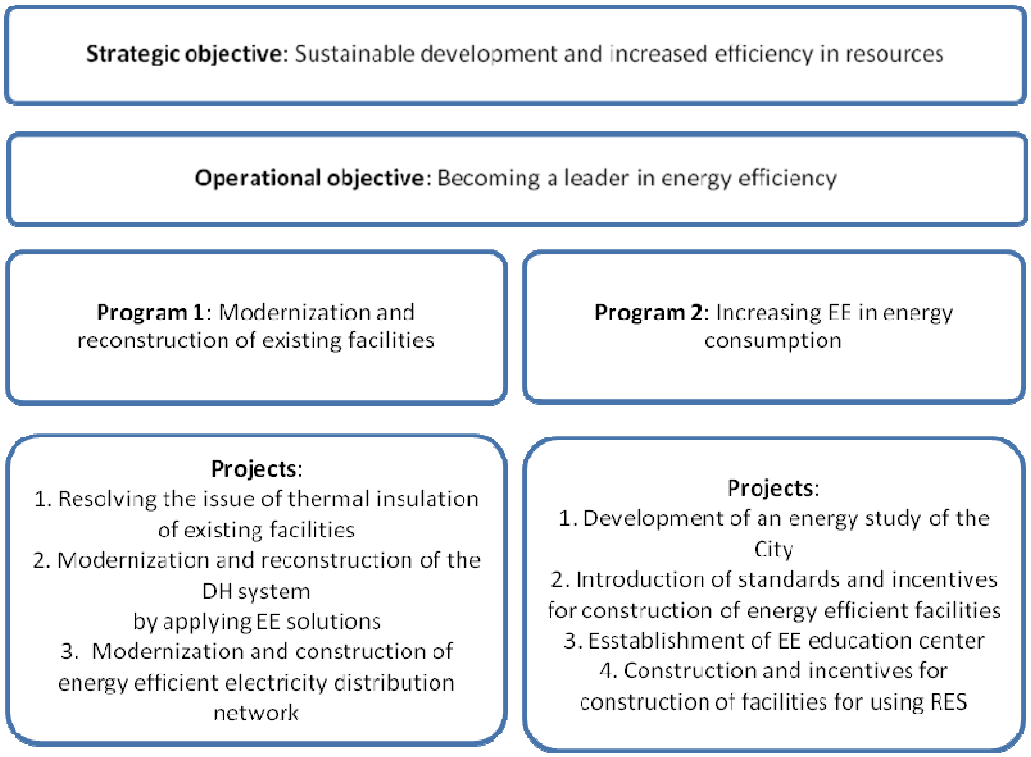
Table 15: *Energy Efficiency Measures for the Residential Sector According to the EEAP of RS*

Title of the program/measure	Overall energy savings expected (PJ)		
	2012	**2015**	**2018**
Labelling of household devices with energy efficiency labels	0.004	0.03	0.09
Renovation of existing residential buildings and individual houses and the construction of new buildings according to the principles of energy efficiency	0.064	0.39	1.21
Energy efficient heating, ventilation and cooling systems	0.009	0.06	0.18
Compulsory division and calculation of heating costs in multi-dwelling and other buildings according to actual consumption	0.009	0.06	0.18
Production of energy from renewable sources in order to increase energy efficiency	0.004	0.03	0.09
Total for residential sector	0.09	0.57	1.75

[38] Official Gazette of RS, No. 59/13
[39] Official Gazette of RS, No. 59/13

3.5.2.5 Development Strategy of the City of Banja Luka

The Strategy, initially adopted for the period 2007-2015 and extended for an additional 4 years (i.e. until 2019[40]), recognizes the city heating system as one of the key problems in the development of the City in terms of the infrastructure and the used fuel, as well as the heating price. The objectives set by the Strategy in the field of district heating and energy efficiency are provided in the following graph.



3.5.2.6 Sustainable Energy Action Plan (SEAP) of the City of Banja Luka

In accordance with the *Law on Energy Efficiency*[41], the City of Banja Luka as a local self-governance unit (LSG) with more than 20,000 inhabitants is required to develop and adopt its Energy Efficiency Action Plan (EEAP), harmonized with the EEAP of RS. However, since the City is a party of the Covenant of Mayors[42] (as of 2009) and developed its Sustainable Energy Action Plan (SEAP) in 2010, the SEAP is considered as an EEAP.

Energy efficiency measures developed in EEAPs for LSG units contain:

- activities on the renovation and maintenance of facilities used by the LSG unit, its administrative offices, as well as public enterprises and public institutions established by the LSG unit,
- activities to improve public utilities (public lighting, thermal energy supply, water supply, waste management, etc.) and transport, in order to improve energy efficiency,
- other activities to be carried out in the LSG unit regarding energy efficiency improvements.

[40] The extension was determined on the basis of the Decision on Amendments to the Decision on Adoption of the Development Strategy of the City of Banja Luka issued by the City Assembly, published in the Official Gazette of the City of Banja Luka, No. 28/15

[41] Official Gazette of RS, No. 59/13

[42] The Covenant of Mayors is a European cooperation movement involving local and regional authorities. Signatories of the Covenant voluntarily commit to increase energy efficiency and the use of RES on their territories.

The implementation of these measures and activities is to be financed from the budget of the LSG units, the Environmental Protection and Energy Efficiency Fund of the RS and other sources.

The SEAP of the City of Banja Luka defines the approach of the City to achieve the reduction of CO_2 emissions by 20% until 2020. SEAP contains activities related to both the private and public sector, in the fields of construction, municipal infrastructure, land use, renewable energy sources, and public and private transport.

Significant energy savings as well as reduction of CO_2 are expected in the DH sector, where particular attention is paid to the modernization of distribution network, thermal sub-stations and the boiler house at the DH plant.

SEAP envisages that the implementation of all measures related to DH in the City of Banja Luka will result in savings in fuel consumption by 2020 (compared to the projected consumption without the implementation of modernization). The expected savings in fuel consumption are 4,500 t of crude oil (approx. 50,293.88 MWh of thermal energy), which will result in the reduction of approx. 14,020.92 t of CO_2 emissions.

The estimated costs for the implementation of all measures related to the DH amount to EUR app. 36,500,000.00.

Table 16: *Measures for DH Modernization Contained in the SEAP of the City of Banja Luka*

Measure	**Objective**	**Planned activities**	**Estimated costs**	**Estimated savings in fuel consumption by 2020**
Boiler house modernization	Improvement of the efficiency of transformation of thermal energy fuels in the boiler house through: • Improved combustion of fuel, less combustion emissions into the air, • Fuel and energy savings, • Cost savings, • Improved operation and safety.	• Purchase of new oil burners, pumps, motors and fans, • Installation of variable speed drives to main motors, • Installation of local automation, • Installation of heat meters in boiler houses, • Installation of equipment for gas (oxygen) removal from the make-up water.	EUR 4,700,000.00	1,170 t of crude oil/per heating season (app. 13,066 MWh of thermal energy) expected to result in the reduction of app. 3,645.42 t of CO_2 emissions.
Reconstruction of primary and secondary distribution network	Expanding the customer base and achieving savings in maintenance costs, fuel and water costs through: • Reduced heat and water losses, • Improved reliability and quality of heat supply, • Reduced maintenance costs.	• Replacement of heavily damaged network sections, • Replacement of valves in chambers and other components.	EUR 10,500,000.00 (primary distribution network) EUR 15,000,000.00 (secondary distribution network)	Primary network: 1,395 t of crude oil/per heating season (app. 15,578.7 MWh of thermal energy) expected to result in the reduction of app. 4,346.47 t of CO_2 emissions. Secondary network: 1,170 t of crude oil (app. 13,066 MWh of thermal energy) expected to result in the reduction of app. 3,645.4 t of CO_2 emissions.

Modernization of operational substations	• Cost savings, • Improved comfort and services to customers, • Measurement of heat consumption of each group of buildings supplied by each substation, • Monitoring of water consumption in secondary networks and buildings.	• Replacement of control valves and automatic regulators, • Replacement of heat exchangers, • Installation of water flow meters between primary and secondary networks, • Installation of heat meters, • Automation.	EUR 3,600,000.00	720 t of HFO (app. 8,040.64 MWh of thermal energy) expected to result in the reduction of app. 2,243.33 t of CO_2 emissions.
Installation of heat meters in buildings	• Facilitate the monitoring of heat consumption and heat losses in secondary networks • Create conditions for payments based on actual consumption of heat energy	• Installation of heat meters in all customer buildings	EUR 2,600,000.00	-

Furthermore, according to SEAP, the construction of a new DH plant is planned in the draft version of the Urban Development Plan for the City of Banja Luka for the period 2008 – 2020. The new DH plant would serve for purposes of heating the City areas that are not connected to the existing DH network. SEAP stipulates the development of a new feasibility study, which would focus on the expansion of the existing DH network and on the possibilities for fuel switching (e.g. geothermal, biomass, etc.). The estimated costs of the feasibility study are EUR 100,000.00.

3.5.2.7 Local Environmental Action Plan (LEAP) for the City of Banja Luka for the period 2016-2021

According to the *Law on Environmental Protection of RS*[43]*,* a LEAP has to be developed by municipalities and cities in order to mitigate the negative impacts of environmental polluters, and to prevent future pollutions with the implementation of the measures which will contribute to local sustainable development.

The LEAP for the City of Banja Luka for the period 2016-2021 was adopted by the City Assembly in December 2015. According to the analysis of the air pollution in the City, pollution is caused by individual heating systems on oil, coal and wood with increased emission of fumes, particles and other combustion products. The DH system also contributes to air pollution by using crude oil as fuel, thus considered to be one of the main air polluters.

In order to improve air quality and decrease air emissions, the following measures are proposed for the modernization of the DH system:

- Modernization of the equipment for electro-filtration of the existing DH,
- Development of feasibility studies for small DH systems in Lauš, Paprikovac and Lazarevo,
- Expansion of the DH network to cover new urban areas,
- Reconstruction of the existing system of distribution network for households and reduction of heat loss,
- Boilers reconstruction and fuel switch – from crude oil to biomass.

[43] Official Gazette of RS No. 71/12 and 79/15

3.5.2.8 Spatial Plan of the City of Banja Luka

According to the Spatial Plan of the City of Banja Luka[44], DH remains the main source of heating in the narrow urban area of the City of Banja Luka. The key points of the Spatial Plan with regard to DH are as follows:

- the DH system is in need of reconstruction and modernization, as the pipeline network is damaged - thus resulting in heat and water losses, HFO is used as fuel which causes pollution, house boiler equipment is outdated etc.,
- it is necessary to replace the old heavily damaged network sections with new pipelines, and build two new DH plants, one in the southern and one in the northern part of the urban area, which will enable the development of the heating network to reach new consumers. Instead of the construction of one or both DH plants, another option would be the construction of co-generation plant on natural gas, which would provide a relatively cheap thermal energy for heating and supply of hot water. The supply of hot water from DH systems would significantly reduce electricity consumption for this purpose. Co-generation system on gas has a much lower impact on the environment without sulphur oxides, slag and ash in the exhaust gases. The projected installed capacity of this co-generation plant is 450 MW_{el} and 250 MW_{th},
- gasification of the City of Banja Luka is also planned through connection with the main gas pipeline of the South Stream. This will enable the supply of thermal energy for new consumers. Until the connection to the main gas pipeline it is planned the gasification of the City by using the liquefied natural gas (LPG).

3.5.3 Legislation Related to District Heating

In Bosnia and Herzegovina, there is no specific legislation at either BiH or entity level regulating the DH sector. DH operations are governed by various pieces of legislation on energy efficiency improvement, use of renewable energy sources, spatial planning and environmental protection.

According to the *Energy Sector Study in BiH* prepared in 2008[45], the current legal regulation in the DH field is undeveloped. It provides an overview of the relevant EU regulatory framework, and in particular of the DH legislation framework in Croatia, as an example of how the development of DH legislation in BiH could proceed.

Since there are no laws or regulations specific for DH activities and operation of DH systems, the current legal framework relies on the *Law on Public Utilities*[46] and *Law on Local Self-Government*[47], whereby public companies and local self-government units regulate the operations related to the DH sector.

3.5.3.1 DH Company Operations

3.5.3.1.1 Regulations on Operations of the Company

The Company is a public enterprise incorporated in accordance with the *Law on Public Enterprises in RS*[48] and the *Law on Companies of RS*[49]. The *Law on Public Enterprises in RS* regulates the specific management and operational issues of public enterprises in RS. According to this Law, a public enterprise is an enterprise that carries out activities of public interest (energy, communications, municipal services, management of public assets and other activities of public interest), and in which the municipality, city or RS is the majority owner. All issues not regulated by this Law are regulated by the *Law on Companies of RS* which defines in general the establishment, operations, management and closing of companies in RS.
The Company is a Joint Stock Company where the majority owner is the City of Banja Luka (77% of shares), whereas the remaining 23% is owned by the Company (19% of shares[50]) and other shareholders (4% of shares)[51].

[44] Official Gazette of the City of Banja Luka, No. 11/14
[45] This is the only energy sector analysis at the level of BiH. Since 2008, the Study was not updated, and no further sector studies were prepared.
[46] Official Gazette of RS, No. 124/11
[47] Official Gazette of RS, No. 101/04, 42/05, 118/05 and 98/13
[48] Official Gazette of RS, No. 79/11
[49] Official Gazette of RS, No. 127/08, 58/09, and 100/11
[50] According to the Law on Companies of RS (Article 219), joint stock companies which acquire up to 10% of shares in their own initial capital are required to sell such shares within one year, and within 3 years for more than 10% of shares.

The Company bodies have been established in accordance with the *Law on Public Enterprises in RS* which sets forth the mandatory bodies of all public enterprises, i.e., the Shareholders Assembly, the Supervisory Board, the Management and the Auditing Board, whose responsibilities are elaborated in detail in the Statute of the Company.

3.5.3.1.2 Regulations on DH Organization in the City of Banja Luka

DH operations in the City of Banja Luka are regulated by the *Law on Public Utilities*[52], the *Law on Local Self-Government*[53], the *Statute of the City of Banja Luka*[54] and the *Decision on General Conditions for Heat Delivery*[55].

Pursuant to the *Law on Public Utilities*[56], the City of Banja Luka regulates:

- The conditions and manner of providing public utility services,
- The conditions for the financing, development, construction and maintenance of utility facilities,
- The conditions for the functioning of the technical and technological unity of the system and devices,
- The possibilities of subsidised prices of utilities, user categories and conditions of subsidising.

The *Statute of the City of Banja Luka* regulates some of the issues defined by the *Law on Local Self-Government*, in particular the responsibilities of the City of Banja Luka with regard to local infrastructure for public utilities. According to the Statute, the City of Banja Luka is responsible for public utility services; the organizational, financial and other conditions for the construction and maintenance of public facilities and public infrastructure; and the incorporation and termination of utility enterprises.

The Company operates in accordance with the City level *Decision on General Conditions for Heat Delivery*[57]. This Decision regulates the:

- conditions and manner for the distribution of thermal energy,
- management of heat distribution system and heat supply to customers,
- the tariff system for the calculation of delivered heat,
- conditions and manner of ensuring continuity in the supply of thermal energy to customers in the City Banja Luka,
- rights and duties of producers, distributors and customers of thermal energy,
- the rights and obligations of heat energy.

3.5.3.1.3 Regulations on Borrowing

Local self-governance (LSG) units (in this case, the City of Banja Luka) have the possibility to assume both short-term and long-term debts according to the *Law on Borrowing, Debt and Guarantees of RS*[58]. Long-term debts may be assumed only with the purpose of financing capital investments and if the loan does not exceed 18% of the regular income realized in the prior fiscal year.

LSG units may become borrowers or issue a guarantee only on the basis of a decision adopted by the LSG Assembly, through a loan agreement and by the issuance of securities.

LSG units may also issue guarantees to legal entities majority owned by the LSG with the purpose of financing capital investments, refinancing of existing debt, financing transferred obligations or financing of obligations incurred during the restructuring and consolidation of such legal entity.

[51] Source: Business Report of the Company for the year 2015
[52] Official Gazette of RS, No. 124/11
[53] Official Gazette of RS, No. 101/04, 42/05, 118/05 and 98/13
[54] Official Gazette of the City of Banja Luka, No. 25/05, 30/07 and 17/12
[55] Official Gazette of the City of Banja Luka, No. 26/13
[56] Official Gazette of RS, No. 124/11
[57] Official Gazette of the City of Banja Luka, No. 26/13
[58] Official Gazette of the City of Banja Luka, No. 71/12 and 52/14

3.5.3.2 Alternative Sources of Energy

Alternative sources of energy include renewable energy sources (RES), co-generation and the use of waste as fuel.

Renewable energy sources and co-generation in RS are regulated by the *Law on Renewable Energy Sources and Efficient Co-generation of RS*[59], according to which power plants which use RES for electricity production are divided into:

- plants which utilize the energy potential of water courses,
- plants which utilize wind energy,
- plants which utilize energy obtained from biomass,
- plants which utilize energy obtained from biogas (waste gas, gas from the facility for the waste water treatment and agricultural biogas),
- plants which utilize geo-thermal energy,
- plants which utilize non-accumulated solar energy (photo-voltaic cells and solar thermal-energy facility),
- co-generation plants,
- plants which utilize a combination of multiple renewable energy sources.

According to this Law, co-generation plants can be based on the following technologies:

- combined cycle gas turbine with heat recovery,
- anti-pressure steam turbine,
- condensing steam turbine with the steam deduction,
- gas turbine with heat recovery,
- internal combustion engine,
- micro-turbine,
- Stirling engine,
- fuel cells,
- steam machine,
- Organic Ranking Cycle,
- other types of technology which generate heat and electricity at same time in one process.

Waste incineration is regulated by the *Law on Waste Management of RS*[60], according to which the reuse of waste is possible by using waste incineration technologies, divided into waste incineration and waste co-incineration. Waste incineration (combustion) is the thermal treatment of waste in stationary or mobile plants with the use of energy produced by combustion or without use of energy generated from combustion whose primary role is thermal treatment of waste, which includes the pyrolysis, gasification and combustion of plasma. Co-incineration is the thermal treatment of waste in stationary or mobile plants whose primary function is to produce energy or material products, which uses waste as a primary or additional fuel or in which waste is thermally treated for disposal.

3.5.3.3 Incentives and Subsidies

There are currently no energy efficiency incentives, such as tax incentives, in place at BiH or RS level. The existing incentives and subsidies are provided only for electricity produced using renewable energy sources. These incentives are prescribed by different laws in RS.

The *Law on Energy of RS*[61] regulates the use of RES and a system of subsidies for production of energy from RES and co-generation, and methods for obtaining and use of incentives regulated by the Regulatory Commission for Energy of RS, upon the prior consent of the Government of RS.

[59] Official Gazette of RS, No. 39/13, 108/13 and 79/15
[60] Official Gazette of RS, No. 113/13
[61] Official Gazette of RS, No. 49/09

The *Law on Electricity*[62] regulates the production and distribution of electricity in RS. The Law regulates the conditions for the cost-effective development of production and distribution of electricity, as well as the rights and obligations of electricity producers and the possibilities of acquiring the status of eligible electricity producer in accordance with the conditions and incentives set by the Regulatory Commission for Energy of RS.

The *Law on Renewable Energy Sources and Efficient Co-generation*[63] regulates the planning of and incentives for the production and consumption of energy generated from RES and efficient co-generation. This Law defines the types of incentives for generation of electricity from RES or in efficient co-generation, follows:

- Benefits for connection to the network,
- Advantages in access to the network (dispatching),
- Right to the obligatory purchase of electricity,
- Right to the feed-in tariff,
- Right to the premium for consumption of electricity for its own needs, or sale to the electricity market.

The *Decision on the Level of Guaranteed Purchase Prices and Premiums for Electricity Generated from Renewable Energy Sources and in Efficient Co-generation*[64] was adopted by the Regulatory Commission for Energy of RS on the basis of *the Law on Renewable Energy Sources and Efficient Co-generation*. This Decision determines the amount of guaranteed feed in tariffs and premiums for electricity generated from RES or in efficient co-generation facilities. The methodology of calculation of the guaranteed feed in tariffs and premium is based on the calculation of the total annual costs of generation of electricity from the typical generation facilities, depending on the type of the plant, using the annuity method of the investment valuation, whereby this calculation is based on the technical and economic parameters which to the greatest extent represent specific technologies of the electricity generated being stimulated. Feed in tariffs and premium for electricity generated in power plants on biomass and by efficient co-generation plant are presented in the Table 17 below. Prices and premiums presented in Table 17 do not include value added tax (VAT).

Table 17: *Feed-in Tariffs and Premiums for Electricity Generated in Power Plants on Biomass and Efficient Co-generation Plants*

Type of power plant according to installed power	**Sale at compulsory purchase at guaranteed purchase prices**			**Sales on the market and consumption for own needs**	
	Guaranteed purchase price BAM/kWh	**Reference Price BAM/kWh**	**Premium (in guaranteed price) BAM/kWh**	**Reference Price BAM/kWh**	**Premium BAM/kWh**
Power Plants on Solid Biomass of capacity					
Up to and including 1 MW	0.2413	0.0541	0.1872	0.0829	0.1584
Over 1 MW up to and including 10 MW	0.2261	0.0541	0.1720	0.0829	0.1432
Power Plants on agricultural biogas up to and including 1 MW	0.2402	0.0541	0.1861	0.0829	0.1573
Conventional sources of energy in efficient co-generation facilities (guaranteed purchase price up to and including 10 MW, and premium for sale on the market and consumption for own needs up to and including 30 MW					
New cogeneration plant on gas up to and including 1 MW	0.2117	0.0541	0.1576	0.0829	0.1288
New cogeneration plant on gas from 1	0.1864	0.0541	0.1323	0.0829	0.1035

[62] Official Gazette of RS, No. 08/08, 34/09, 92/09 and 01/11
[63] Official Gazette of RS, No. 39/13, 108/13 and 79/15
[64] Official Gazette of RS, No. 88/14

Type of power plant according to installed power	Sale at compulsory purchase at guaranteed purchase prices			Sales on the market and consumption for own needs	
	Guaranteed purchase price BAM/kWh	Reference Price BAM/kWh	Premium (in guaranteed price) BAM/kWh	Reference Price BAM/kWh	Premium BAM/kWh
MW up to and including 10 MW					
New cogeneration plant on lignite up to 1 MW	0.1197	0.0541	0.0656	0.0829	0.0368
New cogeneration plant on lignite from 1 MW up to and including 10 MW	0.0882	0.0541	0.0341	0.0829	0.0053
Landfill gas in the efficient co-generation facility					
Up to and including 1 MW	0.0698	0.0541	0.0157	0.0829	0
Over 1 MW up to and including 10 MW	0.0541	0.0541	0	0.0829	0
Solar facilities with the photovoltaic cells (Guaranteed feed in prices and premium from July 1, 2015)					
On the structures of up to and including 50 kW	0.3198	0.0541	0.2657	0.0829	0.2369
On the structures of more than 50 kW up to and including 250 kW	0.2766	0.0541	0.2225	0.0829	0.1937
On the structures of more than 250 kW up to and including 1 MW	0.2207	0.0541	0.1666	0.0829	0.1378
On the land of up to and including 250 kW	0.2566	0.0541	0.2025	0.0829	0.1737
On the land of more than 250 kW up to and including 1 MW	0.2042	0.0541	0.1501	0.0829	0.1213

3.5.3.4 DH Tariffs

The DH tariff system is regulated by the City of Banja Luka, on the basis of:

- the *Law on Public Utilities*[65],
- the *Law on Local Self-Government*[66],
- the *Regulation on the Approval to the Prices of Certain Goods and Services*[67],
- the *Statute of the City of Banja Luka*[68], and
- the *Decision on General Conditions for Heat Delivery*[69].

The *Decision on General Conditions for Heat Delivery of the City of Banja Luka* regulates the tariff system which establishes the elements of and method of calculation of thermal energy tariffs for different group of customers.

[65] Official Gazette of RS, No. 124/11
[66] Official Gazette of RS, No. 101/04, 42/05, 118/05 and 98/13
[67] Official Gazette of RS, No. 11/11
[68] Official Gazette of the City of Banja Luka, No. 25/05, 30/07 and 17/12
[69] Official Gazette of the City of Banja Luka, No. 26/13

The tariff system determines the group of heat customers, tariff elements, tariff rates and billing of thermal energy delivered to customers, criteria and benchmarks for the pricing of heat energy, and the criteria for determining tariff rates. The Decision differentiates 5 customer categories:

Tariff Group 1	households for which the delivered thermal energy is calculated per m^2 of a floor area
Tariff Group 2	households for which the delivered thermal energy is calculated on the basis of actual consumption - expressed in MWh
Tariff Group 3	business customers for which the delivered thermal energy is calculated on the basis of actual consumption - expressed in MW
Tariff Group 4	business customers for which the delivered thermal energy is calculated per m^2 of a building's floor area
Tariff Group 5	business customer for which the delivered thermal energy is calculated on the basis of installed capacity - expressed in MW

Tariff elements are:

- supply power[70],
- amount of delivered thermal energy,
- heated surface.

Tariff rates are:

- Price for heating per m^2 - for household customers,
- Price for heating per m^2 - for customers in the business premises,
- Price per unit of installed capacity - for customers in the business premises,
- Price for the supply heating power - for customers in households [BAM/kW],
- Price for the supply heating power - for customers in business premises [BAM/kW],
- Price for the amount of delivered thermal energy for heating - for household customers [BAM/MWh],
- Price for the amount of delivered thermal energy for heating - for customers in business premises [BAM/MWh].

Prices for heat delivery are determined depending on the category of consumers, as follows:

- Residential customers with the price per m^2,
- Residential customers with installed meters,
- Business customers with installed meters,
- Business customers with the calculation made according to the installed capacity,
- Business customers with the price per m^2.

According to the aforementioned Decision, the total cost of heating for customers is the sum of the monthly cost of supply power for heating (fixed part) and the monthly cost for the amount of delivered thermal energy for heating (variable part).

Prices are determined by the Supervisory Board of the Company, after the prior consent of the City of Banja Luka (Assembly). The existing decision on tariffs was adopted in 2011[71].

Prices for the different groups of heat customers are:

Price for residential customers	1.65 BAM (VAT included) per m^2 (12 months)
Price for residential customers	133.82 BAM (VAT included) per MWh
Price for business customers	199.64 BAM (VAT included) per MWh

[70] Supply power for residential buildings or residential parts of residential/commercial buildings is the power from the main project of DH installation and residential substations. Supply power for commercial buildings or commercial parts of residential/commercial buildings is the power defined by the contract on sale of thermal energy.

[71] http://www.bltoplana.com/images/stories/dokumenti/cijena%20toplotne%20energije.pdf

In accordance with the *Decision on General Conditions for Heat Delivery*, consumers are entitled to an adequate discount/credit note depending on how lower the temperature inside a building is compared to the prescribed minimal temperature. This requirement is applied by the Company in its provision of DH services.

According to the *Report on Operations for 2015* developed by the Company, a subsidy was given by the City of Banja Luka to the Company in order to cover a part of DH costs for pensioners in the amount of 1,000,000 BAM.

3.5.3.5 Fuel and Electricity Prices

Prices for electricity in Banja Luka are based on the *Decision on Tariff System for Electricity in RS* adopted by the Regulatory Commission for Energy of RS. There are 7 tariff groups, of which 2 for households:

- Tariff group I: for which the active electricity consumption is measured by a single-rate meter,
- Tariff group II: for which the active electricity consumption is measured by a two-rate meter.

Two different tariffs for households with two-rate meters are in place:

- High Tariff – from 06.00 to 22.00 hours in winter, and from 07.00 to 23.00 in summer,
- Low Tariff – from 22.00 to 6.00 in winter, and from 23.00 to 7.00 in summer (this tariff include also the electricity delivered during the days of weekend).

Tariffs for residential consumers are presented in Table 18 and Table 19.

Table 18: *Residential Consumers – Electricity Tariffs (Winter)*

	Billing power BAM	High Tariff BAM/kWh	Low Tariff BAM/kWh	Fee for renewables BAM/kWh
Single-rate meter	6.7162		0.1172	0.0021
Two-rate meter	10.5830	0.1410	0.0705	0.0021

Table 19: *Residential Consumers – Electricity Tariffs (Summer)*

	Billing power BAM	High Tariff BAM/kWh	Low Tariff BAM/kWh	Fee for renewables BAM/kWh
Single-rate meter	5.1662		0.0902	0.0021
Two-rate meter	8.1406	0.1083	0.0021	0.0021

The average prices of other fuels are presented in Table 20 below.

Table 20: *Average Prices of Other Fuels*

Fuel	Energy value expressed in kWh_{th}	Market Price	Fuel price expressed in BAM/kWh_{th}
Heavy oil	10.03 kWh/lit.	1.75 BAM/lit.	0.174
Coal	3.61 kWh/kg	160 BAM/t	0.044
Briquette	4.16 kWh/kg	140 BAM/t	0.040
Pellet	4.70 kWh/kg	260 BAM/t	0.061
Firewood	2.85 kWh/kg	75 BAM/mp	0.053

3.5.3.6 Distribution Network

According to the *Decision on General Terms for Heat Delivery*[72], the distribution network is divided into primary and secondary networks which are parts of the system of equipment and installations intended for distribution of thermal energy to customers. The distribution network and connections include pipelines from the Company to house or building substations including the valves at the entrance to the primary part of the building substations.

[72] Official Gazette of the City of Banja Luka, No. 26/13

According to this Decision, the Company is responsible for the maintenance of the distribution network and of all equipment and installations which compose the distribution network.

Pursuant to Article 29 of the Decision, maintenance of common parts of buildings, which includes the installation of DH, falls under the competence of the flat owners. According to the *Law on Maintenance of Buildings*[73], common parts of buildings are parts and devices that serve the building as a whole or specific parts of the building, and in particular: the foundations, main walls, roofs, stairs, chimneys, elevators, facade, basement, attic, hallways, laundry and drying rooms, garbage rooms, electricity, lighting, sewage, water supply and telephone networks, gas and hot water installations and television antennas.

Buildings are managed by Homeowner Associations, which issue decisions on the use and maintenance of the common parts of the building, on the provision and use of funds for maintenance of the common parts of the building and other issues of importance for the building management. Common areas in buildings are joint property of flat owners.

Homeowner Associations may be established for one or more buildings or part of a building. Homeowner Associations are legal entities with the power to conclude and execute binding agreements. Maintenance of a building may be entrusted to a public or private company registered for providing building maintenance services.

Flat owners are required to bear the costs of the investments for regular maintenance and urgent repairs on common parts of buildings.

3.5.3.7 Energy Efficiency (EE) in Buildings

Energy efficiency in buildings in RS is regulated through several laws and by-laws.

The *Law on Energy of RS*[74] regulates the basis of the energy policy of RS and the fundamental issues related to the regulation and realization of energy activities, as well as the conditions for achieving of energy efficiency. The Ministry of Industry, Energy and Mining of RS is responsible for energy efficiency improvements through the implementation of the overall framework of measures aimed at EE and energy savings. These measures include:

- Introduction of favourable conditions for investments through implementation of programs to increase EE (e.g. public-private partnerships, development of financial cooperation and investment funds, etc.),
- Cooperation between energy consumers, producers and suppliers, as well as the public services sector and the local government, to achieve the defined level of EE,
- Achieving the defined levels of EE through reduction of energy losses and energy consumption, by introducing new technological solutions in various sectors (public sector and public services, construction, agriculture, industry, transport, etc.),
- International cooperation in the field of EE.

Furthermore, the Law sets out the obligations of energy suppliers regarding the dissemination of information about rational and efficient energy use. Energy suppliers are required to inform their customers, at least once a year, on the impacts of rational use of energy on the environment and sustainable development, and are also required to educate and provide guidance to customers to use energy in a rational and cost-effective way. In order to reach the objective of rational use of energy, energy consumption calculations have to be based on the actual consumption of energy.

The *Directive 2010/31/EU on the Energy Performance of Buildings* has been transposed into the entity legislation by the *Law on Spatial Planning and Construction*[75] which regulates energy audits and energy performance of buildings. According to the Law, a building has to maintain its technical features and performances including EE, energy savings and thermal protection. Each new building must be designed, constructed and maintained in the

[73] Official Gazette of RS, No. 101/11
[74] Official Gazette of RS, No. 49/09
[75] Official Gazette of RS, No. 40/13

way to maintain the prescribed energy performances during its use. During the planning, design and construction of new buildings, as well as during major renovation of the existing buildings, a set of long-term measures must be applied, as well as minimum requirements regarding the reduction of energy consumption and switch to the use of energy from renewable sources.

The defined energy performance and minimum requirements, as well as the long-term measures, have to be provided through:

- mandatory installation of metering devices for each individual condominium (flat) owner in all new buildings, and in existing buildings during major renovation. At least one metering device for measuring the consumption of an entire building has to be installed,
- encouraging the introduction of intelligent metering systems whenever a building is constructed or undergoes major renovation,
- encouraging the use of district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources,
- the application of new technology of construction and installation of building products that enable the use of primary energy from renewable sources,
- the creation of stimulating conditions and measures to build new buildings and convert them into nearly zero-energy buildings,
- the establishment of a regular audit of technical building systems and equipment that is used for heating or cooling, ventilation, hot water and lighting,
- the creation of conditions for the development and establishment of a system of certification of the energy performance of building showing the energy performance of buildings.

The aforesaid measures are also defined in the *Law on Public Utilities*[76].

Energy audits are performed by legal entities holding the necessary license to carry out energy audits (issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS). The legal entities which perform energy audits are required to submit a report on the completed audit to the Environmental Protection and Energy Efficiency Fund of RS. The Fund issues the energy certificate and sends the certificate to the legal entity that performed the energy audit, to the Ministry and the competent LSG unit on whose territory the audit was performed. This Ministry keeps a single registry of licensed legal entities, whereas LSG units keep a registry of certificates issued on their territory.

Energy performance certificates are issued for buildings or building units constructed after the adoption of the *Law on Spatial Planning and Construction*, before selling or renting them out to a new tenant.

Below is a list of secondary legislation adopted in RS in accordance with the obligations stipulated by the *Law on Spatial Planning and Construction* and regarding the energy performance of buildings:

- Regulation on Minimum Requirements for the Energy Performance of Buildings[77],
- Regulation on Methodology for Calculating the Energy Performance of Buildings[78],
- Regulation on Energy Audit of Buildings and Energy Performance and Energy Certification[79].

Other measures for improving EE are contained in the *Law on Energy Efficiency*[80], according to which EE improvement measures include energy services, energy management and other measures.

Distribution system operators, energy distributors and retail energy sales companies are required to offer energy services at competitive prices to their end customers, either directly or through other energy service providers. If a

[76] Official Gazette of RS, No. 124/11
[77] Official Gazette of RS, No. 30/15
[78] *Ibid*.
[79] *Ibid*
[80] Official Gazette of RS, No. 59/13

distribution system operator, energy distributor or retail energy sales company does not offer energy services at competitive prices to its end customers, it is required to pay a fee to the Environmental Protection and Energy Efficiency Fund of RS, which uses the collected fees to finance energy efficiency improvements.

Energy distributors are required to offer their customers the possibility to purchase and install individual energy consumption meters at competitive prices, if installation of individual meters is technically feasible and financially profitable compared to the long-term estimation of energy savings, in the following cases:

- when the energy is delivered to the end customers without measurement in place,
- during the renovations of the building,
- during the reconstruction of a connection to power system.

Individual metering is required in new buildings.

The following secondary legislation has been adopted on the basis of the *Law on Energy Efficiency*:

- Energy Efficiency Action Plan of RS until 2018[81],
- Regulation on Energy Class of the Product[82],
- Regulation on Methodology of Costs Estimate for Energy Service Supply[83],
- Instruction for Preparing Annual Report on Implementation of Energy Efficiency Action Plan of Local-Self Governments[84],
- Operational Plan to Improve Energy Efficiency in Public Administrative Bodies.

3.5.3.8 Private Sector Involvement

In BiH and RS, private sector participation is regulated by laws governing foreign direct investments (FDI), concessions and Public-Private Partnerships (PPP), providing the possibility of private sector participation (both local and foreign legal entities) in the DH sector in BiH.

BiH has a dedicated law in place to support FDI - the *Law on the Policy of Foreign Direct Investment in BiH*[85], according to which foreign investors are entitled to invest, and to reinvest profits of such investments into any and all sectors of the BiH economy (with the exception of armaments and media, where foreign control is limited to 49%, there are no restrictions on investment).
At the level of RS, FDI are regulated by the *Law on Foreign Investments RS*[86], according to which foreign investors have the same rights and obligations as the residents of BiH and have the possibility to invest in many sectors (including the energy sector).

Various incentives for FDI are provided by the *Law on the Policy of Foreign Direct Investments of BiH*[87], as follows:

- national treatment of foreign investors, i.e., foreign investors have the same rights and obligations as residents of BiH,
- the import of equipment of foreign investors is exempt from paying customs duties (with the exception of passenger vehicles, slot and gambling machines),
- foreign investors are entitled to open accounts in any commercial bank in domestic and/or any freely convertible currency on the territory of BiH,
- foreign investors are entitled to freely employ foreign nationals, subject to the labour and immigration laws in BiH,

[81] *Ibid*
[82] Official Gazette of RS, No. 69/14
[83] Official Gazette of RS, No. 28/14
[84] Official Gazette of RS, No. 1/14
[85] Official Gazette of BiH, No. 17/98, 13/03 and 48/10
[86] Official Gazette RS No. 25/02, 24/04, 52/11 and 68/13
[87] Official Gazette of BiH, No. 17/98, 13/03, 48/10 and 22/15

- foreign investors are entitled to transfer abroad, freely and without delay, in convertible currency, proceeds resulting from their investment in BiH,
- foreign investors may own real estate in BiH,
- foreign investors enjoy the same property rights in respect to real estate as BiH legal entities,
- foreign investors are protected against nationalization, expropriation, requisition or measures having similar effects; such measures may take place only in the public interest in accordance with the applicable laws and regulations and against the payment of an appropriate compensation, i.e. compensation that is adequate, effective and prompt,
- rights and benefits of foreign investors granted and obligations imposed by this Law cannot be terminated or overruled by subsequent laws and regulations

Local and foreign legal persons may be granted concessions in RS. Concessions in RS are regulated by the *Law on Concessions of RS*[88], which regulates the subject, modalities and conditions of concessions and sets the conditions under which local and foreign legal persons may be granted concessions for providing infrastructure and services, as well as exploitation of natural resources, financing, design, construction, rehabilitation, maintenance and/or operation of such infrastructure.

According to this Law, the following may be the subject of concessions:

- construction and operation of power generation facilities with installed capacity over 250 kW, with the exception of energy facilities on biomass and bio-gas and solar plant with photovoltaic cells on buildings regardless of installed capacity,
- exploring and/or use of energy and other mineral raw materials,
- utilities, except for water supply, and construction, rehabilitation, maintenance and/or modernization of utilities,
- use of other goods of general interest and public services, in accordance with laws regulating that sector.

Concessions for construction or reconstruction of buildings, facilities or plants may be granted according to the Build-Operate-Transfer (BOT) model, which includes the construction or reconstruction and financing of the entire building, facility or plants, its use and passing the ownership to the concedent within the agreed timeframe or according to other models.

Public-Private Partnerships (PPP) are regulated by the *Law on Public Private Partnership of RS*[89]. PPP is a form of cooperation between the public and the private sector, achieved by pooling of resources, capital and expert knowledge, for the purpose of fulfilment of public needs. According to this Law, eligible public partners may be public enterprises or LSG units (such as municipalities or cities), whereas private partners local or foreign legal entities established in accordance with the laws of RS, selected through a negotiation procedure in accordance with the norms of international law.

The subject of a PPP may be construction, use, maintenance and operation, or reconstruction, use, maintenance and operation utility infrastructure, management of ecological and solid waste, and other fields of interest for RS and LSG units.

Agreements in the field of cooperation between the public and the private sector may take two basic forms:

- contractual form of PPP, where the partnership between the public and the private partner is based exclusively on contractual relations, or
- institutional form of PPP, where the partnership between the public and the private sector includes cooperation by the vehicle established for that purpose.

The PPP contractual forms also include concessions and private finance initiatives (in which the private partner finances, performs, maintains or manages a public facility for the public sector needs and its services are mostly paid by the public sector). Long-term service contracts, where the public sector provides only services, without the

[88] Official Gazette of RS, No. 59/13
[89] Official Gazette of RS, no. 59/09 and 63/11

capital investments of the private partner and contracts for design, construction and performance of the public sector, are not considered PPP contractual forms.

3.5.3.9 Permitting Procedures

The environmental permitting procedure in RS is regulated by the *Law on Environmental Protection*[90] and the *Regulation on Plants and Facilities that May be Constructed and Operated Only with a Valid Environmental Permit*[91], whereas other permits necessary for the construction of plants and facilities (Location Conditions, Construction Permit and Use Permit) are all regulated by the *Law on Spatial Planning and Construction*[92].

An overview of the mentioned permits is provided in the table below.

Table 21: *Permits in the Construction Process in RS*

Type of permit	Legal regulations in RS	Summary of legal requirements	Competence for issuing the permit
Environmental permit (EP)	• *Law on Environmental Protection* • *Regulation on Plants and Facilities that May be Constructed and Operated Only with a Valid Environmental Permit*	Activities and facilities with a potential environmental impact (due to their nature, size or location) require the preparation of an Environmental Impact Assessment and issuance of an EP. The Regulation provides a list of activities and industrial facilities subject to permitting procedures at RS level and at level of the LSG unit.	The Ministry of Spatial Planning, Civil Engineering and Ecology of RS issues the EP for thermal-power plants with thermal power with and over 10 MW. The authority responsible for environmental protection of the City of Banja Luka issues the EP for thermal-power plants with thermal power below 10 MW.
Location Conditions (LCs)	*Law on Spatial Planning and Construction*	A construction may be authorized if it is in accordance with the spatial planning documentation and other conditions laid down for that area by the LCs.	LCs are generally issued by the authority responsible for spatial planning of the LSG unit (in this case, the City of Banja Luka). However, for specific plants and facilities listed under the Law, LCs are issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS upon a prior opinion issued by the City of Banja Luka, as follows: • facilities for the production of thermal energy - DH and other facilities regulated by specific laws, • energy and other facilities and plants for electricity production, except for solar installations with photovoltaic cells and other facilities using all forms of renewable energy with an installed capacity up to 250 kW.
Construction Permit (CP)	*Law on Spatial Planning and Construction*	The CP is not required for routine maintenance works and restoration of damaged constructions, which may be	The CP is generally issued by the authority responsible for construction works of the LSG unit (in this case, the City of Banja Luka).

[90] Official Gazette of RS No. 71/12 and 79/15
[91] Official Gazette of RS, No. 124/12
[92] Official Gazette of RS, No. 40/13

		considered as current maintenance works. The CP must be obtained for construction of an entire facility or part of the building that makes a technical, technological or functional unit.	However, the Ministry of Spatial Planning, Civil Engineering and Ecology issues CPs for facilities for the production of thermal energy - DH and other facilities regulated by specific laws, and for energy and other facilities and plants for electricity production, except for solar installations with photovoltaic cells and other facilities using all forms of renewable energy with an installed capacity up to 250 kW.
Use Permit (UP)	*Law on Spatial Planning and Construction*	A construction may be used only after obtaining a UP upon a technical inspection of the construction. The technical inspection must be performed within 15 days from the day the request for UP is submitted to the same authority which issued the Construction Permit. The request for the issuance of UP contains the documents listed in the Law, including the CP.	Same authority which issued the Construction Permit

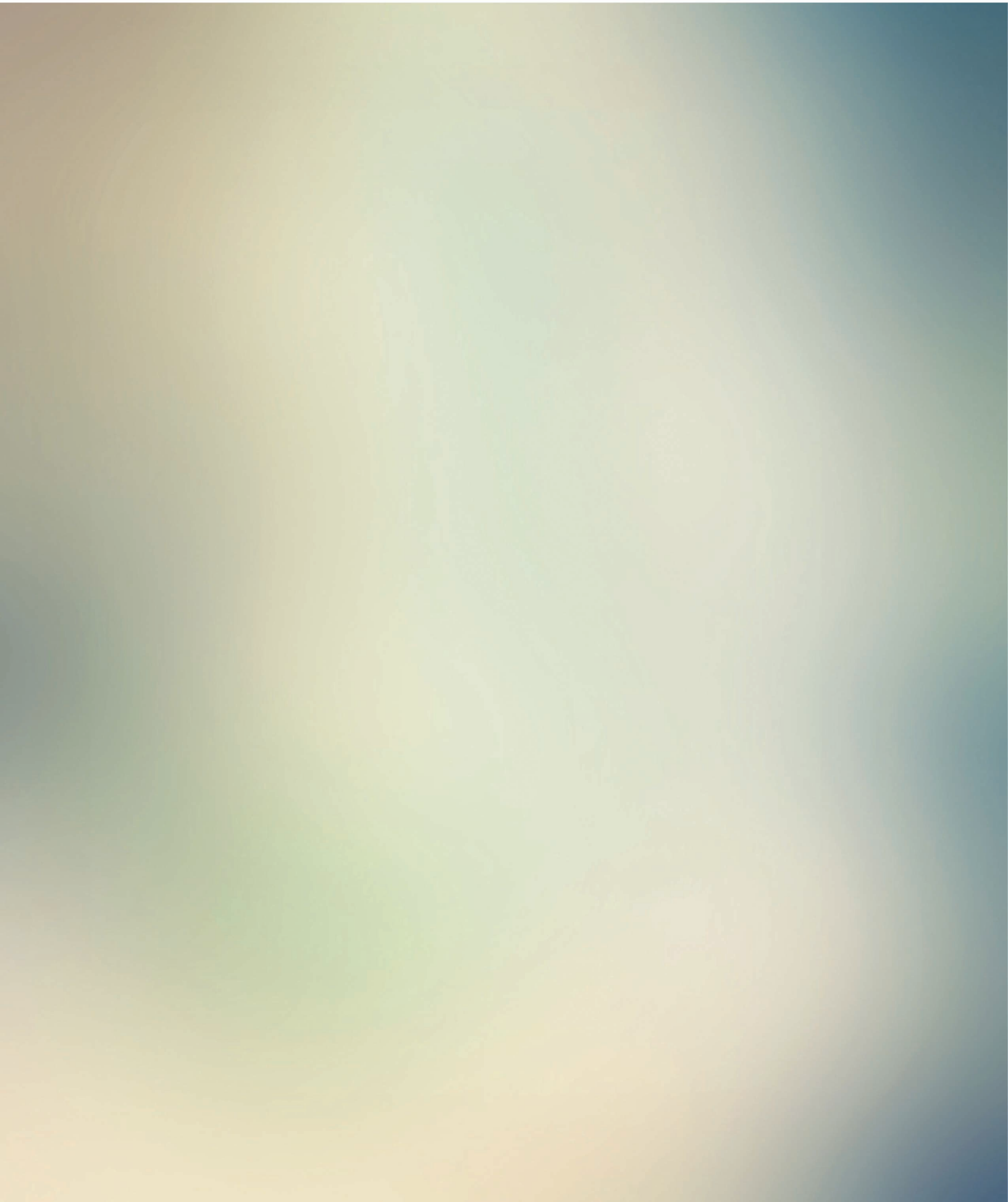
Digging of public areas within the City of Banja Luka is regulated by the *Decision on Manner and Conditions for Digging of Public Areas of the City of Banja Luka*[93], according to which digging of public areas for the construction of underground installations may only be carried out in accordance with the Construction Permit, upon the consent of the City authority responsible for public areas. The request for the digging of public areas is submitted by the investor. The Decision contains a list of documents which have to be attached to the request for digging of public areas, including the Construction Permit. Digging of public areas for maintenance and repairs of existing underground installations may be carried out only upon the issuance of consent by the City authority responsible for public areas. The request for such consent is submitted by the owner of the underground installation. In case of emergency repairs of underground installations, the digging of public areas may be performed without obtaining such consent, upon a notification to the City authority responsible for the management of public areas.

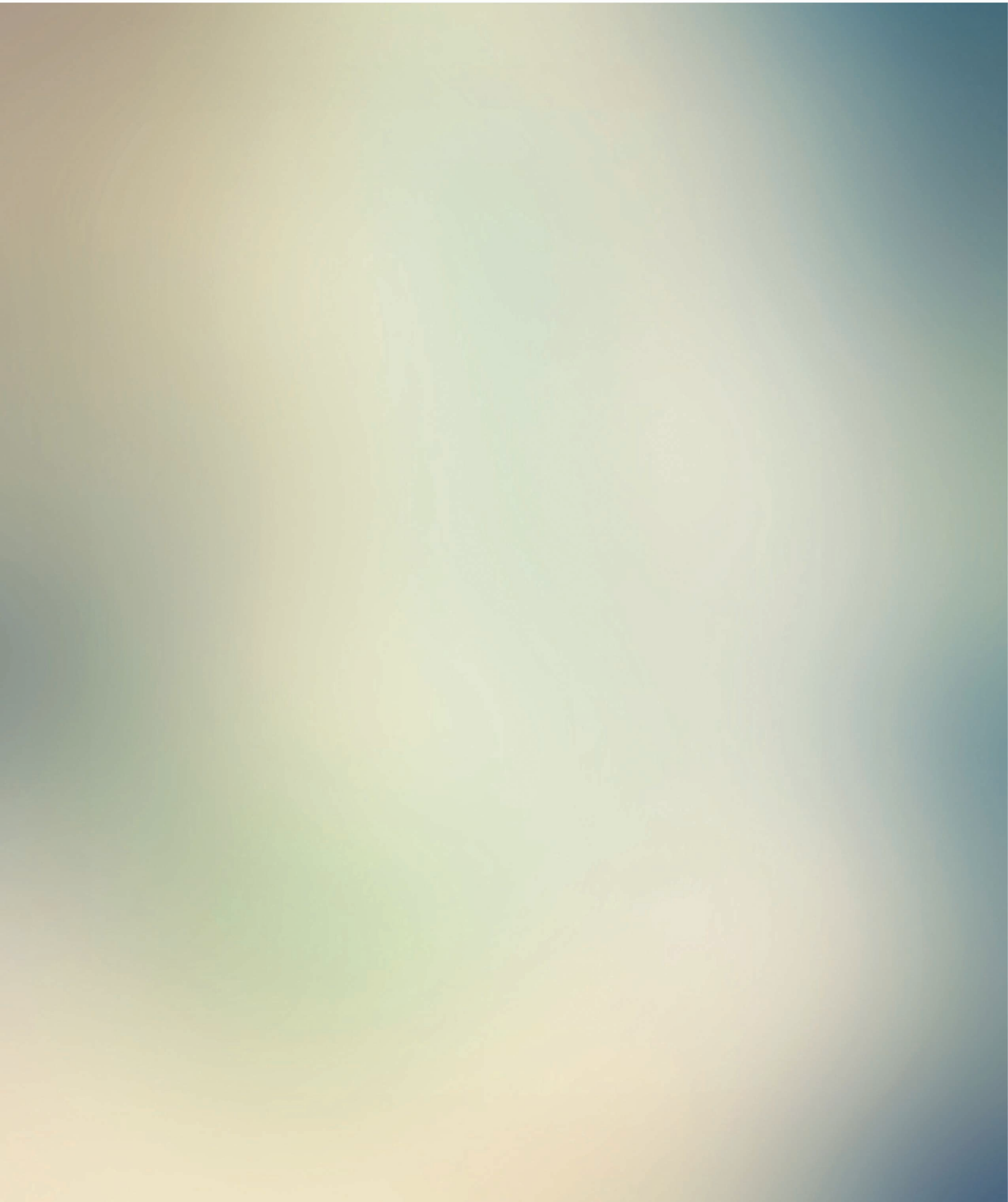
In addition, a permit must be obtained for activities of waste incineration plants and waste co-incineration plants in, which more than 50 tons of waste is annually treated, according to the *Regulation on Conditions for the Operation of Waste Incineration Plants*[94]. The permit is issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS.

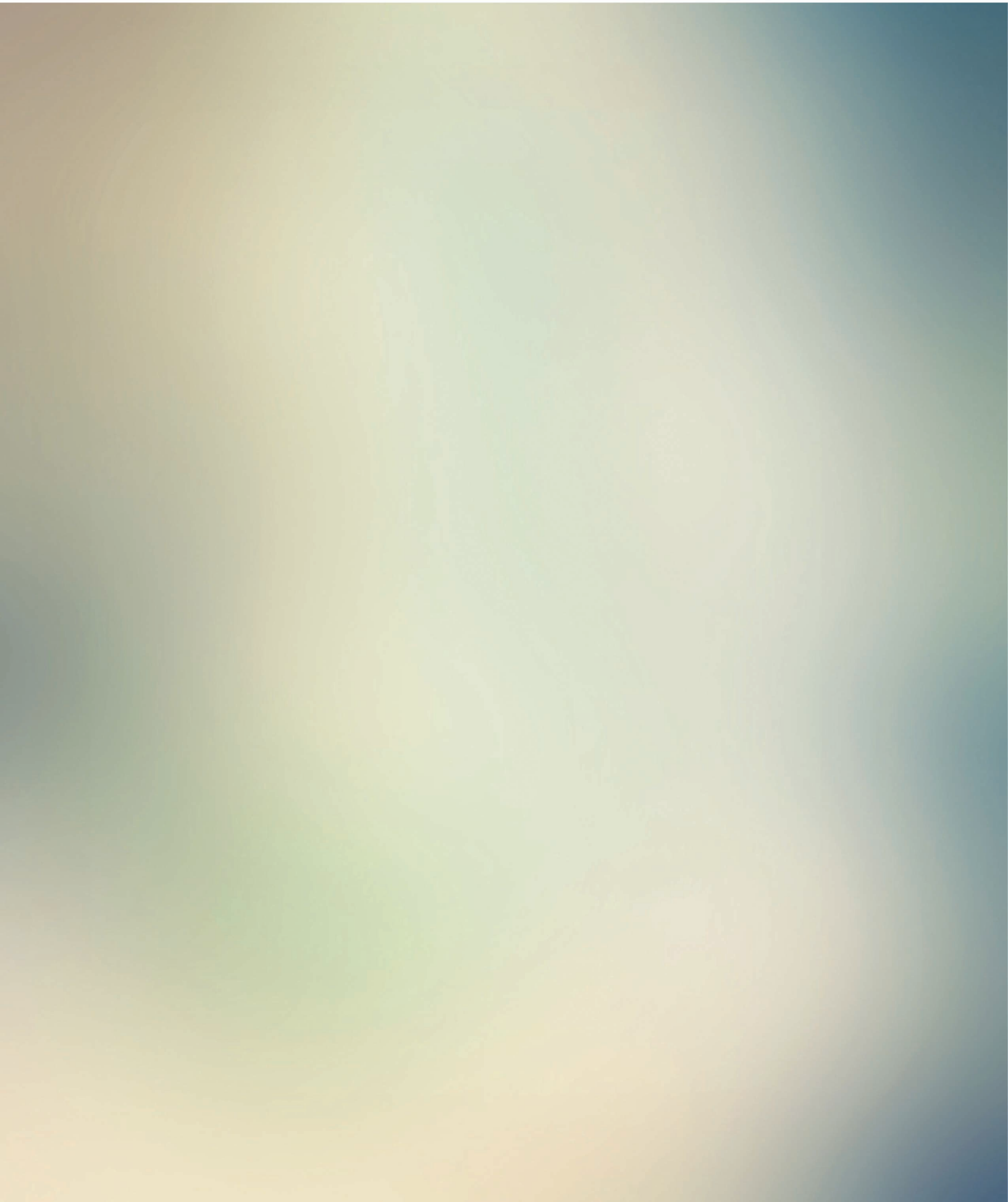
3.5.3.10 Brief Gap Analysis

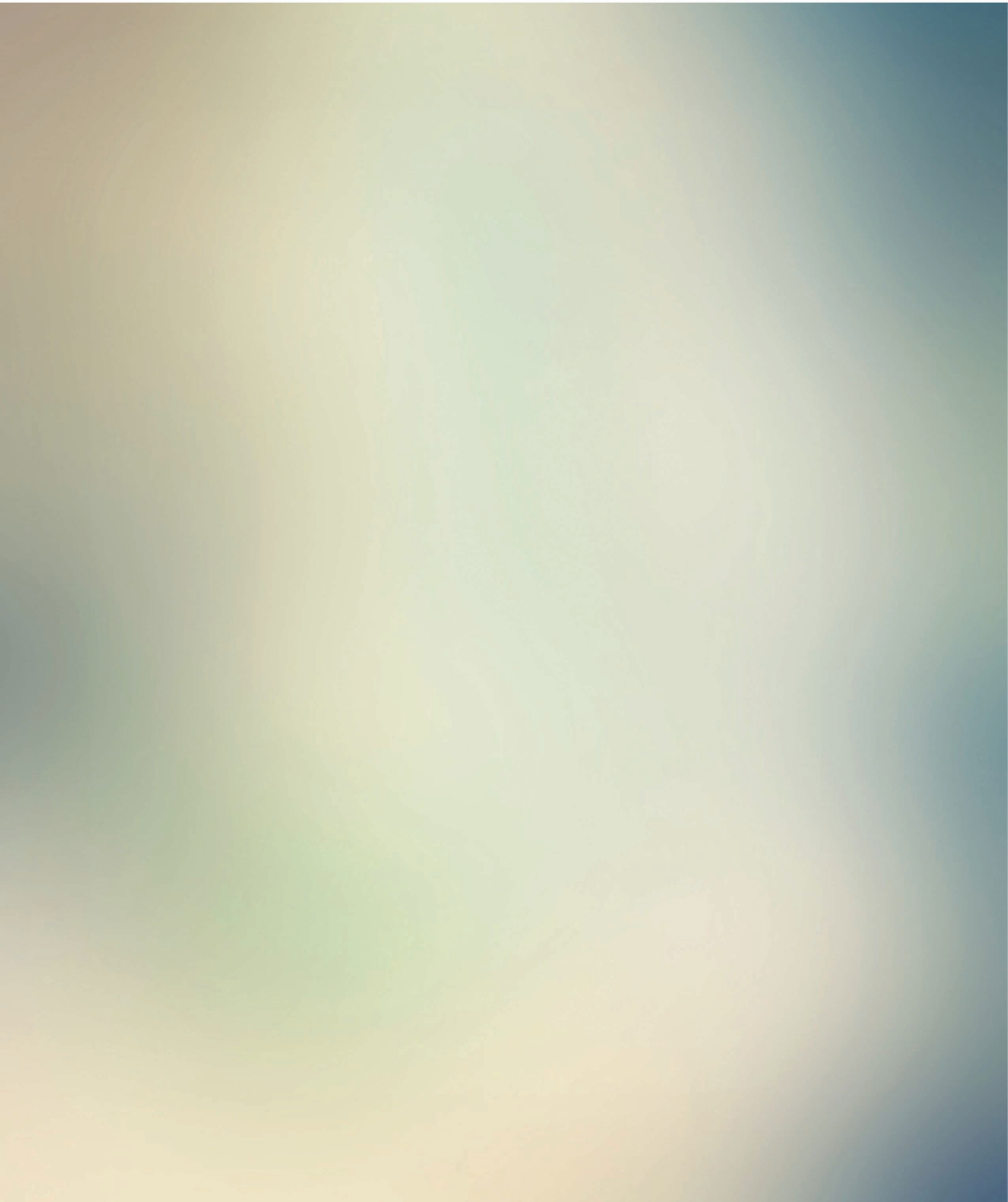
- **There is no dedicated law at either BiH or RS level regulating the DH sector, i.e. the production, distribution and delivery of thermal energy.** DH operations are governed by various pieces of legislation on energy efficiency improvement, use of renewable energy sources, spatial planning and environmental protection. A dedicated law to regulate measures for safe and reliable production and delivery of thermal energy, the timeframes for installation of meters and the conditions for disconnection from the heating network and other issues is missing.

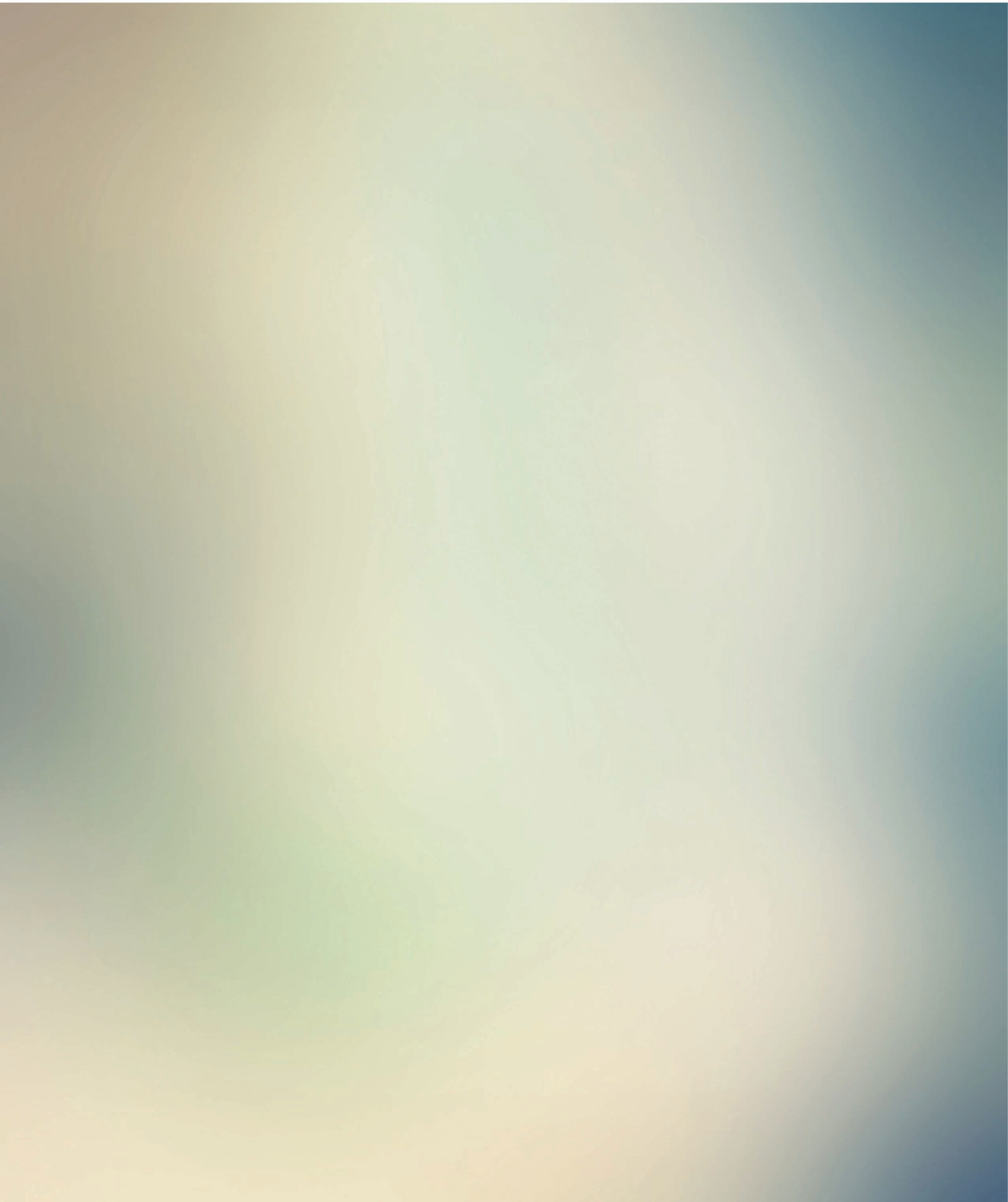
[93] Official Gazette of the City of Banja Luka, No. 5/06, 19/06 and 19/07
[94] Official Gazette of RS, No. 39/15

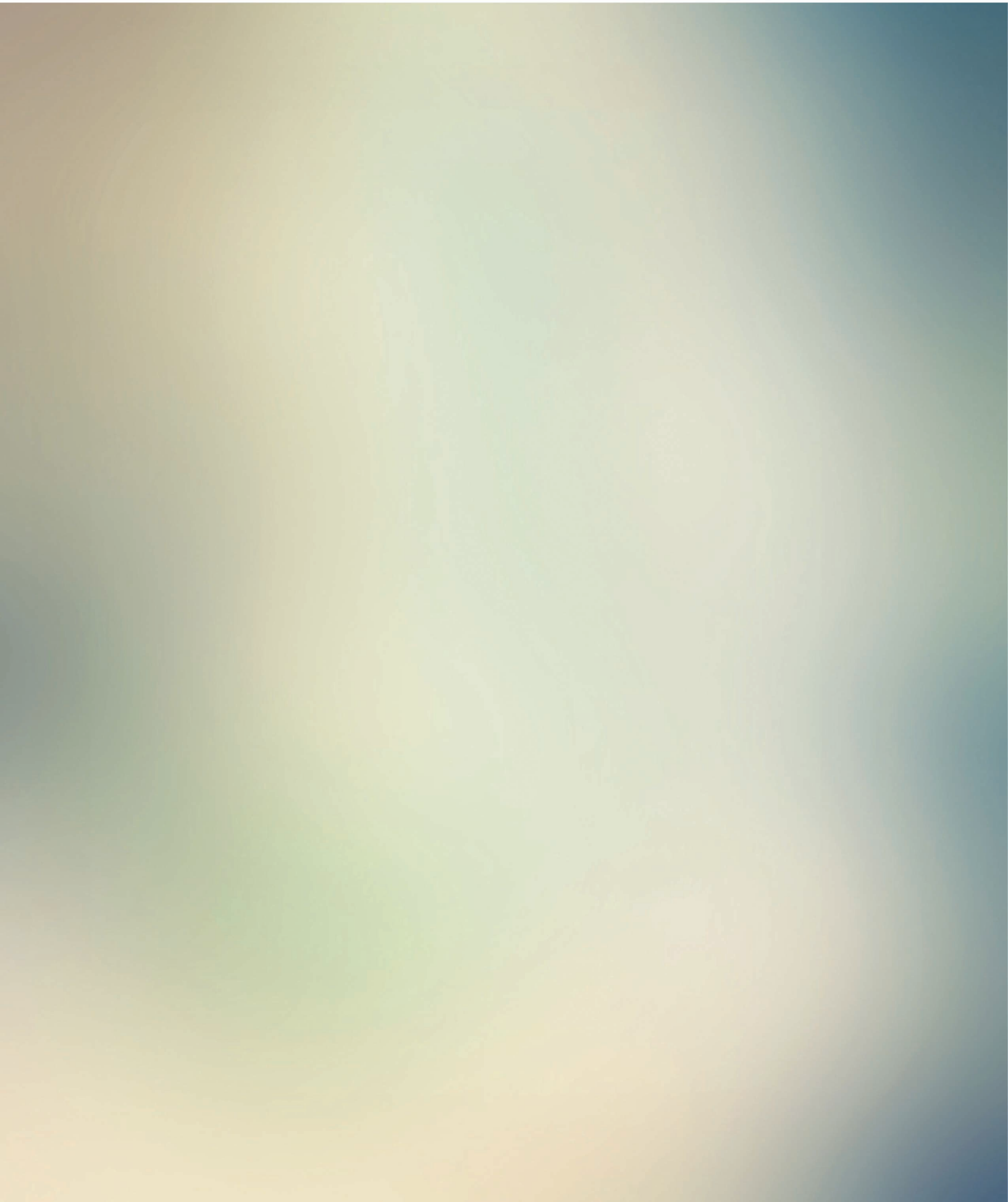


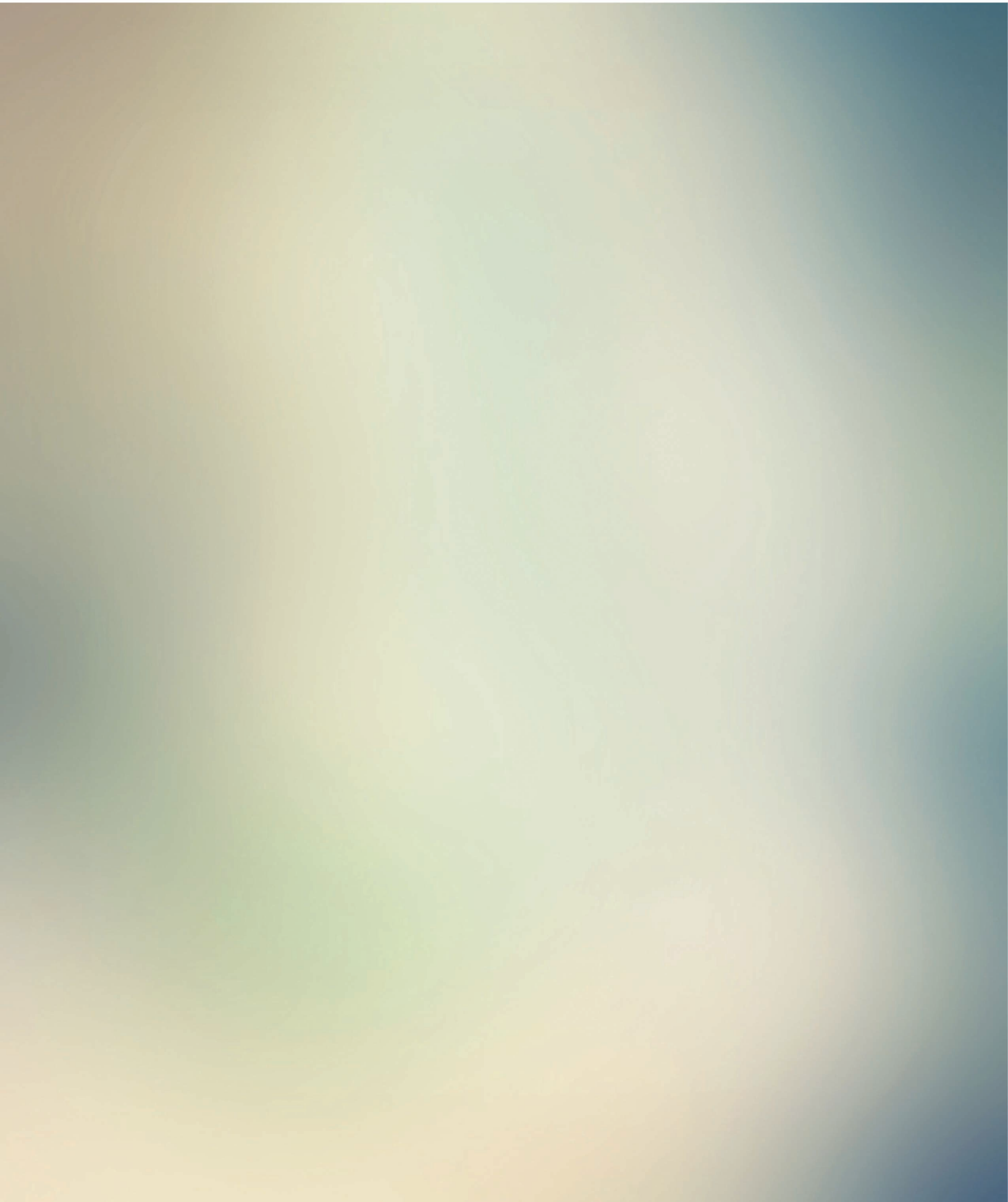


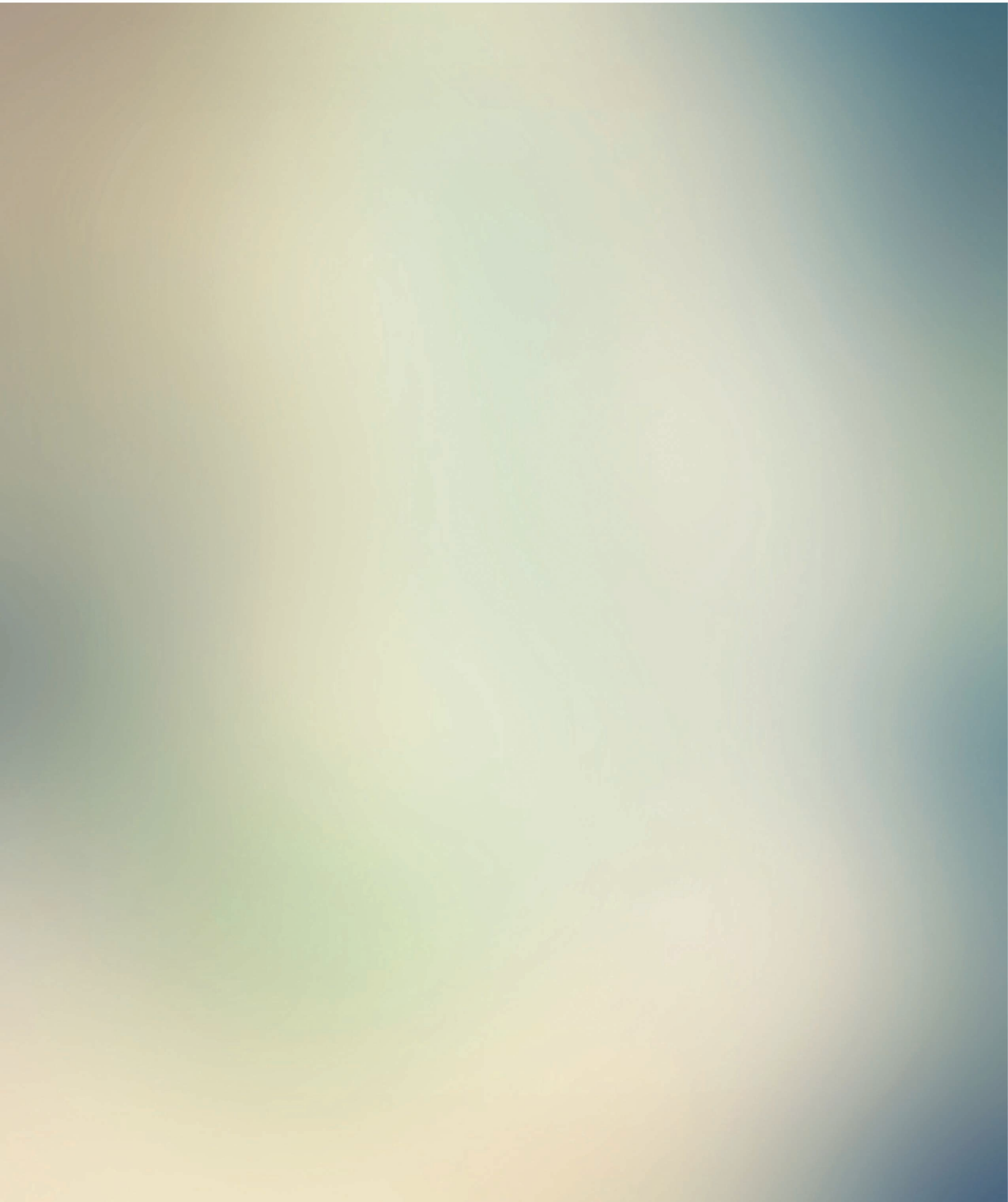


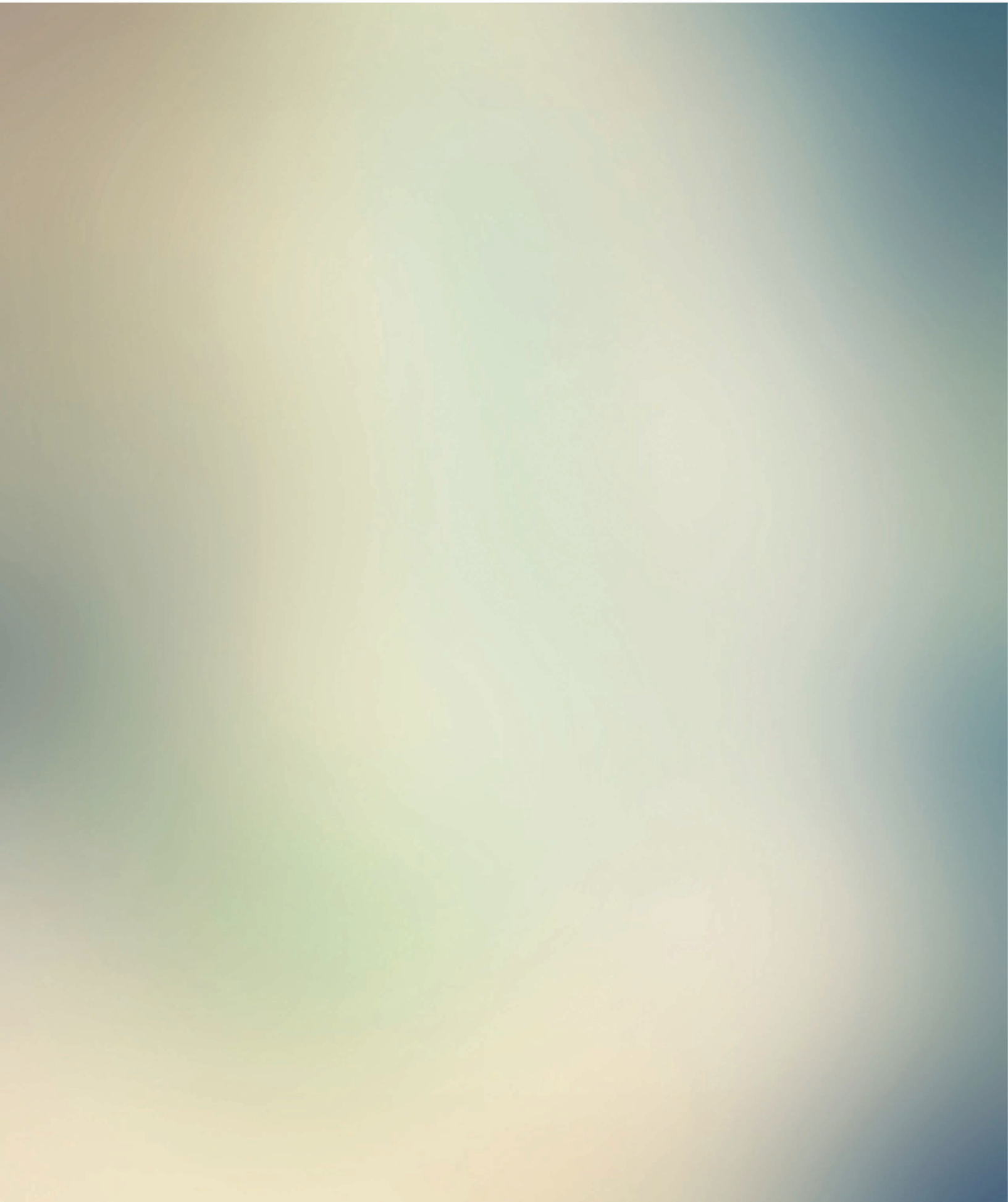


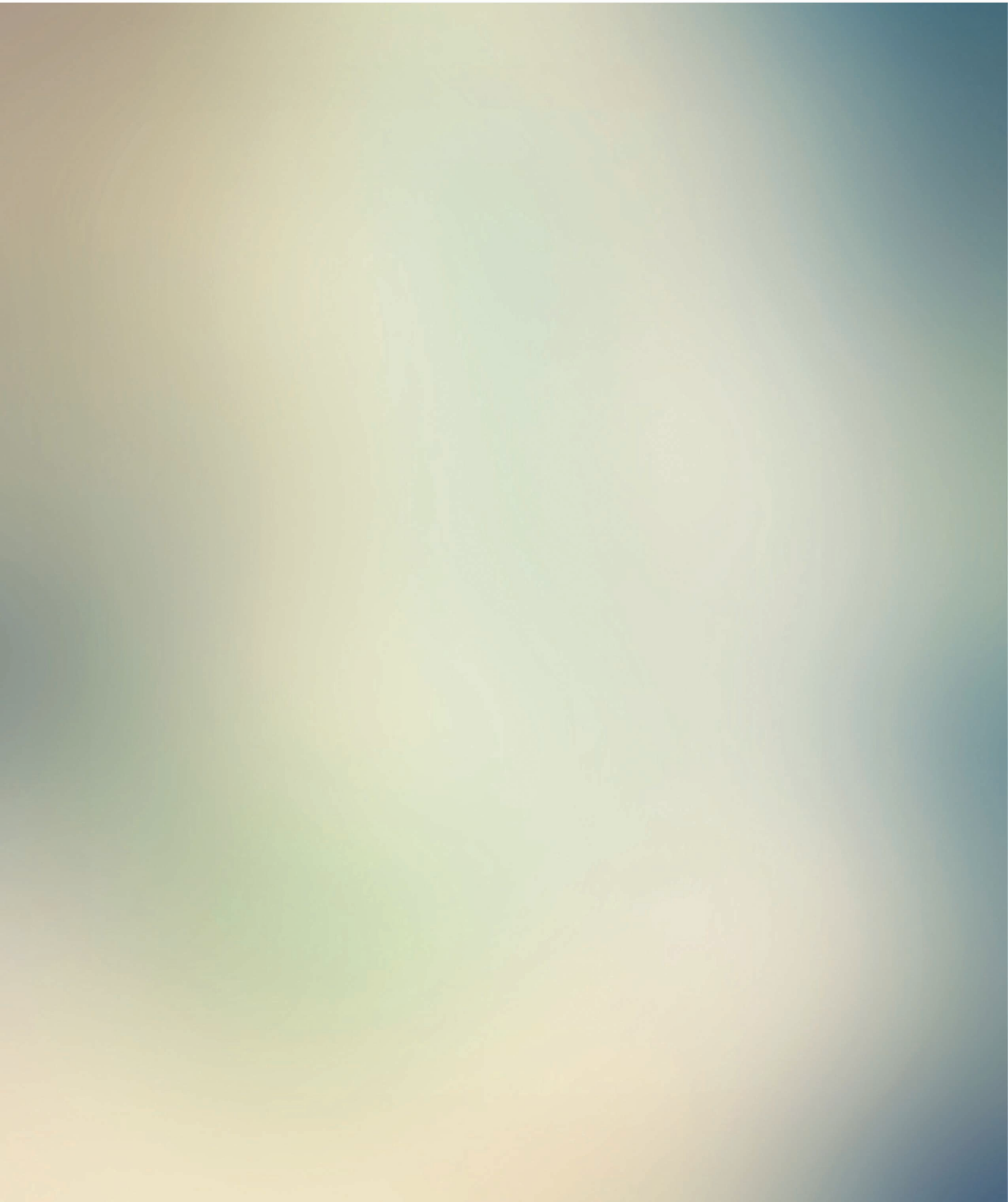


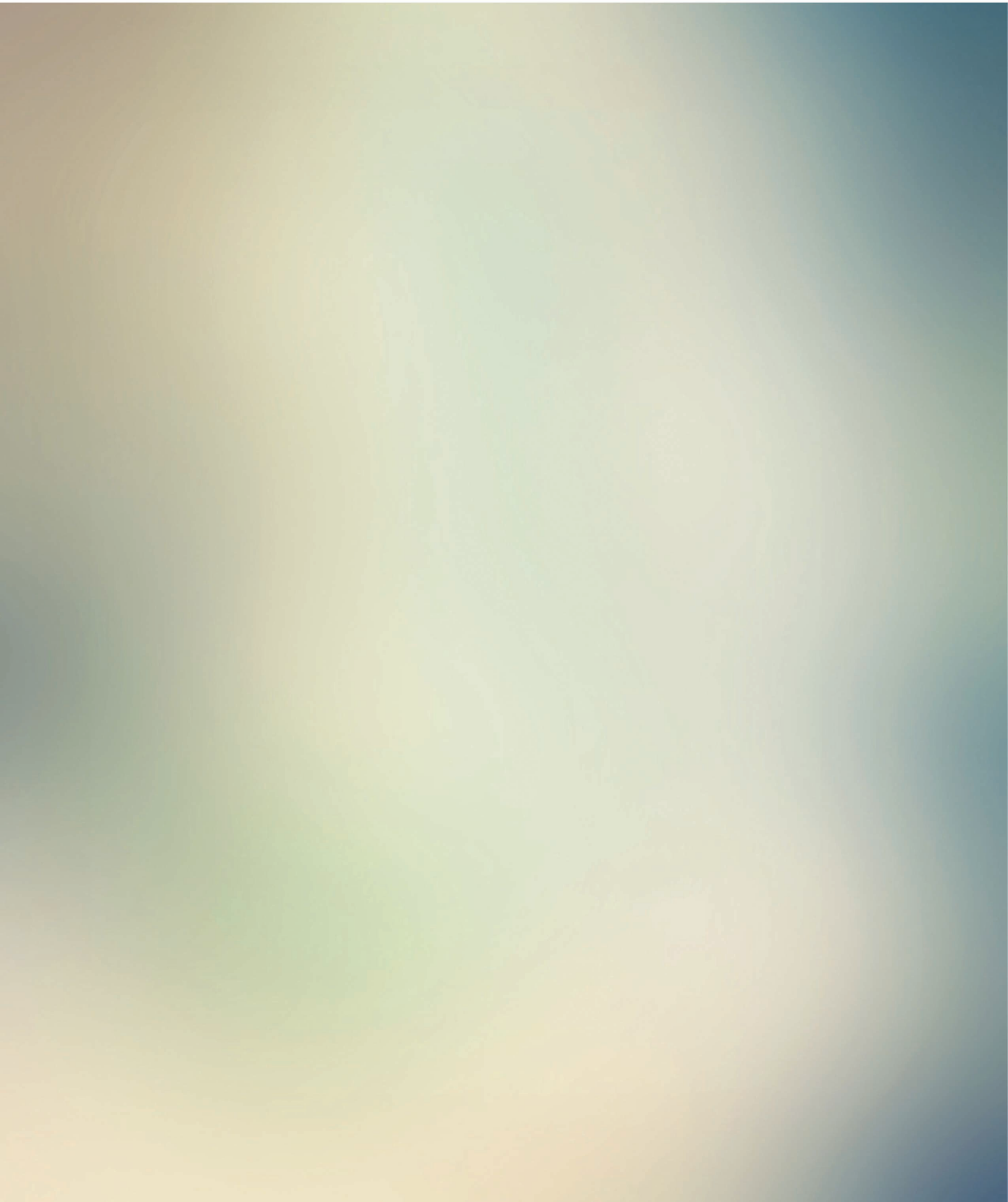


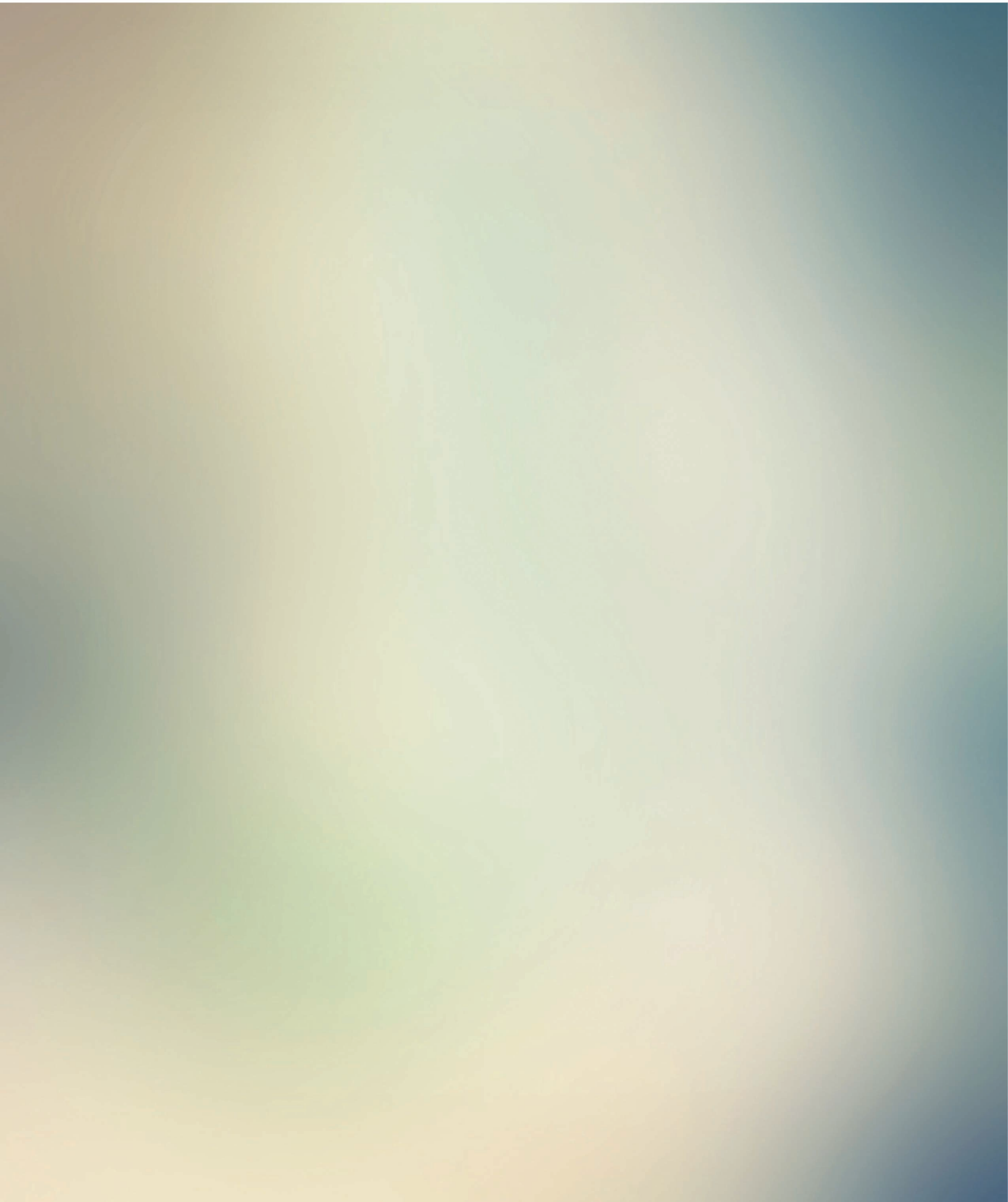


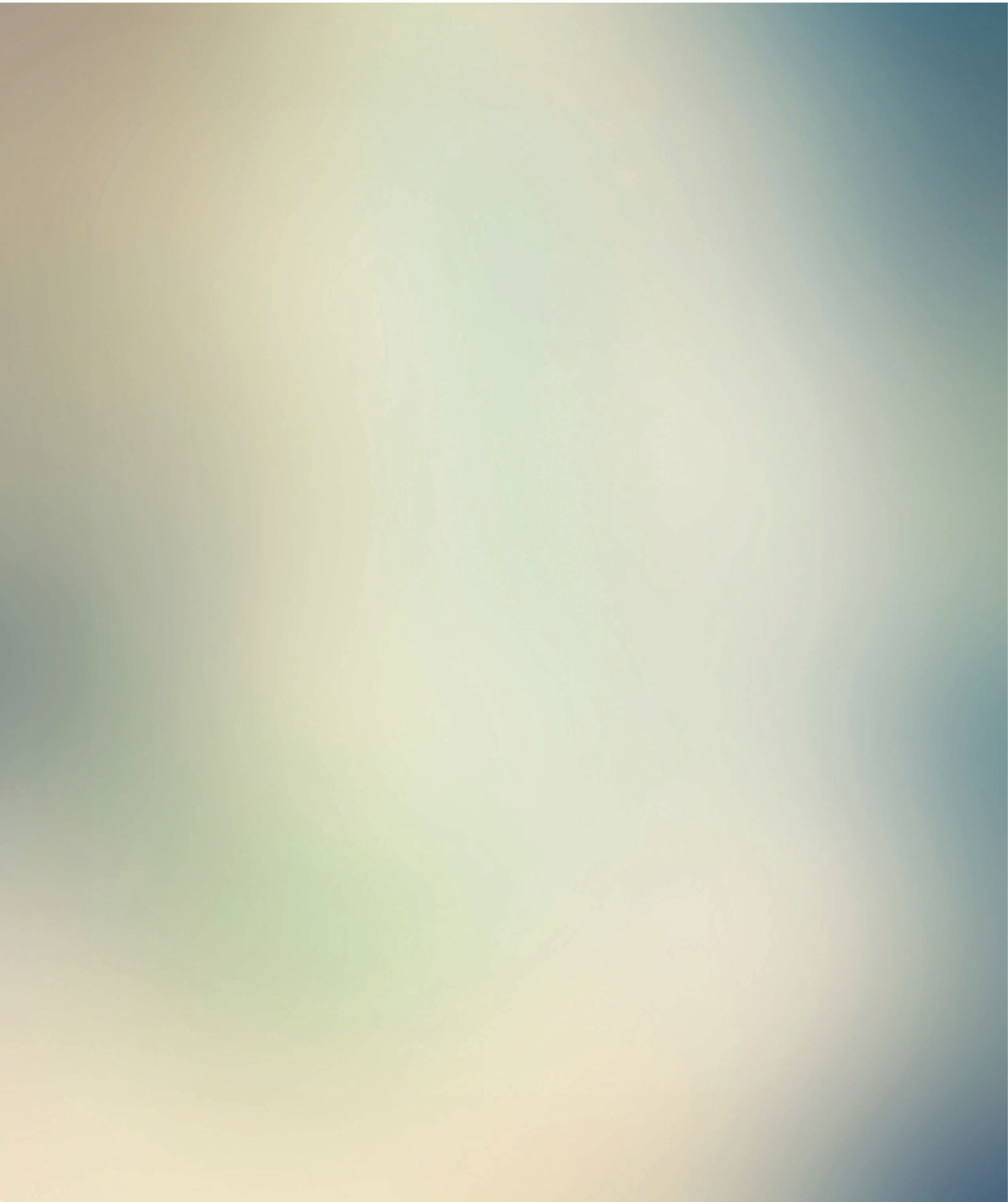


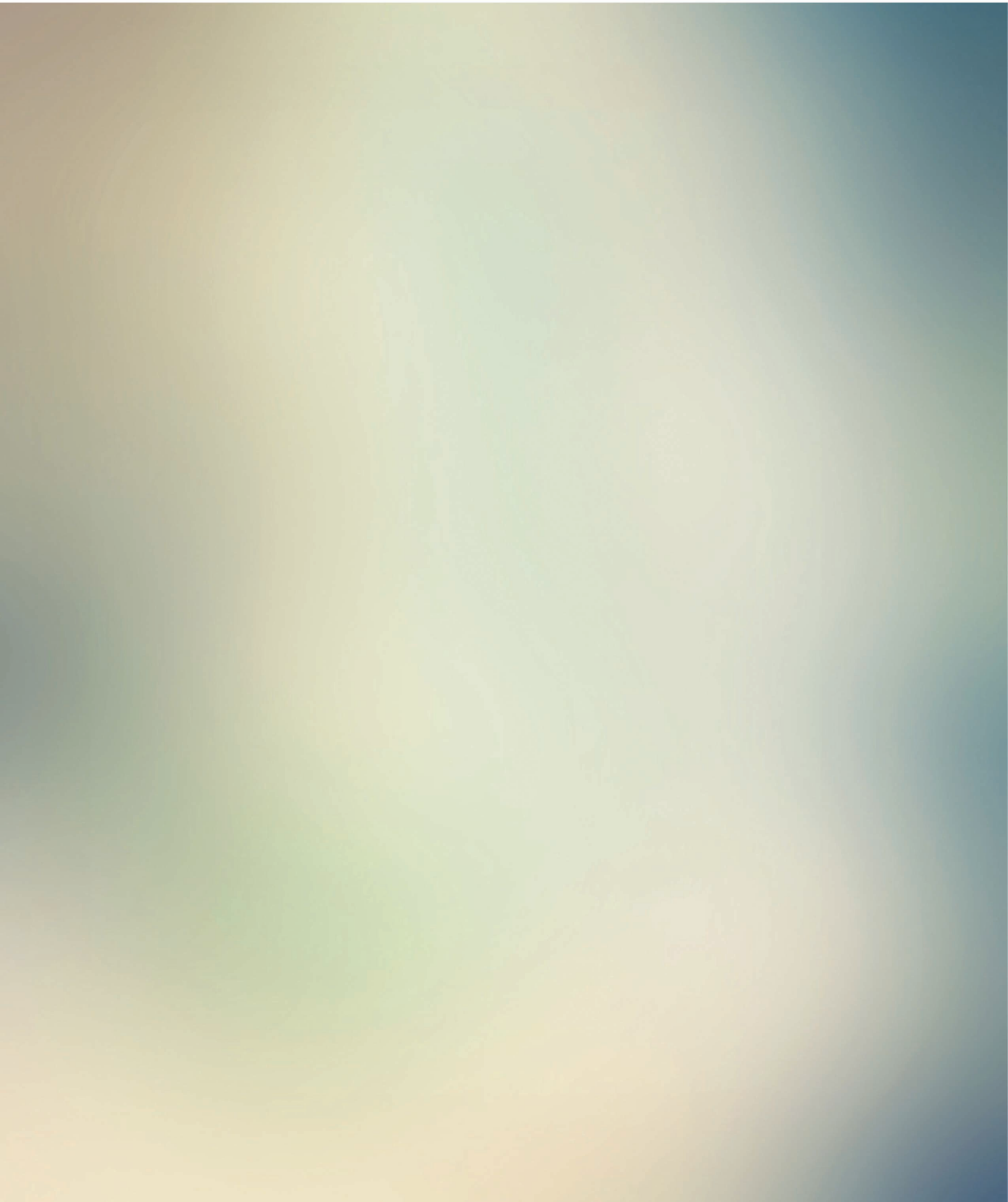


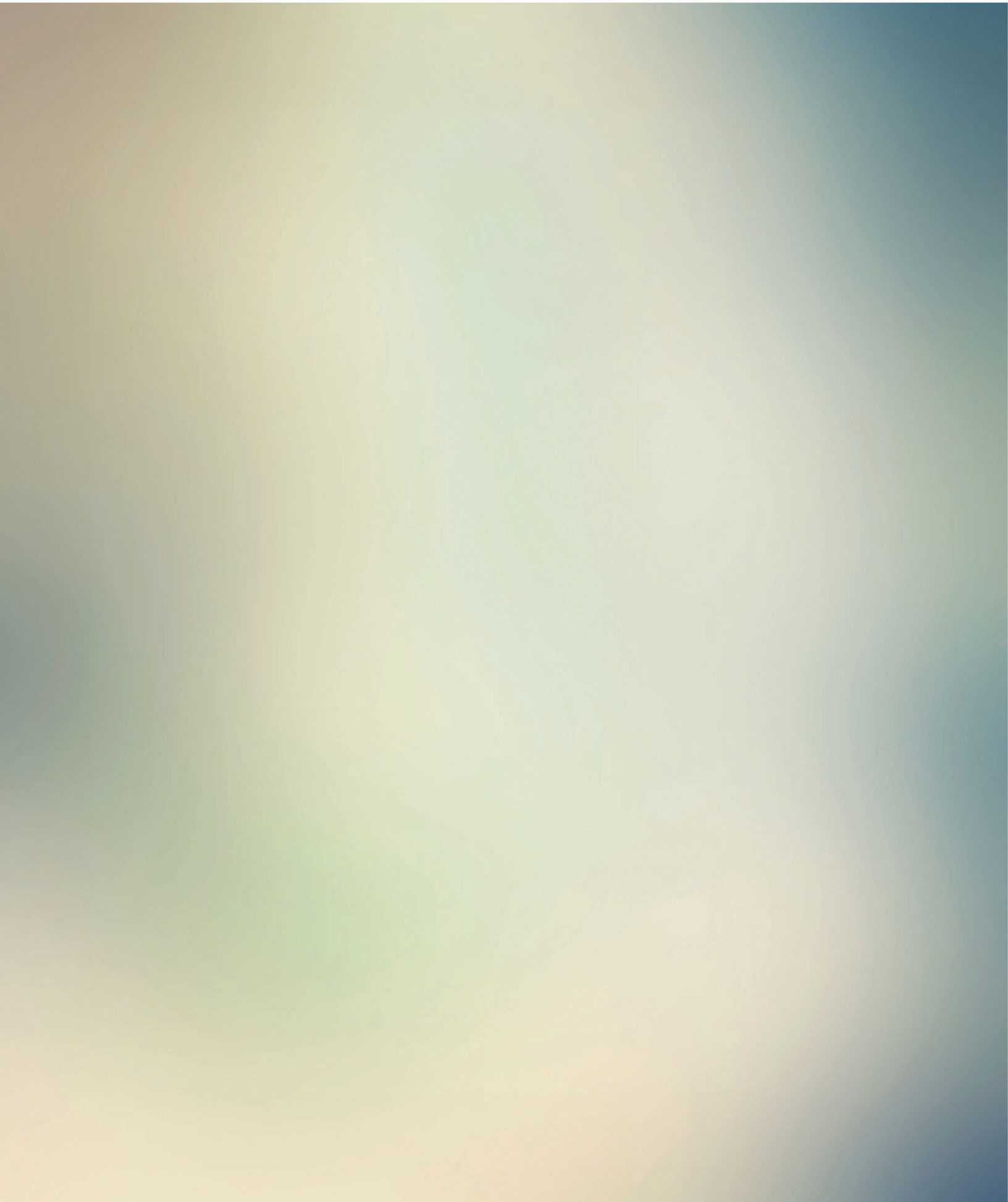


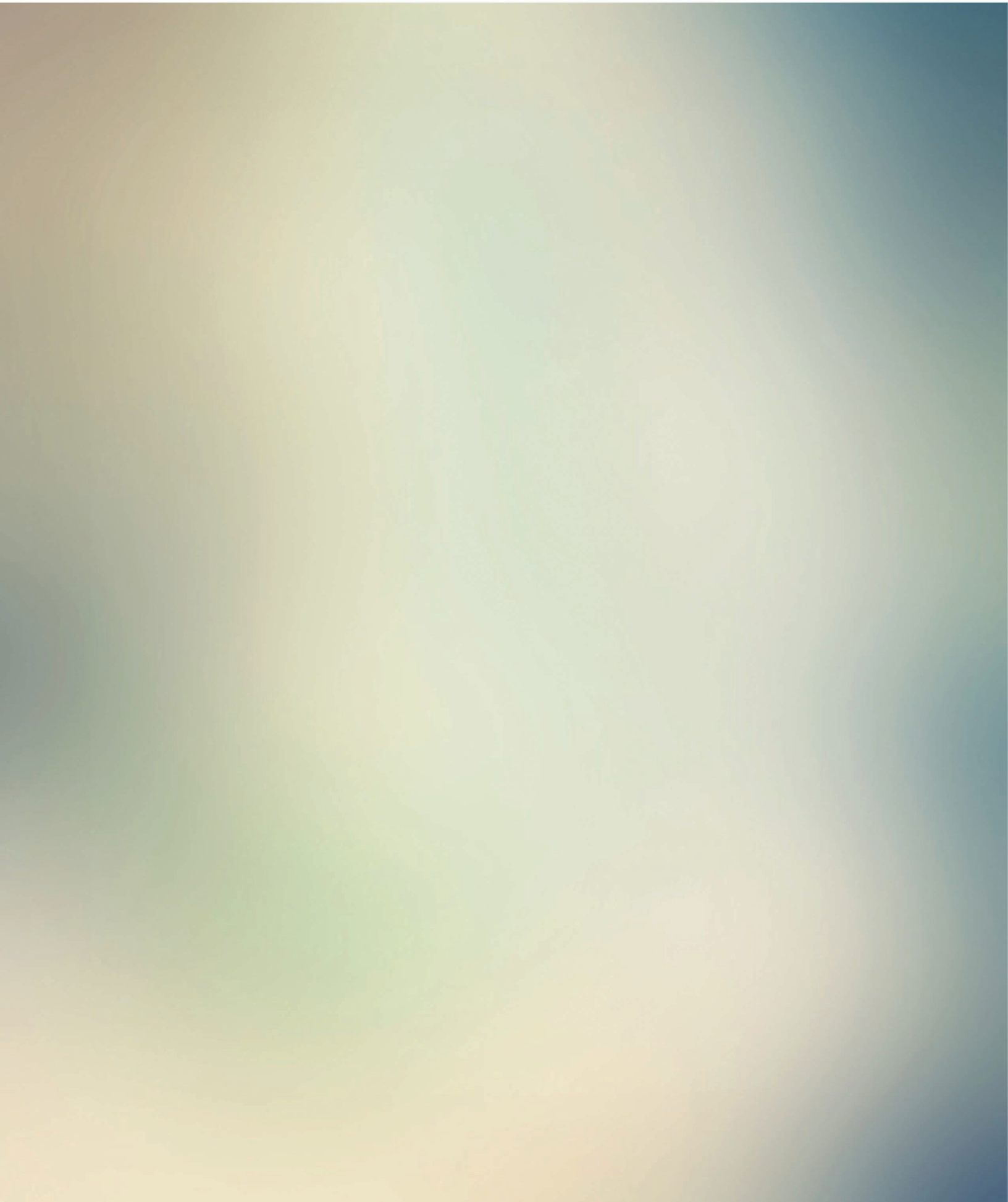


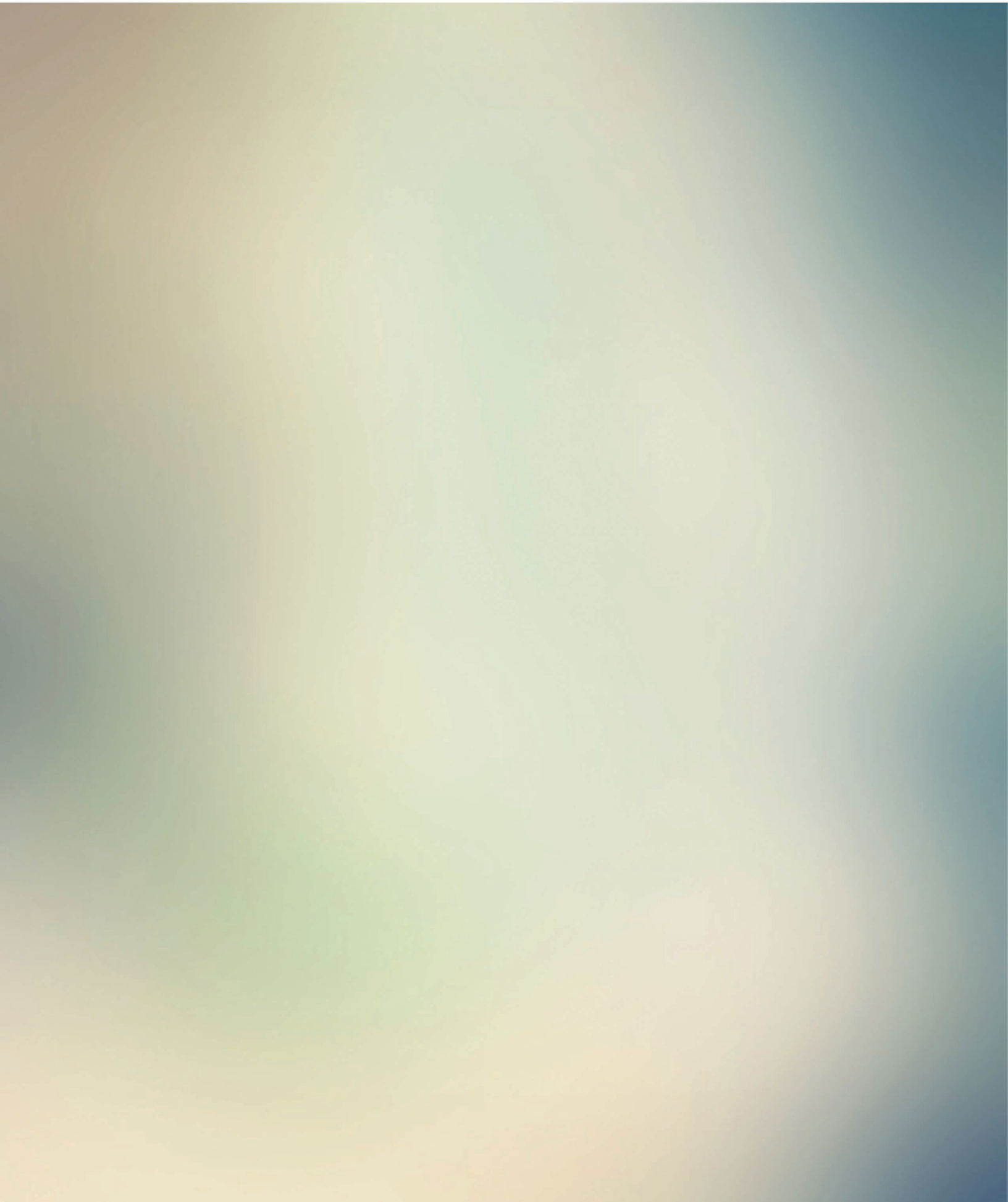


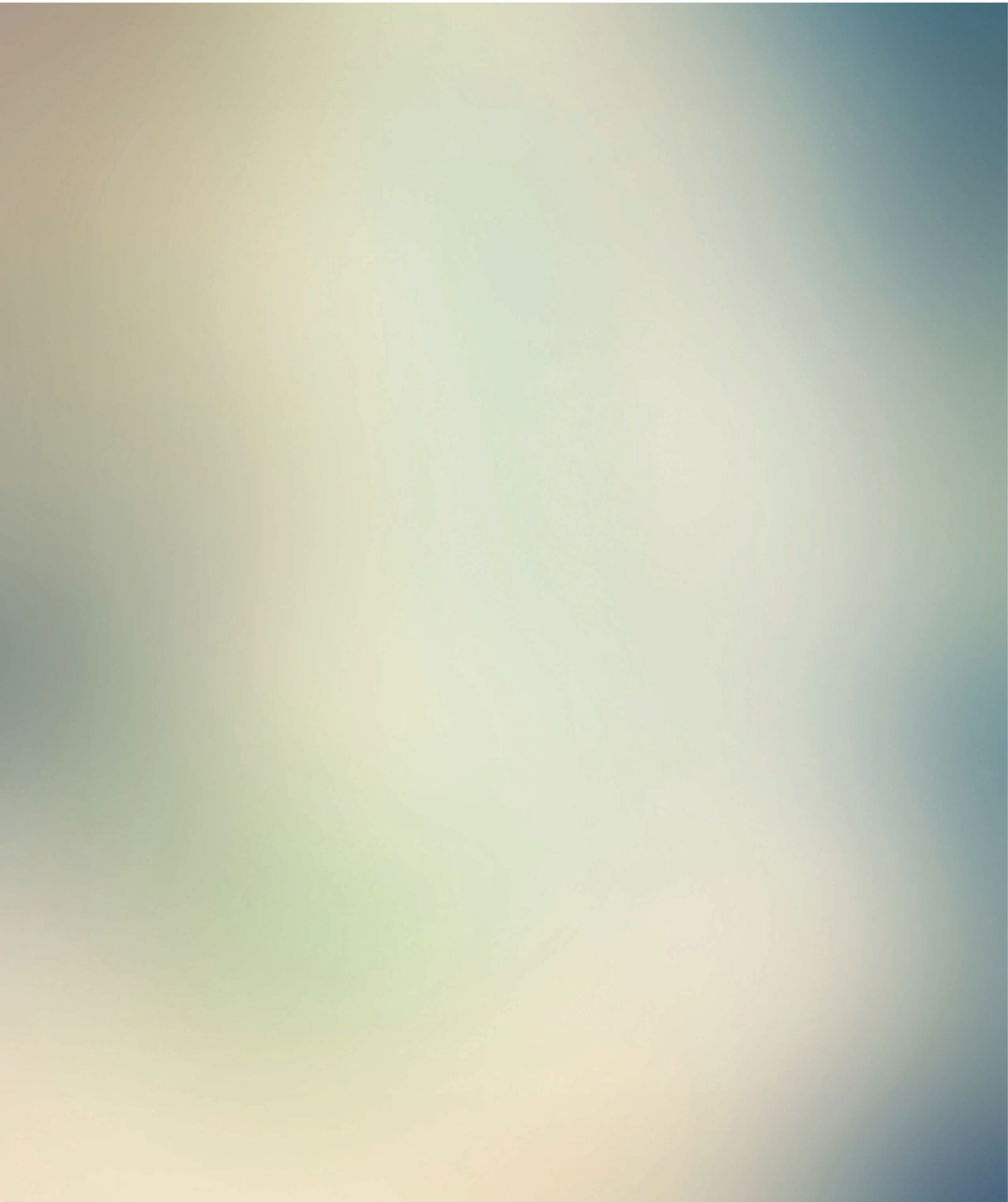


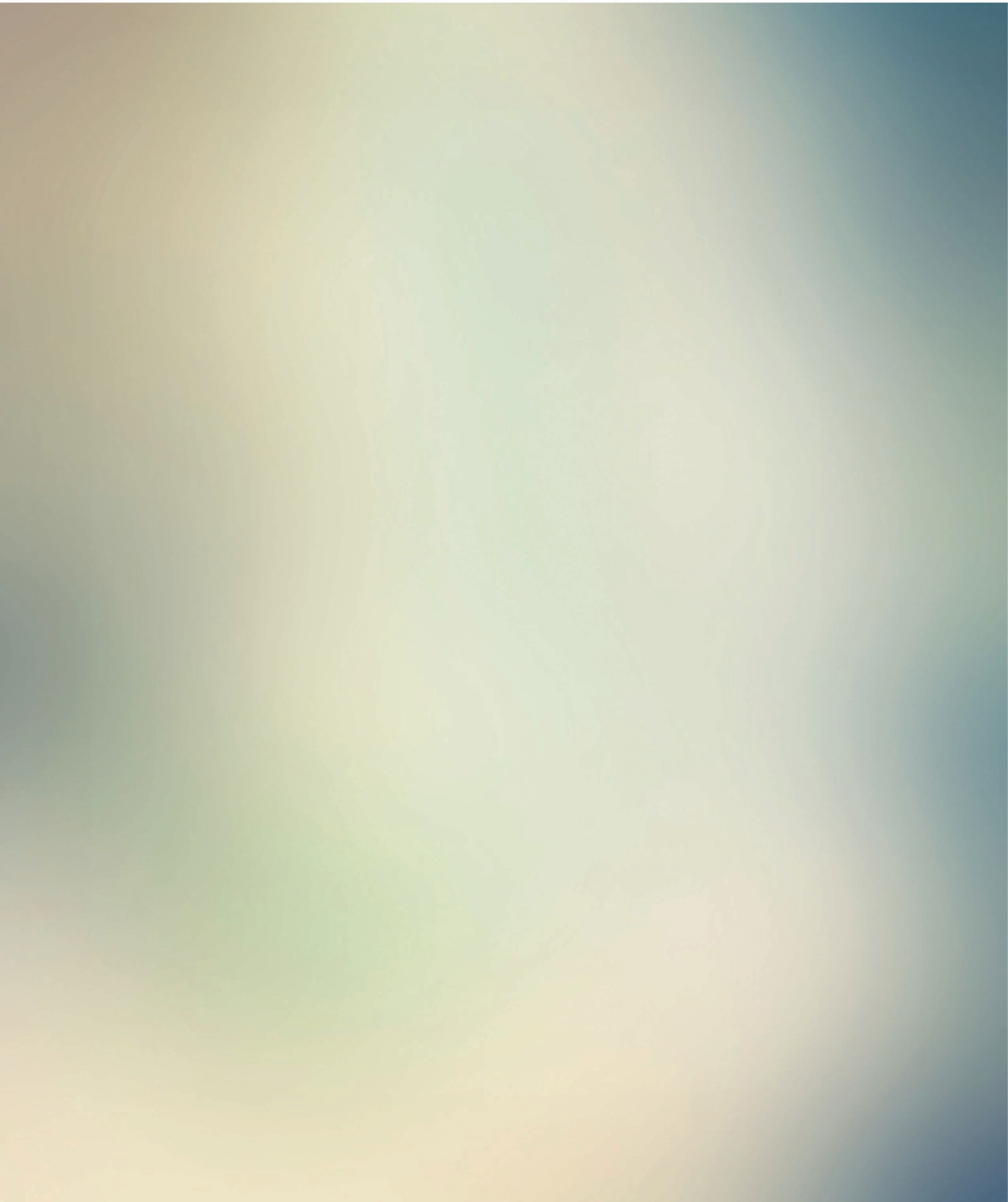


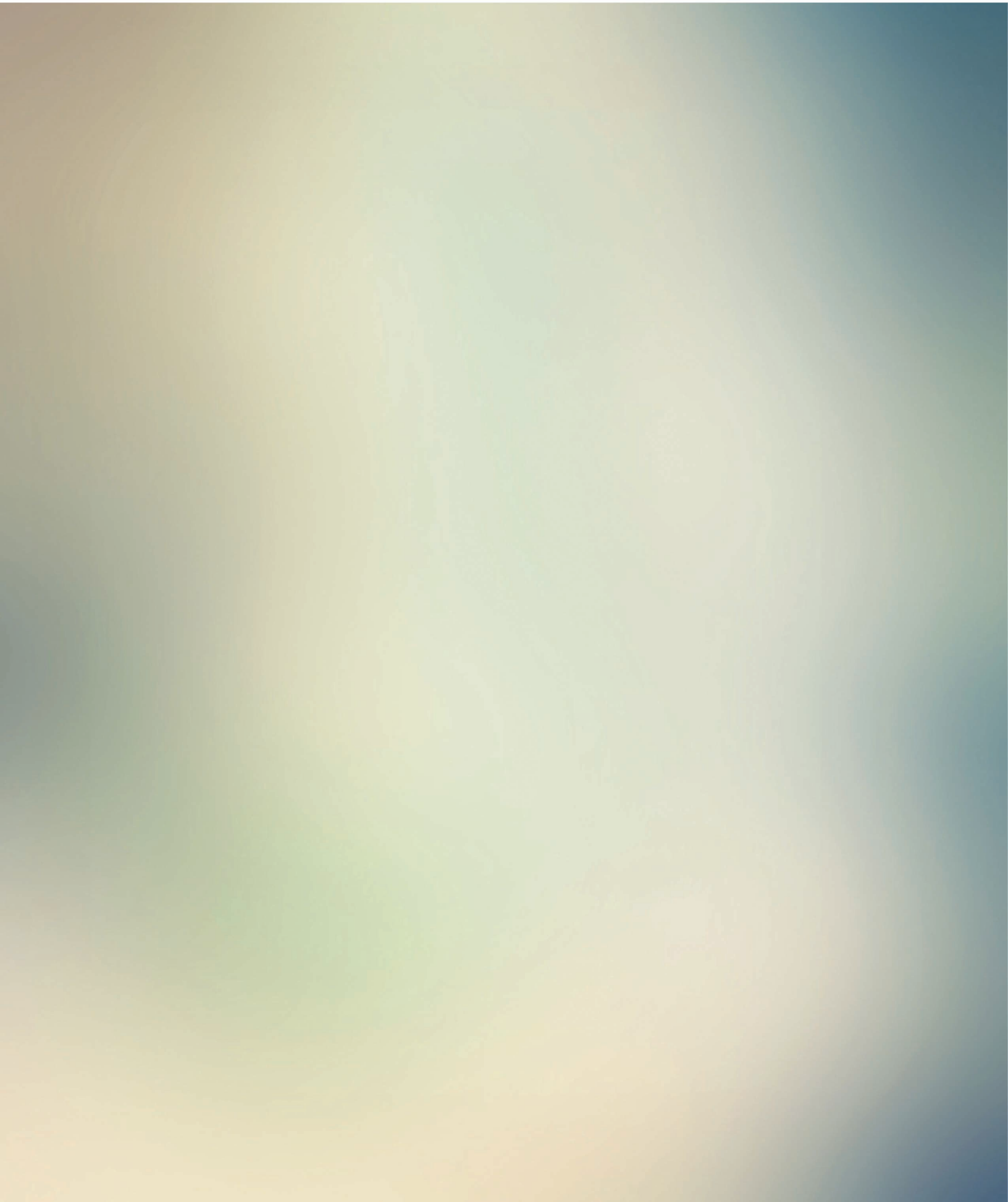


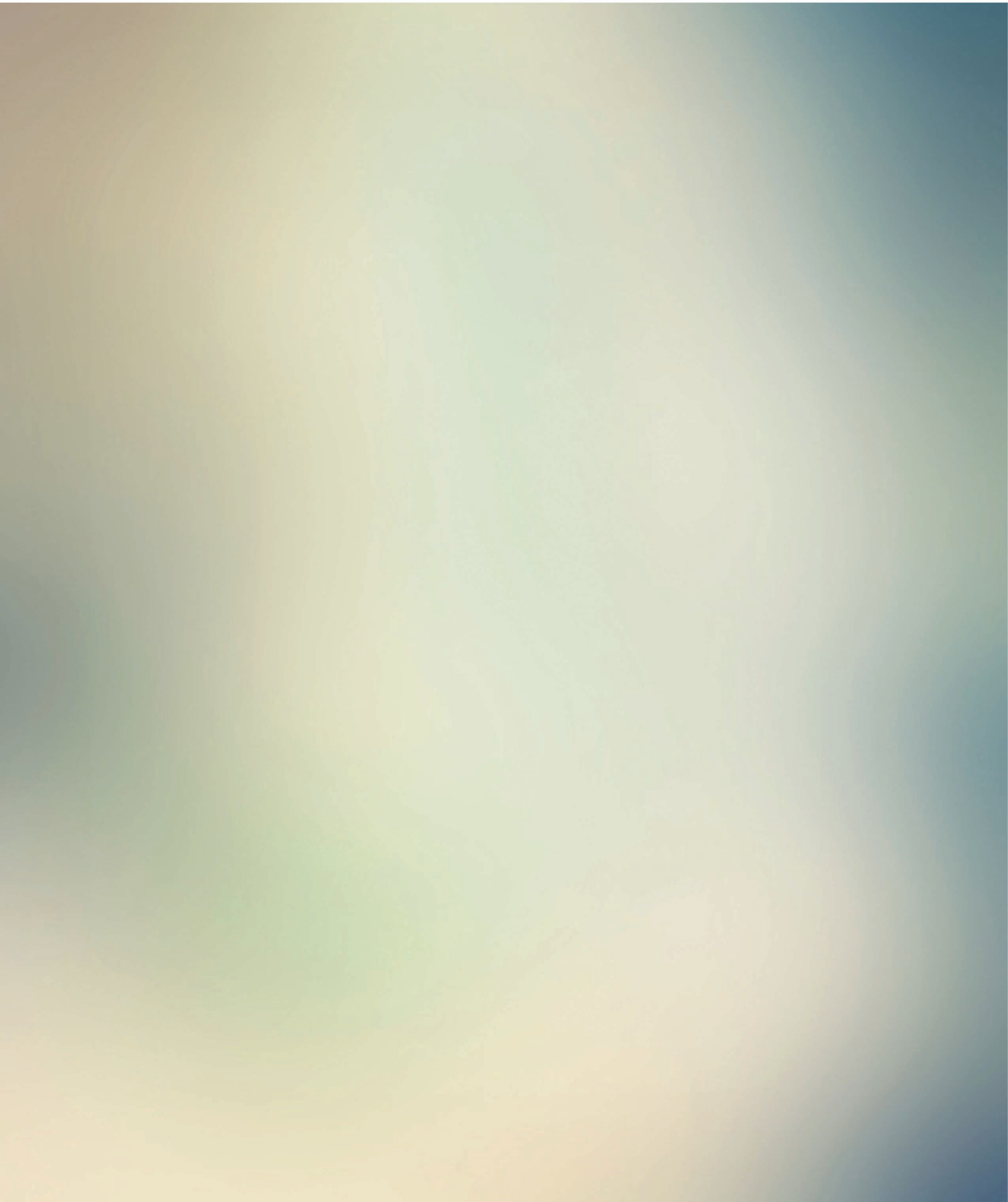


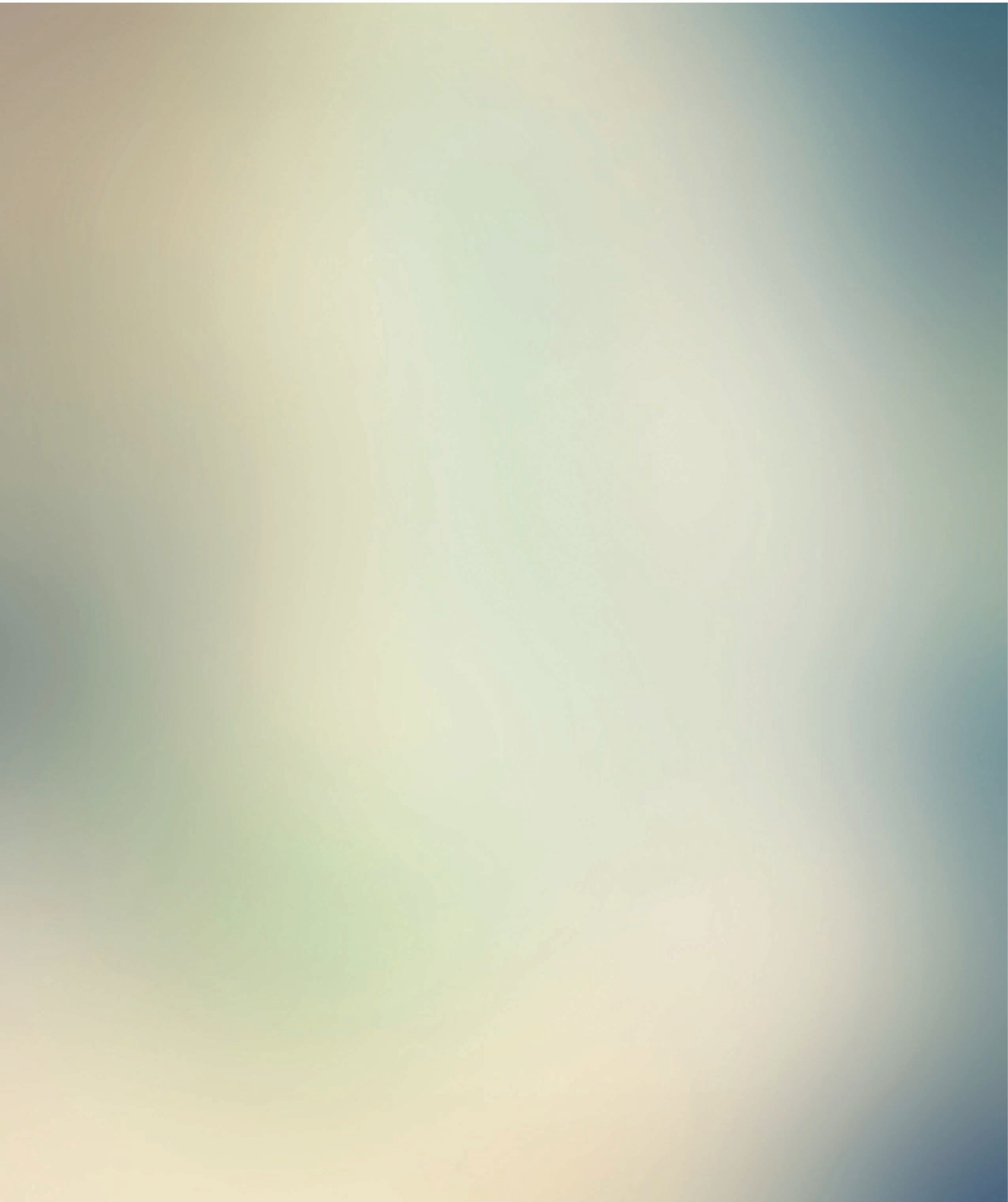


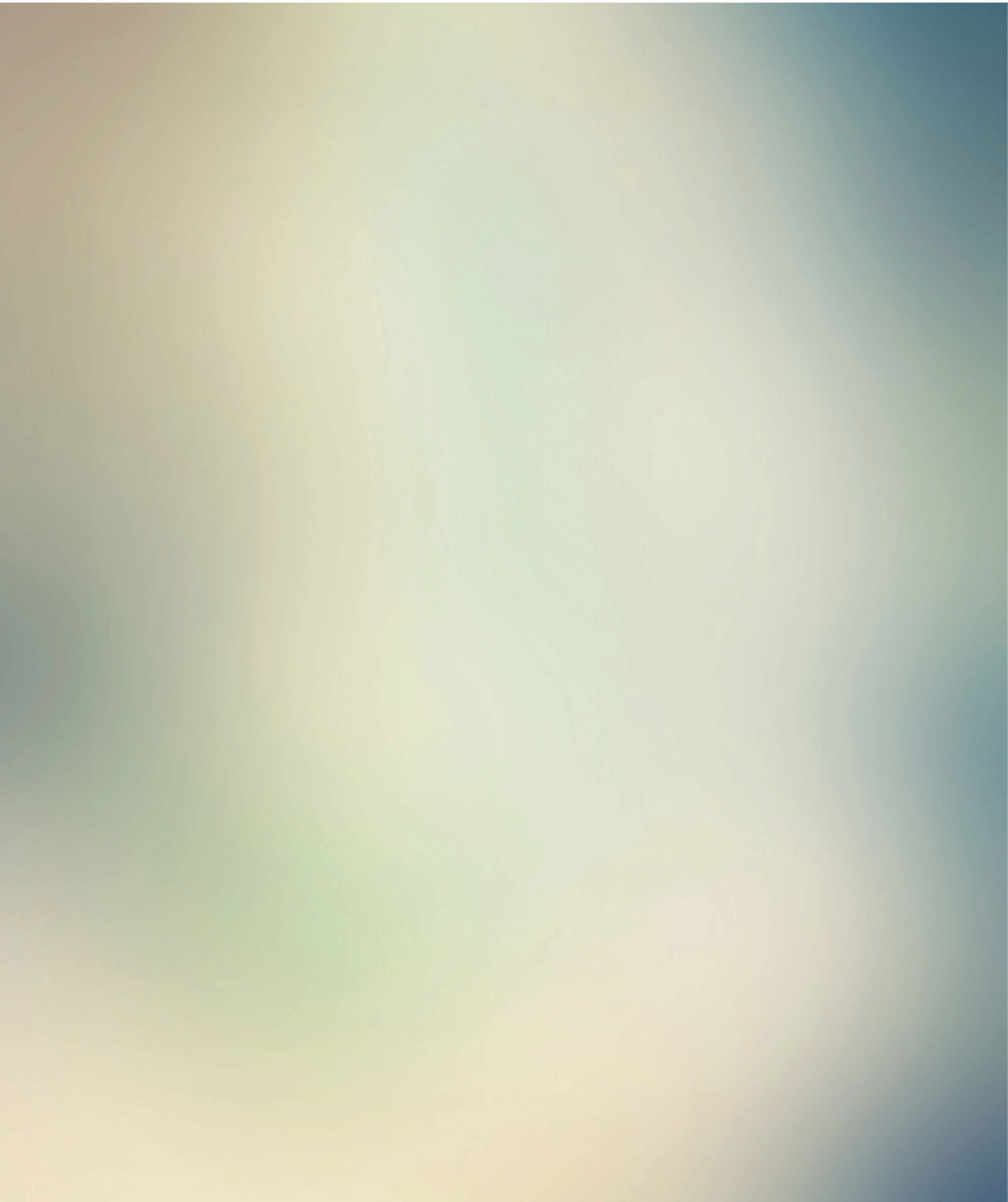


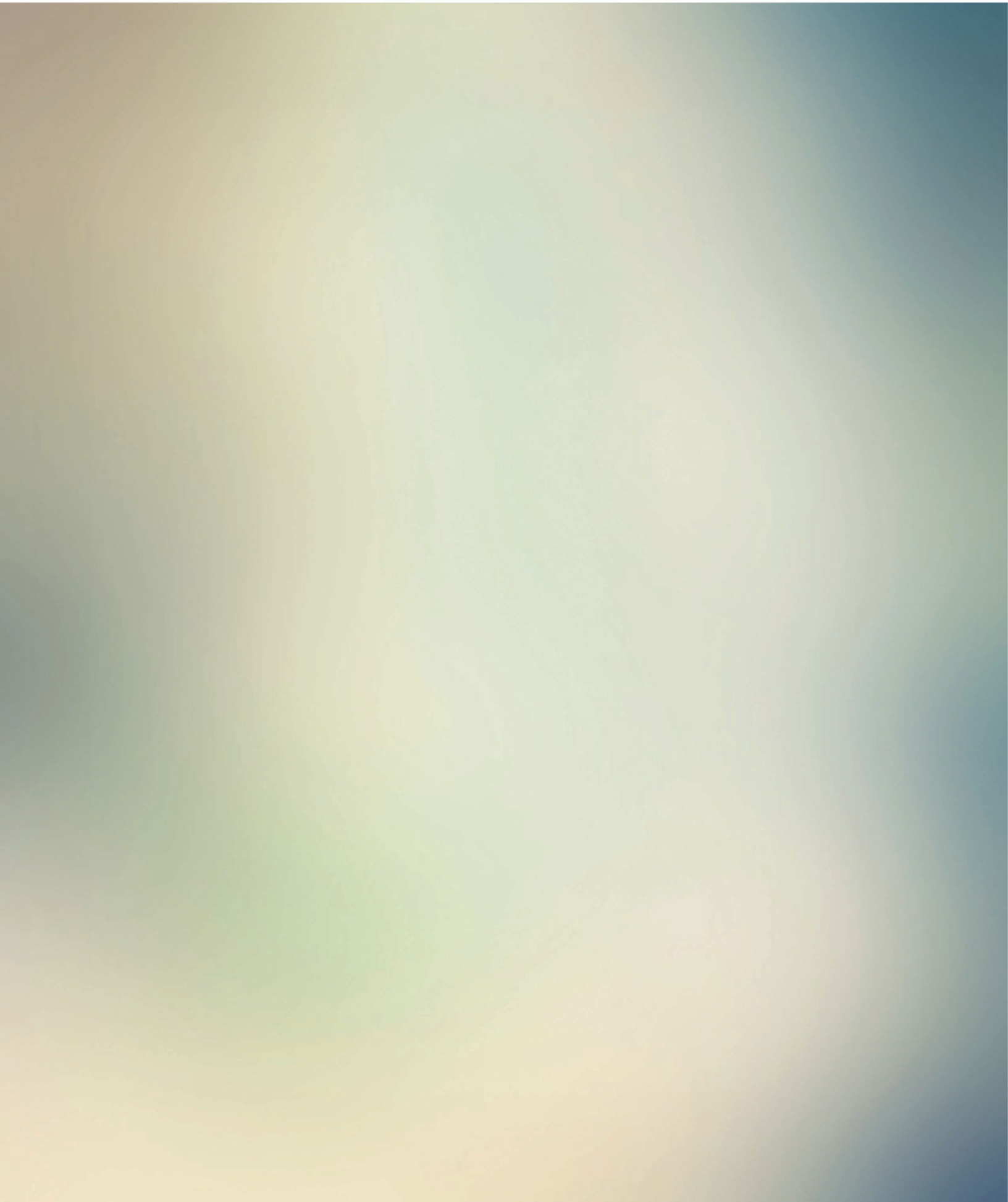


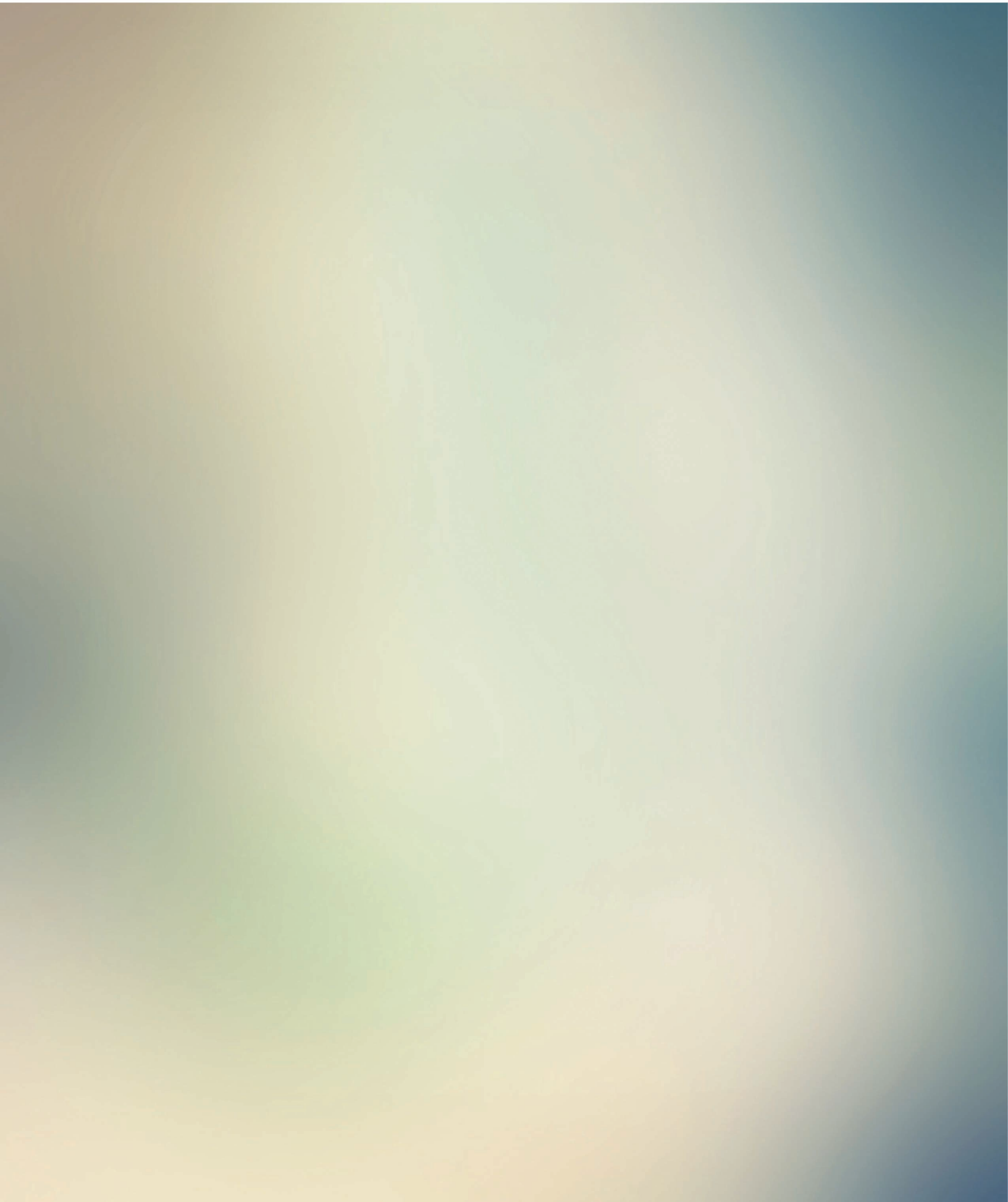


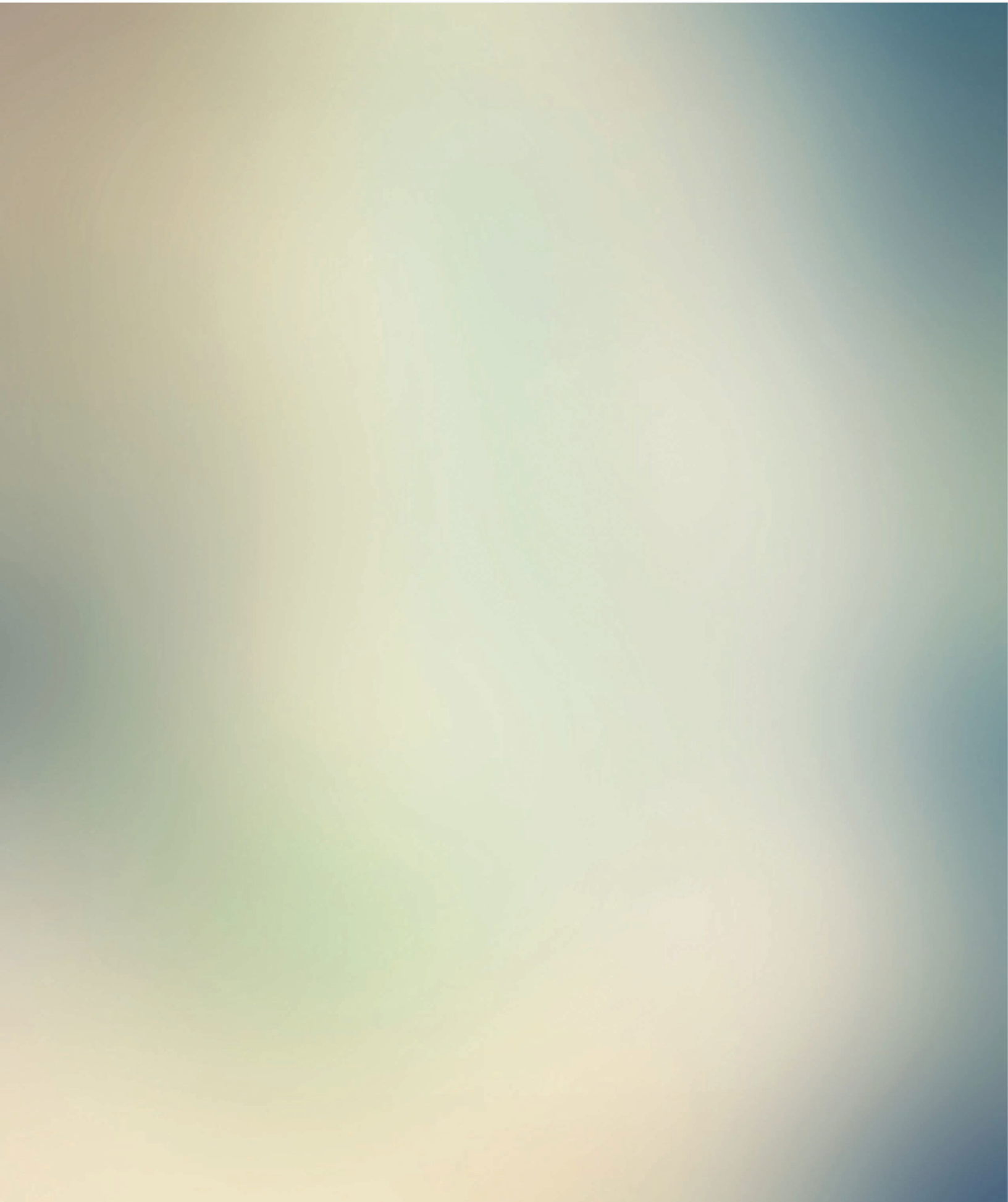


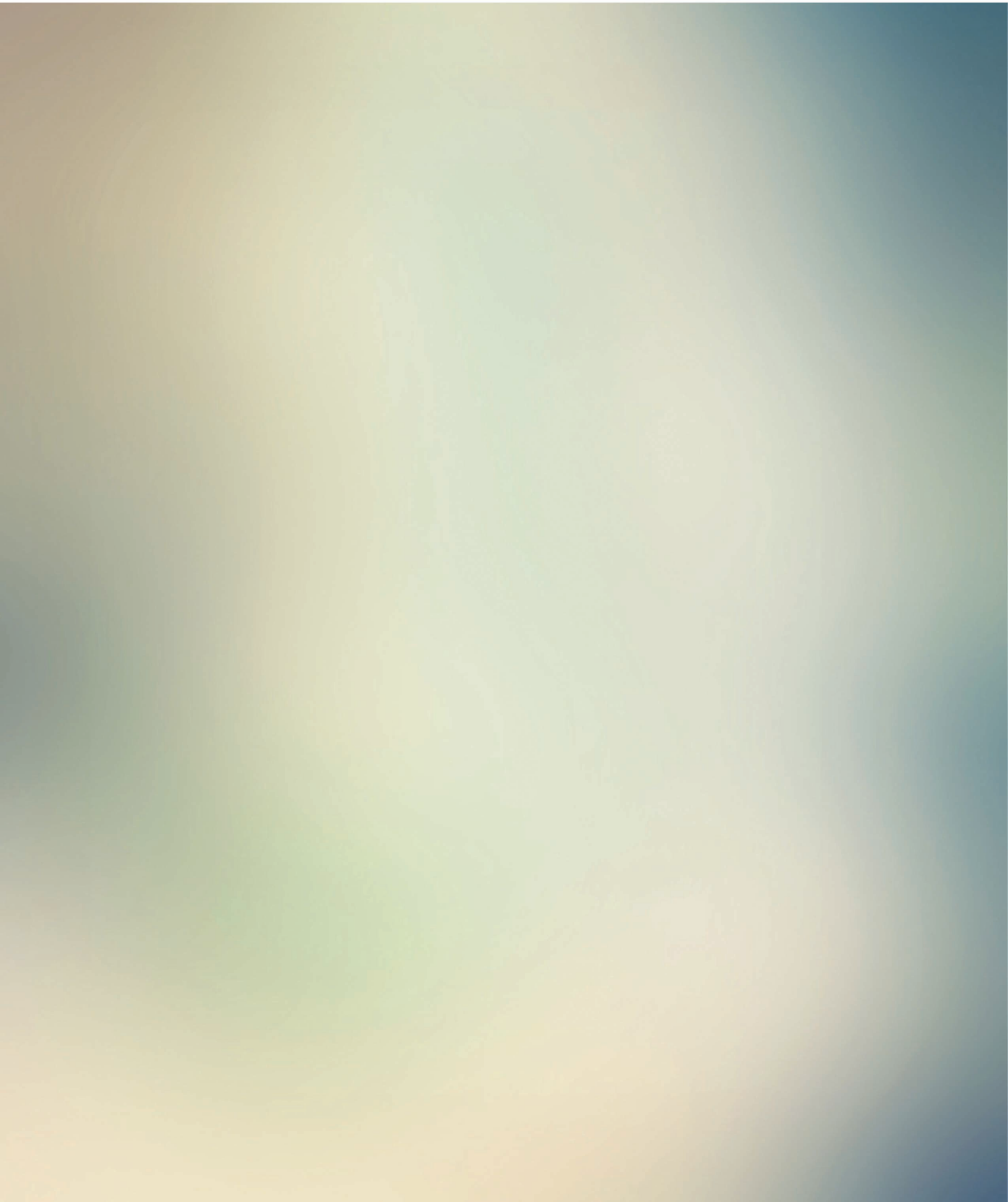


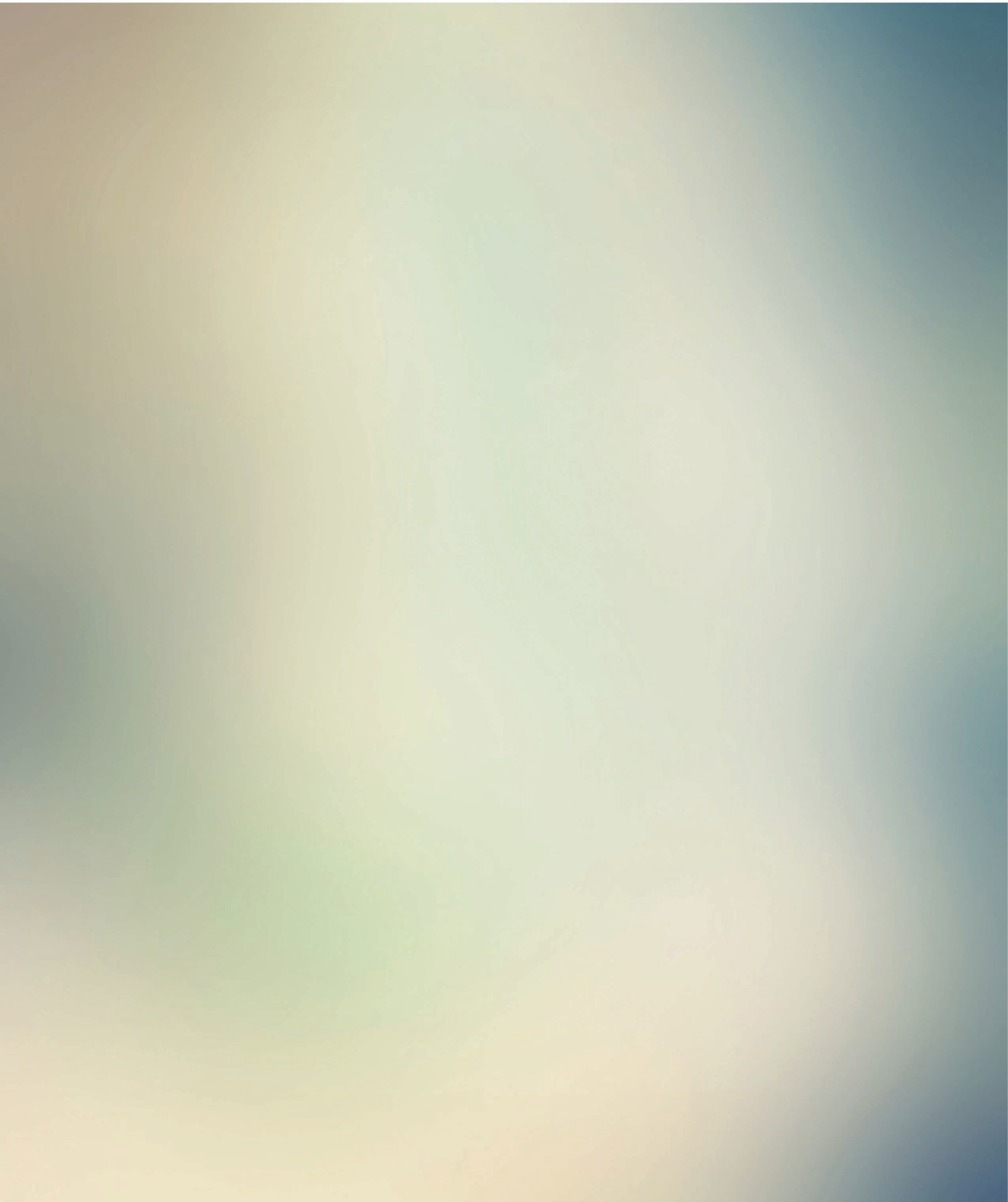


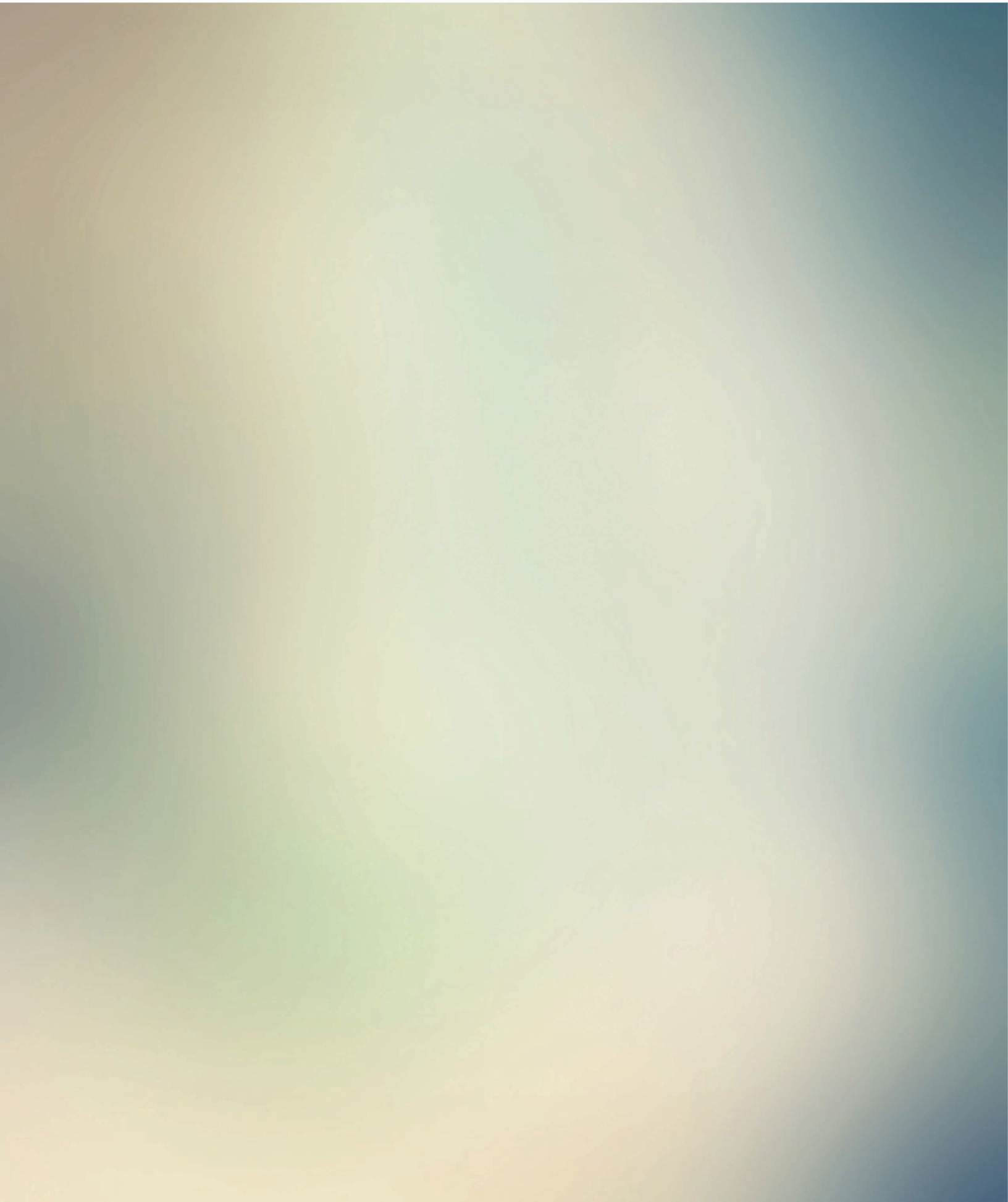


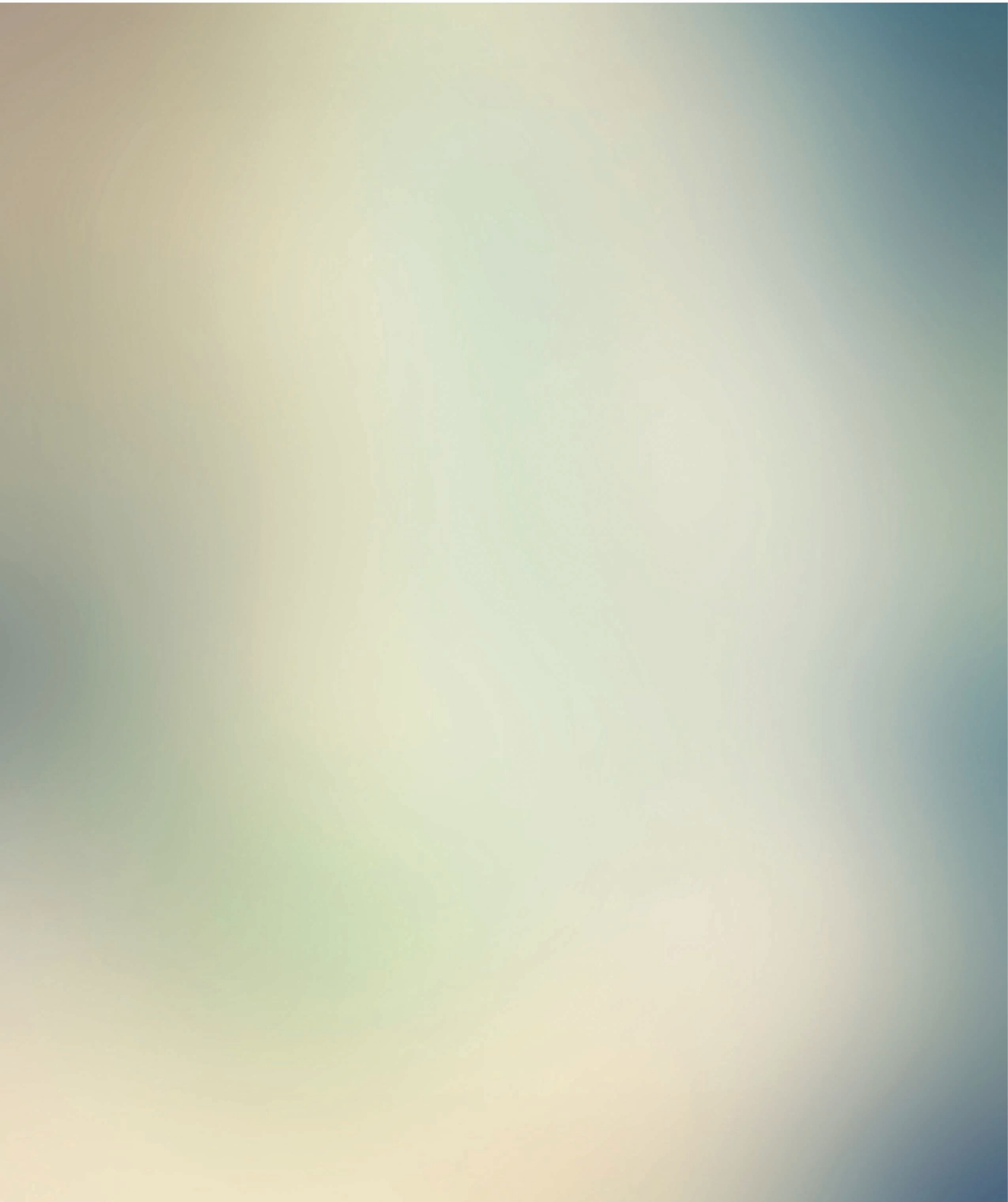


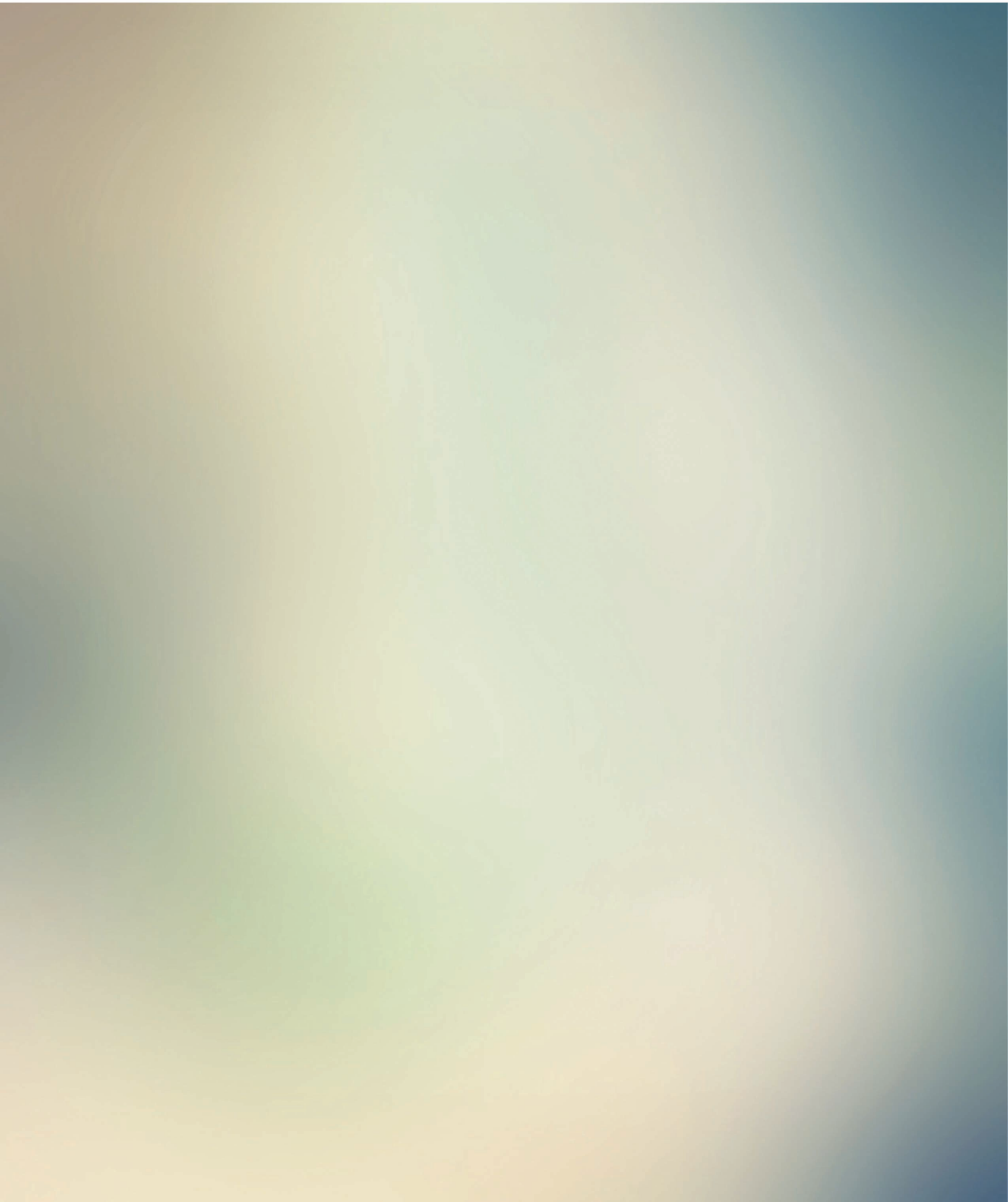


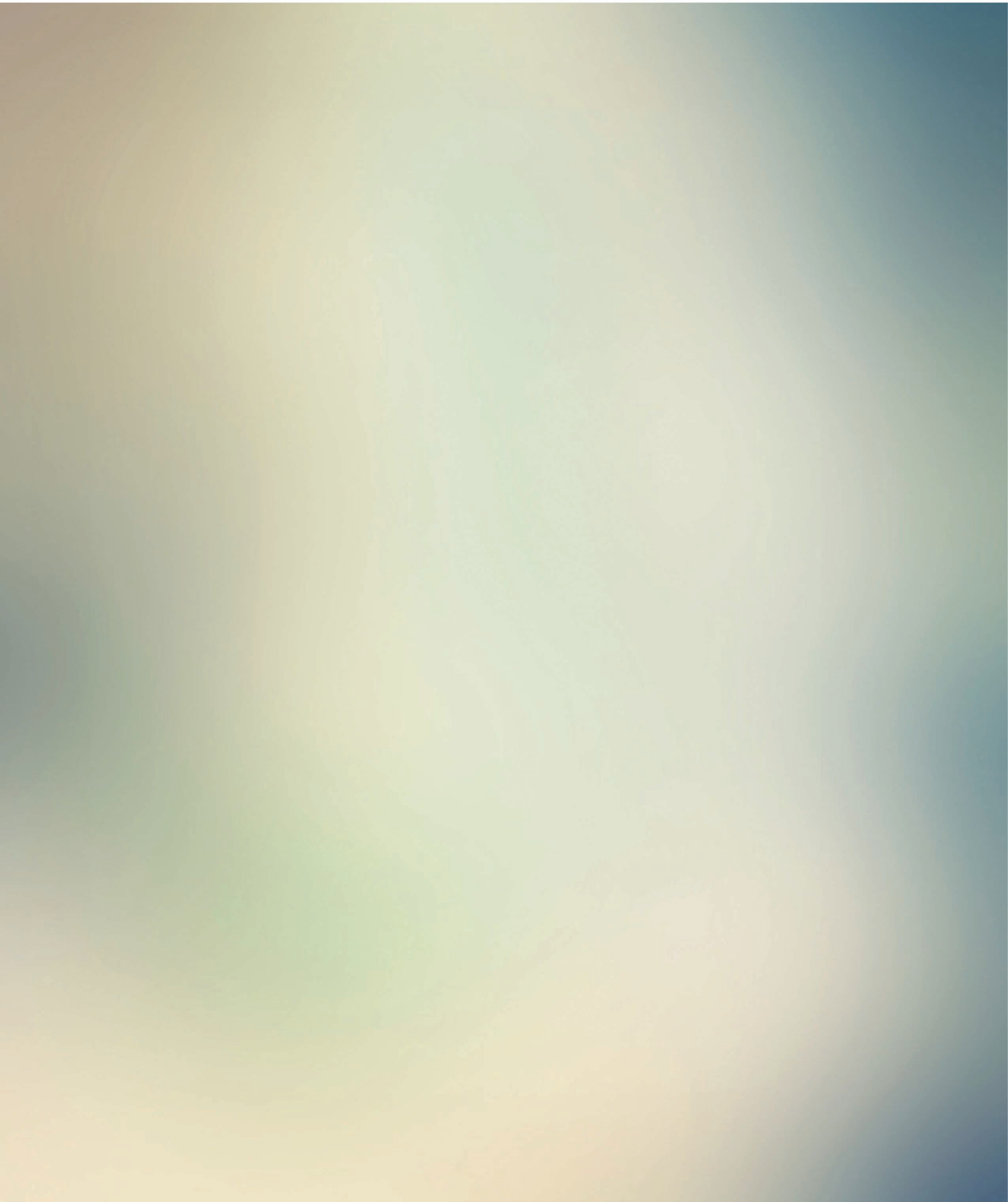


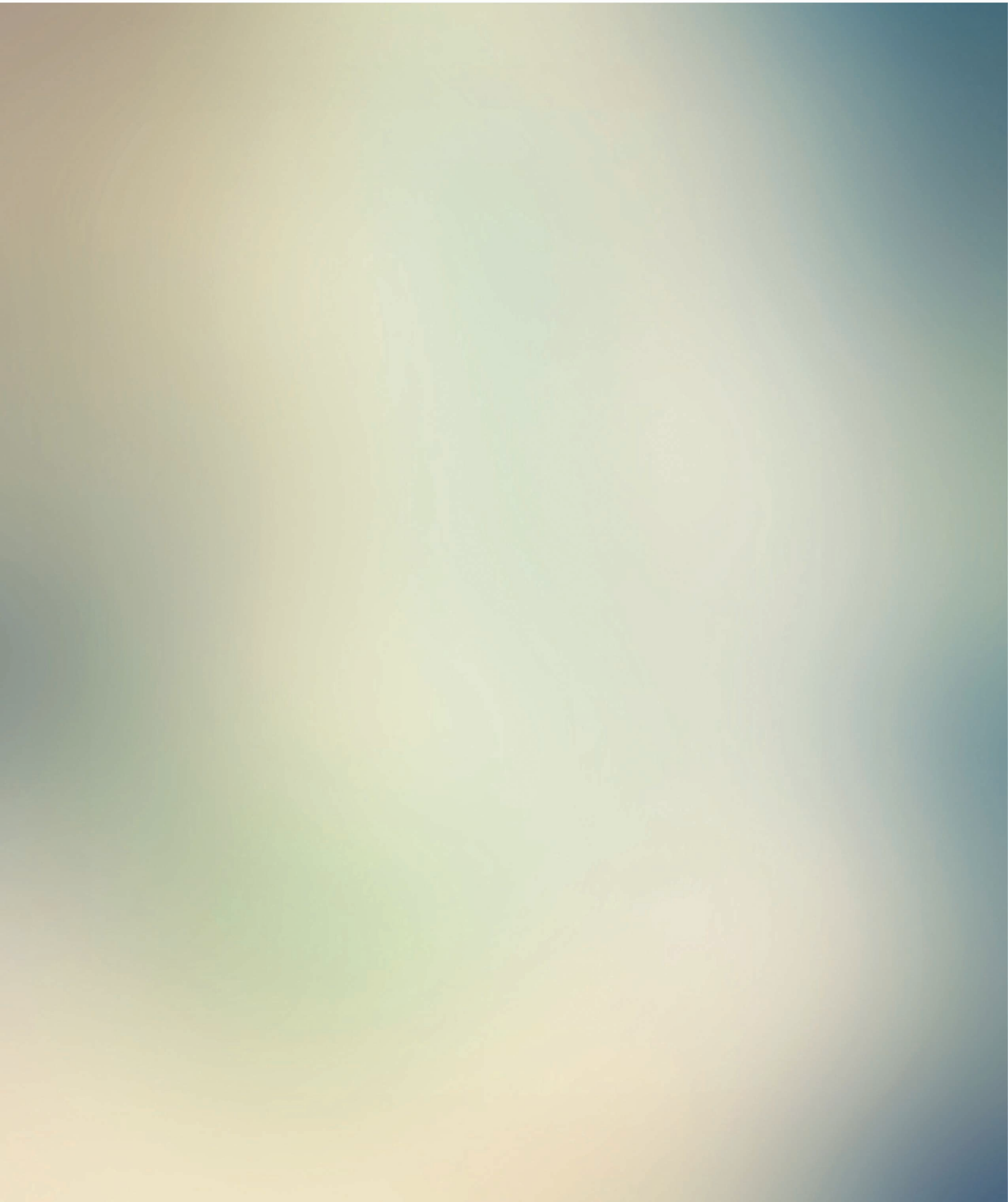


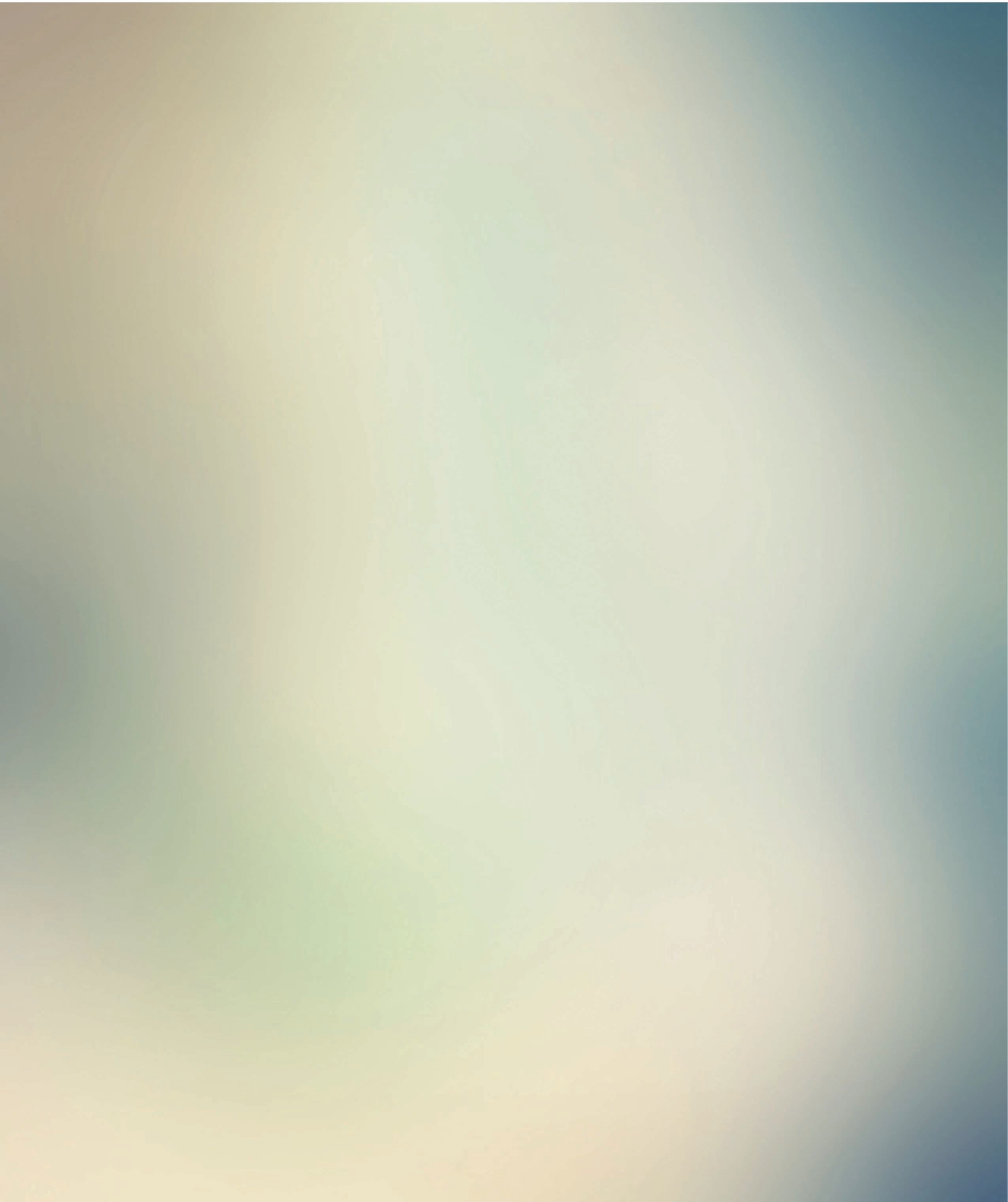


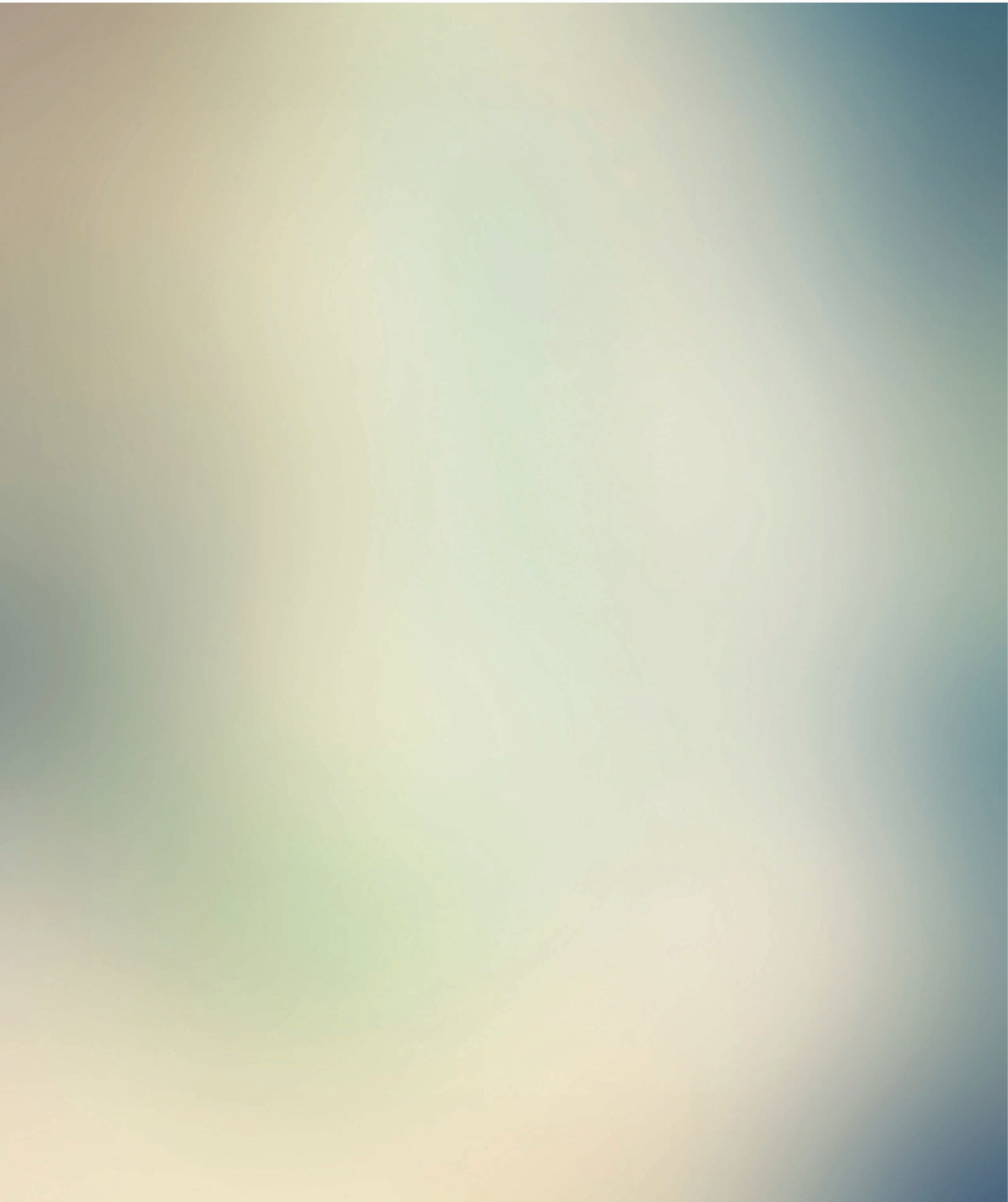


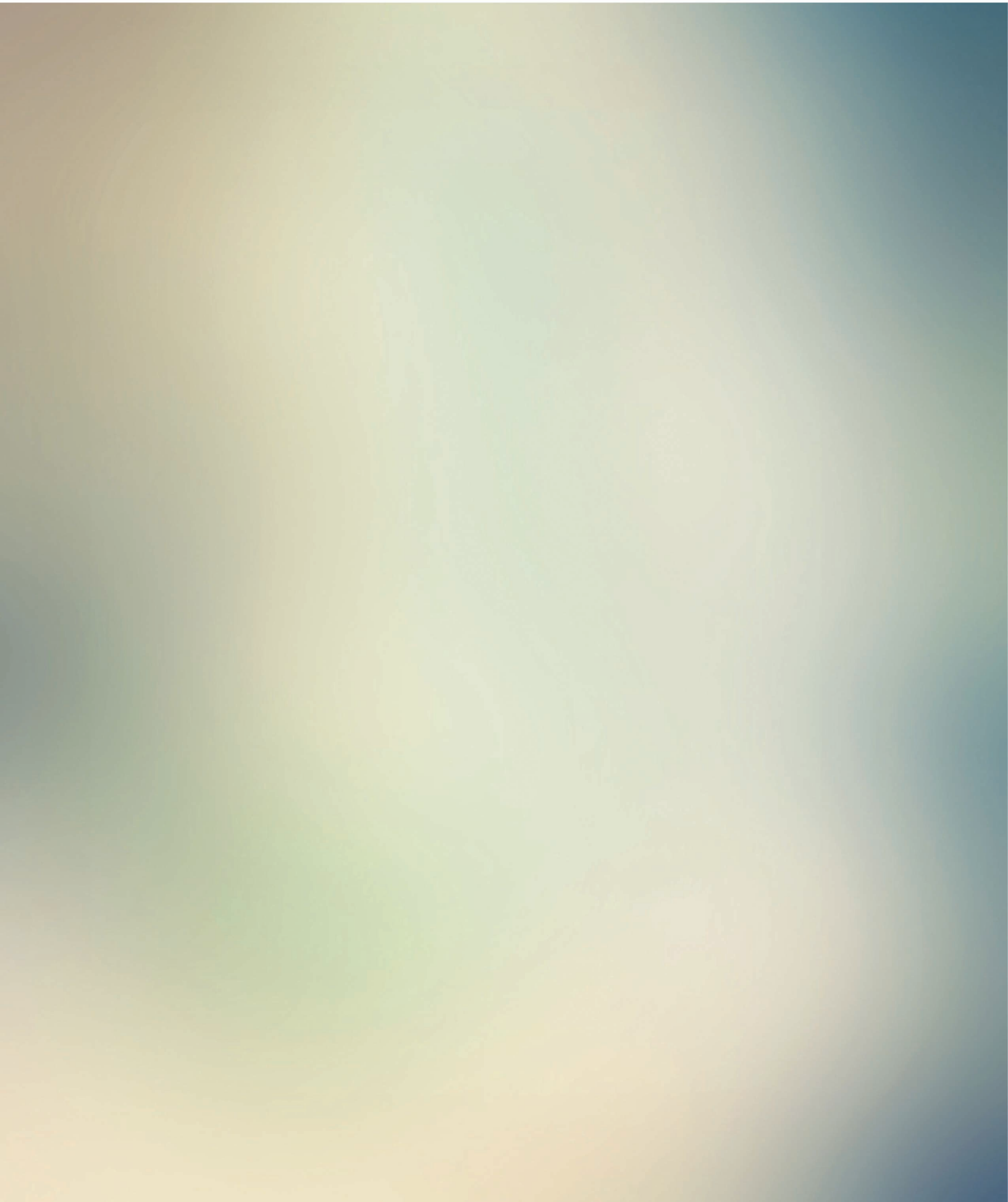


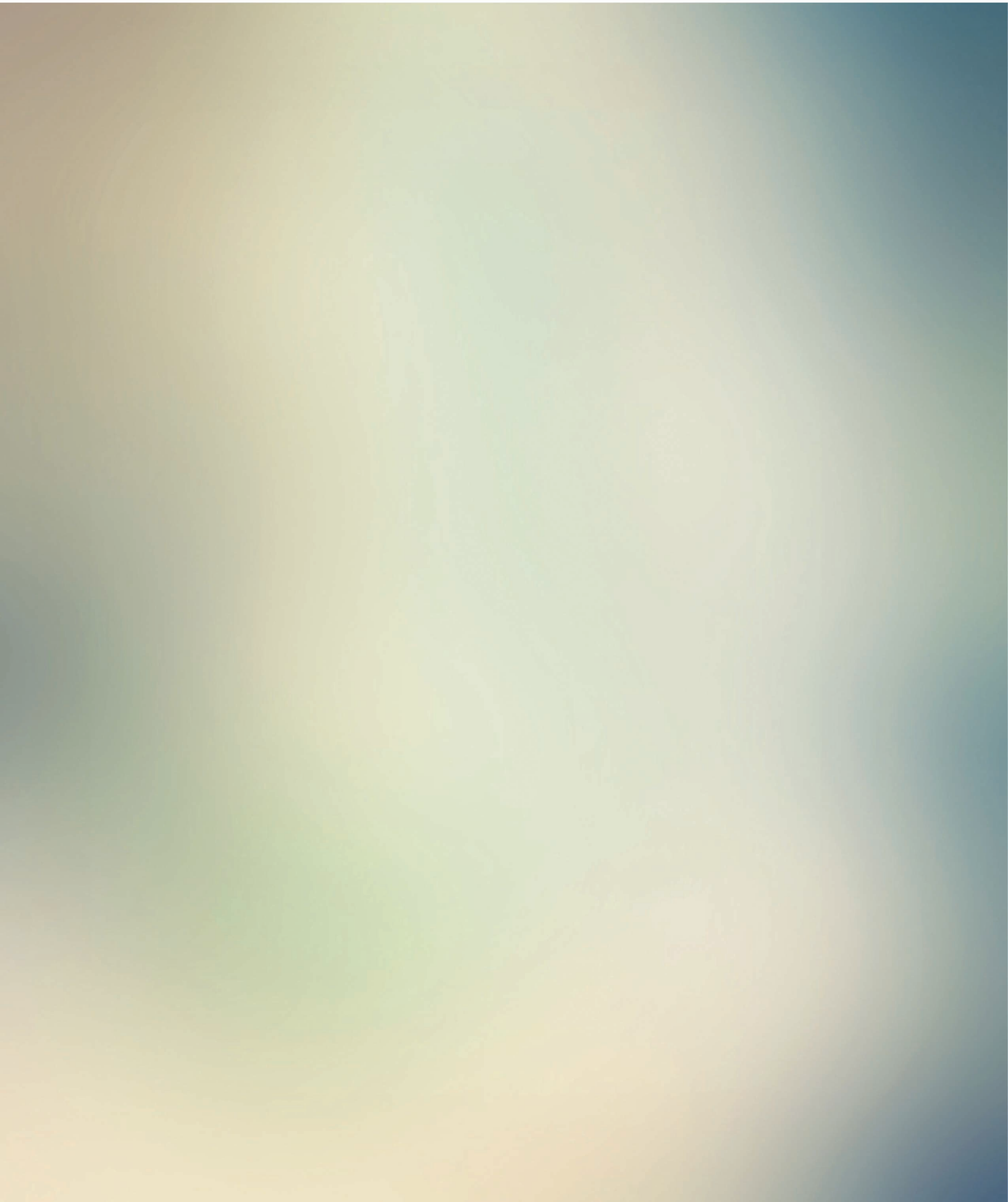


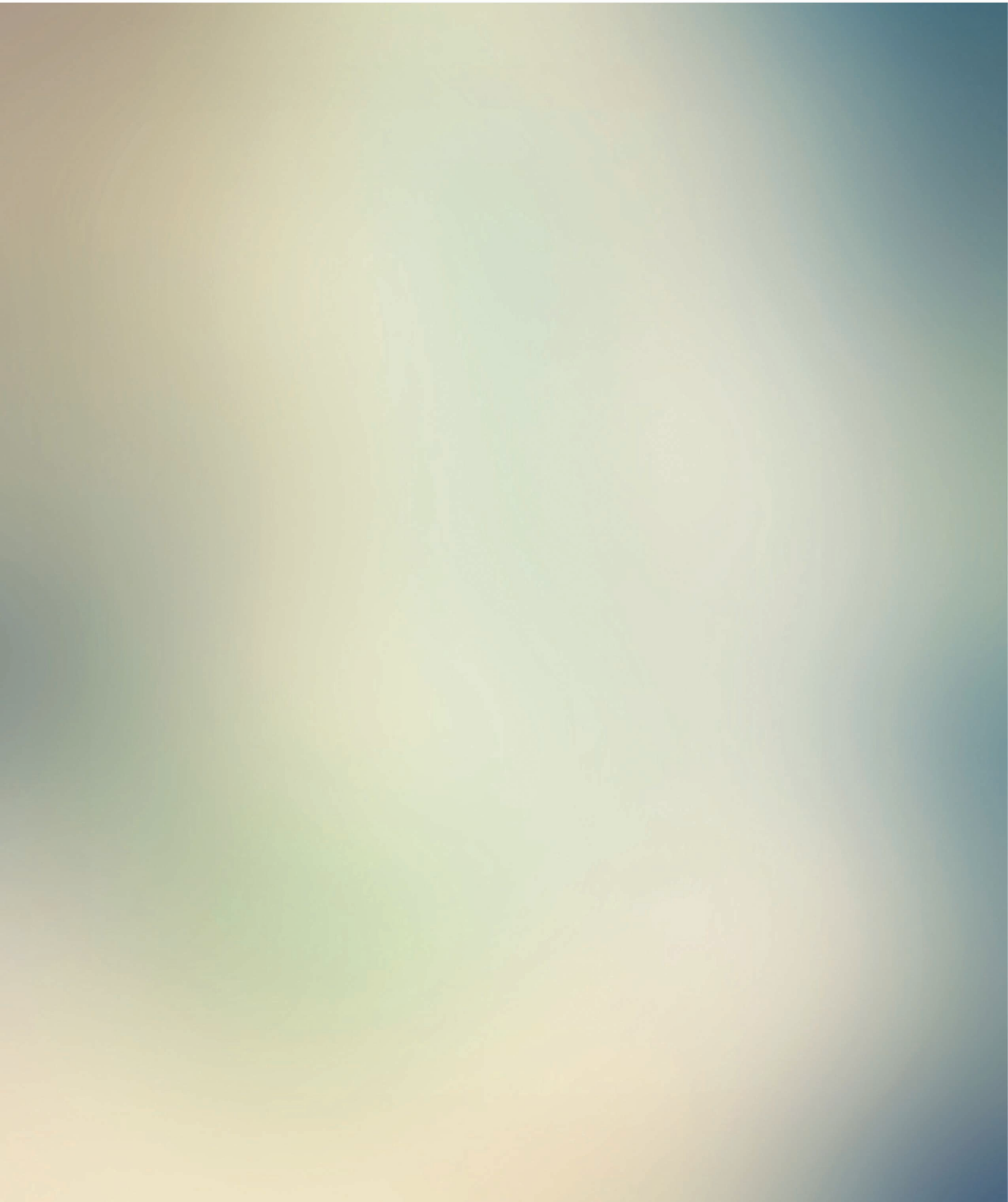


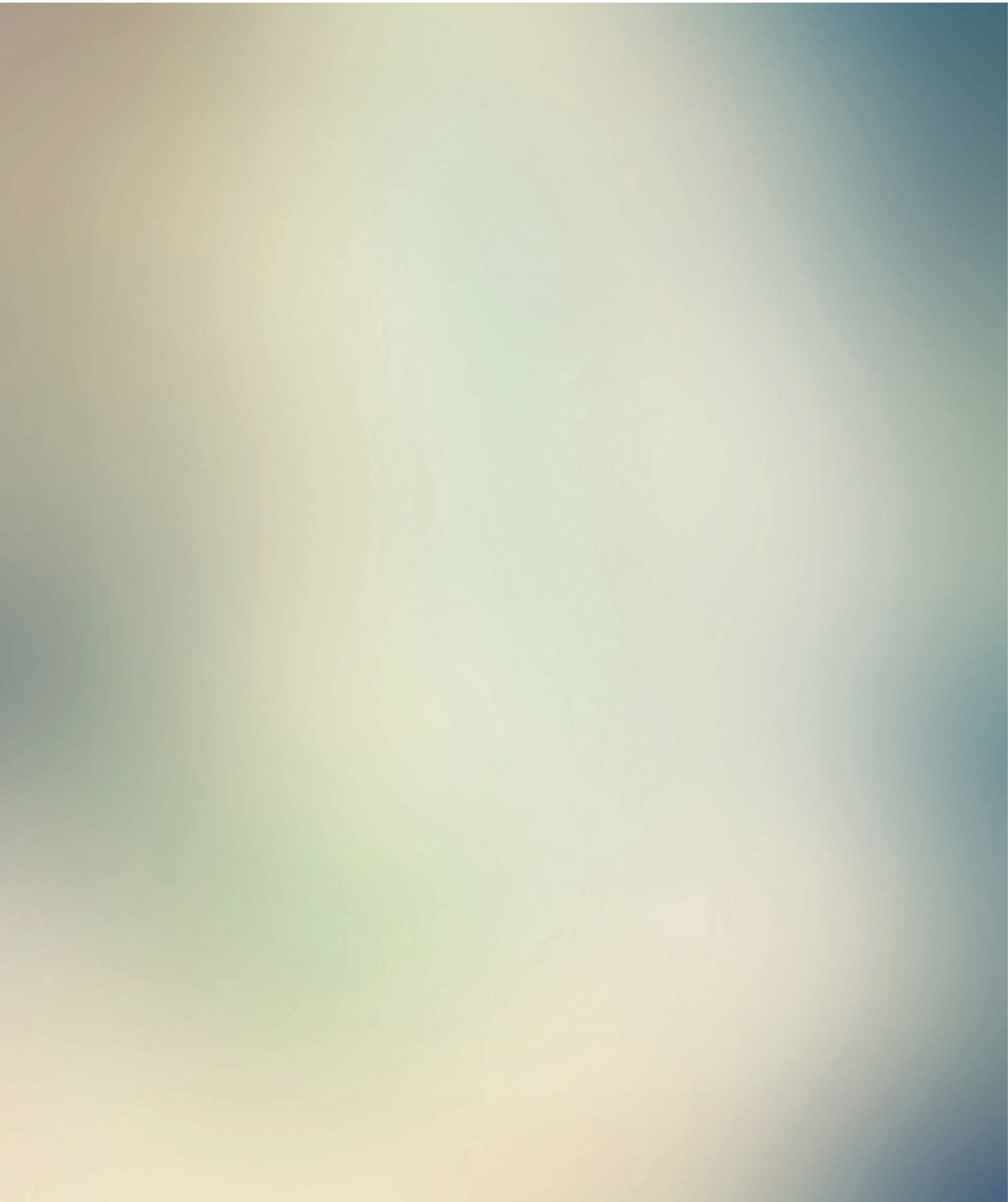


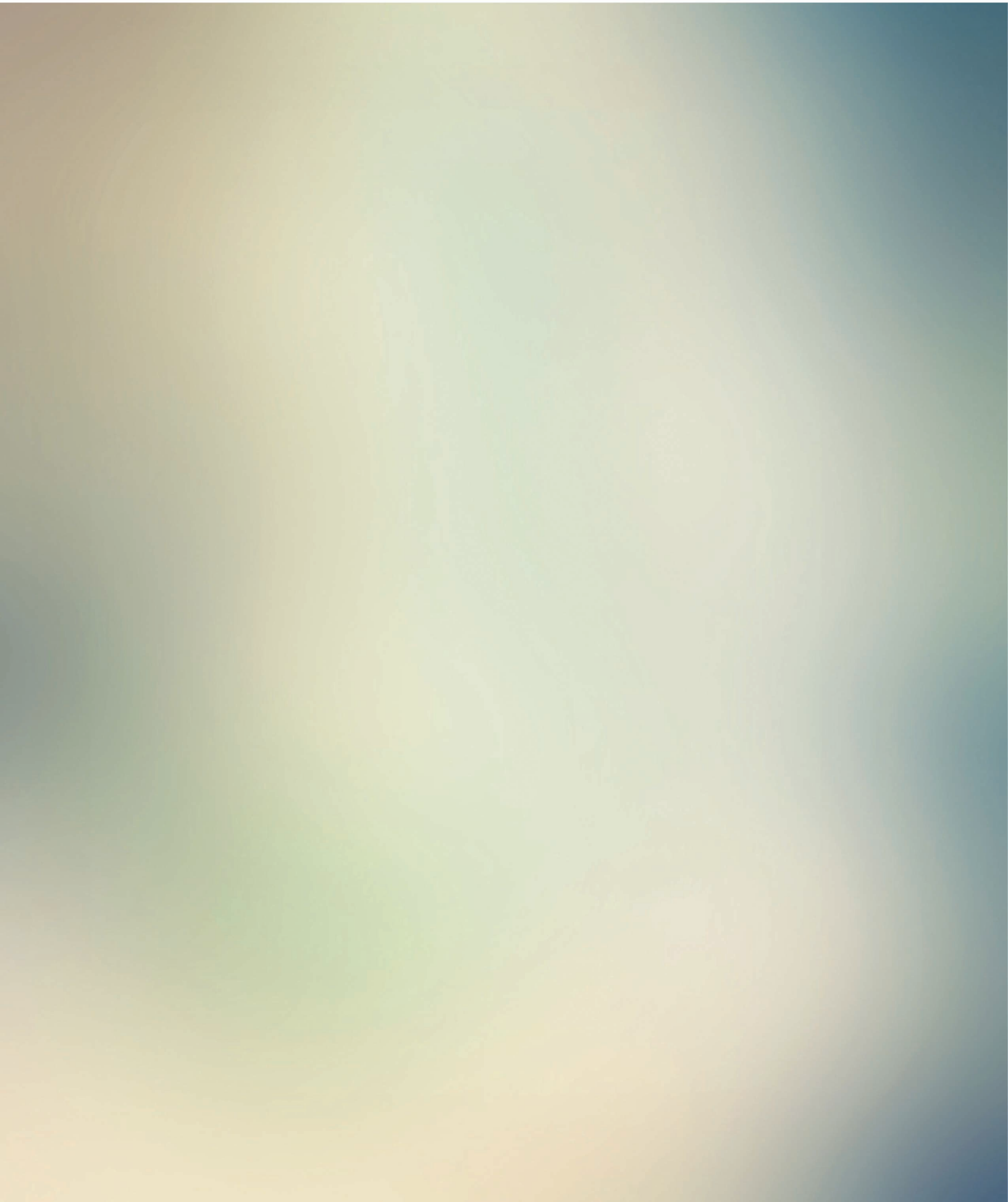


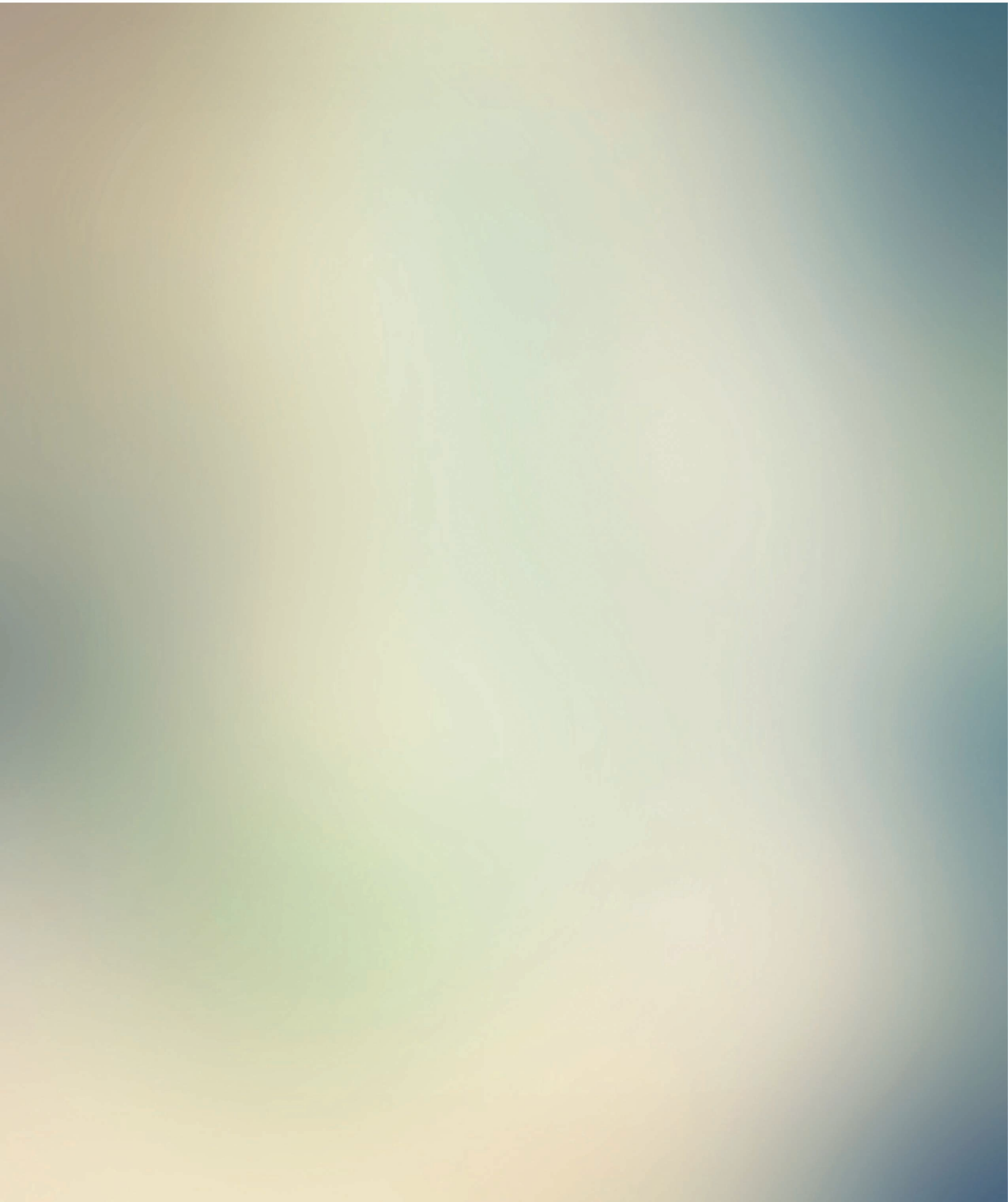


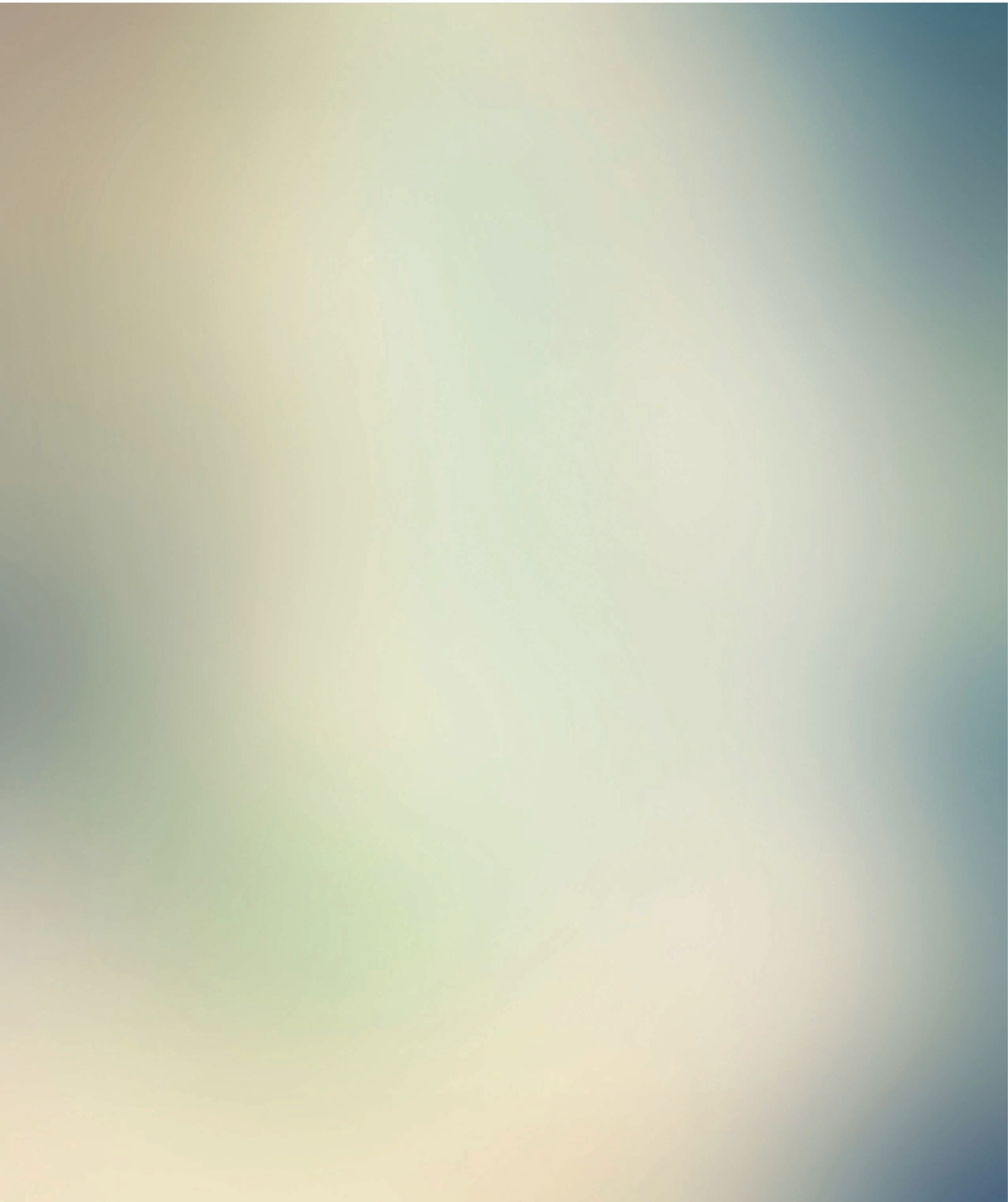


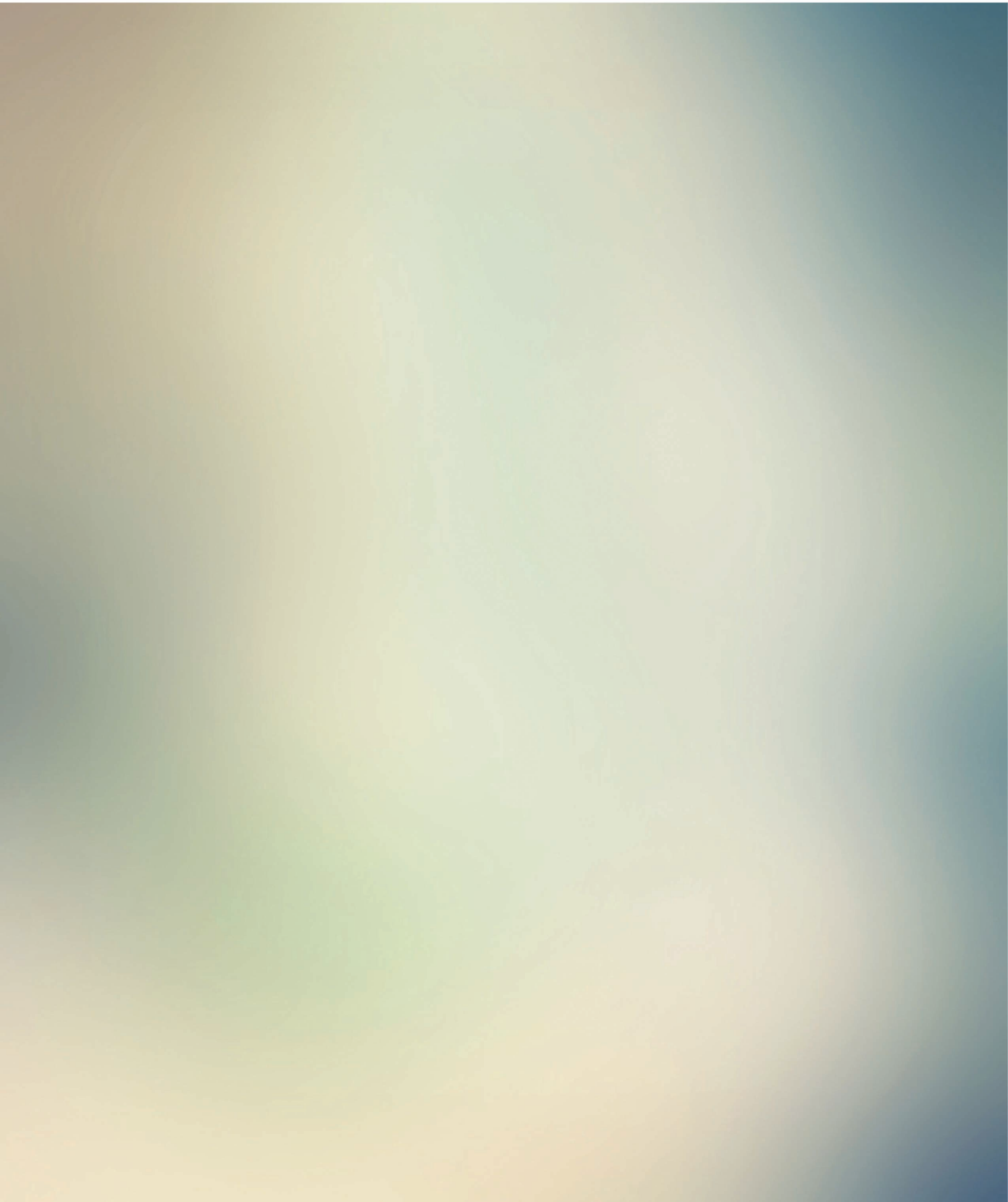


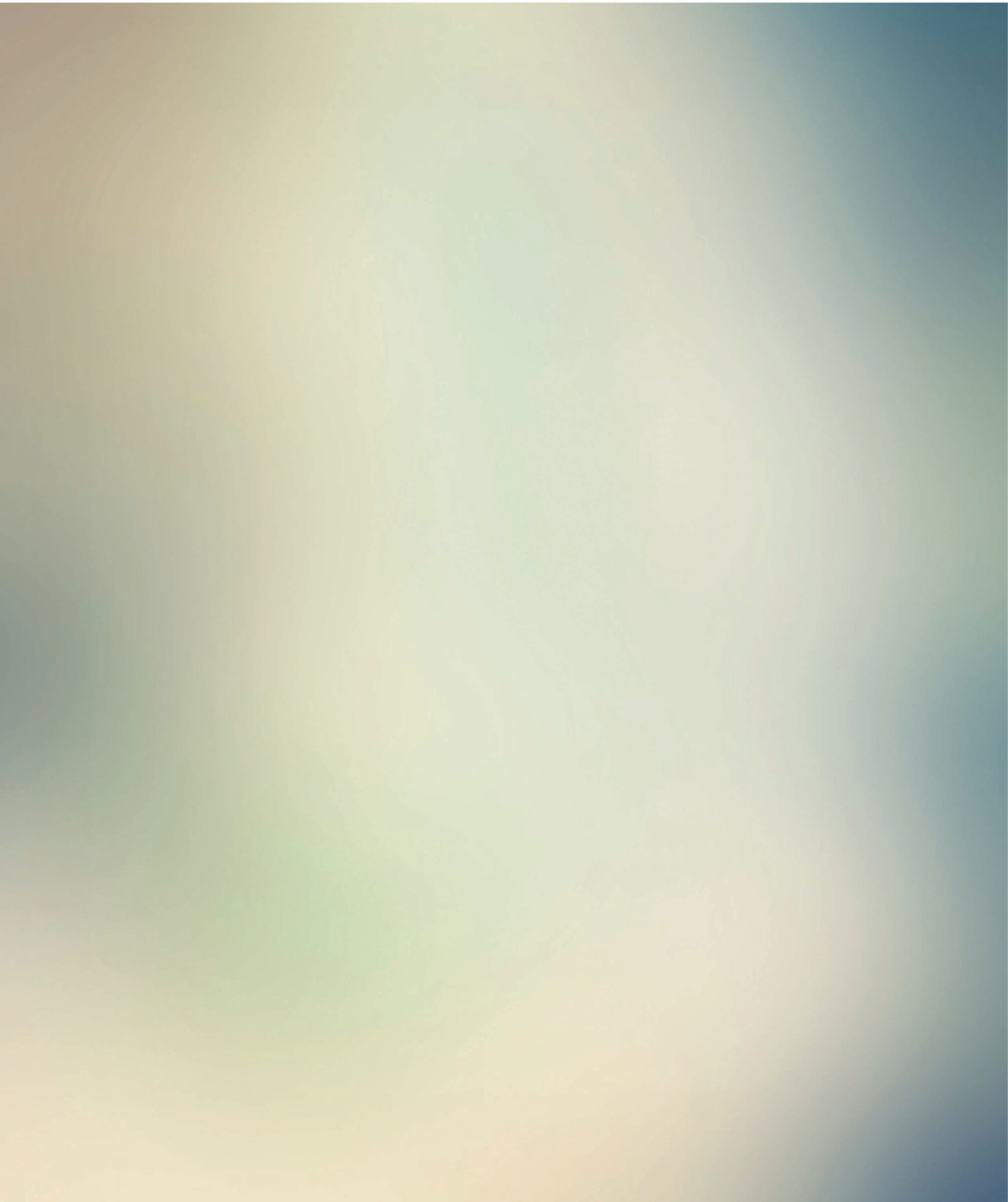


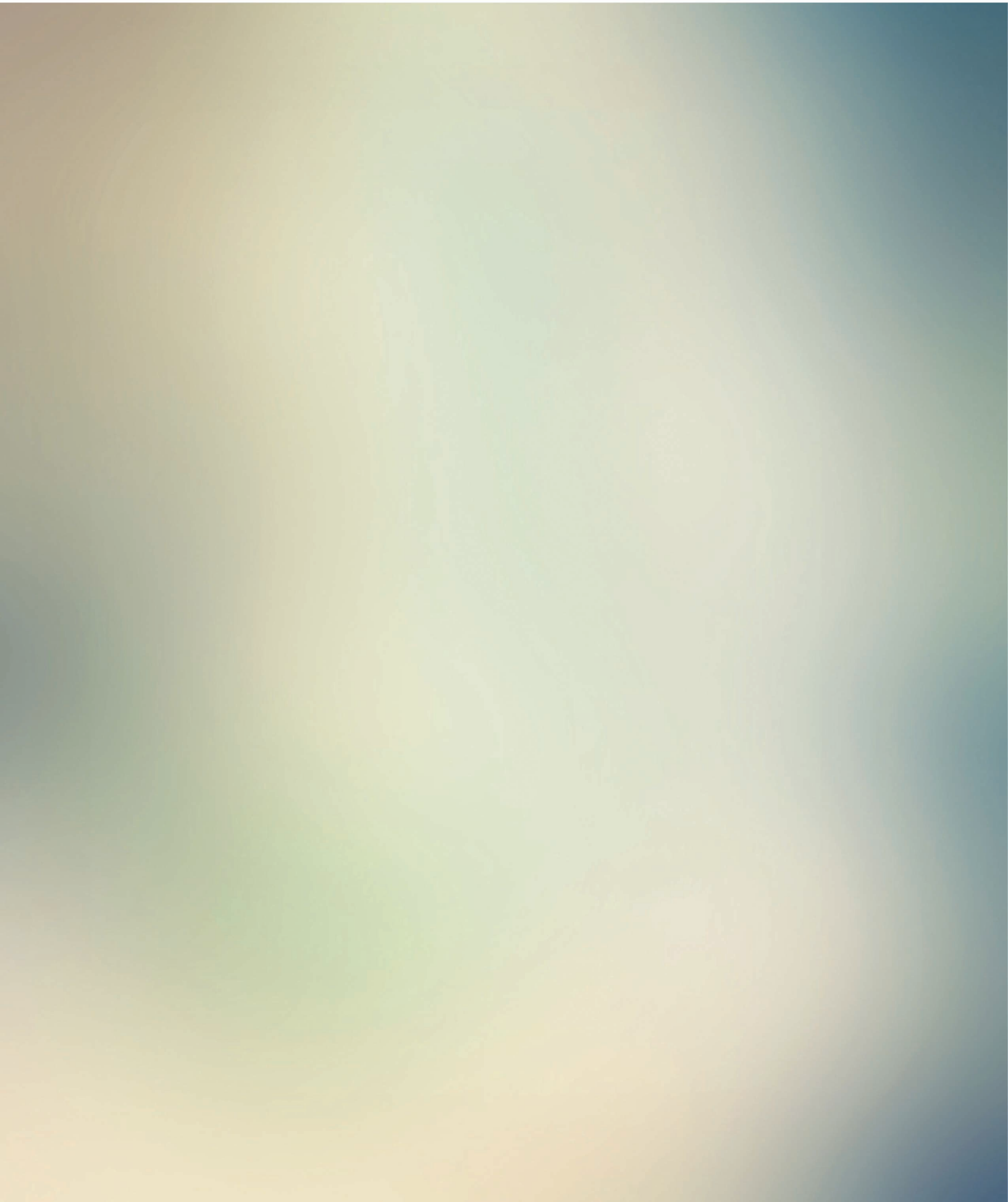


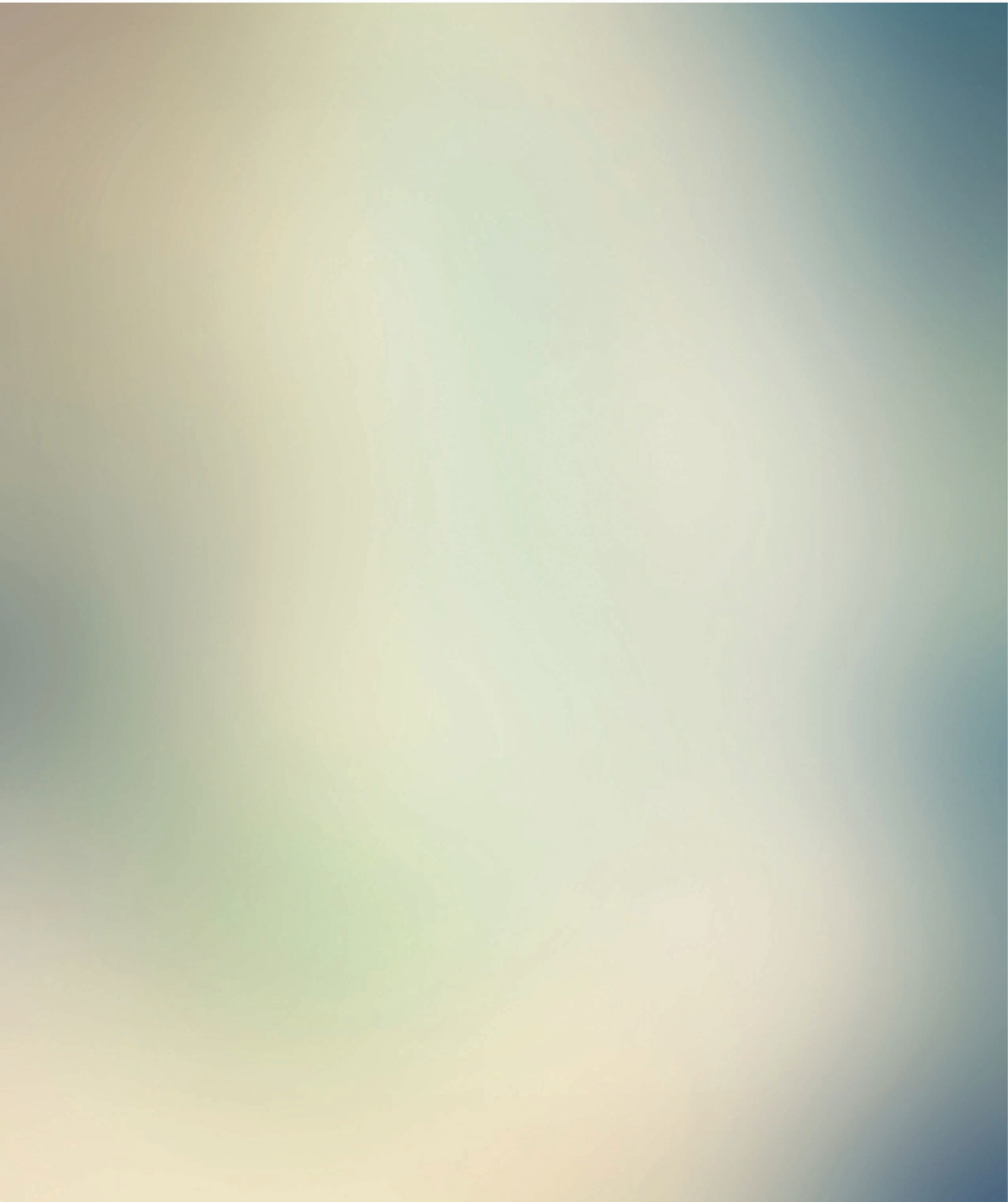


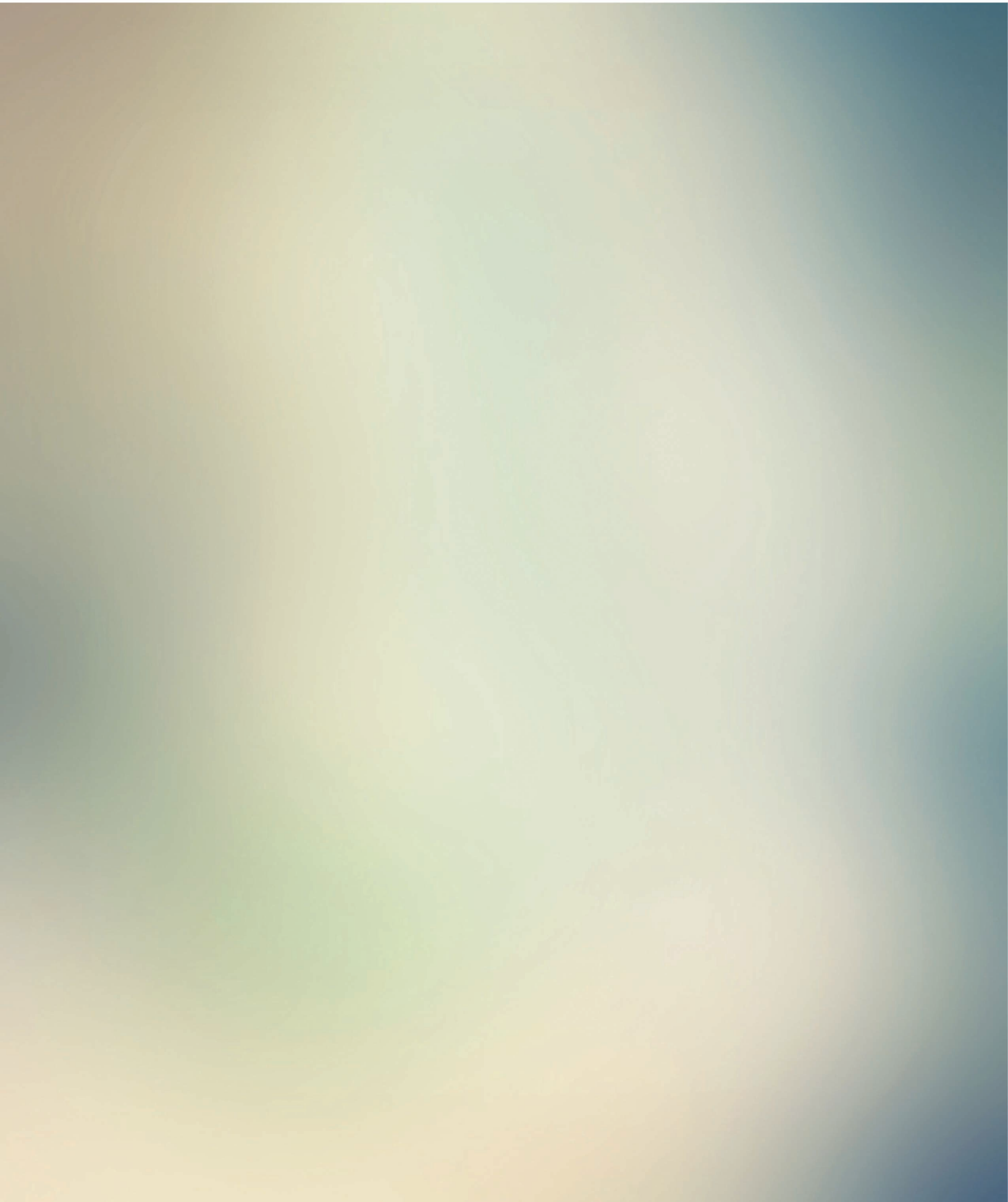


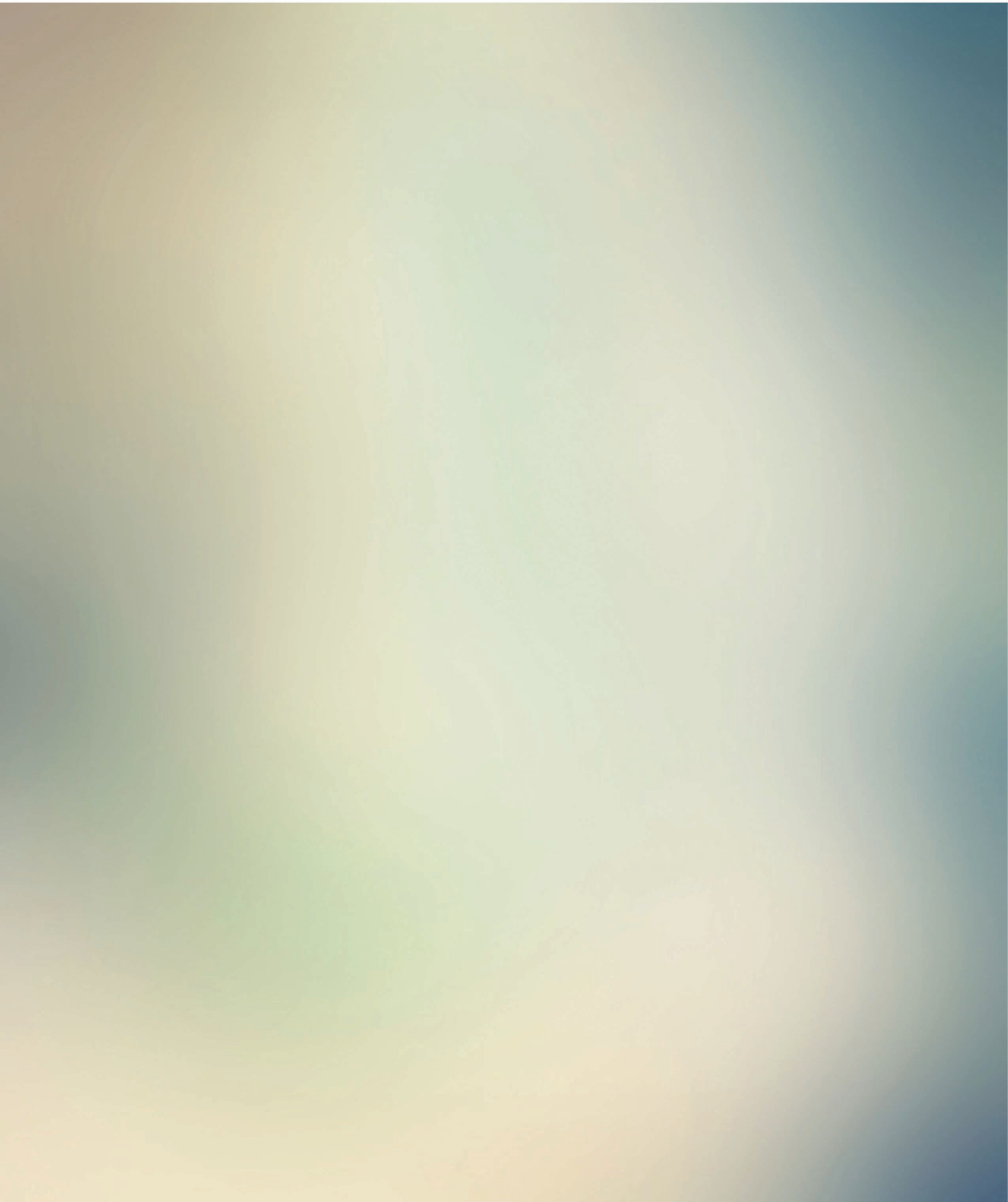


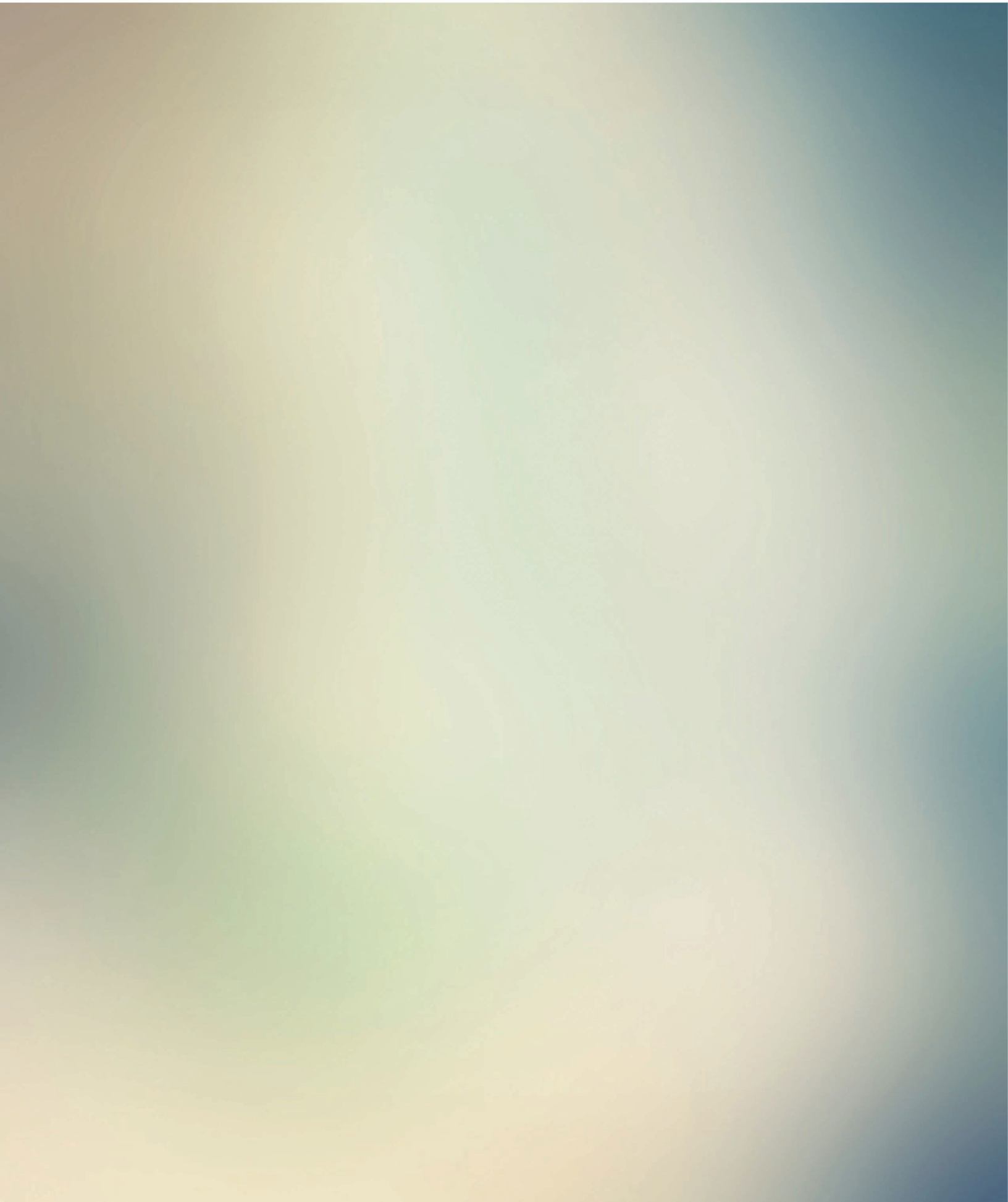


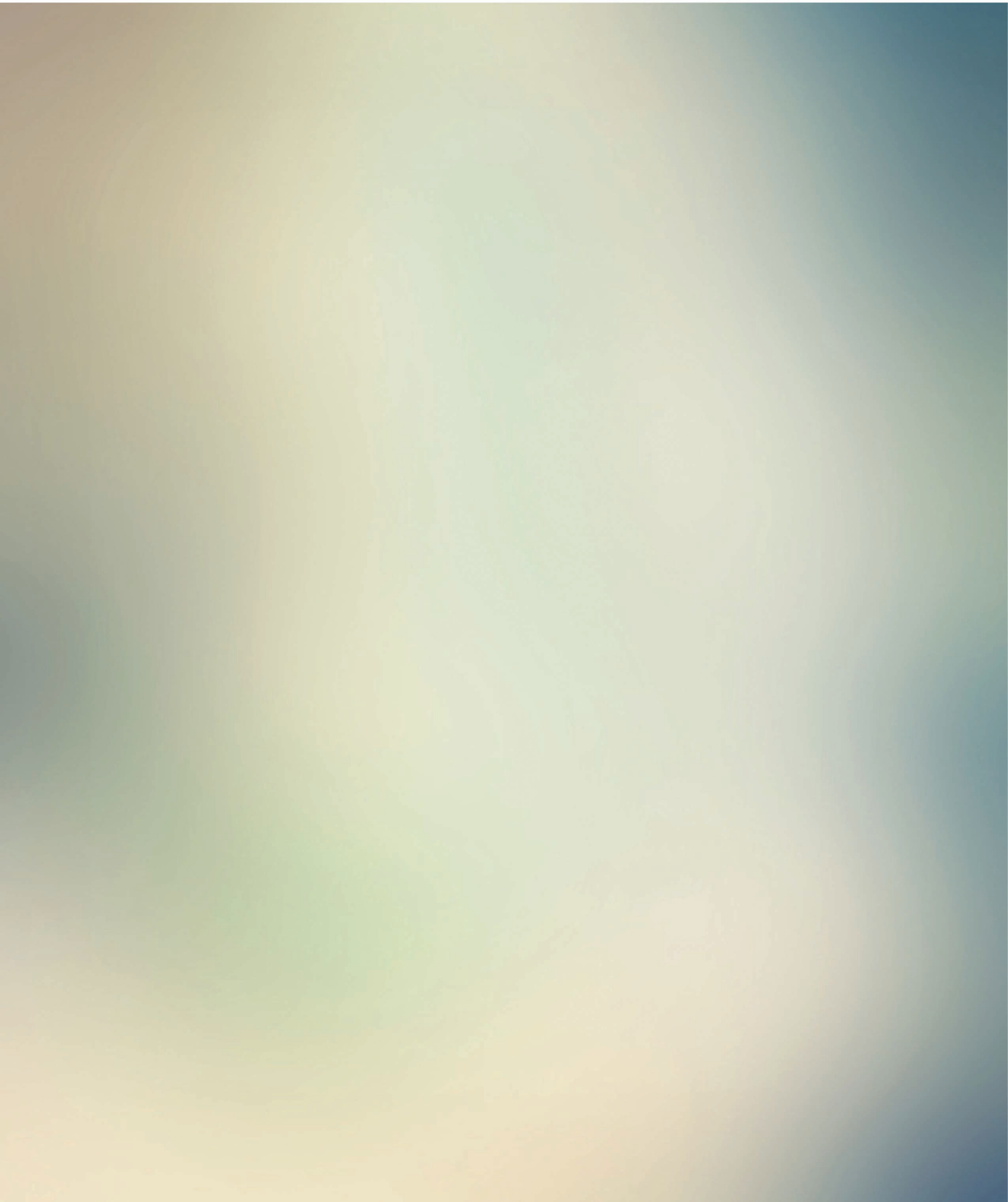


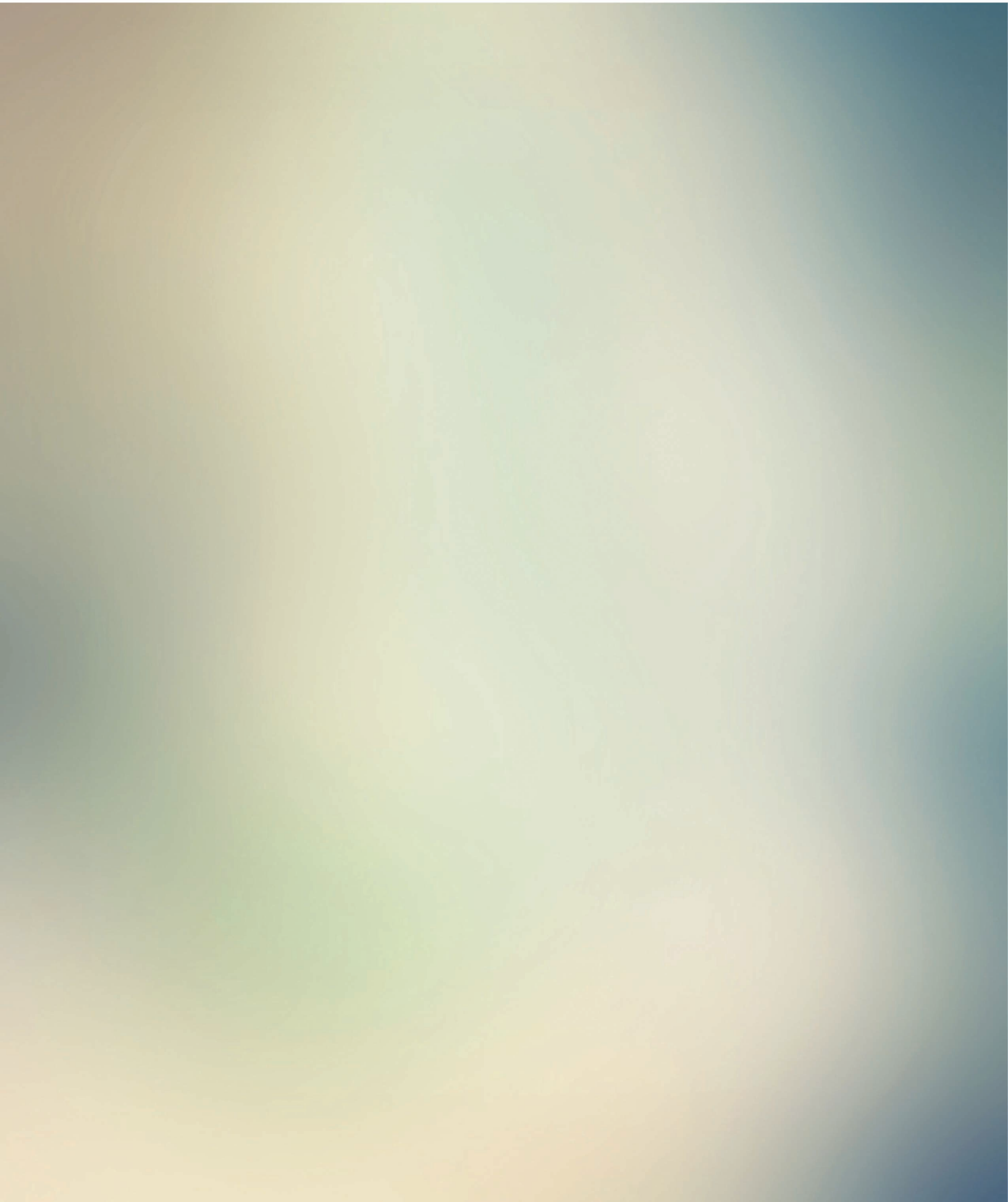


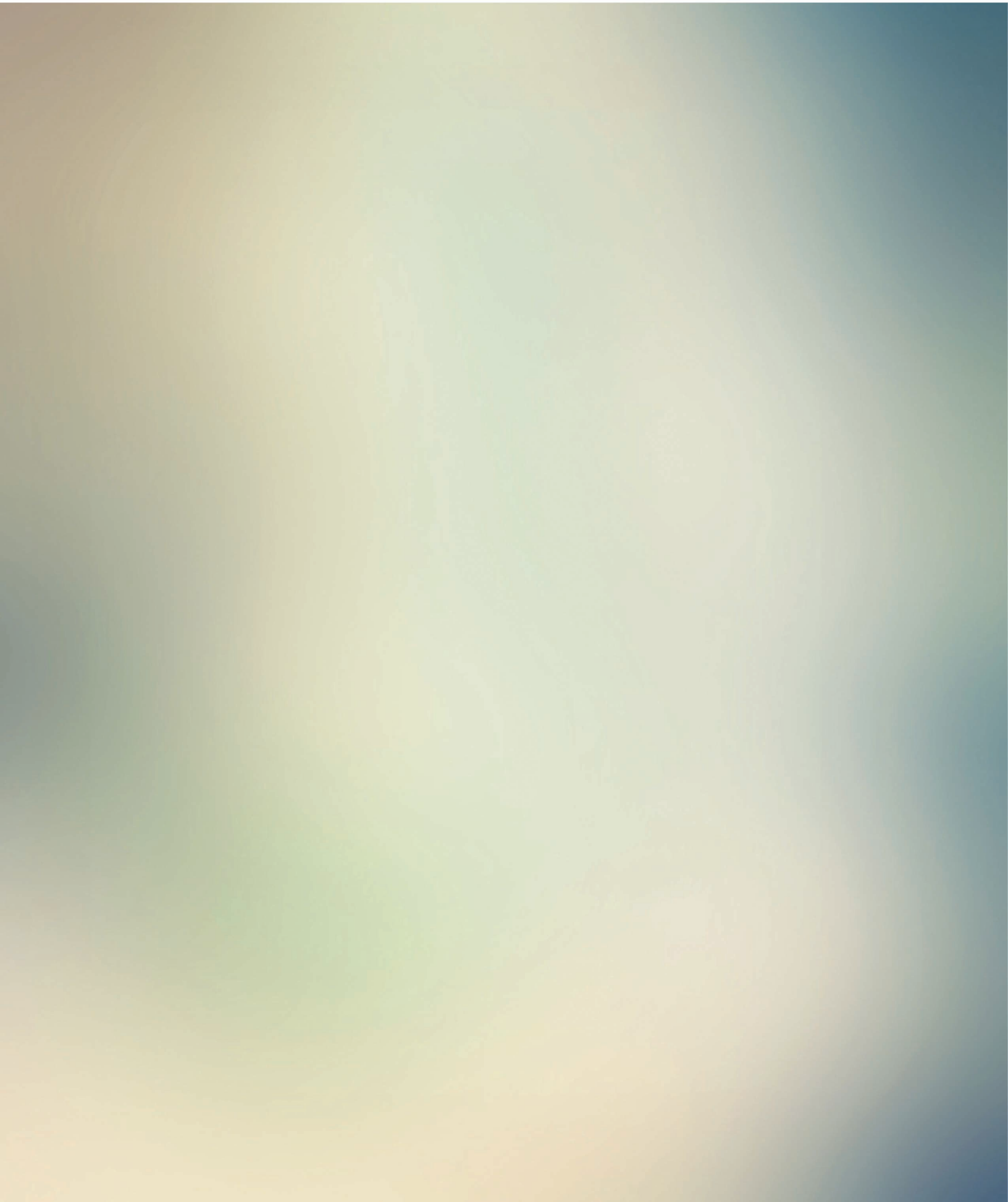


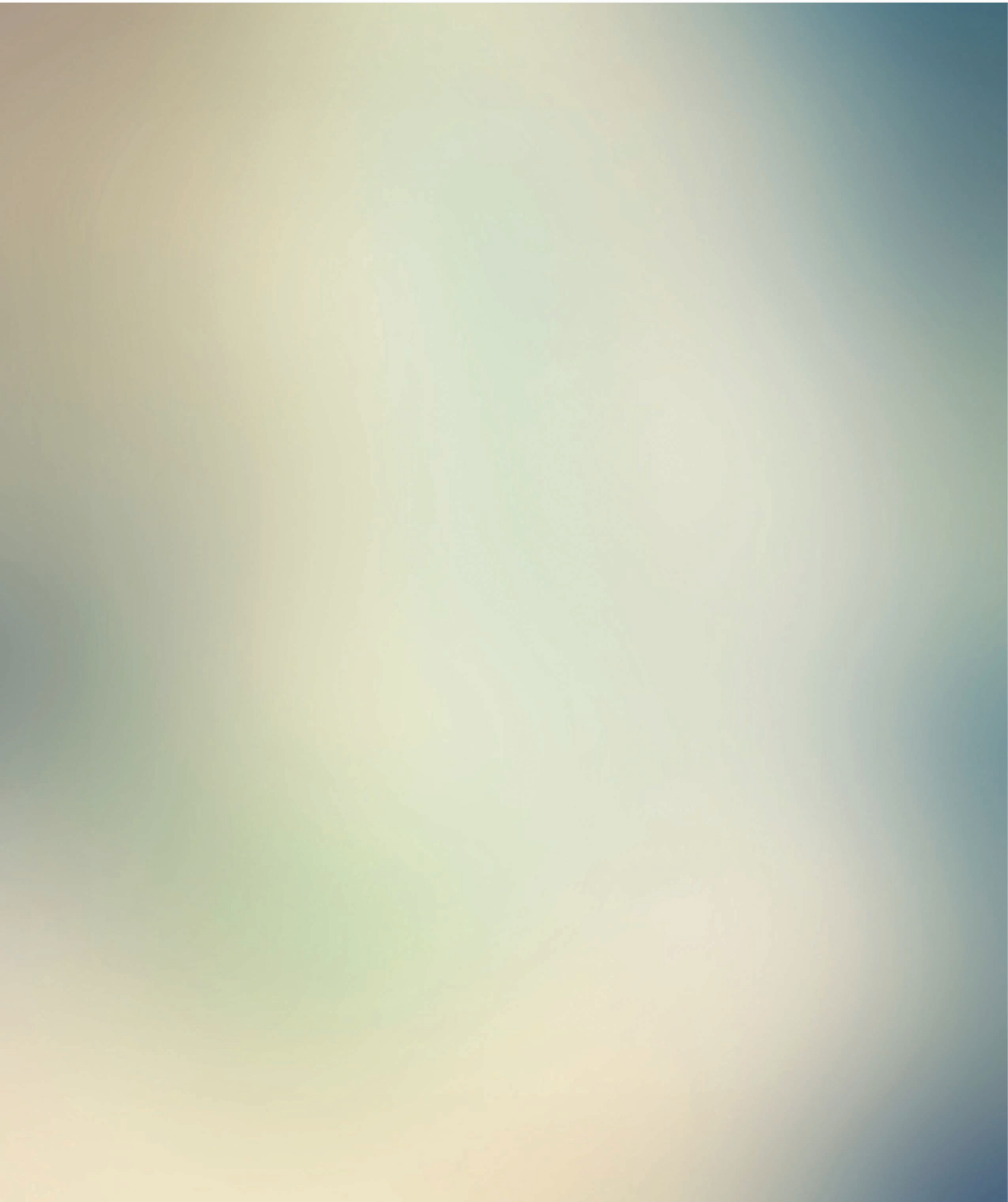


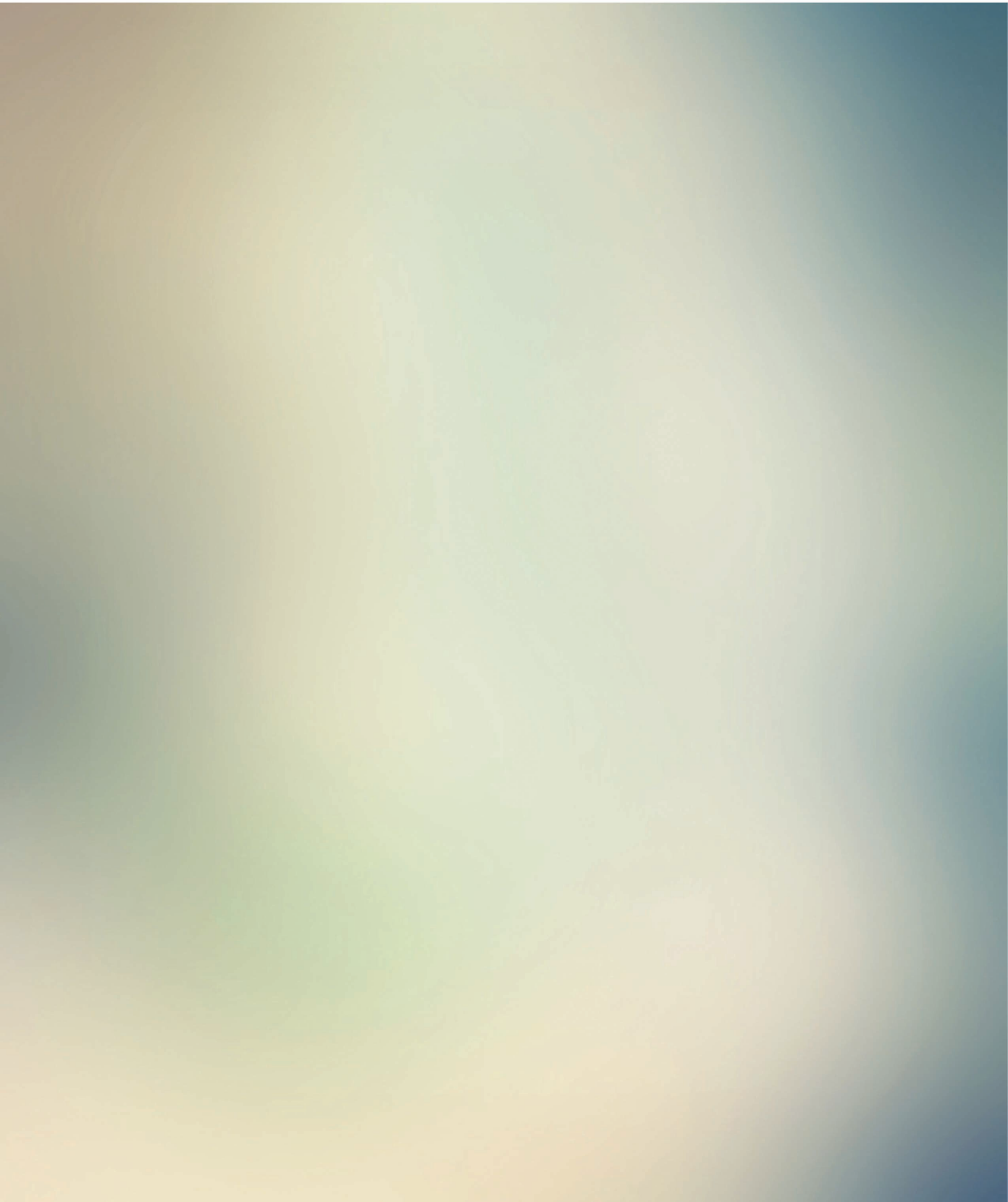


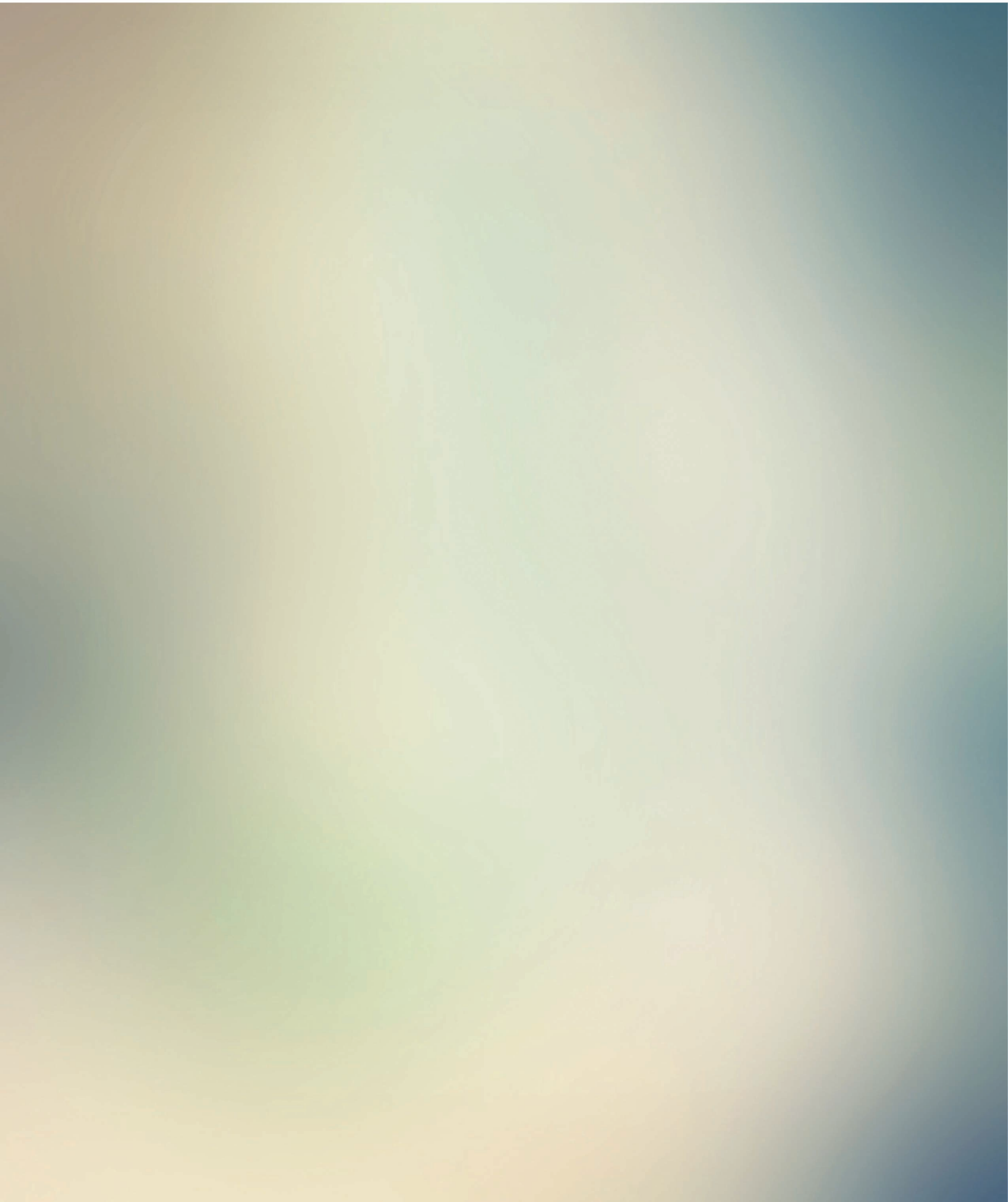


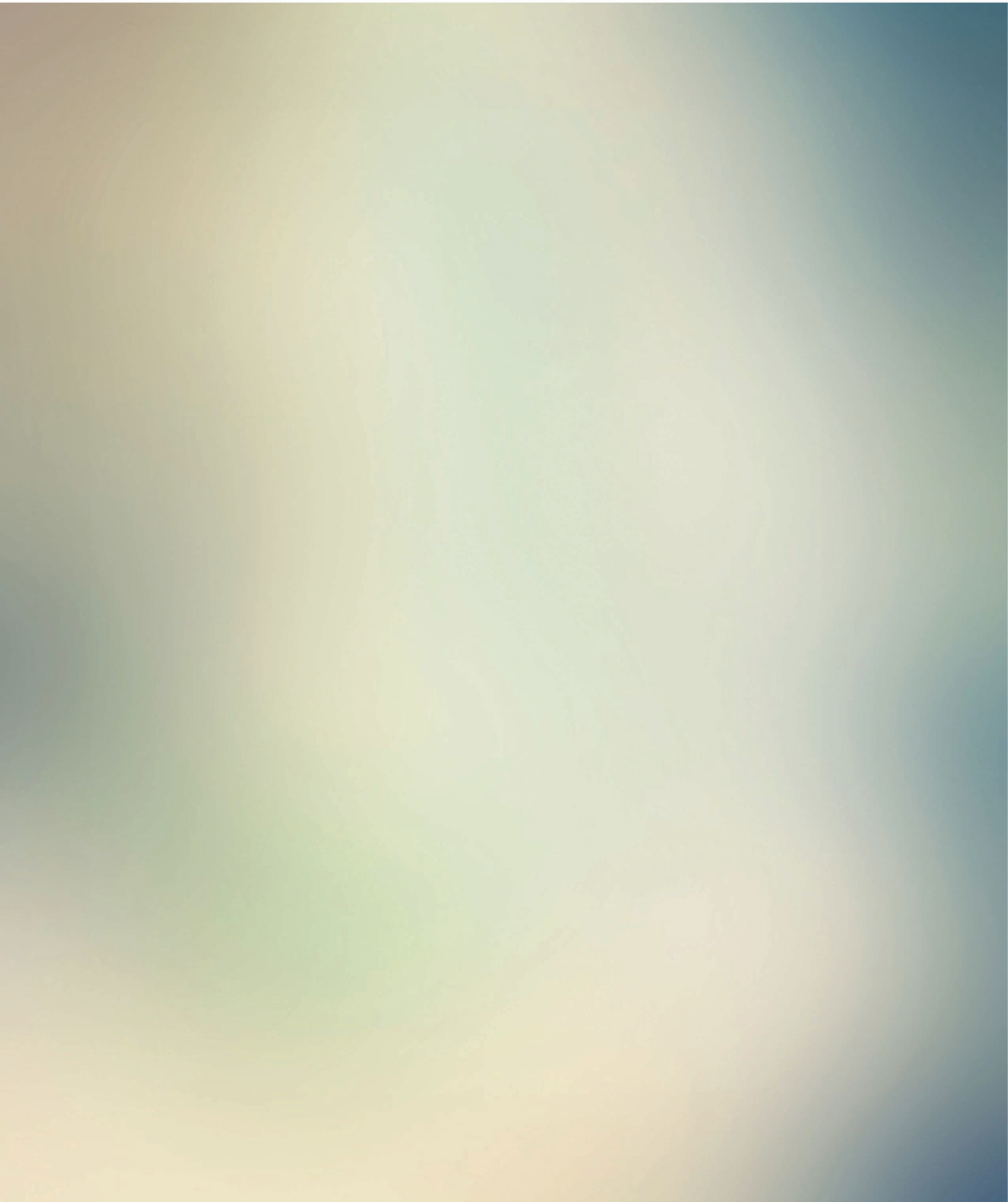


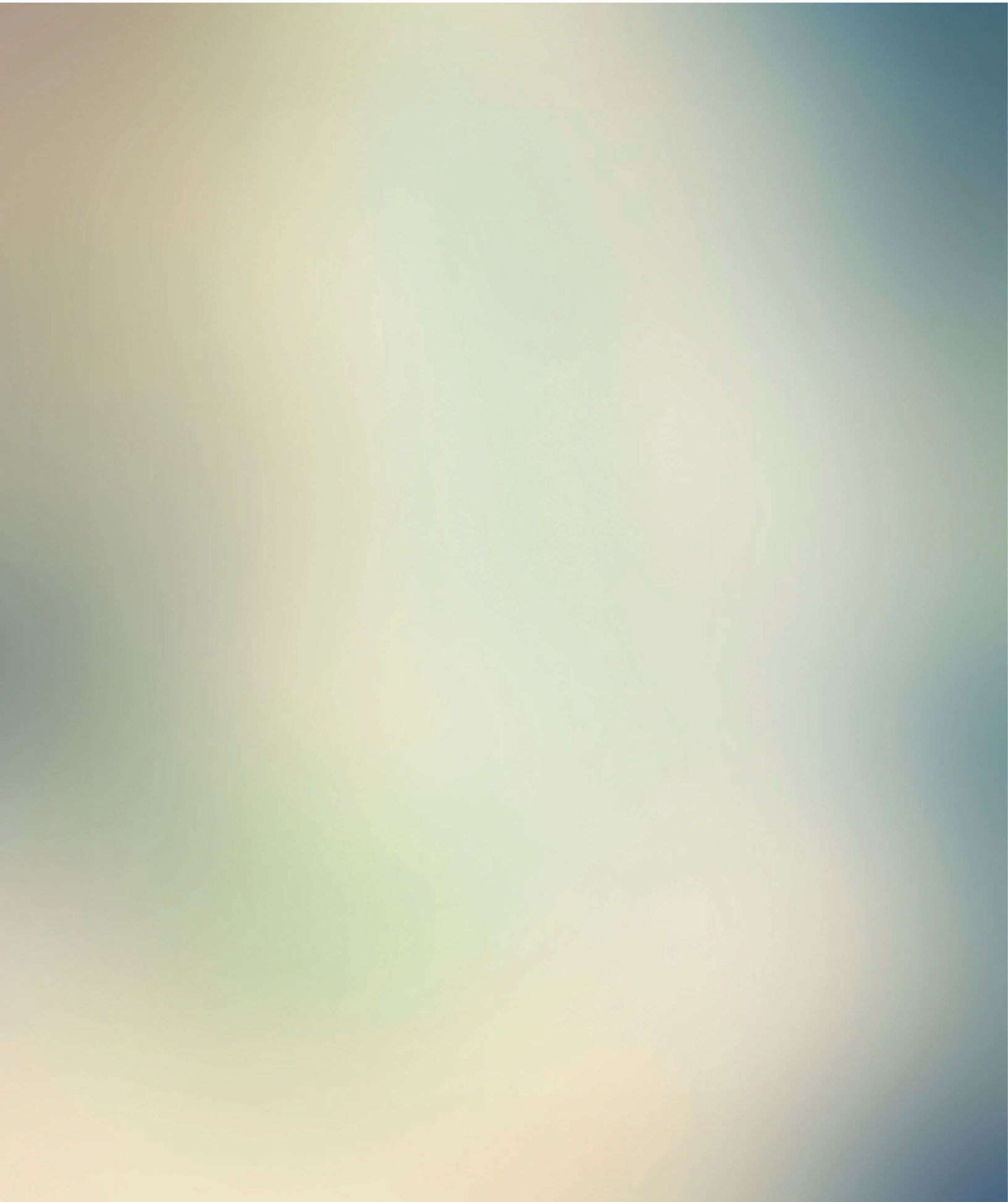


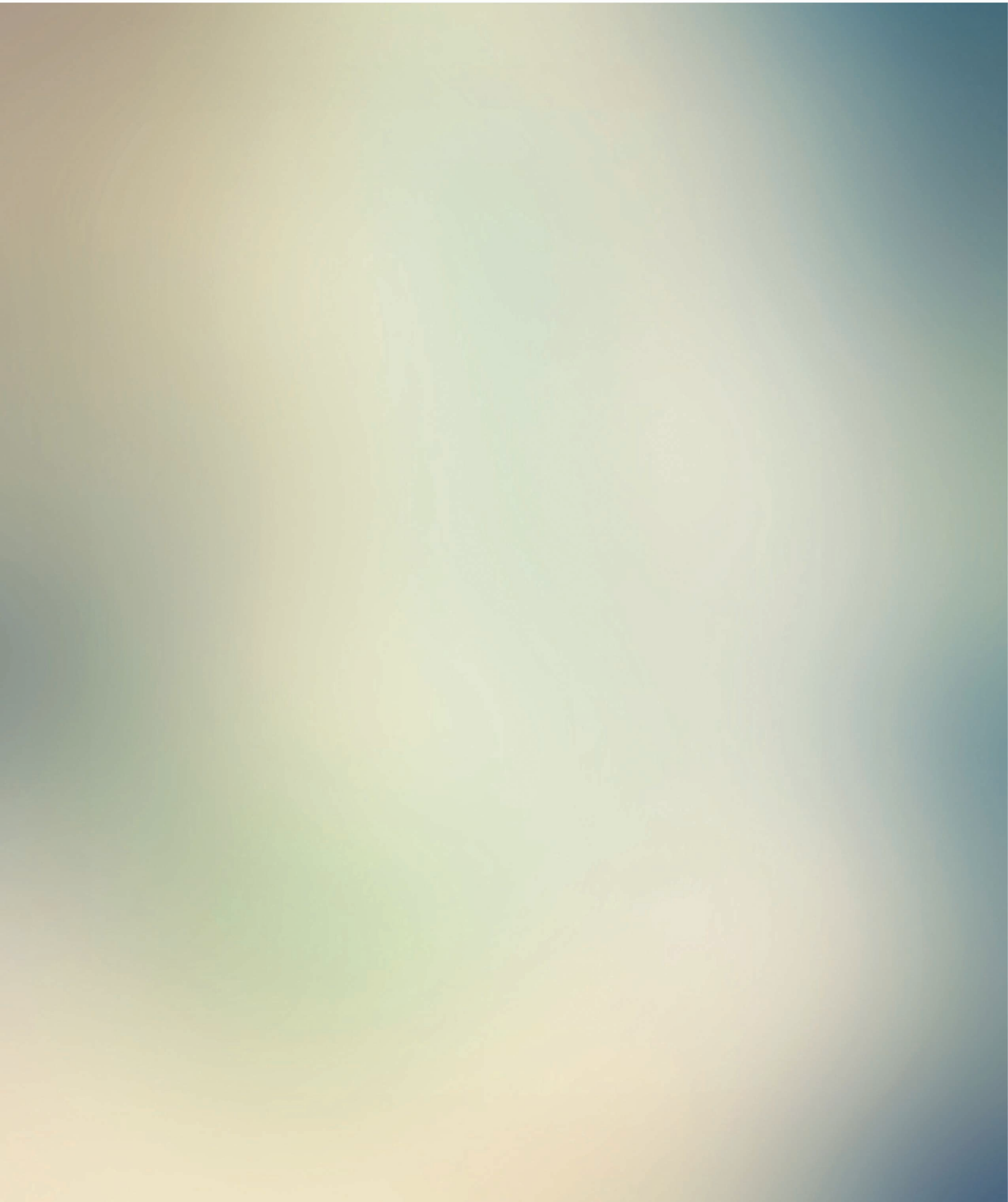


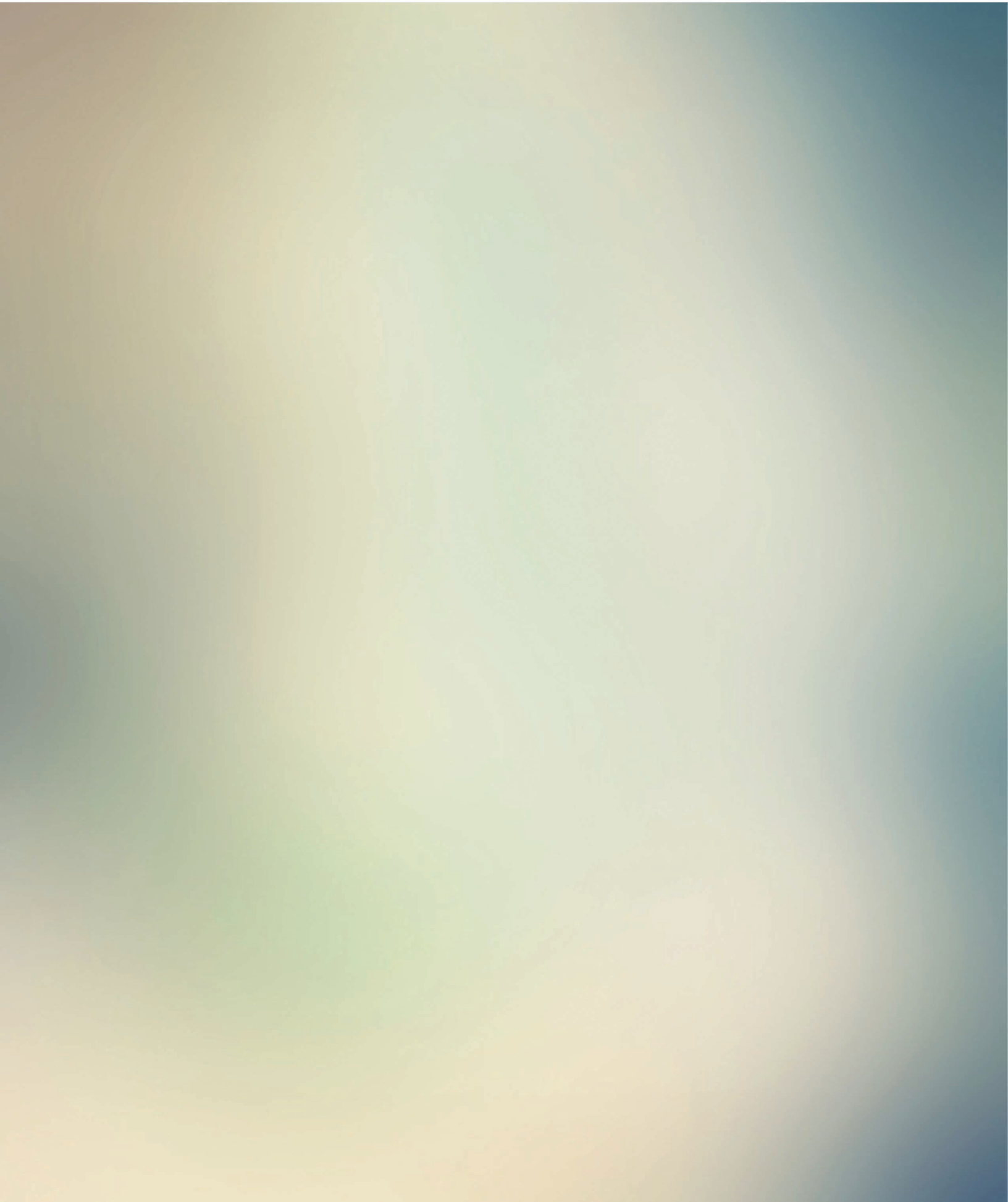


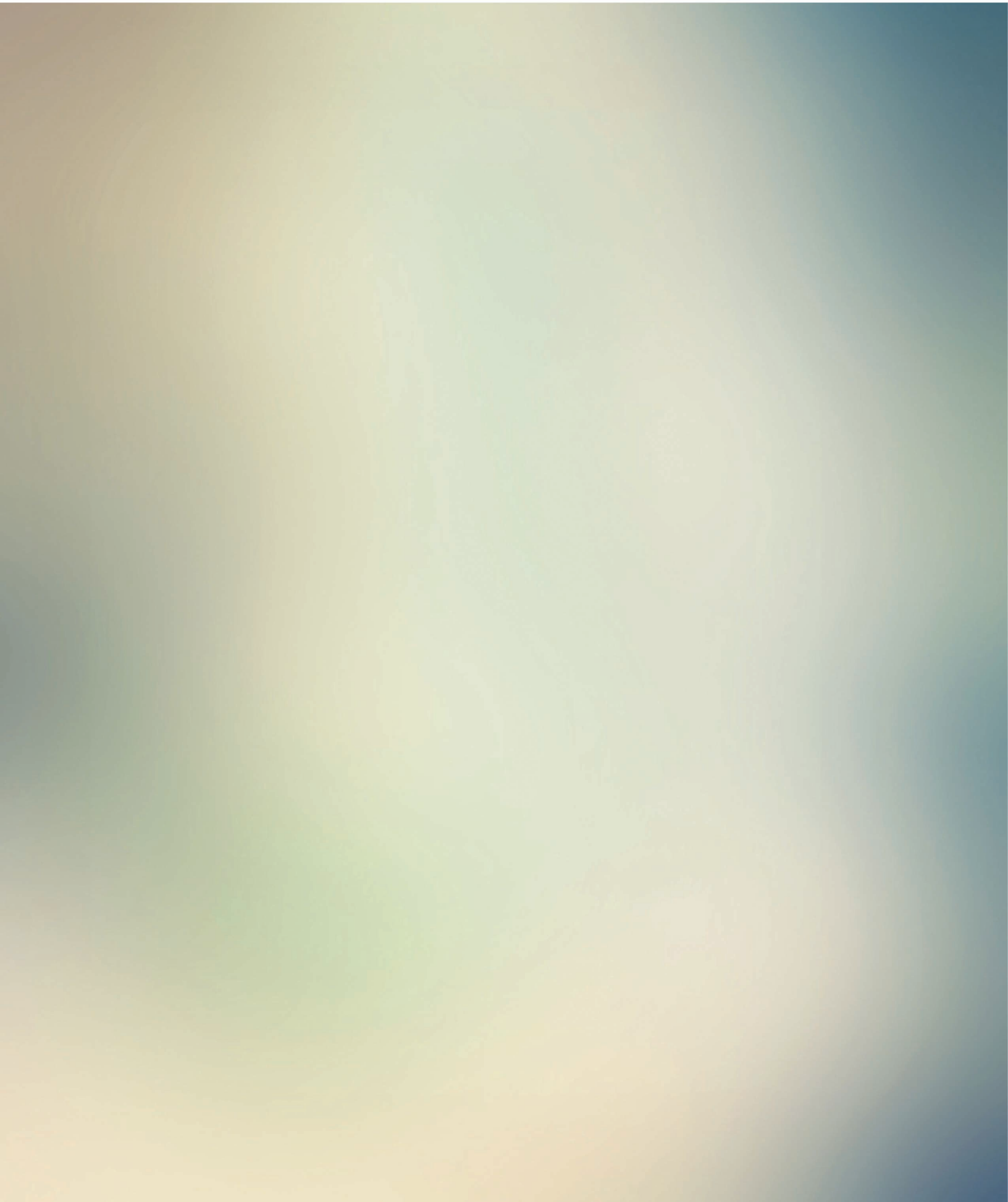


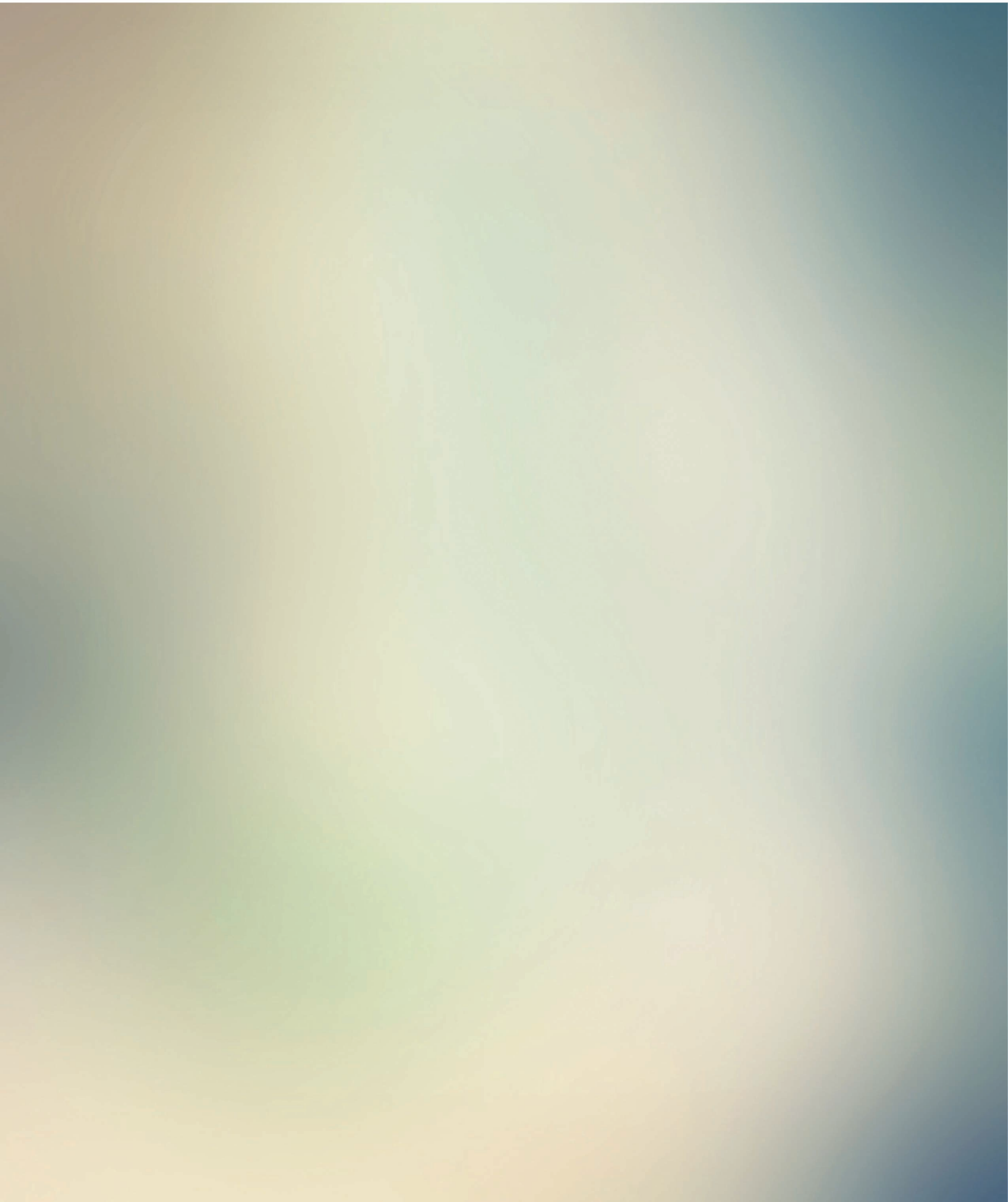


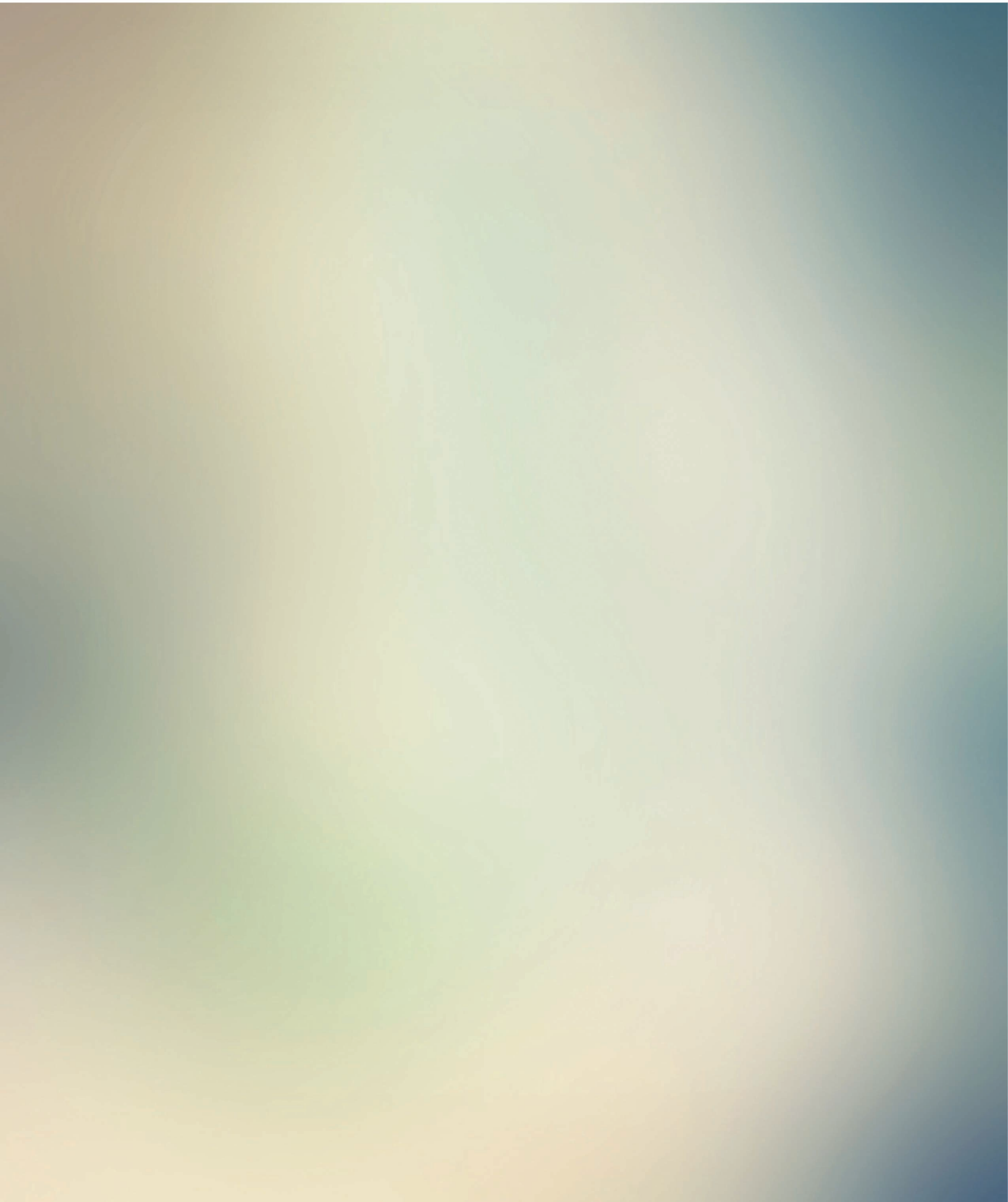


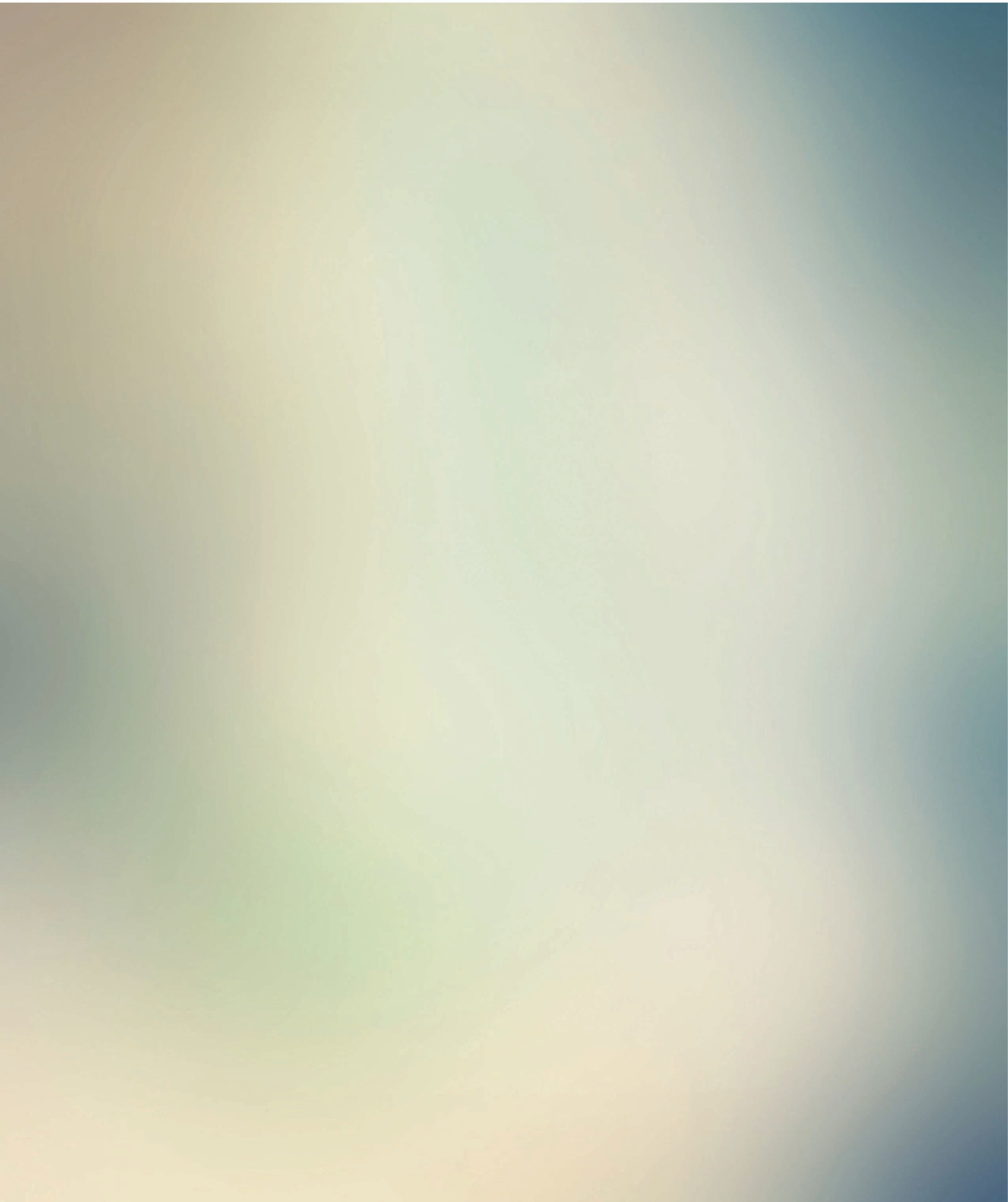


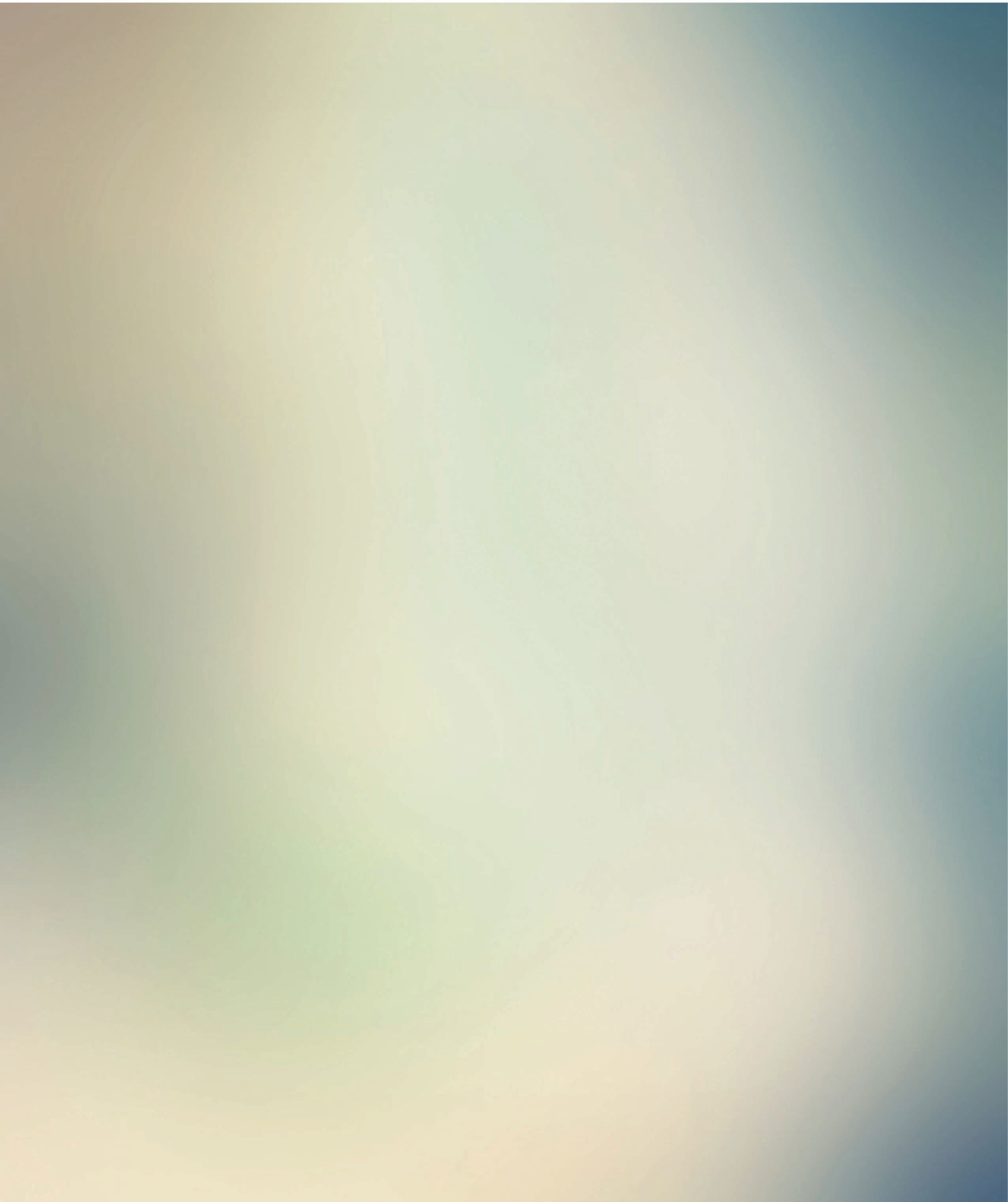


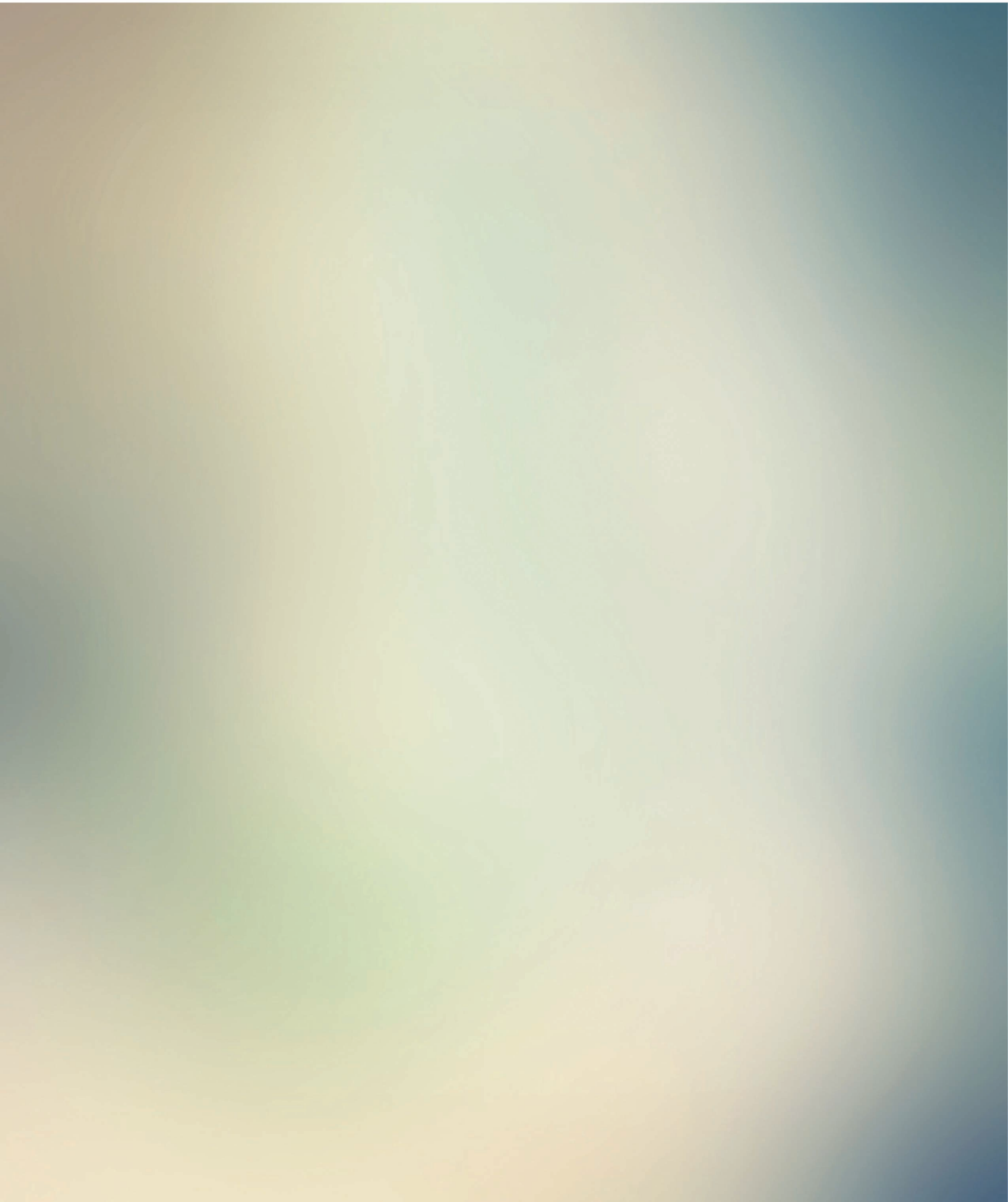


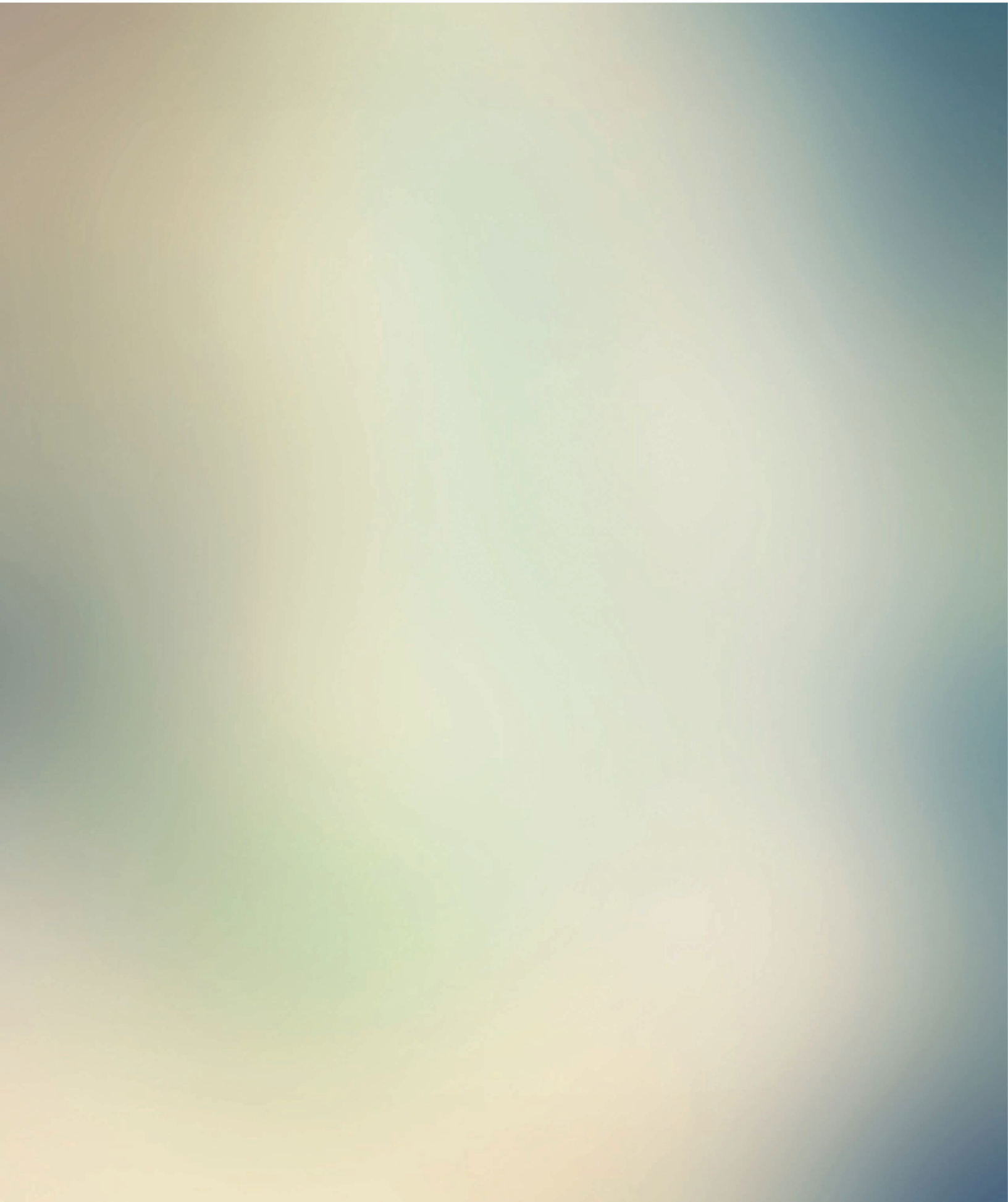


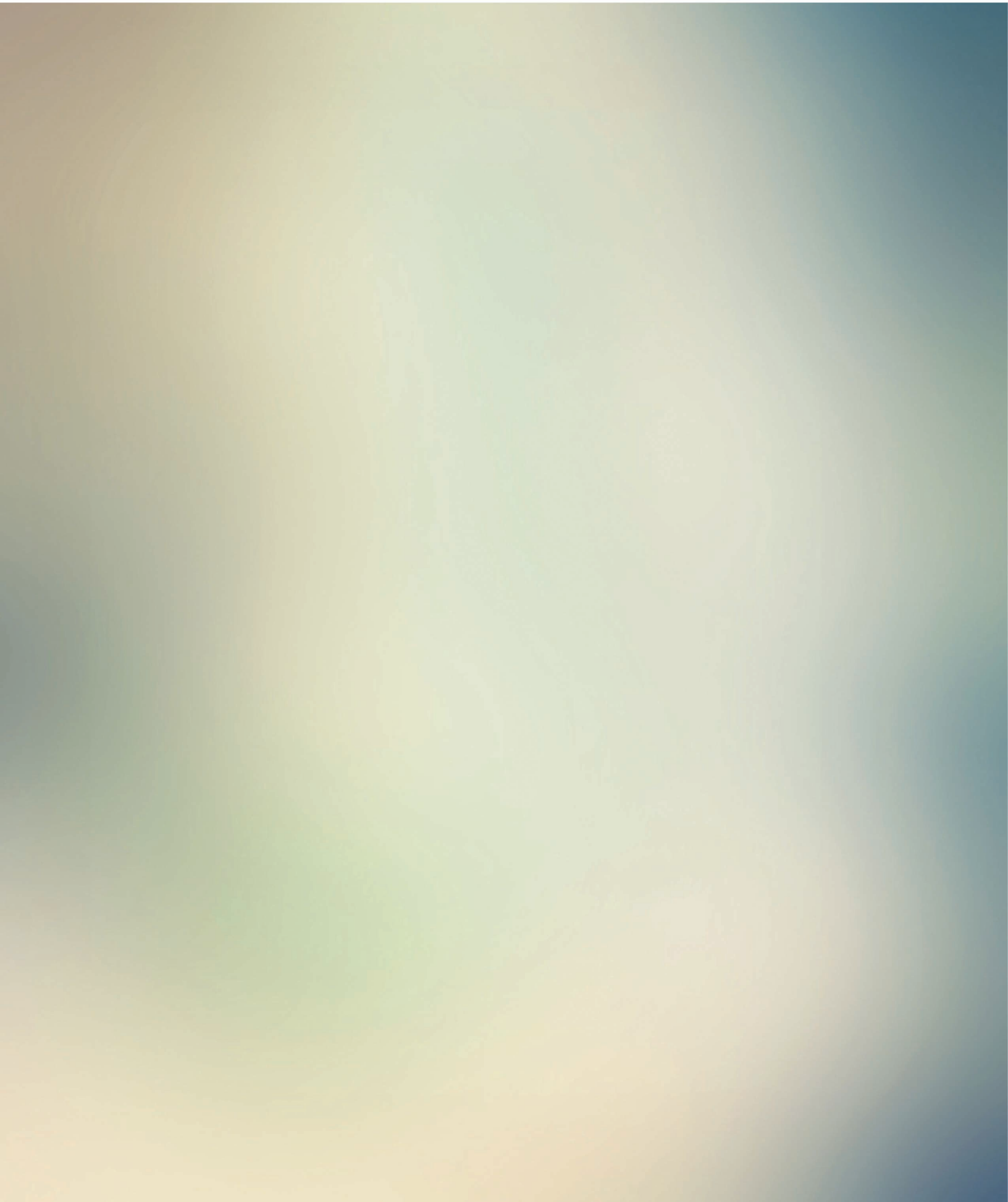


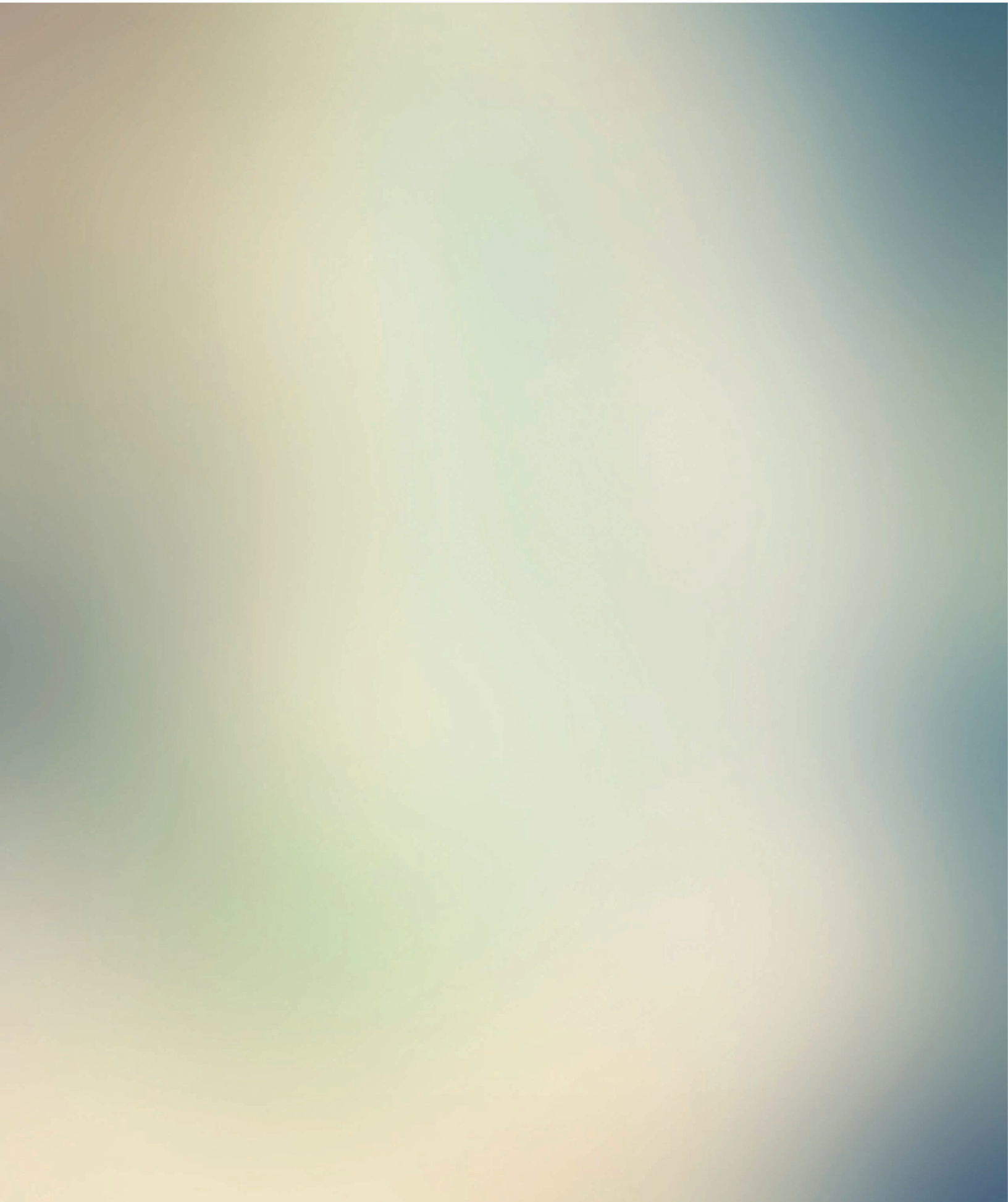


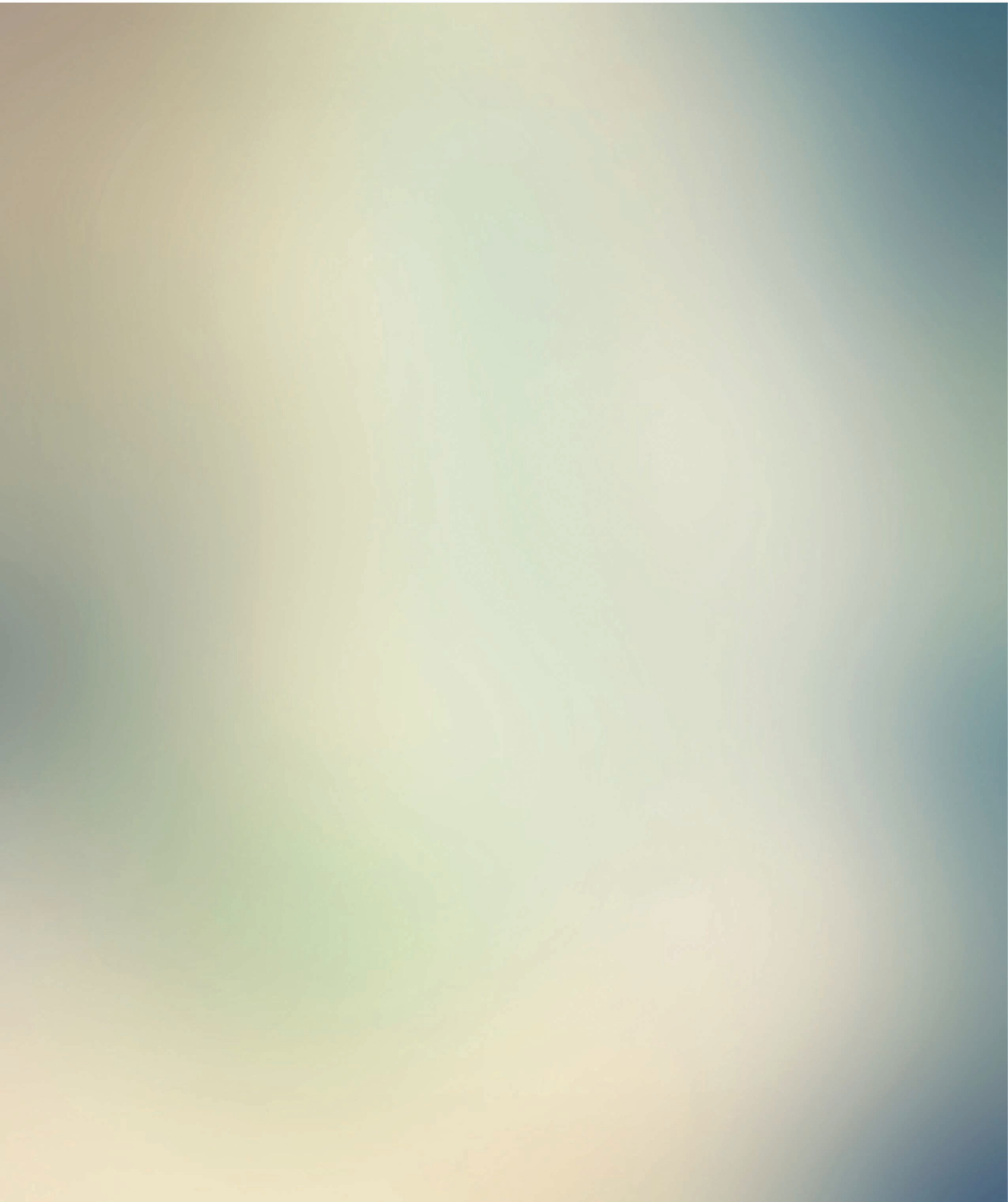


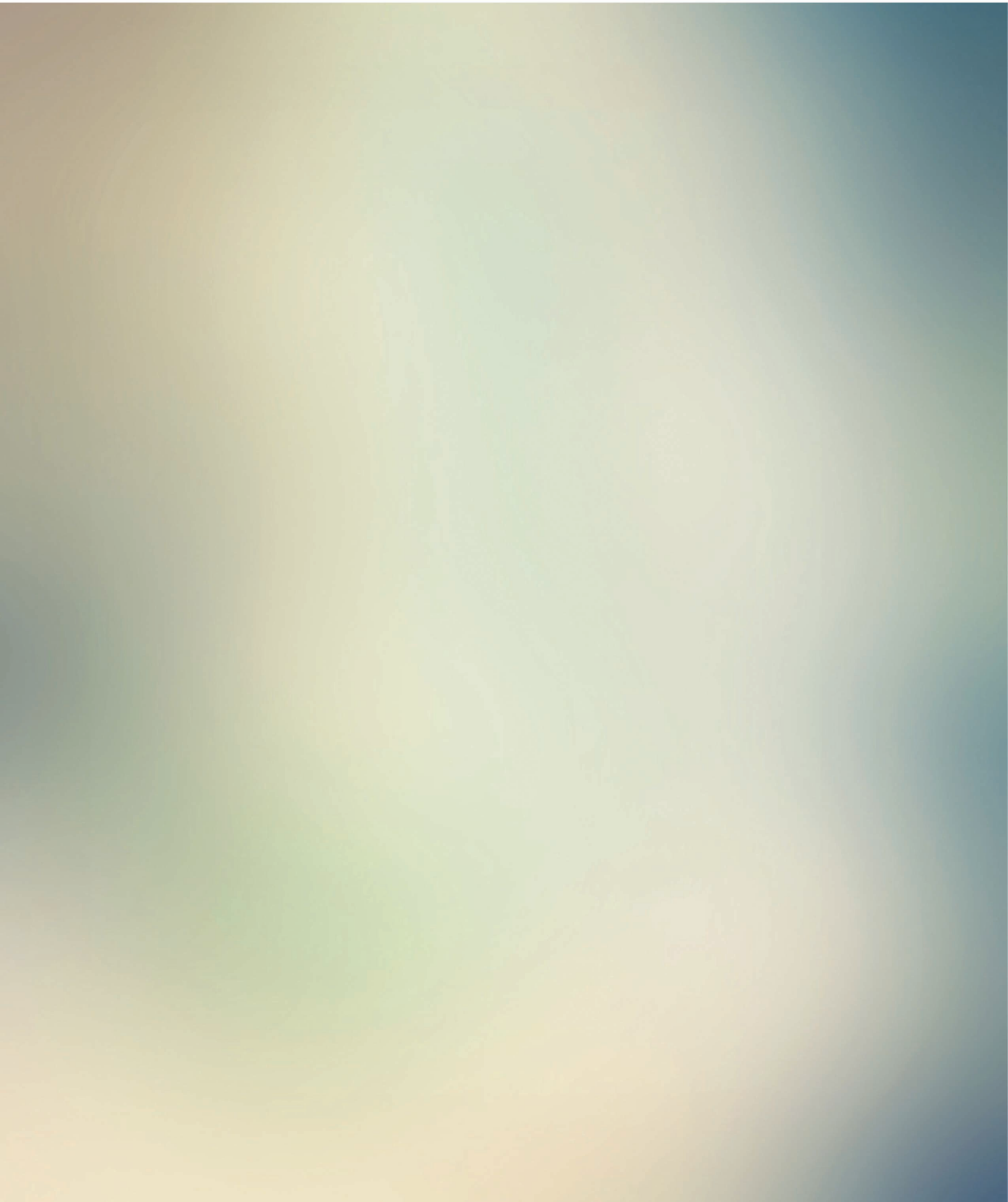


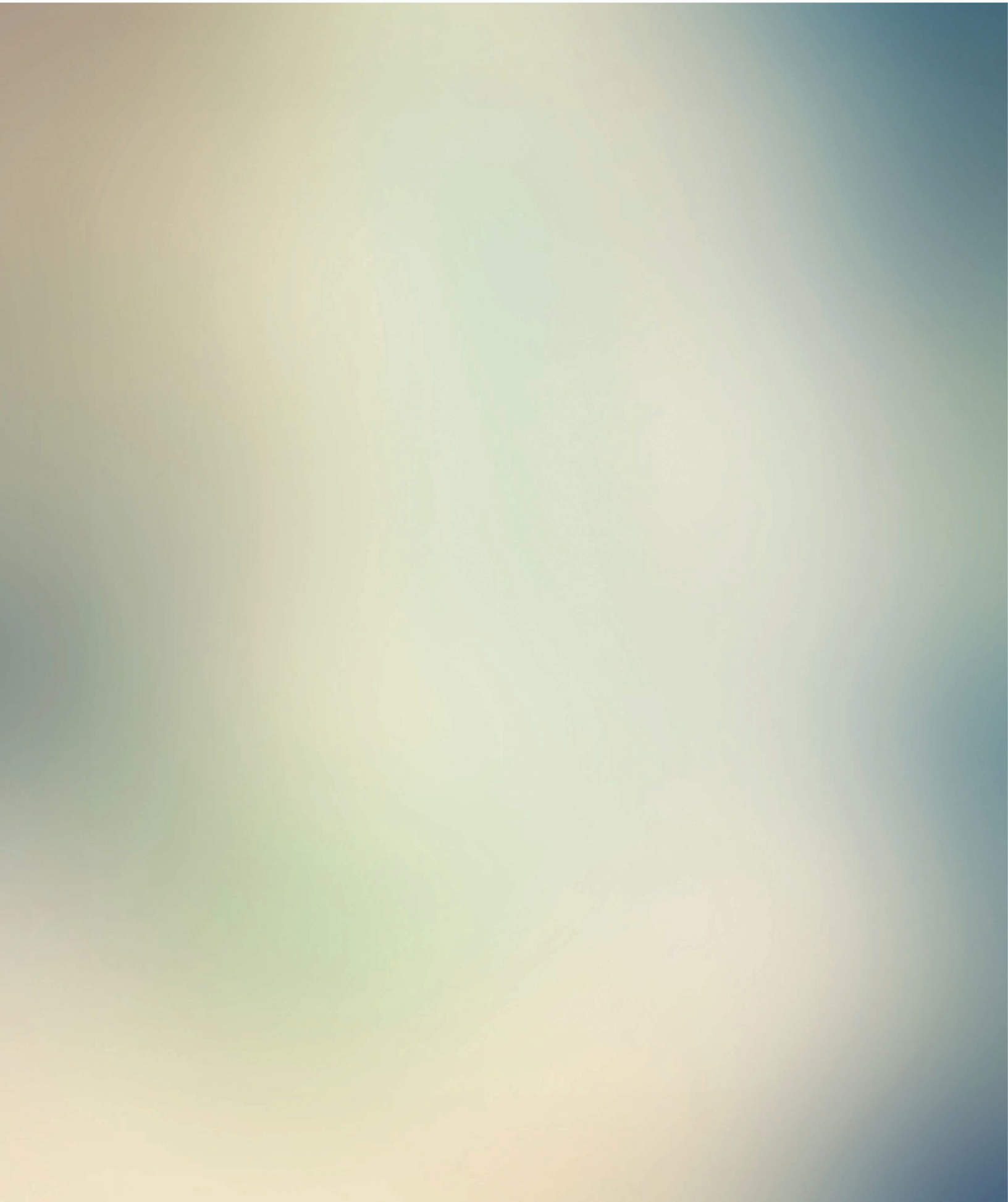


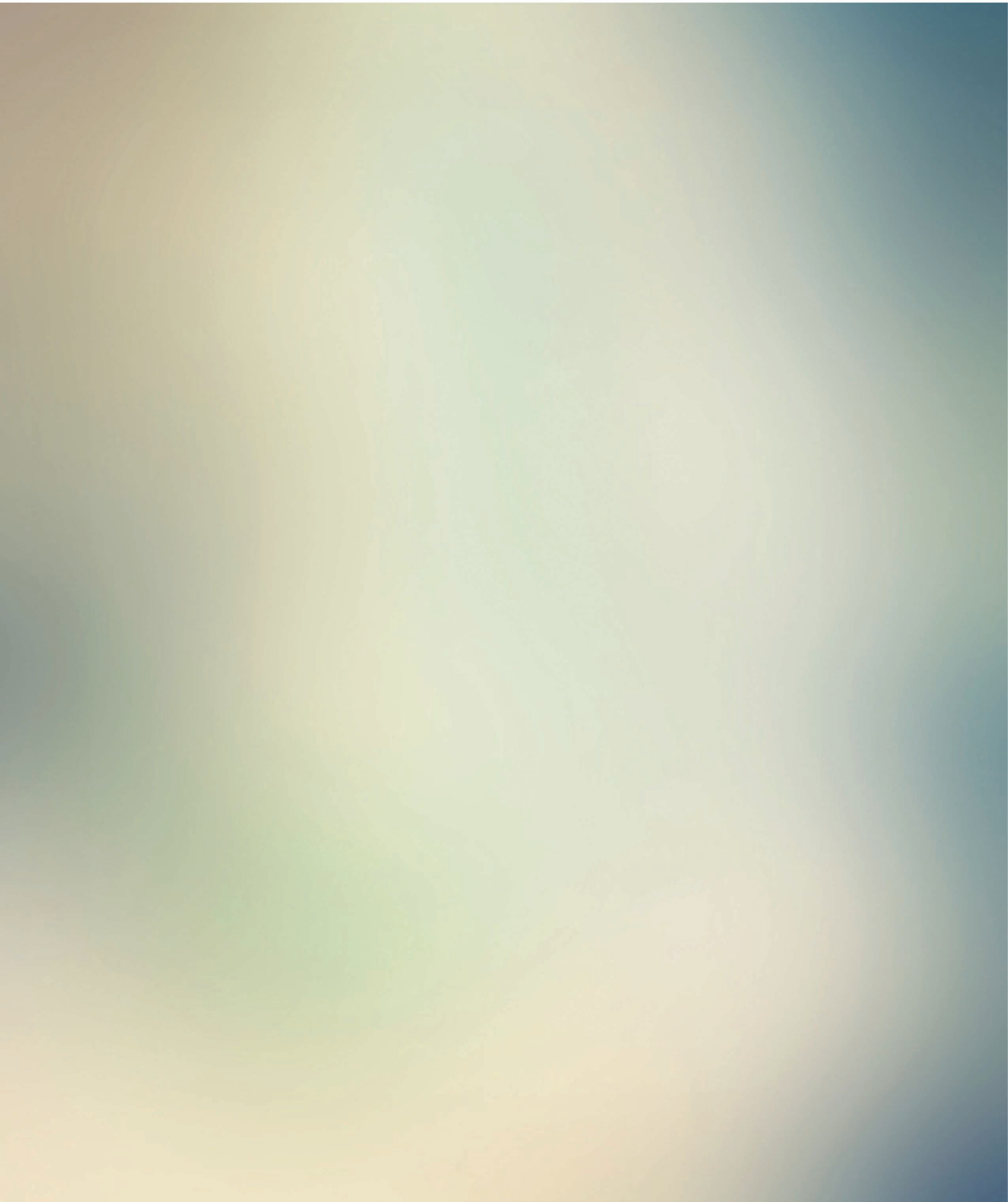


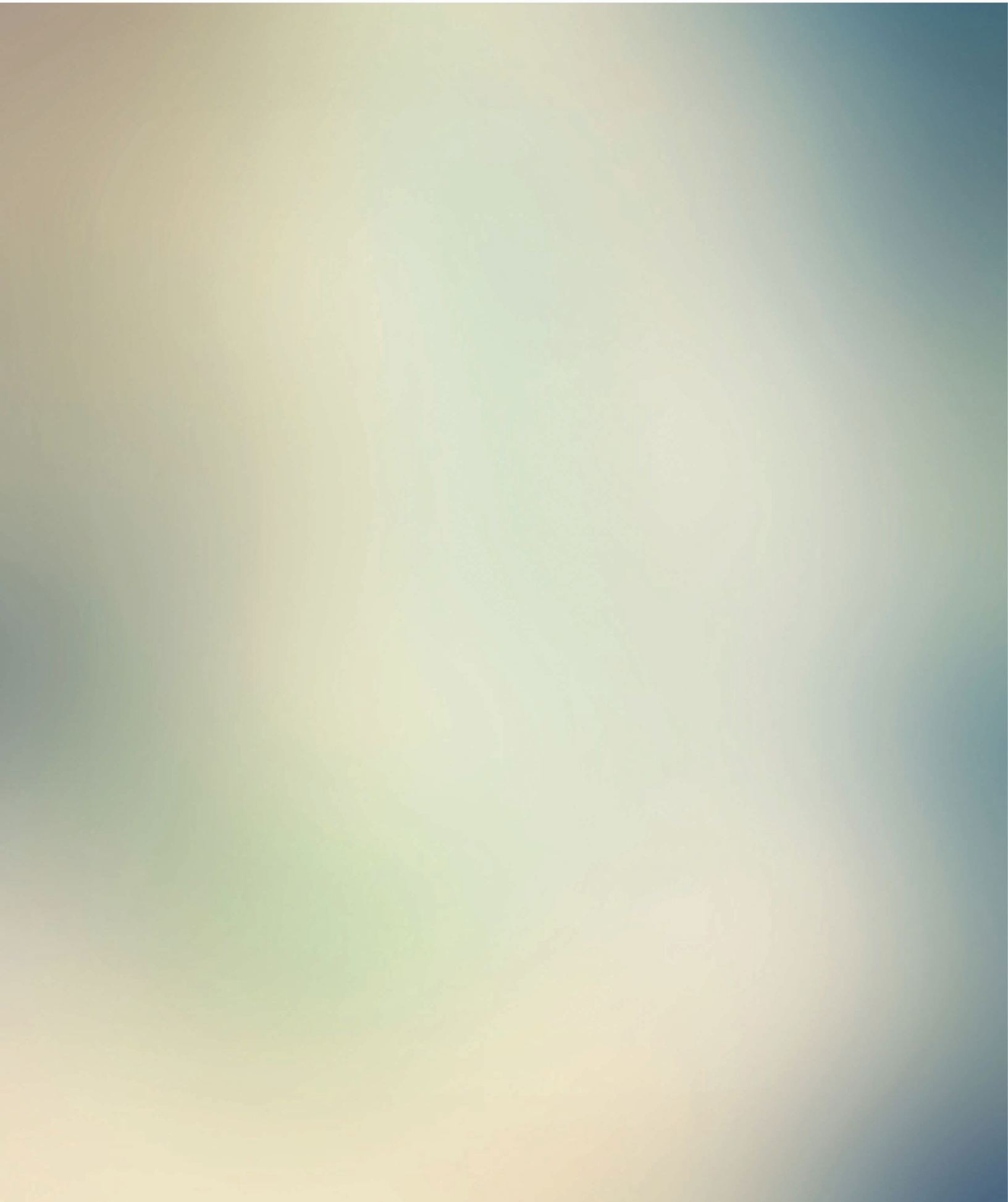


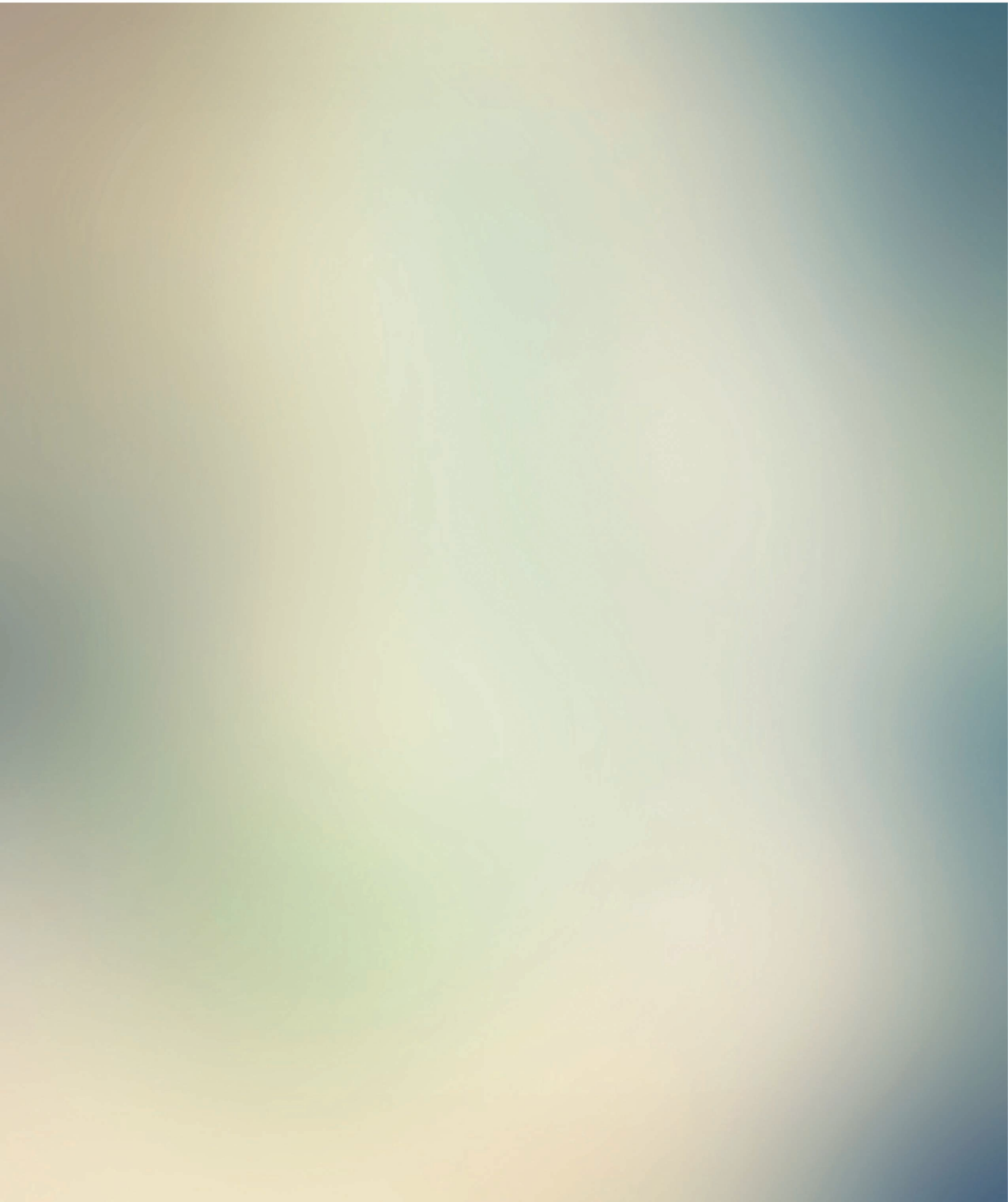


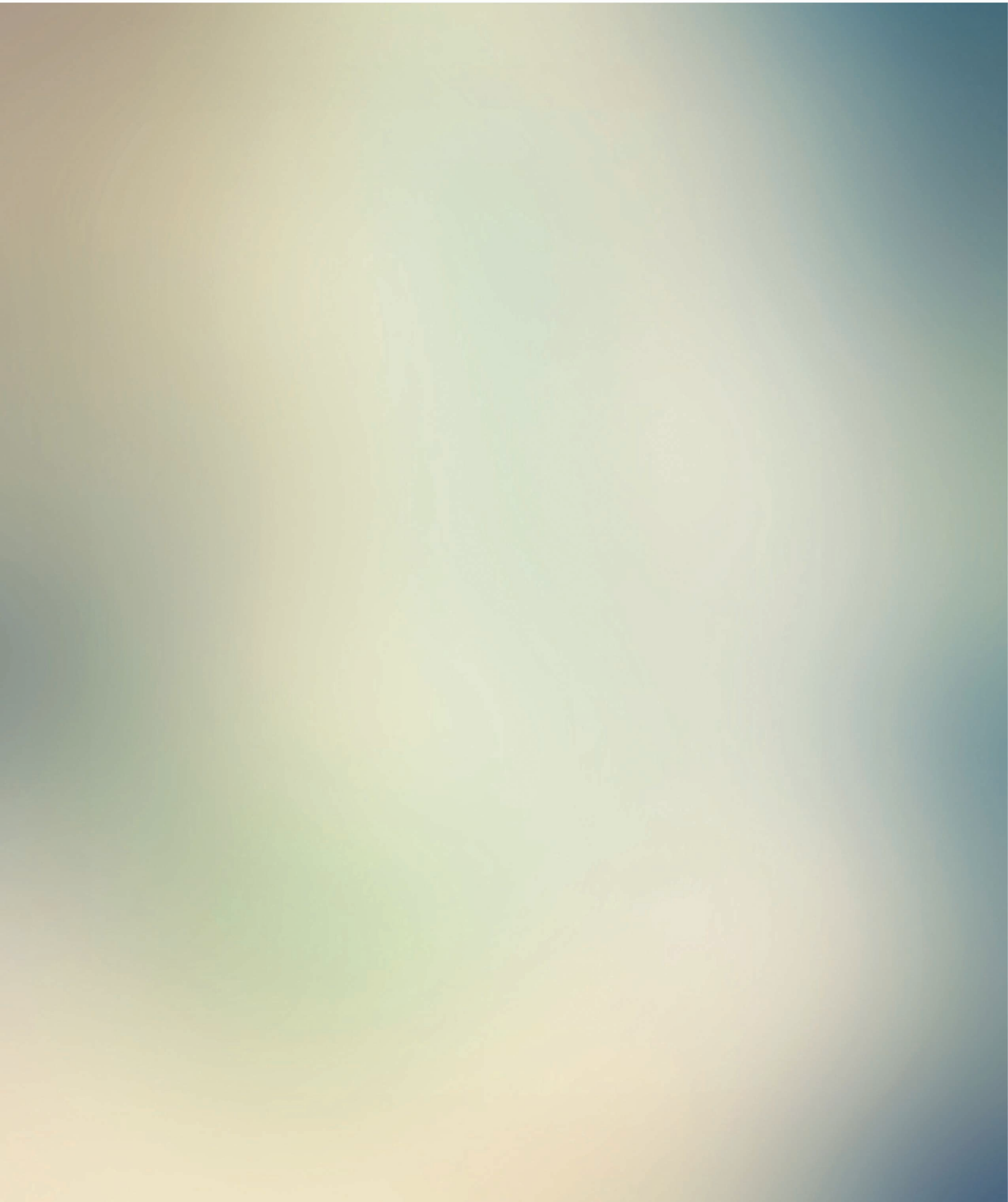


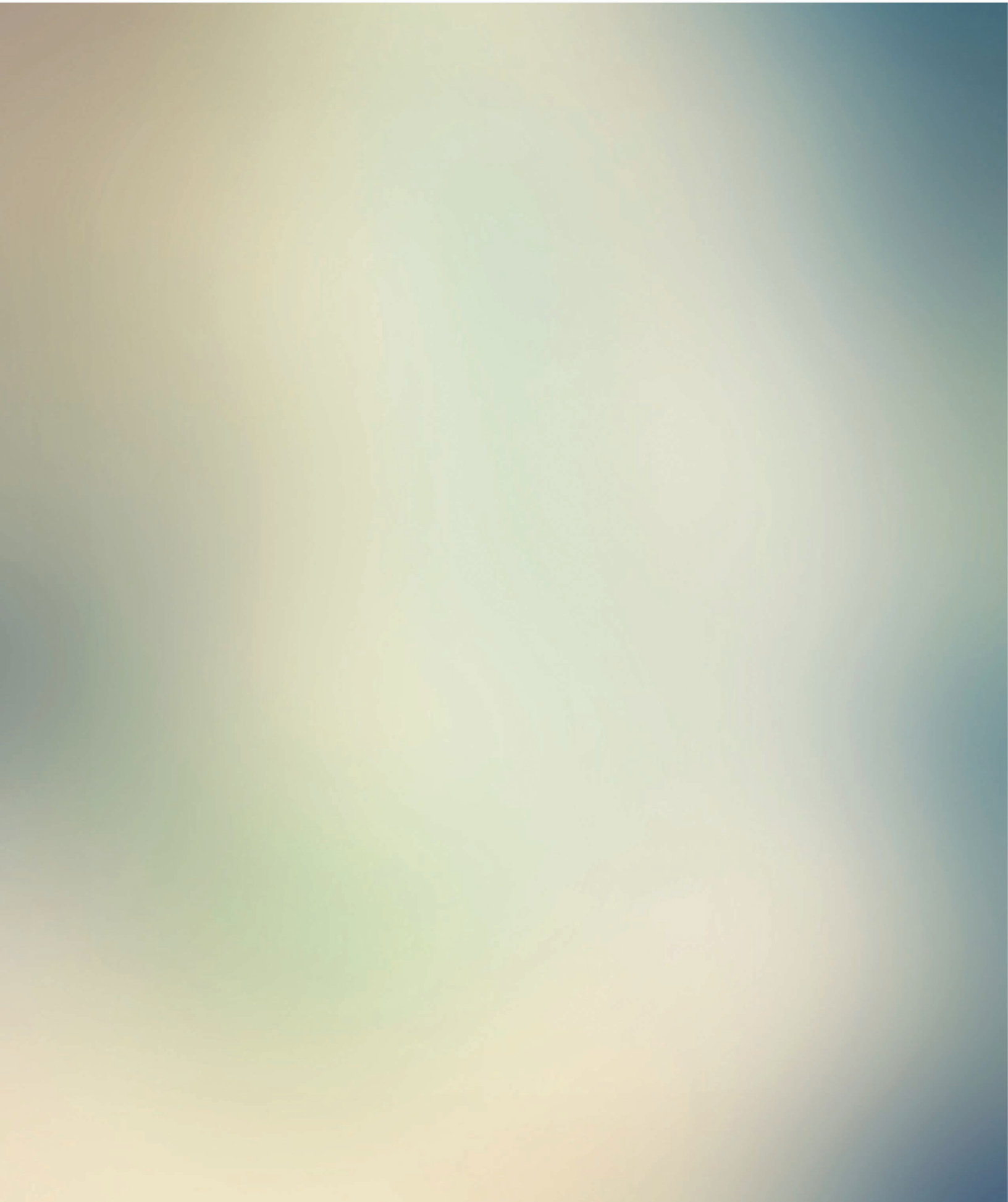


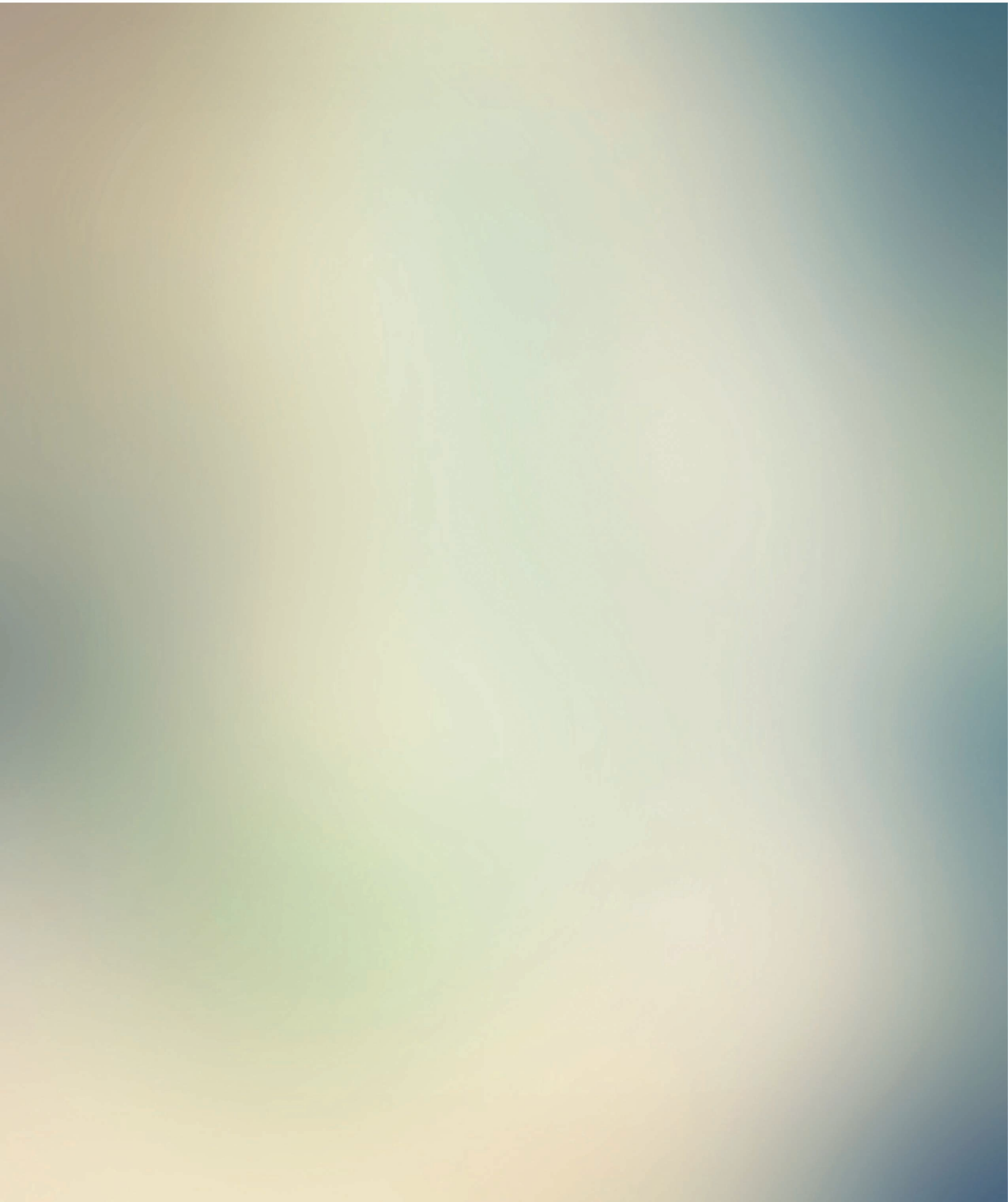


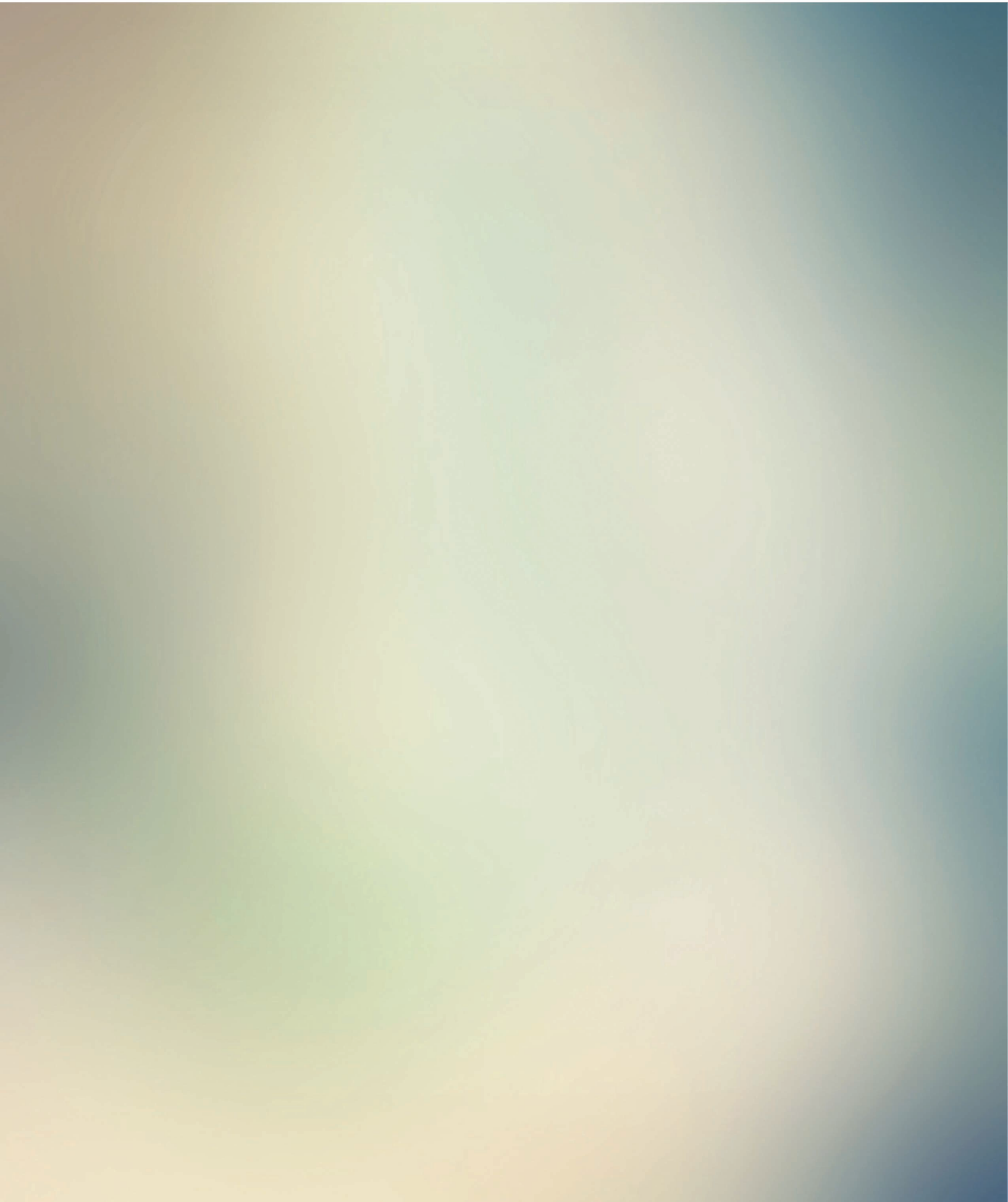


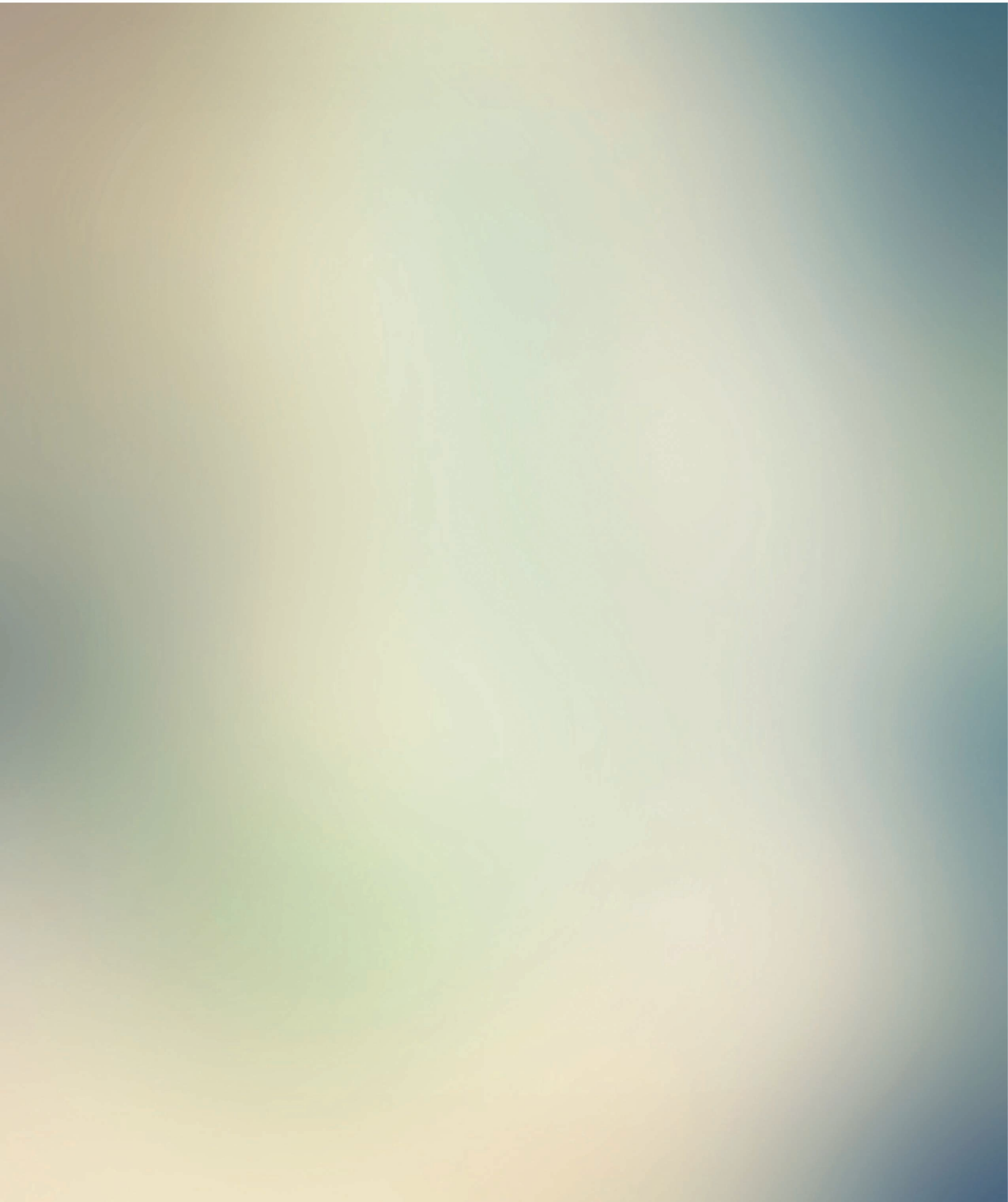


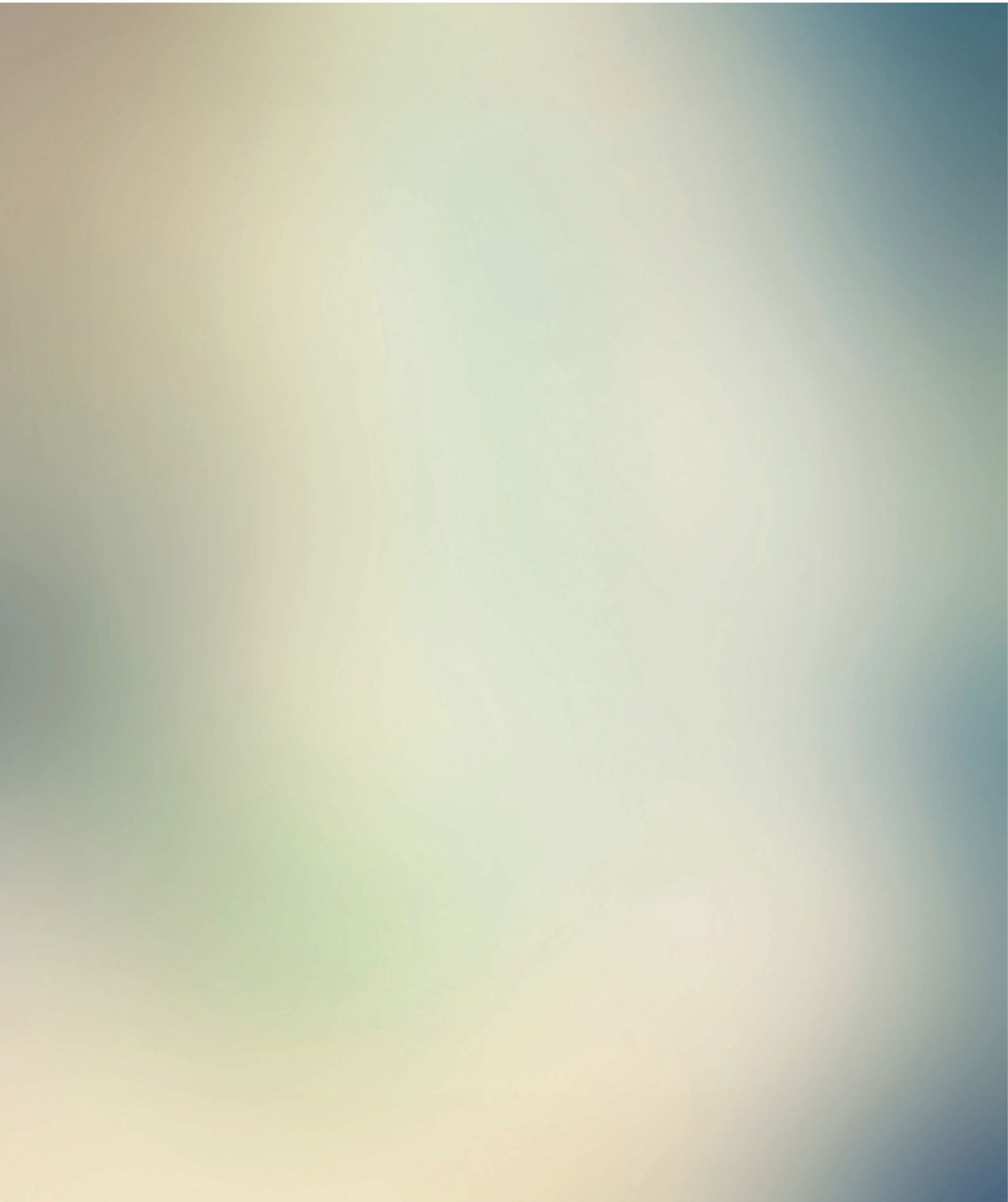


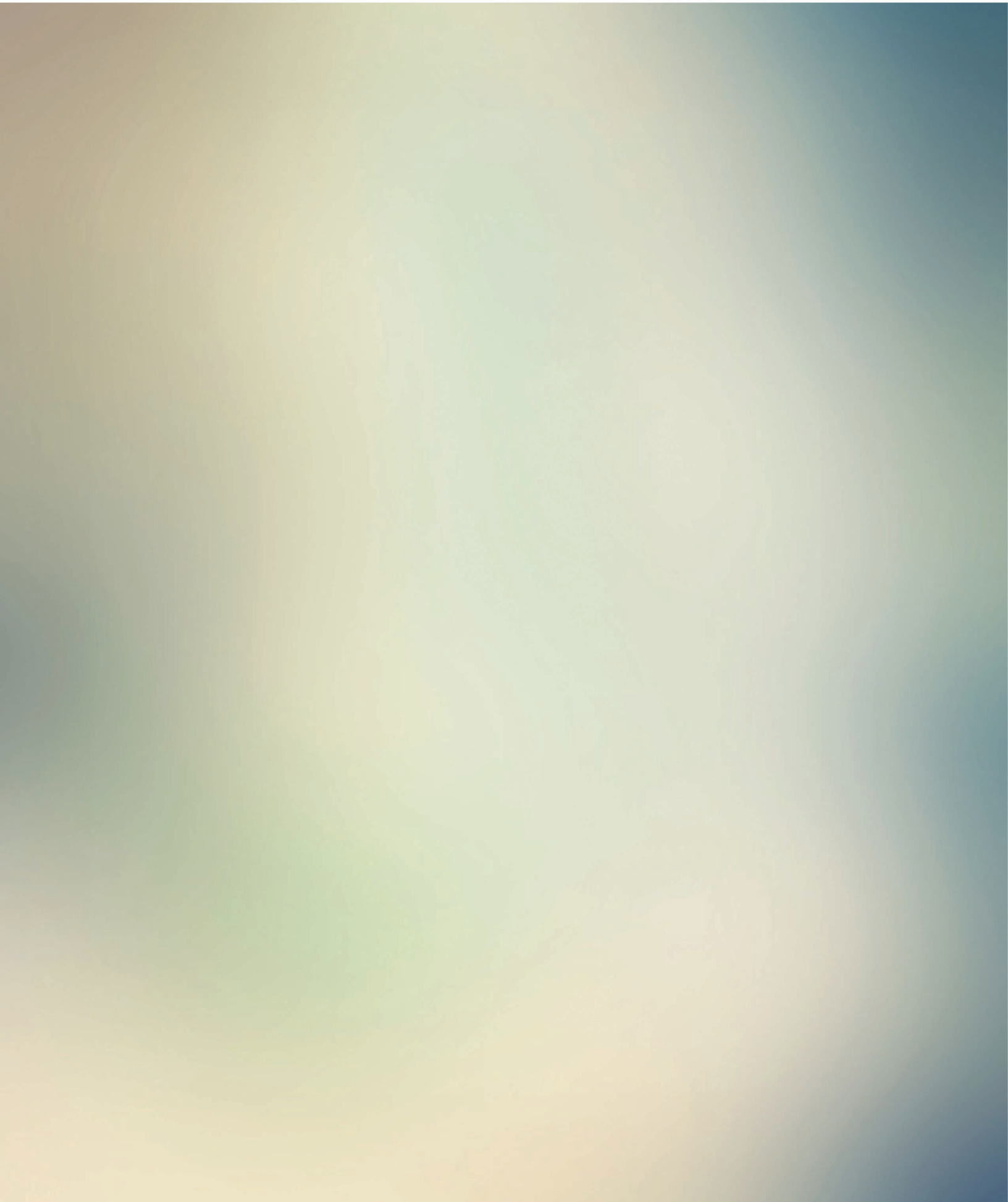


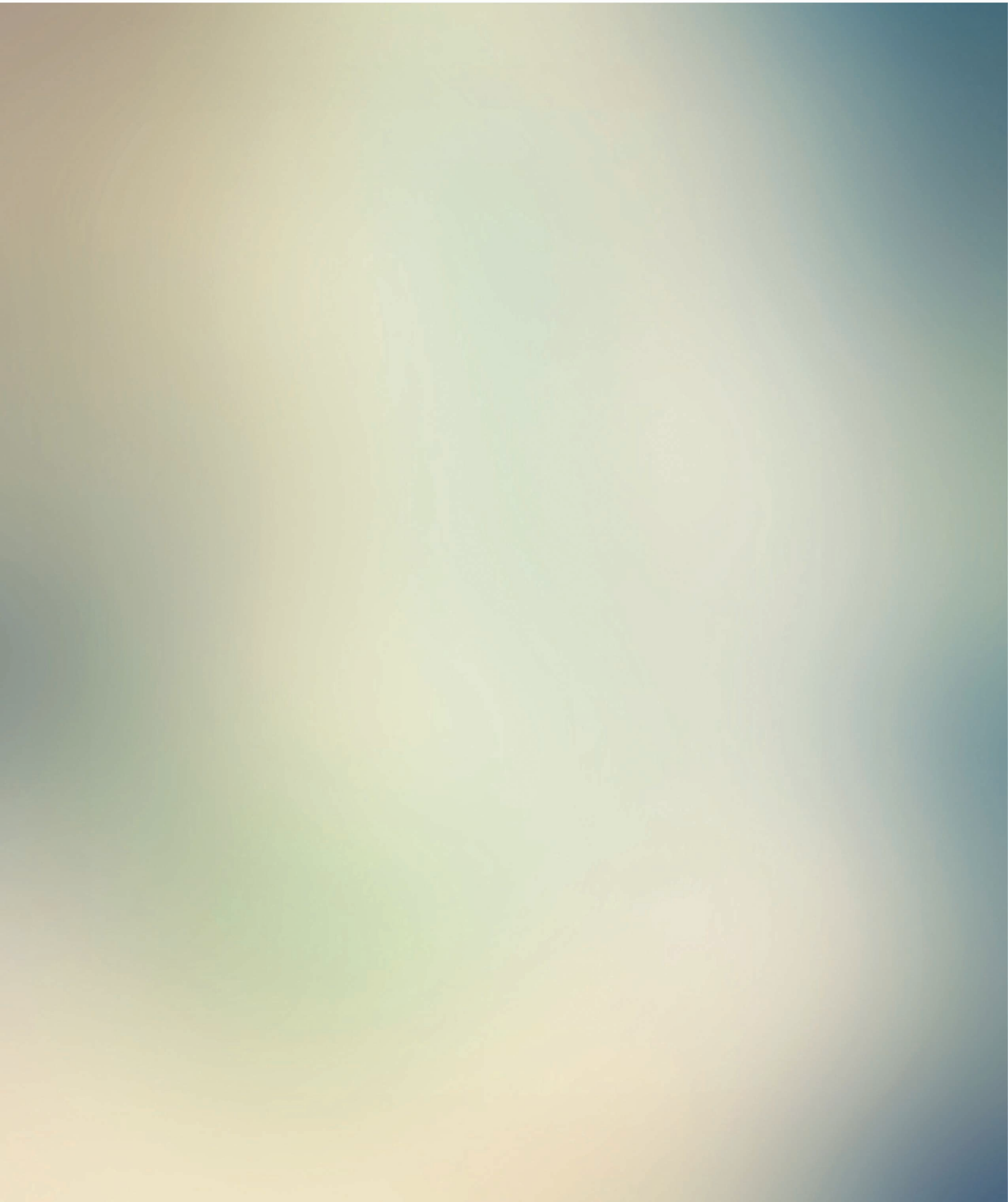


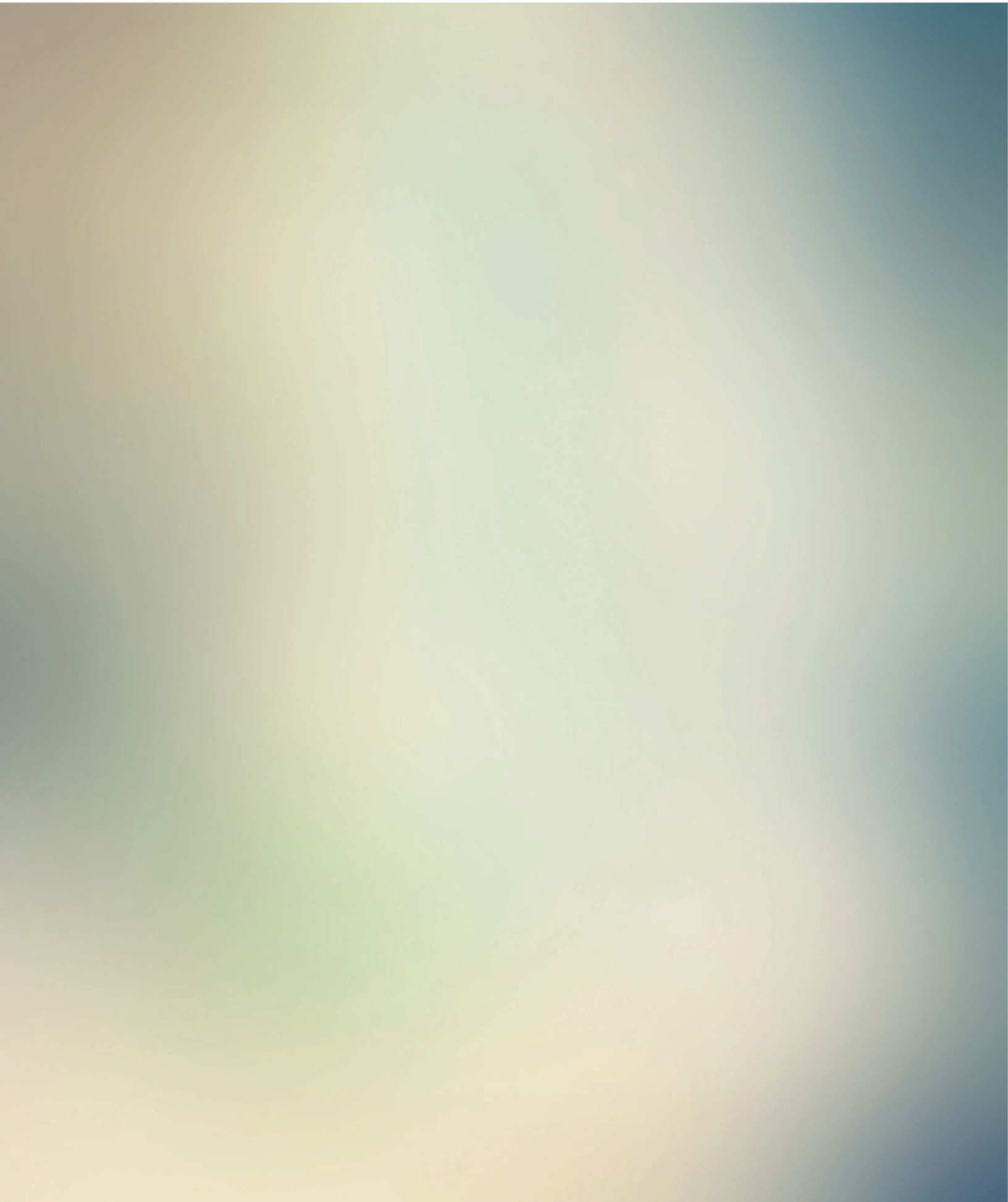


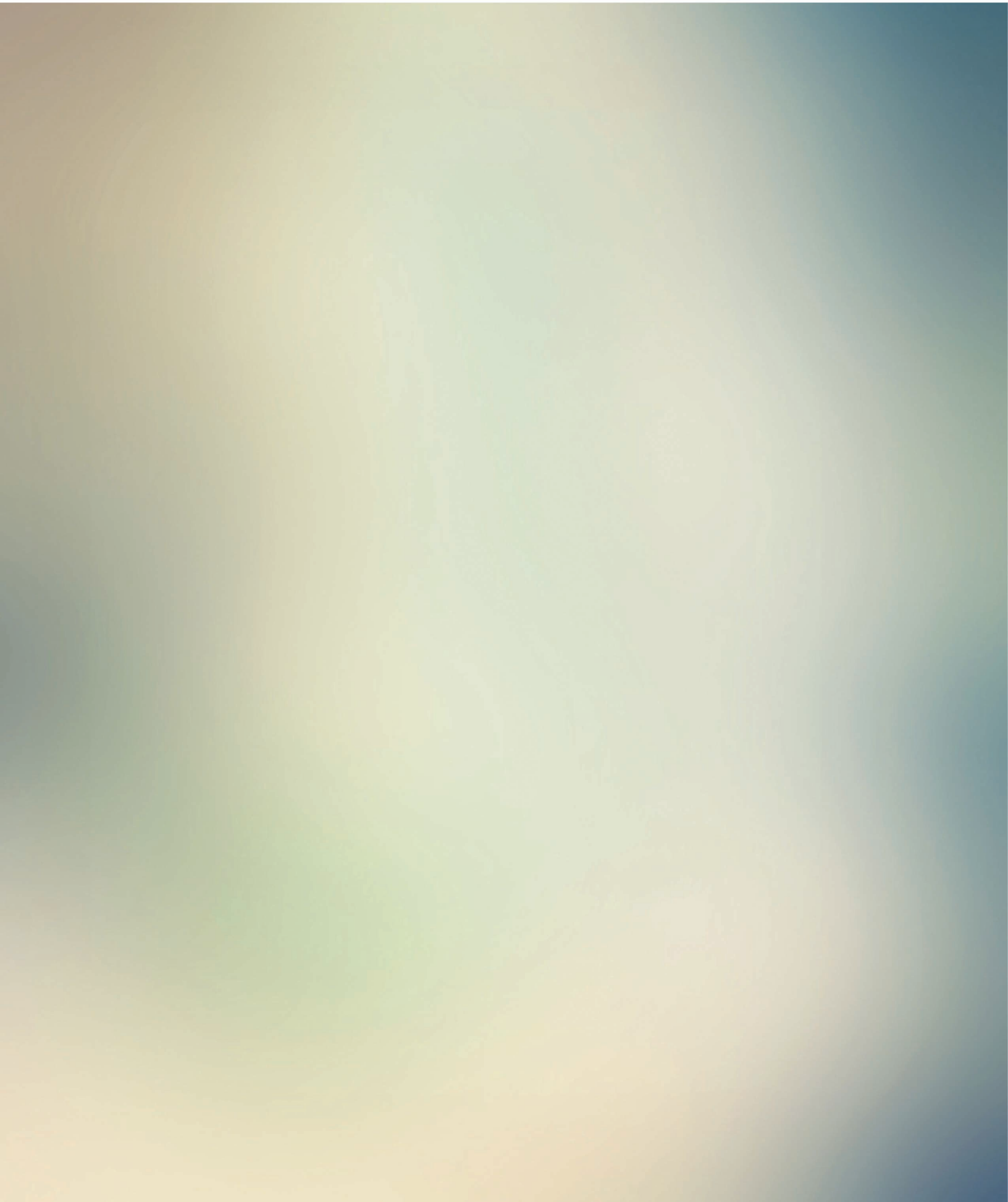


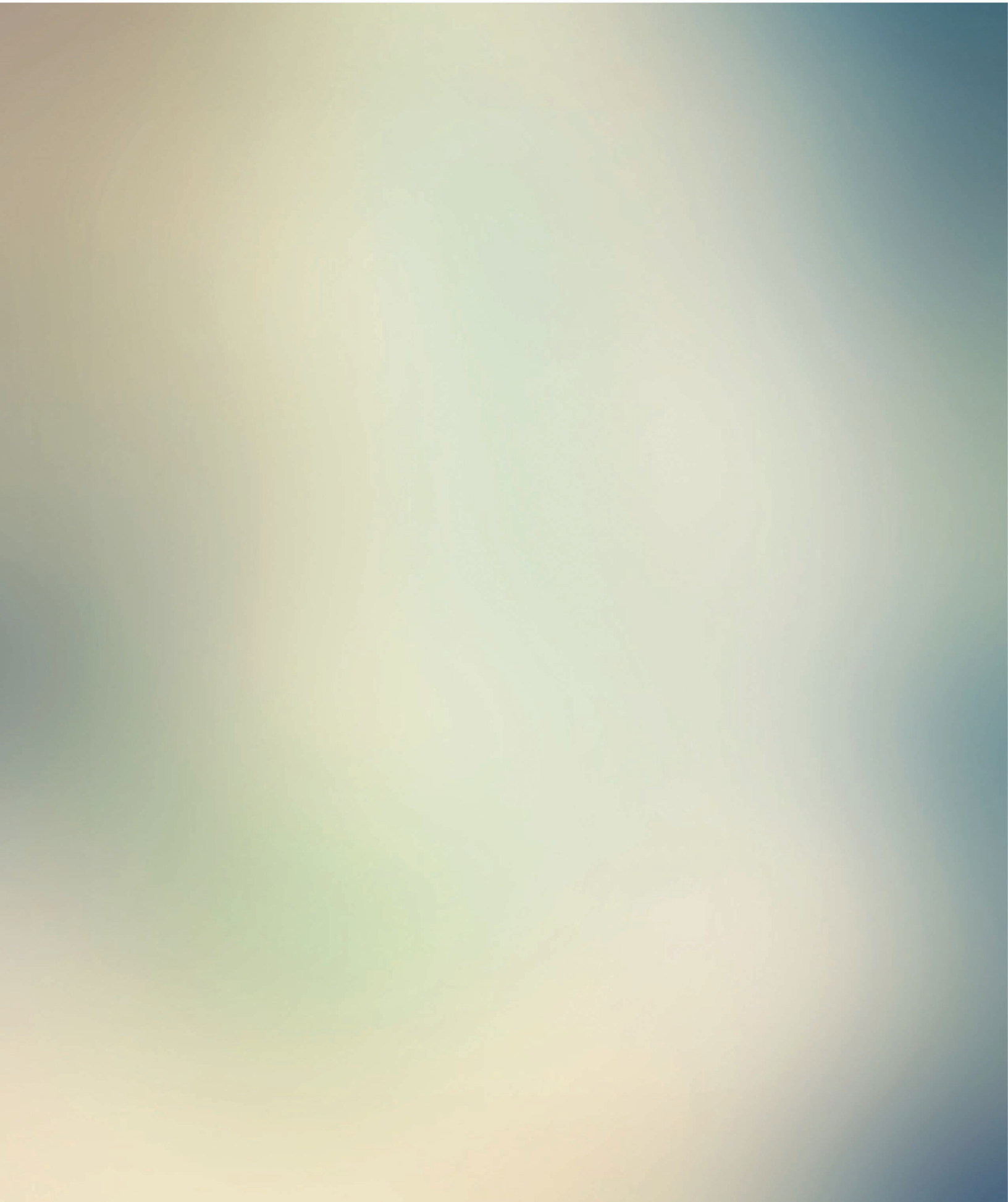


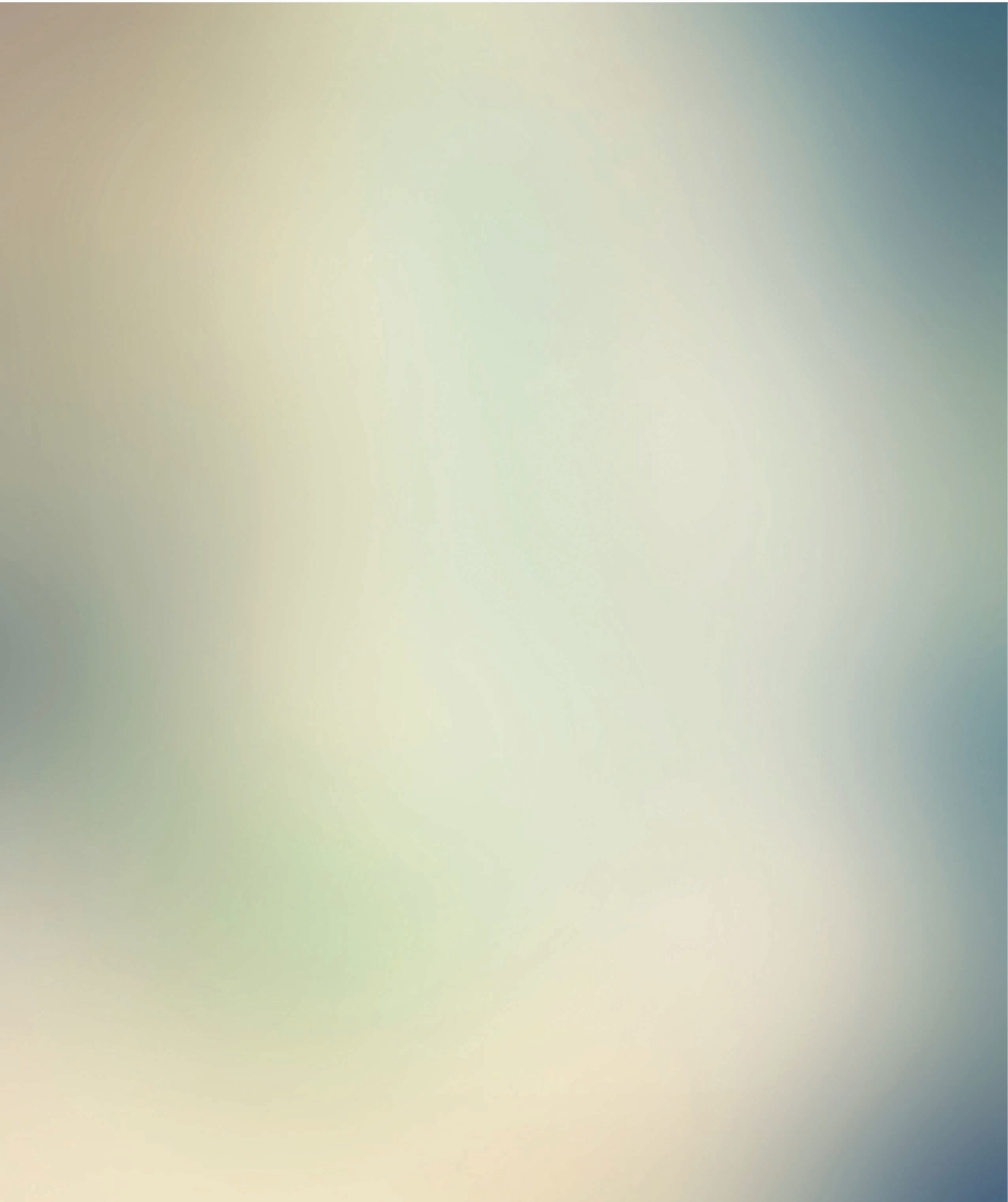


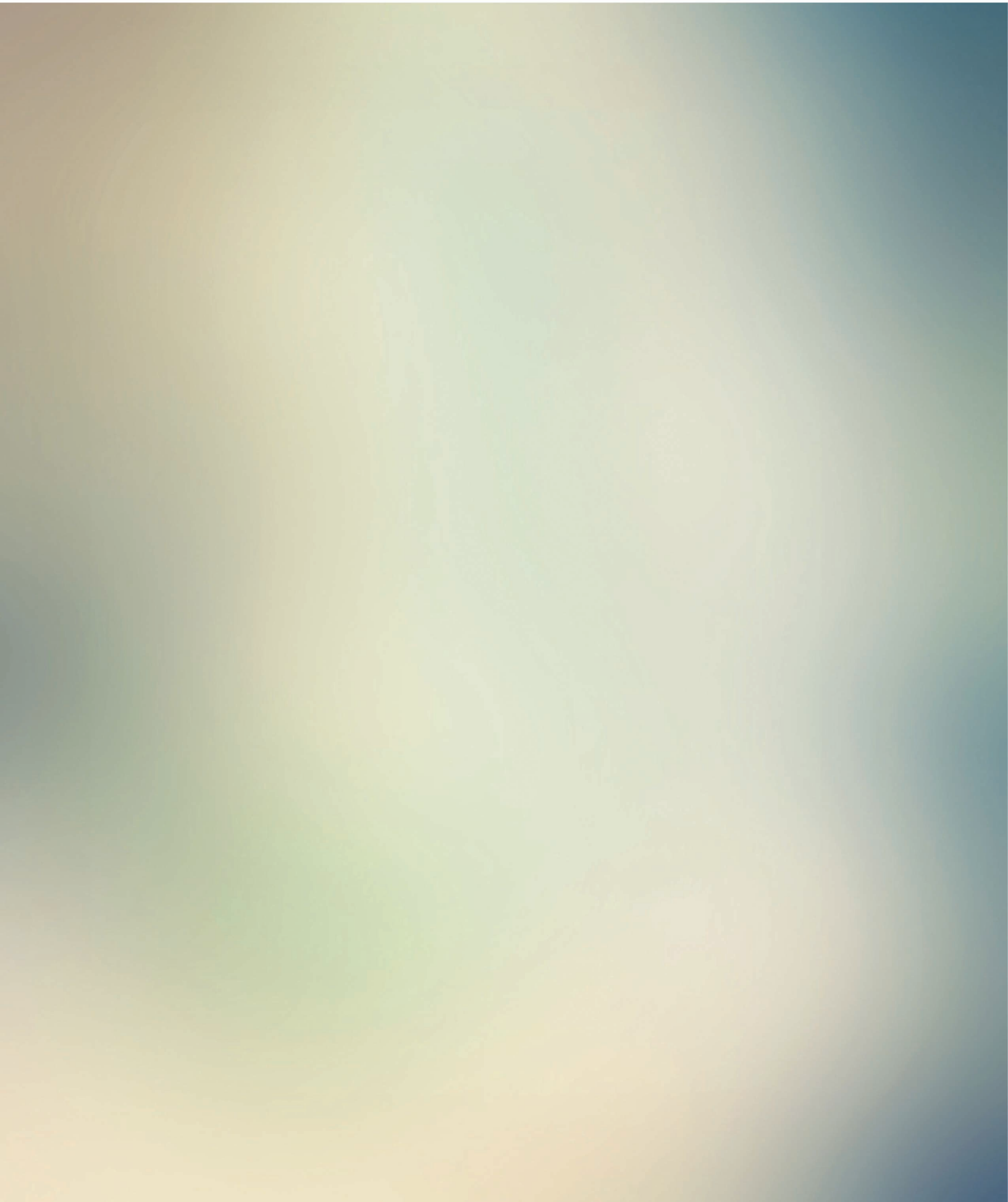












5 GENERAL RECOMMENDATIONS AND PRIORITY INVESTMENT PROGRAM

5.1 General Recommendations

General recommendations on all segments of operation of the Company are listed below. It is advised, that these recommendations are taken into consideration by the Company when determining the strategic objectives and business plans of future operations.

5.1.1 Strategic Planning

Apart from much needed technical improvements of the entire DH system, the Company needs to adopt set of strategic and planning documents in order to define strategic priorities and improve effectiveness of the existing DH system. The adoption of these strategic documents and plans will help the Company to accelerate the transition from current way of operations (on case-by-case basis depending on the urgency of the problems) to more systematic and planned way of operations.

The most important documents that Company has to adopt are:

- The Strategic plan of the Company;
- Development plan of the Company;
- Short-term dynamic operation plans;
- Long-term dynamic plan.

It is advised that the Company should adopt the above listed strategic planning documents before undertaking any activities on the implementation of the priority investment program.

5.1.2 Increasing the Use of Biomass as a Fuel

In order to avoid further spending of the Company's resources on expensive HFO, the Company has to increase usage of other available fuel sources such as biomass, which is considered as the most acceptable energy source for the future operations of the Company. Since the Company had very positive experience with operations of the two existing biomass plants (10 MW + 6 MW), construction of additional biomass plants with significant thermal power should be considered as a top priority for the Company.

The strategic objective of the Company should be to construct the biomass plants with sufficient thermal power to cover the base load, while the existing boilers on HFO will be used to cover peak loads in case of lower outside temperatures. Biomass and HFO boiler plants should operate in parallel, and in case of higher external temperatures, if it is economically justified, they can operate separately.

New biomass fired boilers can be installed at the location of the existing HFO central heating plant. The new biomass boilers can be placed at the location of the old HFO boilers (two boilers 7 MW each) so the existing boiler room can be used for placing the new biomass boilers. Based on preliminary rough estimates the optimal thermal power of two new biomass-fired boilers is 12 MW each, with a total output of 24 MW.

Existing two HFO boiler units (56 MW each) together with the existing installed capacity of the biomass fired boilers are sufficient to cover daily needs for heat supply to consumers. The current installed capacity of the biomass boiler houses is 16 MW, which represents 10.85% of the total engaged power. Since biomass boiler houses operate on a 24 hours regime, they meet more engaged heat power than installed. Following the construction of two new biomass boilers (24 MW), the overall installed power of biomass will be 40 MW, which will represent 27.13% of the total engaged power.

In further development and investment plans the Company should also focus on additionally increasing the use of renewable fuels instead of existing HFO with the aim of eventual complete replacement of HFO with renewable fuels primarily the biomass.

5.1.3 Existing Central Boiler Plant

The existing central boiler plant is over 40 years old, and significant reconstruction of parts that are vital for its functional operation had not been made. The reconstruction of the existing HFO central boiler plant is necessary to secure stable and efficient production of thermal energy, even that only limited capacity of the HFO boilers will be used (after the construction of the biomass boilers) to cover peak loads. Current operational practice of the Company, largely influenced by continuous lack of finance, is focused on emergency maintenance rather than on preventive maintenance which should be the case. The most important recommendations related to the operation of the existing HFO central plant are summarized below:

- Reconstruction of the boiler assembly boiler - burner, with the switch from the two-stage to the modulating burner (variable speed control);
- Installation of circulation pumps with electronic motors (frequency speed control) can have significant impact on savings in total electricity consumption (estimated savings range from 30%-40% of the existing consumption)
- Procurement of HFO with lower SO2 content is mandatory in order to comply with the domestic and EU standards and legislation;
- Defining the norms of fuel consumption depending on the outside temperature and the introduction of consumption monitoring procedures (daily)
- Installation of heat meters on the installations in the central boiler plant in order to monitor the actual production of heat;
- To develop operational manuals is considered of significant importance taking into account envisaged parallel operation of the existing HFO and new biomass plants.

5.1.4 Distribution Network

As described in the Chapter 3.6.6, distribution network is in considerably bad shape, and only partial reconstruction of mainly primary network had been done in the previous years. The Company does not have a database of the entire system of hot water and hot water pipes in the GIS system (or similar) which is a basis for proper planning and maintenance of the distribution network. Significant investments are needed in the reconstruction of the entire distribution network (approximately 45M KM in reconstruction of the primary distribution network and 46M KM in secondary distribution network).

Taking into account financial capability of the Company, it is clear that the reconstruction of the distribution network can be made only in the long-term period if the Company adopts a proper plan for network reconstruction. This plan will have to take into account urgent reconstruction of the most critical parts of the network that have to be made (on the basis of the pre-determined criteria's focused on reduction of heat and water losses with direct impact on the financial performance of the Company).

In order to secure adequate monitoring and maintenance of the distribution network, installation of the section valves on the primary network is necessary. Furthermore, since the leak detection system does not exist, it is necessary to install it in all sections of the network that will be reconstructed as well as in newly constructed parts of the distribution network.

On the secondary network, installation of the equipment such as heat energy meters, balancing valves, thermometers and manometers is necessary. This will enable the Company to monitor the consumer consumption and to introduce billing per actual consumption on a much larger scale. Without installation of these cumulative meters, it will not be possible to measure heat consumption at apartment level, particularly in buildings with two-pipes systems, and if thermostatic valves are not installed, expected savings with installation of pumps with frequent regulations will not be achieved.

5.1.5 Heat Substations

Since most of the substations were constructed during the same period as the distribution network (40 years ago), practically most of them have reached end of their operational lifetime and need urgent refurbishment/reconstruction. As described in the Chapter 3.6.9, only 16% of the total number of substations is equipped with automatic control system, while others are operated manually.

Given the overall technical condition of the existing heat substations considerable investments are needed in this regard, however before the investments in improvement of heat substations are made, the Company has to create a database on heat substations that will enable the Company to monitor implementation of defined procedures and maintenance program.

General recommendations for improvement of this segment of the DH system are given below:

- Replacement of existing circulation pumps and installation of circulation pumps with variable speed control pumps;
- Installation of balancing valves on the primary and secondary sides;
- Installation of equipment for automatic control of secondary supply temperature depending on the outdoor temperature;
- Installation of heat meters on the primary side;
- Where technically and economically justifiable, 2 way electromotive valves have to be installed. In the heat substations where automatic control is already in place, convert two-way valve into the three-way valves. This will enable installation of the frequent regulation pumps in the central boiler house;
- Installation of remote management and control system for management of the entire DH system.
- Insulation of the pipes in the substations that are currently non-insulated.

5.1.6 Reconnection of Disconnected Customers

Since the Company lost about 13% of the customers since 2011 one of the key strategic goals is to ensure the return of the lost customers. As described the network improvements planned in PIP will significantly improve the quality of service namely the consistency of delivering required amount of heat to the customers. Under the current conditions the absence of network balancing and regulation equipment results in uneven distribution and delivery of heat in the network which means that some customers are undersupplied and heated below the required temperature level and that some customers are oversupplied and therefore overheated. This was one of the main reasons for the disconnections since some customers were simply not receiving the needed amount of heat during the season.

The projected network improvements will effectively address this problem and enable the even delivery of required heat therefore removing the underlying reason for the disconnections. Considering the improvements in the quality of service it is realistic to expect the return of the disconnected customers over the next period. Reconnection of the disconnected customers should remain the top strategic priority of the Company since the feasibility of the priority investment program depends on the sales growth projections based on the assumption that the majority of the disconnected customers will reconnect by 2021. This will also significantly improve the liner heat density of the Company as well as its financial performance.

5.1.7 Implementation of Consumption Based Billing System

As presented in Chapter Implementation of Consumption Based Billing System the billing system based on actual consumption of each individual consumer is proscribed by the domestic legislation as well as the international standards therefore the Company should make steps towards achieving this goal. Apart from legal obligations consumption based billing provides a higher level of transparency to customers and increase their confidence in the DH system. However considering the current financial position of the Company and the required size of the investment into achieving entirely consumption based billing system it is not realistic to recommend the full implementation of this measure in the short run. However with the implementation of other recommended

measures which will result in savings and increased revenues it is recommended that the Company should start investing into the individual metering equipment in accordance with its financial capacities.

5.1.8 Network Expansion

As discussed in section 8 there are significant possibilities for the network expansion which would result in the increased revenues of the company. Considering the assessed technical priorities as well as financial position of the company the Priority Investment Program made focus on achieving the financial consolidation of the company by improving the efficiency of operations. By increasing the use of biomass as the alternative fuel the company will cut the costs of fuel and improve its environmental impact. Also by the implementation of recommended network improvements the company will get into position of ensuring the return of the disconnected customers which is its first priority.

The required total amount of investment as well as the required scope of investments works that is needed to implement the recommended measures will be overwhelming for the company in its current condition. For that reason additional investments into network expansion were not included in the PIP. However the projected implementation of PIP will result in considerable savings and growth of revenues coming from reconnected customers. Therefore it will be financially possible to plan additional investments into network expansion after 2018.

5.1.9 Combined Heat and Power Generation

Future network expansion plan should also be based on the increased use of biomass fuel and consider Combined Heat and Power generation options. As discussed in Chapter 4.4 the introduction of CHP would result in higher fuel efficiency and enable production of electricity during the entire year thus resulting in higher financial results particularly under the current local feed in tariffs for electricity produced from biomass.

5.1.10 Network Management Improvement Measures

5.1.10.1 Creation of GIS databases

During the technical assessment of the Company operation, it was observed that the updated documentation of the network is not in place, particularly the documentation related to the secondary network.

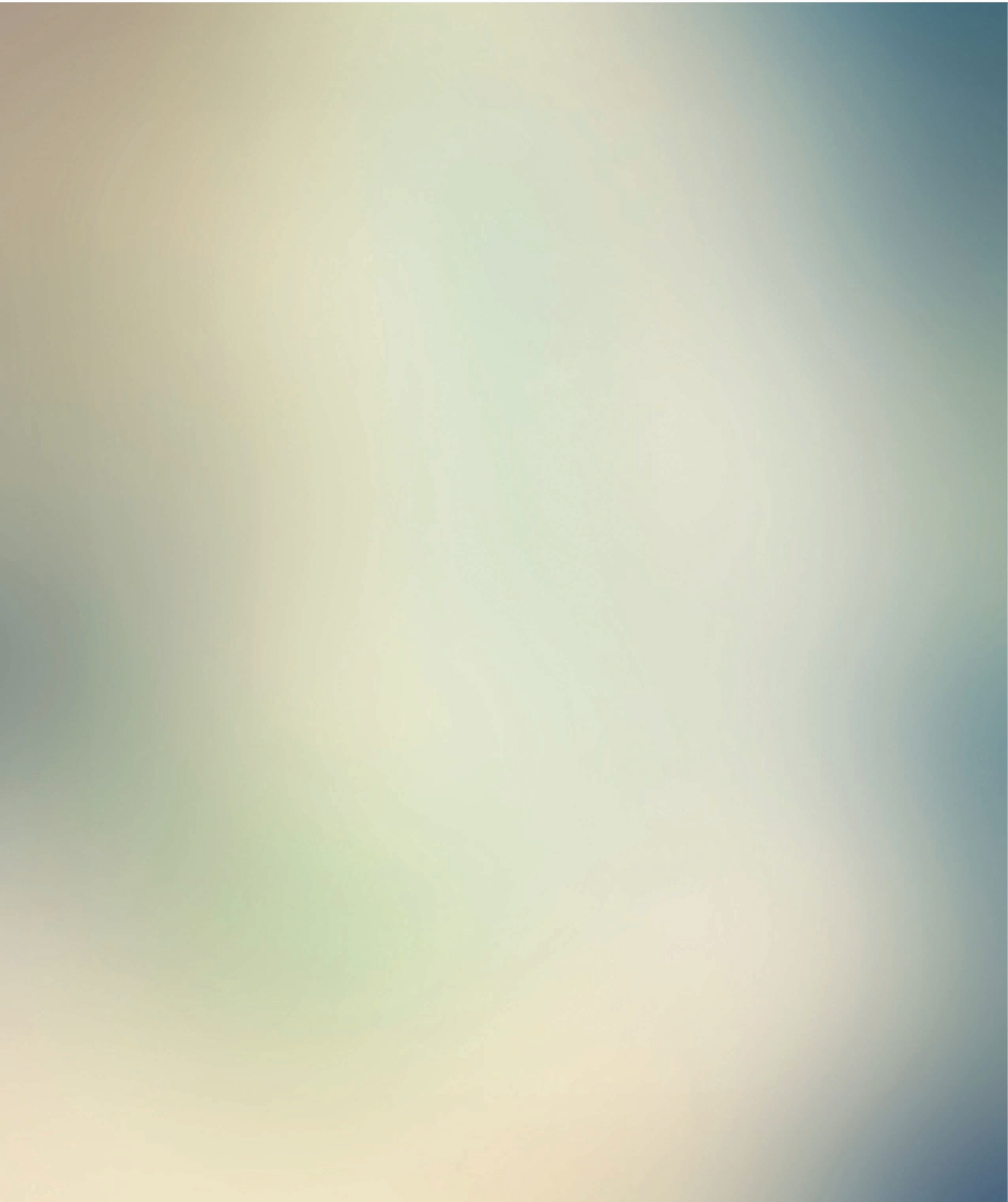
This documentation is crucial to identify the location of the pipelines, and to determine the cost and measures necessary for rehabilitation and maintenance of the network. Setting up GIS database includes on site survey to physically locate, determine the type and size of the pipes and other objects, i.e. valves, chambers, elbows, compensators etc. and to determine geographical coordinates for all objects and pipelines. Once the pipes and other objects are identified, data are transferred to a GIS-system where characteristics for all objects in the DH system are kept. Computerized system for documentation enables improved planning of maintenance, hydraulic as well as economic calculations, and most importantly the location of the pipelines.

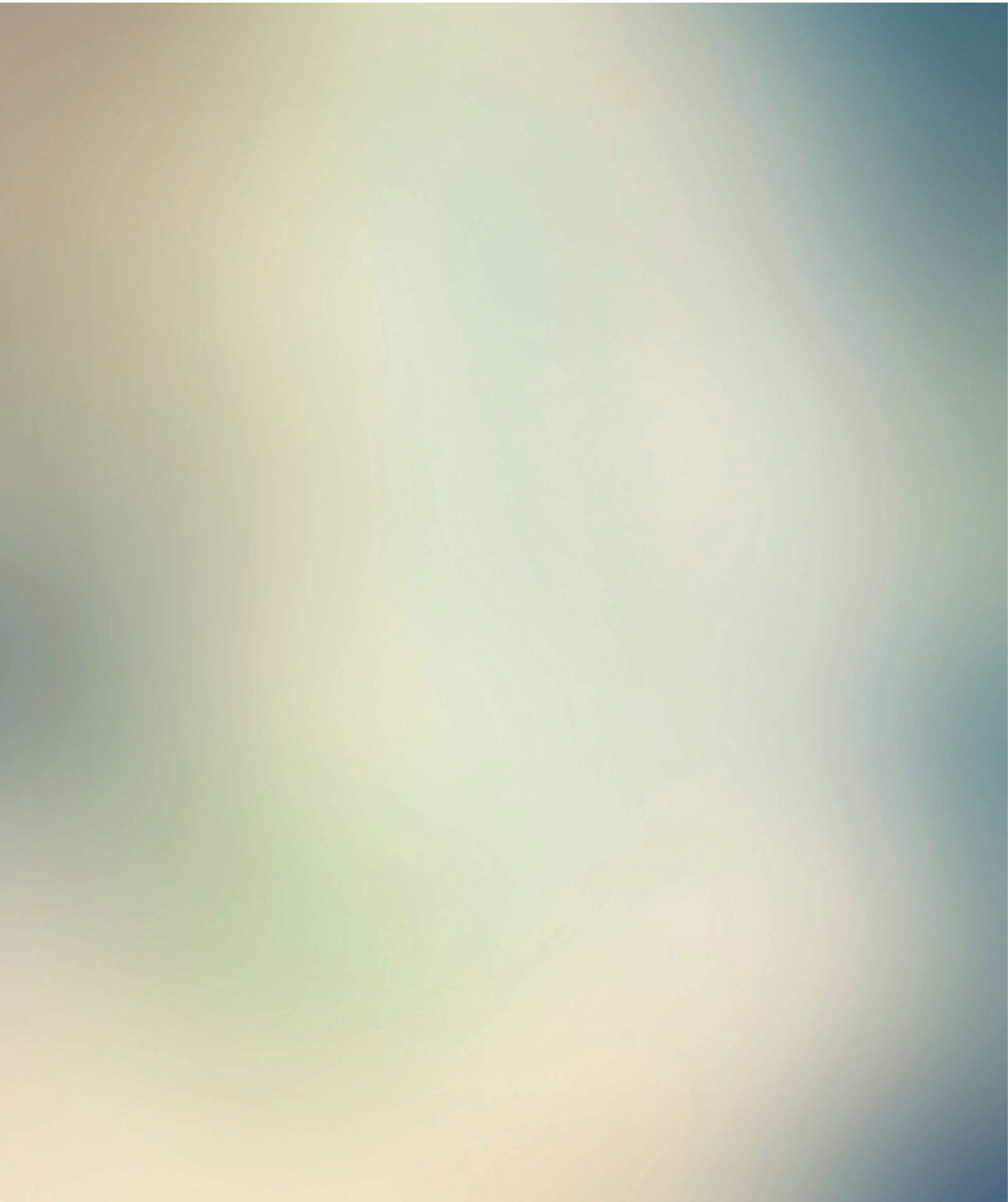
5.1.10.2 Implementation of Measuring and Evaluation Procedures

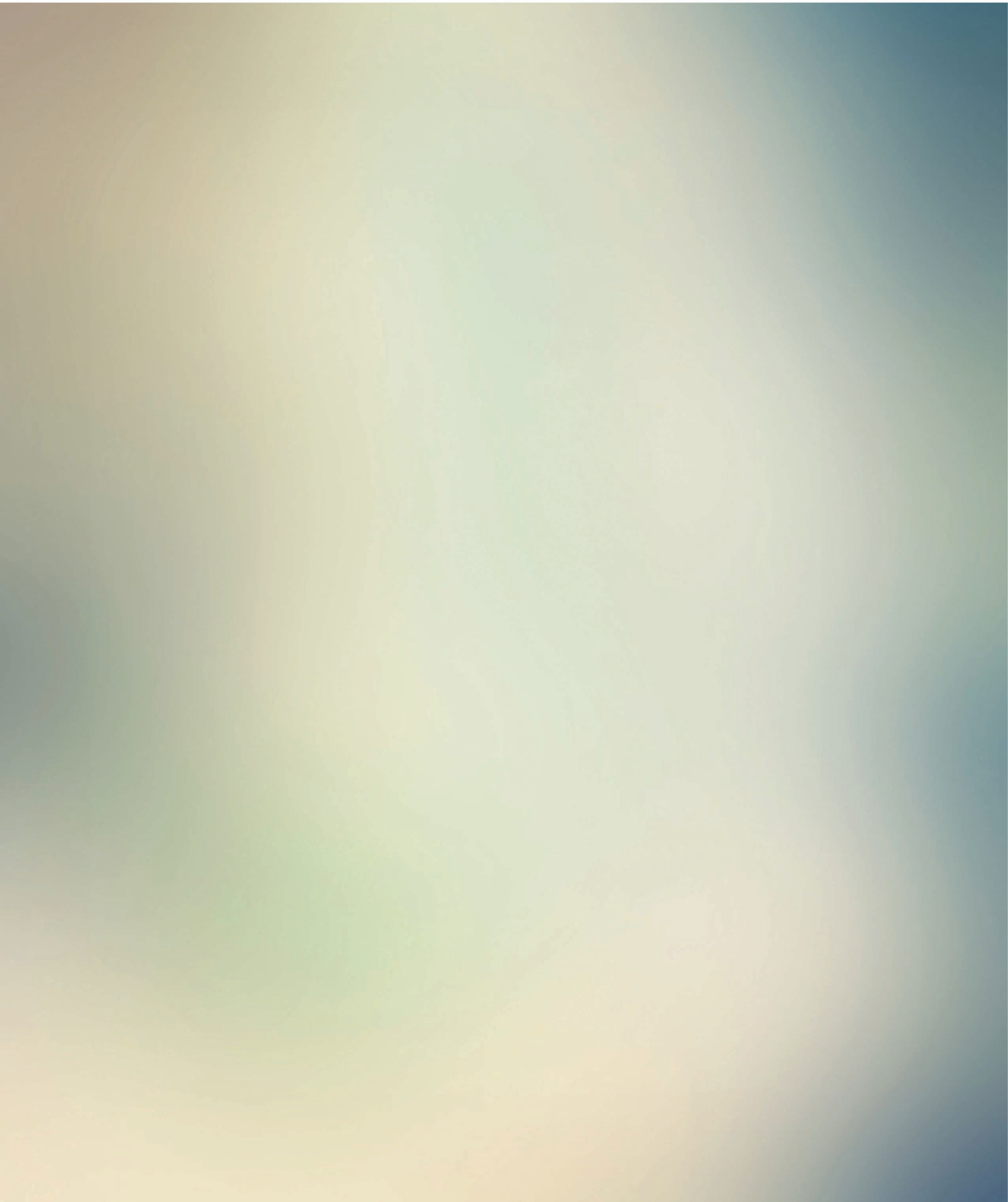
During the technical assessment of the Company, a notable lack of measuring devices was observed (in addition to the lack of updated designed documentation on the networks), as a result of which it is not possible to measure any of the important parameters such as temperature, pressure, heat energy drop, water drop and flow. Most importantly, it is not possible to determine the critical points on the pipelines both in terms of leakage (water loses) and in terms of heat losses in the pipelines.

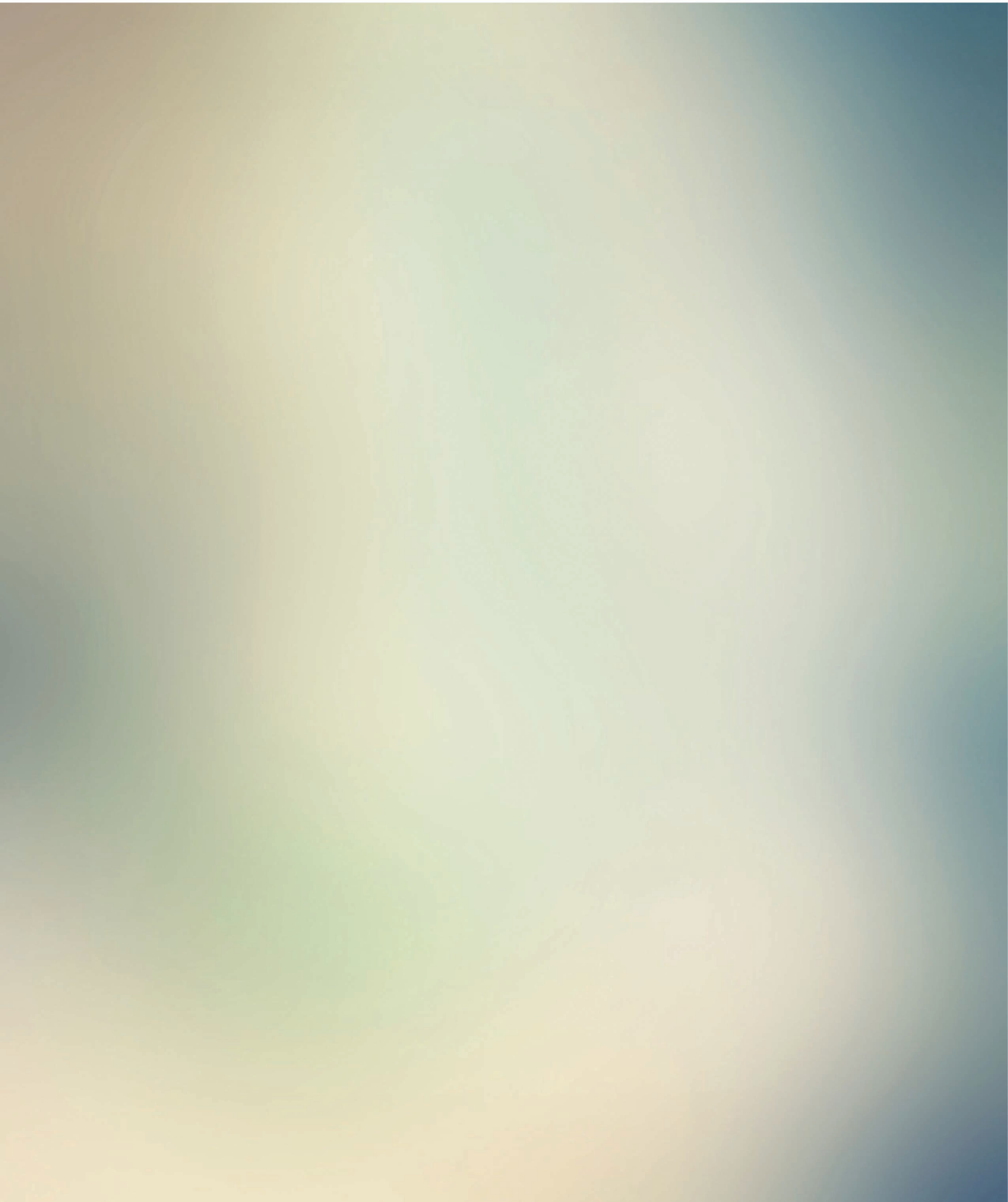
It was also observed that there no preventive maintenance is currently carried out, and only emergency maintenance that provides a minimum of quality and security in terms of functionality is in place.

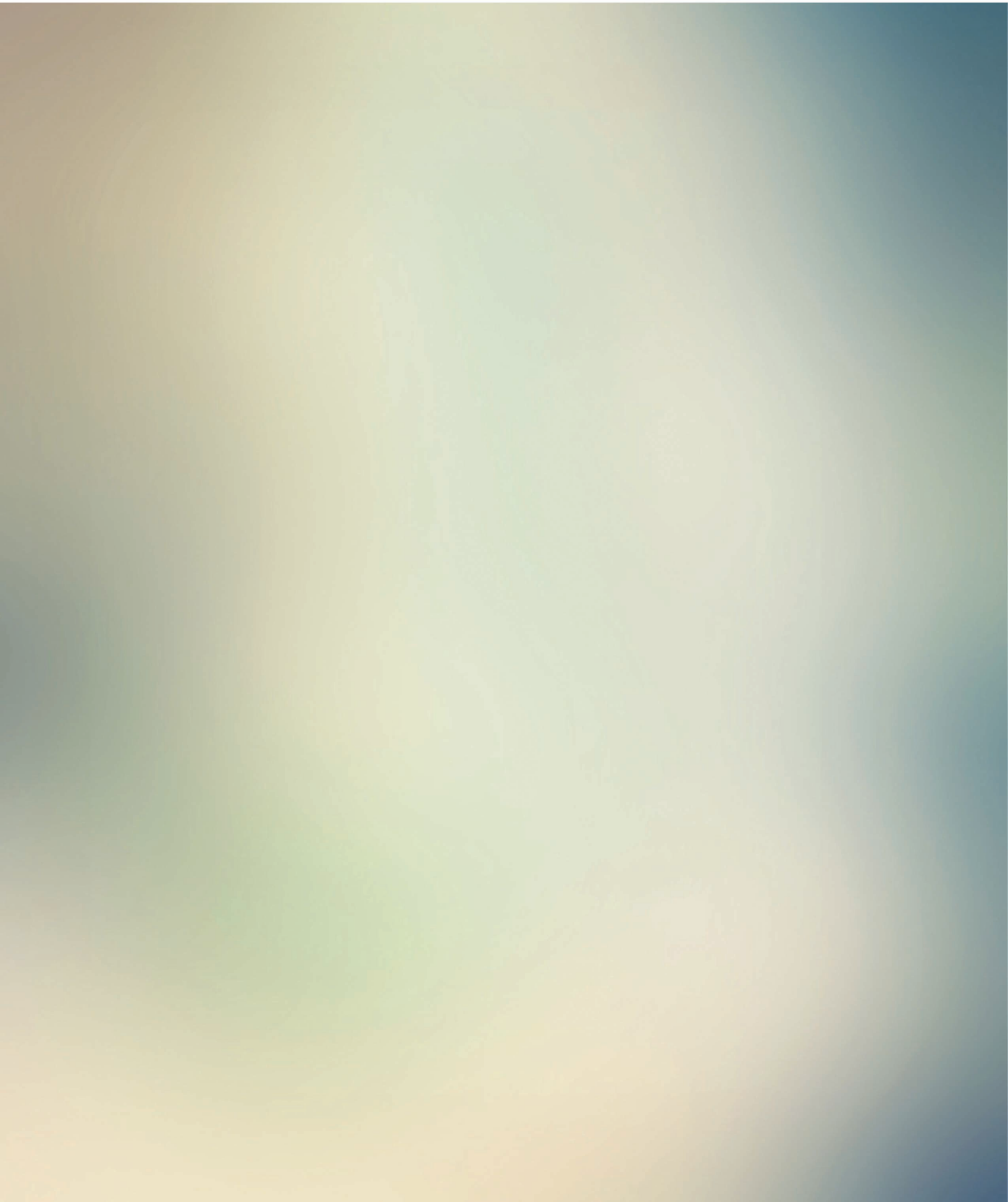
For that reason, the instalment of sectioning valves based on realistic criteria, together with measuring devices (thermometers, manometers), is proposed as an urgent measure. In that manner, it would be possible to measure

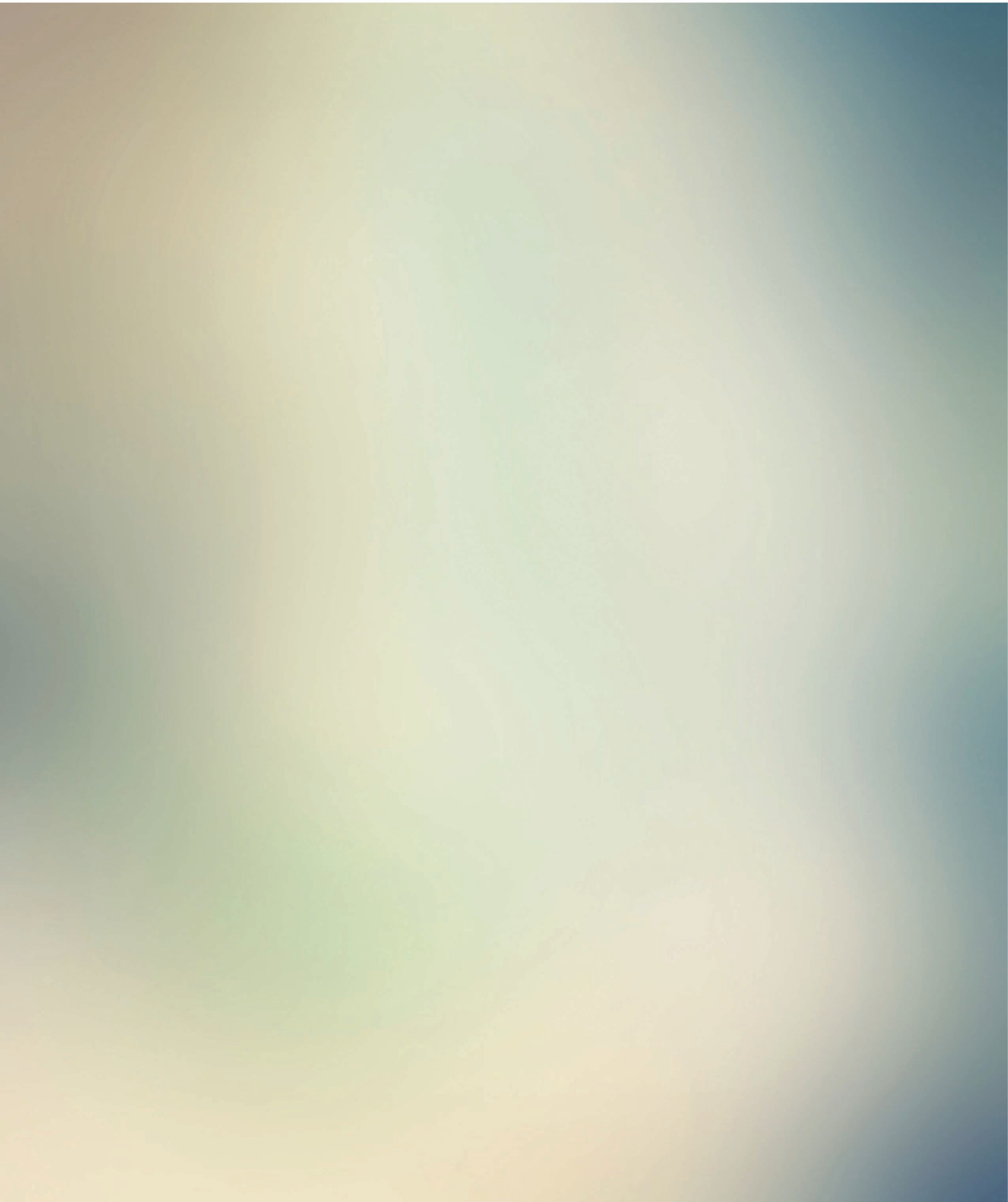


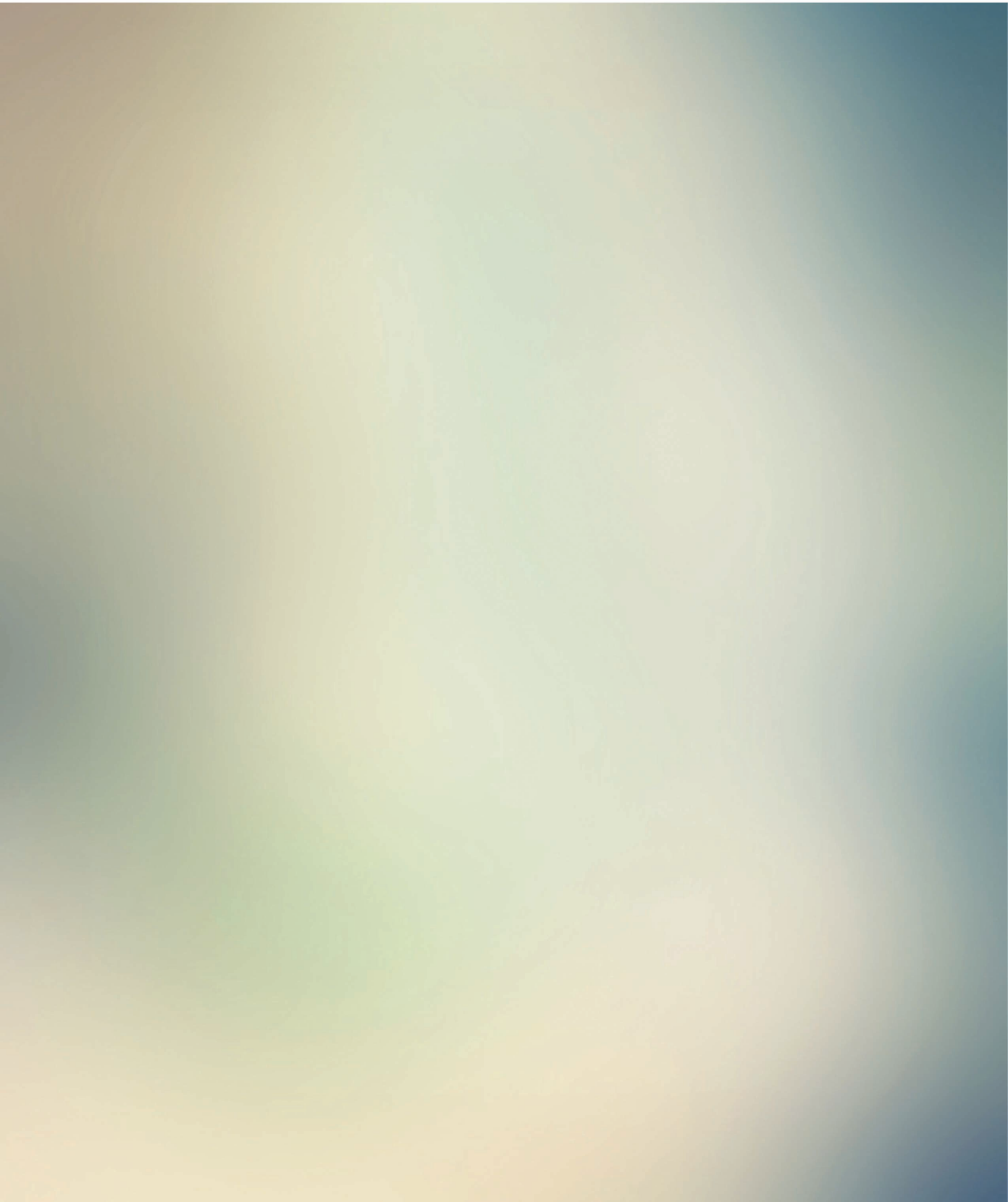


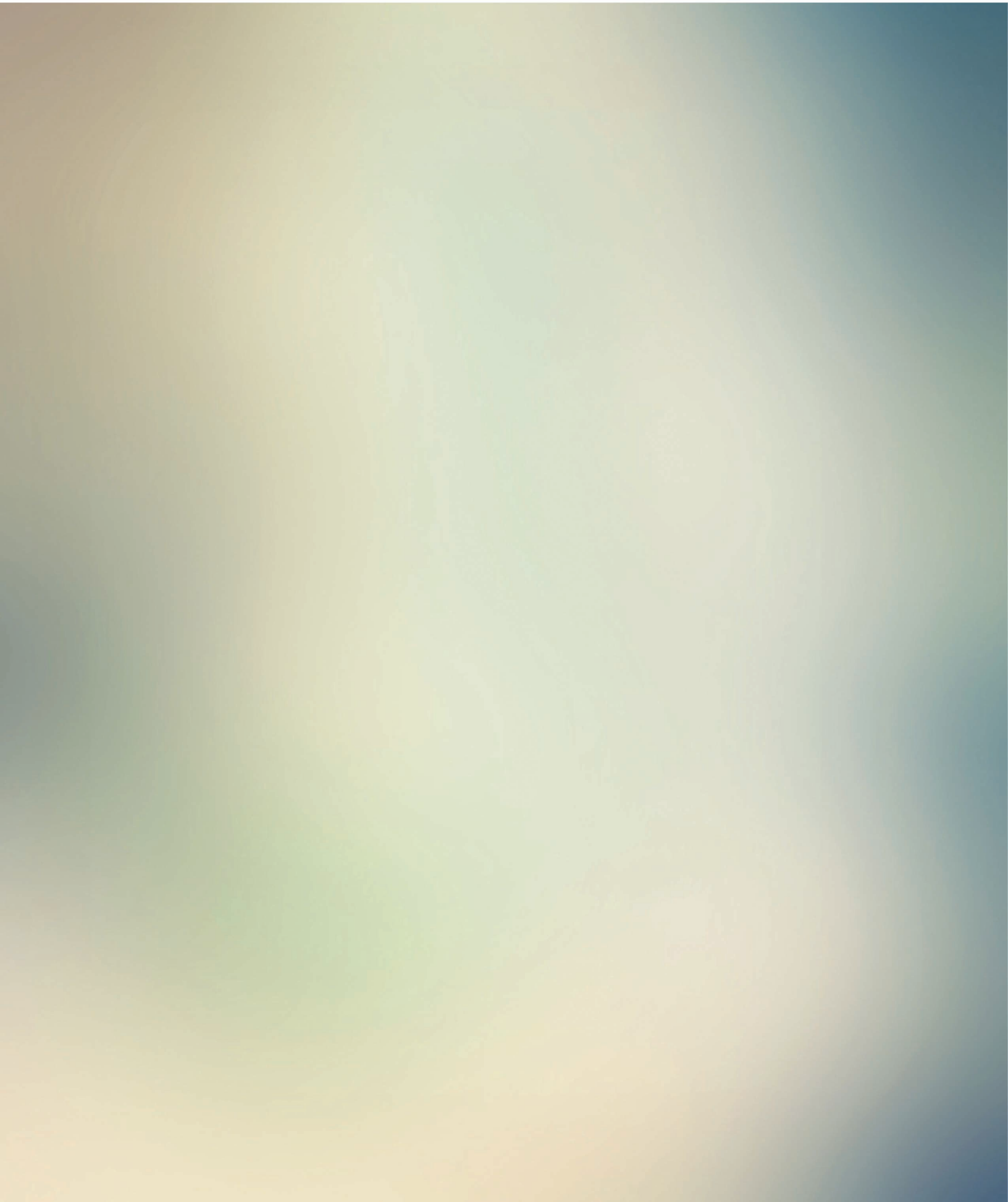


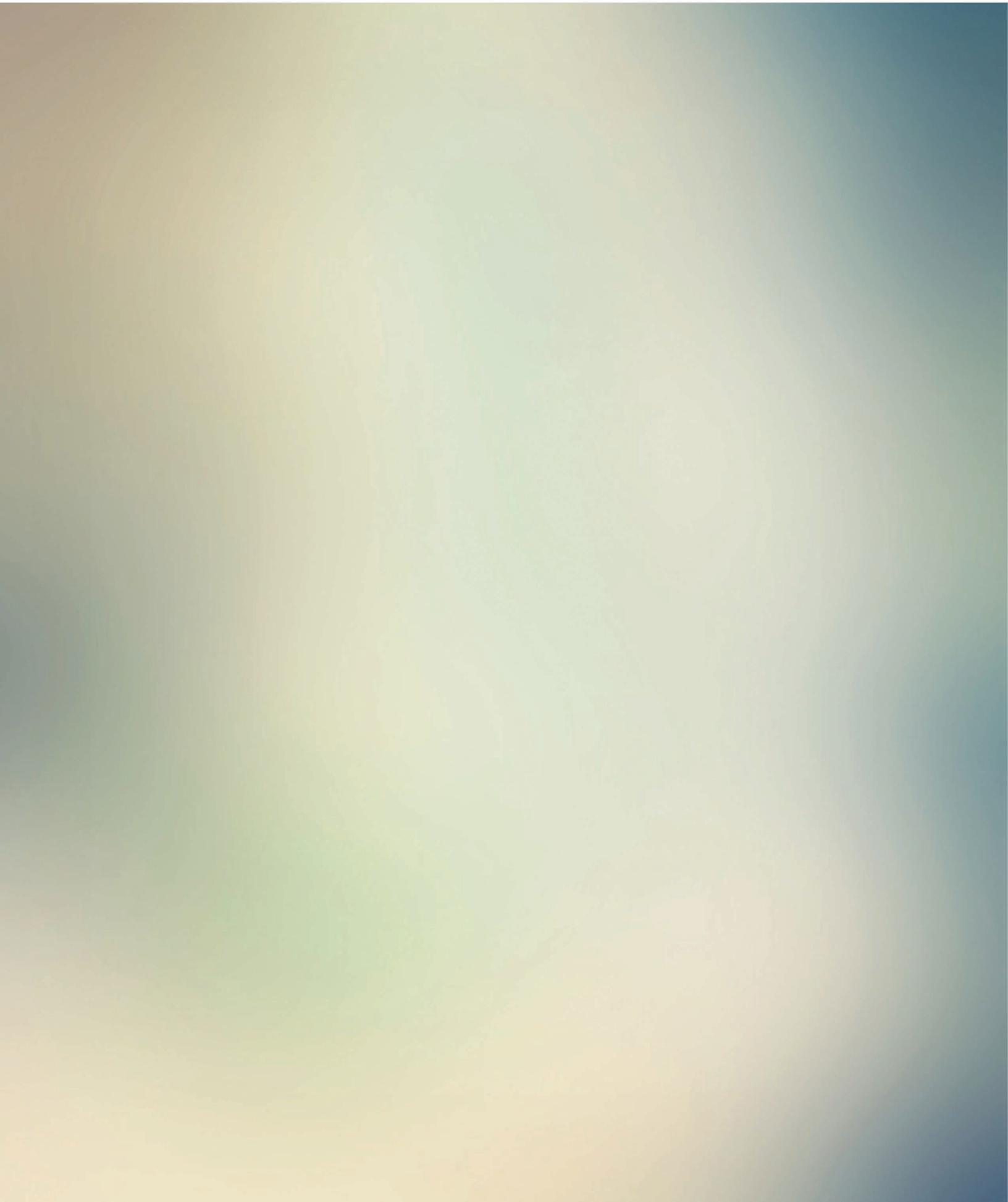


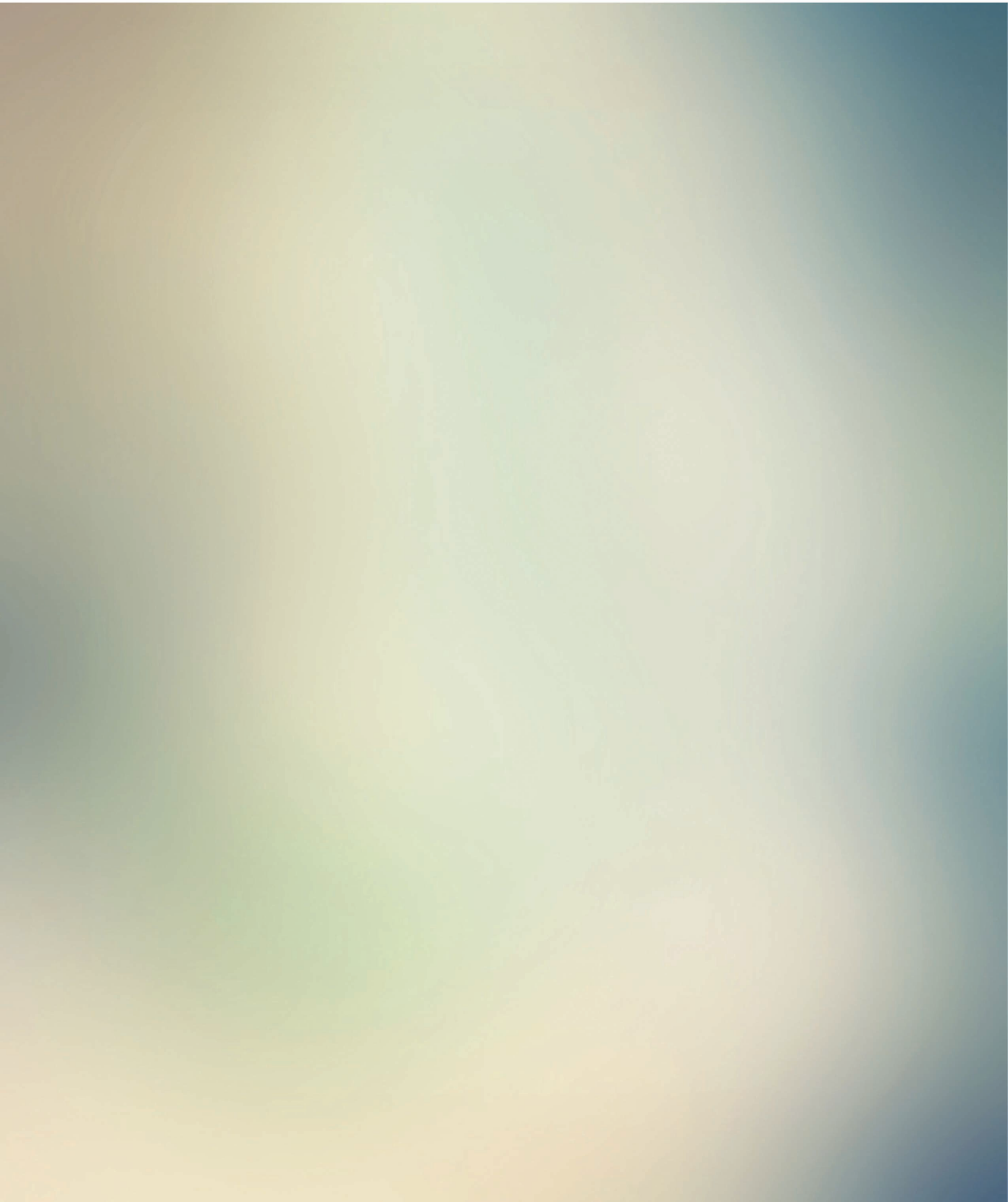


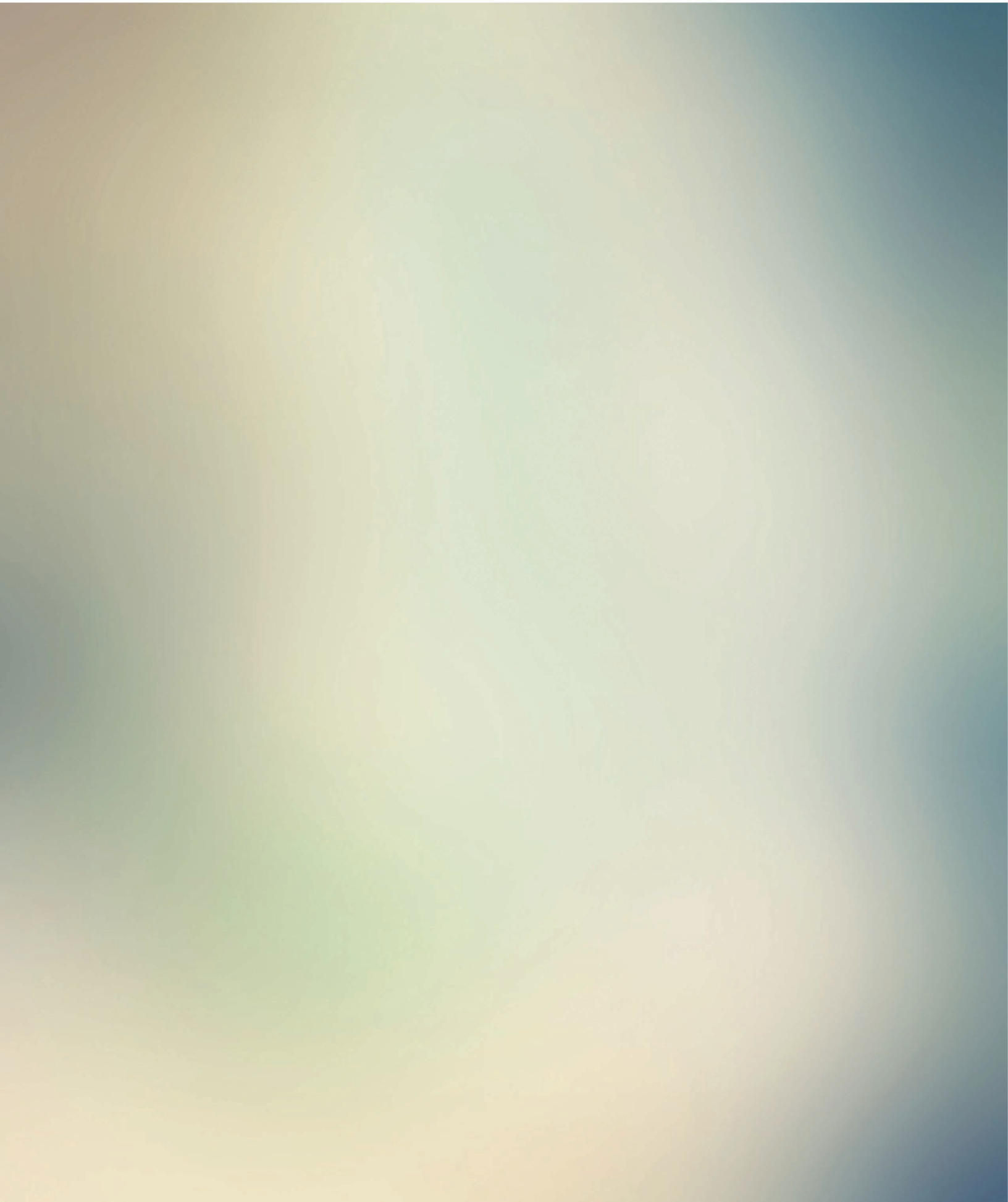


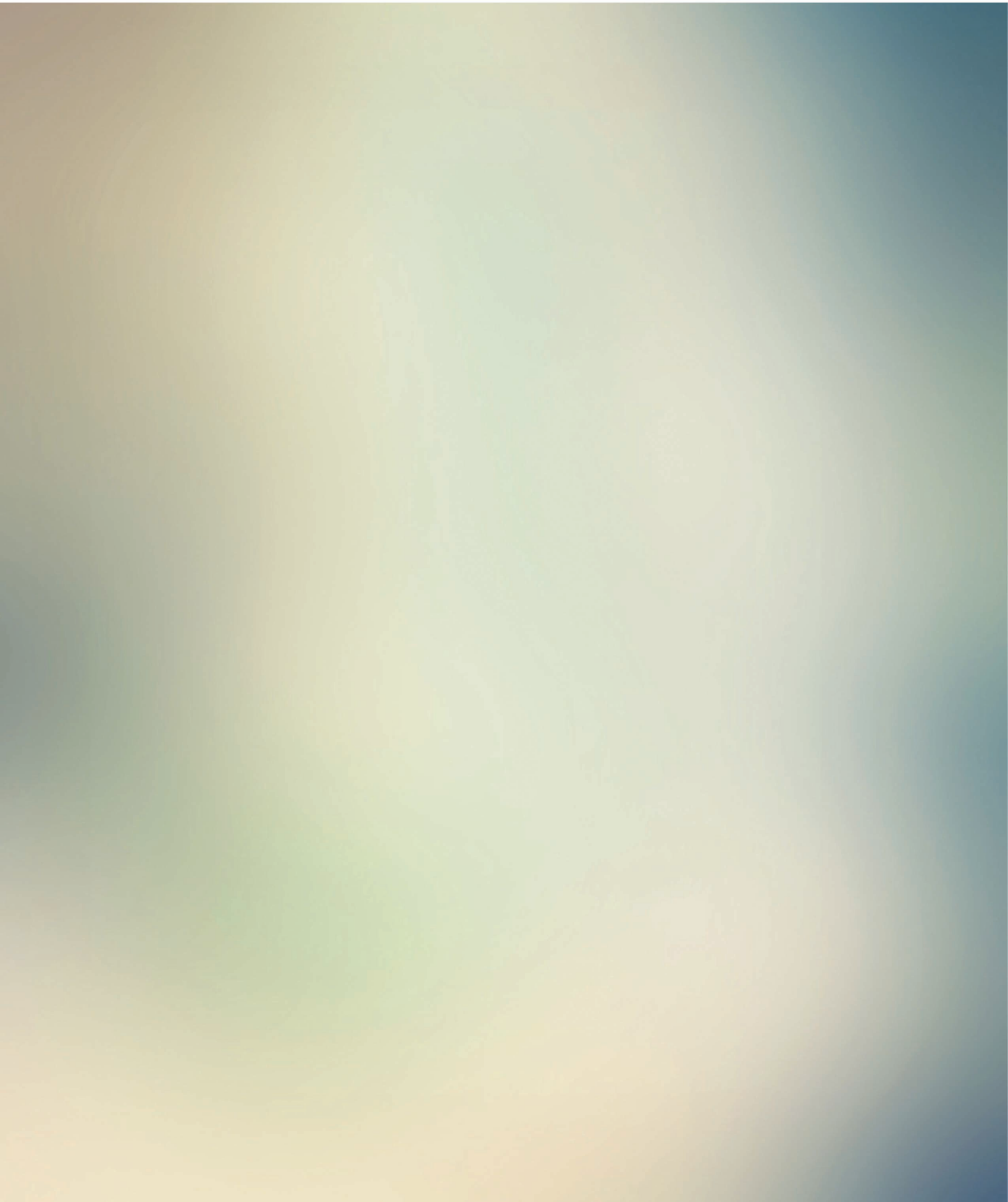


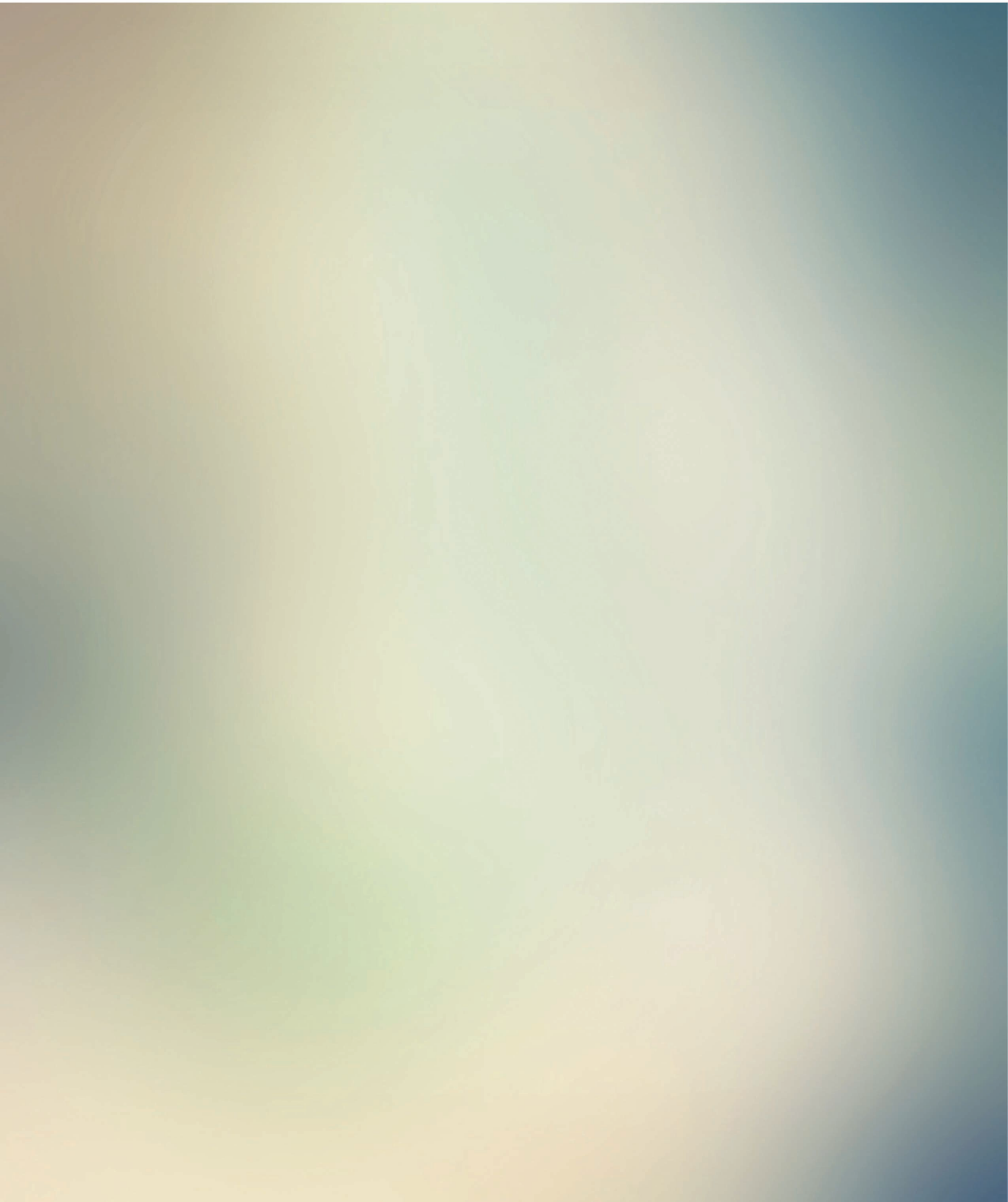


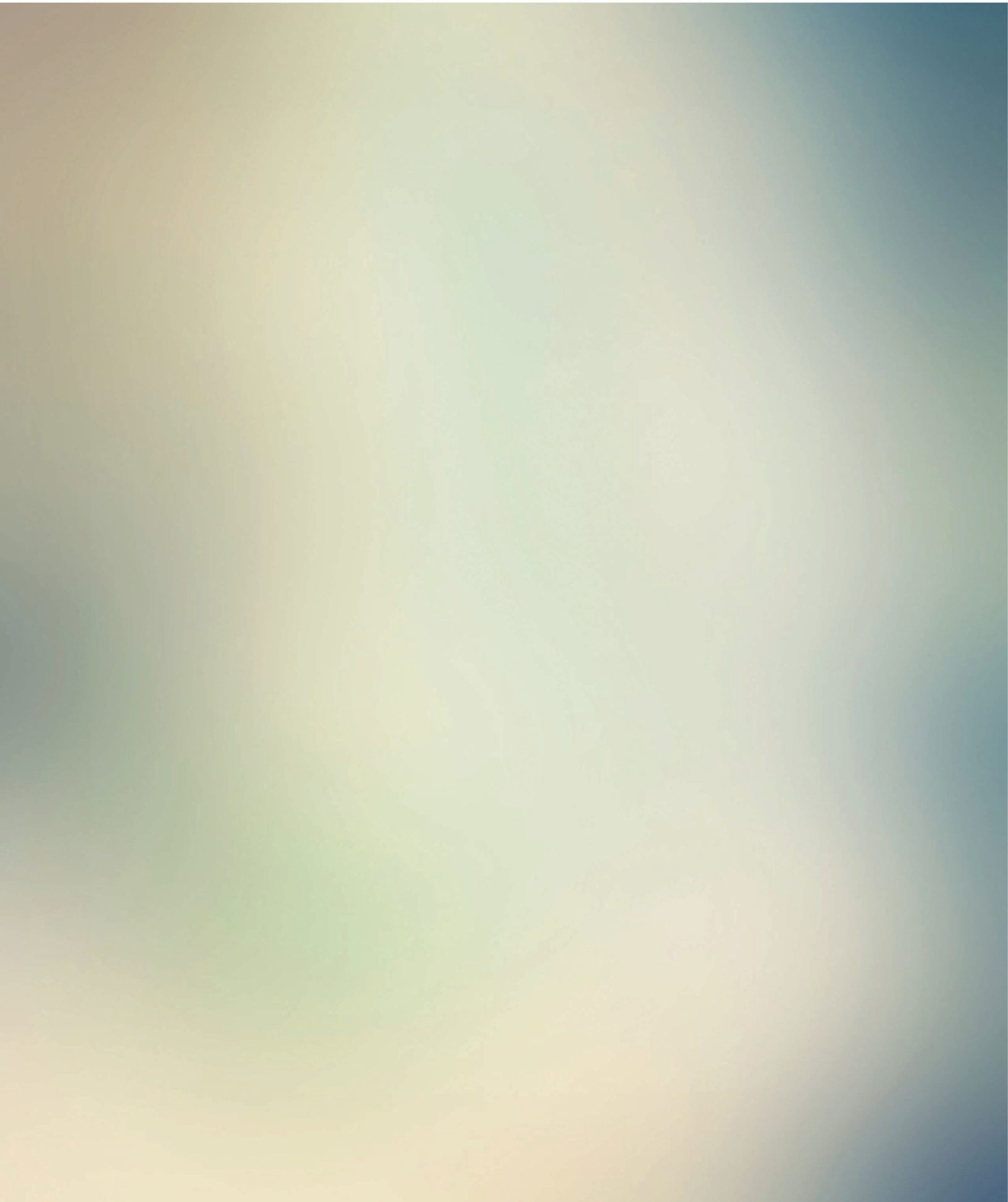


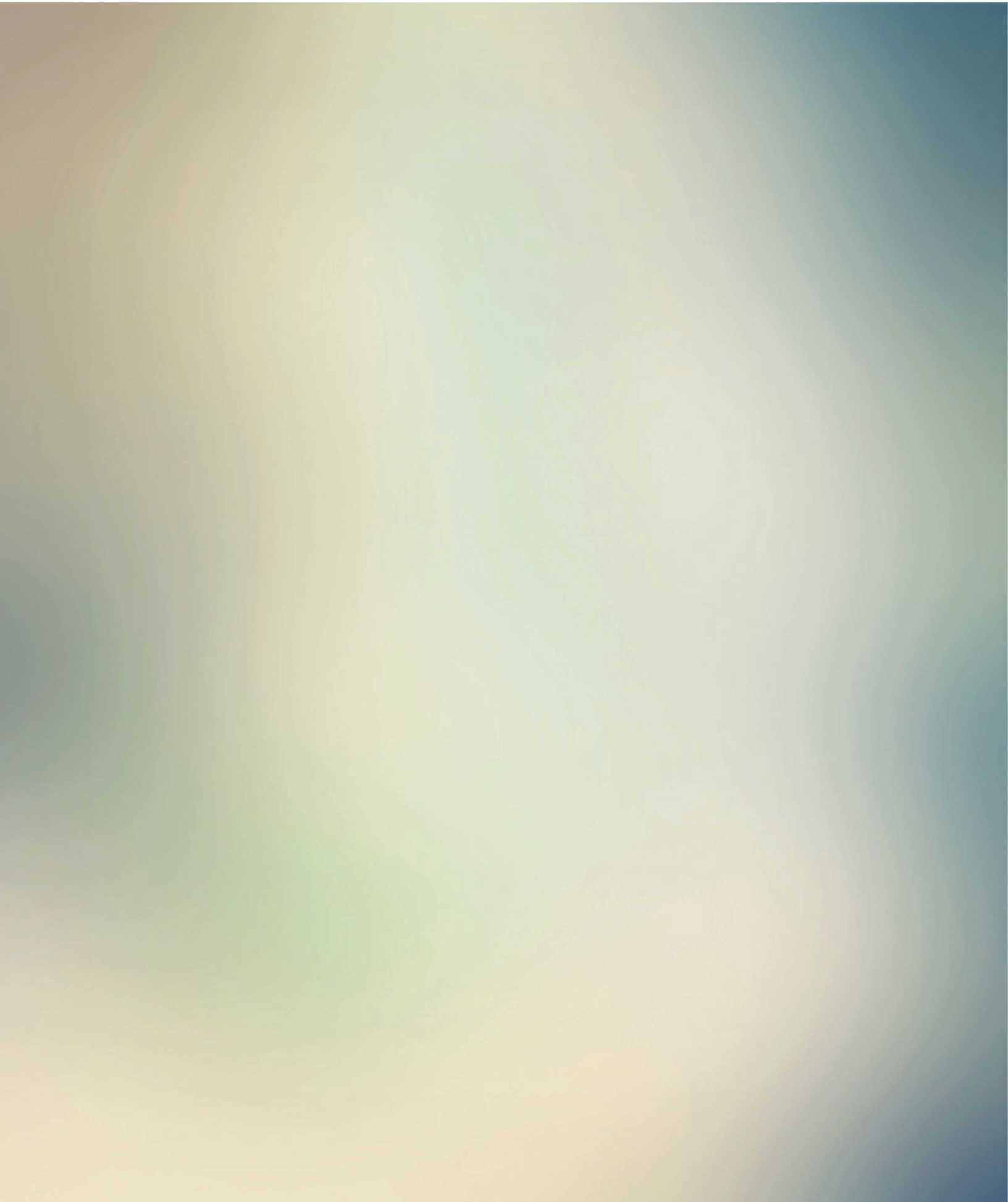


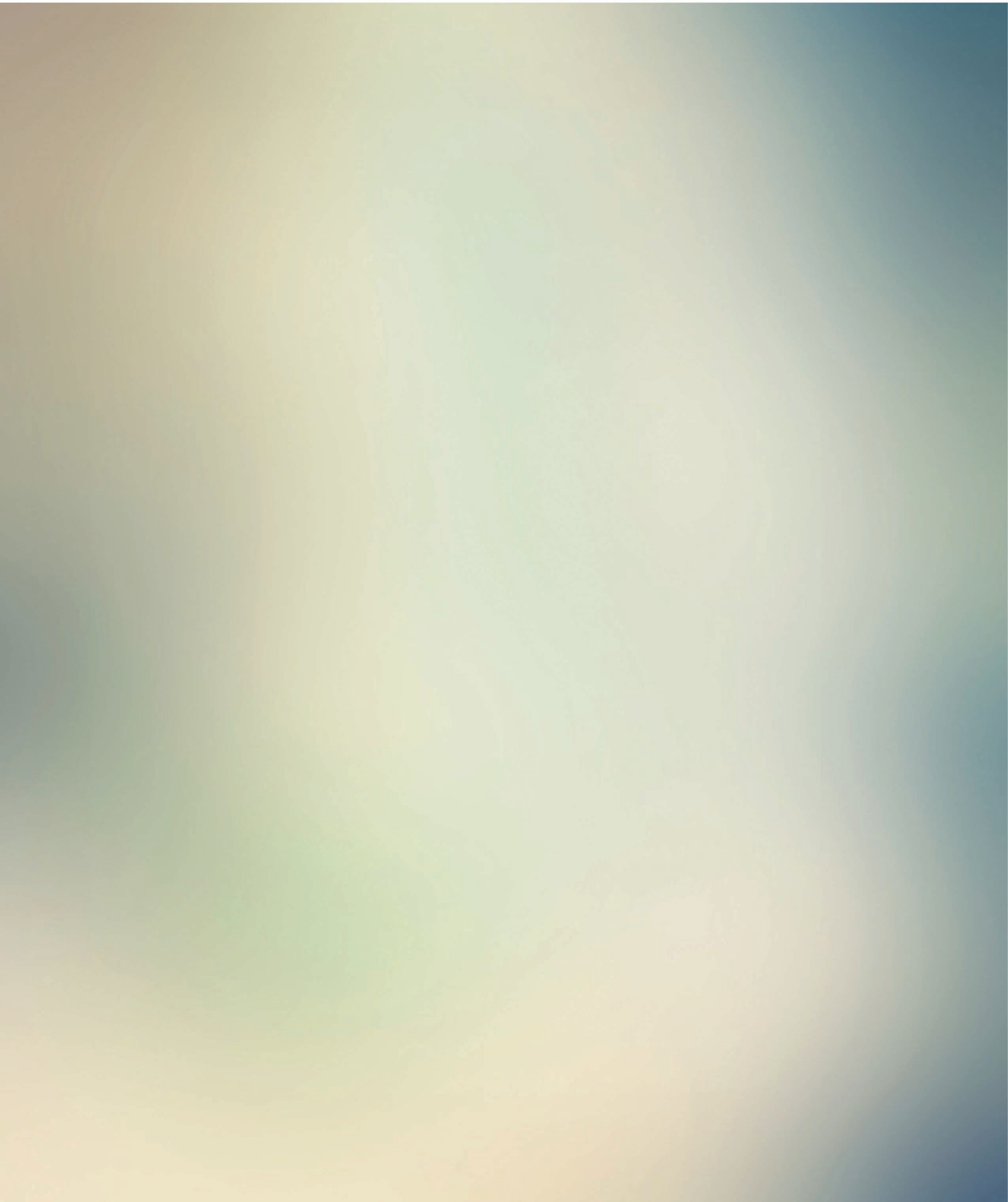


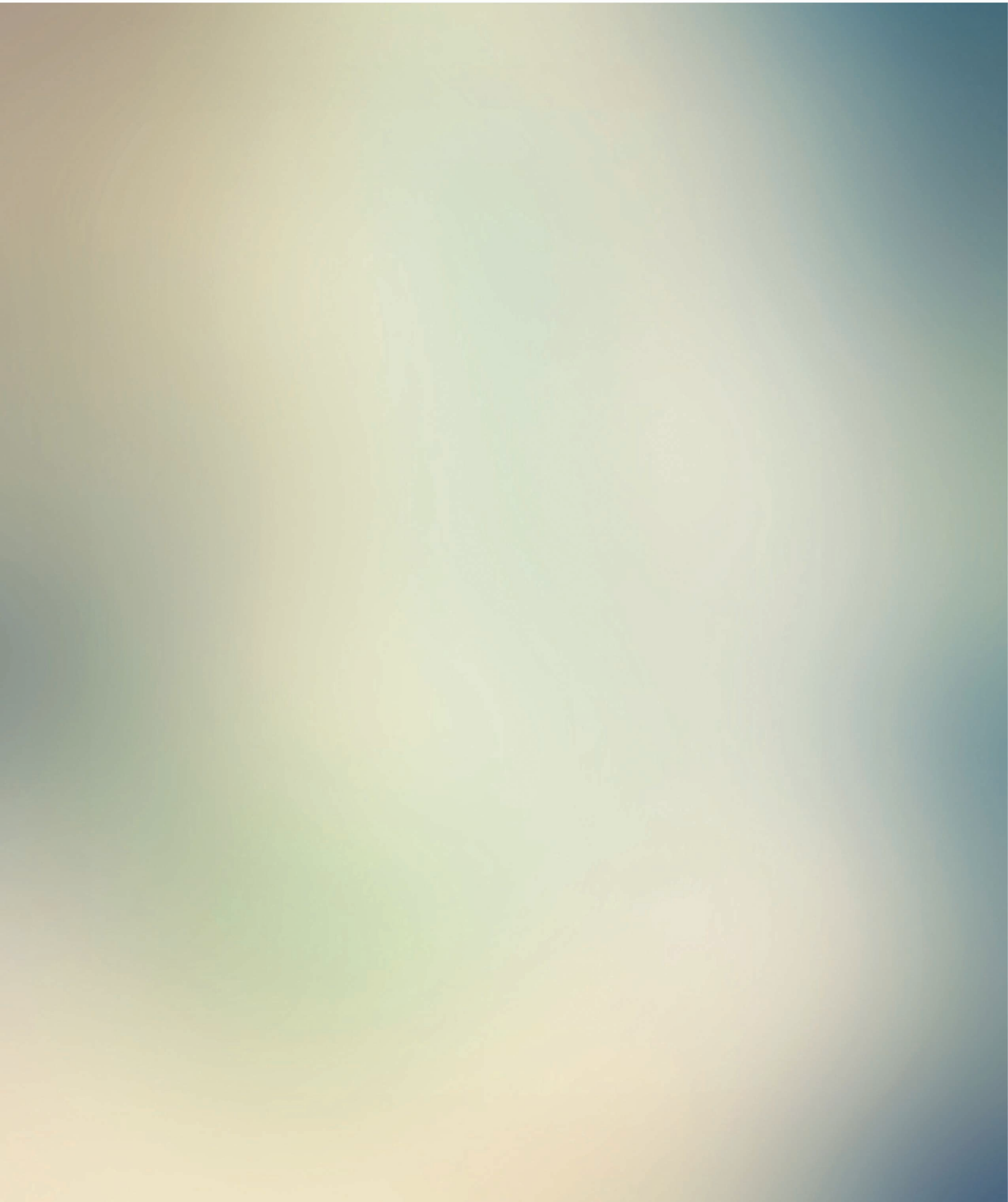


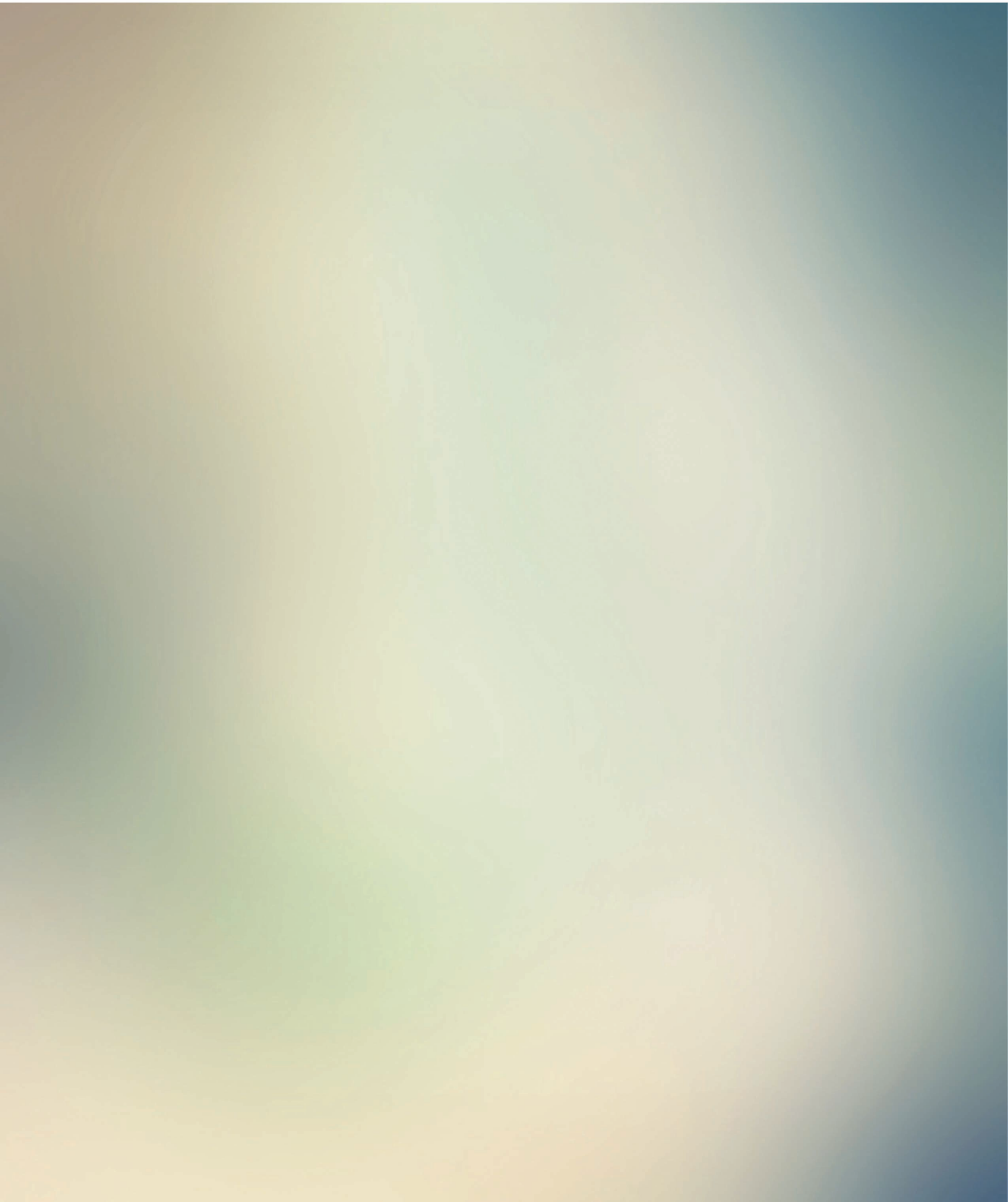


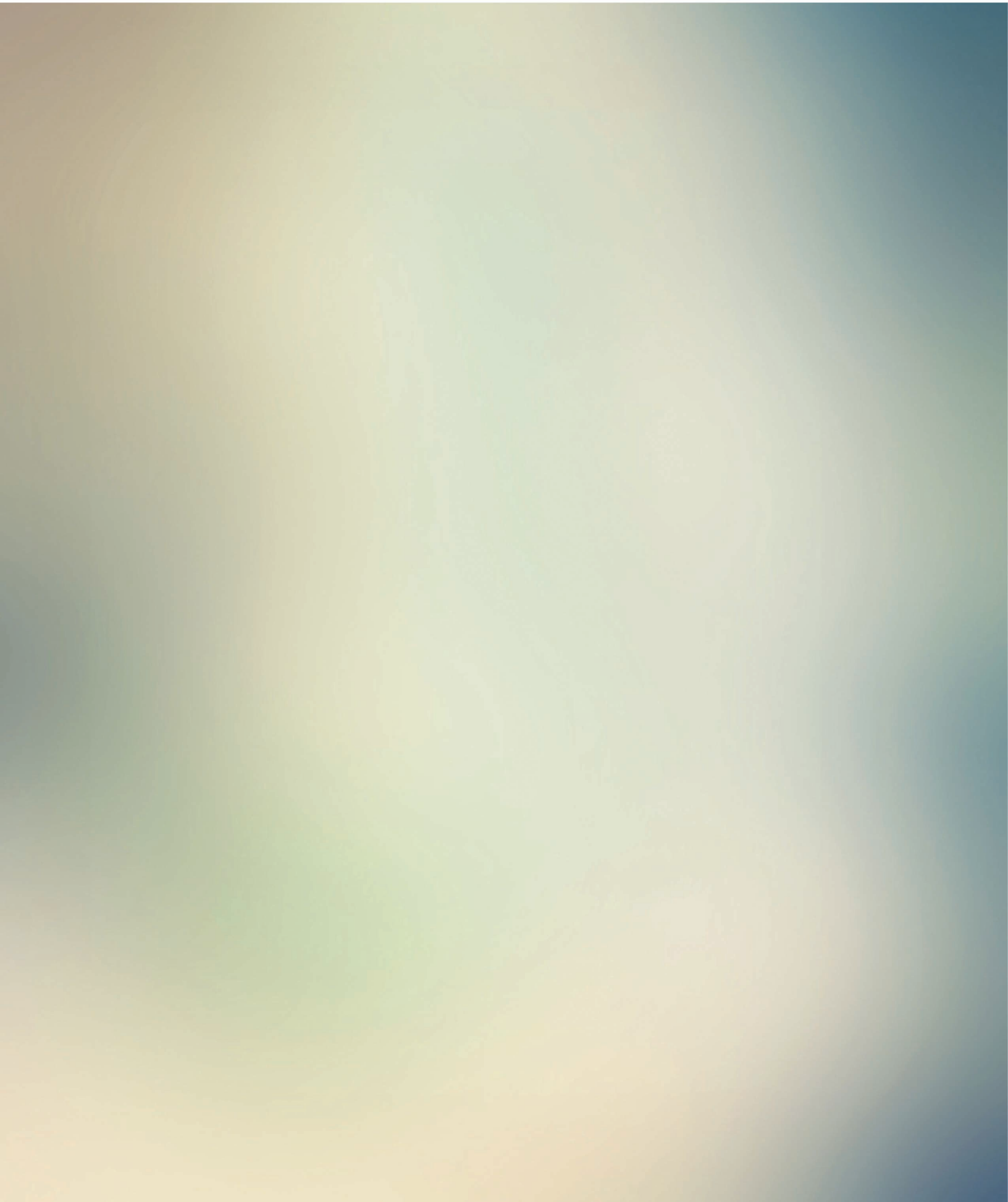


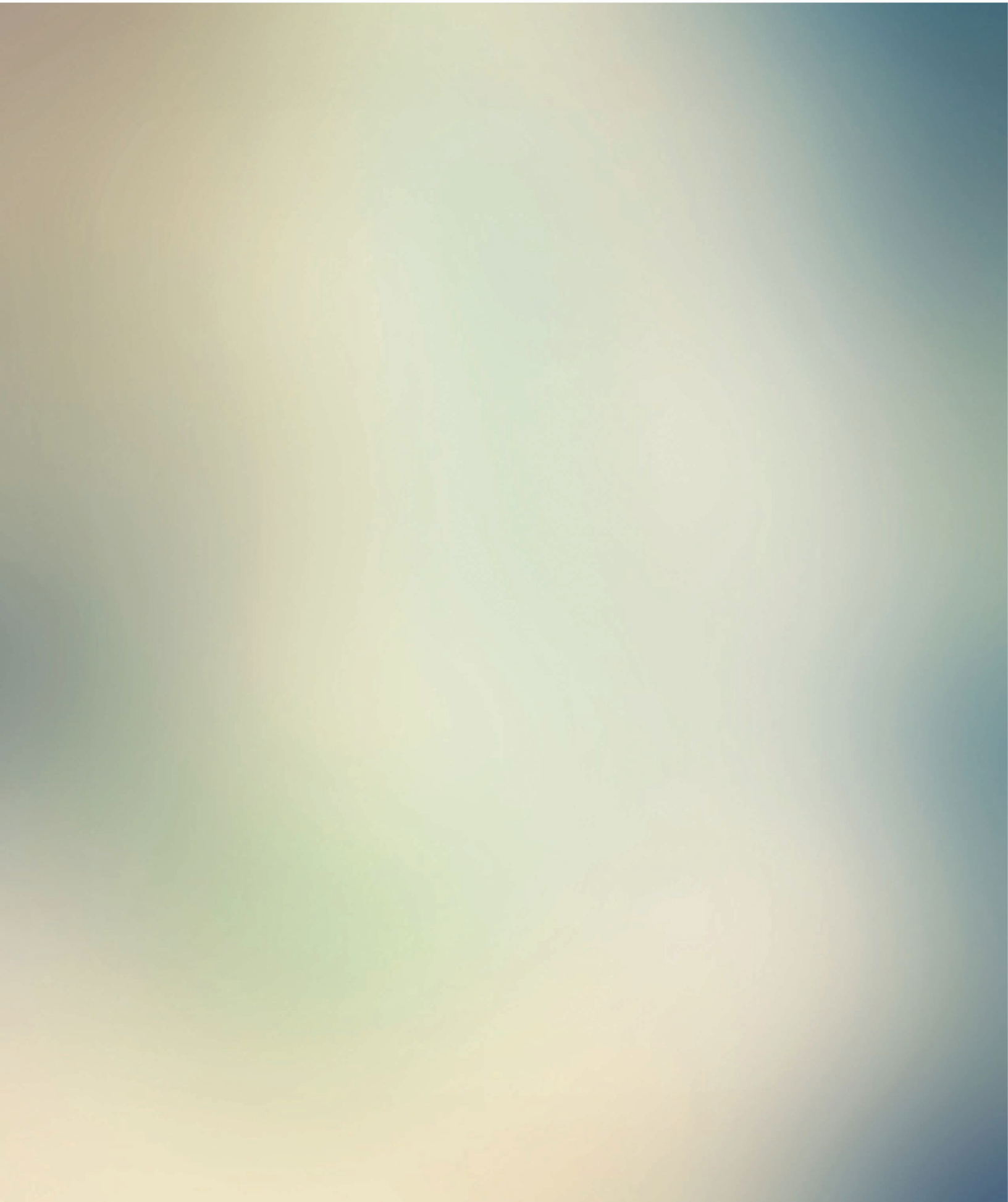


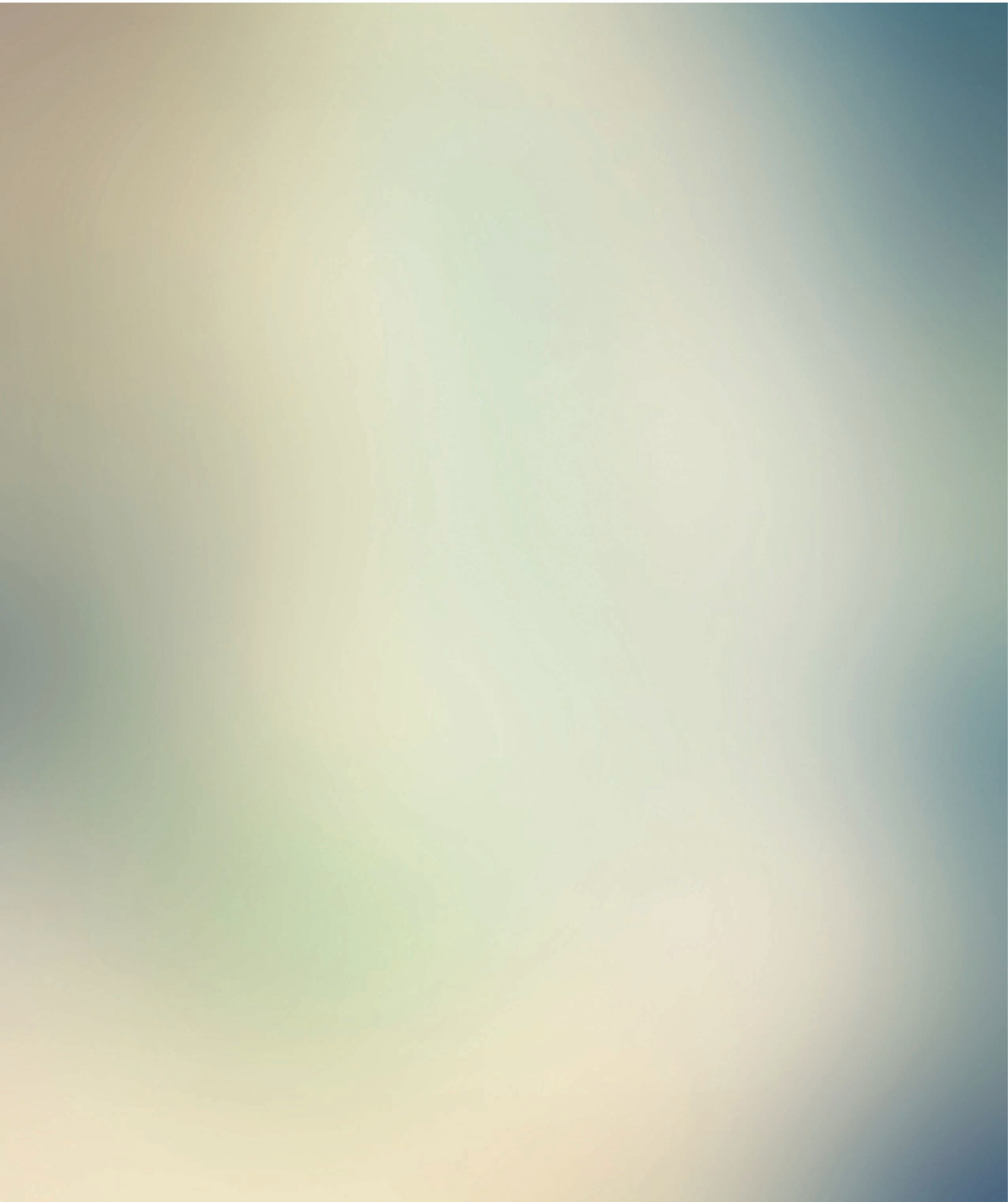


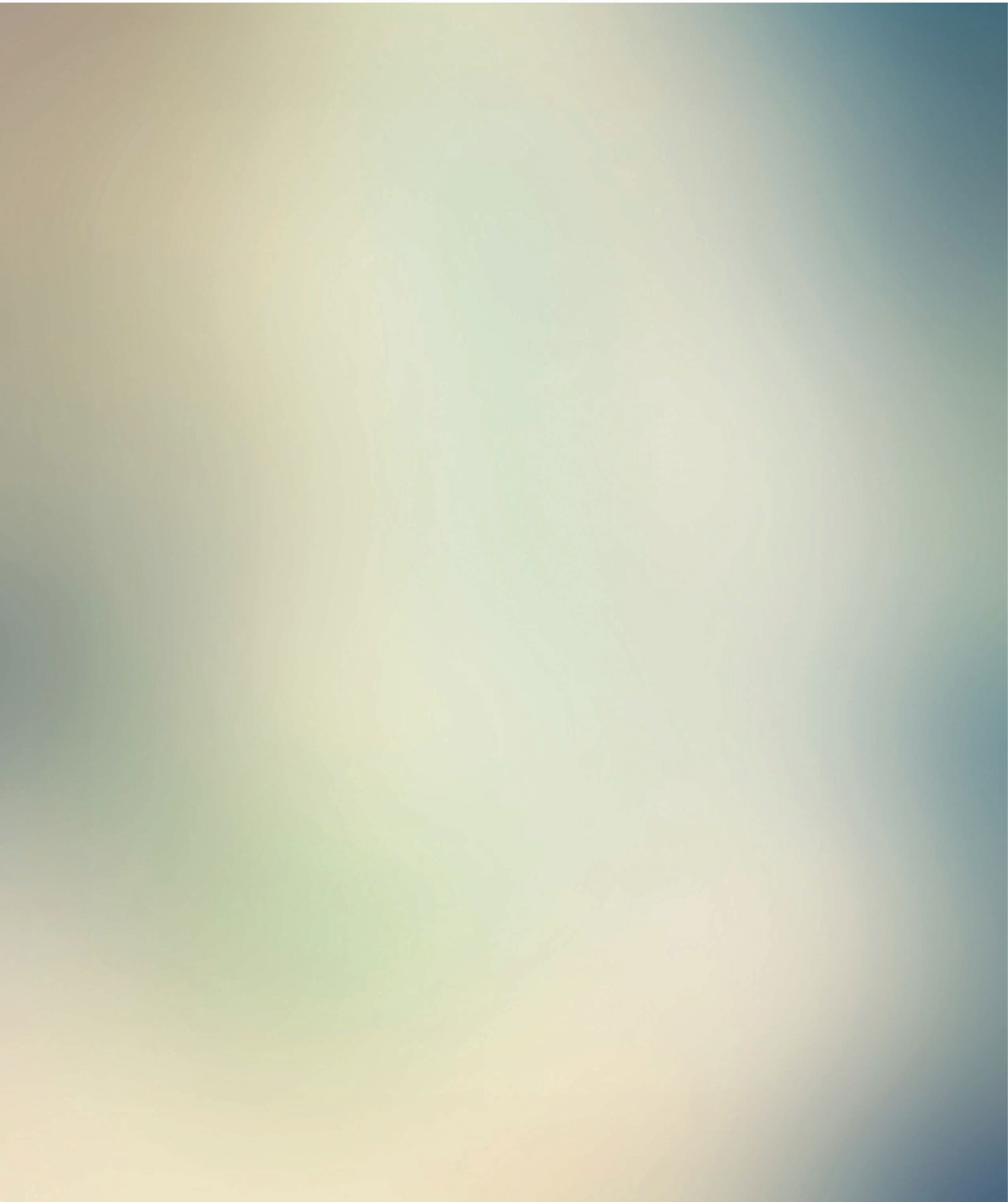


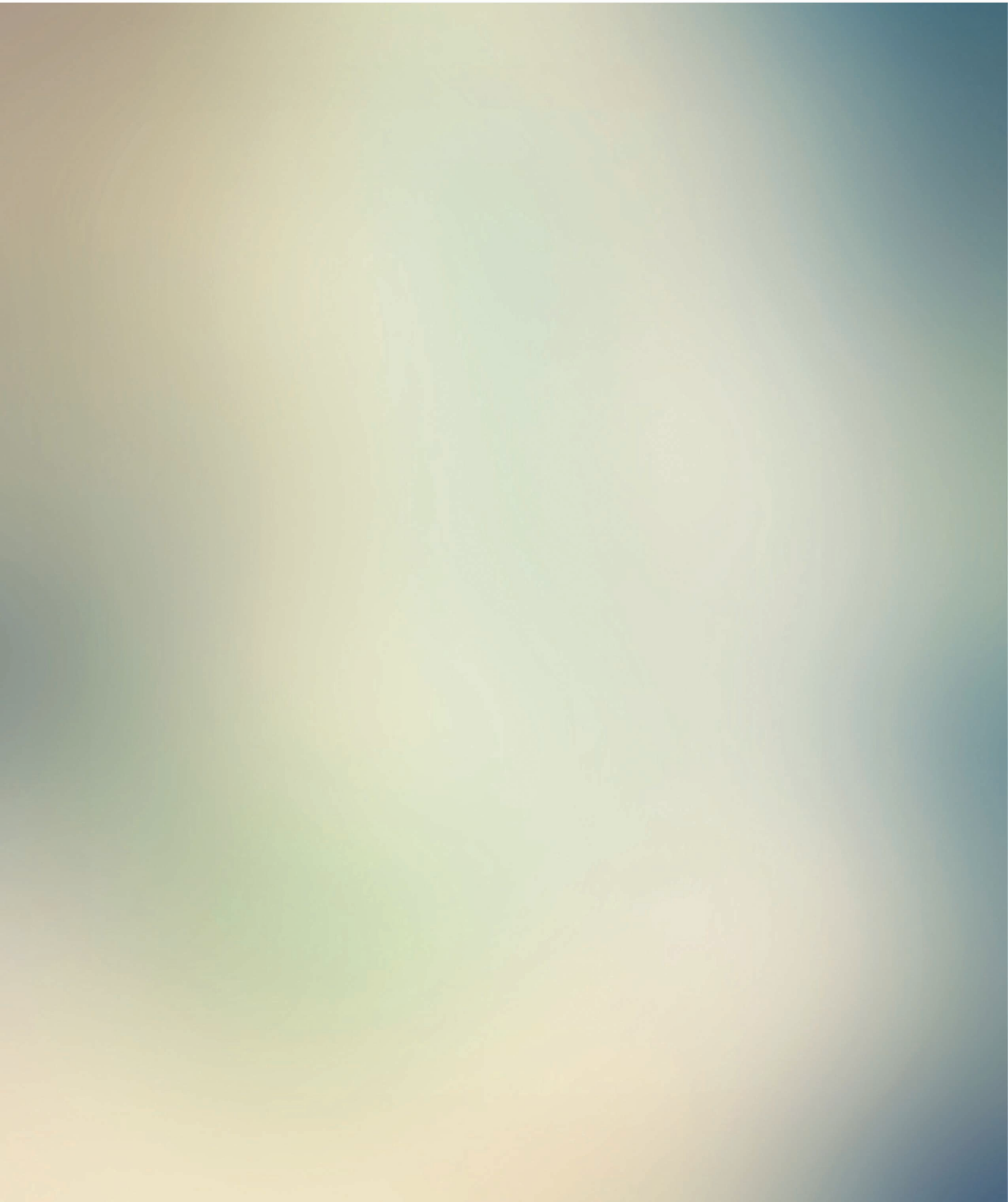


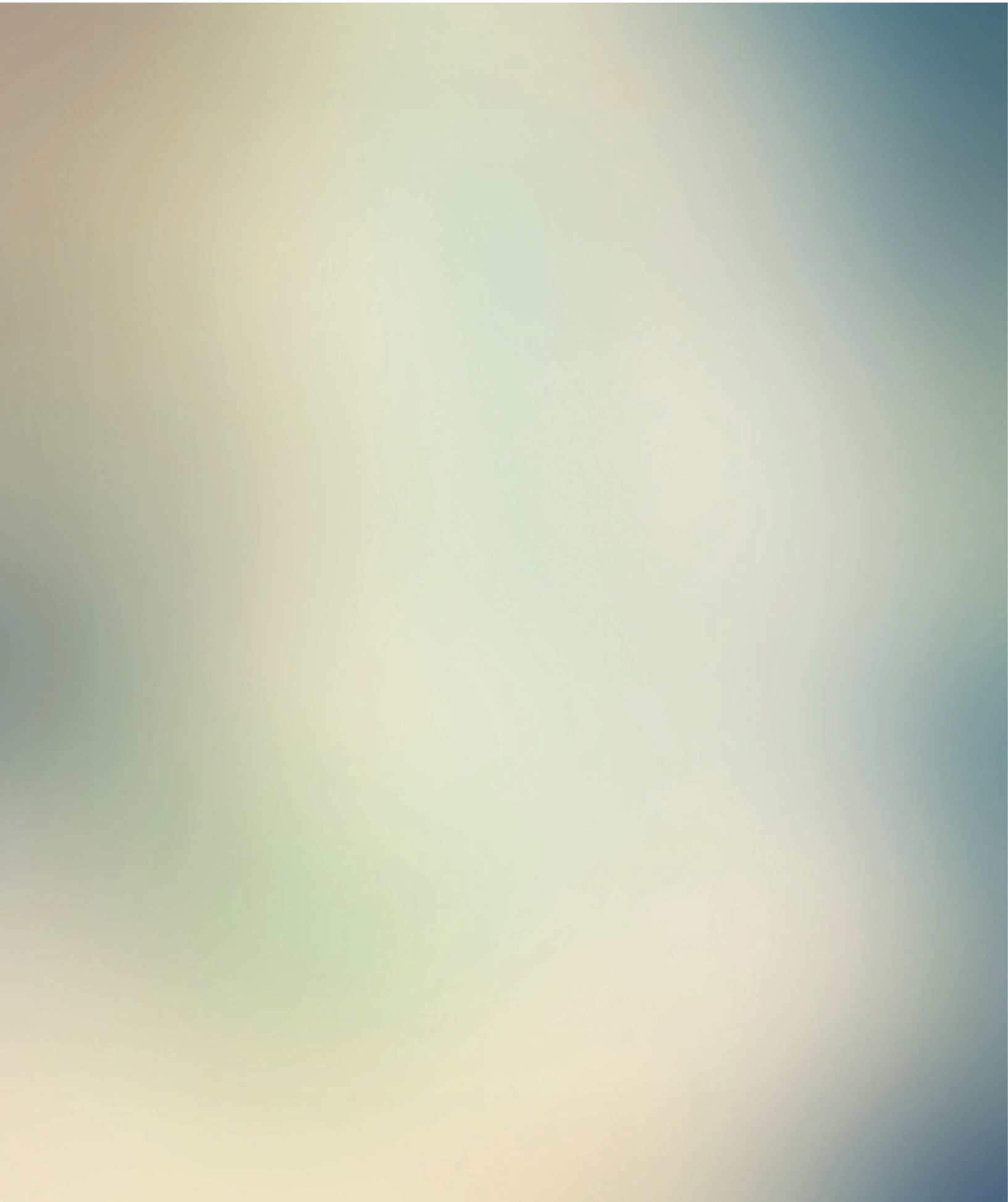


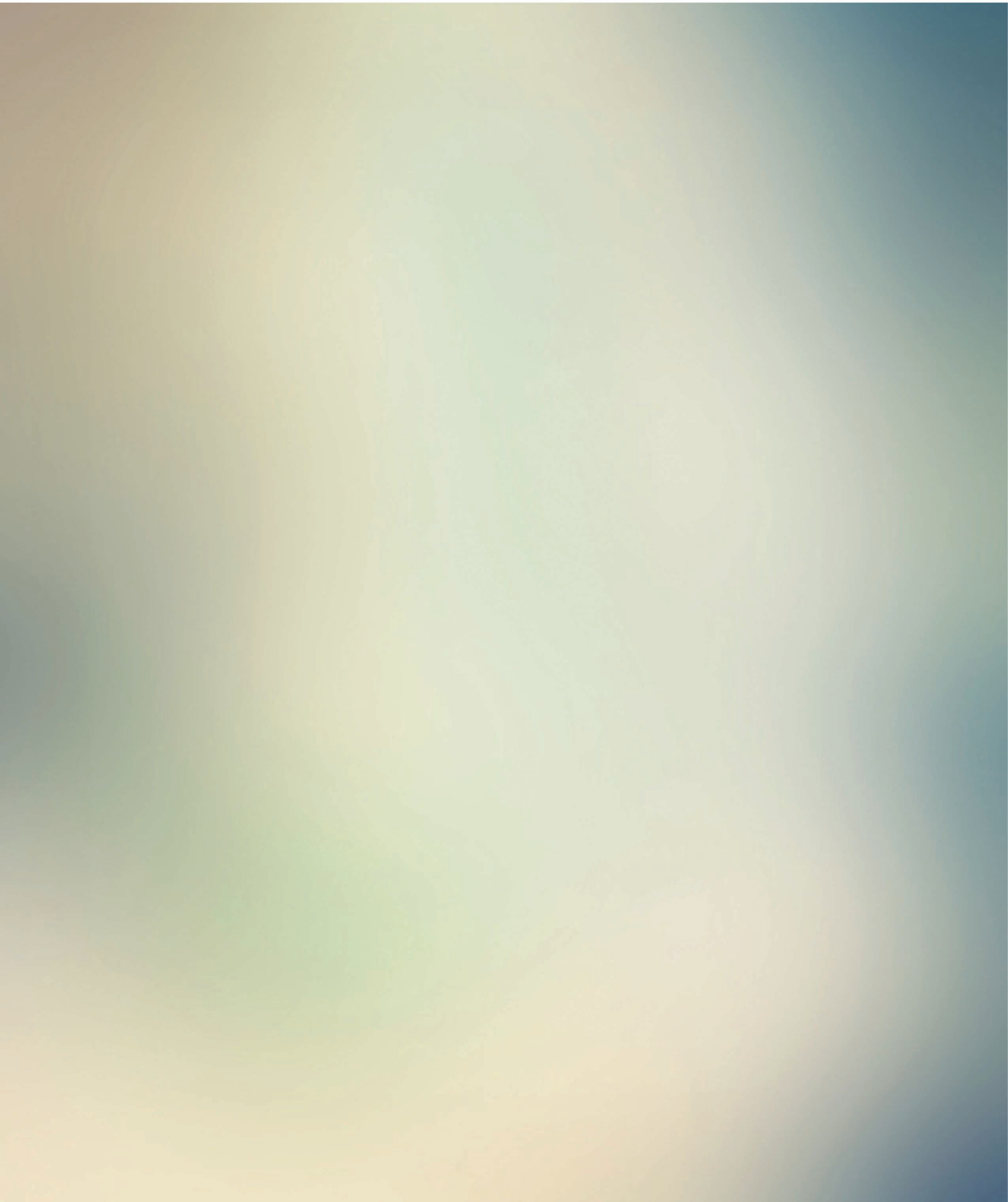


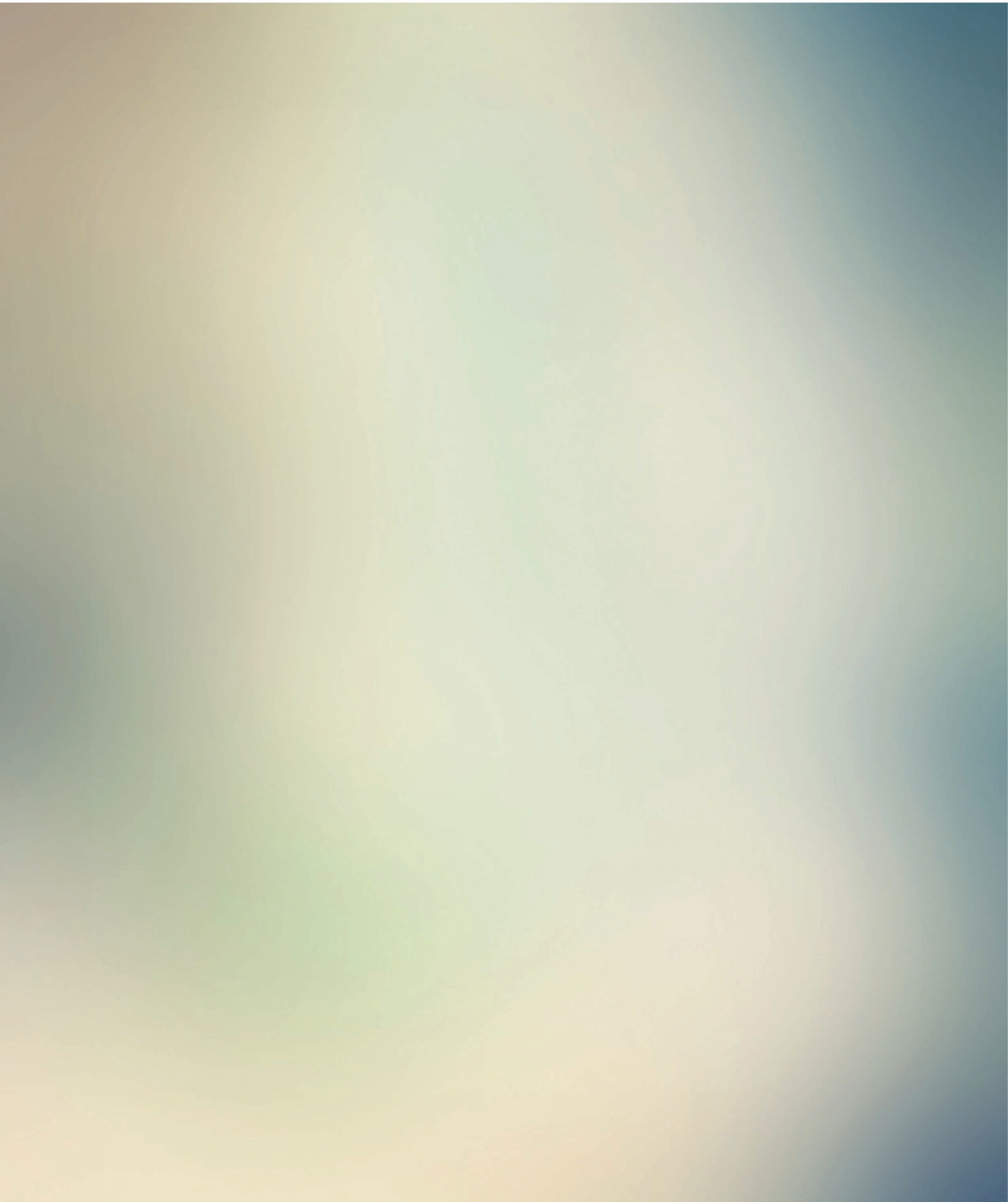












5.5 Policy/Regulatory Gap Analysis

The policy/regulatory gap analysis is presented for the relevant measures proposed within the Priority Investment Program and the recommendations provided.

5.5.1 Installation of New Biomass Boilers

Prior to the installation of two biomass boilers with a total installation capacity of 24MW (2x12MW) in the Central Heating plant and the new biomass boiler with a total installed capacity of 4 MW in the Heating Plant Kočićev Vijenac, the Company needs to obtain the necessary permits required by local legislation, including the Environmental Permit, Location Conditions, Construction Permit and Use Permit.

The environmental permitting procedure in RS is regulated by the *Law on Environmental Protection*[177], the *Regulation on Plants and Facilities that May be Constructed and Operated Only with a Valid Environmental Permit*[178], the *Regulation on Projects Subject to Obligatory Environmental Impact Assessment (EIA) and Criteria for Deciding on the Obligation of Implementation and Scope of the Environmental Impact Assessment*[179]. According to the aforementioned regulations, the installation of two biomass boilers with a total installation capacity of 24MW is subject to an Environmental Permit to be issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS, and in this case the aforementioned Ministry decides if an EIA Study is necessary to be attached to the request for Environmental Permit. Installation of the new biomass boiler with a total installed capacity of 4 MW in the Heating Plant Kočićev Vijenac is subject to an Environmental Permit to be issued by the authority responsible for environmental protection of the City of Banja Luka and without an EIA procedure.

According to the *Law on Spatial Planning and Construction*[180], facilities for the production of thermal energy - DH and other facilities regulated by specific laws are subject to Location Conditions, Construction Permit and Use Permit issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS. This means that for the installation of new biomass boilers in the Central Heating Plant and the new biomass boiler in the Heating Plant Kočićev Vijenac, the aforementioned Permits have to be issued by the Ministry of Spatial Planning, Civil Engineering and Ecology of RS.

5.5.2 Secondary Network Improvements

Consumer connection shafts (shafts, balancing valves, meters, and other equipment)

In case it is not technically feasible and financially acceptable compared to the long-term estimation of energy savings to introduce metering at apartment level, it is necessary to enable the consumer with the possibility to pay heat energy calculated on the basis of actual consumer delivery. The construction of new connecting shafts in front of buildings and installation of measurement and control equipment in such shafts will enable the calculation of heat energy delivered to each building.

The *Decision on General Conditions for Heat Delivery*[181] regulates the possibility of having common meters used for measuring of supplied heat energy to two or more consumers. According to Article 70 of the Decision, consumers who have common meters pay the supply of heat energy according to consumption shown on the common meter, proportionally according to the floor of each apartment for residential consumers, and according to the supply power for business consumers.

In this case, the tariff system determined by the *Decision on General Conditions for Heat Delivery* would need to be changed accordingly in order to enable price setting for consumers whose heat energy consumption is measured through connection shafts. This means that the aforementioned Decision would need to be amended in terms of its provisions on the tariff system which determines the group of heat customers, tariff elements, tariff rates and billing of thermal energy delivered to customers, criteria and benchmarks for the pricing of heat energy, and the criteria for determining tariff rates. All the elements contained in the part regarding the tariff system would need to be modified, and the possibility for pricing of heat energy calculated

[177] Official Gazette of RS No. 71/12 and 79/15
[178] Official Gazette of RS, No. 124/12
[179] Ibid.
[180] Official Gazette of RS, No. 40/13, 106/15 and 3/16
[181] Official Gazette of the City of Banja Luka, No. 26/13

on the floor area would need to be eliminated. It would be necessary to introduce the possibility of pricing the heat delivered to consumers by common meters located in connection shafts according to consumption shown on the common meter, proportionally according to the floor of each apartment for residential consumers, and according to the supply power for business consumers.

5.5.3 End User Measures

Metering at apartment level (individual meters, allocators and thermostatic valves)

The requirement to introduce individual metering of heat consumption in RS is regulated by several laws.

The *Law on Spatial Planning and Construction*[182] which governs, inter alia, the energy performance of buildings, requires the installation of metering devices for each individual condominium (flat) owner in all new buildings, as well as in existing buildings during major renovation[183], if it is technically feasible and financially acceptable, but at least one metering device for measuring the consumption of an entire building has to be installed.

The *Law on Consumer Protection of BiH*[184] states that prices of supplied energy must be based on individual actual consumption calculated on the basis of consumers' meters.

The *Law on Consumer Protection of RS*[185] requires that energy supplied to customers should be metered, and not allocated on the basis of occupied floor area. According to its Article 2*,* the unit price of utility services is the final price per kilowatt hour of district heating, including all taxes and duties. Article 49 stipulates that consumption of heat must be calculated on the basis of actual consumer delivery, as shown by the consumer metering device. If consumption is not calculated on the basis of individual metering, the service provider is required to enable to the consumer, at the request of the consumer, the installation of an appropriate measuring device, based on the project of technical feasibility and in accordance with the general conditions for service delivery and supply.

Furthermore, the *Law on Energy Efficiency of RS*[186] requires energy distributors to offer their customers the possibility to purchase and install individual energy consumption meters at competitive prices, if installation of individual meters is technically feasible and financially profitable compared to the long-term estimation of energy savings, in the following cases: when the energy is delivered to the end customers without measurement in place, during the renovations of the building, during the reconstruction of a connection to power system. Individual metering is required in new buildings.

The *Decision on General Conditions for Heat Delivery*[187] provides for the obligatory installation of individual meters on home installations and common meters on home substations for new buildings which will be connected to the DH system. Consumers (or investors) have to cover the costs of installation of meters*.*

In case of introduction of individual meters, allocators and thermostatic valves in all heated buildings, the tariff system would need to be changed so as to allow billing to be based solely on individual metering (actual consumption). It would, therefore, be necessary to amend the existing *Decision on General Conditions for Heat Delivery*[188]*,* i.e. its provisions on the tariff system which determines the group of heat customers, tariff elements, tariff rates and billing of thermal energy delivered to customers, criteria and benchmarks for the pricing of heat energy, and the criteria for determining tariff rates. All the elements contained in the part regarding the tariff system would need to be changed and the possibility for pricing of heat energy calculated based on floor area would need to be eliminated.

[182] Official Gazette of RS, No. 40/13, 106/15 and 3/16

[183] Major renovation means renovation of a building where the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25% of the value of the building, excluding the value of the land upon which the building is situated, or where more than 25 % of the surface of the building envelope undergoes renovation.

[184] Official Gazette of BiH, No. 25/06

[185] Official Gazette of RS, No. 6/12

[186] Official Gazette of RS, No. 59/13

[187] Official Gazette of the City of Banja Luka, No. 26/13

[188] Official Gazette of the City of Banja Luka, No. 26/13

5.5.4 Connection and Disconnection to the DH System

The existing *Decision on General Conditions for Heat Delivery*[189] sets the procedure for voluntary connection of newly constructed buildings or existing buildings to the DH network, and does not require the mandatory connection of such buildings to the network.

According to the aforementioned Decision, consumers are not allowed to connect or disconnect their building installations to/from the DH system without the consent of the Company. However, the Decision does not regulate in detail the procedure of disconnection by individual consumers and does not contain the conditions for allowing such disconnection or the requirement of disconnected consumers to pay the fixed costs of heating.

Prior to the implementation of the expansion of the DH network as elaborated in Chapter Possibilities for Network Expansion, in order to ensure the connection of buildings to the expanded network and define the criteria for disconnection of individual consumers, the existing *Decision on General Conditions for Heat Delivery* would need to be amended to include provisions on obligatory connection of all buildings to the DH network in the event that the technical installations for connections are provided by the Company and the criteria for disconnection.

5.5.5 Pricing and Payment of Fixed Costs

According to the *Decision on General Conditions for Heat Delivery*[190], the total cost of heating for customers is the sum of the monthly cost of supply power for heating (fixed part) and the monthly cost for the amount of delivered thermal energy for heating (variable part). The existing decision on tariffs adopted in 2011[191] does not take into account the fixed cost, but only the variable costs.

It would be necessary to adopt a new decision on tariffs containing heat energy prices which take into account also the monthly cost of supply power for heating (fixed costs). This new decision would determine the value of fixed costs for each of the category of consumers determined by the *Decision on General Conditions for Heat Delivery.* In addition, such a new decision on tariffs would determine the value of fixed costs to be applied to disconnected residential and business consumers in buildings that are connected to the DH system.

5.5.6 Energy Efficiency in Buildings

The results of the analysis elaborated in Chapter Energy Efficiency Measures show that it is necessary to improve EE in buildings in the City of Banja Luka. In addition to measures that may be undertaken without any costs, other energy efficiency measures which include improving the efficiency of the existing system or reducing the energy required for heating through simple improvements to buildings' envelopes need to be undertaken. Some of these measures include thermal insulation of the ceiling, insulation of radiator recesses, sealing of loose windows and doors and installation of thermostatic valves, as well as complex energy efficiency measures such as thermal insulation of facades, replacement of windows and insulation of ceilings of unheated basement under the heated area, which have higher costs.

According to the *Law on Spatial Planning and Construction*[192], during the planning, design and construction of new buildings, as well as during major renovation of existing buildings, a set of long-term measures, as well as the minimum requirements regarding the reduction of energy consumption and switch to the use of energy from renewable sources must be applied.

There are no legal acts that define any obligation for introduction of EE measures for existing buildings; therefore, amendments to existing legislation would be necessary in order to improve the implementation of EE measures in buildings, i.e. introduce obligatory EE measures for existing buildings. In addition to such measures, it would be necessary to introduce incentives for these measures to assist all homeowners in financing the EE measures in buildings.

[189] Ibid.
[190] Ibid.
[191] http://www.bltoplana.com/images/stories/dokumenti/cijena%20toplotne%20energije.pdf
[192] Ibid.

According to the *Law on Environmental Protection Fund and Financing of RS*[193], the Environmental Protection and Energy Efficiency Fund RS may finance EE improvements pursuant to strategic documents in RS (measures for improving EE in residential buildings are included into the Energy Efficiency Action Plan of RS as well as in the SEAP of the City of Banja Luka). According to the *Law on Energy Efficiency of RS*[194], measures contained in LEAPs or in SEAPs may be financed by the mentioned Fund, budget of the local self-government units and other sources. Currently there are no programs for financing or co-financing the implementation of energy efficiency measures in residential buildings.

Taking into account the provisions of the aforementioned laws, a program for the allocation of financial resources for the implementation of EE in residential buildings would need to be initiated by the Environmental Protection and Energy Efficiency Fund. Flat owners would be the beneficiaries of such programs and have the possibility to apply for financial resources of the Fund through their Homeowners Associations (which are legal entities as prescribed by the *Law on Building Maintenance*[195]). Decision on applying for financial resources may be taken by the assemblies of homeowners associations whereas the presidents of managing boards of such associations are authorized to sign contracts with the Fund.

5.5.6.1 Example of Financing Energy Efficiency in Residential Buildings in Croatia

In Croatia, the Environmental Protection and Energy Efficiency Fund finances and co-finances the rational use of energy and EE activities prescribed by the Croatian *Law on Environmental Protection and Energy Efficiency Fund*[196], the National Action Plan and other plans. The Croatian Government, in cooperation with the Ministry of Construction and Physical Planning, adopted in July 2014 a program of energy renovation of residential buildings from 2014 to 2020 which is implemented by the mentioned Fund. This program includes all buildings with a gross floor area of over 400 m², more than 50% for habitation purposes and a minimum of three residential units (flats), and which are managed by building managers.

The Fund offers flat owners the possibility of co-financing energy audits and certification, preparation of project documentation for reconstruction and measures to increase EE and energy renovation of buildings. Financial resources are also allocated for the installation of individual meters for measuring thermal energy consumption. In this case it is the building manager that applies for financial resources for the implementation of this type of projects. Before applying for financial resources, the building manager and owners' representative for energy renovation of buildings have to obtain a written consent of other co-owners. According to the Croatian *Law on Energy Efficiency*[197], energy renovation of buildings may be carried out according to national programs for energy renovation of residential buildings. The beneficiaries of these types of programs are co-owners of these buildings (flat owners). Decisions for signing the contract for energy renovation of residential buildings can be taken by flat owners on the basis of a simple majority of their votes.

5.5.7 Combined Heat and Power (CHP)

In case of installation of a CHP system as explained in Chapter Analysis of Combined Heat and Power (CHP) Options , the Company would become an electricity producer. For construction of a CHP system, the Company would need to obtain an environmental permit, location conditions, construction permit and use permit.

In addition, according to the *Regulation on Permit Issuance*[198] which regulates the issuance of permits necessary for electricity production, the Company would need to obtain the permit for the construction of an electricity generation facility with an installed capacity over 1 MW. This permit is issued by the Regulatory Commission for Energy of RS (RERS) according to the procedure set out in the aforementioned Regulation.

The Company would also need to obtain the permit for production of electricity. This permit is also issued by RERS according to the same procedure for the issuance of permit for construction of the electricity generation facilities. According to Article 6 of the *Regulation on Permit Issuance,* the permit for the production of electricity is issued for a period not longer than 30 years from the date of beginning of production.

[193] Official Gazette of RS, No. 117/11 and 63/14
[194] Official Gazette of RS, No. 59/13
[195] Official Gazette of RS, No. 101/11
[196] Official Gazette of Republic of Croatia, No. 107/03 and 144/12
[197] Official Gazette of Republic of Croatia, No. 127/14
[198] Official Gazette of RS, No. 39/10 and 65/13

The *Law on Renewable Energy Sources and Efficient Co-generation*[199] regulates the obtainment of the certificate for production facilities. This certificate has to be obtained after the issuance of a Use Permit. According to Article 8 of this Law, the certificate can be issued to the producer of electricity produced from RES or efficient co-generation in an economically appropriate manner, by protecting the environment and in which measuring of all energy values is carried out. Obtaining the certificate for the production facility is a necessary condition for exercising the right to incentives for generation of electricity from RES and in efficient co-generation or issuance of a guarantee of origin of electricity. This permit is issued by RERS according to the procedure prescribed by the *Regulation on Issuance of Certificates for the Production Facility which Produces Electricity from Renewable Sources or in Efficient Co-generation*[200]. For production facilities which produce electricity in efficient co-generation, this certificate is valid for one year.

The *Law on Renewable Energy Sources and Efficient Co-generation* also regulates the types of incentives for generation of electricity from RES or in efficient co-generation. The types of incentives for generation of electricity from RES or in efficient co-generation are as follows:

- Benefits for connection to the network,
- Advantages in access to the network (dispatching),
- Right to the obligatory purchase of electricity,
- Right to the guaranteed purchase price (feed-in tariff),
- Right to the premium for consumption of electricity for its own needs, or sale to the electricity market.

The right to incentives can be exercised by the electricity producer if it produces electricity in efficient co-generation by using new facilities with an installed capacity of up to 10MW_{el}, if the amount of installed capacities does not exceed the amounts for incentives as determined by the Action Plan[201] and if the producer holds the certificate for the production facility.

According to Article 24 of the mentioned Law, electricity producers which meet the aforementioned criteria and requirements are granted the right to guaranteed purchase of electricity in whole or in part at the guaranteed purchase price (feed-in tariff) or the right to the premium if they use electricity for their own needs or sell it on the RS market. Electricity producers are granted the right to purchase at the guaranteed purchase price or right to the premium for a period of up to 15 years.

The amount of guaranteed feed-in tariffs and premiums for electricity generated from RES or in efficient co-generation facilities are determined by the *Decision on the Level of Guaranteed Purchase Prices and Premiums for Electricity Generated from Renewable Energy Sources and in Efficient Co-generation*. According to Article 26 of the *Law on Renewable Energy Sources and Efficient Co-generation,* when signing the contract on purchase at guaranteed purchase prices, the prices established by the Decision in force at the time of conclusion of the contract are applied and remain unchanged during the validity period of the contract, except in the case of major changes in the exchange rate of the convertible mark (BAM) in relation to the euro exchange rate in BiH.

5.5.8 Private Sector Participation (PSP) in DH System

5.5.8.1 PPP and Concessions

According to the *Law on Public Private Partnership of RS*[202], PPP is a form of cooperation between the public and the private sector, achieved by pooling of resources, capital and expert knowledge, for the purpose of fulfilment of public needs. Agreements in the field of cooperation between the public and the private sector may take two basic forms: contractual form of PPP or institutional form of PPP, and these agreements contain clear risks and the risk distribution between the public and private partner. Among these risks there is the demand risk related to instability of the demand compared to the expected demand at the time of contract signature, regardless of the involvement of the private partner, and it is a common risk borne by private parties in a market economy.

[199] Official Gazette of RS, No. 39/13, 108/13 and 79/15
[200] Official Gazette of RS, No. 112/13
[201] Official Gazette of RS, No. 45/14
[202] Official Gazette of RS, no. 59/09 and 63/11

According to Article 10 of the *Law on Public Private Partnership of RS*[203], the contractual form of PPP also includes concessions and private financial initiatives. According to the *Law on Concessions of RS*[204], utilities, except for water supply, and construction, rehabilitation, maintenance and/or modernization of utilities may be the subject of concessions. According to this Law, concessions for construction or reconstruction of buildings, facilities or plants may be granted according to the Build-Operate-Transfer (BOT) model, which includes the construction or reconstruction and financing of the entire building, facility or plants, its use and passing the ownership to the conceding party (grantor) within the agreed timeframe or according to other models. According to Article 10 of the *Law on Concessions of RS,* types of BOT and other types of concessions and detailed provisions regarding the granting of concessions have to be regulated by the *Document on Policy on Granting of Concessions*. The preparation of this Document is under the responsibility of the Commission on Concessions and is adopted by the National Assembly of RS. Currently, the only existing document is the *Document on Policy on Granting of Concessions*[205] adopted according to the former *Law on Concession of RS*[206] from 2002 (amended in 2006 and 2009). This Document is thus not in line with the new *Law on Concessions of RS* and does not contain provisions on BOT, and district heating is regulated as part of energy facilities. According to this Document, the revitalization of existing DH systems in RS, as well as the construction of new ones is possible through concessions. It is necessary also to use new technologies such as RES or natural gas, in order to avoid the use of heavy oil.

According to Article 68 of the *Law on Concessions of RS,* the Commission on Concessions is responsible for preparing the new *Document on Policy on Granting of Concessions* containing detailed provisions on BOT and on granting concessions for utilities. The possibility of granting concessions to ESCOs (or other type of legal entities) for distribution of heat energy produced by DH systems would need to be regulated in order to provide heat energy supply with energy services. This would enable ESCOs to be granted with concessions for part of the DH network to be constructed, revitalised or modernised and managed by ESCOs.

5.5.8.2 ESCOs

The establishment of ESCOs or other legal entities providing energy services on the basis of energy performance contracts is foreseen by the *Law on Energy Efficiency*[207] as one of the measures of EE improvements. ESCOs may perform energy audits, design, construction, reconstruction, energy retrofit, maintenance, consulting or management and control of energy use.

ESCOs could play an important role in providing energy services but it would be necessary to adopt a detailed regulatory framework with the aim of regulating the ESCOs operations and the payments for the provision of energy services in accordance with the energy service contract. In addition, establishment of PPP with ESCOs would need to be regulated in order to provide the heat energy supply with energy services.

5.5.8.3 Example of Partnership with ESCO

Seattle Steam (now Enwave Seattle) is a privately-owned utility that provides district heating to approximately 200 buildings in Seattle's Central Business District and First Hill neighbourhoods. The company produces thermal energy from five boilers located in two plants in downtown Seattle[208]. In the fall of 2009, the company made the commitment to begin generating thermal energy primarily from a sustainable, non-fossil fuel source: biomass. Seattle Steam partnered with an energy service company (ESCO) to offer an energy saving programme directly to its own customers, helping them reduce energy consumption by 29%. The programme assesses a building's energy saving potential and provides access to grants and low-interest loans, which customers can pay back through their monthly utility bills. From a business development perspective, this lowers customers' utility bills (typically after a payback of five to seven years), allowing Seattle Steam to retain customers. Furthermore, the efficiency improvements free up existing heat generation capacity to service new

[203] Ibid.
[204] Official Gazette of RS, No. 59/13
[205] Official Gazette of RS, No. 31/06
[206] Official Gazette of RS, No. 25/02, 91/06 and 92/09
[207] Ibid.
[208] http://www.enwaveseattle.com/

customers, allowing the company to build its customer base without additional capital costs associated with increasing generation capacity[209].

[209] IFC and Public-Private Infrastructure Advisory Facility (PPIAF), Unlocking the Potential for Private Sector Participation in District Heating, 2014