GERON CORP
Form 10-K
March 07, 2019
UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10 K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Fiscal Year Ended December 31, 2018

or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from to .

Commission File Number: 0 20859

GERON CORPORATION

(Exact name of registrant as specified in its charter)

Delaware	75 2287752
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
149 Commonwealth Drive, Suite 2070, Menlo Park, CA	94025
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code: (650) 473 7700

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, $0.001 par value	The Nasdaq Stock Market LLC

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10 K or any amendment to this Form 10 K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non accelerated filer, a smaller reporting company, or emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b 2 of the Exchange Act.

Large accelerated filer	Accelerated filer
Non-accelerated filer	Smaller reporting company
	Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b 2 of the Act). Yes No

The aggregate market value of voting and non voting common equity held by non affiliates of the registrant was approximately $623,076,000 based upon the closing price of the registrant's common stock on June 29, 2018 on the Nasdaq Global Select Market. The calculation of the aggregate market value of voting and non voting common equity held by non affiliates of the registrant excludes shares of common stock held by each officer, director and stockholder that the registrant concluded were affiliates on that date. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of March 1, 2019, there were 186,392,682 shares of common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE:

Document	Form 10 K Parts
Portions of the Registrant's definitive proxy statement for the 2019 annual meeting of stockholders to be filed pursuant to Regulation 14A within 120 days of the Registrant's fiscal year ended December 31, 2018	III

TABLE OF CONTENTS

In this report, unless otherwise indicated or the context otherwise requires, "Geron," "the registrant," "we," "us," and "our" refe
to Geron Corporation, a Delaware corporation.

Forward Looking Statements

This annual report on Form 10 K, including "Business" in Part I, Item 1 and "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part II, Item 7, contains forward looking statements that involve risks and uncertainties, as well as assumptions that, if they never materialize or prove incorrect, could cause the results of Geron Corporation, or Geron or the Company, to differ materially from those expressed or implied by such forward looking statements. All statements other than statements of historical fact are statements that could be deemed forward looking statements. In some cases, forward looking statements can be identified by the use of terminology such as "may," "expects," "plans," "intends," "will," "should," "projects," "believes," "predicts," "anticipates," "estimates," "potent or the negative thereof or other comparable terminology. The risks and uncertainties referred to above include, without limitation, risks related to our ability to timely transition the imetelstat program from Janssen Biotech, Inc., or Janssen, to us, uncertainty of non-clinical and clinical trial results or regulatory approvals or clearances, the future development of imetelstat, including any future efficacy or safety results that may cause the benefit risk profile of imetelstat to become unacceptable, our need for additional capital to support the development and commercialization of imetelstat and to otherwise grow our business, enforcement of our patent and proprietary rights, potential competition and other risks that are described herein and that are otherwise described from time to time in our Securities and Exchange Commission reports including, but not limited to, the factors described in Part I, Item 1A, "Risk Factors," of this annual report on Form 10 K. Geron assumes no obligation for and except as required by law, disclaims any obligation to update these forward looking statements to reflect future information, events or circumstances.

Calculation of Aggregate Market Value of Non Affiliate Shares

For purposes of calculating the aggregate market value of shares of our common stock held by non affiliates as set forth on the cover page of this annual report on Form 10 K, we have assumed that all outstanding shares are held by non affiliates, except for shares held by each of our executive officers, directors and 5% or greater stockholders. In the case of 5% or greater stockholders, we have not deemed such stockholders to be affiliates unless there are facts and circumstances which would indicate that such stockholders exercise any control over our Company. These assumptions should not be deemed to constitute an admission that all executive officers, directors and 5% or greater stockholders are, in fact, affiliates of our Company, or that there are no other persons who may be deemed to be affiliates of our Company. Further information concerning shareholdings of our executive officers, directors and principal stockholders is incorporated by reference in Part III, Item 12 of this annual report on Form 10 K.

PART I

ITEM 1. BUSINESS

Company Overview

We are a late-stage clinical biopharmaceutical company that is focused on the development and commercialization of innovative therapeutics for hematologic myeloid malignancies. We have global rights to imetelstat, a first-in-class telomerase inhibitor, that was discovered and developed at Geron. We believe clinical data from two Phase 2 clinical trials of imetelstat (IMerge and IMbark, discussed below) conducted by Janssen Biotech, Inc., or Janssen, support further development of imetelstat in hematologic myeloid malignancies. We are working with Janssen to transition the imetelstat program to us. See further discussion below regarding our past and current relationship with Janssen.

We plan to open patient screening and enrollment by mid-year of 2019 in a Phase 3 clinical trial (Part 2 of IMerge) to evaluate imetelstat in transfusion dependent patients with Low or Intermediate-1 risk myelodysplastic syndromes, or MDS, who have relapsed after or are refractory to prior treatment with an erythropoiesis stimulating agent, or ESA, have not received prior treatment with either a hypomethylating agent or lenalidomide and do not have a deletion 5q chromosomal abnormality. This target population of lower risk MDS patients depend on serial red blood cell transfusions to manage symptoms of anemia and fatigue. However, dependency on transfusions is associated with poor survival, because of toxicity due to iron overload, as well as potential infections and allergic reactions. The ultimate goal for most trials of investigational agents in lower risk MDS is to enable patients to become transfusion independent for as long as possible. In December 2018, we reported results from the Phase 2 portion of IMerge in which 37% of patients experienced red blood cell transfusion independence for at least 8 consecutive weeks, or an 8-week RBC-TI, rate. Importantly, this 8-week RBC-TI rate was observed in patients with high transfusion burdens, an indicator of a more difficult to treat population. Patients enrolled into the Phase 2 portion of IMerge had a baseline median red blood cell transfusion burden of eight units per eight weeks with a range of four to 14 units. Our results compare favorably to currently used treatments in a similar patient population, such as hypomethylating agents, or HMAs, which have a reported 8-week RBC-TI rate of 17%, or lenalidomide, which has a reported 8-week RBC-TI rate of 27%. In addition, among the patients in the Phase 2 portion of IMerge who achieved a durable response, as reflected by achieving a 24-week RBC-TI, all showed a hemoglobin rise of ≥3.0 g/dL compared to baseline during the transfusion-free interval. We believe these data suggest potential disease-modifying activity of imetelstat treatment.

Regarding our myelofibrosis, or MF, program, we reported data in December 2018 from the IMbark Phase 2 clinical trial, including the median overall survival of 29.9 months observed in the trial in comparison to the median overall survival of 14 – 16 months for patients previously treated with janus kinase, or JAK, inhibitors. We plan to discuss the IMbark data with experts in MF, as well as regulatory authorities, to consider how these results compare with other therapies currently available to MF patients, and to gain a better understanding of the potential significance of these results to patients and physicians. Because IMbark is the first clinical trial to apply rigorous, objective eligibility criteria to define patients considered relapsed or refractory to JAK inhibitors, we believe feedback from these discussions could provide important information on the feasibility, scope and design, including possible outcome measures, of any potential future clinical trials for imetelstat in Intermediate-2 or High-risk MF patients who have relapsed after or are refractory to prior treatment with a JAK inhibitor. We expect to outline our decision whether to continue late-stage development of imetelstat in MF by the end of the third quarter of 2019. This decision will be influenced by our assessment of what would be required to achieve clinical and regulatory success in MF, including the cost and duration of any potential clinical trials.

We had approximately $182.1 million in cash, cash equivalents, restricted cash and current and noncurrent marketable securities as of December 31, 2018, which is sufficient to commence the planned Phase 3 portion IMerge. If approved for marketing by regulatory authorities, we plan to commercialize imetelstat in the United States ourselves and seek

potential commercialization partners for territories outside of the United States.

Telomerase: Scientific Rationale

Telomeres and Telomerase in Normal Development

In the human body, normal growth and maintenance of tissues occurs by cell division. However, most cells are only able to divide a limited number of times, and this number of divisions is regulated by telomere length. Telomeres are repetitions of a deoxyribonucleic acid, or DNA, sequence located at the ends of chromosomes. They act as protective caps to maintain stability and integrity of the chromosomes, which contain the cell's genetic material. Normally, every time a cell divides, the telomeres shorten. Eventually, they shrink to a critically short length, and as a result, the cell either dies by apoptosis or stops dividing and senesces.

Telomerase is a naturally occurring enzyme that maintains telomeres and prevents them from shortening during cell division, such as stem cells that must remain immortalized to support normal health. Telomerase consists of at least two essential components: a ribonucleic acid, or RNA, template (hTR), which binds to the telomere, and a catalytic subunit (hTERT) with reverse transcriptase activity, which adds a specific DNA sequence to the chromosome ends. The 2009 Nobel Prize for Physiology or Medicine was awarded to Drs. Elizabeth H. Blackburn, Carol W. Greider and Jack Szostak, former Geron collaborators, for the discovery of how chromosomes are protected by both telomeres and telomerase.

Telomerase is active during embryonic development, enabling the rapid cell division that supports normal growth. During the latter stages of human fetal development and in adulthood, telomerase is repressed in most cells, and telomere length gradually decreases during a lifetime. In tissues that have a high turnover throughout life, such as blood and gut, telomerase can be transiently upregulated in progenitor cells to enable controlled, self limited proliferation to replace cells lost through natural cell aging processes. As the progeny of progenitor cells mature, telomerase is downregulated and telomeres shorten with cell division, preventing uncontrolled proliferation.

Telomeres and Telomerase in Cancer

Telomerase is upregulated in many tumor progenitor cells, enabling the continued and uncontrolled proliferation of the malignant cells that drive tumor growth and progression. Telomerase expression has been found to be present in approximately 90% of biopsies taken from a broad range of human cancers. Our nonclinical studies, in which the telomerase gene was artificially introduced and expressed in normal cells grown in culture, have suggested that telomerase does not itself cause a normal cell to become malignant. Instead, the sustained upregulation of telomerase enables tumor cells to maintain telomere length, providing them with the capacity for limitless proliferation. We believe that the sustained upregulation of telomerase is critical for tumor progression as it enables malignant progenitor cells to acquire cellular immortality and avoid apoptosis, or cell death.

Telomerase Inhibition: Inducing Cancer Cell Death

We believe that inhibiting telomerase may be an attractive approach to treating cancer because it may limit the proliferative capacity of malignant cells. We and others have observed in various in vitro and rodent tumor models that inhibiting telomerase results in telomere shortening and arrests uncontrolled malignant cell proliferation and tumor growth. In vitro studies have suggested that tumor cells with short telomeres may be especially sensitive to the anti proliferative effects of inhibiting telomerase. Our nonclinical data also suggest that inhibiting telomerase is particularly effective at limiting the proliferation of malignant progenitor cells, which have high levels of telomerase and are believed to be important drivers of tumor growth and progression.

Imetelstat: The First Telomerase Inhibitor to Advance to Clinical Development

Imetelstat is a lipid conjugated 13 mer oligonucleotide that we designed to be complementary to and bind with high affinity to the RNA template of telomerase, thereby directly inhibiting telomerase activity. Imetelstat does not elicit its effect through an antisense inhibition of protein translation. The compound has a proprietary thio phosphoramidate backbone, which is designed to provide resistance to the effect of cellular nucleases, thus conferring improved stability in plasma and tissues, as well as improved binding affinity to its target. To improve the ability of imetelstat to penetrate cellular membranes, we conjugated the oligonucleotide to a lipid group. Imetelstat's IC50, or half maximal inhibitory concentration, is 0.5 – 10 nM in cell free assays. Single dose kinetics in patients has shown dose dependent increases in exposure to imetelstat, with a plasma half life, which is the time it takes for the

concentration or amount of imetelstat to be reduced by half, ranging from 4 – 5 hours. Data from animal studies and clinical trials have suggested that the residence time of imetelstat in bone marrow is long, with 0.19 – 0.51 μM observed at 41 – 45 hours after a 7.5 mg/kg dose in patients. Imetelstat also has been shown in nonclinical studies to exhibit relatively preferential inhibition of the clonal proliferation of malignant progenitor cells compared to normal progenitors. For these reasons, imetelstat has been studied as a potential treatment for malignant diseases.

Imetelstat is the first telomerase inhibitor to advance to clinical development. The Phase 1 trials that we completed evaluated the safety, tolerability, pharmacokinetics and pharmacodynamic effects of imetelstat. We established doses and dosing schedules that were tolerable and achieved target exposures in patients that were consistent with those required for efficacy in animal models. Following intravenous administration of imetelstat using tolerable dosing regimens, clinically relevant and significant inhibition of telomerase activity was observed in various types of tissue in which telomerase activity is measurable, including normal bone marrow hematopoietic cells, malignant plasma cells, hair follicle cells and peripheral blood mononuclear cells. Dose limiting toxicities included thrombocytopenia, or reduced platelet count, and neutropenia, or reduced neutrophil count.

Disease Characteristics of Hematologic Malignancies

Hematologic malignancies, or blood cancers, are classified according to the predominant location of the malignancy. A hematologic myeloid malignancy is a cancer that occurs in the precursor cells to red blood cells, platelets and white blood cells, such as granulocytes. Examples include acute myelogenous leukemia, chronic myelogenous leukemia, MDS and the myeloproliferative neoplasms, such as essential thrombocythemia, or ET, polycythemia vera and MF. These are different from lymphocytic malignancies which typically occur in the lymphoid lineage that includes white blood cells, such as T lymphocytes and B lymphocytes. Examples of lymphoid malignancies include acute lymphoblastic leukemia, chronic lymphocytic leukemia, lymphomas and multiple myeloma.

Many hematologic myeloid malignancies, such as ET, MF, and MDS, have been shown to arise from malignant progenitor cells in the bone marrow that express higher telomerase activity and have shorter telomeres when compared to normal healthy cells.

Unmet Medical Need in Myelodysplastic Syndromes

MDS is a group of blood disorders in which the proliferation of malignant progenitor cell clones in the bone marrow results in disordered and ineffective production of the myeloid lineage, which includes red blood cells, white blood cells and platelets. In MDS, bone marrow and peripheral blood cells may have abnormal, or dysplastic, cell morphology. MDS is frequently characterized clinically by severe anemia, or low red blood cell counts, and low hemoglobin. In addition, other peripheral cytopenias, or low numbers of white blood cells and platelets, may cause life threatening infections and bleeding. Transformation to acute myelogenous leukemia, or AML, occurs in up to 30% of MDS cases and results in poorer overall survival.

MDS is the most common of the myeloid malignancies. There are approximately 60,000 people in the United States living with the disease and approximately 16,000 reported new cases of MDS in the United States every year. MDS is primarily a disease of the elderly, with median age at diagnosis around 70 years. The majority of patients, approximately 70%, fall into what are considered to be the lower risk groups at diagnosis, according to the International Prognostic Scoring System, or IPSS, that takes into account the presence of a number of disease factors, such as cytopenias and cytogenetics, to assign relative risk of progression to AML and overall survival.

Chronic anemia is the predominant clinical problem in patients who have lower risk MDS. Many of these patients become dependent on red blood cell transfusions due to low hemoglobin. Serial red blood cell transfusions can lead to elevated levels of iron in the blood and other tissues, which the body has no normal way to eliminate. Iron overload is

a potentially dangerous condition. Studies in patients with MDS have shown that iron overload resulting from regular red blood cell transfusions is associated with a poorer overall survival and a higher risk of developing AML.

There have been no new drugs approved by the United States Food and Drug Administration, or FDA, for MDS therapy since 2006 and clinicians note that currently available therapies are likely to fail the majority of patients within two to three years after treatment initiation even if there is initial favorable response. Typically, patients with lower risk MDS are treated with ESAs, such as erythropoietin, or EPO. Although ESAs provide an improvement in anemia in approximately 50% of patients, the effect is transient with a median duration of treatment of approximately two years. Once ESAs fail for patients, HMAs and lenalidomide have been used to improve anemia, but with limited success, such as reported 8-week RBC-TI rates of 17% for azacitidine, an HMA, and 27% for lenalidomide. No drug therapy has been shown prospectively to prolong survival in lower risk MDS, nor to delay disease progression.

Unmet Medical Need in Myelofibrosis

MF, a type of myeloproliferative neoplasm, is a chronic blood cancer in which abnormal or malignant precursor cells in the bone marrow proliferate rapidly, causing scar tissue, or fibrosis, to form. As a result, normal blood production in the bone marrow is impaired and may shift to other organs, such as the spleen and liver, which can cause them to enlarge substantially. People with MF may have abnormally low or high numbers of circulating red blood cells, white blood cells or platelets, and abnormally high numbers of immature cells in the blood or bone marrow. MF patients can also suffer from debilitating constitutional symptoms, such as drenching night sweats, fatigue, severe itching, or pruritus, abdominal pain, fever and bone pain. The estimated prevalence of MF in the United States, or U.S., is approximately 13,000 patients, with an annual incidence of approximately 3,000 patients. Up to 20% of patients with MF develop AML.

Approximately 70% of MF patients are classified as having Intermediate 2 or High-risk disease, as defined by the Dynamic International Prognostic Scoring System Plus, or DIPSS Plus, described in a 2011 Journal of Clinical Oncology article. There is currently only one targeted drug therapy, ruxolitinib, a JAK inhibitor, approved by the FDA and other regulatory authorities for treating these MF patients. Currently, no drug therapy is approved for those patients who fail or no longer respond to that treatment, and median survival for such MF patients is only approximately 14 – 16 months, representing a significant unmet medical need.

Developing Imetelstat to Treat Hematologic Myeloid Malignancies

Proof of Concept of Imetelstat's Disease Modifying Potential

We believe that imetelstat may have the potential to suppress the proliferation of malignant progenitor cell clones to allow recovery of normal hematopoiesis in patients with hematologic myeloid malignancies. Early clinical data from a Phase 2 trial of imetelstat in patients with ET, or the ET Trial, and a pilot study of imetelstat in patients with MF conducted at Mayo Clinic, or the Pilot Study, suggest imetelstat may exhibit such disease modifying activity. These data were published in two separate articles in a September 2015 issue of The New England Journal of Medicine.

Reported adverse events, or AEs, and laboratory investigations associated with imetelstat in the ET Trial and the Pilot Study included cytopenias, gastrointestinal symptoms, constitutional symptoms, and hepatic biochemistry abnormalities. Dose limiting toxicities, such as profound and prolonged thrombocytopenia and neutropenia, and other safety issues, including death, were observed in the ET Trial and the Pilot Study. In those trials, such myelosuppression was managed by dose holds and modification rules.

IMerge (Phase 2/3 Trial) in Lower Risk MDS

Trial Design

IMerge is a two-part clinical trial evaluating imetelstat in transfusion dependent patients with Low or Intermediate-1 risk, also referred to as lower risk, MDS, who have relapsed after or are refractory to prior treatment with an ESA. Part 1 of IMerge was designed as a Phase 2, open-label, single-arm trial to assess the efficacy and safety of imetelstat administered as an intravenous infusion at a starting dose of 7.5 mg/kg every four weeks in approximately 30 patients, and originally was conducted by Janssen as part of a Collaboration and License Agreement, or the Collaboration Agreement. See further discussion below regarding our past and current relationship with Janssen. The first patient was dosed in January 2016. To be eligible for the Phase 2 portion of IMerge, patients were required to be

transfusion dependent, defined as requiring at least four units of packed red blood cells, or RBCs, over an eight week period during the 16 weeks before entry into the trial.

The primary efficacy endpoint of IMerge is the rate of RBC transfusion independence, or RBC-TI, lasting at least eight weeks, defined as the proportion of patients without any RBC transfusion during any consecutive eight weeks since entry to the trial, or 8-week RBC-TI rate. Key secondary endpoints include the rate of RBC-TI lasting at least 24 weeks, or 24-week RBC-TI rate, and the rate of hematologic improvement-erythroid, or HI-E, defined as a rise in hemoglobin of at least 1.5 g/dL above the pretreatment level for at least eight weeks or a reduction of at least four units of RBC transfusions over eight weeks compared with the prior RBC transfusion burden. Other secondary efficacy endpoints include the time to and duration of RBC-TI; the proportion of patients achieving Complete Response, or CR, or Partial Response, or PR, according to the 2006 International Working Group, or IWG, criteria for MDS; the proportion of patients requiring RBC transfusions and the transfusion burden; the proportion of patients requiring the use of myeloid growth factors and the dose; assessments of the change in the patients' quality of life using several validated instruments; as well as an assessment of overall survival and time to progression to AML.

32 patients were initially enrolled in the Phase 2 portion of IMerge, of which a cohort of 13 patients had not received prior treatment with either an HMA or lenalidomide and did not have a deletion 5q chromosomal abnormality, also known as non-del(5q). Preliminary data from the Phase 2 portion of IMerge were presented at the European Hematology Association, or EHA, Annual Congress, in June 2018. These data showed that the 13-patient initial cohort exhibited an increased rate and durability of transfusion independence compared to the overall trial population (8-week RBC-TI rate: 54% vs. 34%). The safety profile in the Phase 2 portion of IMerge was consistent with prior clinical trials of imetelstat in hematologic malignancies, and no new safety signals were identified. The most frequently reported adverse events were cytopenias, which were predictable, manageable and reversible, in most cases, including Grade 3 and 4, or severe, neutropenia and thrombocytopenia. In addition, reported adverse events did not differ significantly between the overall trial population and the 13-patient initial cohort.

Based on the preliminary data from the initial cohort of 13 patients, Janssen expanded new patient enrollment in the Phase 2 portion of IMerge and enrolled 25 additional patients, or an expansion cohort, who are non-del(5q) and naïve to HMA and lenalidomide treatment, to increase the clinical experience and confirm the benefit-risk profile of imetelstat in this target patient population. In November 2017, the first patient was dosed in the expanded Phase 2 portion of IMerge and enrollment was completed in February 2018.

Detailed results for the target patient population (n=38) from the combined initial cohort of 13 patients and expansion cohort of 25 patients were recently presented at the 60th American Society of Hematology, or ASH, Annual Meeting and Exposition in December 2018. A summary of the results is below.

ASH Presentation Highlights

In the ASH presentation, results were reported using a clinical cut-off date of October 26, 2018. For the initial 13-patient cohort, the median follow-up was 29.1 months and for the 25-patient expansion cohort, the median follow-up was 8.7 months. The median number of treatment cycles was 8.0 (range: 1 – 34) and the mean dose intensity was 6.9 mg/kg/cycle. The baseline characteristics of the aggregate 38 patients in the combined cohorts highlight the high transfusion burden of these patients, indicating the significant disease burden of this patient population.

Patient Baseline Characteristics (n=38)	
Median age (range), years	71.5 (46-83)
Male, n (%)	25 (66%)
Eastern Cooperative Oncology Group (ECOG) Performance Standard 0-1, n (%)	34 (89%)
International Prognostic Scoring System risk, n (%)	
	24 (63%)
Low	
	14 (37%)
Intermediate-1	
Baseline median (range) RBC transfusion burden, units/8 weeks	8 (4–14)
WHO 2001 category, n (%)	
	27 (71%)
Refractory Anemia with Ringed Sideroblasts (RARS) or Refractory	
Cytopenia with Multilineage Dysplasia and Ringed Sideroblasts	
(RCMD-RS)	
	11 (29%)
All others	
Prior ESA use, n (%)	34 (89%)
Serum EPO > 500 mU/mL, n (%)	12[a] (32%)

[a]Of the 37 patients with sEPO (serum erythropoietin) levels reported.

The 8-week RBC-TI rate for the 38 patients in the combined cohorts was 37% and 26% of patients achieved a durable response with 24-week RBC-TI. In addition, among the patients achieving durable transfusion independence, all showed a hemoglobin rise of ≥3.0 g/dL compared to baseline during the transfusion-free interval. We believe these data suggest potential disease-modifying activity of imetelstat treatment. In addition, similar 8-week RBC-TI rates were observed between ringed sideroblast positive (37%) patients and other patients (36%), and between those patients with baseline erythropoietin levels >500 mU/mL (33%) and ≤500 mU/mL (40%), indicating the broad clinical activity of imetelstat in the Phase 2 portion of this trial. These and other efficacy data are also summarized in the table below:

Key Efficacy Outcomes	n=38
Rate of 8-week RBC-TI, n (%)	14 (37%)
Rate of 24-week RBC-TI, n (%)	10 (26%)
Median time to onset of RBC-TI (range), weeks	8.1 (0.1-33.1)
Median duration of RBC-TI (range), weeks	Not Evaluable (17.0-NE)
Rate of transfusion reduction (hematologic improvement-erythroid, or HI-E), n (%)	27 (71%)
Mean relative reduction of RBC transfusion burden from baseline, %	-68%

CR+ marrow CR + PR (per International Working Group, or IWG), n (%)	8 (21%)

9

As summarized in the table below, the safety profile was consistent with prior clinical trials of imetelstat in hematologic malignancies, and no new safety signals were identified. Nineteen patients (50%) had dose reductions and 26 patients (68%) had cycle delays. Reversible Grade 3 liver function test, or LFT, elevations were observed in three patients (8%) and an independent Hepatic Review Committee deemed the observed LFT elevations were not imetelstat-related hepatic toxicities.

Most Common Treatment-Emergent Adverse Events (TEAE)	Patients > 1 TEAE	
	Grade 1-2	Grade > 3
Neutropenia	1	21
Thrombocytopenia	2	23
Anemia	2	7
Leukopenia	0	7
Aspartate Aminotransferase, or AST, increased	3	3
Alanine Aminotransferase, or ALT, increased	5	2
Headache	5	1
Bronchitis	4	2
Nasopharyngitis	6	0
Diarrhea	6	0
Peripheral edema	6	0
Back pain	4	2

The majority of Grade ≥3 neutropenia and thrombocytopenia were reversible within four weeks as shown in the table below:

Occurrence and Reversibility of Cytopenias	All events n=38	Recovered in < 4wks of patients with an event
Neutrophils, n (%)		
Grade 3	10 (26%)	8 (80%)
Grade 4	12 (32%)	12 (100%)
Platelets, n (%)		
Grade 3	14 (37%)	13 (93%)
Grade 4	10 (26%)	9 (90%)

Current Status of the Phase 2 Portion of IMerge

The Phase 2 portion of IMerge has been officially closed to new patient enrollment and patients remaining in the treatment phase are eligible to continue to receive imetelstat treatment, per investigator discretion. Data collection and patient follow-up continue in accordance with the trial protocol and is being conducted by Janssen during the program transition period. In connection with the transition of the imetelstat program, we expect sponsorship for IMerge to be transferred from Janssen to us by the end of the second quarter of 2019. Once the IND transfer has been completed, we will assume responsibility for treating and following patients in accordance with the Phase 2 trial protocol.

We expect more mature data from the patients continuing in the treatment phase of the Phase 2 portion of IMerge to be available in 2019 and anticipate submitting such data for presentation at a future medical conference in 2019.

Plan for IMerge Phase 3 Clinical Trial to Begin by Mid-Year 2019

Based on the results of the Phase 2 portion of IMerge, we intend to continue the development of imetelstat in lower risk MDS. Importantly, the 37% 8-week RBC-TI rate observed in the Phase 2 portion of IMerge compares favorably to currently used treatments in a similar patient population, such as HMAs, with a reported 8-week RBC-TI rate of 17% or lenalidomide, with a reported 8-week RBC-TI rate of 27%. Also, the IMerge results were observed in patients with high transfusion burdens, an indicator of a more difficult to treat population and among the patients who achieved durable transfusion independence in the Phase 2 portion of IMerge, all showed a hemoglobin rise of ≥3.0 g/dL compared to baseline during the transfusion-free interval. We believe these data suggest potential disease-modifying activity of imetelstat treatment.

We expect patient screening and enrollment of Part 2, or the Phase 3 portion, of IMerge, to begin by mid-year of 2019, after sponsorship of the ongoing imetelstat clinical trials has been transferred from Janssen to us. The Phase 3 portion of IMerge is a double-blind, randomized, placebo-controlled trial in approximately 170 patients, which will evaluate imetelstat in transfusion dependent patients with Low or Intermediate-1 risk MDS, who have relapsed after or are refractory to prior treatment with an ESA, have not received prior treatment with either an HMA or lenalidomide and do not have a deletion 5q chromosomal abnormality. We expect the trial to be conducted at multiple medical centers globally, including North America, Europe and Asia. Trial design information for the Phase 3 portion of IMerge, including patient eligibility criteria and locations of clinical sites, will be posted on clinicaltrials.gov.

IMbark (Phase 2 Trial) in Relapsed/Refractory MF

Trial Design

IMbark was designed as a Phase 2 clinical trial to evaluate two starting dose levels of imetelstat (either 4.7 mg/kg or 9.4 mg/kg administered by intravenous infusion every three weeks) in approximately 200 patients with Intermediate-2 or High-risk MF who have relapsed after or are refractory to prior treatment with a JAK inhibitor. We believe IMbark is the first clinical trial to rigorously define this specific patient population, as currently there is no established clinical definition for relapsed after or refractory to prior treatment with a JAK inhibitor. Patients eligible for the trial were required to have active symptoms of MF, together with worsening of splenomegaly-related abdominal pain at any time after the start of JAK inhibitor therapy, and either: no reduction in spleen volume or size after 12 weeks of JAK inhibitor therapy, or worsening splenomegaly after the start of JAK inhibitor therapy, as documented by an increase in spleen volume from its lowest point, or nadir, by 25% when measured by imaging, or an increase in spleen size when assessed by palpation. IMbark was originally conducted by Janssen as part of the Collaboration Agreement.

The co-primary efficacy endpoints for the trial are spleen response rate, defined as the proportion of patients who achieve a ≥35% reduction in spleen volume assessed by imaging, and symptom response rate, defined as the proportion of patients who achieve a ≥50% reduction in Total Symptom Score, or TSS, at 24 weeks. Key secondary endpoints are safety and overall survival. Other secondary efficacy endpoints include the number of patients achieving complete remission, or CR, or partial remission, or PR, clinical improvement, or CI, and anemia, spleen and symptom responses. Exploratory endpoints include cytogenetic and molecular responses, as well as leukemia free survival.

The first patient in IMbark was dosed in September 2015 and the last patient was enrolled in October 2016. Janssen initiated a protocol-specified primary analysis of IMbark in the second quarter of 2018. The IMbark protocol-specified primary analysis, which included an assessment of overall survival, or OS, coincided with the protocol-specified final analysis for the trial, due to an overlap in the dates triggering each analysis, which resulted in a joint primary/final analysis, which we refer to herein as the primary analysis. The results of this primary analysis and updated data on overall survival were presented at the ASH Annual Meeting and Exposition in December 2018. A summary of the results is below.

11

ASH Presentation Highlights

As reported in the ASH presentation, a total of 107 patients were enrolled in IMbark (48 in the 4.7 mg/kg dosing arm and 59 in the 9.4 mg/kg dosing arm). At the time of the April 26, 2018 clinical cut-off for the primary analysis, patients in IMbark had been followed for a median of 22.6 months (range: 0.2 – 27.4), including median treatment duration of 26.9 weeks (range: 0.2 – 118.1). Seven patients remained on active treatment and 50 patients were being followed for survival. The baseline characteristics of the patients enrolled in IMbark, as presented at ASH and highlighted below, indicate the advanced nature of the disease in, and the potential difficulty to treat, this patient population:

Patient Baseline Characteristic Highlights	4.7 mg/kg (n = 48)	9.4 mg/kg (n = 59)	Total (n = 107)
Median age (range), years	68.5 (44 – 84)	67 (31 – 86)	68.0 (31 – 86)
Myelofibrosis subtype, n (%)			
Primary	27 (56%)	36 (61%)	63 (59%)
Post-Essential Thrombocythemia, or ET	9 (19%)	10 (17%)	19 (18%)
Post-Polycythemia Vera, or PV	12 (25%)	13 (22%)	25 (23%)
DIPSS risk status, n (%)			
Intermediate-1 risk	1[a] (2%)	0 (0%_	1 (1%)
Intermediate-2 risk	28 (58%)	34 (58%)	62 (58%)
High-Risk	19 (40%)	25 (42%)	44 (41%)
Spleen volume (MRI) – Median, IRC (range), cm^3	3353 (726 – 7243)	2998 (890 – 7607)	3167 (726 – 7607)
Platelet count – Median (range), $x10^9/L$	153 (74 – 1097)	146 (65 – 798)	147 (65 – 1097)
Time since initial diagnosis – Median (range), months	49 (2 – 227)	43 (7 – 201)	44 (2 – 227)
Duration of prior JAKi Tx – Median (range), months	22 (3 – 90)	25 (1 – 73)	23 (1 – 90)
Triple negative [b], n (%)	10 (21%)	16 (28%)	26 (25%)
High molecular risk [c], n (%)	36 (75%)	35 (61%)	71 (68%)

[a] Indicated in electronic case report form comments, but does not appear in statistical output. This is a protocol deviation.

[b] Absence of JAK2 V617F, CALR or MPL mutations. Indicator of a poor prognosis.

[c] One or more mutations in ASXL1, EZH2, SRSF2, IDH1, or IDH2. An indicator of progressive disease in the patient.

Six patients (10%) in the 9.4 mg/kg dosing arm and no patients in the 4.7 mg/kg dosing arm had a spleen response per imaging. The spleen volume response rate observed, including in the 9.4 mg/kg dosing arm, was less than that reported in clinical trials with JAK inhibitors in front-line MF patients. Nineteen patients (32%) in the 9.4 mg/kg dosing arm and three patients (6%) in the 4.7 mg/kg dosing arm had a symptom response.

For the assessment of OS, the clinical cut-off date for the ASH presentation was October 22, 2018. The median follow-up was 27.4 months (range: 0.2 – 33.0). The median OS in the 9.4 mg/kg dosing arm was 29.9 months. These and other efficacy data are also summarized in the table below:

	Dosing Arm	
n (%)	4.7 mg/kg	9.4 mg/kg
Number of enrolled patients	48	59
Spleen response rate	0 (0%)	6 (10%)
Symptom response rate	3 (6%)	19 (32%)
Complete remission rate	0 (0%)	0 (0%)
Partial remission rate	0 (0%)	1 (2%)
Median overall survival	19.9 mos	29.9 mos

12

As summarized in the table below, the safety profile was consistent with prior clinical trials of imetelstat in hematologic malignancies, and no new safety signals were identified.

	4.7 mg/kg (n = 48)		9.4 mg/kg (n = 59)	
n (%)	All Grades	Grade ≥ 3	All Grades	Grade ≥ 3
Hematologic (≥ 10% in either arm)				
Thrombocytopenia	11 (23%)	11 (23%)	29 (49%)	24 (41%)
Anemia	15 (31%)	15 (31%)	26 (44%)	23 (39%)
Neutropenia	5 (10%)	5 (10%)	21 (36%)	19 (32%)
Leukopenia	3 (6%)	3 (6%)	8 (14%)	8 (14%)
Non-hematologic (≥ 20% in either arm)				
Nausea	15 (31%)	1 (2%)	20 (34%)	2 (3%)
Vomiting	10 (21%)	1 (2%)	8 (14%)	1 (2%)
Diarrhea	18 (38%)	2 (4%)	18 (31%)	0 (0%)
Fatigue	10 (21%)	3 (6%)	16 (27%)	4 (7%)
Cough	11 (23%)	0 (0%)	9 (15%)	0 (0%)
Dyspnea	9 (19%)	6 (13%)	14 (24%)	3 (5%)
Abdominal pain	10 (21%)	2 (4%)	14 (24%)	3 (5%)
Asthenia	9 (19%)	3 (6%)	14 (24%)	6 (10%)
Pyrexia	8 (17%)	1 (2%)	13 (22%)	3 (5%)
Edema peripheral	13 (27%)	0 (0%)	11 (19%)	0 (0%)

Most cytopenias resolved within four weeks. Grade 3/4 LFT elevations were observed in seven patients on study. An independent Hepatic Review Committee deemed that the observed LFT elevations were not imetelstat-related hepatic toxicities.

Current Status of IMbark

The trial has been officially closed to new patient enrollment since March 2018 and has entered an extension phase to enable patients remaining in the treatment phase to continue to receive imetelstat treatment, per investigator discretion. During the extension phase, which is being conducted by Janssen during the program transition period, standard data collection will primarily consist of safety information.

In connection with the transition of the imetelstat program, we expect sponsorship for IMbark to be transferred from Janssen to us by the end of the second quarter of 2019. Once the IND transfer has been completed, we will be responsible for following patients in accordance with the extension phase protocol.

For MF, we plan to discuss the results of the IMbark primary analysis, including the assessment of OS, with experts in MF, as well as regulatory authorities, to consider how these results compare with other therapies currently available to MF patients, and to gain a better understanding of the potential significance of these results to patients and physicians. We believe feedback from these discussions will provide important information on the feasibility, scope and design, including possible outcome measures, of any potential future clinical trials for imetelstat in Intermediate-2 or High-risk MF patients who have relapsed after or are refractory to prior treatment with a JAK inhibitor. We expect to outline our decision whether to continue late-stage development of imetelstat in MF by the end of the third quarter of 2019. This decision will be influenced by our assessment of what would be required to achieve clinical and regulatory success in MF, including the cost and duration of any potential clinical trials.

13

Transition from Janssen

In December 2014, we entered into the Collaboration Agreement with Janssen, pursuant to which Janssen conducted IMbark and IMerge. Janssen terminated the Collaboration Agreement effective September 28, 2018, and upon the effective date of termination, we regained the global rights to the imetelstat program. Under the terms of the Collaboration Agreement, Janssen is required to provide operational support for the imetelstat program during transition of the program to us. Each company is responsible for its own costs incurred related to transition activities, unless otherwise specified in the Collaboration Agreement. We expect the transition process to be completed by September 2019 to enable the orderly transfer of all ongoing clinical, regulatory, medical affairs and non-clinical activities to us, including transfer of the sponsorship of ongoing imetelstat clinical trials from Janssen to us. In addition, following the effective date of termination of the Collaboration Agreement, we expect Janssen to supply imetelstat to us for up to 24 months during a transition period for clinical manufacturing and such supply will be charged to us at Janssen's cost plus a premium. See "Licensing—Former Collaboration and License Agreement with Janssen" below, for more information about the Collaboration Agreement.

We have engaged Parexel International (IRL) Limited, or Parexel, a global contract research organization, or CRO, to support imetelstat clinical development activities. In addition to recently hiring a head of Pharmacovigilance and Drug Safety and a Chief Medical Officer in January of 2019, we are actively recruiting senior personnel to staff our internal drug development group, as well as contract with subject matter experts in clinical science, biostatistics, clinical operations, pharmacovigilance, quality, manufacturing and regulatory affairs.

Intellectual Property

Intellectual property, including patent protection, is very important to our business. We file patent applications in the United States and other jurisdictions, and we also rely on trade secret protection and contractual arrangements to protect aspects of our business. An enforceable patent with appropriate claim coverage can provide an advantage over competitors who may seek to employ similar approaches to develop therapeutics, and so the future commercial success of imetelstat, and therefore our future success, will be in part dependent on our intellectual property strategy. The information provided in this section should be reviewed in the context of the section entitled "Risks Related to Protecting Our Intellectual Property" under Item 1A, "Risk Factors".

The development of biotechnology products, including imetelstat, typically includes the early development of a technology, followed by rounds of increasingly focused innovation around a product opportunity, including identification and definition of a specific product candidate and uses thereof, manufacturing processes, product formulation and administration methods. The result of this process is that biotechnology products are often protected by several families of patent filings that are filed at different times during product development and cover different aspects of the product. Consequently, earlier filed, broad technology patents will usually expire ahead of patents covering later developments, such as product formulations, so that patent expirations on a product may span several years. Patent coverage may also vary from country to country based on the scope of available patent protection. There are also opportunities to obtain an extension of patent coverage for a product in certain countries, which adds further complexity to the determination of patent life.

We endeavor to monitor worldwide patent filings by third parties that are relevant to our business. Based on this monitoring, we may determine that an action is appropriate to protect our business interests. Such actions may include negotiating patent licenses where appropriate, filing oppositions against a patent, filing a request for post grant review against a patent or filing a request for the declaration of an interference with a patent application or issued patent.

Imetelstat

We own issued patents in the United States, Europe and other countries related to imetelstat. Composition of matter patents generally provide the most material coverage, and therefore may convey competitive advantages. Because imetelstat is still under development, subsequent innovation and associated patent filings may provide additional patent coverage with later expiration dates. Examination of overseas patent applications typically lags behind U.S. examination particularly where cases are filed first in the United States. It may be possible to obtain patent term extensions of some patents in some countries for claims covering imetelstat which could further extend the patent term.

Product Candidate	U.S. Patent Status / Expiration Date	Europe Patent Status / Expiration Date	Japan Patent Status / Expiration Date
Imetelstat (composition of matter)	Issued / 2025	Issued / 2024	Issued / 2024

Our patent rights relating to imetelstat include those covering composition claims to the drug molecule and related nucleic acid telomerase inhibiting molecules, as well as reagents useful in manufacturing processes for the drug, and method of treatment and kit claims, certain of which are co owned with other entities.

Upon the effective date of termination of the Collaboration Agreement with Janssen on September 28, 2018, we regained all of the worldwide rights to imetelstat. In accordance with the termination provisions of the Collaboration Agreement, we have an exclusive worldwide license for intellectual property developed under the Collaboration Agreement for the further development of imetelstat, without any economic obligations to Janssen with respect to such license. Janssen has assigned to us certain intellectual property developed by it under the Collaboration Agreement. We now bear all of the costs for maintaining, prosecuting and litigating all imetelstat intellectual property that we own.

Telomerase

Our U.S. patent rights relating to telomerase that cover technologies, such as variants of the protein component of human telomerase, or hTERT, are co owned with and in licensed exclusively from the University of Colorado. We expect the last of these U.S. patent rights to expire in 2019. A U.S. patent for identifying inhibitors of telomerase activity is in licensed from the University of Texas Southwestern Medical Center and the University of California and will expire in 2019. The expiration of these patents is not expected to have any impact on our intellectual property rights related to imetelstat, or our continued planned development of imetelstat. See Item 1A, “Risk Factors” for additional information regarding our patent rights relating to telomerase.

Licensing

Former Collaboration and License Agreement with Janssen

On November 13, 2014, we entered into the Collaboration Agreement, pursuant to which we granted to Janssen the exclusive rights to develop and commercialize imetelstat worldwide for all indications in oncology, including hematologic myeloid malignancies, and all other human therapeutic uses. The Collaboration Agreement became effective on December 15, 2014, and we received $35 million from Janssen as an upfront payment.

We regained the global rights to imetelstat upon Janssen’s termination of the Collaboration Agreement effective September 28, 2018. As a result of the termination of the Collaboration Agreement, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat, including any clinical development or sales milestones, and Janssen has no further obligations to us or any third parties, such as clinical sites or vendors, to fund any of the ongoing or any potential future imetelstat clinical trials.

Under the termination provisions of the Collaboration Agreement, Janssen is required to provide certain operational support for the imetelstat program during transition of the program to us. The transition process is expected to occur through September 2019 to enable the orderly transfer of all ongoing clinical, regulatory, medical affairs and non-clinical activities to us, including the transfer of the sponsorship of ongoing imetelstat clinical trials from Janssen to us. Each company is responsible for costs incurred related to transition activities unless otherwise specified in the

Collaboration Agreement. Under the Collaboration Agreement, Janssen is required, among other things, to:

- assign all regulatory files and regulatory clearances specific to imetelstat to us, including sponsorship of the ongoing clinical trials, IMbark and the Phase 2 portion of IMerge;
- transfer all safety data to us;
- facilitate negotiations between us and any subcontractors of Janssen performing development or manufacturing activities related to imetelstat;
- transfer any remaining inventory of imetelstat to us at Janssen's cost plus a premium, and use commercially reasonable efforts to facilitate an orderly and prompt transition of manufacturing activities to us; and

- supply imetelstat drug product to us at Janssen's cost plus a premium for up to 24 months following the termination of the Collaboration Agreement, while we seek to re-establish our own supply chain for clinical manufacturing of imetelstat.

Until the sponsorship responsibilities for imetelstat transfers from Janssen to us, including the U.S. Investigational New Drug, or IND, application and all foreign regulatory applications, Janssen will continue conducting IMbark and the Phase 2 portion of IMerge. Patients currently enrolled in IMbark and the Phase 2 portion of IMerge will continue to receive treatment and follow-up under the respective trial protocols. After September 28, 2018, the effective termination date of the Collaboration Agreement, our responsibility for imetelstat development costs, including ongoing conduct of the extension phase of IMbark and the Phase 2 portion of IMerge, and costs for the prosecution of patents that were licensed to Janssen under the Collaboration Agreement increased from 50% to 100%. In the second quarter of 2018, Janssen informed us that no patients remain on study or in follow-up in the Pilot Study. Therefore, we expect Janssen to close the Pilot Study, and the related IND under which the Pilot Study has been conducted will be inactivated.

For a further discussion of the Collaboration Agreement, see Note 4 on License Agreements in Notes to Financial Statements of this Form 10-K. Information about the transition of the imetelstat program from Janssen to us should be reviewed in the context of the section entitled "Risks Related to Transition of the Imetelstat Program from Janssen to Geron" included in Item 1A, "Risk Factors" of this Form 10-K.

Other License Agreements

In addition to the above agreement, we have also granted licenses to a number of other organizations in the ordinary course of our business to utilize aspects of our technologies to develop and commercialize products outside of the imetelstat program. These include:

- a license to Janssen Pharmaceuticals, Inc., or Janssen Pharmaceuticals, an affiliate of Janssen, for the research, development and commercialization of products based on specialized oligonucleotide backbone chemistry and novel amidates for disorders, excluding cancers originating from the blood or bone marrow. In connection with this license, we also granted to Janssen Pharmaceuticals a non exclusive worldwide license under our patent rights covering the synthesis of monomers, which are the building blocks of oligonucleotides;
- two licenses, both of which will expire in 2019, to companies to use or commercialize telomerase immortalized cells in drug discovery research;
- six licenses, five of which will expire in 2019, to companies to develop and commercialize reagent kits, or to provide services, for the measurement of telomere length or telomerase activity for research purposes;
- a license to a company to develop and commercialize a particular telomerase based technology for cancer detection; and
- a license to a company for the development of cancer immunotherapies for veterinary applications.

See Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations—Revenues" for a further discussion of revenues from our license agreements. We expect revenues under our license agreements related to our telomerase technology to be eliminated by the end of 2019 due to upcoming patent expirations on such technology.

Concentration of Revenues

Our revenues were $1.1 million, $1.1 million and $6.2 million for the years ended December 31, 2018, 2017 and 2016, respectively. See Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations—Revenues" for additional detail regarding the composition of our revenues.

Manufacturing

A typical sequence of steps in the manufacture of imetelstat drug product includes the following key components:

- starting materials, which are well defined raw materials that are used to make bulk drug substance;

- bulk drug substance, which is the active pharmaceutical ingredient in a drug product that provides pharmacological activity or other direct effect in the treatment of disease; and
- final drug product, which is the finished dosage form that contains the drug substance that is shipped to the clinic for patient treatment.

In accordance with the termination provisions of the Collaboration Agreement, Janssen is required to supply imetelstat drug product to us at Janssen's cost plus a premium for up to 24 months following the termination of the Collaboration Agreement, while we seek to re-establish our own supply chain for clinical manufacturing of imetelstat. During the transition of the imetelstat program from Janssen to us, we plan to engage third party contractors to perform certain process development and other technical and scientific work with respect to imetelstat, as well as supply starting materials and manufacture drug substance and drug product. Many of these contractors previously had relationships with Geron related to the manufacture and/or supply of imetelstat.

We do not have direct control over third party personnel or operations. These third party contractors, and/or any other contractors that we may rely upon for the manufacture and/or supply of imetelstat, typically complete their services on a proposal by proposal basis under master supply agreements and may need to make substantial investments to enable sufficient capacity increases and cost reductions, and to implement those regulatory and compliance standards necessary for successful Phase 3 clinical trials and commercial production. These third party contractors, and/or any other contractors that we may rely upon for the manufacture and/or supply of imetelstat, may not be able to achieve such capacity increases, cost reductions, or regulatory and compliance standards, and even if they do, such achievements may not be at a commercially reasonable cost. We are responsible for establishing any long term commitments or commercial supply agreements with any of the third party contractors for imetelstat. The information provided in this section should be reviewed in the context of the section entitled "Risks Related to Manufacturing" and "Risks Related to Transition of the Imetelstat Program from Janssen to Geron" under Item 1A, "Risk Factors".

Consultants

To rebuild our drug development expertise, we have established, and expect to continue to establish, consulting agreements with drug development professionals, clinicians and regulatory experts with experience in numerous fields, including clinical science, biostatistics, clinical operations, pharmacovigilance, quality, manufacturing and regulatory affairs. We retain each consultant according to the terms of a consulting agreement. Under such agreements, we pay them a consulting fee and reimburse them for out of pocket expenses incurred in performing their services for us. In addition, we have in the past and may again in the future grant options to purchase our common stock to consultants, subject to the vesting requirements contained in the consulting agreements. Our consultants may be employed by other entities and therefore may have commitments to their employer, or may have other consulting or advisory agreements that may limit their availability to us.

Competition

The pharmaceutical and biotechnology industries are intensely competitive. Other pharmaceutical and biotechnology companies and research organizations currently engage in or have in the past engaged in efforts related to the biological mechanisms related to imetelstat, the study of telomeres, telomerase, or our proprietary oligonucleotide chemistry, and the research and development of therapies for the treatment of hematologic myeloid malignancies. In addition, other products and therapies that could directly compete with imetelstat currently exist or are being developed by pharmaceutical and biopharmaceutical companies and by academic institutions, government agencies and other public and private research organizations.

If approved for commercial sale for the treatment of lower risk MDS, imetelstat would compete against a number of treatment options, including erythropoiesis stimulating agents and other hematopoietic growth factors; immunomodulators, such as lenalidomide by Celgene Corporation, or Celgene,; hypomethylating agents, such as

azacitidine by Celgene and decitabine by Janssen; in addition to investigational treatments that may be further along in development than imetelstat, such as oral versions of azacitidine; histone deacetylase inhibitors; TGF-beta superfamily inhibitors, such as luspatercept by Acceleron Pharma, Inc., or Acceleron, in collaboration with Celgene; PI3 Kinase inhibitors; proteasome inhibitors; aminopeptidase inhibitors, such as tosedostat by CTI Biopharma

Corporation, or CTI Biopharma; TLR2-specific antibodies; TPO agonists, such as romiplostim by Amgen Inc.; anti-CD33 antibodies; anti-CD38 antibodies, such as daratumumab by Genmab A/S in collaboration with Janssen; anti-CD123 antibodies, such as talacotuzumab by Janssen; antagonists of Toll-like receptor signaling; retinoic acid receptor alpha agonists, such as SY-1425 by Syros Pharmaceuticals; hypoxia-inducible factor prolyl hydroxylase inhibitors, such as roxadustat by FibroGen, Inc.; Fas ligand inhibitors; immune checkpoint regulators; and JAK-STAT pathway inhibitors.

If approved for commercial sale for the treatment of MF, imetelstat would compete against Incyte Corporation's ruxolitinib, or Jakafi®, which is orally administered. In clinical trials, Jakafi® reduced spleen size, abdominal discomfort, early satiety, bone pain, night sweats and itching in MF patients. Recently, there have also been reports of overall survival benefit as well as improvement in bone marrow fibrosis from Jakafi® treatment. Other treatment modalities for MF include hydroxyurea for the management of splenomegaly, leukocytosis, thrombocytosis and constitutional symptoms; splenectomy and splenic irradiation for the management of splenomegaly and co-existing cytopenias, or low blood cell counts; chemotherapy and pegylated interferon. Drugs for the treatment of MF-associated anemia include erythropoiesis stimulating agents, androgens, danazol, corticosteroids, thalidomide and lenalidomide. There are other investigational treatments for MF further along in development than imetelstat, such as pacritinib by CTI Biopharma, momelotinib by Sierra Oncology, and fedratinib by Celgene, which have reported results from Phase 3 clinical trials. Other investigational treatments for MF include inhibitors of the JAK-STAT pathway, such as NS-018 by NS Pharma, Inc.; histone deacetylase inhibitors; interleukin-3 receptor targeted agents; inhibitors of heat shock protein 90; hypomethylating agents; PI3 Kinase and mTOR inhibitors; anti-fibrosis antibodies, such as PRM-151 from Promedior, Inc.; hedgehog and SMO inhibitors; PIM kinase inhibitors; IAP inhibitors; anti-LOX2 inhibitors; recombinant pentraxin 2 protein; KIP-1 activators; TGF-beta superfamily inhibitors, such as sotatercept and luspatercept by Acceleron, in collaboration with Celgene; FLT inhibitors; BET inhibitors, such as CPI-0610 by Constellation Pharmaceuticals, Inc.; SMAC mimetics, such as LCL161 by Novartis Pharmaceuticals Corporation; and tyrosine kinase inhibitors.

Smaller companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. We anticipate increased competition in the future as new companies explore treatments for hematologic myeloid malignancies, which may significantly impact the commercial viability of imetelstat. Academic institutions, government agencies and other public and private research organizations may also conduct research, seek patent protection and establish collaborative arrangements for research, clinical development and marketing of products similar to imetelstat. These companies and institutions compete with us in recruiting and retaining qualified development and management personnel as well as in acquiring technologies complementary to the imetelstat program.

In addition to the above factors, imetelstat will face competition based on:

- product efficacy and safety;
- convenience of product administration;
- cost of manufacturing;
- the timing and scope of regulatory consents;
- status of coverage and reimbursement;
- price; and
- patent position, including potentially dominant patent positions of others.

As a result of the foregoing, competitors may develop more commercially desirable or affordable products than imetelstat, or achieve earlier patent protection or product commercialization than we may be able to achieve with imetelstat. Competitors have developed, or are in the process of developing, technologies that are, or in the future may be, competitive to imetelstat. Some of these products may have an entirely different approach or means of accomplishing therapeutic effects similar or superior to those that may be demonstrated by imetelstat. Competitors

may develop products that are safer, more effective, or less costly than imetelstat, or more convenient to administer to patients and, therefore, present a serious competitive threat to imetelstat. In addition, competitors may price their

products below what we may determine to be an acceptable price for imetelstat, may receive better third-party payor coverage and/or reimbursement, or may be more cost-effective than imetelstat. Such competitive products or activities by competitors may render imetelstat obsolete, which may cause us to cease any further development or future commercialization of imetelstat, which would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

Government Regulation

Regulation by governmental authorities in the United States and other countries is a significant factor in the development, manufacture and marketing of imetelstat. Imetelstat will require regulatory approval by governmental agencies prior to commercialization. In particular, potential human therapeutic products, such as imetelstat, are subject to rigorous preclinical and clinical testing and other approval procedures of the FDA and similar regulatory authorities in European and other countries. Various governmental statutes and regulations also govern or influence testing, manufacturing, safety, labeling, storage, import, export, distribution and recordkeeping related to such products and their marketing. The process of obtaining these approvals and the subsequent compliance with appropriate statutes and regulations require the expenditure of substantial time and money, and there can be no guarantee that approvals will be granted. The information provided in this section should be reviewed in the context of the sections entitled “Risks Related to the Development of Imetelstat” and “Risks Related to Regulatory Approval and Commercialization of Imetelstat” under Item 1A, “Risk Factors”.

United States Food and Drug Administration Regulatory Approval Process

Prior to commencement of clinical trials involving humans, preclinical testing of new pharmaceutical products is generally conducted on animals in the laboratory to evaluate the potential efficacy and safety of a product candidate. The results of these trials are submitted to the FDA as part of an Investigational New Drug, or IND, application, which must become effective before clinical testing in humans can begin. The FDA can place an IND on clinical hold at any time, which prevents the conduct of clinical trials under the IND until safety concerns are addressed by the IND sponsor to the FDA’s satisfaction. Typically, clinical evaluation involves a time consuming and costly three phase trial process. In Phase 1, clinical trials are conducted with a small number of healthy volunteers or patients afflicted with a specific disease to assess safety and to evaluate the pattern of drug distribution and metabolism within the body. In Phase 2, clinical trials are conducted with groups of patients afflicted with a specific disease in order to determine preliminary efficacy, optimal dosages and expanded evidence of safety. The Phase 2 trials can be conducted comparing the investigational treatment to a comparator arm, or not. If used, a comparator usually includes standard of care therapy. Safety and efficacy data from Phase 2 clinical trials, even if favorable, may not provide sufficient rationale for proceeding to a Phase 3 clinical trial. In Phase 3, large scale, multi center, comparative trials are conducted with patients afflicted with a target disease to provide sufficient data to demonstrate the efficacy and safety required by the FDA. The FDA closely monitors the progress of each of the three phases of clinical testing and may, at its discretion, re evaluate, alter, suspend, or terminate the trials. Human clinical trials must be conducted in compliance with Good Clinical Practice regulations and applicable laws, with the oversight of Institutional Review Boards for the protection of human subjects. The manufacture of drug product candidates is subject to requirements that drugs be manufactured, packaged and labeled in conformity with current Good Manufacturing Practices and applicable laws.

The results of the preclinical and clinical testing of drugs and complete manufacturing information are submitted to the FDA in the form of a New Drug Application, or NDA, for review and for approval prior to commencement of commercial sales. Submission of an NDA requires the payment of a substantial user fee to the FDA, which may be waived in certain cases. In responding to an NDA submission, the FDA may approve the drug for commercialization, impose limitations on its indications for use and labeling, including in the form of Risk Evaluation and Mitigation Strategies or may issue a complete response letter. Even if an NDA is approved, its sponsor is subject to ongoing and

pervasive regulatory compliance requirements.

European and Other Regulatory Approval Process

Prior to initiating clinical trials in a region outside of the United States, a clinical trial application must be submitted and reviewed by the appropriate regulatory authority regulating the country in which the trial will be conducted. Whether or not FDA clearance or approval has been obtained, approval of a product by comparable regulatory authorities in Europe and other countries is necessary prior to commencement of marketing the product in

such countries. The regulatory authorities in each country may impose their own requirements and may refuse to grant an approval, or may require additional data before granting it, even though the relevant product has been cleared or approved by the FDA or another authority. As with the FDA, the regulatory authorities in the European Union, or EU, and other developed countries have lengthy approval processes for pharmaceutical products. The process for gaining approval in particular countries varies, but generally follows a similar sequence to that described for FDA approval. In Europe, the European Medicine Agency, or EMA, and the European Committee for Proprietary Medicinal Products, or CPMP, provide a mechanism for EU member states to exchange information on all aspects of product licensing. The EU has established the EMA for the evaluation of medical products, with both a centralized procedure with which the marketing authorization is recognized in all EU member states and a decentralized procedure, the latter being based on the principle of licensing within one member country followed by mutual recognition by the other member countries.

Orphan Drug Designation

For a drug to qualify for orphan drug designation by the FDA, both the drug and the disease or condition must meet certain criteria specified in the Orphan Drug Act, or ODA, and FDA's implementing regulations. Orphan drug designation is granted by the FDA's Office of Orphan Drug Products in order to support development of medicines for underserved or rare diseases and patient populations that affect fewer than 200,000 people in the United States or, if the disease or condition affects more than 200,000 individuals annually in the United States, if there is no reasonable expectation that the cost of developing and making the drug would be recovered from sales in the United States. Orphan drug designation qualifies the sponsor of the drug for various development incentives of the ODA, including, if regulatory approval is received, the potential for seven years of market exclusivity with certain limited exceptions and certain tax credits for qualified clinical testing. A marketing application for a prescription drug product that has received orphan drug designation is not subject to a prescription drug user fee unless the application includes an indication for a disease or condition other than the rare disease or condition for which the drug was granted orphan drug designation. The granting of orphan drug designation does not alter the standard regulatory requirements and process for obtaining marketing approval. The safety and effectiveness of a drug must be established through adequate and well controlled studies. Orphan drug exclusivity does not prevent the FDA from approving a different drug for the same disease or condition, or the same drug for a different disease or condition.

On June 11, 2015 and December 23, 2015, the FDA granted orphan drug designation to imetelstat for the treatment of MF and MDS, respectively.

Orphan drug designation by the European Commission provides regulatory and financial incentives for companies to develop and market therapies that treat a life threatening or chronically debilitating condition affecting no more than five in 10,000 persons in the EU, and where no satisfactory treatment is available. In the EU, orphan drug designation also entitles a party to financial incentives such as reduction of fees or fee waivers, as well as protocol assistance from the EMA during the product development phase, and direct access to the centralized authorization procedure. In addition, ten years of market exclusivity is granted following drug product approval, meaning that another application for marketing authorization of a later similar medicinal product for the same therapeutic indication will generally not be approved in the EU. This period may be reduced to six years if the orphan drug designation criteria are no longer met, including where it is shown that the product is sufficiently profitable to not justify maintenance of market exclusivity.

On December 14, 2015, the EMA granted orphan drug designation to imetelstat for the treatment of MF.

Fast Track Designation

Fast Track designation provides opportunities for frequent interactions with FDA review staff, as well as eligibility for priority review, if relevant criteria are met, and rolling review. Fast Track designation is intended to facilitate and expedite development and review of a New Drug Application to address unmet medical needs in the treatment of serious or life-threatening conditions. However, Fast Track designation does not accelerate conduct of clinical trials or mean that the regulatory requirements are less stringent, nor does it ensure that imetelstat will receive marketing approval or that approval will be granted within any particular timeframe. In addition, the FDA may withdraw Fast Track designation if it believes that the designation is no longer supported by data emerging from the imetelstat clinical development program.

In October 2017, the FDA granted Fast Track designation to imetelstat for the treatment of adult patients with transfusion-dependent anemia due to Low or Intermediate-1 risk MDS who are non-del(5q) and who are refractory or resistant to treatment with an ESA.

Fraud and Abuse, Data Privacy and Security, and Transparency Laws and Regulations

We may also be subject to additional healthcare regulation and enforcement by the federal government and by authorities in the states and foreign jurisdictions in which we conduct our business. These additional healthcare regulations could affect our current and future arrangements with healthcare professionals, principal investigators, consultants, customers and third party payors. Such laws include, without limitation, state and federal anti kickback, fraud and abuse, false claims, privacy and security, and physician payment sunshine laws.

The federal Anti Kickback Statute makes it illegal for any person or entity, including a prescription drug manufacturer (or a party acting on its behalf) to knowingly and willfully, directly or indirectly, solicit, receive, offer, or pay any remuneration that is intended to induce the referral of business, including the purchase, order, or lease of any good, facility, item or service for which payment may be made under a federal healthcare program, such as Medicare or Medicaid. The term "remuneration" has been broadly interpreted to include anything of value. Several courts have interpreted the statute's intent requirement to mean that if any one purpose of an arrangement involving remuneration is to induce referrals of federal healthcare covered business, the Anti Kickback Statute has been violated. The Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Reconciliation Act, collectively the Affordable Care Act or ACA, among other things, amended the intent requirement of the federal Anti Kickback Statute such that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate, in order to commit a violation.

Federal civil and criminal false claims and false statement laws, including the federal civil False Claims Act and its whistleblower or qui tam provisions that permit private individuals to bring an action on behalf of the government to enforce the civil False Claims Act, prohibit, among other things, any person or entity from knowingly presenting, or causing to be presented, for payment to, or approval by, federal programs, including Medicare and Medicaid, claims for items or services, including drugs, that are false or fraudulent or not provided as claimed. Entities can be held liable under these laws if they are deemed to "cause" the submission of false or fraudulent claims by, for example, providing inaccurate billing or coding information to customers, promoting a product off label, or for providing medically unnecessary services or items. In addition, a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act. Criminal prosecution is also possible for making or presenting a false, fictitious or fraudulent claim to the federal government.

The federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, created criminal and civil liability for, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third party payors, knowingly and willfully embezzling or stealing from a healthcare benefit program, willfully obstructing a criminal investigation of a healthcare offense, and knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of or payment for healthcare benefits, items or services.

HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, or HITECH, and their implementing regulations, imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security, transmission and breach reporting of individually identifiable health information, upon entities subject to the law, such as health plans, healthcare clearinghouses and certain healthcare providers and their respective business associates that perform services for them that involve individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal

penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in U.S. federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions.

The federal Physician Payments Sunshine Act requires certain manufacturers of drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program, with specific exceptions, to report annually to the Centers for Medicare & Medicaid Services, or CMS,

information related to payments or other transfers of value made to physicians and teaching hospitals, and applicable manufacturers and applicable group purchasing organizations to report annually to CMS ownership and investment interests held by physicians and their immediate family members.

Analogous state and foreign laws and regulations, such as state anti kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non governmental third-party payors, including private insurers. Additionally, we may be subject to state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government. Further, we may be subject to state laws that require drug manufacturers to report information related to payments and other transfers of value to physicians, other healthcare providers and healthcare entities, or marketing expenditures, as well as state and local laws that require the registration of pharmaceutical sales representatives; state laws that require the reporting of information related to drug pricing; and state and foreign laws governing the privacy and security of health information, including the General Data Protection Regulation, or GDPR, from the European Union, or EU, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Efforts to ensure that our current and future business arrangements will comply with applicable healthcare, privacy and data security laws and regulations will involve substantial costs. For example, the GDPR, which became effective on May 25, 2018, imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, the security and confidentiality of the personal data, data breach notification and the use of third-party processors in connection with the processing of personal data. The GDPR also imposes strict rules on the transfer of personal data out of the EU, provides an enforcement authority and authorizes the imposition of large penalties for noncompliance, including the potential for fines of up to €20 million or 4% of the annual global revenues of the noncompliant company, whichever is greater. The GDPR has increased our responsibility and potential liability in relation to personal data that we process or control compared to prior EU law, including in clinical trials, and we may be required to put in place additional mechanisms to ensure compliance with the GDPR, which could divert management's attention and increase our cost of doing business. Likewise, we expect that there will continue to be new proposed laws, regulations and industry standards relating to privacy and data protection in the United States, the EU and other jurisdictions, such as the California Consumer Privacy Act of 2018, which has been characterized as the first "GDPR-like" privacy statute to be enacted in the United States because it mirrors a number of the key provisions in the GDPR, that will go into effect beginning January 1, 2020, and we cannot determine the impact that such laws, regulations and standards will have on our business. In any event, it is possible that governmental authorities will conclude that our business practices do not comply with current or future statutes, regulations, agency guidance or case law involving applicable healthcare or privacy laws, including the GDPR, in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry.

If our operations are found to be in violation of any of these or any other healthcare and privacy-related regulatory laws that may apply to us, we may be subject to significant penalties, including the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, disgorgement, imprisonment, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, reputational harm, diminished profits and future earnings, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations. Defending against any such actions can be costly, time-consuming and may require significant financial and personnel resources. Therefore, even if we are successful in defending against any such actions that may be brought against us, our business may be impaired.

Reimbursement and Healthcare Reform

Significant uncertainty exists as to the coverage and reimbursement status of any product candidate that receives regulatory approval. In the United States and markets in other countries, sales of imetelstat, if approved for commercial sale, will depend, in part, on the extent to which third party payors provide coverage and establish adequate reimbursement levels for imetelstat.

In the United States, third party payors include federal and state healthcare programs, government authorities, private managed care providers, private health insurers and other organizations. There has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and federal and state legislative activity designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, reduce the cost of drugs under Medicare, and reform government program reimbursement methodologies for drugs, some of which are included in the Trump Administration's budget proposal for fiscal year 2019. Additionally, at the federal level, the Trump Administration released a "Blueprint" that contains additional proposals to increase manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products and reduce the out of pocket costs of drug products paid by consumers. On January 31, 2019, the U.S. Department of Health and Human Services, Office of Inspector General, proposed modifications to federal Anti-Kickback Statute safe harbors which, among other things, will affect rebates paid by manufacturers to Medicare Part D plans, the purpose of which is to further reduce the cost of drug products to consumers. While a number of these and other proposed measures may require authorization through additional legislation to become effective, Congress and the Trump Administration have each indicated that they will continue to seek new legislative and/or administrative measures to control drug costs. At the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, to encourage importation from other countries and bulk purchasing. Further, third party payors are increasingly challenging the price, examining the medical necessity and reviewing the cost effectiveness of medical drug products and medical services, in addition to questioning their safety and efficacy. Such payors may limit coverage to specific drug products on an approved list, also known as a formulary, which might not include all of the FDA approved drugs for a particular indication. We may need to conduct expensive pharmaco economic studies in order to demonstrate the medical necessity and cost effectiveness of imetelstat, in addition to the costs required to obtain the FDA approvals. Nonetheless, imetelstat may not be considered medically necessary or cost effective.

Moreover, the process for determining whether a third party payor will provide coverage for a drug product may be separate from the process for setting the price of a drug product or for establishing the reimbursement rate that such a payor will pay for the drug product. A payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Further, one payor's determination to provide coverage for a drug product does not assure that other payors will also provide coverage for the drug product, as there is no uniform coverage and reimbursement policy among third-party payors in the United States. Adequate third party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in imetelstat.

The United States and some foreign jurisdictions are considering or have enacted legislative and regulatory proposals to contain healthcare costs, as well as to improve quality and expand access. For example, in March 2010, the ACA, was signed into law that included a number of provisions of importance to the biopharmaceutical industry. Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump Administration to repeal or replace certain aspects of the ACA. For example, since January 2017, President Trump has signed two executive orders and other directives designed to delay, circumvent, or loosen certain requirements mandated by the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, two bills affecting the implementation of certain taxes under the ACA have been signed into law. The Tax Cuts and Jobs Act of 2017, or Tax Act, includes a provision which repealed, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year, that is commonly referred to as the "individual mandate." On January 22, 2018, President Trump signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain

ACA-mandated fees.

The Bipartisan Budget Act of 2018, among other things, amended the ACA, effective January 1, 2019, to close the coverage gap in most Medicare Part D drug plans, commonly referred to as the “donut hole”. In July 2018, CMS published a final rule permitting further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA risk adjustment program in response to the outcome of federal district court litigation regarding the method CMS uses to determine this risk adjustment. On December 14, 2018, a Texas U.S.

District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA. We expect that other healthcare reform measures that may be adopted in the future may result in more rigorous coverage criteria and lower reimbursement, and additional downward pressure on the price that may be charged for imetelstat.

In addition, other legislative changes have been proposed and adopted since the ACA was enacted. For example, in August 2011, the Budget Control Act of 2011 was enacted, which, among other things, created the Joint Select Committee on Deficit Reduction to recommend to Congress proposals in spending reductions. The Joint Select Committee on Deficit Reduction did not achieve a targeted deficit reduction of at least $1.2 trillion for fiscal years 2012 through 2021, triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, which went into effect beginning on April 1, 2013 and, due to subsequent legislative amendments to the statute, including the Bipartisan Budget Act of 2018, will stay in effect through 2027 unless additional Congressional action is taken. Additionally, in January 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, reduced Medicare payments to several providers, including hospitals and imaging centers. More recently, there has been heightened governmental scrutiny in the United States to control the rising cost of healthcare.

Executive Officers of the Company

The following table sets forth certain information with respect to our executive officers as of January 31, 2019:

Name	Age	Position
John A. Scarlett, M.D.	67	President, Chief Executive Officer and Chairman of the Board
Olivia K. Bloom	50	Executive Vice President, Finance, Chief Financial Officer and Treasurer
Melissa A. Kelly Behrs	55	Executive Vice President and Chief Business Officer
Andrew J. Grethlein, Ph.D.	54	Executive Vice President and Chief Operating Officer
Aleksandra Rizo, M.D., Ph.D.	44	Executive Vice President and Chief Medical Officer
Stephen N. Rosenfield, J.D.	69	Executive Vice President, Chief Legal Officer and Corporate Secretary

John A. Scarlett, M.D., has served as our Chief Executive Officer and a director since September 2011 and President since January 2012 and was appointed to Chairman of the Board in December 2018. Dr. Scarlett has served as a director for Chiasma, Inc., a biopharmaceutical company focused on transforming injectable drugs into oral medications, since February 2015 and CytomX Therapeutics, Inc., a biopharmaceutical company focused on developing antibody therapeutics for the treatment of cancer, since June 2016. Prior to joining Geron, Dr. Scarlett served as President, Chief Executive Officer and a member of the board of directors of Proteolix, Inc., a privately held, oncology oriented biopharmaceutical company, from February 2009 until its acquisition by Onyx Pharmaceuticals, Inc., an oncology oriented biopharmaceutical company, in November 2009. From February 2002 until its acquisition by Ipsen, S.A. in October 2008, Dr. Scarlett served as the Chief Executive Officer and a member of the board of directors of Tercica, Inc., an endocrinology oriented biopharmaceutical company, and also as its President from February 2002 through February 2007. From March 1993 to May 2001, Dr. Scarlett served as President and Chief Executive Officer of Sensus Drug Development Corporation. In 1995, he co founded Covance Biotechnology Services, Inc., a contract biopharmaceutical manufacturing operation, and served as a member of its

board of directors from inception to 2000. From 1991 to 1993, Dr. Scarlett headed the North American Clinical Development Center and served as Senior Vice President of Medical and Scientific Affairs at Novo Nordisk Pharmaceuticals, Inc., a wholly owned subsidiary of Novo Nordisk A/S. Dr. Scarlett received his B.A. degree in chemistry from Earlham College and his M.D. from the University of Chicago, Pritzker School of Medicine.

Olivia K. Bloom has served as our Executive Vice President, Finance since February 2014, Chief Financial Officer since December 2012 and Treasurer since February 2011. Ms. Bloom previously served as our Senior Vice President, Finance from December 2012 to February 2014, Chief Accounting Officer from September 2010 to December 2012 and Vice President, Finance from January 2007 to December 2012. Ms. Bloom joined the Company in 1994 as a Senior Financial Analyst and from 1996 to 2011 served as our Controller. Prior to joining Geron, Ms. Bloom started her career in public accounting at KPMG Peat Marwick and became a Certified Public Accountant in 1994. Ms. Bloom graduated Phi Beta Kappa with a B.S. in Business Administration from the University of California at Berkeley.

Melissa A. Kelly Behrs has served as our Executive Vice President and Chief Business Officer since January 2019. Previously, she was our Executive Vice President, Business Development and Portfolio & Alliance Management, from February 2014 to January 2019, and our Senior Vice President, Portfolio and Alliance Management from September 2012 to February 2014. Ms. Behrs joined Geron in November 1998 as Director of Corporate Development. Since then, she has also served in various managerial positions, including General Manager, R&D Technologies; Vice President, Corporate Development; Senior Vice President, Therapeutic Development, Oncology; and Senior Vice President, Strategic Portfolio Management. From 1990 to 1998, Ms. Behrs worked at Genetics Institute, Inc., a biotechnology research and development company, serving initially as Assistant Treasurer and then as Associate Director of Preclinical Operations where she was responsible for all business development, regulatory, and project management activities for the Preclinical Development function. Ms. Behrs received a B.S. from Boston College and an M.B.A. from Babson College.

Andrew J. Grethlein, Ph.D., has served as our Executive Vice President and Chief Operating Officer since January 2019. Previously, he served as our Executive Vice President, Development and Technical Operations, from July 2014 to January 2019. He joined Geron in September 2012 as our Executive Vice President, Technical Operations. Prior to joining Geron, Dr. Grethlein was Executive Vice President and Chief Operating Officer for Inspiration Biopharmaceuticals, a biopharmaceutical company, from January 2010 to September 2012. From October 2008 until January 2010, Dr. Grethlein was Senior Vice President of Biotechnology and Portfolio Management Team Leader for Hematology at Ipsen S.A., a global specialty pharmaceutical company. His responsibilities at Ipsen included planning and execution of worldwide strategy for product and portfolio development in the hematologic therapeutic area. From 2003 to 2008, Dr. Grethlein served as Senior Vice President of Pharmaceutical Operations at Tercica, Inc., an endocrinology oriented biopharmaceutical company, where he was a member of the senior executive team that governed corporate strategy, business planning and company operations, and had responsibility for all manufacturing and quality functions. Before joining Tercica, Dr. Grethlein served in various positions at Elan Corporation, a biotechnology company, from 1997 to 2003, including as Senior Director, South San Francisco Pharmaceutical Operations. From 1995 to 1997, Dr. Grethlein served as Manager, Biologics Development and Manufacturing, for Athena Neurosciences, Inc., a pharmaceutical company. Prior to this, he served in various engineering positions for the Michigan Biotechnology Institute, a nonprofit technology research and business development corporation. Dr. Grethlein received his A.A. degree in liberal arts from Simon’s Rock Early College, his B.S. in biology from Bates College, and his M.S. and Ph.D. in chemical engineering from Michigan State University.

Aleksandra Rizo, M.D., Ph.D., has served as our Executive Vice President and Chief Medical Officer since January 2019. Prior to joining Geron, Dr. Rizo was Executive Director, Strategy and Clinical Lead at Celgene Corporation, a biopharmaceutical company, from March 2018 to January 2019, where she led submission activities and participated in strategic and business development initiatives. From October 2008 to March 2018, Dr. Rizo served in a number of oncology drug development functions at Janssen Research and Development, LLC, a pharmaceutical company, including Senior Director, Compound Development Team Leader for all Phase 1 myeloid assets, and Global Clinical Leader for all late-stage myeloid assets, including imetelstat from November 2014 to March 2018, as well as Global Clinical Leader for the ibrutinib mantle cell lymphoma program. In these roles, she had oversight and leadership responsibilities for overall clinical development strategy, study designs, execution and data interpretation. In addition,

Dr. Rizo was a core member of Janssen's Hematology Strategy Team where she participated and led diligence projects in hematology. During her initial tenure with Janssen, Dr. Rizo also worked on a variety of Velcade clinical trials in lymphoma and multiple myeloma. Dr. Rizo holds an M.D. from the University Ss Cyril and Methodius, Skopje, Macedonia, where she also completed a residency in internal medicine/hematology. She also has a Ph.D. in human leukemic stem cell biology from the University of Groningen, Groningen, Netherlands, and a Ph.D. in mouse stem cell biology from the University of Tokyo, Tokyo, Japan.

Stephen N. Rosenfield, J.D., has served as our Executive Vice President, Chief Legal Officer and Corporate Secretary since January 2019. Previously, he served as our Executive Vice President, General Counsel and Corporate Secretary from February 2012 to January 2019, General Counsel and Secretary since January 2012 and Secretary since October 2011. From July 2009 to February 2012, Mr. Rosenfield served as a consultant to private companies. From June 2004 until June 2009, Mr. Rosenfield held several positions at Tercica, Inc., an endocrinology oriented biopharmaceutical company, and through its acquisition by Ipsen, S.A. in October 2008, including General Counsel and Secretary. Prior to joining Tercica, Mr. Rosenfield served as the Executive Vice President of Legal Affairs, General Counsel and Secretary of InterMune, Inc., a biotechnology company that focused on pulmonology and fibrotic diseases. Prior to joining InterMune, Mr. Rosenfield was an attorney at Cooley LLP, an international law firm, where he served as outside counsel for biotechnology and technology clients. Mr. Rosenfield received a B.S. from Hofstra University and a J.D. from Northeastern University School of Law.

Employees

As of December 31, 2018, we had 17 full time employees and one part time employee. One of our employees holds a Ph.D. degree and seven hold other advanced degrees. Of this current total workforce, three employees were engaged in, or directly supported, our research and development activities, and 15 employees were engaged in business development, legal, finance and administration. None of our employees are covered by a collective bargaining agreement; nor have we experienced work stoppages. We consider relations with our employees to be good.

Corporate Information

Geron Corporation was incorporated in the State of Delaware on November 28, 1990.

Available Information

Our internet address is www.geron.com. Information included on our website is not part of this annual report on Form 10 K. We make available free of charge on our website our annual reports on Form 10 K, quarterly reports on Form 10 Q, current reports on Form 8 K, and all amendments to those reports as soon as reasonably practicable after such material is electronically filed with or furnished to the United States Securities and Exchange Commission, or the SEC. In addition, copies of our annual reports are available free of charge upon written request.

ITEM 1A. RISK FACTORS

Our business is subject to various risks and uncertainties that may have a material adverse effect on our business, financial condition or results of operations. You should carefully consider the risks and uncertainties described below, together with all of the other information included in this annual report on Form 10 K. Our business faces significant risks and uncertainties, and those described below may not be the only risks and uncertainties we face. Additional risks and uncertainties not presently known to us or that we currently believe are immaterial may also significantly impair our business, financial condition or results of operations. If any of these risks or uncertainties occur, our business, financial condition or results of operations could suffer, the market price of our common stock could decline and you could lose all or part of your investment in our common stock.

RISKS RELATED TO THE DEVELOPMENT OF IMETELSTAT

Our future success depends solely on imetelstat, our only product candidate, and we cannot be certain that we will be able to continue to develop imetelstat or advance imetelstat to subsequent clinical trials, or that we will be able to receive regulatory approval for imetelstat on a timely basis, or at all.

Imetelstat is our sole product candidate, upon whose success we are wholly dependent. We do not have any other products or product candidates. Our ability to develop imetelstat to and through regulatory approval and commercial launch is subject to significant risks and uncertainties, including, among other things, our ability to:

- cause the IND for imetelstat to be maintained without such IND being placed on full or partial clinical hold by the FDA;
- generate additional safety and efficacy data from existing and potential future clinical trials of imetelstat, providing a positive benefit-risk profile that supports the continued and future development of imetelstat in hematologic myeloid malignancies;
- ascertain that the use of imetelstat does not result in significant systemic or organ toxicities, including hepatotoxicity, or other safety issues resulting in an unacceptable benefit-risk profile;
- develop clinical plans for, and successfully enroll and complete, potential future clinical trials of imetelstat in hematologic myeloid malignancies, including the Phase 3 portion of IMerge;
- collaborate successfully with clinical trial sites, academic institutions, clinical research organizations, physician investigators and other third parties;
- obtain required regulatory clearances and approvals for imetelstat; for example, it is uncertain:
  - whether the FDA and regulatory authorities in other countries will require us to obtain and submit additional non-clinical, manufacturing, or clinical data to proceed with any potential future clinical trials,
  - how the FDA and other regulatory authorities will interpret safety and efficacy data from any clinical trial, including from IMbark or IMerge,
  - what scope and type of clinical development and other data will be required before the FDA and other regulatory authorities might grant us marketing approval, if any, and
  - what the length of time and cost for us will be to complete any such requirements;
- enter into and maintain arrangements with third parties to provide services needed to further research and develop imetelstat, including maintaining the agreement with our CRO, or to manufacture imetelstat, in each case at commercially reasonable costs;
- enter into and maintain arrangements with third parties, or establish internal capabilities, to provide sales, marketing and distribution functions in compliance with applicable laws;
- obtain appropriate coverage and reimbursement levels for the cost of imetelstat from governmental authorities, private health insurers and other third-party payors;
- maintain and enforce adequate intellectual property protection for imetelstat;

27

- maintain adequate financial resources and personnel to advance imetelstat to and through potential future clinical trials, regulatory approval and commercial launch; and
- obtain funding necessary to fund our operations and to advance the development of imetelstat on commercially reasonable terms, including completion of the Phase 3 portion of IMerge and potential clinical development of other indications.

If we are not able to successfully achieve the above-stated goals and overcome other challenges that we may encounter in the research, development, manufacturing and potential commercialization of imetelstat, we may be forced to abandon our development of imetelstat, which would severely harm our business and prospects, and might cause us to cease operations.

Commencement of potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, and completion of the extension phase of IMbark and the Phase 2 portion of IMerge, could be interrupted, further delayed or abandoned for a variety of reasons.

Currently, there are two active clinical trials of imetelstat, the extension phase of IMbark and the Phase 2 portion of IMerge. Completion of these clinical trials, and the commencement of any potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, could be interrupted, delayed or abandoned for a variety of reasons, including as a result of failures or delays in:

- the comprehensive transition of the imetelstat program from Janssen to us, as discussed in more detail under the heading, “Risks Related to Transition of the Imetelstat Program from Janssen to Geron”;
- demonstrating sufficient safety and efficacy of imetelstat in IMerge and any potential future clinical trials, without safety issues, side effects or dose-limiting toxicities, including any additional or more severe safety issues in addition to those that have been observed to date in previous or ongoing clinical trials related to imetelstat, whether or not in the same indications or therapeutic areas;
- obtaining or maintaining regulatory clearances in the United States or other countries to conduct clinical trials, such as obtaining or maintaining regulatory clearances to commence, conduct or modify current or potential future clinical trials of imetelstat, in a timely manner, or at all, which could, for example, cause the anticipated commencement of the Phase 3 portion of IMerge to be delayed beyond mid-year 2019 or prevent us from commencing or completing the Phase 3 portion of IMerge;
- maintaining the IND for imetelstat without such IND being placed on full or partial clinical hold, suspended or subject to other requirements by the FDA or other regulatory authorities;
- properly (i) completing the extension phase of IMbark, including collecting data about serious adverse events and overall survival from the extension phase of IMbark; (ii) completing the Phase 2 portion of IMerge, including assessing the durability of RBC-TI responses; and (iii) designing, enrolling, conducting and completing the Phase 3 portion of IMerge, and promptly or adequately reporting data from such trials;
- determining, after consultations with experts in MF and discussions with regulatory authorities, whether the results from the IMbark primary analysis provide a feasible registration path, if any, for imetelstat in Intermediate-2 or High risk MF patients who have relapsed after or are refractory to prior treatment with a JAK inhibitor;
- obtaining or accessing necessary clinical data in accordance with appropriate clinical or quality practices to ensure complete data sets;
- responding to safety findings by the data review committees of current clinical trials, including the extension phase of IMbark and the Phase 2 portion of IMerge, and safety or futility findings by the data review committees of potential future clinical trials of imetelstat, such as the Phase 3 portion of IMerge, based on emerging data occurring during such clinical trials, such as significant systemic or organ toxicities, including severe cytopenias, hepatotoxicity, fatal bleeding with or without any associated thrombocytopenia, patient injury or death, or other safety issues, resulting in an unacceptable benefit-risk profile;
- obtaining funding on commercially reasonable terms necessary to advance the development of imetelstat;

- manufacturing sufficient quantities of imetelstat or other clinical trial materials in a manner that meets the quality standards of the FDA and other regulatory authorities, and responding to any disruptions to drug supply, clinical trial materials or quality issues that may arise;
- ensuring the ability to manufacture imetelstat at acceptable costs for potential Phase 3 clinical trials and commercialization;
- obtaining sufficient quantities of any study-related treatments, materials (including comparator products, placebo or combination therapies) or ancillary supplies;
- obtaining acceptance by regulatory authorities of manufacturing changes, as well as successfully implementing any such manufacturing changes;
- complying with current and future regulatory requirements, policies or guidelines, including domestic and international laws and regulations pertaining to fraud and abuse, transparency, and the privacy and security of health information;
- reaching agreement on acceptable terms and on a timely basis, if at all, with collaborators and vendors located in the United States or foreign jurisdictions, including contract research organizations, laboratory service providers and clinical trial sites, on all aspects of clinical development;
- obtaining timely review and clearances by regulatory authorities of future protocol amendments which may be sought for the Phase 3 portion of IMerge and potential future clinical trials of imetelstat, including responding to questions or comments from these authorities in a timely and adequate manner, which could, for example, cause the anticipated commencement of the Phase 3 portion of IMerge to be delayed beyond mid-year 2019 or prevent us from commencing or completing the Phase 3 portion of IMerge; and
- obtaining institutional review board or ethics committee approval of clinical trial protocols or protocol amendments, including any future refinements to the trial design we may seek for the Phase 3 portion of IMerge, which could, for example, cause the anticipated commencement of the Phase 3 portion of IMerge to be delayed beyond mid-year 2019 or prevent us from commencing or completing the Phase 3 portion of IMerge.

Failures or delays with respect to any of these events could adversely affect our ability to continue or successfully complete the extension phase of IMbark or the Phase 2 portion of IMerge or to commence potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, which could increase development costs, or interrupt, further delay or halt our development or commercialization of imetelstat, any of which could severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

Imetelstat may cause, or have attributed to it, undesirable or unintended side effects or other adverse events that further delay or prevent the commencement and/or completion of clinical trials for imetelstat, further delay or prevent its regulatory approval, or limit its commercial potential.

Imetelstat may cause, or have attributed to it, undesirable or unintended side effects or other adverse events affecting its safety or efficacy that could interrupt, further delay or halt current or potential future clinical trials of imetelstat. For example, adverse events and dose-limiting toxicities observed in previous clinical trials of imetelstat include:

- hematologic toxicities, such as profound and/or prolonged thrombocytopenia or neutropenia, including one case of febrile neutropenia after prolonged myelosuppression with intracranial hemorrhage resulting in patient death, which the investigator assessed as possibly related to imetelstat;
- bleeding events, with or without thrombocytopenia;
- liver function test, or LFT, abnormalities, the clinical significance and long-term consequences of which are currently undetermined;
- gastrointestinal events;
- infections;

- muscular and joint pain;
- fatigue; and
- infusion reactions.

Such adverse events and other safety issues, including deaths, were also observed in IMbark and the Phase 2 portion of IMerge. If patients in any potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, experience similar or more severe adverse events, or new or unusual adverse events, or if the FDA or other regulatory authorities determine that efficacy and safety data in current or potential future clinical trials of imetelstat do not support an adequate benefit-risk profile to justify continued treatment of patients, then the FDA or other regulatory authorities may again place the IND for imetelstat on clinical hold, as occurred in March 2014.

Further, clinical trials by their nature examine the effect of a potential therapy in a sample of the potential future patient population. As such, clinical trials conducted with imetelstat, to date and in the future, may not uncover all possible adverse events that patients treated with imetelstat may experience. Because remaining patients in the treatment phase continue to receive imetelstat, in the extension phase of IMbark and in the Phase 2 portion of IMerge, additional or more severe toxicities or safety issues, including additional serious adverse events and dose-limiting toxicities, may be observed as patient treatment continues and more data become available. In addition, since additional data are being generated from the extension phase of IMbark and Part 1 of IMerge, the benefit-risk profile of imetelstat will continue to be assessed, including the risk of hepatotoxicity, severe cytopenias, fatal bleeding with or without any associated thrombocytopenia, patient injury or death, and any other severe adverse effects that may be associated with life-threatening clinical outcomes. If such toxicities or other safety issues in any clinical trial of imetelstat are determined by us, the FDA or any other regulatory authority to result in an unacceptable benefit-risk profile, then:

- additional information supporting the benefit-risk profile of imetelstat may be requested by the FDA or other regulatory authorities and if any such information supplied by Janssen, or by us following the transition of the imetelstat program to us is not deemed acceptable, current clinical trials of imetelstat could be suspended, terminated, or placed on clinical hold by the FDA or other regulatory authorities;
- the ability to retain enrolled patients in current clinical trials may be negatively affected, resulting in incomplete data sets and the inability to adequately assess the benefit-risk profile of imetelstat in a specific patient population; or
- additional, unexpected clinical trials or non-clinical studies may be required to be conducted.

The occurrence of any of these events could interrupt, further delay, or halt, any development and commercialization of imetelstat by us, which would have a severe adverse effect on our results of operations, financial condition, business prospects and the future of imetelstat, any of which might cause us to cease operations.

Results obtained in prior non-clinical studies and clinical trials do not predict success in later clinical trials. Likewise, preliminary data from clinical trials should be considered carefully and with caution since final data may be materially different from preliminary data, particularly as more patient data become available.

Success in non-clinical testing and early clinical trials does not ensure that later clinical trials will be successful. We cannot be certain that any of the prior, current or potential future clinical trials of imetelstat will generate sufficient, consistent or adequate efficacy and safety data demonstrating a positive benefit-risk profile, which would be necessary to obtain regulatory approval to market imetelstat in any indication. Product candidates in later stages of clinical trials may fail to show the desired benefit-risk profile despite having progressed through non-clinical studies and initial clinical trials. Other companies in the biopharmaceutical industry have frequently suffered significant setbacks in later clinical trials, even after achieving promising results in earlier non-clinical studies or clinical trials.

Safety and efficacy data from previous or current imetelstat clinical trials in hematologic myeloid malignancies should not be relied upon as predictive or indicative of future clinical trial results. For example, complete and partial remissions observed in the Pilot Study suggested potential disease-modifying activity of imetelstat in the MF patient population enrolled in the Pilot Study. However, similar activity was not observed in the MF patients enrolled in IMbark, as shown by the one partial remission observed in the IMbark primary analysis. We believe that differences in the IMbark study design when compared to the Pilot Study design, such as more restrictive patient enrollment criteria requiring either documented objective lack of response to a JAK inhibitor or evidence of progressive disease while on treatment with a JAK inhibitor, may have contributed to the data observed in IMbark differing significantly from data reported from the Pilot Study, but we cannot assure you that any future clinical trials of imetelstat in MF will yield results comparable to IMbark or the Pilot Study. In addition, the potential improvement in survival observed in the 9.4 mg/kg dosing arm in IMbark will need to be further assessed in a Phase 3 clinical trial comparing imetelstat to a control therapy, and similar results, including potential improvement in survival, if any, with respect to any patient population or patient population subgroup, may not be observed.

Similarly, in the Phase 2 portion of IMerge, the initial data review for the expansion cohort conducted by Janssen in the second quarter of 2018, which Janssen called a “data snapshot,” exhibited 8-week RBC-TI rate of 28%, while the 13-patient initial cohort exhibited 8-week RBC-TI rate of 54% resulting in an overall 8-week RBC-TI rate of 37% for the combined cohorts. We believe the observed difference in 8-week RBC-TI rate between the 13-patient initial cohort and the 25-patient expansion cohort may be attributable to factors such as the maturity of the data at the time of the data snapshot since the median follow-up time of the expansion cohort at the time of the data snapshot was less than half the length of time the 13-patient initial cohort had been followed when their data were first reported, or the higher overall baseline transfusion burden of the expansion cohort, but we cannot assure you that the combined 8-week RBC-TI rate observed in the Phase 2 portion of IMerge will improve with longer follow-up, or at all, or that the 8-week RBC-TI rate of patients enrolled in the Phase 3 portion of IMerge, if any, will be comparable to what has been observed in the 13-patient initial cohort, the expansion cohort, or the combined cohorts.

Additional or updated safety and efficacy data from current or potential future imetelstat clinical trials may result in a benefit-risk profile that does not justify continued development of imetelstat in a particular patient population, or at all. For example, because patients remaining in the treatment phase continue to receive imetelstat, in the extension phase of IMbark and the Phase 2 portion of IMerge, efficacy and safety data continue to be generated. Such additional data could result in a lower benefit-risk profile than initially expected, which could hinder the commencement, completion and potential success in the Phase 3 portion of IMerge, or could cause us to abandon further development of imetelstat entirely. Data from the Phase 3 portion, of IMerge could materially differ from the overall conclusions reported for the Phase 2 portion of IMerge. In general, Phase 3 clinical trials with larger numbers of patients or longer durations of therapy may fail to replicate efficacy results observed in earlier clinical trials, or may reveal safety concerns that were not identified in smaller or shorter trials, any of which could adversely affect future development prospects of imetelstat.

From time-to-time, safety and efficacy data from previous and current imetelstat clinical trials have been reported or announced by us, clinical investigators or Janssen. For example, preliminary data from the Phase 2 portion of IMerge was presented at the ASH annual meetings in December 2017 and December 2018, and at the EHA annual congress in June 2018. We expect similar reports or announcements of safety and efficacy data from us or clinical investigators as data matures in current imetelstat clinical trials and from potential future clinical trials. Preliminary or interim results may not be reproduced in any potential future clinical trials of imetelstat, and thus should be considered carefully and with caution, and not relied upon as indicative of future clinical results. Material adverse differences in final data, compared to preliminary or interim data, could severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

The research and development of imetelstat is subject to numerous risks and uncertainties.

The science and technology of telomere biology, telomerase and our proprietary oligonucleotide chemistry are relatively new. There is no precedent for the successful commercialization of a therapeutic product candidate based on these technologies. Significant research and development activities will be necessary to further develop imetelstat, which is our sole product candidate, which may take years to accomplish, if at all.

Because of the significant scientific, regulatory and commercial challenges that must be overcome to successfully research, develop and commercialize imetelstat, the development of imetelstat in hematologic myeloid malignancies, including MF and MDS, or any other indications, may be further delayed or abandoned, even after significant resources have been expended on it. Examples of such situations include:

- the discontinuation of our Phase 2 clinical trial of imetelstat in metastatic breast cancer in September 2012;
- the discontinuation of our development of imetelstat in solid tumors with short telomeres in April 2013;
- Janssen's decisions in the third quarter of 2016 to close the 4.7 mg/kg dosing arm in IMbark to new patient enrollment and to suspend enrollment in the 9.4 mg/kg dosing arm in IMbark because an insufficient number of patients in the 9.4 mg/kg dosing arm met the protocol defined interim efficacy criteria at 12 weeks;
- Janssen's decision in the third quarter of 2017 to expand the Phase 2 portion of IMerge to enroll additional lower risk MDS patients in a target patient population; and
- Janssen's decision in September 2018 to terminate the Collaboration Agreement.

Further delay, suspension or abandonment of the development of imetelstat in hematologic myeloid malignancies, including further delays resulting from the termination of the Collaboration Agreement, transition of the imetelstat program from Janssen to us, and our ability to successfully plan for and commence future clinical trials of imetelstat, including the Phase 3 portion of IMerge, could have a material adverse effect on the future of imetelstat and our business prospects, and we might cease operations.

If we encounter difficulties enrolling or retaining patients in current or potential future clinical trials of imetelstat, including in the Phase 3 portion of IMerge, clinical development and commercialization activities could be further delayed or otherwise adversely affected, which would cause our business and business prospects to be severely harmed, and we might cease operations.

The timely completion of a clinical trial in accordance with its protocol depends, among other things, on the ability to enroll a sufficient number of patients who remain in the trial until its conclusion. For example, if we experience difficulties in retaining patients in the extension phase of IMbark, our ability to continue to assess OS would be adversely affected. If we experience difficulties in retaining patients in the Phase 2 portion of IMerge, our ability to continue to assess the durability of RBC-TI responses would be adversely affected. In addition, we may encounter challenges in enrolling and retaining patients in potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, for a variety of reasons. The enrollment and retention of patients depends on many factors, including:

- the patient eligibility criteria specified in the protocol;
- the size of the patient population required for analysis of the trial's primary endpoint;
- the proximity of patients to trial sites;
- the design of the trial;
- our ability to recruit and retain clinical trial investigators with the appropriate competencies and experience;
- clinicians' and patients' perceptions of the potential advantages of imetelstat, both in relation to other available therapies, including any new drugs that may be approved for the indications being investigated, and as a result of data reported from previous or current clinical trials of imetelstat;
- the ability to obtain and maintain patient consents; and
- the risk that patients enrolled in any imetelstat clinical trial will drop out of the trial before completion due to lack of efficacy, adverse side effects, investigator decision, slow progress to later stage clinical trials or personal issues.

In addition, potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, will compete, with other clinical trials for product candidates that are in the same therapeutic areas with imetelstat and such trials may also be conducted at the same clinical sites, and this competition will reduce the number and type of patients available to enroll or remain in the imetelstat clinical trials. Moreover, because imetelstat represents a departure from more commonly used methods for cancer treatment, potential patients and their doctors may be inclined to use conventional therapies, rather than enroll patients into imetelstat clinical trials, or may decide not to enroll, or may not recommend enrollment, in future clinical trials of imetelstat, based on efficacy and safety results reported to date and that may be reported in the future.

Delays in patient enrollment or the inability to retain or treat patients could result in increased costs, lead to incomplete data sets, or adversely affect the timing or outcome of current or potential future clinical trials of imetelstat, including the Phase 3 portion of IMerge, which could prevent completion of these trials and adversely affect the clinical development and potential commercialization of imetelstat. Such occurrences would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

We do not have experience as a company in conducting large-scale, late-stage clinical trials, such as the Phase 3 portion of IMerge or potential future similar trials, or in those functional areas that would be required for the successful commercialization of our sole product candidate, imetelstat.

We have no experience in conducting large-scale, late-stage clinical trials, such as the Phase 3 portion of IMerge, nor do we have experience with activities that would be required for the commercialization of imetelstat, should we receive future regulatory approval to do so. We cannot be certain that we will be able to design, enroll, conduct or complete the Phase 3 portion of IMerge, or any other future large-scale, late-stage clinical trial of imetelstat, in a timely fashion, or at all. Large-scale, late-stage clinical trials require additional financial resources and certain internal development experience that we do not currently possess, as well as increased reliance on third-party clinical investigators, CROs, service providers, vendors, suppliers and consultants. Relying on these third parties and establishing effective and collaborative relationships with them to conduct large-scale, late-stage clinical trials may cause further delays that are outside of our control. Any such further delays could have a material adverse effect on our business.

We also do not have commercialization capabilities. Developing an internal sales, marketing and distribution capability would be an expensive and time-consuming process, and will require additional management expertise. We may not be able to negotiate and enter into third-party marketing and distribution agreements on terms that are economically attractive, or at all. Even if we do enter into such agreements, third party marketers and distributors may not successfully market or distribute our sole product candidate, imetelstat.

Our inability to successfully conduct large-scale, late-stage clinical trials, such as the Phase 3 portion of IMerge or future similar trials, or to successfully establish commercialization capabilities for imetelstat if we receive future regulatory approval to do so, would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

We will rely on third parties to conduct our current and potential future clinical trials of imetelstat. If these third parties do not successfully carry out their contractual duties or meet expected deadlines, we may be unable to continue the development of, obtain regulatory approval for, or commercialize imetelstat.

We do not have the ability to independently conduct clinical trials. Therefore, we will rely on medical institutions, clinical investigators, contract laboratories and other third parties, such as CROs, service providers, vendors, suppliers and consultants, to conduct clinical trials of imetelstat. The third parties with whom we contract for execution of our clinical trials will play a critical role in the conduct of these trials and the subsequent collection and analysis of data. However, these third parties are not our employees, and except for contractual duties and obligations, we have limited ability to control their performance, or the amount or timing of resources that they devote to imetelstat. For example, the CRO we have retained to support our clinical development activities will be critical to our development of imetelstat, including the Phase 3 portion of IMerge, and any failure by our CRO to perform its contractual obligations, or disputes with our CRO about the quality of its performance or other matters, could cause the anticipated commencement of the Phase 3 portion of IMerge to be delayed beyond mid-year 2019 or

prevent us from commencing or completing the Phase 3 portion of IMerge, or could otherwise further delay or halt our imetelstat development activities. These third parties may also have relationships with other commercial entities, some of which may compete with us. Under certain circumstances, these third parties may terminate their agreements with us without cause and upon immediate written notice.

Although we will rely on third parties to conduct any imetelstat clinical trials, including the Phase 3 portion of IMerge, we remain responsible for ensuring that each clinical trial is conducted in accordance with its investigational plan and protocol. Moreover, the FDA and foreign regulatory authorities require us to comply with regulations and standards, including regulations commonly referred to as good clinical practices, or GCPs, for conducting, monitoring, recording and reporting the results of clinical trials to ensure that the data and results are scientifically credible and accurate, and that patients are adequately informed of the potential risks of participating in clinical trials. Our ability to comply with these regulations and standards is contingent upon activities conducted by third parties, and if they fail to perform in accordance with contractual obligations and legal requirements, our development of imetelstat may be interrupted, further delayed or halted, which would have a severe adverse effect on our results of operations, financial condition, business prospects and the future of imetelstat, any of which might cause us to cease operations.

In addition, the execution of clinical trials and the subsequent compilation and analysis of the data produced, requires coordination among various parties. In order for these functions to be carried out effectively and efficiently, it is imperative that these parties communicate and coordinate with one another. If the quality or accuracy of the clinical data obtained, compiled or analyzed by third parties is compromised due to their failure to adhere to our clinical trial protocols or GCPs, or for any other reason, we may need to enter into new arrangements with alternative third parties, which could be difficult, costly or impossible. If third parties conducting our clinical trials do not perform their contractual duties or obligations, experience work stoppages, do not meet expected deadlines, terminate their agreements with us or need to be replaced, our clinical trials may be extended, delayed or terminated, or may be unsuccessful or need to be repeated, which could have a material adverse effect on our business and might cause us to cease operations.

RISKS RELATED TO TRANSITION OF THE IMETELSTAT PROGRAM FROM JANSSEN TO GERON

Encountering delays or difficulties in transitioning the imetelstat program from Janssen to us would prevent us from timely developing imetelstat, or preclude us from developing imetelstat at all, which could severely and adversely affect our financial results, business and business prospects, and might cause us to cease operations.

Under the terms of the Collaboration Agreement, Janssen is required to provide operational support for the imetelstat program during transition of the program to us. The transition process is expected to occur through September 2019, to enable the orderly transfer of all ongoing clinical, regulatory, medical affairs and non-clinical activities to us, including transfer of the sponsorship of ongoing imetelstat clinical trials from Janssen to us. In addition, following the effective date of termination of the Collaboration Agreement, we expect Janssen to supply imetelstat to us for up to 24 months during a transition period for clinical manufacturing and such supply will be charged to us at Janssen's cost plus a premium. Our future clinical development plans for imetelstat substantially depend on the timely and comprehensive transition of the imetelstat program from Janssen to us. Delays in completing the transition activities or unwillingness by Janssen to fully perform all of the transition activities will further delay or preclude the clinical development of imetelstat, increase our operating costs and thereby negatively impact our financial results, as well as harm imetelstat's future prospects, any of which could severely and adversely affect our business and business prospects, and might cause us to cease operations.

During the transition period, we remain dependent on Janssen for several key operational development areas. Poor or incomplete performance by Janssen in these areas could severely and adversely affect imetelstat's future value and our business and business prospects, and might cause us to cease operations.

During the transition period, we will remain dependent on Janssen to perform certain activities related to imetelstat, which subjects us to a number of risks, including:

- Janssen may not perform as expected or required by the Collaboration Agreement, and we are not able to control the amount or timing of the resources that Janssen may devote to the transition;
- there may be disputes between us and Janssen that result in the delay of the transition, or the achievement of development, regulatory and commercial objectives, or affect our license to the proprietary rights arising

under the Collaboration Agreement, which may result in costly litigation or arbitration that diverts our management's attention and resources;

- the manner and timing in which Janssen effects the transition could adversely impact the development of imetelstat;
- failure by Janssen to comply with applicable regulatory guidelines could result in our inability to assume sponsorship responsibility for the IND for imetelstat or to plan for and commence future clinical trials of imetelstat, including the Phase 3 portion of IMerge, or could result in administrative or judicially imposed sanctions on us, including warning letters, civil and criminal penalties, injunctions, product seizures or detention, product recalls, total or partial suspension of manufacturing activities, and the potential refusal to approve any new drug applications;
- our ability to transfer and subsequently maintain the IND for imetelstat and to submit required regulatory reports within required timelines may be compromised if Janssen is not fully cooperative in transferring all data and information from the imetelstat program, including IMbark and IMerge, to us;
- business combinations or significant changes in Janssen's business strategy or failure to apply financial and other resources to the transition may also adversely affect Janssen's ability to perform its obligations related to transition of the imetelstat program to us; and
- Janssen may not properly maintain or defend intellectual property rights arising from the Collaboration Agreement, may use our proprietary information in such a way as to cause disputes that could jeopardize or invalidate our proprietary information or expose us to potential litigation, or may disclose our proprietary information in a manner that could put our intellectual property rights at risk.

The occurrence of any of these events could severely and adversely affect imetelstat's future value and our business and business prospects, and might cause us to cease operations.

RISKS RELATED TO REGULATORY APPROVAL

AND COMMERCIALIZATION OF IMETELSTAT

Maintaining regulatory clearances and approvals to continue the clinical development of imetelstat, and obtaining future regulatory clearances to potentially market imetelstat, in the United States and other countries, is a costly and lengthy process, and we cannot predict when or if regulatory authorities will permit additional imetelstat development or when or if regulatory authorities will approve imetelstat for commercial sale.

Federal, state and local governments in the United States and governments in other countries have significant regulations in place that govern drug research and development and may prevent us from successfully conducting development efforts or commercializing imetelstat. Delays in obtaining regulatory clearances and approvals or limitations in the scope of such clearances or approvals could:

- impede or halt our clinical development activities and plans;
- significantly harm the commercial potential of imetelstat;
- impose additional development costs;
- diminish any competitive advantages that may have been available to us; or
- further delay or preclude any revenue we may receive from the future commercialization of imetelstat, if any.

Before we can seek to obtain regulatory approval for the commercial sale of imetelstat, multiple clinical trials, including larger-scale Phase 3 clinical trials, will need to be conducted to demonstrate if imetelstat is safe and effective for use in a diverse population. Significant additional research, non-clinical testing and clinical testing is required before we can file any application with the FDA or other regulatory authorities for regulatory approval of imetelstat. As such, we do not expect imetelstat to be commercially available for many years, if at all. Our clinical development program for imetelstat may not lead to regulatory approval from the FDA and similar foreign regulatory

authorities if we fail to demonstrate that imetelstat is safe and effective. If imetelstat cannot be developed in potential future clinical trials, including in Phase 3 clinical trials, our business and business prospects would be severely and adversely affected, and we might cease operations. Even if we do successfully complete one or more future clinical trials of

imetelstat in hematologic myeloid malignancies, including the Phase 3 portion of IMerge, those results are not necessarily predictive of results of future pivotal trials that may be needed before we may submit an NDA to the FDA for the initial or other future indications. We may therefore fail to further develop or commercialize imetelstat.

If our interpretation of safety and efficacy data obtained from non-clinical studies and clinical trials varies from interpretations by the FDA or regulatory authorities in other countries, this would likely further delay, limit or prevent further development and approval of imetelstat. For example, the FDA and regulatory authorities in other countries may require more or different data than what has been generated from our non-clinical studies and previous or ongoing clinical trials, even though protocols for these trials may have been reviewed by FDA and any resulting feedback incorporated. In addition, delays or rejections of regulatory approvals, or limitations in marketing authorizations, may be encountered as a result of changes in the regulatory environment or regulatory policy during the period of product development and/or the period of review of any application for regulatory approval for imetelstat.

The benefit-risk profile of imetelstat will also affect the assessment by the FDA and regulatory authorities in other countries of the drug's cost-effectiveness and/or marketability, which assessment could prevent or limit its approval for marketing and successful commercial use. If regulatory submissions requesting approval to market imetelstat are submitted, the FDA and regulatory authorities in other countries may conclude that the overall benefit-risk profile of imetelstat treatment does not merit approval of imetelstat for marketing or further development for any indication. Any of these events could cause us to halt future development and commercialization of imetelstat, if any, which would severely harm our business and business prospects, and might cause us to cease operations.

Imetelstat must receive all relevant regulatory approvals before it may be marketed in the United States or other countries. Obtaining regulatory approval is a lengthy, expensive and uncertain process. For example, in June 2016, the electorate in the United Kingdom voted in favor of exiting the European Union, and in March 2017, the Government of the United Kingdom initiated the formal procedure of withdrawal from the European Union. Although the impact of the withdrawal of the United Kingdom from the European Union will not be known for some time, this could lead to a period of considerable uncertainty in relation to the regulatory process in Europe, which could result in a delay in the review of regulatory submissions made in Europe by biotechnology and pharmaceutical companies, including potentially by us in the future, and could also lead to less efficient, more expensive, and potentially lengthier regulatory review processes for companies like us, who may seek to obtain regulatory approval for drug products in the European Union or the United Kingdom. Such changes could adversely affect and/or delay our ability to obtain approval of, and market and sell, imetelstat in the United States. In addition, because imetelstat involves the application of new technologies and a new therapeutic approach, it may be subject to substantial additional review by various government regulatory authorities, and, as a result, the process of obtaining regulatory approvals for imetelstat may proceed more slowly than for product candidates based upon more conventional technologies, and any approval that may be received could limit the use of imetelstat. We do not expect imetelstat to be approved for commercial sale for many years, if at all.

Even if the necessary time and resources are committed by us, the required regulatory clearances and approvals may not be obtained for imetelstat. Further, if regulatory clearances and approvals are obtained to commence commercial sales of imetelstat, they may impose significant limitations on the indicated uses or other aspects of the product label for which imetelstat can be marketed. An approval might also be contingent on the performance of costly additional post-marketing clinical trials. Any failure to advance imetelstat to subsequent clinical trials, failure to obtain regulatory approval of imetelstat, or limitations on any regulatory approval that we might receive, could reduce the potential commercial use of imetelstat, and potential market demand for imetelstat and therefore result in decreased revenue for us from any commercialization of imetelstat, any of which would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

Although orphan drug designation has been granted to imetelstat for the treatment of MF and MDS, these designations may not be maintained, which would eliminate the benefits associated with orphan drug designation, including the potential for market exclusivity, which would likely result in decreased sales revenue from commercialization of imetelstat, if any, and would likely harm our business and business prospects.

The FDA granted orphan drug designation to imetelstat in June 2015 for the treatment of MF and for the treatment of MDS in December 2015, and the European Medicines Agency, or EMA, granted it in December 2015 for the treatment of MF. The designation of imetelstat as an orphan drug does not guarantee that any regulatory authority

will accelerate regulatory review of, or ultimately approve, imetelstat, nor does it limit the ability of any regulatory authority to grant orphan drug designation to product candidates of other companies that treat the same indications as imetelstat prior to imetelstat receiving any exclusive marketing approval.

We may lose orphan drug exclusivity if the FDA or EMA determines that the request for orphan drug designation was materially defective or if we cannot ensure sufficient quantities of imetelstat to meet the needs of patients with MF or MDS.

Even if we maintain orphan drug exclusivity for imetelstat, the exclusivity may not effectively protect imetelstat from competition because different drugs with different active moieties can be approved for the same condition. Even after an orphan drug product is approved, the FDA or EMA can subsequently approve a different drug with the same active moiety for the same condition, if the FDA or EMA concludes that the later drug is safer, more effective, or makes a major contribution to patient care. The occurrence of any of these events could result in decreased sales of imetelstat, should it ever receive marketing approval, and may harm our business and business prospects. In addition, orphan drug designation will neither shorten the development time nor regulatory review time for imetelstat, and does not give imetelstat any advantage in the regulatory review or approval process.

A Fast Track designation by the FDA, such as the Fast Track designation received for imetelstat, does not guarantee approval and may not lead to a faster development, regulatory review or approval process.

In October 2017, the FDA granted fast track designation for the imetelstat clinical development program for the treatment of adult patients with transfusion-dependent anemia due to Low or Intermediate-1 risk MDS who are non-del(5q) and who are refractory or resistant to treatment with an erythropoiesis stimulating agent. Fast track designation provides opportunities for frequent interactions with FDA review staff, as well as eligibility for priority review, if relevant criteria are met, and rolling review. Fast track designation is intended to facilitate and expedite development and review of a New Drug Application to address unmet medical needs in the treatment of serious or life-threatening conditions. However, fast track designation does not accelerate conduct of clinical trials or mean that the regulatory requirements are less stringent, nor does it ensure that imetelstat will receive marketing approval or that approval will be granted within any particular timeframe. In addition, the FDA may withdraw fast track designation if it believes that the designation is no longer supported by data emerging from the imetelstat clinical development program.

Failure to achieve continued compliance with government regulations could delay or halt commercialization of imetelstat.

Approved products and their manufacturers are subject to continual review, and discovery of previously unknown problems with a product or its manufacturer may result in restrictions on the product or manufacturer, including import restrictions, seizure and withdrawal of the product from the market. If approved for commercial sale, future sales of imetelstat will be subject to government regulation related to numerous matters, including the processes of:

- manufacturing;
- advertising and promoting;
- selling and marketing;
- labeling; and
- distribution.

If, and to the extent that, we are unable to comply with these regulations, our ability to earn potential revenue from the commercialization of imetelstat, if any, would be materially and adversely impacted.

Failure to comply with regulatory requirements can result in severe civil and criminal penalties, including but not limited to:

- recall or seizure of products;
- injunctions against the import, manufacture, distribution, sales and/or marketing of products; and

- criminal prosecution.

The imposition of any of these penalties or other commercial limitations would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

RISKS RELATED TO MANUFACTURING IMETELSTAT

Failure by Janssen to manufacture or provide adequate clinical quantities of imetelstat on a timely basis, or at all, for the period required by the Collaboration Agreement, or our failure to establish a manufacturing supply chain to appropriately and adequately supply imetelstat for future clinical and commercial uses, would result in a further delay in or cessation of clinical trials and a further delay in or our inability to obtain regulatory approvals of imetelstat, and our business and business prospects could be severely harmed, and we could cease operations.

Pursuant to the Collaboration Agreement, Janssen is required to supply imetelstat to us until September 28, 2020 while we are planning to re-establish our own manufacturing supply chain. Consequently, we will remain dependent on Janssen to appropriately supply imetelstat and other clinical trial materials until such date or when we re-establish our own manufacturing supply chain. Thereafter, we will be responsible for the manufacture and supply of imetelstat for future clinical and commercial uses. The process of manufacturing imetelstat is complex and subject to several risks, including:

- the ability to scale-up and attain sufficient production yields with appropriate quality control and quality assurance;
- reliance on third-party manufacturers and suppliers;
- supply chain issues, including the timely availability and shelf life requirements of raw materials and other supplies;
- shortage of qualified personnel; and
- compliance with regulatory requirements, which are less well-defined for oligonucleotide products than for small molecule drugs and vary in each country where imetelstat might be sold or used.

As a result of these and other risks, Janssen may not perform as agreed or may default in its obligations to supply clinical quantities of imetelstat for the period of time required by the Collaboration Agreement, or may fail to deliver the required quantities of imetelstat on a timely basis, or at required or applicable quality standards, which would result in a further delay or cessation of current and potential future clinical trials and otherwise significantly further delay our ability to develop imetelstat, which would severely and adversely affect our business and business prospects, and might cause us to cease operations. In addition, our inability to establish a manufacturing supply chain capable of providing imetelstat for clinical trials and potential future commercial uses following the termination of Janssen's obligation to supply us with imetelstat would further delay or result in a cessation of potential future clinical trials and would further delay or preclude any applications for regulatory approval and therefore further delay or preclude our ability to earn revenue from the commercialization, if any, of imetelstat, which would severely and adversely affect our financial results, business and business prospects, and might cause us to cease operations.

If third parties that manufacture imetelstat fail to perform as needed, then the clinical and commercial supply of imetelstat will be limited, and we may be unable to conduct future clinical trials of imetelstat, including the Phase 3 portion of IMerge, or to commercialize imetelstat in the future.

Following the termination of Janssen's obligation to supply us with imetelstat, we expect to rely solely upon third-party contractors to perform certain process development or other technical and scientific work with respect to imetelstat, as well as to supply starting materials and manufacture drug substance and drug product. We currently have no arrangements with third parties for the manufacture of imetelstat, and the establishment of such arrangements could further delay, perhaps substantially, or preclude our ability to pursue imetelstat development on our own, increase our costs and otherwise negatively affect our financial results, business and business prospects. We may not be able to obtain third-party manufacturers for imetelstat on acceptable terms, or at all. We expect to rely on third-party

contractors to produce and deliver sufficient quantities of imetelstat and other materials to support clinical trials on a timely basis and to comply with applicable regulatory requirements. We will not have direct control over these

third-party personnel or operations. Reliance on these third-party manufacturers is subject to numerous risks, including:

- being unable to identify suitable third-party manufacturers, because the number of potential manufacturers is limited;
- regulatory authorities may require significant activities to validate and qualify any replacement manufacturer, which could involve new testing and compliance inspections;
- being unable to contract with third-party manufacturers on acceptable terms, or at all;
- the inability of third-party manufacturers to timely formulate and manufacture imetelstat or to produce imetelstat in the quantities or of the quality required to meet clinical and commercial needs;
- decisions by third-party manufacturers to exit the contract manufacturing business during the time required to supply clinical trials or to successfully produce, store and distribute products;
- compliance by third-party manufacturers with current Good Manufacturing Practice, or cGMP, standards mandated by the FDA and state agencies and other government regulations corresponding to foreign regulatory authorities;
- breach or termination of manufacturing contracts;
- inadequate storage at contracted facilities resulting in theft or spoilage;
- capacity limitation and scheduling imetelstat manufacturing activities as a priority in contracted facilities; and
- natural disasters that affect contracted facilities.

Each of these risks could lead to delays or shortages in drug supply, or the inability to manufacture drug supply necessary for non-clinical and clinical activities, and commercialization. For example, manufacturing delays could adversely impact the completion of current clinical trials, such as the extension phase of IMbark and the Phase 2 portion of IMerge, or the commencement of potential future clinical trials, including the Phase 3 portion of IMerge, which could severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

In addition, third-party contractors and/or any other contractors may need to make substantial investments to enable sufficient capacity increases and cost reductions, and to implement those regulatory and compliance standards necessary for successful Phase 3 clinical trials and commercial production of imetelstat. These third-party contractors may not be willing or able to achieve such capacity increases, cost reductions, or regulatory and compliance standards, and even if they do, such achievements may not be at commercially reasonable costs. Changing manufacturers may be prolonged and difficult due to inherent technical complexities and because the number of potential manufacturers is limited. It may be difficult or impossible for us to find a replacement manufacturer on acceptable terms, or at all.

It may not be possible to manufacture imetelstat at costs or scales necessary to conduct clinical trials or potential future commercialization activities.

Oligonucleotides are relatively large molecules produced using complex chemistry, and the cost of manufacturing an oligonucleotide like imetelstat is greater than the cost of making typical small-molecule drugs. Therefore, imetelstat for clinical use is more expensive to manufacture than most other treatments currently available today or that may be available in the future. Similarly, the cost of manufacturing imetelstat for commercial use will need to be significantly lower than current costs in order for imetelstat to become a commercially successful product. We may not be able to achieve sufficient scale increases or cost reductions necessary for successful commercial production of imetelstat. Failure to achieve necessary cost reductions could result in decreased sales, if any, for us, which would materially and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

RISKS RELATED TO MANAGING OUR GROWTH AND OTHER BUSINESS OPERATIONS

We may be unable to successfully retain or recruit key personnel to support the development and potential future commercialization of imetelstat or to otherwise successfully manage our growth.

Our ability to successfully develop imetelstat in the future and to potentially commercialize imetelstat depends to a significant extent on the skills, experience and efforts of our executive officers and key members of our staff. In addition, we will need to hire a number of senior personnel to re-staff our internal drug development group, as well as to contract with subject matter experts in clinical science, biostatistics, clinical operations, pharmacovigilance, quality systems, manufacturing and regulatory affairs, to enable us to further develop and potentially commercialize imetelstat.

We face intense competition for qualified individuals from numerous pharmaceutical, biopharmaceutical and biotechnology companies, as well as academic and other research institutions, and competition in our geographic region is particularly intense. Termination of the Collaboration Agreement by Janssen, as well as the previous restructurings we implemented, and the uncertainties regarding our future business viability could have an adverse impact on our ability to retain and recruit qualified personnel or we may incur unanticipated inefficiencies caused by our reduced personnel resources. We may also face higher than expected personnel costs in order to attract new management or development personnel, or to maintain our current executive officers and staff. If we are unable to successfully retain, motivate and incentivize our existing personnel, or to attract, assimilate and retain other highly qualified management and senior development personnel in the future on acceptable terms, our ability to further develop imetelstat will be impaired, and our business and the price of our common stock would be adversely impacted.

As our operations potentially expand, we expect that we will need to manage new and additional relationships with various service providers, vendors, suppliers and other third parties, as well as additional office locations, for example, our planned office opening in northern New Jersey. Such potential growth and expansion will require members of our management to assume significant added responsibilities. Our performance in managing any such future growth, if ineffective, could negatively impact our business prospects. We may not successfully manage our anticipated imetelstat development efforts and potential future imetelstat clinical trials, including the Phase 3 portion of IMerge, effectively. If we fail to achieve key development goals, our abilities to grow as a company, and to further develop and commercialize imetelstat, could be prevented or hindered, and our business and business prospects would be severely harmed, which might cause us to cease operations.

We expect imetelstat to remain our sole product candidate for the foreseeable future. If we are unable to successfully develop or commercialize imetelstat, our business and business prospects would be severely harmed, which might cause us to cease operations.

We plan to focus our efforts on the further development of imetelstat in hematologic myeloid malignancies. Accordingly, we do not currently have any plans to engage in any efforts to discover new product candidates or to seek to acquire and/or in-license other oncology products, product candidates, programs or companies in order to diversify our business. Since we do not currently have a discovery function or capabilities, and do not plan to establish such capabilities or to seek to diversify our product candidate portfolio through acquisition and/or in-licensing activity, we will be wholly reliant upon the development of imetelstat, our sole product candidate, for the foreseeable future. If we are unable to successfully develop and commercialize imetelstat, our business and business prospects would be severely harmed, which might cause us to cease operations.

If we are unable to establish potential future collaborative arrangements for imetelstat, we may have to delay, alter or abandon our imetelstat development and commercialization plans.

We intend to develop imetelstat broadly for hematologic malignancies, and to potentially commercialize, market and sell imetelstat by ourselves in the United States. We plan to seek another collaborative partner or partners, at an appropriate time, to assist us in the potential development and commercialization of imetelstat outside the United States, and to provide funding for such activities. We face significant competition in seeking appropriate collaborative partners, and these potential collaborative arrangements are complex and time consuming to negotiate, document and implement. We may not be able to negotiate collaborative arrangements on acceptable terms, or at all. In this regard, collaborative arrangements with third parties may require us to relinquish material rights, including revenue from potential commercialization, on terms that are less attractive than under the Collaboration Agreement we had with Janssen, or to assume material ongoing development obligations that we would have to fund or otherwise support.

In any event, we are unable to predict when, if ever, we will enter into any collaborative arrangements because of the numerous risks and uncertainties associated with establishing collaborative arrangements. Moreover, as a result of the termination of the Collaboration Agreement and the significant uncertainty regarding the future imetelstat development program, potential collaborative partners may be less willing to enter into new collaborative arrangements with us, or may only be willing to do so on terms that are not favorable to us. As a result, we may not be successful in finding a new collaborative partner or partners on favorable terms, if at all. If we are unable to negotiate collaborative arrangements, we may have to:

- curtail the development of imetelstat,
- further delay, alter or abandon the imetelstat development program,
- further delay or abandon its potential commercialization,
- reduce the scope of potential future sales or marketing activities, or
- increase our expenditures and undertake development or commercialization activities at our own expense, which will require substantial additional capital than our current resources.

In order to advance the imetelstat program, including completing the Phase 3 portion of IMerge and potential clinical trials in other indications, as well as potential commercialization activities in the United States, we will need to raise substantial additional capital. In addition, if we elect to increase our expenditures to fund imetelstat development or commercialization activities outside the United States on our own, we will be required to substantially increase our personnel resources and we will need to obtain substantial further capital, which may not be available to us on acceptable terms, or at all. If we do not have sufficient funds, we will not be able to advance the imetelstat program, including completing the Phase 3 portion of IMerge or clinical trials in other indications, or to bring imetelstat to market and generate product revenues. Establishing the infrastructure necessary to further develop, commercialize, market and sell imetelstat worldwide will require substantial resources and may divert the attention of our management and key personnel and negatively impact our imetelstat development or commercialization efforts in the United States.

We currently have no products approved for commercial sale and we have not yet demonstrated an ability to obtain marketing approvals for any product candidates, which makes it difficult to assess our future viability.

We have never derived any revenue from the sales of any products. Our operations to date have been limited to organizing and staffing our company, acquiring, developing and securing our technology, undertaking non-clinical studies and early stage clinical trials of imetelstat and past product candidates that we have subsequently discontinued, and engaging in research and development under collaboration agreements. We have not yet demonstrated an ability to obtain regulatory approvals, formulate and manufacture commercial-scale products, or conduct sales and marketing activities necessary for successful product commercialization. Consequently, for these and other reasons discussed elsewhere in these risk factors, it is difficult to predict our future success and the viability of our business and the imetelstat program.

We may not be able to obtain or maintain sufficient insurance on commercially reasonable terms or with adequate coverage against potential liabilities in order to protect ourselves against product liability claims or claims related to clinical trial conduct.

Our business exposes us to potential product liability and other risks that are inherent in the testing, manufacturing and marketing of human therapeutic and diagnostic products. We may become subject to product liability claims or claims related to clinical trial conduct if the use of imetelstat is alleged to have injured patients, including any injuries alleged to arise from any hepatotoxicity or hemorrhagic event associated with the use of imetelstat. We currently have limited clinical trial liability insurance, and we may not be able to maintain this type of insurance for any clinical trials, including the Phase 3 portion of IMerge, or this type of insurance may become too expensive for us to afford because of the highly risky and uncertain nature of clinical trials generally and the high cost of insurance for our business

activities. In addition, business liability and product liability insurance are becoming increasingly expensive, particularly for biotechnology and pharmaceutical companies, and the pool of insurers offering insurance coverage to biotechnology and pharmaceutical companies generally is becoming smaller, making it more difficult to obtain insurance for our business activities at a reasonable price, or at all. Being unable to obtain or

maintain product liability, clinical trial liability, or other insurance for our business activities in the future on acceptable terms or with adequate coverage against potential liabilities could have a material adverse effect on our business.

We have been, and may in the future be, involved in securities-related legal actions that are expensive and time consuming. Any securities-related legal actions, if resolved adversely, could harm our business, financial condition, or results of operations.

Securities-related class action lawsuits and/or derivative lawsuits have often been brought against companies, including biotechnology and biopharmaceutical companies, that experience volatility in the market price of their securities. This risk is especially relevant for us because we often experience significant stock price volatility in connection with our product development activities.

We and certain of our officers were named as defendants in two purported class action securities lawsuits filed in the United States District Court for the Northern District of California, or the California District Court, as well as a third securities lawsuit, not styled as a class action, which was transferred to the California District Court. These three cases, or the Class Action Lawsuits, were consolidated for all purposes and settled in July 2017. In connection with the settlement, in April 2017, we paid $250,000 and our insurance providers paid $6.0 million to a settlement escrow account to be paid to members of the settlement class, less payment of attorneys' fees and costs to plaintiff's counsel.

The termination of the Collaboration Agreement could also result in litigation arising out of any claims that our stockholders suffered financial losses. The market price of our common stock declined significantly after the announcement on September 27, 2018 of the termination of the Collaboration Agreement, and certain stockholders experienced significant financial losses. Therefore, it is possible that lawsuits will be filed naming us and/or our officers and directors as defendants with respect to the termination of the Collaboration Agreement by Janssen or other matters related to the Collaboration Agreement, future clinical trials of imetelstat, if any, including the Phase 3 portion of IMerge, or other business activities. Monitoring, initiating and defending against legal actions is time-consuming for our management, is likely to be expensive and may detract from our ability to fully focus our internal resources on our business activities. We could be forced to expend significant resources in the settlement or defense of any additional lawsuits, and we may not prevail in such lawsuits. Additionally, we may not be successful in having any such lawsuit dismissed or settled within the limits of our insurance coverage.

We have not established any reserve for any potential liability relating to any lawsuits. It is possible that we could, in the future, incur judgments or enter into settlements of claims for monetary damages. A decision adverse to our interests in any such lawsuit, or in similar or related litigation, could result in the payment of substantial damages, or possibly fines, and could have a material adverse effect on our business, our stock price, cash flow, results of operations and financial condition.

We may be subject to third-party litigation, and such litigation would be costly to defend or pursue and uncertain in its outcome.

Our business may bring us into conflict with our licensees, licensors, or others with whom we have contractual or other business relationships, or with our competitors or others whose interests differ from ours. We may experience employment-related disputes as we seek to expand our personnel resources. If we are unable to resolve those conflicts on terms that are satisfactory to all parties, we may become involved in litigation brought by or against us.

We may face litigation with Janssen arising from or related to the Collaboration Agreement and Janssen's termination of it. Possible disagreements with Janssen could include disagreements regarding the transition of the imetelstat program from Janssen back to us, or the ownership of proprietary rights arising from the work performed by Janssen

under the Collaboration Agreement. We may become involved in performance or other disputes with the CRO we have retained to support our imetelstat clinical development activities, or with other third parties such as service providers, vendors, suppliers or consultants, which could result in a further delay or cessation of current and potential future clinical trials and otherwise significantly further delay our ability to develop imetelstat.

Lawsuits are subject to inherent uncertainties, and defense and disposition costs depend upon many unknown factors. Despite the availability of insurance, we may incur substantial legal fees and costs in connection with litigation. Lawsuits could result in judgments against us that require us to pay damages, enjoin us from certain

activities, or otherwise negatively affect our legal or contractual rights, which could have a significant adverse effect on our business. In addition, the inherent uncertainty of such litigation could lead to increased volatility in our stock price and a decrease in the value of our stockholders' investment in our common stock.

RISKS RELATED TO PROTECTING OUR INTELLECTUAL PROPERTY

Our success and the success of our planned future development of imetelstat will depend on our ability to protect our technologies and imetelstat through patents and other intellectual property rights.

Protection of our proprietary technology is critically important to our business. Our success will depend in part on our ability to obtain, maintain, enforce and extend our patents and maintain trade secrets, both in the United States and in other countries. Our patents may be challenged, invalidated or circumvented, and our patent rights may not provide proprietary protection or competitive advantages to us. In the event that we are unsuccessful in obtaining, maintaining, and enforcing our patents and other intellectual property rights or having our licensors maintain the intellectual property rights we have licensed, the value of our technologies and imetelstat will be adversely affected, and we may not be able to further develop or potentially commercialize imetelstat. Loss or impairment of our intellectual property related to imetelstat might further delay or halt ongoing or potential future clinical trials of imetelstat and any applications for regulatory approval, and therefore further delay or preclude any future development or commercialization of imetelstat by us. Further, if imetelstat is approved for commercial sale, such events could impair our ability to sell imetelstat and therefore result in decreased sales for us. Occurrence of any of these events would materially and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

Changes in U.S. or foreign patent law or interpretations of such patent laws could diminish the value of our patents in general, thereby impairing our ability to protect our technologies and imetelstat.

The patent positions of pharmaceutical and biopharmaceutical companies, including ours, are highly uncertain and involve complex legal and technical questions. In particular, legal principles for biotechnology and pharmaceutical patents in the United States and in other countries are evolving, and the extent to which we will be able to obtain patent coverage to protect our technologies and imetelstat, or enforce or defend issued patents, is uncertain.

Since the publication of discoveries in scientific or patent literature tends to lag behind actual discoveries by at least several months and sometimes several years, the persons or entities that we name as inventors in our patents and patent applications may not have been the first to invent the inventions disclosed in the patent applications or patents, or the first to file patent applications for these inventions. As a result, we may not be able to obtain patents for discoveries that we otherwise would consider patentable and that we consider to be extremely significant to the future success of imetelstat. Thus, our ability to protect our patentable intellectual property depends, in part, on our ability to be the first to file patent applications with respect to our inventions or inventions that were developed by Janssen under the Collaboration Agreement and to which we have an exclusive license for the further development, commercialization and manufacture of imetelstat. Delay in the filing of a patent application for any purpose, including further development or refinement of an invention, may result in the risk of loss of patent rights.

A number of significant changes to U.S. patent law occurred when the Leahy-Smith America Invents Act, or the AIA, was signed into law on September 16, 2011. These include provisions that affect the way patent applications are examined and may affect patent litigation. Many of the substantive changes to patent law associated with the AIA, and in particular, the first to file provisions, became effective on March 16, 2013. For example, the AIA limits where a patentee may file a patent infringement suit. The AIA and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents.

U.S. court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. For example, on June 13, 2013, the U.S. Supreme Court, or the Court, issued a decision in Association for Molecular Pathology v. Myriad Genetics, Inc. holding that claims to isolated genomic DNA were not patentable subject matter, but claims to complementary DNA, or cDNA, molecules were patentable subject matter. On March 20, 2012, in Mayo Collaborative Services, DBA Mayo Medical Laboratories, et al. v. Prometheus Laboratories, Inc., the Court held that several claims drawn to measuring drug metabolite levels from patient samples and correlating them to drug doses were not patentable subject matter. In addition, court rulings in cases such as BRCA1- & BRCA2-Based Hereditary Cancer Test Patent Litig. and Promega Corp. v. Life Technologies Corp. have also narrowed the scope of patent protection available in certain circumstances. In addition

to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events may have created uncertainty with respect to the value of certain patents we have previously obtained or in-licensed.

In addition, in June 2016, the electorate of the United Kingdom voted to exit the European Union, and in March 2017 the Government of the United Kingdom initiated the formal procedure of withdrawal from the European Union. While the exit of the United Kingdom from the European Union is planned, the exact timing of the withdrawal and the resulting effect of withdrawal will not be known for some time, which could lead to a period of considerable uncertainty relating to our ability to obtain and maintain Supplementary Protection Certificates of our products based on our United Kingdom patents and our ability to establish and maintain European trademarks in the United Kingdom.

In 2012, the European Union Patent Package, or EU Patent Package, regulations were passed with the goal of providing for a single pan-European Unity Patent, or UP, and a new European Unified Patent Court, or UPC, for litigation of European patents. Once established, the UPC would have jurisdiction over traditional European patents and new UPs in the United Kingdom and all Contracting Member States of the European Union. However, political activity in the United Kingdom and a legal challenge in Germany has delayed ratification of the EU Patent Package in these countries. There have been many delays in the implementation of the EU Patent Package, and further delays may occur. When the EU Patent Package is ratified and in effect, all European patents, including those issued prior to ratification, would by default automatically fall under the jurisdiction of the UPC and allow for the possibility of obtaining pan-European injunctions. Under the EU Patent Package as currently proposed, once the UPC is established, patent holders are permitted to “opt out” of the UPC on a patent-by-patent basis, although the time permitted for this opt-out is not yet known. Owners of traditional European Patent applications who receive notice of grant after the EU Patent Package is ratified could validate the patent nationally, and file an opt-out demand. The EU Patent Package may increase the uncertainties and costs surrounding the enforcement or defense of our issued European patents. The full impact on future European patent filing strategy and the enforcement or defense of our issued European patents in member states and/or the UPC is not known.

Depending on decisions by the U.S. federal courts, the U.S. Patent and Trademark Office, or the Patent Office, and similar authorities in foreign jurisdictions, the interpretation of laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents. Occurrence of these events and/or significant impairment of our imetelstat patent rights would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, which might cause us to cease operations.

Challenges to our owned or licensed patent rights would result in costly and time-consuming legal proceedings that could prevent or limit development of imetelstat.

Our patents or those patent rights we have licensed, including patent rights that we may seek with respect to inventions made by Janssen under the Collaboration Agreement, may be challenged through administrative or judicial proceedings, which could result in the loss of important patent rights. For example, where more than one party seeks U.S. patent protection for the same technology, the Patent Office may declare an interference proceeding in order to ascertain the party to which the patent should be issued. Patent interferences are typically complex, highly contested legal proceedings, subject to appeal. They are usually expensive and prolonged, and can cause significant delay in the issuance of patents. Our pending patent applications or our issued patents, or those we have licensed and may license from others, including Janssen, may be drawn into interference proceedings or be challenged through post-grant review procedures or litigation, any of which could delay or prevent the issuance of patents, or result in the loss of issued patent rights.

Under the AIA, interference proceedings between patent applications filed on or after March 16, 2013 have been replaced with other types of proceedings, including derivation proceedings. The AIA also includes post-grant review

procedures subjecting U.S. patents to post-grant review procedures similar to European oppositions, such as inter partes review, or IPR, covered business method post-grant reviews and other post-grant reviews. This applies to all of our U.S. patents and those we have licensed and may license from others, including Janssen, even those issued before March 16, 2013. Because of a lower evidentiary standard necessary to invalidate a patent claim in Patent Office proceedings compared to the evidentiary standard in U.S. federal court, a third party could potentially provide evidence in a Patent Office proceeding sufficient for the Patent Office to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third

party could attempt to use the Patent Office procedures to invalidate patent claims that would not have been invalidated if first challenged by the third party as a defendant in a district court action. U.S. patents owned or licensed by us may therefore be subject to post-grant review procedures, as well as other forms of review and re-examination. In addition, the IPR process under the AIA permits any person, whether they are accused of infringing the patent at issue or not, to challenge the validity of certain patents. As a result, entities associated with hedge funds have challenged valuable pharmaceutical patents through the IPR process. Significant impairment of our imetelstat patent rights would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, which might cause us to cease operations.

Certain jurisdictions, such as Europe, New Zealand and Australia, permit oppositions to be filed against granted patents or patents proposed to be granted. Because we may in the future seek to commercialize imetelstat internationally, securing both proprietary protection and freedom to operate outside of the United States is important to our business. Opposition proceedings require significant time and costs, and if we are unsuccessful or are unable to commit these types of resources to protect our imetelstat patent rights, we could lose our patent rights and we could be prevented or limited in the development and commercialization of imetelstat.

As more groups become engaged in scientific research and product development in the areas of telomerase biology and hematologic malignancies, the risk of our patents, or patents that we have in-licensed, being challenged through patent interferences, derivation proceedings, IPRs, post-grant proceedings, oppositions, re-examinations, litigation or other means will likely increase. For example, litigation may arise as a result of our decision to enforce our patent rights against third parties. Challenges to our patents through these procedures would be extremely expensive and time-consuming, even if the outcome was favorable to us. An adverse outcome in a patent dispute could severely harm our ability to further develop or commercialize imetelstat, or could otherwise have a material adverse effect on our business, and might cause us to cease operations, by:

- causing us to lose patent rights in the relevant jurisdiction(s);
- subjecting us to litigation, or otherwise preventing us from commercializing imetelstat in the relevant jurisdiction(s);
- requiring us to obtain licenses to the disputed patents;
- forcing us to cease using the disputed technology; or
- requiring us to develop or obtain alternative technologies.

We may be subject to infringement claims that are costly to defend, and such claims may limit our ability to use disputed technologies and prevent us from pursuing research, development, manufacturing or commercialization of imetelstat.

The commercial success of imetelstat will depend upon our ability to research, develop, manufacture, market and sell imetelstat without infringing or otherwise violating the intellectual property and other proprietary rights of third parties. There is considerable intellectual property litigation in the biotechnology and pharmaceutical industries, and many pharmaceutical companies, including potential competitors, have substantial patent portfolios. In the event our technologies infringe the rights of others or require the use of discoveries and technologies controlled by third parties, we may be prevented from pursuing research, development, manufacturing or commercialization of imetelstat, or may be required to obtain licenses to those patents or other proprietary rights or develop or obtain alternative technologies. For example, we are aware that certain third parties have or may be prosecuting patents and patent estates that may relate to imetelstat, and while we believe these patents will expire before imetelstat is commercialized and/or that these patents are invalid and/or would not be infringed by the manufacture, use or sale of imetelstat, it is possible that the owner(s) of these patents will assert claims against us in the future. If that were to occur, we would need to obtain unblocking licenses from such third parties, develop alternative non-infringing technologies, which we may not be able to do at an acceptable cost or on acceptable terms, or at all, or cease the development of imetelstat. In addition, while Janssen has terminated the Collaboration Agreement, we are still subject to indemnification obligations to Janssen under the Collaboration Agreement, including with respect to claims of third party patent infringement.

45

Since we cannot be aware of all intellectual property rights potentially relating to imetelstat and its uses, we do not know with certainty that imetelstat, or the intended commercialization thereof, does not and will not infringe or otherwise violate any third party's intellectual property. Any infringement claims against us would likely be expensive to resolve, and the cost of any unblocking license that we could be required to obtain is unpredictable and could be significant. If we are unable to resolve an infringement claim successfully, we could be subject to an injunction that would prevent us from commercializing imetelstat and could also require us to pay substantial damages. In addition to infringement claims, in the future we may also be subject to other claims relating to intellectual property, such as claims that we have misappropriated the trade secrets of third parties. Provided that we are successful in continuing the development of imetelstat, we expect to see more efforts by others to obtain patents that are positioned to cover imetelstat. Our success therefore depends significantly on our ability to operate without infringing patents and the proprietary rights of others.

We may become aware of discoveries and technologies controlled by third parties that are advantageous or necessary to further develop or manufacture imetelstat. For example, as we transition the imetelstat program from Janssen to us, we may learn of changes to the imetelstat manufacturing process made by Janssen which would require us to obtain licenses to third party intellectual property rights. Under such circumstances, we may initiate negotiations for licenses to other technologies as the need or opportunity arises. We may not be able to obtain a license to a technology required for the research, development, manufacture or commercialization of imetelstat on commercially favorable terms, or at all, or such licenses may be terminated on certain grounds, including as a result of our failure to comply with the obligations under such licenses. If we do not obtain a necessary license or if such a license is terminated, we may need to redesign such technologies or obtain rights to alternative technologies, which may not be possible, and even if possible, could cause further delays in the development efforts for imetelstat and could increase the development and/or production costs of imetelstat. In cases where we are unable to license necessary technologies, we could be subject to litigation and prevented from researching, developing, manufacturing or commercializing imetelstat which would materially and adversely impact our business. Failure by us to obtain rights to alternative technologies or a license to any technology that may be required to research, develop, manufacture or commercialize imetelstat would further delay potential future clinical trials of imetelstat and any applications for regulatory approval, impair our ability to sell imetelstat and therefore result in decreased sales of imetelstat for us. Occurrence of any of these events would materially and adversely affect our business, and might cause us to cease operations.

We may become involved in disputes with past or future collaborator(s), including Janssen, over intellectual property inventorship or ownership, and publications by us, or by investigators, scientific consultants, research collaborators or others could impair our ability to obtain patent protection or protect our proprietary information, which, in either case, could have a significant impact on our business.

Inventions discovered under research, material transfer or other collaborative agreements, including our Collaboration Agreement with Janssen which was terminated effective September 28, 2018, may become jointly owned by us and the other party to such agreements in some cases, and may be the exclusive property of either party in other cases. Under some circumstances, it may be difficult to determine who invents and owns a particular invention, or whether it is jointly owned, and disputes can arise regarding inventorship and ownership of those inventions. These disputes could be costly and time-consuming, and an unfavorable outcome could have a significant adverse effect on our business if we were not able to protect our license rights to these inventions. In addition, clinical trial investigators, scientific consultants and research collaborators generally have contractual rights to publish data and other proprietary information, subject to review by the trial sponsor. Publications by us, or by investigators, scientific consultants, previous employees, research collaborators or others, either with permission or in contravention of the terms of their agreements with us or with Janssen or otherwise, may impair our ability to obtain patent protection or protect proprietary information which would have a material adverse effect on our business, and might cause us to cease operations.

Much of the information and know-how that is critical to our business is not patentable, and we may not be able to prevent others from obtaining this information and establishing competitive enterprises.

We sometimes rely on trade secrets to protect our proprietary technology, especially in circumstances in which we believe patent protection is not appropriate or available. We attempt to protect our proprietary technology in part by confidentiality agreements with our employees, consultants, collaborators and contractors. We cannot provide assurance that these agreements will not be breached, that we would have adequate remedies for any breach, or that our trade secrets will not otherwise become known or be independently discovered by competitors, any of which would harm our business significantly.

In May 2016, the Defend Trade Secrets Act of 2016, or the DTSA, was enacted, providing a federal cause of action for misappropriation of trade secrets. Under the DTSA, an employer may not collect enhanced damages or attorney fees from an employee or contractor in a trade secret dispute brought under the DTSA, unless certain advanced provisions are observed. We cannot provide assurance that our existing agreements with employees and contractors contain notice provisions that would enable us to seek enhanced damages or attorneys' fees in the event of any dispute for misappropriation of trade secrets brought under the DTSA.

Significant disruptions of information technology systems, including cloud-based systems, or breaches of data security could adversely affect our business.

Our business is increasingly dependent on critical, complex and interdependent information technology systems, including cloud-based systems, to support business processes as well as internal and external communications. Our computer and information technology systems, and those of our collaborators, service providers and contractors, are potentially vulnerable to breakdown, malicious intrusion, malware, computer viruses, natural disasters, terrorism, war, and telecommunication and electrical failures that may result in damage to or the impairment of key business processes, or the loss or corruption of confidential information, including intellectual property, proprietary business information and personal information. Such disruptions and breaches of security could have a material adverse effect on our business, financial condition and results of operations. The costs to us to mitigate network security problems, bugs, viruses, worms, malicious software programs and security vulnerabilities could be significant, and while we have implemented security measures to protect our data security and information technology systems, our efforts to address these problems may not be successful, and these problems could result in unexpected interruptions, delays, cessation of service and other harm to our business and our competitive position. In addition, we will rely on our collaborators, service providers and contractors to establish and maintain appropriate information technology systems and data security protections. However, except for contractual duties and obligations, we have limited ability to control their actions related to such matters. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our imetelstat development program. For example, the loss of clinical study data from completed, ongoing or planned clinical trials could result in delays in potential regulatory approval efforts and significantly increase our costs to recover or reproduce the data.

In addition, our computer and information technology systems, as well as those of our collaborators, service providers and contractors, are potentially vulnerable to data security breaches, whether by employees, contractors, consultants, malware, phishing attacks, or other cyber-attacks, that may expose confidential information, intellectual property, proprietary business information or personal information to unauthorized persons. If a data security breach affects our systems or those of third parties upon which we rely, corrupts our data or results in the unauthorized disclosure or release of personally identifiable information by our collaborators, service providers, contractors or us, our reputation could be materially damaged and we could be subject to significant fines, increased costs or loss of revenue. In addition, such a breach may require notification to governmental agencies, supervisory bodies, credit reporting agencies, the media or individuals pursuant to various federal, state and foreign data protection, privacy and security laws, regulations and guidelines, if applicable. These may include state breach notification laws, and the EU General Data Protection Regulation (EU) 2016/679, or GDPR. Accordingly, a data security breach or privacy violation that leads to unauthorized access to, disclosure or modification of personal information (including protected health information), that prevents access to personal information or materially compromises the privacy, security, or confidentiality of the personal information, could result in fines, increased costs or loss of revenue as a result of:

- harm to our reputation;
- fines or penalties imposed on us by regulatory authorities;
- additional compliance obligations or enforcement measures under federal, state or foreign laws;
- remediation and corrective action we undertake as required by law or as otherwise necessary;
- litigation and potential civil or criminal liability; and

- requirements to verify the accuracy of affected data.

If we are unable to prevent such data security breaches or privacy violations or implement satisfactory remedial measures, our operations could be disrupted, and we may suffer loss of reputation, financial loss and other regulatory penalties because of lost or misappropriated information, including sensitive patient data. In addition, these breaches and other inappropriate access can be difficult to detect, and any delay in identifying them may lead to increased harm of the type described above. Moreover, the prevalent use of mobile devices that access confidential information increases the risk of data security breaches, which could lead to the loss of confidential information, trade secrets or other intellectual property. While we have implemented security measures to protect our computer and information technology systems, because the techniques used to obtain unauthorized access, disable or degrade service, or sabotage systems change frequently, become more sophisticated, and often are not recognized until launched against a target, we or our collaborators, service providers or contractors may be unable to anticipate these techniques or to implement adequate preventative measures. In addition, failure to maintain effective internal accounting controls related to data security breaches and cybersecurity in general could impact our ability to produce timely and accurate financial statements and could subject us to regulatory scrutiny.

Changes in and failures to comply with U.S. and foreign privacy and data protection laws, regulations and standards may adversely affect our business, operations and financial performance.

We are subject to or affected by numerous federal, state and foreign laws and regulations, as well as regulatory guidance, governing the collection, use, disclosure, retention, and security of personal data, such as information that we collect about patients and healthcare providers in connection with clinical trials in the United States and abroad. The global data protection landscape is rapidly evolving, and implementation standards and enforcement practices are likely to remain uncertain for the foreseeable future. This evolution may create uncertainty in our business, affect our or our collaborators', service providers' and contractors' ability to operate in certain jurisdictions or to collect, store, transfer use and share personal information, necessitate the acceptance of more onerous obligations in our contracts, result in liability or impose additional costs on us. The cost of compliance with these laws, regulations and standards is high and is likely to increase in the future. Any failure or perceived failure by us or our collaborators, service providers and contractors to comply with federal, state or foreign laws or regulation, our internal policies and procedures or our contracts governing processing of personal information could result in negative publicity, diversion of management time and effort and proceedings against us by governmental entities or others. In many jurisdictions, enforcement actions and consequences for noncompliance are rising.

In the United States, California enacted the California Consumer Privacy Act (CCPA) on June 28, 2018, which takes effect on January 1, 2020. The CCPA gives California residents expanded rights to access and delete their personal information, opt out of certain personal information sharing, and receive detailed information about how their personal information is used. The CCPA provides for civil penalties for violations, as well as a private right of action for data breaches that is expected to increase data breach litigation. The CCPA may increase our compliance costs and potential liability. Some observers have noted that the CCPA could mark the beginning of a trend toward more stringent privacy legislation in the United States, which could increase our potential liability and adversely affect our business.

Our operations abroad may also be subject to increased scrutiny or attention from data protection authorities. Many countries in these regions have established or are in the process of establishing privacy and data security legal frameworks with which we, our collaborators, service providers and contractors must comply. For example, the EU has adopted the GDPR, which went into effect in May 2018 and introduces strict requirements for processing the personal information of EU subjects, including clinical trial data. The GDPR has and will continue to increase compliance burdens on us, including by mandating potentially burdensome documentation requirements and granting certain rights to individuals to control how we collect, use, disclose, retain and process information about them. The processing of sensitive personal data, such as physical health condition, may impose heightened compliance burdens under the GDPR and is a topic of active interest among foreign regulators. In addition, the GDPR provides for more

robust regulatory enforcement and fines of up to €20 million or 4% of the annual global revenue of the noncompliant company, whichever is greater. As we expand into other foreign countries and jurisdictions, we may be subject to additional laws and regulations that may affect how we conduct business.

RISKS RELATED TO OUR FINANCIAL POSITION AND NEED FOR ADDITIONAL FINANCING

Our failure to obtain additional capital when needed could force us to further delay, reduce or eliminate development of imetelstat, including the Phase 3 portion of IMerge, or our potential future imetelstat commercialization efforts, which would severely and adversely affect our financial results, business and business prospects, and might cause us to cease operations.

Successful drug development and commercialization requires significant amounts of capital. We will require substantial additional capital in order to further advance the imetelstat program, including conducting the research and development and clinical and regulatory activities necessary to bring imetelstat to market, such as completion of the Phase 3 portion of IMerge and potential clinical trials in other indications, and to establish sales and marketing capabilities to commercialize imetelstat in the United States on our own, if regulatory approval is granted. Because the outcome of any clinical activities and/or regulatory approval process is highly uncertain, we cannot reasonably estimate whether any development activities we may undertake will succeed, and we may never recoup our investment in any imetelstat development, which would adversely affect our financial condition and our business and business prospects, and might cause us to cease operations. Our future capital requirements are difficult to forecast and will depend on many factors, including:

- the accuracy of the assumptions underlying our estimates for our capital needs;
- the progress, timing, magnitude, scope and costs of clinical development, manufacturing and commercialization of imetelstat, including the number of indications being pursued, subject to clearances and approvals by the FDA and other regulatory authorities;
- the scope, progress, duration, results and costs of current and future clinical trials, including the Phase 3 portion of IMerge, as well as non-clinical studies and assessments, of imetelstat;
- the costs, timing and outcomes of regulatory reviews or other regulatory actions related to imetelstat, including obtaining regulatory clearances and approvals in the United States and in other countries;
- the costs of preparing, filing and prosecuting patent applications and maintaining, enforcing and defending intellectual property-related claims;
- the costs of manufacturing imetelstat, including our ability to meaningfully reduce those manufacturing costs;
- the costs of multiple third-party vendors and service providers, including our CRO, to support the development, manufacturing and commercialization of imetelstat;
- our ability to establish, enforce and maintain collaborative or other strategic arrangements for research, development, clinical testing, manufacturing, commercialization and marketing of imetelstat;
- our ability to successfully market and sell imetelstat, if imetelstat receives future regulatory approval or clearance, in the United States and other countries;
- our need to hire additional qualified employees and consultants to support the development and commercialization of imetelstat;
- the costs and timing of building a U.S. sales force to market and sell imetelstat, should it receive regulatory clearance;
- the sales price for imetelstat;
    - the availability of coverage and adequate third-party reimbursement for imetelstat;
- the extent and scope of our general and administrative expenses, including expenses associated with potential future litigation; and
- the costs of maintaining and operating facilities in California and New Jersey, including higher expenses for travel, telecommunications and administrative oversight.

As a result of the termination of the Collaboration Agreement effective September 28, 2018, we are responsible for funding all clinical development, manufacturing, intellectual property maintenance and commercial activities for imetelstat. In order to further advance the imetelstat program, including completion of the Phase 3 portion of IMerge and potential clinical trials in other indications, we will need to raise substantial additional capital or establish additional collaborative arrangements with third-party collaborative partners, which may not be possible. In addition, as a result of the termination of the Collaboration Agreement, we will not receive any further milestone payments or royalties from Janssen for the development or sale of imetelstat, including any clinical development milestones. If we are unable to raise additional capital or establish alternative collaborative arrangements with third-party collaborative partners for imetelstat, the development of imetelstat may be further delayed, altered or abandoned, which might cause us to cease operations. Additional financing through public or private equity financings, including pursuant to our 2018 Sales Agreement with B. Riley FBR, capital lease transactions or other financing sources may not be available on acceptable terms, or at all. We may raise equity capital at a stock price or on other terms that could result in substantial dilution of ownership for our stockholders. The receptivity of the public and private equity markets to proposed financings is substantially affected by the general economic, market and political climate and by other factors which are unpredictable and over which we have no control. In this regard, continued volatility and instability in the global financial markets and political climate could adversely affect our ability to raise additional funds through financings and the terms upon which we may raise those funds.

In addition, we may seek additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interests of our stockholders may be diluted, and the terms may include liquidation or other preferences that materially and adversely affect the rights of our stockholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through alliance, collaboration or licensing arrangements with third parties, we may have to relinquish valuable rights to imetelstat or our technologies or grant licenses on terms that are not favorable to us.

We cannot assure you that our existing capital resources, future interest income, and potential future sales of our common stock, including under our 2018 Sales Agreement with B. Riley FBR, will be sufficient to fund our operating plans. We will need additional funds to meet operational needs and capital requirements to advance the imetelstat program in clinical development and potential commercialization, and our need for additional funds may arise sooner than planned. If adequate funds are not available on a timely basis, if at all, we may be unable to pursue further development or potential commercialization of imetelstat, which could adversely affect our business.

We currently have no source of product revenue and may never become consistently profitable.

Although we were profitable in 2015 due to the recognition of revenue in connection with the upfront payment from Janssen under the Collaboration Agreement, we have otherwise never been profitable and have incurred operating losses every year since our operations began in 1990. We will not receive any future milestone-based or royalty payments from Janssen relating to imetelstat, nor will Janssen share the cost of ongoing or future clinical trials of imetelstat or the costs for patents that were licensed to them under the terminated Collaboration Agreement, after September 28, 2018. We expect to incur significant additional operating losses and, as we assume responsibility for imetelstat clinical development activities, our operating losses are likely to substantially increase. As of December 31, 2018, our accumulated deficit was approximately $1.01 billion. Losses have resulted principally from costs incurred in connection with our research and development activities and from general and administrative costs associated with our operations.

Substantially all of our revenues to date have been payments under collaborative agreements and milestones, royalties and other revenues from our licensing arrangements. With the termination of the Collaboration Agreement effective

September 28, 2018, we have no ongoing collaborative agreements related to imetelstat. Any revenues generated from our remaining licensing agreements related to our telomerase technology are expected to be minimal, and will be insufficient to sustain our operations. Our telomerase-related licensing revenues declined significantly in 2018 due to the expiration of the patents underlying such technology, and are expected to be eliminated later in 2019. We have no current plans to enter into any new corporate collaboration, partnership or license agreements that result in revenues, and our remaining telomerase-related license agreements may be terminated by the other parties to such licenses, or expire with the underlying patents.

We also expect to experience increased negative cash flow for the foreseeable future as we fund our operations and assume full payment responsibility for imetelstat clinical development activities. This will result in decreases in our working capital, total assets and stockholders' equity. Further, we may be unable to replenish our working capital by future financings. We will need to generate significant revenues to achieve consistent future profitability. We may never achieve consistent future profitability. Even if we do become profitable in the future, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to achieve consistent future profitability could negatively impact the market price of our common stock and our ability to sustain operations.

The comprehensive U.S. tax reform bill passed in 2017 could adversely affect our business and financial condition.

On December 22, 2017, President Trump signed into law legislation, known as the Tax Cuts and Jobs Act of 2017, that significantly revised the Internal Revenue Code of 1986, as amended, or the Code. The legislation, among other things, contained significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%; reduction in the percentage of allowable expenses eligible for orphan drug credit purposes; limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks; immediate deductions for certain new investments instead of deductions for depreciation expense over time; and modifying or repealing many business deductions and credits. Notwithstanding the reduction in the corporate income tax rate, the overall long-term impact of the federal tax law changes are uncertain and our business and financial condition could be adversely affected. In addition, it is uncertain if and to what extent various states will conform to the federal tax law changes. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to this legislation and the potential tax consequences of investing in or holding our common stock.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

Our net operating loss carryforwards could expire unused and be unavailable to offset future income tax liabilities. Under the 2017 federal income tax law changes, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. It is uncertain if and to what extent various states will conform to the federal tax law changes. In addition, under Section 382 of the Code, and corresponding provisions of state law, if a corporation undergoes an "ownership change," generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes (such as research tax credits) to offset its post-change taxable income or taxes may be limited. Changes in our stock ownership, some of which are outside of our control, may have resulted or could in the future result in an ownership change. If a limitation were to apply, utilization of a portion of our domestic net operating loss and tax credit carryforwards could be limited in future periods. In addition, a portion of the carryforwards may expire before being available to reduce future income tax liabilities which could adversely impact our financial position.

RISKS RELATED TO OUR COMMON STOCK AND FINANCIAL REPORTING

Historically, our stock price has been extremely volatile.

Historically, our stock price has been extremely volatile. Between January 1, 2009 and December 31, 2018, our stock has traded as high as $8.73 per share and as low as $0.86 per share. Between January 1, 2016 and December 31, 2018, the price has ranged between a high of $6.99 per share and a low of $0.95 per share. The significant market price fluctuations of our common stock have been due to and may in the future be influenced by a variety of factors, including:

- termination of the Collaboration Agreement by Janssen in September 2018;
- announcements regarding the research and development of imetelstat, or results of, further delays in, discontinuation of, or further modifications or refinements to any clinical trials of imetelstat for any reason, including as a result of the failure to successfully transition the imetelstat program to us by Janssen, or our inability, for any reason, to successfully continue the development of imetelstat after any such transfer;
- preliminary, interim or final clinical trial data reported with respect to current or potential future clinical trials of imetelstat, and investor perceptions thereof;

- not receiving timely regulatory clearances or approvals in any jurisdiction, whether within or outside of the United States, including, if we do not obtain regulatory clearance to commence, conduct or continue clinical trials of imetelstat in MF, MDS or any additional hematologic myeloid malignancies in a timely manner or at all, or to amend any clinical trial protocol with respect to the anticipated conduct of the Phase 3 portion of IMerge or any potential future clinical trials of imetelstat;
- announcements regarding the safety of imetelstat and partial or full clinical holds placed on the imetelstat IND by the FDA or other regulatory authorities, or other regulatory developments related to imetelstat;
- the experimental nature of imetelstat;
- the terms and timing of any future collaborative arrangements for the development and potential commercialization of imetelstat that we may establish;
- the demand in the market for our common stock;
- announcements of technological innovations, new commercial products, or clinical progress or lack thereof by us, potential future collaborative partners or our competitors;
- fluctuations in our operating results;
- increased or continuing operating losses as a result of our sole responsibility for the development and potential future commercialization of imetelstat or otherwise;
- general domestic and international market conditions or market conditions relating to the biopharmaceutical and pharmaceutical industries;
- announcements concerning imetelstat proprietary rights;
- comments by securities analysts or other third parties, including blogs, articles and other media;
- large stockholders exiting their position in our common stock or an increase in the short interest in our common stock;
- announcements of or developments concerning potential future litigation, including any securities class action litigation initiated as a result of the termination of the Collaboration Agreement;
- the issuance of common stock to partners, vendors or investors to raise additional capital; and
- the occurrence of any other risks and uncertainties discussed under the heading “Risk Factors.”

Stock prices and trading volumes for many biopharmaceutical companies fluctuate widely for a number of reasons, including factors which may be unrelated to their businesses or results of operations, such as media coverage, statements made on message boards and social media forums, legislative and regulatory measures and the activities of various interest groups or organizations. In addition to the risk factors described in this section, overall market volatility, as well as general domestic or international economic, market and political conditions, could materially and adversely affect the market price of our common stock and the return on your investment.

In addition, as further discussed in the Risk Factor above titled “We have been, and may in the future be, involved in securities-related legal actions that are expensive and time consuming. Any securities-related legal actions, if resolved adversely, could harm our business, financial condition, or results of operations”, class action litigation has often been instituted against companies, including us, whose securities have experienced periods of volatility in market price. Any such litigation brought against us in the future could result in substantial costs, which would hurt our financial condition and results of operations and divert management’s attention and resources, which could result in further delays of potential future clinical trials or commercialization efforts.

We may fail to continue to meet the listing standards of Nasdaq, and as a result our common stock may be delisted, which could have a material adverse effect on the liquidity of our common stock.

Our common stock is currently traded on the Nasdaq Global Select Market. The Nasdaq Stock Market LLC has requirements that a company must meet in order to remain listed on Nasdaq. In particular, Nasdaq rules require us to maintain a minimum closing bid price of $1.00 per share of our common stock. On December 21, 2018, the closing price of our common stock was $0.98 per share, and while the closing price of our common stock rose to $1.02 per share on December 26, 2018, and has subsequently remained at or above the minimum closing bid price of $1.00 per share from December 26, 2018 through the date of filing of this Annual Report on Form 10-K, it may in the future fall below the closing minimum bid price of $1.00 per share. If the closing bid price of our common stock were to fall below $1.00 per share for 30 consecutive trading days, or we do not meet other listing requirements, we would fail to be in compliance with Nasdaq's listing standards. There can be no assurance that we will continue to meet the minimum bid price requirement, or any other requirement in the future. If we fail to meet the minimum bid price requirement, The Nasdaq Stock Market LLC may initiate the delisting process with a notification letter. If we were to receive such a notification, we would be afforded a grace period of 180 calendar days to regain compliance with the minimum bid price requirement. In order to regain compliance, shares of our common stock would need to maintain a minimum closing bid price of at least $1.00 per share for a minimum of 10 consecutive trading days. In addition, we may be unable to meet other applicable Nasdaq listing requirements, including maintaining minimum levels of stockholders' equity or market values of our common stock, in which case our common stock could be delisted. If our common stock were to be delisted, the liquidity of our common stock would be adversely affected, and the market price of our common stock could decrease.

The sale of a substantial number of shares may adversely affect the market price of our common stock.

As of December 31, 2018, we had 300,000,000 shares of common stock authorized for issuance and 186,392,682 shares of common stock outstanding. In addition, we had reserved 40,665,152 shares of our common stock for future issuance pursuant to our option and equity incentive plans and outstanding warrants as of December 31, 2018. In addition, under the universal shelf registration statement filed by us in May 2018 and declared effective by the SEC in July 2018, we may sell any combination of common stock, preferred stock, debt securities and warrants in one or more offerings, up to a cumulative value of $250 million.

Future sales of our common stock or the perception that such sales could occur, or the issuance of common stock to fund our operations and imetelstat development, including pursuant to our 2018 Sales Agreement with B. Riley FBR, could cause immediate dilution and adversely affect the market price of our common stock. The sale or issuance of our securities, as well as the existence of outstanding options and shares of common stock reserved for issuance under our option and equity incentive plans and outstanding warrants, also may adversely affect the terms upon which we are able to obtain additional capital through the sale of equity securities, which could negatively affect the market price of our common stock and the return on your investment.

Our undesignated preferred stock may inhibit potential acquisition bids; this may adversely affect the market price of our common stock and the voting rights of holders of our common stock.

Our certificate of incorporation provides our board of directors with the authority to issue up to 3,000,000 shares of undesignated preferred stock and to determine or alter the rights, preferences, privileges and restrictions granted to or imported upon these shares without further vote or action by our stockholders. The issuance of shares of preferred stock may delay or prevent a change in control transaction without further action by our stockholders. As a result, the market price of our common stock may be adversely affected.

In addition, if in the future, we issue preferred stock that has preference over our common stock with respect to the payment of dividends or upon our liquidation, dissolution or winding up, or if we issue preferred stock with voting rights that dilute the voting power of our common stock, the rights of holders of our common stock or the market price of our common stock could be adversely affected.

Provisions in our charter, bylaws and Delaware law may inhibit potential acquisition bids for us, which may prevent holders of our common stock from benefiting from what they believe may be the positive aspects of acquisitions and takeovers.

Provisions of our charter documents and bylaws may make it substantially more difficult for a third party to acquire control of us and may prevent changes in our management, including provisions that:

- prevent stockholders from taking actions by written consent;
- divide the board of directors into separate classes with terms of office that are structured to prevent all of the directors from being elected in any one year; and
- set forth procedures for nominating directors and submitting proposals for consideration at stockholders' meetings.

Provisions of Delaware law may also inhibit potential acquisition bids for us or prevent us from engaging in business combinations. In addition, we have individual severance agreements with our executive officers and a company-wide severance plan, either of which could require a potential acquirer to pay a higher price. Either collectively or individually, these provisions may prevent holders of our common stock from benefiting from what they may believe are the positive aspects of acquisitions and takeovers, including the potential realization of a higher rate of return on their investment from these types of transactions.

We do not intend to pay cash dividends on our common stock in the foreseeable future.

We do not anticipate paying cash dividends on our common stock in the foreseeable future. Any payment of cash dividends will depend upon our financial condition, results of operations, capital requirements and other factors and will be at the discretion of our board of directors.

Failure to achieve and maintain effective internal controls in accordance with Section 404 of the Sarbanes-Oxley Act of 2002 could have a material adverse effect on our business and stock price.

Section 404 of the Sarbanes-Oxley Act of 2002, or Section 404, requires that we establish and maintain an adequate internal control structure and procedures for financial reporting. Our annual reports on Form 10-K must contain an annual assessment by management of the effectiveness of our internal control over financial reporting and must include disclosure of any material weaknesses in internal control over financial reporting that we have identified. In addition, our independent registered public accounting firm must provide an opinion annually on the effectiveness of our internal control over financial reporting.

The requirements of Section 404 are ongoing and also apply to future years. We expect that our internal control over financial reporting will continue to evolve as our business develops. Although we are committed to continue to improve our internal control processes and we will continue to diligently and vigorously review our internal control over financial reporting in order to ensure compliance with Section 404 requirements, any control system, regardless of how well designed, operated and evaluated, can provide only reasonable, not absolute, assurance that its objectives will be met. Therefore, we cannot be certain that material weaknesses or significant deficiencies will not exist or otherwise be discovered in the future. If material weaknesses or other significant deficiencies occur, such weaknesses or deficiencies could result in misstatements of our results of operations, restatements of our financial statements, a decline in our stock price, or other material adverse effects on our business, reputation, results of operations, financial condition or liquidity.

RISKS RELATED TO COMPETITIVE FACTORS

Competitors may develop products, product candidates or technologies that are superior to or more cost-effective than ours, which may significantly impact the development and commercial viability of imetelstat, which would severely

and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

The pharmaceutical and biotechnology industries are intensely competitive. Other pharmaceutical and biotechnology companies and research organizations currently engage in or have in the past engaged in efforts related to the biological mechanisms related to imetelstat, the study of telomeres, telomerase, or our proprietary oligonucleotide chemistry, and the research and development of therapies for the treatment of hematologic myeloid malignancies. In addition, other products and therapies that could directly compete with imetelstat currently exist or are being developed by pharmaceutical and biopharmaceutical companies and by academic institutions, government agencies and other public and private research organizations.

If approved for commercial sale for the treatment of lower risk MDS, imetelstat would compete against a number of treatment options, including erythropoiesis stimulating agents and other hematopoietic growth factors; immunomodulators, such as lenalidomide by Celgene Corporation, or Celegene; hypomethylating agents, such as azacitidine by Celgene and decitabine by Janssen; in addition to investigational treatments that may be further along in development than imetelstat, such as oral versions of azacitidine; histone deacetylase inhibitors; TGF-beta superfamily inhibitors, such as luspatercept by Acceleron Pharma, Inc., or Acceleron, in collaboration with Celgene; PI3 Kinase inhibitors; proteasome inhibitors; aminopeptidase inhibitors, such as tosedostat by CTI Biopharma Corporation, or CTI Biopharma; TLR2-specific antibodies; TPO agonists, such as romiplostim by Amgen Inc.; anti-CD33 antibodies; anti-CD38 antibodies, such as daratumumab by Genmab A/S in collaboration with Janssen; anti-CD123 antibodies, such as talacotuzumab by Janssen; antagonists of Toll-like receptor signaling; retinoic acid receptor alpha agonists, such as SY-1425 by Syros Pharmaceuticals; hypoxia-inducible factor prolyl hydroxylase inhibitors, such as roxadustat by FibroGen, Inc.; Fas ligand inhibitors; immune checkpoint regulators; and JAK-STAT pathway inhibitors.

If approved for commercial sale for the treatment of MF, imetelstat would compete against Incyte Corporation's ruxolitinib, or Jakafi®, which is orally administered. In clinical trials, Jakafi® reduced spleen size, abdominal discomfort, early satiety, bone pain, night sweats and itching in MF patients. Recently, there have also been reports of overall survival benefit as well as improvement in bone marrow fibrosis from Jakafi® treatment. Other treatment modalities for MF include hydroxyurea for the management of splenomegaly, leukocytosis, thrombocytosis and constitutional symptoms; splenectomy and splenic irradiation for the management of splenomegaly and co-existing cytopenias, or low blood cell counts; chemotherapy and pegylated interferon. Drugs for the treatment of MF-associated anemia include erythropoiesis stimulating agents, androgens, danazol, corticosteroids, thalidomide and lenalidomide. There are other investigational treatments for MF further along in development than imetelstat, such as pacritinib by CTI Biopharma, momelotinib by Sierra Oncology, and fedratinib by Celgene, which have reported results from Phase 3 clinical trials. Other investigational treatments for MF include inhibitors of the JAK-STAT pathway, such as NS-018 by NS Pharma, Inc.; histone deacetylase inhibitors; interleukin-3 receptor targeted agents; inhibitors of heat shock protein 90; hypomethylating agents; PI3 Kinase and mTOR inhibitors; anti-fibrosis antibodies, such as PRM-151 from Promedior, Inc.; hedgehog and SMO inhibitors; PIM kinase inhibitors; IAP inhibitors; anti-LOX2 inhibitors; recombinant pentraxin 2 protein; KIP-1 activators; TGF-beta superfamily inhibitors, such as sotatercept and luspatercept by Acceleron, in collaboration with Celgene; FLT inhibitors; BET inhibitors, such as CPI-0610 by Constellation Pharmaceuticals, Inc.; SMAC mimetics, such as LCL161 by Novartis Pharmaceuticals Corporation and other tyrosine kinase inhibitors.

Smaller companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. We anticipate increased competition in the future as new companies explore treatments for hematologic myeloid malignancies, which may significantly impact the commercial viability of imetelstat. Academic institutions, government agencies and other public and private research organizations may also conduct research, seek patent protection and establish collaborative arrangements for research, clinical development and marketing of products similar to imetelstat. These companies and institutions compete with us in recruiting and retaining qualified development and management personnel as well as in acquiring technologies complementary to the imetelstat program.

In addition to the above factors, imetelstat will face competition based on:

- product efficacy and safety;
- convenience of product administration;
- cost of manufacturing;
- the timing and scope of regulatory consents;
- status of coverage and level of reimbursement;

- price; and
- patent position, including potentially dominant patent positions of others.

55

As a result of the foregoing, competitors may develop more commercially desirable or affordable products than imetelstat, or achieve earlier patent protection or product commercialization than we may be able to achieve with imetelstat. Competitors have developed, or are in the process of developing, technologies that are, or in the future may be, competitive to imetelstat. Some of these products may have an entirely different approach or means of accomplishing therapeutic effects similar or superior to those that may be demonstrated by imetelstat. Competitors may develop products that are safer, more effective, or less costly than imetelstat, or more convenient to administer to patients and, therefore, present a serious competitive threat to imetelstat. In addition, competitors may price their products below what we may determine to be an acceptable price for imetelstat, may receive better third-party payor coverage and/or reimbursement, or may be more cost-effective than imetelstat. Such competitive products or activities by competitors may render imetelstat obsolete, which may cause us to cease any further development or future commercialization of imetelstat, which would severely and adversely affect our financial results, business and business prospects, and the future of imetelstat, and might cause us to cease operations.

To be commercially successful, imetelstat must be accepted by the health care community, which can be very slow to adopt or unreceptive to new technologies and products.

If approved for marketing, imetelstat may not achieve market acceptance since hospitals, physicians, patients or the medical community in general may decide not to accept and utilize imetelstat. If approved for commercial sale, imetelstat will compete with a number of conventional and widely accepted drugs and therapies manufactured and marketed by major pharmaceutical companies. The degree of market acceptance of imetelstat will depend on a number of factors, including:

- the clinical indications for which imetelstat is approved;
- the country and/or regions within which imetelstat is approved;
- the establishment and demonstration to the medical community of the clinical efficacy and safety of imetelstat;
- the ability to demonstrate that imetelstat is superior to alternatives on the market at the time;
- the ability to establish in the medical community the potential advantages of imetelstat over alternative treatment methods, including with respect to efficacy, safety, cost or route of administration;
- the label and promotional claims allowed by the FDA or other regulatory authorities for imetelstat, if any;
- the timing of market introduction of imetelstat as well as competitive products;
- the effectiveness of sales, marketing and distribution support for imetelstat;
- the pricing of imetelstat;
- the availability of coverage and adequate reimbursement by government and third-party payors; and
- the willingness of patients to pay out-of-pocket in the absence of coverage by third-party payors, including governmental authorities.

The established use of conventional products competitive with imetelstat may limit or preclude the potential for imetelstat to receive market acceptance upon any commercialization. We may be unable to demonstrate any pharmacoeconomic advantage for imetelstat compared to established or standard-of-care therapies, or newly developed therapies, for hematologic myeloid malignancies. Third-party payors may decide that any potential improvement that imetelstat may provide to clinical outcomes in hematologic myeloid malignancies is not adequate to justify the costs of treatment with imetelstat. If the health care community does not accept imetelstat for any of the foregoing reasons, or for any other reason, our ability to further develop or commercialize imetelstat may be negatively impacted or precluded altogether, which would seriously and adversely affect our business and business prospects, and might cause us to cease operations.

If acceptable prices or adequate reimbursement for imetelstat is not obtained, the use of imetelstat could be severely limited.

The ability to successfully commercialize imetelstat will depend significantly on obtaining acceptable prices and the availability of coverage and adequate reimbursement to the patient from third-party payors. Government payors, such as the Medicare and Medicaid programs, and other third-party payors, such as private health insurers and health maintenance organizations, determine which medications they will cover and the reimbursement levels. Assuming we obtain coverage for imetelstat by a third-party payor, the resulting reimbursement payment rates may not be adequate or may require co-payments that patients find unacceptably high. If imetelstat is approved for commercial sale, patients are unlikely to use it unless coverage is provided, and reimbursement is adequate to cover all or a significant portion of its cost. Therefore, coverage and adequate reimbursement will be critical to new product acceptance.

Government authorities and other third-party payors are developing increasingly sophisticated methods of controlling healthcare costs, such as by limiting coverage and the amount of reimbursement for particular medications. Increasingly, third-party payors are requiring that drug companies provide them with predetermined discounts from list prices as a condition of coverage, are using restrictive formularies and preferred drug lists to leverage greater discounts in competitive classes, and are challenging the prices charged for medical products. Further, no uniform policy requirement for coverage and reimbursement for drug products exists among third-party payors in the United States. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of imetelstat to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance.

We cannot be sure that coverage and reimbursement will be available for imetelstat, if approved for commercial sale, and, if reimbursement is available, what the level of reimbursement will be. There may also be significant delays in obtaining coverage and reimbursement for newly approved drugs, and coverage may be more limited than the purposes for which the drug is approved by the FDA or comparable foreign regulatory authorities. Coverage and reimbursement may impact the demand for, or the price of, any product candidate for which marketing approval is obtained. If coverage and reimbursement are not available or reimbursement is available only to limited levels, we may not successfully commercialize imetelstat, even if marketing approval is obtained, which would negatively impact our business and business prospects.

The adoption of health policy changes and health care reform in the United States may adversely affect our business and financial results.

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, collectively known as the Affordable Care Act, or ACA, became law and substantially changed the way healthcare is funded by both governmental and private insurers, and significantly impacted the pharmaceutical industry. The ACA contains a number of provisions that may have a significant impact on our business.

While the Supreme Court upheld the constitutionality of most elements of the ACA in June 2012 and upheld the ACA against challenges to nationwide tax subsidies in July 2015, other judicial and Congressional challenges against the ACA have been brought, and are likely to be brought in the future. Since January 2017, President Trump has signed two executive orders and other directives designed to delay, circumvent, or loosen certain requirements mandated by the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, two bills affecting the implementation of certain taxes under the ACA have been signed into law. The Tax Cuts and Jobs Act of 2017, or Tax Act, includes a provision which repealed, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA

on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the “individual mandate”. On January 22, 2018, President Trump signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain ACA-mandated fees. The Bipartisan Budget Act of 2018, among other things, amended the ACA, effective January 1, 2019, to close the coverage gap in most Medicare Part D drug plans, commonly referred to as the “donut hole”. In July 2018, CMS published a final rule permitting further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA risk adjustment program in response to the outcome of federal district court

litigation regarding the method CMS uses to determine this risk adjustment. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA and our business.

In addition, other legislative changes have been proposed and adopted since the ACA was enacted. For example, in August 2011, the Budget Control Act of 2011 was enacted, which, among other things, created the Joint Select Committee on Deficit Reduction to recommend to Congress proposals in spending reductions. The Joint Select Committee on Deficit Reduction did not achieve a targeted deficit reduction of at least $1.2 trillion for fiscal years 2012 through 2021, triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, which went into effect beginning on April 1, 2013 and, due to subsequent legislative amendments to the statute, including the Bipartisan Budget Act of 2018, will stay in effect through 2027 unless additional Congressional action is taken. Further, the American Taxpayer Relief Act of 2012, signed into law in January 2013, among other things, also reduced Medicare payments to certain providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.

In the future, we anticipate additional proposals relating to the reform of the U.S. healthcare system, some of which could further limit the prices, or the amounts of reimbursement available for imetelstat. There has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices in light of the rising cost of prescription drugs and biologics. Specifically, there have been several recent U.S. Congressional inquiries and federal and state legislative activity designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, reduce the price of drugs under Medicare, and reform government program reimbursement methodologies for drugs, some of which are included in the Trump administration's budget proposal for fiscal year 2019. Additionally, the Trump administration released a "Blueprint" that contains additional proposals to increase manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products and reduce the out of pocket costs of drug products paid by consumers. On January 31, 2019, the U.S. Department of Health and Human Services, Office of Inspector General, proposed modifications to federal Anti-Kickback Statute safe harbors which, among other things, will affect rebates paid by manufacturers to Medicare Part D plans, the purpose of which is to further reduce the cost of drug products to consumers. While a number of these and other proposed measures may require authorization through additional legislation to become effective, Congress and the Trump Administration have each indicated that they will continue to seek new legislative and/or administrative measures to control drug costs. If future legislation were to impose direct governmental price controls and access restrictions, it could have a significant adverse impact on our business and financial results. Managed care organizations, as well as Medicaid and other government agencies, continue to seek price discounts. At the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biologic product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, to encourage importation from other countries and bulk purchasing. Due to the volatility in the current economic and market dynamics, we are unable to predict the impact of any unforeseen or unknown legislative, regulatory, payor or policy actions, which may include cost containment and healthcare reform measures. Such policy actions could have a material adverse impact on future worldwide sales of imetelstat, if approved.

Cost control initiatives also could decrease the price that we may receive for imetelstat in the future. If imetelstat is not considered cost-effective or adequate third-party reimbursement for the users of imetelstat cannot be obtained, then we may be unable to maintain price levels sufficient to realize an appropriate return on our investment in

imetelstat. Any of these events would severely and adversely affect our financial results, business and business prospects, and might cause us to cease operations.

If we fail to comply with federal, state and foreign healthcare laws, including fraud and abuse, transparency, and health information privacy and security laws, we could face substantial penalties and our business, results of operations, financial condition and prospects could be adversely affected.

Our business operations and current and future arrangements with investigators, healthcare professionals, consultants, third-party payors and customers, may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations. These laws may constrain the business or financial arrangements and relationships through which we conduct our operations, including how we research, market, sell and distribute any product of ours for which marketing approval is obtained. Such laws include:

- the federal Anti-Kickback Statute, which prohibits, among other things, persons and entities, including prescription drug manufacturers (or a party acting on its behalf), from knowingly and willfully, directly or indirectly, soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order, lease or recommendation of, any good, facility, item or service for which payment may be made under a federal healthcare program such as Medicare and Medicaid. The term "remuneration" has been broadly interpreted to include anything of value. Several courts have interpreted the statute's intent requirement to mean that if any one purpose of an arrangement involving remuneration is to induce referrals of federal healthcare covered business, the federal Anti Kickback Statute has been violated. The ACA, among other things, amended the intent requirement of the federal Anti Kickback Statute such that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate, in order to commit a violation;
- the federal civil and criminal false claims and civil monetary penalties laws, including the federal civil False Claims Act and its qui tam or whistleblower provisions which permit a private individual to bring an action on behalf of the government to enforce the civil False Claims Act, prohibit, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government. Entities can be held liable under these laws if they are deemed to "cause" the submission of false or fraudulent claims by, for example, providing inaccurate billing or coding information to customers, promoting a product off label, or for providing medically unnecessary services or items. In addition, a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which imposes criminal and civil liability for, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third-party payors, knowingly and willfully embezzling or stealing from a healthcare benefit program, willfully obstructing a criminal investigation of a healthcare offense, and knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false or fraudulent statements in connection with the delivery of or payment for healthcare benefits, items or services;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, or HITECH, and their implementing regulations, which imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security, transmission and breach reporting of individually identifiable health information, upon entities subject to the law, such as health plans, healthcare clearinghouses and certain healthcare providers, known as covered entities, and their respective business associates that perform services for them that involve individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in U.S. federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- the federal Physician Payments Sunshine Act, which requires certain manufacturers of drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program, with specific exceptions, to report annually to the Centers for Medicare & Medicaid Services, or CMS, information related to payments or other transfers of value made to physicians and teaching hospitals, and applicable manufacturers and applicable group purchasing organizations to report annually to CMS ownership and investment interests held by physicians and their immediate family members; and
- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, which may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government; state laws that require drug manufacturers to report information related to payments and other transfers of value to physicians, other healthcare providers, and healthcare entities, or marketing expenditures; state laws that require the reporting of information related to drug pricing; state and local laws that require the registration of pharmaceutical sales representatives; and state and foreign laws governing the privacy and security of health information, including the GDPR, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Efforts to ensure that our current and future business arrangements will comply with applicable healthcare, privacy and data security laws and regulations will involve substantial costs. For example, the GDPR, which became effective on May 25, 2018, imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, the security and confidentiality of the personal data, data breach notification and the use of third party processors in connection with the processing of personal data. The GDPR also imposes strict rules on the transfer of personal data out of the EU, provides an enforcement authority and authorizes the imposition of large penalties for noncompliance, including the potential for fines of up to €20 million or 4% of the annual global revenues of the noncompliant company, whichever is greater. The GDPR has increased our responsibility and potential liability in relation to personal data that we process or control compared to prior EU law, including in clinical trials, and we may be required to put in place additional mechanisms to ensure compliance with the GDPR, which could divert management's attention and increase our cost of doing business. Likewise, we expect that there will continue to be new proposed laws, regulations and industry standards relating to privacy and data protection in the United States, the EU and other jurisdictions, such as the California Consumer Privacy Act of 2018, which has been characterized as the first "GDPR-like" privacy statute to be enacted in the United States because it mirrors a number of the key provisions in the GDPR, that will go into effect beginning January 1, 2020, and we cannot determine the impact such laws, regulations and standards will have on our business. In any event, it is possible that governmental authorities will conclude that our business practices do not comply with current or future statutes, regulations, agency guidance or case law involving applicable healthcare or privacy laws, including the GDPR, in light of the lack of applicable precedent and regulations.

Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry. If our operations are found to be in violation of any of these or any other healthcare and privacy-related regulatory laws that may apply to us, we may be subject to significant penalties, including the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, disgorgement, imprisonment, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, reputational harm, diminished profits and future earnings, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations. Defending against any such actions can be costly, time-consuming and may require significant financial and personnel resources. Therefore, even if we are successful in defending against any such actions that may be brought against us, our business may be impaired.

60

ITEM 1B. UNRESOLVED STAFF COMMENTS
None.

ITEM 2. PROPERTIES
In September 2017, we amended the lease agreement for our premises at 149 Commonwealth Drive, Menlo Park, California, to extend the lease term from February 2018 through January 2020. During the term of the amended lease, we will continue to occupy approximately 14,500 square feet of office space. Our amended lease at 149 Commonwealth Drive includes an option to extend the lease for one additional period of two years. In addition, we plan to open an office in northern New Jersey to facilitate the expansion of our clinical development team and to provide support for future global clinical trials. Other corporate functions also expected to be managed from the New Jersey office include business development and, assuming imetelstat is approved, future commercial operations.

ITEM 3. LEGAL PROCEEDINGS
None.

ITEM 4. MINE SAFETY DISCLOSURES
Not applicable.

PART II

ITEM 5. MARKET FOR THE REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information

Our common stock is quoted on the Nasdaq Global Select Market under the symbol GERN. As of March 1, 2019, there were approximately 542 stockholders of record of our common stock. This number does not include "street name" or beneficial holders, whose shares are held of record by banks, brokers and other financial institutions.

Dividend Policy

We have never paid cash dividends on our capital stock and do not anticipate paying cash dividends in the foreseeable future, but intend to retain our capital resources for reinvestment in our business. Any future determination to pay cash dividends will be at the discretion of the board of directors and will be dependent upon our financial condition, results of operations, capital requirements and other factors our board of directors deems relevant.

Recent Sales of Unregistered Securities

During the year ended December 31, 2018, there were no unregistered sales of equity securities by us.

ITEM 6. SELECTED FINANCIAL DATA

We are a smaller reporting company as defined by Rule 12b-2 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and are not required to provide the information specified under this item.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion should be read in conjunction with the section entitled "Business" in Part I, Item 1 and the audited financial statements and notes thereto included in Part II, Item 8 of this annual report on Form 10 K. The information provided should be reviewed in the context of the sections entitled "Risks Related to the Development of Imetelstat", "Risks Related to Transition of the Imetelstat Program from Janssen to Geron" and "Risks Related to Regulatory Approval and Commercialization of Imetelstat" in Part I, Item 1A entitled "Risk Factors" and elsewhere in this annual report on Form 10-K.

Business Overview

We are a late-stage clinical biopharmaceutical company that is focused on the development and commercialization of innovative therapeutics for hematologic myeloid malignancies. We have global rights to imetelstat, a first-in-class telomerase inhibitor, that was discovered and developed at Geron. We believe clinical data from two Phase 2 clinical trials of imetelstat (IMerge and IMbark, discussed below) conducted by Janssen Biotech, Inc., or Janssen, support further development of imetelstat in hematologic myeloid malignancies. We are working with Janssen to transition the imetelstat program to us. See further discussion below regarding our past and current relationship with Janssen.

We plan to open patient screening and enrollment by mid-year of 2019 in a Phase 3 clinical trial (Part 2 of IMerge) to evaluate imetelstat in transfusion dependent patients with Low or Intermediate-1 risk myelodysplastic syndromes, or MDS, who have relapsed after or are refractory to prior treatment with an erythropoiesis stimulating agent, or ESA, have not received prior treatment with either a hypomethylating agent or lenalidomide and do not have a deletion 5q chromosomal abnormality. This target population of lower risk MDS patients depend on serial red blood cell transfusions to manage symptoms of anemia and fatigue. However, dependency on transfusions is associated with

poor survival, because of toxicity due to iron overload, as well as potential infections and allergic reactions. The ultimate goal for most trials of investigational agents in lower risk MDS is to enable patients to become transfusion independent for as long as possible. In December 2018, we reported results from the Phase 2 portion of IMerge in which 37% of patients experienced red blood cell transfusion independence for at least 8 consecutive weeks, or an

8-week RBC-TI rate. Importantly, this 8-week RBC-TI rate was observed in patients with high transfusion burdens, an indicator of a more difficult to treat population. Patients enrolled into the Phase 2 portion of IMerge had a baseline median red blood cell transfusion buren of eight units per eight weeks with a range of four to 14 units. Our results compare favorably to currently used treatments in a similar patient population, such as hypomethylating agents, or HMAs, which have a reported 8-week RBC-TI rate of 17% or lenalidomide, which has a reported 8-week RBC-TI rate of 27%. In addition, among the patients who achieved durable transfusion independence in our trial, as reflected by achieving a 24-week RBC-TI, all showed a hemoglobin rise of ≥3.0 g/dL compared to baseline during the transfusion-free interval. We believe these data suggest potential disease-modifying activity of imetelstat treatment.

Regarding our myelofibrosis, or MF, program, we reported data in December 2018 from the IMbark Phase 2 clinical trial, including the median overall survival of 29.9 months observed in the trial in comparison to the median overall survival of 14 – 16 months for patients previously treated with janus kinase, or JAK, inhibitors. We plan to discuss the IMbark data with experts in MF, as well as regulatory authorities, to consider how these results compare with other therapies currently available to MF patients, and to gain a better understanding of the potential significance of these results to patients and physicians. Because IMbark is the first clinical trial to apply rigorous, objective eligibility criteria to define patients considered relapsed or refractory to JAK inhibitors, we believe feedback from these discussions could provide important information on the feasibility, scope and design, including possible outcome measures, of any potential future clinical trials for imetelstat in Intermediate-2 or High-risk MF patients who have relapsed after or are refractory to prior treatment with a JAK inhibitor. We expect to outline our decision whether to continue late-stage development of imetelstat in MF by the end of the third quarter of 2019. This decision will be influenced by our assessment of what would be required to achieve clinical and regulatory success in MF, including the cost and duration of any potential clinical trials.

We have engaged Parexel as our CRO to support imetelstat clinical development activities. Parexel will provide contract research services related to clinical trials conducted by us, in accordance with the terms of the Master Services Agreement, or the MSA, that we entered into with Parexel on January 30, 2019, and related work orders. We may terminate the MSA and/or any work order without cause on prior written notice to Parexel. Contemporaneously with entering the MSA, we entered into a first work order with Parexel, under which Parexel will provide services related to IMerge. Under the first work order, we will pay Parexel service fees and pass-through expenses estimated to be approximately $33 million in the aggregate for Parexel’s services related to IMerge. We may amend the first work order or enter future work orders with Parexel related to MF or future clinical trials or services.

Status of Former Collaboration Agreement with Janssen

On November 13, 2014, we entered into a collaboration and license agreement, or the Collaboration Agreement, pursuant to which we granted Janssen the exclusive rights to develop and commercialize imetelstat worldwide for all indications in oncology, including hematologic myeloid malignancies, and all other human therapeutic uses. Janssen terminated the Collaboration Agreement effective September 28, 2018. Upon the effective date of termination, we regained the global rights to the imetelstat program. As a result of the termination of the Collaboration Agreement, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat, including any clinical development or sales milestones, and Janssen has no further obligations to us or any third parties, such as clinical sites or vendors, to fund any of the ongoing or any potential future imetelstat clinical trials.

Under the termination provisions of the Collaboration Agreement, Janssen is required to provide certain operational support for the imetelstat program during transition of the program to us. Each company is responsible for its own costs incurred related to transition activities unless otherwise specified in the Collaboration Agreement. We expect the transition process to be completed by September 2019 to enable the orderly transfer of all ongoing clinical, regulatory, medical affairs and non-clinical activities to us, including transfer of the sponsorship of ongoing imetelstat clinical

trials from Janssen to us. In addition, following the effective date of termination of the Collaboration Agreement, we expect Janssen to supply imetelstat to us for up to 24 months during a transition period for clinical manufacturing and such supply will be charged to us at Janssen's cost plus a premium.

Until the sponsorship responsibilities for imetelstat transfer from Janssen to us, including the U.S. Investigational New Drug, or IND, application, and all foreign regulatory applications, Janssen will continue conducting IMbark and the Phase 2 portion of IMerge. Patients currently enrolled in IMbark and the Phase 2 portion of

IMerge will continue to receive treatment and follow-up under the respective trial protocols. After September 28, 2018, the effective termination date of the Collaboration Agreement, our responsibility for imetelstat development costs, including ongoing conduct of the extension phase of IMbark and the Phase 2 portion of IMerge, and costs for the prosecution of patents that were licensed to Janssen under the Collaboration Agreement increased from 50% to 100%.

For a further discussion of the Collaboration Agreement, see Note 4 on License Agreements in Notes to Financial Statements of this Form 10-K. Information about the transition of the imetelstat program from Janssen to us should be reviewed in the context of the section entitled “Risks Related to Transition of the Imetelstat Program from Janssen to Geron” included in Item 1A, “Risk Factors” of this Form 10-K.

Financial Overview

We had approximately $182.1 million in cash, cash equivalents, restricted cash and current and noncurrent marketable securities as of December 31, 2018. We will require substantial additional capital in order to further advance the imetelstat program, including conducting the research and development and clinical and regulatory activities necessary to bring imetelstat to market, such as completing the Phase 3 portion of IMerge and potential clinical trials in other indications, and establishing sales and marketing capabilities to commercialize imetelstat in the United States on our own, if regulatory approval is granted. If approved for marketing by regulatory authorities, we plan to seek potential commercialization partners for territories outside of the United States. While we reported a small profit for the year ended December 31, 2015 due to our recognition of revenue in connection with the upfront payment from Janssen under the Collaboration Agreement, until 2015 we had never been profitable, and have not reported any profit since. We have incurred significant net losses since our inception in 1990, resulting principally from costs incurred in connection with our research and development activities and from general and administrative costs associated with our operations. As of December 31, 2018, we had an accumulated deficit of $1.01 billion. Since our inception, we primarily have financed our operations through the sale of equity securities, interest income on our marketable securities and payments we received under our collaborative and licensing arrangements.

Substantially all of our revenues to date have been payments under collaborative agreements, and milestones, royalties and other revenues from our licensing arrangements. We currently have no source of product revenue. The significance of future losses, future revenues and any potential future profitability will depend primarily on the clinical and commercial success of imetelstat. In any event, imetelstat will require significant additional clinical testing prior to possible regulatory approval in the United States and other countries. In addition, as a result of the termination of the Collaboration Agreement, we expect research and development expenses, general and administrative expenses, and losses to substantially increase in future periods as we assume sole responsibility for the imetelstat development program. We do not expect imetelstat to be commercially available for many years, if at all.

Critical Accounting Policies and Estimates

Our financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses. Note 1 of Notes to Financial Statements describes the significant accounting policies used in the preparation of our financial statements. Certain of these significant accounting policies are considered to be critical accounting policies, as defined below.

A critical accounting policy is defined as one that is both material to the presentation of our financial statements and requires management to make difficult, subjective or complex judgments that could have a material effect on our financial condition and results of operations. Specifically, critical accounting estimates have the following attributes: (i) we are required to make assumptions about matters that are highly uncertain at the time of the estimate; and

(ii) different estimates we could reasonably have used, or changes in the estimate that are reasonably likely to occur, would have a material effect on our financial condition or results of operations.

Estimates and assumptions about future events and their effects cannot be determined with certainty. We base our estimates on historical experience and on various other assumptions believed to be applicable and reasonable under the circumstances. These estimates may change as new events occur, as additional information is obtained and as our operating environment changes. These changes historically have been minor and have been included in the financial statements as soon as they became known. Based on a critical assessment of our accounting policies and the

underlying judgments and uncertainties affecting the application of those policies, management believes that our financial statements are stated fairly in accordance with accounting principles generally accepted in the United States, and meaningfully present our financial condition and results of operations.

We believe the following critical accounting policies reflect our more significant estimates and assumptions used in the preparation of our financial statements:

Fair Value of Financial Instruments

We categorize financial instruments recorded at fair value on our balance sheets based upon the level of judgment associated with inputs used to measure their fair value. The categories are as follows:

Level 1—Inputs are unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date. An active market for the asset or liability is a market in which transactions for the asset or liability occur with sufficient frequency and volume to provide pricing information on an ongoing basis.

Level 2—Inputs (other than quoted market prices included in Level 1) are either directly or indirectly observable for the asset or liability through correlation with market data at the measurement date and for the duration of the instrument's anticipated life.

Level 3—Inputs reflect management's best estimate of what market participants would use in pricing the asset or liability at the measurement date. Consideration is given to the risk inherent in the valuation technique and the risk inherent in the inputs to the model.

A financial instrument's categorization within the valuation hierarchy is based upon the lowest level of input that is significant to the fair value measurement. Following is a description of the valuation methodologies used for financial instruments measured at fair value on our balance sheets, including the category for such financial instruments.

Financial instruments classified as Level 1 include money market funds and certificates of deposit, representing approximately 4% of our total financial instruments classified as assets measured at fair value as of December 31, 2018. Financial instruments classified as Level 2 include commercial paper, corporate notes and equity investments, representing approximately 96% of our total financial instruments classified as assets measured at fair value as of December 31, 2018. The price for each security at the measurement date is derived from various sources. Periodically, we assess the reasonableness of these sourced prices by comparing them to the prices provided by our portfolio managers from broker quotes as well as reviewing the pricing methodologies used by our portfolio managers. Historically, we have not experienced significant deviation between the sourced prices and our portfolio managers' prices.

For a further discussion regarding fair value measurements, see Note 2 on Fair Value Measurements in Notes to Financial Statements of this annual report on Form 10 K.

Revenue Recognition

On January 1, 2018, we adopted the provisions of Accounting Standards Codification Topic 606, Revenue from Contracts with Customers, or Topic 606, using the modified retrospective transition method as discussed in the subsection entitled, "New Accounting Pronouncements – Recently Adopted", in Note 1 of Notes to Financial Statements of this Form 10-K. Financial results for the reporting periods beginning after January 1, 2018 are presented under Topic 606, while prior period amounts have not been adjusted and continue to be reported in accordance with our historical accounting under Accounting Standards Codification Topic 605, Revenue Recognition, or Topic 605, and

therefore, there is a lack of comparability to the prior periods presented. In connection with the adoption of Topic 606, we recognized a cumulative-effect adjustment to our opening balance of accumulated deficit and an increase to interest and other receivables as of January 1, 2018 for projected sales-based royalties on product sales occurring in 2017 for which payments had not yet been received as of December 31, 2017. Such royalties were recognized as revenue in prior periods when payments were received from our licensees.

In determining the appropriate amount and timing of revenue to be recognized under Topic 606, we perform the following five steps: (i) identify the contract(s) with our customer; (ii) identify the promised goods or services in the agreement and determine whether they are performance obligations, including whether they are distinct in the context of the agreement; (iii) measure the transaction price, including the constraint on variable consideration; (iv) allocate the transaction price to the performance obligations based on stand-alone selling prices; and (v) recognize revenue when (or as) we satisfy each performance obligation. Significant management judgment is required to determine the level of effort required and the period over which completion of the performance obligations is expected under an agreement. If reasonable estimates regarding when performance obligations are either complete or substantially complete cannot be made, then revenue recognition is deferred until a reasonable estimate can be made. Revenue is then recognized over the remaining estimated period of performance using the cumulative catch-up method. Amounts expected to be recognized as revenue within the 12 months following the balance sheet date are classified as current deferred revenue. Amounts not expected to be recognized as revenue within the 12 months following the balance sheet date are classified as noncurrent deferred revenue.

We allocate the total transaction price to each performance obligation based on the estimated relative stand-alone selling prices of the promised goods or services underlying each performance obligation. Estimated selling prices for license rights are calculated using an income approach model and include the following key assumptions, judgments and estimates: the development timeline, revenue forecast, commercialization expenses, discount rate and probabilities of technical and regulatory success.

Our revenues historically have consisted of collaboration revenue and license fees and royalties. Collaboration revenue primarily represented amounts earned under the Collaboration Agreement with Janssen for the imetelstat program. Effective September 28, 2018, the Collaboration Agreement with Janssen was terminated. As a result, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat. License fees and royalty revenue primarily represents amounts earned under agreements that out-license our technology to various oncology, diagnostics, research tools and biologics production companies. Economic terms in these agreements may include non-refundable upfront license payments in cash or equity securities, annual license maintenance fees, cost sharing arrangements, milestone payments, royalties on future sales of products, or any combination of these items. Non-refundable upfront fees, annual license maintenance fees and funding of research and development activities are considered fixed, while milestone payments and royalties are identified as variable consideration.

Licenses of Intellectual Property. If we determine the license to intellectual property is distinct from the other performance obligations identified in the agreement and the licensee can use and benefit from the license, we recognize revenue from non-refundable upfront fees allocated to the license upon the completion of the transfer of the license to the licensee. For such licenses, we recognize revenue from annual license maintenance fees upon the start of the new license period. For licenses that are bundled with other performance obligations, we assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue from non-refundable upfront fees or annual license maintenance fees. At each reporting period, we reassess the progress and, if necessary, adjust the measure of performance and related revenue recognition.

Milestone Payments. At the inception of each agreement that includes milestone payments, we evaluate whether the milestones are considered probable of being achieved and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the value of the associated milestone is included in the transaction price. For milestones that we do not deem to be probable of being achieved, the associated milestone payments are fully constrained and the value of the milestone is excluded from the transaction price with no revenue being recognized. Milestone payments that are not within our control, such as regulatory-related accomplishments, are not considered probable of being achieved until those accomplishments

have been communicated by the relevant regulatory authority. Once the assessment of probability of achievement becomes probable, we recognize revenue for the milestone payment. At each reporting period, we assess the probability of achievement of each milestone under our current agreements.

Royalties. For agreements with sales-based royalties, including milestone payments based on the level of sales, where the license is deemed to be the predominant item to which the royalties relate, we recognize revenue at the later of: (a) when the related sales occur, or (b) when the performance obligation, to which some or all of the royalty has been allocated, has been satisfied (or partially satisfied). At each reporting period, we estimate the sales incurred by each licensee based on historical experience and accrue the associated royalty amount.

Cost Sharing Arrangements. Research and development and other expenses being shared by both parties under an agreement are recorded as earned or owed based on the performance obligations by both parties under the respective agreement. For arrangements in which we and our collaboration partner in the agreement are exposed to significant risks and rewards that depend on the commercial success of the activity, we recognize payments between the parties on a net basis and record such amounts as a reduction or addition to research and development expense. For arrangements in which we have agreed to perform certain research and development services for our collaboration partner and are not exposed to significant risks and rewards that depend on the commercial success of the activity, we recognize the respective cost reimbursements as revenue under the collaborative agreement over time in a manner proportionate to the costs we incurred to perform the services using the input method.

Revenue recognition for licenses and collaboration agreements requires significant judgment. Our assessments and estimates are based on contractual terms, historical experience and general industry practice. Revisions in these values or estimations have the effect of increasing or decreasing license fee or collaboration revenue in the period of revision. As of December 31, 2018, we have not made any revisions to revenue recognition estimates.

Clinical Trial Accruals

For the clinical development activities being conducted by Janssen under the former Collaboration Agreement, we monitor patient enrollment levels and related activities to the extent possible through discussions with Janssen personnel and base our estimates of clinical trial costs on the best information available at the time. However, additional information may become available to us which would allow us to make a more accurate estimate in future periods. In this event, we may be required to record adjustments to research and development expenses in future periods when the actual level of activity becomes more certain.

Valuation of Stock Based Compensation

We measure and recognize compensation expense for all share based payment awards to our employees and directors, including service-based and performance-based stock options, restricted stock awards and employee stock purchases related to our Employee Stock Purchase Plan, or ESPP, based on estimated grant date fair values for these instruments. The grant date fair value of share based payment awards is amortized over the vesting period of the awards using a straight line method and reduced for estimated forfeitures. For performance-based stock options with vesting conditioned on the achievement of certain strategic milestones, stock-based compensation expense is recognized over the period from the date the performance condition is determined to be probable of occurring through the date the applicable condition is expected to be met and is reduced for estimated forfeitures, as applicable. If the performance condition is not considered probable of being achieved, no stock-based compensation expense is recognized until such time as the performance condition is considered probable of being met, if at all. If that assessment of the probability of the performance condition being met changes, the impact of the change in estimate would be recognized in the period of the change. We use the Black Scholes option pricing model to estimate the grant date fair value of our service-based and performance-based stock options and employee stock purchases. The grant-date fair value for service-based restricted stock awards is determined using the fair value of our common stock on the date of grant.

Option pricing model assumptions, such as expected volatility, expected term and risk free interest rate, impact the fair value estimate. Expected volatilities are based on historical volatilities of our stock since traded options on our

common stock do not correspond to option terms and trading volume of options is limited. The expected term of options represents the period of time that options granted are expected to be outstanding. In deriving this assumption, we review actual historical exercise and post vesting cancellation data and the remaining outstanding options not yet exercised or cancelled. For performance-based stock options, we also assess the projected timing of potential achievement of the milestones. The expected term of employees' purchase rights under our ESPP is equal to the purchase period. The risk free interest rate is based on the U.S. Zero Coupon Treasury Strip Yields for the expected

term in effect on the date of grant. Forfeiture rates are estimated based on historical data and are adjusted, if necessary, over the requisite service period based on the extent to which actual forfeitures differ, or are expected to differ, from their estimate.

We evaluate the assumptions used in estimating grant date fair values of our share based payment awards by reviewing current trends in comparison to historical data on an annual basis. We have not revised the methods by which we derive assumptions in order to estimate grant date fair values of our share based payment awards. If factors change and we employ different assumptions in future periods, the stock based compensation expense that we record for share based payment awards to employees and directors may differ significantly from what we have recorded in the current period.

For our non employee stock based awards, the measurement date on which the fair value of the stock based award is calculated is equal to the earlier of: (i) the date at which a commitment for performance by the counterparty to earn the equity instrument is reached or (ii) the date at which the counterparty's performance is complete.

Results of Operations

Our results of operations have fluctuated from period to period and may continue to fluctuate in the future, especially in light of the termination of the Collaboration Agreement with Janssen effective September 28, 2018. Results of operations for any period may be unrelated to results of operations for any other period. Thus, historical results should not be viewed as indicative of future operating results. For example, in 2015 we reported net income for the first time due to recognition of revenue in connection with the upfront payment from Janssen under the Collaboration Agreement. Effective September 28, 2018, the Collaboration Agreement with Janssen was terminated. As a result, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat. In addition, we expect to incur increasing operating losses in the future as we assume clinical development activities for imetelstat on our own to enable potential commercialization of imetelstat in the United States and other countries. We are subject to risks common to companies in our industry and at our stage of development, including, but not limited to, risks inherent in research and development efforts, including the transition of the imetelstat program from Janssen to us, the development, manufacture, regulatory approval for and commercialization of, imetelstat, uncertainty of non-clinical and clinical trial results or regulatory approvals or clearances, the future development of imetelstat by us, including any future efficacy or safety results that may cause the benefit-risk profile of imetelstat to become unacceptable, our need for future capital, enforcement of our patent and proprietary rights, reliance upon our consultants, licensees, investigators and other third parties, and potential competition. In order for imetelstat to be commercialized, we must conduct non-clinical tests and clinical trials to demonstrate the safety and efficacy of imetelstat, obtain regulatory approvals or clearances and enter into manufacturing, distribution and marketing arrangements, as well as obtain market acceptance. We do not expect to receive revenue based on sales of imetelstat for many years, if at all.

Revenues

We have entered into several license or collaboration agreements with companies involved with oncology, diagnostics, research tools and biologics production, whereby we have granted certain rights to our non imetelstat related technologies. In connection with these agreements, we are eligible to receive license fees, option fees, milestone payments and royalties on future sales of products, or any combination thereof. As discussed above, we adopted Topic 606 using the modified retrospective transition method on January 1, 2018. As a result, prior period amounts have not been adjusted and continue to be reported in accordance with our historical accounting under Topic 605 and therefore, there is a lack of comparability to the prior periods presented. However, we do not expect the

application of Topic 606 to have a material impact on our financial results on an ongoing basis in comparison to the results that would have been realized if we had continued to apply Topic 605.

We recognized license fee revenues of $641,000, $667,000 and $5.6 million in 2018, 2017 and 2016, respectively, related to our various agreements. The decrease in license fee revenues in 2018 compared to 2017 primarily reflects a reduction in the number of active license agreements in 2018 for research licenses related to our human telomerase reverse transcriptase, of hTERT, technology. The decrease in license fee revenues in 2017 compared to 2016 primarily reflects the full recognition of an upfront payment of $5 million from Janssen Pharmaceuticals, Inc., or Janssen Pharmaceuticals, under a license agreement that was executed in September 2016, or the License Agreement, related to license rights to commercialize products based on specialized oligonucleotide backbone chemistry and novel amidates for RNAi for the prevention, treatment and/or diagnosis of any and all human

disorders, excluding cancers originating from the blood or bone marrow, and products whose predominant or primary mechanism of action is telomerase inhibition. See further discussion of revenue recognition under and description of the terms of the License Agreement in Note 4 on License Agreements in Notes to Financial Statements of this annual report on Form 10-K.

We recognized royalty revenues of $425,000, $398,000 and $537,000 in 2018, 2017 and 2016, respectively, on product sales of telomerase detection and telomere measurement kits to the research use only market and cell based research products. The increase in royalty revenues in 2018 compared to 2017 primarily reflects a change in the method that revenue is being recognized for royalties upon the adoption of Topic 606 as of January 1, 2018. Under Topic 606, we estimate sales-based royalties earned on product sales by our licensees in each reporting period and accrue the associated royalty amount. In prior periods, revenue from royalties was being recognized when payments were received from our licensees. The decrease in royalty revenues in 2017 compared to 2016 primarily reflects lower product sales by our licensees.

In 2018, the majority of our revenues were from license fees and royalties under licenses granted to several biotechnology and pharmaceutical companies to use telomerase immortalized cells in drug discovery research and for drug discovery applications. Two customers accounted for approximately 59% and 39% of our 2018 and 2017 revenues, respectively. The upfront payment from Janssen Pharmaceuticals represented approximately 81% of our 2016 revenues.

Future license fee and royalty revenues are dependent on additional agreements being signed, if any, current agreements being maintained and the underlying patent rights for the licenses remaining active. We expect license fee and royalty revenues under our license agreements related to our hTERT technology to be lower in 2019 than in previous years, and to be eliminated by the end of 2019, due to upcoming patent expirations on such technology. In addition, due to the termination of the Collaboration Agreement effective September 28, 2018, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat. Current revenues may not be predictive of future revenues.

Research and Development Expenses

During the years ended December 31, 2018, 2017 and 2016, imetelstat was the sole research and development program we supported. For the imetelstat research and development program, we incur direct external, personnel related and other research and development costs. For the years ended December 31, 2018, 2017 and 2016, direct external expenses primarily consisted of our proportionate share of research and development costs incurred by Janssen under the Collaboration Agreement. Personnel related expenses primarily consist of salaries and wages, stock based compensation, payroll taxes and benefits for Geron employees involved with ongoing research and development efforts. Other research and development expenses primarily consist of research related overhead associated with allocated expenses for rent and maintenance of facilities and other supplies.

Research and development expenses were $13.4 million, $11.0 million and $18.0 million for the years ended December 31, 2018, 2017 and 2016, respectively. The increase in research and development expenses in 2018 compared to 2017 primarily reflects higher direct external costs for our share of clinical development expenses under the former collaboration with Janssen where our share of such costs increased from 50% to 100% as of the termination date of the Collaboration Agreement, higher direct external costs for contract research services and consulting expenses and increased personnel related expenses. The decrease in research and development expenses in 2017 compared to 2016 primarily reflects lower direct external costs for our proportionate share of clinical development expenses under the collaboration with Janssen and reduced personnel related expenses.

Research and development expenses for the years ended December 31, 2018, 2017 and 2016 were as follows:

	Year Ended December 31,		
(In thousands)	2018	2017	2016
Direct external research and development expenses:			
Clinical program: Imetelstat	$10,353	$8,437	$14,695
Personnel related expenses	2,429	2,063	2,729
All other research and development expenses	650	533	623
Total	$13,432	$11,033	$18,047

Since cost sharing between Janssen and us for imetelstat clinical development ceased on September 28, 2018, the effective date of termination of the Collaboration Agreement, we expect research and development expenses to substantially increase in future periods as we assume sole responsibility for the imetelstat development program, including any ongoing or potential future clinical trials, engage third parties, such as Parexel International (IRL) Limited, or Parexel, our CRO, and other service providers to conduct clinical trials of imetelstat, and hire additional senior personnel to oversee the program. Under the terms of the Collaboration Agreement, Janssen is required to provide operational support for the imetelstat program, including continuing to conduct ongoing imetelstat clinical trials, during transition of the program to us. We reimburse Janssen for 100% of the costs for such operational support. However, costs associated with transition activities, such as transfer of the sponsorship of ongoing imetelstat clinical trials, moving databases and related systems and transmitting regulatory files, are being incurred by each company, unless otherwise specified in the Collaboration Agreement. We expect the transition process to be completed by September 2019. In addition, following the effective date of termination of the Collaboration Agreement, we expect Janssen to supply imetelstat to us for up to 24 months during a transition period for clinical manufacturing and such supply will be charged to us at Janssen's cost plus a premium.

At this time, we cannot provide reliable estimates of how much time or investment will be necessary to advance imetelstat toward commercialization. For a more complete discussion of the risks and uncertainties associated with the development of imetelstat, see the sub sections entitled "Risks Related to the Development of Imetelstat" and "Risks Related to Regulatory Approval and Commercialization of Imetelstat" in Part I, Item 1A entitled "Risk Factors" and elsewhere in this annual report on Form 10 K.

General and Administrative Expenses

General and administrative expenses were $18.7 million, $19.3 million and $18.8 million for the years ended December 31, 2018, 2017 and 2016, respectively. The decrease in general and administrative expenses in 2018 compared to 2017 primarily reflects the net result of reduced personnel related expenses, including lower stock-based compensation expense, partially offset by higher consulting expenses and patent prosecution expenses. The increase in general and administrative expenses in 2017 compared to 2016 primarily reflects higher non-cash stock-based compensation expense, an increased allocation of facilities and other overhead costs to general and administrative activities and higher consulting costs, partially offset by lower legal costs. We expect general and administrative expenses to substantially increase in the future since the cost sharing between Janssen and us for patent prosecution expenses related to the imetelstat program ceased upon termination of the Collaboration Agreement and we expect to hire additional personnel to support our research and development activities for imetelstat.

Interest and Other Income

Interest and other income was $3.3 million, $1.4 million and $1.2 million for the years ended December 31, 2018, 2017 and 2016, respectively. The increase in interest and other income in 2018 compared to 2017 primarily reflects higher yields on our marketable securities portfolio and the increase in the size of our marketable securities portfolio in 2018 resulting from the receipt of net cash proceeds from issuances of common stock pursuant to our At Market Issuance Sales Agreement, or the 2015 Sales Agreement, with MLV & Co. LLC, or MLV, and our At Market Issuance Sales Agreement, or the 2018 Sales Agreement, with B. Riley FBR, Inc., or B. Riley FBR. The increase in interest income in 2017 compared to 2016 primarily reflects higher yields on our marketable securities portfolio. Interest earned in future periods will depend on the size of our marketable securities portfolio and prevailing interest rates.

Gain on Settlement

In July 2018, we and the other former shareholders of ViaGen, Inc., or ViaGen, filed an arbitration claim against Trans Ova Genetics, L.C., or Trans Ova, for alleged violations under a Share Purchase Agreement, or SPA, including failure to make payments under certain conditions. In December 2018, we and the other former shareholders of ViaGen agreed to settle the dispute for a one-time payment of $3.7 million, of which we received $1.5 million, which represents our 40% share of the settlement amount. With this settlement, Trans Ova has been released from any further obligations under the SPA, including any future payments. No comparable amounts were incurred in 2017 or 2016.

Change in Fair Value of Equity Investment

With the adoption of ASU 2016-01 on January 1, 2018, as described in the sub-section entitled, "New Accounting Pronouncements – Recently Adopted" in Note 1 on Organization and Summary of Significant Accounting Policies in Notes to Financial Statements of this annual report on Form 10 K, we remeasure the fair value of our equity investment in Sienna Cancer Diagnostics Limited, or Sienna, at each reporting date and any resulting change in fair value based on observable price changes is included in our statements of operations. For the year ended December 31, 2018, the overall decrease in the fair value of our equity investment in Sienna resulting from observable price changes in Sienna's stock was $541,000. No comparable amounts were incurred in 2017 or 2016. The fair value of our equity investment in Sienna fluctuates based on changes in Sienna's stock price and is therefore subject to volatility that could adversely affect our future operating results.

Other Expense

Other expense was $154,000, $77,000 and $83,000 for the years ended December 31, 2018, 2017 and 2016, respectively. Other expense reflects the effect of foreign currency translation on our equity investment in Sienna and bank charges related to our cash operating accounts and marketable securities portfolio. Other expense for the year ended December 31, 2018 included losses of $63,000 related to foreign currency translation for our equity investment in Sienna. No comparable amounts were incurred in 2017 or 2016. The fair value of our equity investment in Sienna fluctuates based on changes in the exchange rate between the U.S. dollar and Australian dollar and is therefore subject to volatility that could adversely affect our future operating results.

Liquidity and Capital Resources

As of December 31, 2018, we had cash, restricted cash, cash equivalents and marketable securities of $182.1 million, compared to $109.2 million at December 31, 2017. The net increase in cash, restricted cash, cash equivalents, and current and noncurrent marketable securities in 2018 was the net result of the receipt of net cash proceeds of approximately $86.0 million from sales of our common stock under the 2015 Sales Agreement and the 2018 Sales Agreement and cash proceeds of $6.9 million from the exercise of outstanding stock options, partially offset by cash being used for operations. We estimate that our existing capital resources and future interest income will be sufficient to fund our current level of operations through at least the next 12 months. However, we expect to experience negative cash flow for the foreseeable future as a result of the termination of the Collaboration Agreement with Janssen and as we assume responsibility for the development of the imetelstat program on our own.

We have an investment policy to invest our cash in liquid, investment grade securities, such as interest bearing money market funds, certificates of deposit, municipal securities, U.S. government and agency securities, corporate notes and commercial paper. Our investment portfolio does not contain securities with exposure to sub prime mortgages, collateralized debt obligations, asset backed securities or auction rate securities and, to date, we have not recognized any other than temporary impairment charges on our marketable securities or any significant changes in aggregate fair

value that would impact our cash resources or liquidity. To date, we have not experienced lack of access to our invested cash and cash equivalents; however, access to our invested cash and cash equivalents may be impacted by adverse conditions in the financial and credit markets.

In August 2015, we entered into the 2015 Sales Agreement with MLV, under which we could elect to issue and sell shares of our common stock having an aggregate offering price of up to $50 million. Pursuant to the 2015 Sales Agreement, common stock was sold at market prices prevailing at the time of sale through MLV as our sales agent. We paid MLV an aggregate commission rate equal to up to 3.0% of the gross proceeds of the sales price per share for common stock sold through MLV under the 2015 Sales Agreement. From January 2018 through April 2018, we sold an aggregate of 13,195,106 shares of our common stock under the 2015 Sales Agreement, resulting in net cash proceeds to us of approximately $47.7 million after deducting sales commissions and offering expenses payable by us. Under the 2015 Sales Agreement, we sold a cumulative total of 13,809,336 shares of our common stock resulting in net cash proceeds to us of approximately $48.7 million after deducting sales commissions and offering expenses payable by us. No further shares of common stock may be sold under the 2015 Sales Agreement.

In May 2018, we entered into the 2018 Sales Agreement with B. Riley FBR, pursuant to which we may elect to issue and sell shares of our common stock having an aggregate offering price of up to $100 million in such quantities and on such minimum price terms as we set from time to time through B. Riley FBR as our sales agent. Pursuant to the 2018 Sales Agreement, B. Riley FBR sells our common stock at market prices prevailing at the time of sale for which B. Riley FBR receives an aggregate commission rate equal to up to 3.0% of the gross proceeds. From May 2018 through July 2018, we sold an aggregate of 10,083,079 shares of our common stock under the 2018 Sales Agreement, resulting in net cash proceeds to us of approximately $38.4 million after deducting sales commissions and offering expenses payable by us. As of December 31, 2018, approximately $60.5 million of our common stock remained available for issuance under the 2018 Sales Agreement. The 2018 Sales Agreement will expire upon the earlier of the remaining common stock being sold or May 2021.

We will require substantial additional capital in order to further advance the imetelstat program, including conducting the research and development and clinical and regulatory activities necessary to bring imetelstat to market, such as completion of the Phase 3 portion of IMerge and potential clinical trials in other indications, and to establish sales and marketing capabilities to commercialize imetelstat in the United States on our own, if regulatory approval is granted. Because the outcome of any clinical activities and/or regulatory approval process is highly uncertain, we cannot reasonably estimate whether any development activities we may undertake will succeed, and we may never recoup our investment in any imetelstat development, which would adversely affect our financial condition and our business and business prospects, and might cause us to cease operations. Our future capital requirements are difficult to forecast and will depend on many factors, including:

- the accuracy of the assumptions underlying our estimates for our capital needs;
- the progress, timing, magnitude, scope and costs of clinical development, manufacturing and commercialization of imetelstat, including the number of indications being pursued, subject to clearances and approvals by the FDA and other regulatory authorities;
- the scope, progress, duration, results and costs of current and future clinical trials, including the Phase 3 portion of IMerge, as well as non-clinical studies and assessments, of imetelstat;
- the costs, timing and outcomes of regulatory reviews or other regulatory actions related to imetelstat, including obtaining regulatory clearances and approvals in the United States and in other countries;
- the costs of preparing, filing and prosecuting patent applications and maintaining, enforcing and defending intellectual property-related claims;
- the costs of manufacturing imetelstat, including our ability to meaningfully reduce those manufacturing costs;
- the costs of multiple third-party vendors and service providers, including our CRO, to support the development, manufacturing and commercialization of imetelstat;
- our ability to establish, enforce and maintain collaborative or other strategic arrangements for research, development, clinical testing, manufacturing, commercialization and marketing of imetelstat;
- our ability to successfully market and sell imetelstat, if imetelstat receives future regulatory approval or clearance, in the United States and other countries;

- our need to hire additional qualified employees and consultants to support the development and commercialization of imetelstat;

- the costs and timing of building a U.S. sales force to market and sell imetelstat, should it receive regulatory clearance;
- the sales price for imetelstat;
- the availability of coverage and adequate third-party reimbursement for imetelstat;
- the extent and scope of our general and administrative expenses, including expenses associated with potential future litigation; and
- the costs of maintaining and operating facilities in California and New Jersey, including higher expenses for travel, telecommunications and administrative oversight.

As a result of the termination of the Collaboration Agreement effective September 28, 2018, we are responsible for funding all clinical development, manufacturing, intellectual property maintenance and commercial activities for imetelstat. In order to further advance the imetelstat program, including completion of the Phase 3 portion of IMerge and potential clinical trials in other indications, we will need to raise substantial additional capital or establish additional collaborative arrangements with third-party collaborative partners, which may not be possible. In addition, as a result of the termination of the Collaboration Agreement, we will not receive any further milestone payments or royalties from Janssen for the development or sale of imetelstat, including any clinical development milestones. If we are unable to raise additional capital or establish alternative collaborative arrangements with third-party collaborative partners for imetelstat, the development of imetelstat may be further delayed, altered or abandoned, which might cause us to cease operations. Additional financing through public or private equity financings, including pursuant to our 2018 Sales Agreement with B. Riley FBR, capital lease transactions or other financing sources may not be available on acceptable terms, or at all. We may raise equity capital at a stock price or on other terms that could result in substantial dilution of ownership for our stockholders. The receptivity of the public and private equity markets to proposed financings is substantially affected by the general economic, market and political climate and by other factors which are unpredictable and over which we have no control. In this regard, continued volatility and instability in the global financial markets and political climate could adversely affect our ability to raise additional funds through financings and the terms upon which we may raise those funds.

In addition, we may seek additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interests of our stockholders may be diluted, and the terms may include liquidation or other preferences that materially and adversely affect the rights of our stockholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through alliance, collaborative or licensing arrangements with third parties, we may have to relinquish valuable rights to imetelstat or our technologies or grant licenses on terms that are not favorable to us.

We cannot assure you that our existing capital resources, future interest income, and potential future sales of our common stock, including under our 2018 Sales Agreement with B. Riley FBR, will be sufficient to fund our operating plans. We will need additional funds to meet operational needs and capital requirements to advance the imetelstat program in clinical development and potential commercialization, and our need for additional funds may arise sooner than planned. If adequate funds are not available on a timely basis, if at all, we may be unable to pursue further development or potential commercialization of imetelstat, which could adversely affect our business.

Cash Flows from Operating Activities

Net cash used in operations was $21.0 million, $20.6 million and $18.4 million in 2018, 2017 and 2016, respectively. The increase in net cash used in operations in 2018 compared to 2017 primarily reflects the net result of higher costs associated with business development activities, partially offset by lower payments to Janssen in 2018 under the cost sharing arrangement for imetelstat clinical development. The increase in net cash used in operations in 2017 compared

to 2016 primarily reflects the net result of the receipt of the $5 million upfront payment from Janssen Pharmaceuticals under the License Agreement in 2016, partially offset by lower payments to Janssen in 2017 under the cost-sharing arrangement for imetelstat clinical development.

Cash Flows from Investing Activities

Net cash used in investing activities in 2018 was $77.7 million. Net cash provided by investing activities in 2017 and 2016 was $23.0 million and $8.8 million, respectively. The increase in net cash used in investing activities in 2018 compared to 2017 primarily reflects a higher rate of purchases than maturities of marketable securities in 2018 resulting from the investment of net cash proceeds from the sales of our common stock pursuant to the 2015 Sales Agreement with MLV and the 2018 Sales Agreement with B. Riley FBR. The increase in net cash provided by investing activities in 2017 compared to 2016 primarily reflects a higher rate of maturities than purchases of marketable securities in 2017.

For the three years ended December 31, 2018, we purchased approximately $73,000 in property and equipment, none of which was financed through equipment financing arrangements.

Cash Flows from Financing Activities

Net cash provided by financing activities in 2018, 2017 and 2016 was $93.0 million, $1.1 million and $1.2 million, respectively. The increase in net cash provided by financing activities in 2018 compared to 2017 primarily reflects the receipt of net cash proceeds from the sales of our common stock under the 2015 Sales Agreement with MLV and the 2018 Sales Agreement with B. Riley FBR and cash proceeds from the exercise of stock options under our equity plans. The decrease in net cash provided by financing activities in 2017 compared to 2016 primarily reflects the net result of the receipt of higher cash proceeds in 2016 from the exercise of outstanding stock options under our equity plans, partially offset by the receipt of net cash proceeds in 2017 from the sales of our common stock pursuant to the 2015 Sales Agreement with MLV. See Note 7 on Stockholders' Equity for additional information about the 2015 Sales Agreement with MLV and the 2018 Sales Agreement with B. Riley FBR.

Significant Cash and Contractual Obligations

As of December 31, 2018, our contractual obligations for the next five years and thereafter were as follows:

	Payments Due by Period				
Contractual Obligations [1]	Total	Less Than 1 Year	1-3 Years	4 - 5 Years	After 5 Years
	(In thousands)				
Equipment lease	$22	$11	$ 11	$ —	$ —
Operating lease[2]	757	699	58	—	—
License fees[3]	185	50	30	30	75
Total contractual cash obligations	$964	$760	$ 99	$ 30	$ 75

(1) This table does not include payments under our severance plan if there were a change in control of Geron or severance payments to employees in the event of an involuntary termination. In addition, this table does not include any royalty obligations under our license agreements as the timing and likelihood of such payments are not known.

(2) In September 2017, we amended the lease agreement for our premises at 149 Commonwealth Drive, Menlo Park, California, to extend the lease term from February 2018 through January 2020. Our amended lease at 149

Commonwealth Drive includes an option to extend the lease for one additional period of two years. Operating lease obligations in the table above do not assume the exercise by us of the option to extend the lease or any right of termination.

(3) License fees are comprised of minimum annual license payments under our existing license agreements with several universities and companies for the right to use intellectual property related to technologies that we have in licensed.

Off Balance Sheet Arrangements

We have not engaged in any off balance sheet arrangements, including the use of structured finance, special purpose entities or variable interest entities.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We are a smaller reporting company as defined by Rule 12b-2 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, and are not required to provide the information specified under this item.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The following financial statements and the related notes thereto, of Geron Corporation and the Report of Independent Registered Public Accounting Firm, Ernst & Young LLP, are filed as a part of this annual report on Form 10 K.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Geron Corporation

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Geron Corporation (the Company) as of December 31, 2018 and 2017, the related statements of operations, comprehensive loss, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), and our report dated March 7, 2019 expressed an unqualified opinion thereon.

Adoption of ASU No. 2016-01

As discussed in Note 1 to the financial statements, the Company changed its method of accounting for certain equity investments due to the adoption of ASU No. 2016-01, Recognition and Measurement of Financial Assets and Financial Liabilities, and the amendment in ASU 2018-03 effective January 1, 2018.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in

the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 1992.

Redwood City, California

March 7, 2019

GERON CORPORATION

BALANCE SHEETS

	December 31, 2018	December 31, 2017
	(In thousands, except share and per share data)	
ASSETS		
Current assets:		
Cash and cash equivalents	$ 10,575	$ 16,335
Restricted cash	269	268
Marketable securities	152,714	78,351
Interest and other receivables	1,168	436
Prepaid assets	1,332	580
Total current assets	166,058	95,970
Noncurrent marketable securities	18,582	14,241
Property and equipment, net	59	102
Other assets	585	—
	$ 185,284	$ 110,313
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 982	$ 503
Accrued compensation and benefits	2,642	3,385
Amount due to Janssen Biotech, Inc.	2,610	1,702
Accrued liabilities	1,317	926
Total current liabilities	7,551	6,516
Commitments and contingencies		
Stockholders' equity:		
Preferred stock, $0.001 par value; 3,000,000 shares authorized; no shares issued and outstanding at December 31, 2018 and 2017	—	—
Common stock, $0.001 par value; 300,000,000 shares authorized; 186,392,682 and 159,877,239 shares issued and outstanding at December 31, 2018 and 2017, respectively	186	160
Additional paid-in capital	1,189,194	1,089,684
Accumulated deficit	(1,011,464)	(985,840)
Accumulated other comprehensive loss	(183)	(207)
Total stockholders' equity	177,733	103,797
	$ 185,284	$ 110,313

See accompanying notes.

GERON CORPORATION

STATEMENTS OF OPERATIONS

	Year Ended December 31,		
	2018	2017	2016
	(In thousands, except share and per share data)		
Revenues:			
License fees and royalties	$1,066	$1,065	$6,162
Operating expenses:			
Research and development	13,432	11,033	18,047
General and administrative	18,707	19,287	18,761
Total operating expenses	32,139	30,320	36,808
Loss from operations	(31,073)	(29,255)	(30,646)
Interest and other income	3,291	1,416	1,192
Gain on settlement	1,460	—	—
Change in fair value of equity investment	(541)	—	—
Other expense	(154)	(77)	(83)
Net loss	$(27,017)	$(27,916)	$(29,537)
Basic and diluted net loss per share	$(0.15)	$(0.18)	$(0.19)
Shares used in computing basic and diluted net loss per share	176,504,996	159,224,986	159,045,644

See accompanying notes.

GERON CORPORATION

STATEMENTS OF COMPREHENSIVE LOSS

	Year Ended December 31,		
	2018	2017	2016
	(In thousands)		
Net loss	$(27,017)	$(27,916)	$(29,537)
Net unrealized gain (loss) on marketable securities	24	(154)	160
Comprehensive loss	$(26,993)	$(28,070)	$(29,377)

See accompanying notes.

GERON CORPORATION

STATEMENTS OF STOCKHOLDERS' EQUITY

	Common Stock Shares	Amount	Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	(In thousands, except share data)					
Balances at December 31, 2015	158,781,359	$ 159	$1,070,567	$(928,387)	$ (213)	$ 142,126
Net loss	—	—	—	(29,537)	—	(29,537)
Other comprehensive income	—	—	—	—	160	160
Stock-based compensation related to issuance of common stock and options in exchange for services	21,541	—	156	—	—	156
Issuances of common stock under equity plans	355,736	—	1,169	—	—	1,169
Stock-based compensation for equity-based awards to employees and directors	—	—	8,245	—	—	8,245
401(k) contribution	—	—	61	—	—	61
Balances at December 31, 2016	159,158,636	159	1,080,198	(957,924)	(53)	122,380
Net loss	—	—	—	(27,916)	—	(27,916)
Other comprehensive loss	—	—	—	—	(154)	(154)
Issuance of common stock in connection with at market offering, net of issuance costs of $114	614,230	1	1,059	—	—	1,060
Stock-based compensation related to issuance of common stock and options in exchange for services	72,066	—	200	—	—	200
Issuances of common stock under equity	32,307	—	51	—	—	51

plans						
Stock-based compensation for equity-based awards to employees and directors	—	—	8,144	—	—	8,144
401(k) contribution	—	—	32	—	—	32
Balances at December 31, 2017	159,877,239	160	1,089,684	(985,840)	(207)	103,797
Cumulative effect of accounting principle change	—	—	—	1,393	—	1,393
Net loss	—	—	—	(27,017)	—	(27,017)
Other comprehensive income	—	—	—	—	24	24
Issuance of common stock in connection with at market offering, net of issuance costs of $2,282	23,278,185	23	85,994	—	—	86,017
Stock-based compensation related to issuance of common stock and options in exchange for services	73,980	—	191	—	—	191
Issuances of common stock under equity plans	3,163,278	3	6,948	—	—	6,951
Stock-based compensation for equity-based awards to employees and directors	—	—	6,368	—	—	6,368
401(k) contribution	—	—	9	—	—	9
Balances at December 31, 2018	186,392,682	$ 186	$1,189,194	$(1,011,464)	$ (183)	$ 177,733

See accompanying notes.

GERON CORPORATION

STATEMENTS OF CASH FLOWS

	Year Ended December 31,		
	2018	2017	2016
	(In thousands)		
Cash flows from operating activities:			
Net loss	$(27,017)	$(27,916)	$(29,537)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	59	76	81
Loss (gain) on retirement/sales of property and equipment	—	5	(16)
Accretion and amortization on investments, net	(978)	273	552
Change in fair value of equity investment, including foreign currency translation	604	—	—
Stock-based compensation for services by non-employees	191	200	156
Stock-based compensation for employees and directors	6,368	8,144	8,245
Amortization related to 401(k) contributions	9	32	61
Changes in assets and liabilities:			
Interest and other receivables	(528)	39	731
Prepaid assets	(752)	(56)	123
Accounts payable	479	278	65
Accrued compensation and benefits	(743)	542	(183)
Amount due to Janssen Biotech, Inc.	908	(1,665)	1,039
Accrued liabilities	391	(508)	314
Net cash used in operating activities	(21,009)	(20,556)	(18,369)
Cash flows from investing activities:			
Purchases of property and equipment	(16)	—	(57)
Proceeds from sales of property and equipment	—	—	16
Purchases of marketable securities	(188,365)	(100,006)	(129,250)
Proceeds from maturities of marketable securities	110,663	122,976	138,054
Net cash (used in) provided by investing activities	(77,718)	22,970	8,763
Cash flows from financing activities:			
Proceeds from issuances of common stock under equity plans	6,951	51	1,169
Proceeds from issuances of common stock from financings	86,017	1,060	—
Net cash provided by financing activities	92,968	1,111	1,169
Net (decrease) increase in cash, cash equivalents and restricted cash	(5,759)	3,525	(8,437)
Cash, cash equivalents and restricted cash at the beginning of the period	16,603	13,078	21,515
Cash, cash equivalents and restricted cash	$10,844	$16,603	$13,078

at the end of the period

See accompanying notes.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS

1. ORGANIZATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Organization

Geron Corporation, or we or Geron, was incorporated in the State of Delaware on November 28, 1990. We are a late-stage clinical biopharmaceutical company that is focused on the development and commercialization of innovative therapeutics for hematologic myeloid malignancies. We have global rights to imetelstat, a first-in-class telomerase inhibitor, that was discovered and developed at Geron. Principal activities to date have included obtaining financing, securing operating facilities and conducting research and development. In November 2014, we entered into an exclusive collaboration and license agreement, or the Collaboration Agreement, with Janssen Biotech, Inc., or Janssen, to develop and commercialize imetelstat worldwide for all indications in oncology, including hematologic myeloid malignancies, and all other human therapeutic uses. Janssen terminated the Collaboration Agreement effective September 28, 2018. Upon the effective date of termination, we regained the global rights to the imetelstat program. Under the termination provisions of the Collaboration Agreement, Janssen is required to provide certain operational support for the imetelstat program during transition of the program to us. The transition process is expected to occur through September 2019. Each company is responsible for costs incurred related to transition activities unless otherwise specified in the Collaboration Agreement. See Note 4 on License Agreements for additional information on the former Collaboration Agreement with Janssen.

Prior Period Reclassifications

With the adoption of Accounting Standards Update, or ASU, No. 2016-18, Statement of Cash Flows (Topic 230) Restricted Cash, or ASU No. 2016-18, the prior period presentation of cash and cash equivalents in the statements of cash flows has been updated to conform with current period presentation. See “New Accounting Pronouncements – Recently Adopted” in this Note 1 for further discussion of the adoption of ASU No. 2016-18. In addition, the prior period presentation of certain cash flows from financing activities in the statements of cash flows has been updated to conform with current period presentation.

Net Loss Per Share

Basic net income (loss) per share is calculated by dividing net income (loss) by the weighted-average number of shares of common stock outstanding during the periods presented, without consideration for potential common shares. Diluted net income per share would be calculated by adjusting the weighted-average number of shares of common stock outstanding for the dilutive effect of potential common shares outstanding for the periods presented, as determined using the treasury-stock method. Potential dilutive securities consist of outstanding stock options and a warrant to purchase our common stock. Diluted net loss per share excludes potential dilutive securities outstanding for all periods presented as their effect would be anti-dilutive. Accordingly, basic and diluted net loss per share is the same for all periods presented in the accompanying statements of operations. Since we incurred a net loss for 2018, 2017 and 2016, the diluted net loss per share calculation excludes potential dilutive securities of 27,823,845, 22,946,422 and 19,663,180, respectively, related to outstanding stock options and warrants as their effect would have been anti-dilutive.

Use of Estimates

The accompanying financial statements have been prepared in accordance with U.S. generally accepted accounting principles, or GAAP. The preparation of financial statements in conformity with GAAP requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities as of the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. On an ongoing basis, we evaluate our estimates, including those related to accrued liabilities, revenue recognition, fair value of marketable securities and equity investments, income taxes, and stock-based compensation. We base our estimates on historical experience and on various other market specific and relevant assumptions that we believe to be reasonable under the circumstances. Actual results could differ from those estimates.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Fair Value of Financial Instruments

Cash Equivalents and Marketable Securities

We consider all highly liquid investments with an original maturity of three months or less to be cash equivalents. We are subject to credit risk related to our cash equivalents and marketable securities. Our marketable debt securities include U.S. government sponsored enterprise securities, commercial paper and corporate notes.

We classify our marketable debt securities as available for sale. We record available for sale debt securities at fair value with unrealized gains and losses reported in accumulated other comprehensive income (loss) in stockholders' equity. Realized gains and losses are included in interest and other income and are derived using the specific identification method for determining the cost of securities sold and have been insignificant to date. Dividend and interest income are recognized when earned and included in interest and other income in our statements of operations. We recognize a charge when the declines in the fair values below the amortized cost bases of our available for sale securities are judged to be other than temporary. We consider various factors in determining whether to recognize an other than temporary charge, including whether we intend to sell the security or whether it is more likely than not that we would be required to sell the security before recovery of the amortized cost basis. Declines in market value judged as other than temporary result in a charge to interest and other income. We have not recorded any other than temporary impairment charges on our available for sale securities for the years ended December 31, 2018, 2017 and 2016. See Note 2 on Fair Value Measurements.

Equity Investments

With the adoption of ASU No. 2016-01, Financial Instruments - Overall: Recognition and Measurement of Financial Assets and Financial Liabilities, or ASU 2016-01, beginning January 1, 2018, we measure our investment in equity securities at fair value at each reporting period. Changes in fair value resulting from observable price changes are included in change in fair value of equity investment and changes in fair value resulting from foreign currency translation are included in other expense in our statements of operations. See "New Accounting Pronouncements – Recently Adopted" in this Note 1 for additional information on the adoption of ASU 2016-01.

Revenue Recognition

Beginning January 1, 2018, we recognize revenue in accordance with the provisions of Accounting Standards Codification Topic 606, Revenue from Contracts with Customers, or Topic 606. In determining the appropriate amount and timing of revenue to be recognized under this guidance, we perform the following five steps: (i) identify the contract(s) with our customer; (ii) identify the promised goods or services in the agreement and determine whether they are performance obligations, including whether they are distinct in the context of the agreement; (iii) measure the transaction price, including the constraint on variable consideration; (iv) allocate the transaction price to the performance obligations based on stand-alone selling prices; and (v) recognize revenue when (or as) we satisfy each performance obligation. See "New Accounting Pronouncements – Recently Adopted" in this Note 1 for further discussion of the adoption of Topic 606.

A performance obligation is a promise in an agreement to transfer a distinct good or service to the customer and is the unit of account in Topic 606. Significant management judgment is required to determine the level of effort required and the period over which completion of the performance obligations is expected under an agreement. If reasonable estimates regarding when performance obligations are either complete or substantially complete cannot be made, then revenue recognition is deferred until a reasonable estimate can be made. Revenue is then recognized over the

remaining estimated period of performance using the cumulative catch-up method.

We allocate the total transaction price to each performance obligation based on the estimated relative stand-alone selling prices of the promised goods or services underlying each performance obligation. Estimated selling prices for license rights are calculated using an income approach model and include the following key assumptions, judgments and estimates: the development timeline, revenue forecast, commercialization expenses, discount rate and probabilities of technical and regulatory success.

Following is a description of the principal activities from which we generate revenue. License fees and royalty revenue primarily represent amounts earned under agreements that out-license our technology to various companies.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

License and/or Collaboration Agreements

We have entered into several license agreements with various oncology, diagnostics, research tools and biologics production companies. Economic terms in these agreements may include non-refundable upfront license payments in cash or equity securities, annual license maintenance fees, cost sharing arrangements, milestone payments, royalties on future sales of products, or any combination of these items. Non-refundable upfront fees, annual license maintenance fees and funding of research and development activities are considered fixed, while milestone payments and royalties are identified as variable consideration.

Licenses of Intellectual Property. If we determine the license to intellectual property is distinct from the other performance obligations identified in the agreement and the licensee can use and benefit from the license, we recognize revenue from non-refundable upfront fees allocated to the license upon the completion of the transfer of the license to the licensee. For such licenses, we recognize revenue from annual license maintenance fees upon the start of the new license period. For licenses that are bundled with other performance obligations, we assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue from non-refundable upfront fees or annual license maintenance fees. At each reporting period, we reassess the progress and, if necessary, adjust the measure of performance and related revenue recognition.

Milestone Payments. At the inception of each agreement that includes milestone payments, we evaluate whether the milestones are considered probable of being achieved and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the value of the associated milestone is included in the transaction price. For milestones that we do not deem to be probable of being achieved, the associated milestone payments are fully constrained and the value of the milestone is excluded from the transaction price with no revenue being recognized. Milestone payments that are not within our control, such as regulatory-related accomplishments, are not considered probable of being achieved until those accomplishments have been communicated by the relevant regulatory authority. Once the assessment of probability of achievement becomes probable, we recognize revenue for the milestone payment. At each reporting period, we assess the probability of achievement of each milestone under our current agreements.

Royalties. For agreements with sales-based royalties, including milestone payments based on the level of sales, where the license is deemed to be the predominant item to which the royalties relate, we recognize revenue at the later of (a) when the related sales occur, or (b) when the performance obligation, to which some or all of the royalty has been allocated, has been satisfied (or partially satisfied). At each reporting period, we estimate the sales incurred by each licensee based on historical experience and accrue the associated royalty amount.

Cost Sharing Arrangements. Research and development and other expenses being shared by both parties under an agreement are recorded as earned or owed based on the performance obligations by both parties under the respective agreement. For arrangements in which we and our collaboration partner in the agreement are exposed to significant risks and rewards that depend on the commercial success of the activity, we recognize payments between the parties on a net basis and record such amounts as a reduction or addition to research and development expense. For arrangements in which we have agreed to perform certain research and development services for our collaboration partner and are not exposed to significant risks and rewards that depend on the commercial success of the activity, we recognize the respective cost reimbursements as revenue under the collaborative agreement over time in a manner proportionate to the costs we incurred to perform the services using the input method.

Restricted Cash

Restricted cash consists of funds maintained in a separate certificate of deposit account for credit card purchases.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Research and Development Expenses

Research and development expenses consist of expenses incurred in identifying, developing and testing product candidates resulting from our independent efforts as well as efforts associated with collaborations. These expenses include, but are not limited to, in process research and development acquired in an asset acquisition and deemed to have no alternative future use, payroll and personnel expense, lab supplies, non-clinical studies, clinical trials, including support for investigator sponsored clinical trials, raw materials to manufacture clinical trial drugs, manufacturing costs for research and clinical trial materials, sponsored research at other labs, consulting, costs to maintain technology licenses, our proportionate share of research and development costs under cost sharing arrangements with collaboration partners and research related overhead. Research and development costs are expensed as incurred, including costs incurred under our collaboration and/or license agreements.

Until the sponsorship responsibilities for imetelstat transfer from Janssen to us, including the U.S. Investigational New Drug, or IND, application and all foreign regulatory applications, Janssen will continue conducting ongoing clinical trials of imetelstat during the transition of the program to us. For the clinical development activities being conducted by Janssen under the Collaboration Agreement, which was terminated effective September 28, 2018, we monitor patient enrollment levels and related activities to the extent possible through discussions with Janssen personnel and base our estimates of clinical trial costs on the best information available at the time. However, additional information may become available to us which would allow us to make a more accurate estimate in future periods. In this event, we may be required to record adjustments to research and development expenses in future periods when the actual level of activity becomes more certain.

Depreciation and Amortization

We record property and equipment at cost and calculate depreciation using the straight line method over the estimated useful lives of the assets, generally four years. Leasehold improvements are amortized over the shorter of the estimated useful life or remaining term of the lease.

Stock Based Compensation

We maintain various stock incentive plans under which stock options and restricted stock awards are granted to employees, directors and consultants. We also have an employee stock purchase plan for all eligible employees. We recognize stock based compensation expense based on the grant-date fair values of service-based instruments on a straight line basis over the requisite service period, which is generally the vesting period. For performance-based stock options with vesting based on the achievement of certain strategic milestones, stock-based compensation expense is recognized over the period from the date the performance condition is determined to be probable of occurring through the date the applicable condition is expected to be met and is reduced for estimated forfeitures, as applicable. If the performance condition is not considered probable of being achieved, no stock-based compensation expense is recognized until such time as the performance condition is considered probable of being met, if at all. If that assessment of the probability of the performance condition being met changes, the impact of the change in estimate would be recognized in the period of the change. The determination of grant-date fair values for our service-based and performance-based stock options and employee stock purchases using the Black Scholes option pricing model is affected by our stock price as well as assumptions regarding a number of complex and subjective variables. The

grant-date fair value for service-based restricted stock awards is determined using the fair value of our common stock on the date of grant.

For our non employee stock based awards, the measurement date on which the fair value of the stock based award is calculated is equal to the earlier of: (i) the date at which a commitment for performance by the counterparty to earn the equity instrument is reached or (ii) the date at which the counterparty's performance is complete. We recognize stock based compensation expense for the fair value of the vested portion of non employee stock based awards in our statements of operations. For additional information, see Note 7 on Stockholders' Equity.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Accumulated Other Comprehensive Loss

Accumulated other comprehensive loss includes certain changes in stockholders' equity which are excluded from net income (loss). Accumulated other comprehensive loss on our balance sheets as of December 31, 2018 and 2017 is solely comprised of net unrealized gains and losses on marketable securities.

Income Taxes

We maintain deferred tax assets and liabilities that reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes and are subject to tests of recoverability. Our deferred tax assets include net operating loss carryforwards, research credits and capitalized research and development. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Our net deferred tax asset has been fully offset by a valuation allowance because of our history of losses. Any potential accrued interest and penalties related to unrecognized tax benefits would be recorded as income tax expense.

Concentrations of Customers and Suppliers

The majority of our revenues was earned in the United States. Two customers accounted for approximately 59% and 39% of our 2018 and 2017 revenues, respectively. Approximately 81% of our 2016 revenues represented an upfront payment from Janssen Pharmaceuticals, Inc., or Janssen Pharmaceuticals, in connection with a license agreement signed in September 2016, or the License Agreement.

Segment Information

Our executive management team represents our chief decision maker. We view our operations as a single segment, the development of therapeutic products for oncology. As a result, the financial information disclosed herein materially represents all of the financial information related to our principal operating segment.

Recent Accounting Pronouncements

New Accounting Pronouncements – Recently Adopted

In May 2014, the Financial Accounting Standards Board, or FASB, issued ASU No. 2014-09, which amends the guidance for accounting for revenue from contracts with customers. This ASU superseded the revenue recognition requirements in Accounting Standards Codification Topic 605, Revenue Recognition, or Topic 605, and created Topic 606.

We adopted Topic 606 on January 1, 2018 using the modified retrospective transition method for those agreements which were not completed as of January 1, 2018. Financial results for the reporting periods beginning after January 1, 2018 are presented under Topic 606, while prior period amounts have not been adjusted and continue to be reported in accordance with our historical accounting under Topic 605.

In connection with the adoption of Topic 606, we recognized a cumulative-effect adjustment to our opening balance of accumulated deficit and an increase to interest and other receivables of $204,000 as of January 1, 2018 for projected sales-based royalties on product sales occurring in 2017 for which payments had not yet been received as of December 31, 2017. Such royalties were recognized as revenue in prior periods when payments were received from our licensees. In accordance with Topic 606-10-50-14a, we have elected to exclude providing further information about our sales-based royalties.

The adoption of Topic 606 did not result in any changes to the estimated transaction price or the performance obligations for current agreements or the amounts allocated to satisfied performance obligations. We do not have any deferred revenue associated with unsatisfied performance obligations. Since we view our operations as a single segment and all of our revenues are recognized at a point in time from similar license agreements, disaggregated revenue disclosures would not materially provide additional information. In 2018, the application of Topic 606 did not have a material impact on our financial results in comparison to results that would have been realized if we had continued to apply Topic 605. Additionally, we do not expect the application of Topic 606 to have a material impact on our financial results on an ongoing basis in comparison to results that would have been realized if we had continued to apply Topic 605.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

In January 2016, the FASB issued ASU 2016-01 which requires equity investments to be measured at fair value with changes in fair value recognized in the statements of operations. To further clarify ASU 2016-01, the FASB issued ASU No. 2018-03, Technical Corrections and Improvements to Financial Instruments - Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities, or ASU 2018-03, in February 2018. ASU 2018-03 requires application of a prospective transition approach only for those equity investments for which the new measurement alternative is being applied. We adopted ASU 2016-01 and ASU 2018-03 on January 1, 2018 using the modified retrospective transition method and recognized a cumulative-effect adjustment to our opening balance of accumulated deficit and other assets for the fair value of our equity investment in Sienna Cancer Diagnostics Limited, or Sienna. In accordance with ASU 2016-01, we remeasured the fair value of our equity investment in Sienna at each reporting date in 2018 and included the change in fair value resulting from observable price changes in change in fair value of equity investment and the change in fair value resulting from foreign currency translation in other expense in our statements of operations. See Note 2 on Fair Value Measurements for additional information on our equity investment in Sienna.

The cumulative-effect adjustments to our January 1, 2018 balance sheet for the adoption of Topic 606 and ASU 2016-01 and ASU 2018-03 were as follows (in thousands):

Balance Sheet	Balance at December 31, 2017	Adjustments Due to Topic 606	Adjustments Due to ASU 2016-01 and ASU 2018-03	Balance at January 1, 2018
Assets:				
Interest and other receivables	$ 436	$ 204	$ —	$640
Other assets	$ —	$ —	$ 1,189	$1,189
Stockholders' Equity:				
Accumulated deficit	$ (985,840)	$ 204	$ 1,189	$(984,447)

As of January 1, 2018, we also adopted ASU No. 2016-15, Classification of Certain Cash Receipts and Cash Payments, ASU No. 2016-18, Statement of Cash Flows (Topic 230) Restricted Cash, and ASU No. 2017-09, Compensation — Stock Compensation: Scope of Modification Accounting. With the adoption of ASU No. 2016-18, changes in the total of cash, cash equivalents and restricted cash are presented in our statements of cash flows. The adoption of these new standards did not have a material impact on our financial statements and related disclosures.

New Accounting Pronouncements – Issued But Not Yet Adopted

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842), or ASU 2016-02. ASU 2016-02 requires an entity to recognize a right-of-use asset and lease liability for all lease arrangements with terms of more than 12 months, measured at the present value of the lease payments. Recognition, measurement and presentation of expenses will depend on classification as a finance or operating lease. Certain quantitative and qualitative disclosures about leasing arrangements also are required. ASU 2016-02 is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted. The updated guidance requires a modified retrospective adoption. In July 2018, the FASB issued ASU 2018-11, Leases (Topic 842): Targeted

Improvements, or ASU 2018-11. In issuing ASU 2018-11, the FASB decided to provide another transition method in addition to the existing transition method by allowing entities to initially apply the new leases standard at the adoption date and recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. We adopted ASU 2016-02 on January 1, 2019 using the modified retrospective method as allowed under ASU 2018-11 by recording a cumulative-effect adjustment to the opening balance of retained earnings on January 1, 2019. In evaluating the impact of adopting the new lease guidance, we have determined that our current operating lease for our office space will require us to record an asset and an obligation for the arrangement of approximately $719,000 upon adoption of ASU 2016-02. We have also evaluated other rental and equipment service contracts and believe such agreements do not contain any embedded lease arrangements. We will elect the practical expedients upon transition that will retain the lease classification and initial direct costs for any leases that existed prior to the adoption of these standards.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

In June 2016, the FASB issued ASU 2016-13, Measurement of Credit Losses on Financial Instruments, or ASU 2016-13. The main objective of ASU 2016-13 is to provide financial statement users with more decision-useful information about an entity's expected credit losses on financial instruments and other commitments to extend credit at each reporting date. To achieve this objective, the amendments in this update replace the incurred loss impairment methodology currently used today with a methodology that reflects expected credit losses and requires consideration of a broader range of reasonable and supportable information to develop credit loss estimates. Subsequent to issuing ASU 2016-13, the FASB issued ASU 2018-19, Codification Improvements to Topic 326, Financial Instruments - Credit Losses, for the purpose of clarifying certain aspects of ASU 2016-13. ASU 2018-19 has the same effective date and transition requirements as ASU 2016-13. ASU 2016-13 will be effective for fiscal years beginning after December 15, 2019, using a modified retrospective approach. Early adoption is permitted. We do not expect the adoption of this standard to have a material impact on our financial statements.

In June 2018, the FASB issued ASU 2018-07, Improvements to Nonemployee Share-Based Payment Accounting, or ASU 2018-07, to simplify the accounting for share-based payments to nonemployees by aligning it with the accounting for share-based payments to employees, with certain exceptions. The new guidance applies to nonemployee awards issued in exchange for goods or services used or consumed in an entity’s own operations. There are no new disclosure requirements. The new guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted, including in an interim period for which financial statements have not been issued. We adopted ASU 2018-07 on January 1, 2019. Since all of our share-based payments to nonemployees were fully vested as of the adoption date, we do not anticipate that the adoption of ASU 2018-07 will have a material impact on our financial statements.

In August 2018, the FASB issued ASU 2018-13, Disclosure Framework — Changes to the Disclosure Requirements for Fair Value Measurement, which modifies the disclosure requirements on fair value measurements. The new standard is effective for fiscal years beginning after December 15, 2019, and early adoption is permitted. We plan to adopt ASU 2018-13 as of January 1, 2020. While we continue to assess the potential impact of this standard, we do not expect the adoption of this standard to have a material impact on our financial statements.

In August 2018, the Securities and Exchange Commission issued Release No. 33-10532 that amends and clarifies certain financial reporting requirements. The principal change to our financial reporting will be the inclusion of the annual disclosure requirement of changes in stockholders’ equity in Rule 3-04 of Regulation S-X to interim periods. We will adopt this new rule beginning with our financial reporting for the quarter ending March 31, 2019. Upon adoption, we will include a Statement of Stockholders’ Equity with each quarterly filing on Form 10-Q.

In November 2018, the FASB issued ASU 2018-18, Collaborative Arrangements (Topic 808): Clarifying the Interaction Between Topic 808 and Topic 606. The amended guidance precludes presenting consideration from a transaction in a collaborative arrangement as revenue from contracts with customers if the counterparty is not a customer for that transaction. The new guidance is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. Early adoption is permitted. We plan to adopt ASU 2018-18 as of January 1, 2020. We do not expect the adoption of ASU 2018-18 to have a material impact on our financial statements given the termination of the Collaboration Agreement in September 2018.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

2. FAIR VALUE MEASUREMENTS

Cash Equivalents and Marketable Securities

Cash equivalents, restricted cash and marketable securities by security type at December 31, 2018 were as follows:

(In thousands)	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Included in cash and cash equivalents:				
Money market funds	$ 7,003	$ —	$ —	$ 7,003
Restricted cash:				
Certificate of deposit	$ 269	$ —	$ —	$ 269
Marketable securities:				
Commercial paper (due in less than one year)	$ 57,594	$ 22	$ (29)	$ 57,587
Corporate notes (due in less than one year)	95,238	7	(118)	95,127
Corporate notes (due in one to two years)	18,647	—	(65)	18,582
	$ 171,479	$ 29	$ (212)	$ 171,296

Cash equivalents, restricted cash and marketable securities by security type at December 31, 2017 were as follows:

(In thousands)	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Included in cash and cash equivalents:				
Money market funds	$ 11,030	$ —	$ —	$ 11,030
Commercial paper	2,242	—	—	2,242
Corporate notes	1,750	—	(1)	1,749
	$ 15,022	$ —	$ (1)	$ 15,021
Restricted cash:				
Certificate of deposit	$ 268	$ —	$ —	$ 268
Marketable securities:				
Government-sponsored enterprise securities (due in less than one year)	$ 12,500	$ —	$ (40)	$ 12,460
Commercial paper (due in less than one year)	10,928	4	(1)	10,931
Corporate notes (due in less than one year)	55,067	—	(107)	54,960
Corporate notes (due in one to two years)	14,303	—	(62)	14,241
	$ 92,798	$ 4	$ (210)	$ 92,592

89

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Cash equivalents and marketable securities with unrealized losses that have been in a continuous unrealized loss position for less than 12 months and 12 months or longer at December 31, 2018 and 2017 were as follows:

	Less Than 12 Months		12 Months or Greater		Total	
(In thousands)	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses
As of December 31, 2018:						
Commercial paper (due in less than one year)	$22,628	$ (29)	$—	$ —	$22,628	$ (29)
Corporate notes (due in less than one year)	66,557	(82)	14,221	(36)	80,778	(118)
Corporate notes (due in one to two years)	18,582	(65)	—	—	18,582	(65)
	$107,767	$ (176)	$14,221	$ (36)	$121,988	$ (212)
As of December 31, 2017:						
Government-sponsored enterprise securities (due in less than one year)	$—	$ —	$12,460	$ (40)	$12,460	$ (40)
Commercial paper (due in less than one year)	7,717	(1)	—	—	7,717	(1)
Corporate notes (due in less than one year)	55,210	(106)	1,499	(2)	56,709	(108)
Corporate notes (due in one to two years)	14,241	(62)	—	—	14,241	(62)
	$77,168	$ (169)	$13,959	$ (42)	$91,127	$ (211)

The gross unrealized losses related to government sponsored enterprise securities, commercial paper and corporate notes as of December 31, 2018 and 2017 were due to changes in interest rates. We determined that the gross unrealized losses on our cash equivalents and marketable securities as of December 31, 2018 and 2017 were temporary in nature. We review our investments quarterly to identify and evaluate whether any investments have indications of possible impairment. Factors considered in determining whether a loss is temporary include the length of time and extent to which the fair value has been less than the cost basis and whether we intend to sell the security or whether it is more likely than not that we would be required to sell the security before recovery of the amortized cost basis. We currently do not intend to sell these securities before recovery of their amortized cost bases.

Fair Value on a Recurring Basis

We categorize financial instruments recorded at fair value on our balance sheets based upon the level of judgment associated with inputs used to measure their fair value. The categories are as follows:

—

Level 1	Inputs are unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date. An active market for the asset or liability is a market in which transactions for the asset or liability occur with sufficient frequency and volume to provide pricing information on an ongoing basis.
Level 2	Inputs (other than quoted market prices included in Level 1) are either directly or indirectly observable for the asset or liability through correlation with market data at the measurement date and for the duration of the instrument's anticipated life.
Level 3	Inputs reflect management's best estimate of what market participants would use in pricing the asset or liability at the measurement date. Consideration is given to the risk inherent in the valuation technique and the risk inherent in the inputs to the model.

A financial instrument's categorization within the valuation hierarchy is based upon the lowest level of input that is significant to the fair value measurement. Below is a description of the valuation methodologies used for financial instruments measured at fair value on our balance sheets, including the category for such financial instruments.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Money market funds are categorized as Level 1 within the fair value hierarchy as their fair values are based on quoted prices available in active markets. U.S. government sponsored enterprise securities, commercial paper, corporate notes and equity investments are categorized as Level 2 within the fair value hierarchy as their fair values are estimated by using pricing models, quoted prices of securities with similar characteristics or discounted cash flows.

The following table presents information about our financial instruments that are measured at fair value on a recurring basis as of December 31, 2018 and 2017 and indicates the fair value category assigned.

	Fair Value Measurements at Reporting Date Using			
(In thousands)	Quoted Prices in Active Markets for Identical Assets Level 1	Significant Other Observable Inputs Level 2	Significant Unobservable Inputs Level 3	Total
As of December 31, 2018:				
Money market funds[1]	$7,003	$ —	$ —	$7,003
Commercial paper[2]	—	57,587	—	57,587
Corporate notes[2][3]	—	113,709	—	113,709
Equity investment[4]	—	585	—	585
Total	$7,003	$ 171,881	$ —	$178,884
As of December 31, 2017:				
Money market funds[1]	$11,030	$ —	$ —	$11,030
Government-sponsored enterprise securities[2]	—	12,460	—	12,460
Commercial paper[1][2]	—	13,173	—	13,173
Corporate notes[1][2][3]	—	70,950	—	70,950
Total	$11,030	$ 96,583	$ —	$107,613

(1) Included in cash and cash equivalents on our balance sheets.
(2) Included in current portion of marketable securities on our balance sheets.
(3) Included in noncurrent portion of marketable securities on our balance sheets.
(4) Included in other assets on our balance sheets. See “Equity Investment” in this Note 2 for further discussion of this equity investment.

Equity Investment

In December 2007, we received 13,842,625 ordinary shares in Sienna in connection with a license we granted to them for our human telomerase reverse transcriptase, or hTERT, technology for use in human diagnostics. Upon receipt, the shares were recorded at a zero cost basis under the cost method of accounting. On August 3, 2017, Sienna became a publicly traded company on the Australian Securities Exchange Limited, or ASX, under the ticker symbol SDX. In connection with Sienna’s initial public offering under Australian securities regulations, we signed a 24-month trading restriction from the effective date of Sienna’s listing on the ASX. Due to this trading restriction, under the cost method of accounting, we maintained a zero cost basis for our shares in Sienna as of December 31, 2017. With the adoption of ASU 2016-01 and ASU 2018-03 on January 1, 2018, as described in Note 1 on Organization and Summary of

Significant Accounting Policies, our equity investment in Sienna must be reported at fair value and therefore, we recorded a cumulative-effect adjustment of $1,189,000 on our balance sheet for the fair value of our shares in Sienna, as measured using the closing stock price reported on the ASX and converted to U.S. dollars as of January 1, 2018. In accordance with ASU 2016-01, we remeasure the fair value of our shares in Sienna at the end of each reporting period, and as of December 31, 2018, the fair value of our shares in Sienna was $585,000, resulting in a decrease in fair value of $604,000 for the year ended December 31, 2018, including a loss of $63,000 related to foreign currency translation.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Credit Risk

We currently place our cash, restricted cash, cash equivalents and marketable securities with four financial institutions in the United States. Generally, these deposits may be redeemed upon demand and therefore, bear minimal risk. Deposits with banks may exceed the amount of insurance provided on such deposits. Financial instruments that potentially subject us to concentrations of credit risk consist primarily of cash equivalents and marketable securities. Cash equivalents and marketable securities currently consist of money market funds, commercial paper and corporate notes. Our investment policy, approved by the audit committee of our board of directors, limits the amount we may invest in any one type of investment issuer, thereby reducing credit risk concentrations.

3. PROPERTY AND EQUIPMENT

Property and equipment, stated at cost, is comprised of the following:

	December 31,	
(In thousands)	2018	2017
Furniture and computer equipment	$727	$711
Leasehold improvements	111	111
	838	822
Less accumulated depreciation and amortization	(779)	(720)
	$59	$102

4. LICENSE AGREEMENTS

Janssen Biotech, Inc. Collaboration and License Agreement

On November 13, 2014, we and Janssen entered into the Collaboration Agreement under which we granted to Janssen exclusive worldwide rights to develop and commercialize imetelstat for all human therapeutic uses, including hematologic myeloid malignancies. Upon the effectiveness of the Collaboration Agreement, we received $35,000,000 from Janssen as an upfront payment, which we classified as deferred revenue upon receipt.

Under the Collaboration Agreement, Janssen was wholly responsible for the development, manufacturing, seeking regulatory approval for and commercialization of, imetelstat worldwide. Janssen has been conducting two clinical trials of imetelstat: a Phase 2 trial in myelofibrosis, referred to as IMbark, and a Phase 2/3 trial in myelodysplastic syndromes, referred to as IMerge. Development costs for IMbark and IMerge were shared between us and Janssen on a 50/50 basis. Additionally, under the terms of the Collaboration Agreement, we remained responsible for prosecuting, at Janssen’s direction, the patents licensed to Janssen at the time we entered into the Collaboration Agreement, with costs shared between us and Janssen on a 50/50 basis. The cost sharing arrangement with Janssen began in January 2015.

Janssen terminated the Collaboration Agreement effective September 28, 2018. Upon the effective date of termination, we regained the global rights to the imetelstat program and plan to continue development of imetelstat on our own. As a result of the termination of the Collaboration Agreement, we will not receive any further milestone payments or royalties from Janssen for the development or commercialization of imetelstat, including any clinical

development or sales milestones, and Janssen has no further obligations to us or any third parties, such as clinical sites or vendors, to fund any potential future imetelstat clinical trials. Under the termination provisions of the Collaboration Agreement, Janssen is required to provide certain operational support for the imetelstat program during transition of the program to us. The transition process is expected to occur through September 2019 to enable the orderly transfer of all ongoing clinical, regulatory, medical affairs and non-clinical activities to us, including the transfer of the sponsorship of ongoing imetelstat clinical trials from Janssen to us. Each company is responsible for costs incurred related to transition activities unless otherwise specified in the Collaboration Agreement. In addition, Janssen is expected to supply imetelstat to us for up to 24 months during a transition period for clinical manufacturing and such supply will be charged to us at Janssen's cost plus a premium. Until the sponsorship responsibilities for imetelstat transfer from Janssen to us, including the U.S. Investigational New Drug, or IND, application and all foreign regulatory applications, Janssen will continue conducting ongoing clinical trials of imetelstat. After September 28, 2018, the effective termination date of the Collaboration Agreement, our responsibility for imetelstat development costs, including continuing conduct of ongoing clinical trials of imetelstat, and costs for the prosecution of patents that were licensed to Janssen under the Collaboration Agreement increased from 50% to 100%. As of December 31, 2018, the amount due to Janssen of $2,610,000 on our balance sheet primarily represents the amount owed to Janssen for operational support of the imetelstat program for the three months ended December 31, 2018.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Janssen Pharmaceuticals, Inc. License Agreement

On September 15, 2016, we entered into the License Agreement with Janssen Pharmaceuticals whereby we granted to Janssen Pharmaceuticals an exclusive worldwide license, or the Exclusive License, under our proprietary patents for the research, development and commercialization of products based on specialized oligonucleotide backbone chemistry and novel amidates for ribonucleic acid interference, or RNAi, for the prevention, treatment and/or diagnosis of any and all human disorders, excluding cancers originating from the blood or bone marrow, and products whose predominant or primary mechanism of action is telomerase inhibition.

In addition to the Exclusive License, we granted to Janssen Pharmaceuticals a non exclusive worldwide license, or the Non Exclusive License, under our patents covering the synthesis of monomers, which are the building blocks of oligonucleotides, and certain know how necessary for the research, development and commercialization of products under the Exclusive License.

Under the terms of the License Agreement, Janssen Pharmaceuticals, at its sole expense, is required to use reasonable efforts to perform research, development and commercialization activities to obtain at least one licensed product to be researched, developed and commercialized under the License Agreement. We remain responsible for prosecuting the patent rights under the Exclusive License, with reasonable input provided by Janssen Pharmaceuticals, and the costs for such prosecution will be shared between us and Janssen Pharmaceuticals on a 50/50 basis.

Under the terms of the License Agreement, we received $5,000,000 from Janssen Pharmaceuticals as a non refundable upfront payment. We are also eligible to receive additional potential payments of up to an aggregate maximum total of $75,000,000 for the achievement of certain development and regulatory milestones and tiered royalties in the low single digit percentage range on worldwide net sales of each licensed product commercialized under the License Agreement in any countries where there are valid claims under the patent rights licensed to Janssen Pharmaceuticals.

The License Agreement will remain in effect until the expiration of the last to expire patent, unless terminated earlier. Janssen Pharmaceuticals may also terminate the License Agreement at will upon prior written notice to us. In the event of an early termination of the License Agreement, all licenses to Janssen Pharmaceuticals would terminate.

The license rights granted to Janssen Pharmaceuticals are the only performance obligation for us under the License Agreement. In addition, we concluded that Janssen Pharmaceuticals can use and benefit from the license rights without any further performance from us due to their specific knowledge of oligonucleotide chemistry, and sufficient capital to independently research, develop and commercialize products under the License Agreement on a global basis. Accordingly, we fully recognized the $5,000,000 upfront payment from Janssen Pharmaceuticals as license fee revenue on our statements of operations in the third quarter of 2016 upon the completion of the transfer of the license rights to Janssen Pharmaceuticals.

We have determined that each of the additional potential development and regulatory milestone payments to us under the License Agreement represent fully constrained variable consideration under Topic 606 as achievement of these milestones has not been deemed probable as of December 31, 2018. Consequently, we will recognize revenue for each of these payments in their entirety once the assessment of probability of achievement of the related milestone becomes probable. Royalties on potential future product sales under the License Agreement will be recognized as revenue when the related sales occur.

5. ACCRUED LIABILITIES

Accrued liabilities consisted of the following:

	December 31,	
(In thousands)	2018	2017
Professional legal and accounting fees	$327	$272
Clinical trial costs	529	516
Other	461	138
	$1,317	$926

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

6. COMMITMENTS AND CONTINGENCIES

Indemnifications to Officers and Directors

Our corporate bylaws require that we indemnify our directors, as well as those who act as directors and officers of other entities at our request, against expenses, judgments, fines, settlements and other amounts actually and reasonably incurred in connection with any proceedings arising out of their services to Geron. In addition, we have entered into separate indemnification agreements with each of our directors and officers which provide for indemnification of these directors and officers under similar circumstances and under additional circumstances. The indemnification obligations are more fully described in our bylaws and the indemnification agreements. We purchase standard insurance to cover claims or a portion of the claims made against our directors and officers. Since a maximum obligation is not explicitly stated in our bylaws or in our indemnification agreements and will depend on the facts and circumstances that arise out of any future claims, the overall maximum amount of the obligations cannot be reasonably estimated.

Operating Lease Commitment

On September 21, 2017, we amended the lease agreement for our premises at 149 Commonwealth Drive, Menlo Park, California, to extend the lease term from February 2018 through January 2020. As of December 31, 2018, operating lease obligations under the amended lease agreement include aggregate future minimum payments of approximately $757,000, of which payments of approximately $699,000 and $58,000 are due in 2019 and 2020, respectively. Rent expense under our operating leases was approximately $703,000, $691,000 and $708,000 for the years ended December 31, 2018, 2017 and 2016, respectively.

Severance Plan

We have an Amended and Restated Severance Plan, or Severance Plan, that applies to all employees that are not subject to performance improvement plans, and provides for, among other benefits: (i) a severance payment upon a Change of Control Triggering Event and Separation from Service and (ii) a severance payment for each non executive employee upon a Non Change of Control Triggering Event and Separation from Service. As defined in the Severance Plan, a Change of Control Triggering Event and Separation from Service requires a “double trigger” where: (i) an employee is terminated by us without cause in connection with a change of control or within 12 months following a change of control provided, however, that if an employee is terminated by us in connection with a change of control but immediately accepts employment with our successor or acquirer, the employee will not be eligible for the benefits outlined in the Severance Plan, (ii) an employee resigns because in connection with a change of control, the offered terms of employment (new or continuing) by us or our successor or acquirer within 30 days after the change of control results in a material change in the terms of employment, or (iii) after accepting (or continuing) employment with us after a change of control, an employee resigns within 12 months following a change of control due to a material change in the terms of employment. Under the Severance Plan, a Non Change of Control Triggering Event and Separation from Service is defined as an event where a non executive employee is terminated by us without cause. Severance payments range from two to 18 months of base salary, depending on the employee’s position with us, payable in a lump sum payment. The Severance Plan also provides that the provisions of employment agreements entered into between us and executive or non executive employees supersede the provisions of the Severance Plan. As of December 31, 2018, all our executive officers have employment agreements with provisions that may provide greater severance benefits than those in the Severance Plan.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Gain on Settlement

From November 2010 to September 2012, we owned 40% of ViaGen, Inc., or ViaGen, a company with in-house breeding services and expertise in advanced reproductive technologies for animal cloning. In September 2012, we and the other shareholders of ViaGen executed a Share Purchase Agreement, or SPA, and sold our equity interests to Trans Ova Genetics, L.C., or Trans Ova. Under the SPA, we and the other ViaGen shareholders would receive potential payments aggregating up to $6,000,000 upon Trans Ova reaching certain commercial milestones. We and the other ViaGen shareholders were also eligible to receive potential proceeds upon the sale by Trans Ova of a non-marketable equity investment originally held by ViaGen. Payments under the SPA would be shared amongst the ViaGen shareholders according to their original equity interests in ViaGen prior to the sale to Trans Ova.

In July 2018, we and the other former shareholders of ViaGen filed an arbitration claim against Trans Ova for alleged violations under the SPA, including failure to make payments under certain conditions. In December 2018, we and the other former shareholders of ViaGen agreed to settle the dispute for a one-time payment of $3,650,000, of which we received $1,460,000, which represents our 40% share of the settlement amount. With this settlement, Trans Ova has been released from any further obligations under the SPA, including any future payments.

7. STOCKHOLDERS' EQUITY

Sales Agreements

On August 28, 2015, we entered into an At Market Issuance Sales Agreement, or the 2015 Sales Agreement, with MLV & Co. LLC, or MLV, under which we could elect to issue and sell shares of our common stock having an aggregate offering price of up to $50,000,000. Pursuant to the 2015 Sales Agreement, common stock was sold at market prices prevailing at the time of sale through MLV as our sales agent. We paid MLV an aggregate commission rate equal to up to 3.0% of the gross proceeds of the sales price per share for common stock sold through MLV under the 2015 Sales Agreement. In December 2017, we sold an aggregate of 614,230 shares of our common stock pursuant to the 2015 Sales Agreement, resulting in net cash proceeds to us of approximately $1,060,000 after deducting sales commissions and offering expenses payable by us. From January 2018 through April 2018, we completed the sale of the remaining common stock subject to the 2015 Sales Agreement and issued an aggregate of 13,195,106 shares of our common stock, resulting in net cash proceeds to us of approximately $47,651,000 after deducting sales commissions and offering expenses payable by us. No further shares of common stock may be sold under the 2015 Sales Agreement.

On May 18, 2018, we entered into an At Market Issuance Sales Agreement, or the 2018 Sales Agreement, with B. Riley FBR, Inc., or B. Riley FBR, pursuant to which we may elect to issue and sell shares of our common stock having an aggregate offering price of up to $100,000,000 in such quantities and on such minimum price terms as we set from time to time through B. Riley FBR as our sales agent. We pay B. Riley FBR an aggregate commission rate equal to up to 3.0% of the gross proceeds of the sales price per share for common stock sold through B. Riley FBR under the 2018 Sales Agreement. From May 2018 through July 2018, we sold an aggregate of 10,083,079 shares of our common stock pursuant to the 2018 Sales Agreement, resulting in net cash proceeds to us of approximately $38,366,000 after deducting sales commissions and offering expenses payable by us. The 2018 Sales Agreement will expire upon the earlier of: (a) the sale of all common stock subject to the 2018 Sales Agreement and (b) May 18,

2021.

Warrant

In connection with each disbursement under a previous loan agreement with the California Institute for Regenerative Medicine, or CIRM, we were obligated to issue to CIRM a warrant to purchase Geron common stock. Such warrants and the underlying common stock were unregistered. We have no further obligations to issue any additional warrants to CIRM. As of December 31, 2018, a warrant to purchase 537,893 shares of our common stock remained outstanding. The warrant was issued to CIRM in August 2011 at an exercise price of $3.98 per share and expires in August 2021.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Equity Plans

2002 Equity Incentive Plan

The 2002 Equity Incentive Plan, or 2002 Plan, expired in May 2012. Upon the adoption of the 2011 Incentive Award Plan in May 2011 (see below), no further grants of options or stock purchase rights were made from the 2002 Plan. Options granted under the 2002 Plan expire no later than ten years from the date of grant. Option exercise prices were equal to 100% of the fair market value of the underlying common stock on the date of grant. Service based stock options under the 2002 Plan generally vested over a period of four years from the date of the option grant. Other stock awards (restricted stock awards and restricted stock units) had variable vesting schedules which were determined by our board of directors on the date of grant. All outstanding awards granted under the 2002 Plan remain subject to the terms of the 2002 Plan and the individual award agreements thereunder.

2011 Incentive Award Plan

In May 2011, our stockholders approved the adoption of the 2011 Incentive Award Plan, or 2011 Plan. The 2011 Plan provided for grants of either incentive stock options or nonstatutory stock options and stock purchase rights to employees (including officers and employee directors) and consultants (including non employee directors). Upon the adoption of the 2018 Equity Incentive Plan in May 2018 (see below), no further grants of options or stock purchase rights were made from the 2011 Plan. Options granted under the 2011 Plan expire no later than ten years from the date of grant. Option exercise prices were equal to the fair market value of the underlying common stock on the date of grant.

Service based stock options under the 2011 Plan generally vested over a period of four years from the date of the option grant. Other stock awards (restricted stock awards and restricted stock units) had variable vesting schedules which were determined by our board of directors on the date of grant. All outstanding awards granted under the 2011 Plan remain subject to the terms of the 2011 Plan and the individual award agreements thereunder.

Under certain circumstances, options may be exercised prior to vesting, subject to our right to repurchase the shares underlying such option at the exercise price paid per share. Our repurchase rights would generally terminate on a vesting schedule identical to the vesting schedule of the exercised option. During 2018, we have not repurchased any shares under the 2011 Plan. As of December 31, 2018, we have no shares outstanding subject to repurchase under the 2011 Plan.

2018 Equity Incentive Plan

On May 15, 2018, our stockholders approved the adoption of the 2018 Equity Incentive Plan, or 2018 Plan, as the successor to the 2011 Plan. The 2018 Plan provides for the grant of incentive stock options, nonstatutory stock options, stock appreciation rights, restricted stock awards, restricted stock unit awards, other stock awards, and performance awards that may be settled in cash, stock, or other property. Eligible participants under the 2018 Plan include our employees, consultants and directors. The number of shares reserved for issuance under the 2018 Plan (subject to adjustment for certain changes in capitalization) is equal to the sum of (i) the unallocated shares of common stock remaining available for grant under the 2011 Plan as of May 15, 2018, (ii) 10,000,000 newly reserved shares of common stock and (iii) the number of shares subject to awards granted under the 2002 Plan, and the 2011 Plan as such shares become available from time to time, referred to as the Prior Plans' Returning Shares. Such Prior Plans' Returning Shares become available for issuance under the 2018 Plan if outstanding stock awards granted under the 2002 Plan and the 2011 Plan, after May 15, 2018, expire or terminate for any reason prior to exercise or settlement

or are forfeited, cancelled or otherwise returned to us because of the failure to meet a contingency or condition required for the vesting of such shares, or, subject to certain exceptions, are reacquired or withheld (or not issued) by us to satisfy a tax withholding obligation in connection with a stock award.

Options granted under the 2018 Plan expire no later than ten years from the date of grant. Option exercise prices shall be equal to the fair market value of the underlying common stock on the date of grant. If, at the time we grant an option, the optionee directly or by attribution owns stock possessing more than 10% of the total combined voting power of all classes of our stock, the option exercise price shall be at least 110% of the fair market value of the underlying common stock and shall not be exercisable more than five years after the date of grant.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

We grant service-based and performance-based stock options to employees under the 2018 Plan. Service-based options generally vest over a period of four years from the date of the option grant. Performance-based options vest upon the achievement of specified milestones. Other stock awards (restricted stock awards and restricted stock units) have variable vesting schedules as determined by our board of directors on the date of grant.

Under certain circumstances, options may be exercised prior to vesting, subject to our right to repurchase the shares underlying such option at the exercise price paid per share. Our repurchase rights would generally terminate on a vesting schedule identical to the vesting schedule of the exercised option. During 2018, we have not repurchased any shares under the 2018 Plan. As of December 31, 2018, we have no shares outstanding subject to repurchase under the 2018 Plan.

As of December 31, 2018, our Non Employee Director Compensation Policy adopted by our board of directors in March 2014 and amended by our board of directors in February 2015, May 2015, February 2016, January 2018, May 2018, October 2018 and January 2019 provides for the automatic grant to non employee directors of the following types of equity awards under the 2018 Plan:

First Director Option. Each person who becomes a non employee director, whether by election by our stockholders or by appointment by our board of directors to fill a vacancy, will automatically be granted an option to purchase 120,000 shares of common stock, or First Director Option, on the date such person first becomes a non employee director. The First Director Option vests annually over three years upon each anniversary date of appointment to our board of directors.

Subsequent Director Option. Each non employee director (other than any director receiving a First Director Option on the date of the annual meeting) will automatically be granted a subsequent option to purchase 70,000 shares of common stock, a Subsequent Director Option, on the date of the annual meeting of stockholders in each year during such director's service on our board of directors. The Subsequent Director Option vests in full on the earlier of: (i) the date of the next annual meeting of our stockholders or (ii) the first anniversary of the date of grant.

2006 Directors' Stock Option Plan

The 2006 Directors' Stock Option Plan, or 2006 Directors Plan, was terminated by our board of directors and replaced by the 2011 Plan in March 2014. No further grants of options were made from the 2006 Directors Plan upon the 2006 Directors Plan's termination. All outstanding awards granted under the 2006 Directors Plan remain subject to the terms of the 2006 Directors Plan and the individual award agreements thereunder.

The options granted to non employee directors under the 2006 Directors Plan were nonstatutory stock options, and they expire no later than ten years from the date of grant. The option exercise price was equal to the fair market value of the underlying common stock on the date of grant. The First Director Option granted to non employee directors under the 2006 Directors Plan vested annually over three years upon each anniversary date of appointment to the board of directors. The Subsequent Director Option granted to non employee directors on the date of the annual meeting of stockholders in each year during such director's service on our board of directors under the 2006 Directors Plan vested one year from the date of grant.

2018 Inducement Award Plan

In December 2018, our board of directors approved the adoption of the 2018 Inducement Award Plan, or the Inducement Plan, pursuant to which we reserved 3,000,000 shares of Geron common stock (subject to customary

adjustments in the event of a change in capital structure) to be used exclusively for grants of inducement awards to individuals who were not previously Geron employees or directors, other than following a bona fide period of non-employment. The Inducement Plan provides for the grant of nonstatutory stock options, stock appreciation rights, restricted stock awards, restricted stock units and other stock awards, and all awards under the Inducement Plan are intended to meet the standards under Rule 5635(c)(4) of the Nasdaq Listing Rules. The terms and conditions of the Inducement Plan and the inducement awards to be granted thereunder are substantially similar to the 2018 Plan. As of December 31, 2018, we had not granted any awards under the Inducement Plan.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Directors' Market Value Stock Purchase Plan

In October 2018, our board of directors adopted a Directors' Market Value Stock Purchase Plan, or the Directors Market Plan. A total of 1,000,000 shares of Geron common stock has been reserved for the Directors Market Plan. Under the Directors Market Plan, non-employee directors may purchase shares of Geron common stock at the prevailing market price on the purchase date with cash compensation payable to them for their services as a board member. As stated in Geron's Non-Employee Director Compensation Policy, each non-employee director receives annual cash compensation, payable quarterly in arrears, for their services on the board and various committees of the board. As provided in the Non-Employee Director Compensation Policy, a non-employee director may elect to receive fully vested shares of common stock in lieu of cash and such shares shall be issuable from the Directors Market Plan. As of December 31, 2018, we have not issued any shares under the Directors Market Plan.

Aggregate option and award activity for the 2002 Plan, 2011 Plan, 2018 Plan, 2006 Directors Plan, Inducement Plan and Directors Market Plan is as follows:

		Outstanding Options			
	Shares Available For Grant	Number of Shares	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Life (In years)	Aggregate Intrinsic Value (In thousands)
Balance at December 31, 2017	6,202,727	22,408,529	$ 2.96		
Additional shares authorized	14,000,000	—	$ —		
Options granted	(9,265,000)	9,265,000 (1)	$ 2.07		
Awards granted	(139,652)	—	$ —		
Options exercised	—	(3,144,878)	$ 2.20		
Options cancelled/forfeited/expired	1,166,324	(1,242,699)	$ 3.48		
Balance at December 31, 2018	11,964,399	27,285,952 (1)	$ 2.72	6.71	$ —
Options exercisable at December 31, 2018		16,464,746	$ 3.13	5.10	$ —
Options fully vested and expected to vest at December 31, 2018		26,293,625	$ 2.75	6.61	$ —

(1) Includes 4,500,000 performance-based stock options that have not achieved certain strategic milestones.

The aggregate intrinsic value in the preceding table represents the total intrinsic value, based on Geron's closing stock price of $1.00 per share as of December 31, 2018, which would have been received by the option holders had all the option holders exercised their options as of that date.

We have not granted any options with an exercise price below or greater than the fair market value of our common stock on the date of grant in 2018, 2017 or 2016. As of December 31, 2018, 2017 and 2016, there were 16,464,746,

17,249,032 and 14,074,457 exercisable options outstanding at weighted average exercise prices per share of $3.13, $3.03 and $2.99, respectively.

The total pretax intrinsic value of stock options exercised during 2018, 2017 and 2016 was $8,812,000, $15,000 and $595,000, respectively. Cash received from the exercise of options in 2018, 2017 and 2016 totaled approximately $6,929,000, $18,000 and $493,000, respectively.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Information about stock options outstanding as of December 31, 2018 is as follows:

	Options Outstanding		
Exercise Price Range	Number of Shares	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Life (In years)
$1.10 - $1.72	10,290,050	$ 1.61	7.04
$1.73 - $2.45	7,144,384	$ 2.27	7.65
$2.54 - $5.01	8,055,105	$ 3.95	6.06
$5.09 - $7.31	1,796,413	$ 5.33	4.03
$1.10 - $7.31	27,285,952 (1)	$ 2.72	6.71

(1) Includes 4,500,000 performance-based stock options that have not achieved certain strategic milestones.

Aggregate restricted stock activity for the 2011 Plan and the 2018 Plan is as follows:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share	Weighted Average Remaining Contractual Term (In years)
Non-vested restricted stock at December 31, 2017	—	$ —	—
Granted	73,980	$ 1.91	
Vested	(73,980)	$ 1.91	
Non-vested restricted stock at December 31, 2018	—	$ —	—

The weighted average grant date fair value of restricted stock granted during the years ended December 31, 2018, 2017 and 2016 was $1.91, $2.20 and $2.44 per share, respectively. The total fair value of restricted stock that vested during 2018, 2017 and 2016 was $141,000, $159,000 and $54,000, respectively.

Employee Stock Purchase Plan

In March 2014, our board of directors adopted the 2014 Employee Stock Purchase Plan, or 2014 Purchase Plan. The 2014 Purchase Plan was approved by our stockholders in May 2014. The 2014 Purchase Plan replaced the 1996 Employee Stock Purchase Plan, or 1996 Purchase Plan, which was terminated effective as of the date the 2014 Purchase Plan was approved by our stockholders. Under the 2014 Purchase Plan, we are authorized to sell to eligible employees up to an aggregate of 1,000,000 shares of Geron common stock. As of December 31, 2018, an aggregate of 123,092 shares of our common stock have been issued under the 2014 Purchase Plan since its adoption.

The 2014 Purchase Plan is comprised of a series of offering periods, each with a maximum duration (not to exceed 12 months) with new offering periods commencing on January 1st and July 1st of each year. The date an employee enters the offering period will be designated as the entry date for purposes of that offering period. An employee may participate only in one offering period at a time. Each offering period consists of two consecutive purchase periods of six months' duration, with the last day of such period designated a purchase date.

Under the terms of the 2014 Purchase Plan, employees can choose to have up to 10% of their annual salary withheld to purchase our common stock. An employee may not make additional payments into such account or increase the withholding percentage during the offering period.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

The purchase price per share at which common stock is purchased by the employee on each purchase date within the offering period is equal to 85% of the lower of (i) the fair market value per share of Geron common stock on the employee's entry date into that offering period or (ii) the fair market value per share of Geron common stock on the purchase date. If the fair market value per share of Geron common stock on the purchase date is less than the fair market value at the beginning of the offering period, a new 12 month offering period will automatically begin on the first business day following the purchase date with a new fair market value.

Stock Based Compensation for Employees and Directors

We measure and recognize compensation expense for all share based payment awards made to employees and directors, including employee stock options, restricted stock awards and employee stock purchases, based on grant date fair values for these instruments. We use the Black Scholes option pricing model to estimate the grant date fair value of our service-based and performance-based stock options and employee stock purchases. The fair value for service based restricted stock awards is determined using the fair value of our common stock on the date of grant.

As stock based compensation expense recognized in the statements of operations for the years ended December 31, 2018, 2017 and 2016 is based on awards ultimately expected to vest, it has been reduced for estimated forfeitures, but at a minimum, reflects the grant date fair value of those awards that actually vested in the period. Forfeitures have been estimated at the time of grant based on historical data and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. With the adoption of Accounting Standards Update No. 2016-09, Improvements to Employee Share Based Payment Accounting, or ASU 2016-09, in the first quarter of 2017, we elected to continue to estimate forfeitures expected to occur to determine the amount of stock-based compensation expense to be recognized in each period. The adoption of ASU 2016-09 did not impact our accounting for or presentation of excess tax benefits recognized on stock-based compensation expense on our financial statements since our net deferred tax assets are fully offset by a valuation allowance due to our history of operating losses. In addition, presentation requirements for cash flows related to employee taxes paid for withheld shares had no impact to all periods presented.

In 2018, our board of directors awarded performance-based stock options to certain employees. These performance-based stock options are included in the outstanding options table above. Performance-based options vest only upon achievement of discrete strategic milestones. Stock-based compensation expense for performance-based options is recognized over the period from the date the performance condition is determined to be probable of occurring through the date the applicable condition is expected to be met and is reduced for estimated forfeitures, as applicable. If the performance condition is not considered probable of being achieved, no stock-based compensation expense is recognized until such time as the performance condition is considered probable of being met, if ever.

We recognize stock based compensation expense for service-based stock options on a straight line basis over the requisite service period, which is generally the vesting period. We have not recognized any stock-based compensation expense for performance-based stock options in our statements of operations for the year ended December 31, 2018, as the achievement of the specified strategic milestones was not considered probable during that time. The following table summarizes the stock based compensation expense related to service-based stock options, restricted stock awards and employee stock purchases for the years ended December 31, 2018, 2017 and 2016 which was allocated as follows:

	Year Ended December 31,

(In thousands)	2018	2017	2016
Research and development	$949	$988	$1,275
General and administrative	5,419	7,156	6,970
Stock-based compensation expense included in operating expenses	$6,368	$8,144	$8,245

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

The fair value of stock options granted in 2018, 2017 and 2016 has been estimated at the date of grant using the Black Scholes option pricing model with the following assumptions:

	Year Ended December 31,		
	2018	2017	2016
Dividend yield	0%	0%	0%
Expected volatility range	0.821 to 0.990	0.884 to 0.892	0.888 to 0.890
Risk-free interest rate range	2.55% to 3.11%	1.98% to 1.99%	1.21% to 1.38%
Expected term range	5.25 - 6.62 yrs	5.5 yrs	5.5 yrs

The fair value of employee stock purchases in 2018, 2017 and 2016 has been estimated using the Black Scholes option pricing model with the following assumptions:

	Year Ended December 31,		
	2018	2017	2016
Dividend yield	0%	0%	0%
Expected volatility range	0.437 to 0.475	0.577 to 0.641	0.641 to 0.684
Risk-free interest rate range	1.53% to 1.76%	0.45% to 0.89%	0.28% to 0.45%
Expected term range	6 - 12 mos	6 - 12 mos	6 - 12 mos

Dividend yield is based on historical cash dividend payments and Geron has paid no cash dividends to date. The expected volatility range is based on historical volatilities of our stock since traded options on Geron common stock do not correspond to option terms and the trading volume of options is limited. The risk free interest rate range is based on the U.S. Zero Coupon Treasury Strip Yields for the expected term in effect on the date of grant for an award. The expected term of options is derived from actual historical exercise and post vesting cancellation data and represents the period of time that options granted are expected to be outstanding. The expected term of employees' purchase rights is equal to the purchase period.

Based on the Black Scholes option pricing model, the weighted average estimated fair value of stock options granted during the years ended December 31, 2018, 2017 and 2016 was $1.52, $1.58 and $1.83 per share, respectively. The weighted average estimated fair value of employees' purchase rights for the years ended December 31, 2018, 2017 and 2016 was $0.56, $0.75 and $1.01 per share, respectively. As of December 31, 2018, total compensation cost related to unvested share based payment awards not yet recognized, net of estimated forfeitures and assuming no probability of achievement for outstanding performance-based stock options, was $8,814,000, which is expected to be recognized over the next 27 months on a weighted average basis.

401(k) Plan Matching Contributions

We sponsor a defined contribution savings plan under Section 401(k) of the Internal Revenue Code covering all full time U.S. employees, or the Geron 401K Plan. Participating employees may contribute up to the annual Internal Revenue Service contribution limit. The Geron 401K Plan also permits us to provide discretionary matching and profit

sharing contributions. Prior to 2014, our board of directors approved matching contributions for the Geron 401K Plan in our common stock, which vested ratably over four years for each year of service completed by our employees, commencing from the date of hire.

Stock Based Compensation to Service Providers

We grant stock options and restricted stock awards to consultants from time to time in exchange for services performed for us. In general, the stock options and restricted stock awards vest over the contractual period of the consulting arrangement. The fair value of stock options and restricted stock awards held by consultants is recorded as operating expenses over the vesting term of the respective equity awards. In addition, we will record any increase in the fair value of the stock options and restricted stock awards as the respective equity award vests. We recorded stock based compensation expense of $50,000, $41,000 and $104,000 for the vested portion of the fair value of stock options and restricted stock awards held by consultants in 2018, 2017 and 2016, respectively.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

We have also issued common stock to non employee directors and consultants. For stock issuances where services are to be performed for us, we record a prepaid asset equal to the fair market value of the shares on the date of issuance and amortize the fair value of the shares to our operating expenses on a pro rata basis as services are performed. For stock issuances where services have been performed for us, we record the fair market value of the shares on the date of issuance to offset the amounts owed. In 2018, 2017 and 2016, we issued 73,980, 72,066 and 21,541 shares of common stock, respectively, in exchange for services provided. In 2018, 2017 and 2016, we recognized approximately $141,000, $159,000 and $52,000, respectively, of expense in connection with stock grants to non employee directors and consultants.

Common Stock Reserved for Future Issuance

Common stock reserved for future issuance as of December 31, 2018 is as follows:

Outstanding stock options	27,285,952
Options and awards available for grant	11,964,399
Employee stock purchase plan	876,908
Warrant outstanding	537,893
Total	40,665,152

8. INCOME TAXES

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of our deferred tax assets are as follows:

	December 31,	
	2018	2017
	(In thousands)	
Net operating loss carryforwards	$192,100	$187,700
Research credits	35,500	34,300
Capitalized research and development	2,500	2,500
License fees	—	100
Other-net	7,000	8,200
Total deferred tax assets	237,100	232,800
Valuation allowance for deferred tax assets	(237,100)	(232,800)
Net deferred tax assets	$—	$—

We record net deferred tax assets to the extent we believe these assets will more likely than not be realized. In making such determination, we consider all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax planning strategies and recent financial performance. Forming a conclusion that a valuation allowance is not required is difficult when there is negative evidence such as

cumulative losses in recent years. Because of our history of losses, the net deferred tax assets have been fully offset by a valuation allowance. The valuation allowance increased by $4,300,000 and $9,600,000 for the years ended December 31, 2018 and 2016, respectively, and decreased by $89,400,000 during the year ended December 31, 2017. No income tax benefit was realized from stock options exercised in 2018 because our net deferred tax assets have been fully offset by a valuation allowance.

As of December 31, 2018, we had domestic federal net operating loss carryforwards of approximately $816,800,000. Of this, $788,500,000 will expire at various dates beginning in 2019 through 2037 and the remaining will carryforward indefinitely under the new tax laws, but is subject to an 80% taxable income limitation. As of December 31, 2018, we had state net operating loss carryforwards of approximately $294,800,000 expiring at various dates beginning in 2028 through 2038, if not utilized. We also had federal research and development tax credit carryforwards of approximately $35,500,000 expiring at various dates beginning in 2019 through 2038, if not utilized. Our state research and development tax credit carryforwards of approximately $19,200,000 carry forward indefinitely.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

Due to the change of ownership provisions of the Tax Reform Act of 1986, utilization of a portion of our domestic net operating loss and tax credit carryforwards may be limited in future periods. Further, a portion of the carryforwards may expire before being applied to reduce future income tax liabilities.

On December 22, 2017, the Tax Cuts and Jobs Act of 2017, or 2017 Tax Act, was signed into law. Among other things, the 2017 Tax Act permanently lowers the corporate federal income tax rate to 21% from the previous maximum rate of 35%, effective for tax years including or commencing January 1, 2018. In accordance with GAAP, we remeasured the carrying value of our deferred tax assets as of December 31, 2017 using the new enacted corporate federal income tax rate of 21%. This remeasurement reduced our aggregate deferred tax assets and correspondingly reduced the valuation allowance by approximately $102,300,000. The remeasurement did not impact our financial statements.

In accordance with Staff Accounting Bulletin 118, as of December 31, 2017, we made a reasonable estimate of the effects of the 2017 Tax Act on our existing deferred tax assets. Our preliminary estimate and the remeasurement of our deferred tax assets was subject to further analysis related to certain matters, such as developing interpretations of the provisions of the 2017 Tax Act, changes to certain estimates and the filing of our tax returns. U.S. Treasury regulations, administrative interpretations or court decisions interpreting the 2017 Tax Act may require further adjustments and changes in our estimates. In the fourth quarter of 2018, we completed our analysis to determine the effect of the 2017 Tax Act. No material adjustments were noted from the completion of the analysis as of December 31, 2018.

We adopted the provision of the standard for accounting for uncertainties in income taxes on January 1, 2007. Upon adoption, we recognized no material adjustment in the liability for unrecognized tax benefits. At December 31, 2018, we had approximately $16,400,000 of unrecognized tax benefits, none of which would currently affect our effective tax rate if recognized due to our deferred tax assets being fully offset by a valuation allowance.

A reconciliation of the beginning and ending amounts of unrecognized tax benefits is as follows (in thousands):

Balance as of December 31, 2017	$15,900
Decrease related to prior year tax positions	(100)
Increase related to current year tax positions	600
Balance as of December 31, 2018	$16,400

If applicable, we would classify interest and penalties related to uncertain tax positions in income tax expense. Through December 31, 2018, there has been no interest expense or penalties related to unrecognized tax benefits.

We do not currently expect any significant changes to unrecognized tax benefits during the fiscal year ended December 31, 2019. In certain cases, our uncertain tax positions are related to tax years that remain subject to examination by the relevant tax authorities. Tax years for which we have carryforward net operating loss and credit attributes remain subject to examination by federal and most state tax authorities.

9. STATEMENTS OF CASH FLOWS DATA

	Year Ended December 31,		
	2018	2017	2016
	(In thousands)		
Supplemental investing activities:			
Net unrealized gain (loss) on marketable securities	$24	$(154)	$160

We have not made any cash payments for taxes or interest for the years ended December 31, 2018, 2017 and 2016.

GERON CORPORATION

NOTES TO FINANCIAL STATEMENTS (Continued)

10. SELECTED QUARTERLY FINANCIAL INFORMATION (UNAUDITED)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(In thousands, except per share amounts)			
Year Ended December 31, 2018:				
Revenues	$318	$208	$165	$375
Operating expenses	7,755	7,450	6,970	9,964
Net loss	(7,186)	(6,934)	(5,597)	(7,300)
Basic and diluted net loss per share	$(0.04)	$(0.04)	$(0.03)	$(0.04)
Year Ended December 31, 2017:				
Revenues	$537	$174	$163	$191
Operating expenses	8,031	6,905	7,407	7,977
Net loss	(7,183)	(6,405)	(6,899)	(7,429)
Basic and diluted net loss per share	$(0.05)	$(0.04)	$(0.04)	$(0.05)

Basic and diluted net loss per share are computed independently for each of the quarters presented. Therefore, the sum of the quarters may not be equal to the full year net loss per share amounts.

11. SUBSEQUENT EVENT

We have engaged Parexel as our contract research organization to support imetelstat clinical development activities. Parexel will provide contract research services related to clinical trials conducted by us, in accordance with the terms of the Master Services Agreement, or the MSA, that we entered into with Parexel on January 30, 2019, and related work orders. We may terminate the MSA and/or any work order without cause on prior written notice to Parexel. Contemporaneously with entering the MSA, we entered into a first work order with Parexel, under which Parexel will provide services related to IMerge. Under the first work order, we will pay Parexel service fees and pass-through expenses estimated to be approximately $33 million in the aggregate for Parexel’s services related to IMerge.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

(I) Evaluation of Disclosure Controls and Procedures

We have carried out an evaluation under the supervision and with the participation of management, including our Chief Executive Officer and our Chief Financial Officer, of our disclosure controls and procedures (as defined in Rule 13a 15(e) of the Securities Exchange Act of 1934, as amended) as of the end of the period covered by this annual report on Form 10 K. Based on that evaluation, our Chief Executive Officer and our Chief Financial Officer concluded that our disclosure controls and procedures were effective at the reasonable assurance level as of December 31, 2018.

In designing and evaluating disclosure controls and procedures, our management recognizes that any system of controls, however well designed and operated, can provide only reasonable assurance, and not absolute assurance, that the desired control objectives of the system are met. In addition, the design of any control system is based in part upon certain assumptions about the likelihood of future events. Because of these and other inherent limitations of control systems, there can be no assurance that any design will succeed in achieving its stated goals in all future circumstances. Accordingly, our disclosure controls and procedures are designed to provide reasonable, not absolute, assurance that the objectives of our disclosure control system are met and, as set forth above, our Chief Executive Officer and our Chief Financial Officer have concluded, based on their evaluation as of the end of the period covered by this annual report on Form 10 K, that our disclosure controls and procedures were effective to provide reasonable assurance that the objectives of our disclosure control system were met.

(II) Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

(III) Management's Report on Internal Control over Financial Reporting

Internal control over financial reporting refers to the process designed by, or under the supervision of, our Chief Executive Officer and Chief Financial Officer, and effected by our board of directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles, and includes those policies and procedures that:

(1) Pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of our assets;
(2) Provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that our receipts and expenditures are being made only in accordance with authorizations of our management and directors; and
(3) Provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on the financial statements.

Management is responsible for establishing and maintaining an adequate internal control over financial reporting for us. Internal control over financial reporting cannot provide absolute assurance of achieving financial reporting objectives because of its inherent limitations. Internal control over financial reporting is a process that involves human diligence and compliance and is subject to lapses in judgment and breakdowns resulting from human failures. Internal control over financial reporting also can be circumvented by collusion or improper management override. Because of such limitations, there is a risk that material misstatements may not be prevented or detected on a timely basis by internal control over financial reporting. However, these inherent limitations are known features of the financial reporting process. Therefore, it is possible to design into the process safeguards to reduce, though not eliminate, this risk.

Under the supervision and with the participation of our management, including our Chief Executive Officer and our Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework set forth in "Internal Control—Integrated Framework" issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on our evaluation under the framework set forth in "Internal Control—Integrated Framework," our management concluded that our internal control over financial reporting was effective as of December 31, 2018. The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by Ernst & Young LLP, an independent registered public accounting firm, as stated in their report which is included herein.

(IV) Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Geron Corporation

Opinion on Internal Control over Financial Reporting

We have audited Geron Corporation's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Geron Corporation (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the balance sheets of the Company as of December 31, 2018 and 2017, the related statements of operations, comprehensive loss, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and our report dated March 7, 2019 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that

transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Redwood City, California

March 7, 2019

ITEM 9B. OTHER INFORMATION
None.

PART III

Certain information required by Part III is omitted from this annual report on Form 10 K because we will file with the U.S. Securities and Exchange Commission a definitive proxy statement pursuant to Regulation 14A in connection with the solicitation of proxies for Geron's Annual Meeting of Stockholders expected to be held in June 2019, or the Proxy Statement, not later than 120 days after the end of the fiscal year covered by this annual report on Form 10 K, and certain information included therein is incorporated herein by reference.

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE
Identification of Directors and Nominees for Director

The information required by this item concerning our directors and nominees for director is incorporated by reference from the section captioned "Proposal 1: Election of Directors" contained in our Proxy Statement.

Identification of Executive Officers

The information required by this item concerning our executive officers is set forth in Part I, Item 1 of this annual report on Form 10 K.

Code of Ethics

We have adopted a Code of Conduct with which every person who works for Geron, including our board of directors, is expected to comply. The Code of Conduct is publicly available on our website under the Investor Relations section at www.geron.com. This website address is intended to be an inactive, textual reference only; none of the material on this website is part of this annual report on Form 10 K. If any substantive amendments are made to the Code of Conduct or any waiver granted, including any implicit waiver, from a provision of the Code to our Chief Executive Officer, Chief Financial Officer or Corporate Controller, we will disclose the nature of such amendment or waiver on that website or in a report on Form 8 K.

Copies of the Code of Conduct will be furnished without charge to any person who submits a written request directed to the attention of our Corporate Secretary, at our offices located at 149 Commonwealth Drive, Suite 2070, Menlo Park, California, 94025.

Section 16(a) Compliance

Information concerning Section 16(a) beneficial ownership reporting compliance is incorporated by reference from the section captioned "Section 16(a) Beneficial Ownership Reporting Compliance" contained in the Proxy Statement.

Certain Corporate Governance Matters

The information required by this item concerning our audit committee, audit committee financial expert and procedures by which stockholders may recommend nominees to our board of directors, may be found under the sections captioned "Board Leadership and Governance" and "Other Matters" contained in the Proxy Statement.

ITEM 11. EXECUTIVE COMPENSATION

The information required by this item is incorporated by reference from the sections captioned “Compensation Discussion and Analysis,” “Compensation Committee Report,” “Executive Compensation Tables and Related

Narrative Disclosure," "Compensation of Directors" and "Compensation Committee Interlocks and Insider Participation" contained in the Proxy Statement.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required by this item is incorporated by reference from the sections captioned "Equity Compensation Plan Information" and "Security Ownership of Certain Beneficial Owners and Management" contained in the Proxy Statement.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this item is incorporated by reference from the sections captioned "Proposal 1: Election of Directors" and "Certain Transactions" contained in the Proxy Statement.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information required by this item is incorporated by reference from the section captioned "Principal Accountant Fees and Services" contained in the Proxy Statement.

PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES

(a)(1) Financial Statements
Included in Part II, Item 8 of this Report:

(2) Financial Statement Schedules
Financial statement schedules are omitted because they are not required or the information is disclosed in the financial statements listed in Item 15(a)(1) above.

(3) Exhibits

Exhibit Number	Description	Incorporation by Reference Exhibit Number	Filing	Filing Date	File No.
2.1	Asset Contribution Agreement by and among Geron Corporation, BioTime, Inc. and Asterias Biotherapeutics, Inc. (formerly known as BioTime Acquisition Corporation)	2.1	8 K	January 8, 2013	000 20859
3.1	Restated Certificate of Incorporation	3.3	8 K	May 18, 2012	000 20859
3.2	Certificate of Amendment of the Restated Certificate of Incorporation	3.1	8 K	May 18, 2012	000 20859
3.3	Amended and Restated Bylaws of Registrant	3.1	8 K	March 19, 2010	000 20859
3.4	Amendment to Amended and Restated Bylaws of Registrant	3.4	8-K	November 22, 2017	000 20859
4.1	Form of Common Stock Certificate	4.1	10 K	March 15, 2013	000 20859
4.2	Form of 2011 Warrant	Attachment to 10.1	10 Q	November 3, 2011	000 20859
10.1	Form of Indemnification Agreement	10.1	10 K	March 7, 2012	000 20859
10.2	Amended and Restated 2002 Equity Incentive Plan*	4.1	S 8	June 4, 2010	333 167349
10.3	Form of Stock Option Agreement under 2002 Equity Incentive Plan*	10.6	10 K	March 15, 2013	000 20859

10.4	Amended and Restated 2006 Directors' Stock Option Plan*	10.5	10 Q	November 7, 2013	000	20859	
10.5	2011 Incentive Award Plan*	10.1	8 K	May 16, 2011	000	20859	
10.6	Form of Stock Option Agreement under 2011 Incentive Award Plan*	10.11	10 K	March 15, 2013	000	20859	
10.7	Form of Restricted Stock Award Agreement under 2011 Incentive Award Plan*	10.12	10 K	March 15, 2013	000	20859	

Exhibit Number	Description	Incorporation by Reference Exhibit Number	Filing	Filing Date	File No.
10.8	Form of Non_Employee Director Stock Option Agreement under 2011 Incentive Award Plan*	10.2	10 Q	May 7, 2015	000 20859
10.9	2018 Equity Incentive Plan*	10.2	8-K	May 18, 2018	000-20859
10.10	Form of Employee Stock Option Agreement under 2018 Equity Incentive Plan*	10.3	8-K	May 18, 2018	000-20859
10.11	Form of Employee Stock Option Agreement under 2018 Equity Incentive Plan, as amended*				
10.12	Form of Non-Employee Director Stock Option Agreement under 2018 Equity Incentive Plan*	10.4	8-K	May 18, 2018	000-20859
10.13	Form of Non-Employee Director Stock Option Agreement under 2018 Equity Incentive Plan, as amended*				
10.14	Form of Performance-Vesting Stock Option Agreement under 2018 Equity Incentive Plan*				
10.15	Form of Performance-Vesting Stock Option Agreement under 2018 Equity Incentive Plan, as amended*				
10.16	2018 Inducement Award Plan*	10.1	8-K	December 14, 2018	000 20859
10.17	2018 Inducement Award Plan, as amended*				
10.18	Form of Stock Option Agreement under 2018 Inducement Award Plan*	10.2	8-K	December 14, 2018	000 20859
10.19	Form of Stock Option Agreement under 2018 Inducement Award Plan, as amended*				
10.20	Form of Performance-Vesting Stock Option Agreement under 2018 Inducement Award Plan*				
10.21	2014 Employee Stock Purchase Plan*	10.1	8 K	May 23, 2014	000 20859
10.22	Non_Employee Director Compensation Policy, as amended February 11, 2016*	10.30	10-K	March 10, 2016	000 20859
10.23	Non_Employee Director Compensation Policy, as amended January 31, 2018*	10.31	10-K	March 16, 2018	000 20859
10.24	Non-Employee Director Compensation Policy, as amended May 15, 2018*	10.5	8-K	May 18, 2018	000-20859
10.25	Non-Employee Director Compensation Policy, as amended October 1, 2018*	10.2	10-Q	November 1, 2018	000-20859
10.26	Non-Employee Director Compensation Policy, as amended January 30, 2019*				
10.27	Directors' Market Value Stock Purchase Plan, effective October 1, 2018*	10.1	10-Q	November 1, 2018	000-20859
10.28	Amended and Restated Severance Plan, effective as of January 30, 2019*				

Exhibit Number	Description	Incorporation by Reference Exhibit Number	Filing	Filing Date	File No.
10.29	Amended and Restated Employment agreement between the Registrant and John A. Scarlett, M.D., effective as of January 31, 2019*				
10.30	Amended and Restated Employment agreement between the Registrant and Stephen N. Rosenfield, effective as of January 31, 2019*				
10.31	Amended and Restated Employment agreement between the Registrant and Andrew J. Grethlein, effective as of January 31, 2019*				
10.32	Amended and Restated Employment agreement between the Registrant and Olivia K. Bloom, effective as of January 31, 2019*				
10.33	Amended and Restated Employment agreement between the Registrant and Melissa A. Kelly Behrs, effective as of January 31, 2019*				
10.34	Employment Agreement between the Registrant and Aleksandra K. Rizo, effective as of January 15, 2019*				
10.35†	California Institute for Regenerative Medicine Notice of Loan Award	10.1	10 Q	November 3, 2011	000 20859
10.36†	Office Lease Agreement by and between the Registrant and Exponent Realty, LLC, effective as of February 29, 2012	10.36	10-K/A	March 27, 2012	000 20859
10.37	Fifth Amendment to Office Lease Agreement by and between the Registrant and Exponent Realty, LLC, effective as of September 15, 2015	10.1	8 K	September 18, 2015	000 20859
10.38	Sixth Amendment to Office Lease Agreement by and between the Registrant and Exponent Realty, LLC, effective as of September 21, 2017	10.1	8-K	September 22, 2017	000 20859
10.39	At Market Issuance Sales Agreement, dated August 28, 2015, by and between the Registrant and MLV & Co. LLC	10.1	8 K	August 28, 2015	000 20859
10.40	At Market Issuance Sales Agreement, dated May 18, 2018, by and between Geron Corporation and B. Riley FBR, Inc.	10.1	8-K	May 18, 2018	000-20859
10.41†	Collaboration and License Agreement by and between the Registrant and Janssen Biotech, Inc., dated November 13, 2014	10.36	10 K	March 11, 2015	000 20859
10.42#	Master Services Agreement by and between the Registrant and Parexel International (IRL) Limited, dated January 30, 2019				

Exhibit Number	Description	Incorporation by Reference Exhibit Number	Filing Date	File No.
10.43#	Work Order No. 1 under Master Services Agreement by and between the Registrant and Parexel International (IRL) Limited, dated January 30, 2019			
23.1	Consent of Independent Registered Public Accounting Firm			
24.1	Power of Attorney (see signature page)			
31.1	Certification of Chief Executive Officer pursuant to Form of Rule 13a 14(a), as Adopted Pursuant to Section 302(a) of the Sarbanes Oxley Act of 2002, dated March 7, 2019			
31.2	Certification of Chief Financial Officer pursuant to Form of Rule 13a 14(a), as Adopted Pursuant to Section 302(a) of the Sarbanes Oxley Act of 2002, dated March 7, 2019			
32.1	Certification of Chief Executive Officer pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes Oxley Act of 2002, dated March 7, 2019**			
32.2	Certification of Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes Oxley Act of 2002, dated March 7, 2019**			
101	The following materials from the Registrant's annual report on Form 10 K for the year ended December 31, 2018, formatted in Extensible Business Reporting Language (XBRL) include: (i) Balance Sheets as of December 31, 2018 and 2017, (ii) Statements of Operations, Comprehensive Loss, Stockholders' Equity and Cash Flows for each of the three years in the period ended December 31, 2018, and (iii) Notes to Financial Statements			

† Confidential treatment has been granted for certain portions of this exhibit. Omitted information has been filed separately with the Securities and Exchange Commission.

Confidential treatment has been requested for certain portions of this exhibit. Omitted information has been filed separately with the Securities and Exchange Commission.

* Management contract or compensation plan or arrangement.

** The certifications attached as Exhibits 32.1 and 32.2 that accompany this annual report on Form 10 K, are not deemed filed with the Securities and Exchange Commission and are not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of this Form 10 K), irrespective of any general incorporation language contained in such filing.

ITEM 16. FORM 10 K SUMMARY

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

GERON CORPORATION

Date: March 7, 2019 By: /s/ Olivia K. Bloom
OLIVIA K. BLOOM

Executive Vice President, Finance,

Chief Financial Officer and Treasurer

POWER OF ATTORNEY

KNOW BY ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints, jointly and severally, John A. Scarlett, M.D., and Olivia K. Bloom, and each one of them, attorneys in fact for the undersigned, each with the power of substitution, for the undersigned in any and all capacities, to sign any and all amendments to this annual report on Form 10 K, and to file the same, with exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, hereby ratifying and confirming all that each of said attorneys in fact, or his or her substitutes, may do or cause to be done by virtue hereof.

IN WITNESS WHEREOF, each of the undersigned has executed this Power of Attorney as of the date indicated opposite his/her name.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ John A. Scarlett JOHN A. SCARLETT	President, Chief Executive Officer and Chairman of the Board (Principal Executive Officer)	March 7, 2019
/s/ Olivia K. Bloom	Executive Vice	March 7, 2019

OLIVIA K. BLOOM	President, Finance, Chief Financial Officer and Treasurer (Principal Financial and Accounting Officer)	
/s/ Daniel M. Bradbury DANIEL M. BRADBURY	Director	March 7, 2019
/s/ Karin Eastham KARIN EASTHAM	Director	March 7, 2019
/s/ V. Bryan Lawlis V. BRYAN LAWLIS	Director	March 7, 2019
/s/ Susan M. Molineaux SUSAN M. MOLINEAUX	Director	March 7, 2019
/s/ Robert J. Spiegel ROBERT J. SPIEGEL	Director	March 7, 2019