The Weird Seed



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Daniel's Great Adventure with Grandpa Bob



Written by Robert William Schmieder, also known as "Grandpa Bob" For

Daniel Bo Schmieder

It is my sincere hope that this book will remind you of the magic and power of your imagination.

I will always treasure the adventure so briefly captured here.

The Weird Seed

"Mommy! Daddy! What's this?"

Daniel ran into the house so fast he almost tripped on the first step. In his hand was the strangest thing he had ever seen. He had found it on the fence in the front yard. It looked like a ball of cotton, but of course Daniel knew it wasn't.



"Is it a flower?" he asked Mommy.

"No," she said. "It's not a flower, but it can *make* a flower."

"How will it make a flower?" Daniel asked.

"You should ask Daddy. He should know."

Daniel looked around for Daddy, but it took a long time to find him, since he was in the backyard repairing the door on the greenhouse.

"Daddy, what is this? Mommy says it can make a flower. Can it?"

Daddy put down his tools for a minute and looked carefully at the object. It was very soft, all white and very shiny, but it also had lots of little brown pieces that were very hard. After what seemed to Daniel to be a very long time, Daddy finally said "Yes, this can make a flower. But I think you should talk with Grandpa Bob. He probably will have some ideas about how to make it do that."

Just then Grandpa Bob came back from a long walk, and Daniel ran to him with his discovery in his hands. He was so out of breath he could hardly talk. Without waiting even a second he blurted out "Grandpa Bob, what is this? Will it make a flower?"

"Why, yes, it will," Grandpa Bob replied. "This is a *seed pod*, and these brown things are the *seeds*. The white parts are like feathers, to help the seeds find a good place to live. The seeds will make flowers, but that will take a long time. If you want to make some flowers from the seeds, I can help you."

"Yes!" cried Daniel. He could hardly wait.

So...the first thing they did was examine the seed pods very carefully, for a long time. Daniel asked about the white parts that looked like feathers.

"That's called *angel's hair*. It is made of hundreds of threads that enable the seeds to blow in the wind, so they can find a new place to grow and produce their own flowers." Daniel listened very carefully to Grandpa Bob.



The next thing Grandpa Bob did was take a picture of one seed. The pod had hundreds of seeds in it, and they gently pulled one seed out and put it on a shiny table. Grandpa Bob set the lens on his camera so it could take a close-up picture of the seed. The shiny table made it look like there were two seeds, but really there was only one.



"Grandpa Bob, where did the seed come from?" asked Daniel. "From a plant," Grandpa Bob explained. "A plant makes flowers, and the flowers make seeds."

"But *why* does the plant make the flowers and the seeds? Why doesn't it just make another plant?" Daniel was a bit confused.

"Well, some plants do just make another plant, but some plants make flowers and seeds, too. The seeds are tough and most of them can stand being cool or warm. They can be carried by a bird or animal or by the wind to a new place, where they could make a new plant."

"Grandpa Bob, *how* do the seeds make flowers?" asked Daniel. Grandpa paused before answering. He knew it was complicated, but he didn't want it to be *too* complicated for Daniel to understand. Finally, he said "The seed is alive. It doesn't look alive, because it doesn't move or eat, but if we put it in some soil and add water it will start to grow. If we keep it moist and give it the right kind of food, it will grow into a plant, and that plant will make flowers."

"So is there a plant inside the seed?" asked Daniel.

"No, the seed is a bit like a hen's egg. An egg doesn't have a chicken inside of it, but if you do just the right thing, like keep it warm, it will grow a new chick inside the egg. Then, when the chick is ready, it breaks the egg open, gets out, and grows into a chicken. The seed does almost the same thing. When you keep the seed moist and not let it get too cold or too hot, the seed starts to grow a baby plant inside. When it's ready, the baby plant will make an opening in the seed and grow out as a small plant called a <u>seedling</u>. If it gets water and food, the seedling will grow into a big plant and may it will even grow flowers."

Daniel had lots more questions, but he really wanted to get started. "Grandpa Bob, let's get the seed to make a new plant and some flowers!"

Grandpa Bob thought they should ask Daniel's Mommy and Daddy if it would be OK for them to do this project.

"Sure," said Daddy. "Grandpa Bob can show you what to do, and you can work together. It will be a good project, but it will take a long time. Be sure to show us the new plant that will grow from the seed." Mommy also liked the idea.



So Daniel and Grandpa Bob sat down at the old wooden table in the basement, and talked about what they would need to do this project.

Grandpa Bob said, "I think we need to keep a record of what we do, so I'll get one of my notebooks, and we'll write down everything we do. That way we'll always know what we have done already and what we need to do next." He found an empty notebook and opened it to the first page and began to write notes.



He read each part to Daniel, who thought it was funny to say "We will *plant* the seed so that it can make a new *plant*."

Grandpa Bob explained that some words have two or more different meanings. *Planting* the seed means putting it into the ground, but a *plant* grows from the seed when it is watered. Words sure can be strange!

Once Grandpa Bob finished writing, he said, "OK, we'll need a pot, some dirt, a watering can, and the hose to get the water. Can you find a pot?"

Daniel ran to Mommy, who gave him a green metal watering can. "You can use it as long as you like, but be sure to put it away each day," she said.

"Now," said Grandpa Bob, "a pot and some dirt. The pot needs to have a hole in the bottom so the water can drip out, and the dirt has to be moist, not too hard and not too sandy. Where can we find these things?"

Daniel knew exactly where to find them: in the greenhouse. So they walked up to the greenhouse and Daddy gave them a nice clay pot and some very good dirt.



Next, Grandpa Bob asked Daniel to pick out some good seeds from the pod. Very carefully, Daniel separated five seeds from the pod and used a pair of scissors to snip off the angel's hair.



"How should we plant them?" Daniel asked.

"Well, we should put them on top of the dirt in the pot and then cover them with a little dirt. Then we should water them very gently so the seeds get moist. We won't have to do anything else—the seeds will start to grow all by themselves."

"How long will it take?" Daniel wanted to know.

"Oh, about a week or two weeks. We should look at the pot every few days to make sure the dirt is still moist, but we should be patient—it will take some time for the seeds to sprout."

But Daniel didn't *feel* like being patient. He wanted to see the new plants right now! He was disappointed it would take so long, but there was nothing he could do. So he went off to find his brother Elias, who was in the kitchen making some cookies with Mommy. In about ten minutes, everyone, including Daddy and Elias and Lisa and Grandpa Bob were sitting at the table eating cookies! The pot containing Daniel's seeds just sat on the deck in the pot and seemed to be doing nothing at all. By the next day Daniel had forgotten about the pot, and the next day after that he also forgot about it. Luckily it was cloudy, and the temperature outside was not very high or very low. The pot just sat there and seemed to do nothing.

But the day after that Daniel suddenly remembered the pot and ran to look at it. The dirt was a bit dry, so he got the watering can and sprinkled the top of the dirt. He examined it very carefully, but he couldn't see anything that might be a new plant.

After a week, Daniel was getting very discouraged. "There are no new plants!" he complained to Grandpa Bob. "Why aren't there any new plants?"

Grandpa Bob reminded him that there had not been enough time. The seeds needed at least a week, and probably two or even three weeks, to make new plants. "You must be very patient," he told Daniel.

Daniel understood, but he didn't *want* to be patient.

Another week went by, and Daniel seldom looked at the pot. He almost forgot about it entirely, but Grandpa Bob reminded him to check on it.



"Grandpa! It's growing!" Daniel exclaimed excitedly. Sure enough, looking very close at the dirt, he could just barely see a tiny patch of green plant poking through the top of the dirt. "Mommy! Daddy! A new plant is growing!"

Over the next few weeks, Daniel looked at the pot every single day. Each day that the dirt seemed to be a bit dry he added some water. The little plants first grew two leaves, then two more, and then two more, until finally there were so many leaves Daniel wasn't sure he could count them all. By the end of a month, the plants were getting tall!

"Well, well," said Grandpa Bob. "Looks like you have some new plants!"

"Yes," said Daniel. He was very happy with himself.



One day Grandpa Bob told Daniel, "We must help your baby plants by *thinning* them. They will not grow well if we don't."

Daniel didn't know exactly what this meant, so Grandpa Bob explained that the five seeds they had planted had made just four plants. One seed had not grown, although they didn't know why. If they let these four plants continue to grow, they would be too crowded, and would not be healthy. "They could even die," he said.

So they got a garden trowel and carefully separated three of the plants, and put them in three new pots that Daddy provided from the greenhouse. Now they had four pots, each with its own new baby plant. Daniel lined up all four pots on the edge of the deck, and carefully watered all of them.

Grandpa Bob then described for Daniel what was happening below the surface of the dirt, where they could not see the plant.

"Usually, there is as much of the plant below the surface growing *down* into the dirt as there is growing *up* into the air above the dirt."

"What do you mean?" Daniel asked.

Grandpa Bob found a piece of paper and drew a picture. It showed how the plant grows, both above and below the surface. Daniel could see that as the plant got bigger on top, it was also getting bigger on the bottom.



"Almost all plants grow that way," explained Grandpa Bob. "That's how big trees stay up when there is a strong wind. If the trees didn't have those big roots, a storm might blow them all down. So if you see a tree that is as high as the roof on a house, you can be pretty sure that its roots go down as deep as the floor of the basement."

Daniel understood that immediately and was very impressed.

Week by week, Daniel's four plants grew larger and larger. The leaves got bigger, too. After about two months, the plants were taller than Daniel. He could even see the bottoms of the leaves without turning them over, just by looking up!



One day Grandpa Bob announced, "It's time we found out what this plant is."

Daniel didn't know what to say, so he said nothing.

"Watch this," said Grandpa Bob. He held a piece of the stalk of the plant and suddenly broke it! To Daniel's surprise, some white liquid oozed out. It looked like milk.



"That's called *sap*," said Grandpa Bob. "It *looks* like milk, but it isn't milk. But now we know what kind of plant it is. There's only one kind of plant that makes milky sap: *milkweed*!" "Grandpa Bob, can we *eat* this plant? Daniel asked. Grandpa Bob showed Daniel the sap again. "We *could* eat parts of the plant, but we would have to cook it very well first because this sap is like a poison. You would get very sick if you are it raw."

"By the way," he continued. "Here is another interesting thing about milkweed: it can be used to make a lotion to protect you from the sun. Do you remember Mommy putting suntan lotion on your skin? Well, this plant can be used to make that lotion."



The plants were getting so big that Daddy suggested that they put them out in the garden, at the side of the greenhouse, so Daniel moved them all there. There they blended in with the other plants, and he didn't notice that they were growing some sort of clumps on their tops. At first, the clumps were small and green, but in a few more weeks they got as big as cantaloupes. Then, almost without warning, the clumps burst open and changed into flowers! "Grandpa Bob!" he shouted. "The plants have flowers!"



Daniel was so excited he failed to notice that Grandpa Bob was standing right there looking at the flowers, too. The flowers looked like fireworks, which Daniel had seen in the city on special occasions. They had dark pink stems and light pink flowers with five parts arranged in a circle around the center. Daniel held up his hand and spread his five fingers to try to make them look the same as the flowers.



Daniel looked at one of the flowers up close. "Look!" he exclaimed. "There's an *ant* in the flower!"



And indeed, there was.

Grandpa Bob wrote a lot in his notebook about the new flowers. Of course, he had been writing about the plants all along, every few days, but this day was special because this was the day the new flowers appeared, so he wrote more than usual.



Suddenly, Daniel spotted a *butterfly*! It was orange, with black edges on its wings. It was a very beautiful butterfly, and it was sitting right on one of Daniel's milkweed plants!



Grandpa Bob knew what it was. "Monarch butterfly," he said, without taking his eyes off the butterfly. "I can tell you something very interesting about this particular kind of butterfly. It flies hundreds of kilometers just to find a milkweed plant. When it finally finds one, it lays its eggs on the plant. After a short time the butterfly dies, but the eggs hatch and *caterpillars* come out of them. Eventually those caterpillars become butterflies. The milkweed plant and the monarch butterfly have to live together because they help each other. The butterfly can't lay its eggs on any other plant, and the plant gives the butterfly a little bit of poison that helps protect it from birds and other animals that might harm it. So the milkweed plants are very important to the monarch butterflies which are important to us, and because of that the milkweed plants are important to us."

Daniel thought this was very cool.

While Grandpa Bob was explaining about the butterflies and the milkweed and the caterpillars, Daniel had been looking up and down his plants to see if he could spot a caterpillar, and sure enough he finally did.

"Grandpa Bob! Look! Here is a caterpillar!"



"Yes. Beautiful, isn't it?!" said Grandpa Bob. "Just look at all those stripes! With luck it will turn into a beautiful butterfly." Just then, something else caught Daniel's eye, but it was so small it was very difficult to see. He ran in the house and retrieved his magnifying glass.



He looked carefully at the spot where he had thought he had seen something move. Finally, he saw what it was: a bright-red beetle!

"What's that?" he asked Grandpa Bob.

"Wow, Daniel. What a great find you made!" They both peered at the bright red beetle.

Grandpa continued: "That's called the *milkweed beetle*. Like the monarch butterfly, it lives only on the milkweed plant. When it eats the plant's juice, it gets a little bit of poison that doesn't hurt the beetle but protects it from other animals that might harm it."

"Why doesn't the poison hurt the beetle?" Daniel asked.

"The beetle has chemicals in its body that protect it from the poison. But if anything ate the beetle, probably it would not be protected from the poison and it would get very sick."

"What would eat the beetle?"

"Well, lots of birds eat beetles and other insects. They don't think of it as harming the insects; they are just hungry. But when the beetle gets eaten, it is most certainly harmed, wouldn't you say?"

Daniel laughed. Grandpa Bob is silly, he thought.

"Here's another!" cried Daniel. "But this one is *different*." He showed Grandpa Bob another insect, red and black like the beetle, but longer, about 2 cm long. "That's big!" he thought.



Grandpa Bob continued explaining about these insects. "This one is called the *milkweed bug*. It's not a beetle, but it is an insect. and it also lives *only* on the milkweed. And it also gets protection by eating the plant and getting poisons that help protect it."

"Now, here is

something that is really amazing: All these insects, the *butterfly*, the *beetle*, and the *bug*, are red or red-orange, and black, and they all are poisonous because they eat the milkweed plant. The colors of these particular insects serve as a warning to other animals to not bother them. In fact, it is common among many insects to be colored red and black to warn others that they are poisonous. Now isn't that something?"

"And here's something else!" exclaimed Daniel, already distracted by another new discovery. "Look at this!"

Even with the magnifying glass, they could just barely see a very, *very* tiny insect holding on to a very thin stem of the plant. Fortunately, Grandpa Bob had another magnifier in his pocket, one with a much stronger lens. Holding the lens close to the insect, they were able to see it more clearly. It was only about 5 millimeters long—very tiny!





"That's the *milkweed weevil*," said Grandpa Bob. "Like the beetle and the bug, the weevil eats the milkweed, but although the beetle and the bug don't harm the plant, the weevil *does* harm it, by biting the stems in half. We like the milkweed plant because it attracts butterflies, but we consider the weevil to be a pest because it hurts the plant. By the way, did you notice that the weevil is not red and black? That probably means it's not poisonous. Isn't that interesting?"

Daniel saw that the weevil was gray, not red and black.

Daniel looked at the flowers almost every day for the next month. Eventually, the flowers wilted and fell off. But then something remarkable happened: a fruit started growing in each place the flowers had been!



"Those are *new* seed pods," explained Grandpa Bob. "Do you remember months ago when you found the seed pod and we talked about how it could make a plant that could make flowers that could make new seed pods. Well, these are the new seed pods. Right now the new seeds are growing inside the pods. However, we will have to wait until they are ready to come out."

"How long will we have to wait?" Daniel asked, impatient as usual to see what would happen next. "I want to see them now!"

Grandpa Bob reminded him they had to be patient. "Well, if you looked now, you wouldn't find any seeds, just the same as if you looked inside an egg too soon you wouldn't find a chick. We have to be very patient, and wait for the pod to dry up. When it's completely dry, it will open and the new seeds will pop out. We don't have to do anything except to be patient and wait." Grandpa Bob wrote a few more notes in the notebook. He made a drawing of the plant, and Daniel thought the drawing looked just like the plant.



Little by little, week by week, the pods dried up. Daniel thought they looked like they were dying, but Grandpa Bob assured him that they were not—they were doing exactly what they should be doing so that they could make more seeds.



They waited, and they waited. Many weeks went by, then a whole month more. Daniel was getting discouraged. Then, just as he was about to give up, he saw something.

"Grandpa Bob, look!" Daniel exclaimed. "One of the seed pods is coming apart. And look! It has something inside it."

Sure enough, Grandpa Bob saw that one of the pods was partially split open. With Daniel's help, he twisted it off the plant and carried it to a table in front of the greenhouse. Daddy brought a strong tool, which they used to pry the seed pod open. Inside, they found dozens and dozens of new seeds, each with angel's hair attached. When they pulled the pod completely open, hundreds of seeds fell all over the table. They were very beautiful, and each seed had its own angel's hair.



A week later or so, Daniel went out again to look at his milkweed plants. He was surprised to see that *many* of the seed pods were split open. Thousands and thousands of seeds were being scattered everywhere by the wind. Daniel watched one seed after another as it was carried by the wind high above him, then away over the treetops to some other place. He imagined each seed growing a whole new plant.



"Grandpa Bob, will all the seeds make new plants?" Daniel asked.

"No, they won't." Grandpa Bob replied. "In fact, only one or two out of hundreds or thousands will make a new plant. Many of the seeds will fall on the ground where there is not enough water, so they will just dry up and die. Some of the seeds might fall into a place where there is *too much* water, like a pond or a river, and those won't make a new plant, either. Some of the seeds will be eaten by birds or squirrels or other animals. Even if a seed falls into a good place, it might get moist, start to make a new plant, and then dry out and never grow into a plant. Sometimes a seed can have something wrong with it and just cannot make a new plant. So it's very unlikely that *any particular* seed will make a new plant, but there are so many seeds, it's very likely that *some* new plants will grow. This is one way the world makes just the right number of new plants." Daniel thought about all this, and figured that it was good that the world worked this way. Otherwise there might be so many plants there would be no room for anything else!

Daniel found one very big seed pod that was partially open, and he got Daddy to help him dig all the seeds out of it. Then Daniel cut off the angel hair from each seed so he could keep only the seeds. When he finished getting the seeds out of just one pod, he had hundreds of seeds.



Grandpa Bob suggested that they measure the size of one of the seeds. He had a special instrument called *calipers* that they could use to make very accurate measurement of the sizes of the seeds. Daniel selected one particular seed and Grandpa Bob showed him how to measure it with the calipers. That seed was 2-1/2 millimeters across and not quite 5 millimeters long. They measured the sizes of 20 different seeds, and Grandpa Bob wrote all these measurements into the notebook.



Daniel looked carefully at the seeds in his hand, the new ones from the new plants, and then he looked at some others he had saved from the seed pod he had found on the fence last year. He put the two groups of seeds on the table next to each other and looked back and forth to compare them with each other. He was surprised that he couldn't tell them apart—they looked *exactly the same*!



After thinking about this for several minutes, he finally asked Grandpa Bob.

"How does the plant know how to make *exactly* the same kind of seeds?"

"Good question!" replied Grandpa Bob. "Well, each plant has a lot of very, very tiny parts in its body that tell it how it should be. It's like having a recipe for making bread. If you always follow the same recipe, you'll always get the same bread. The seed has a

kind of recipe in its body. It knows how to make a *new* plant, which knows how to make new seeds just like the old ones, just by following the recipe."

"But wait!" objected Daniel. "If the seeds are always the same, why does the plant have to make new ones? Why doesn't it just stay the same and keep growing?"

"Good question!" replied Grandpa Bob. "Well, the seeds *look* the same, and they are *almost* exactly the same. But actually, each seed is very slightly different from all the others. Not *very* different, but just a *little bit* different. When the plant makes new seeds, the new seeds are just a little bit different from the old seeds. The plant always makes seeds that are just a little bit different."

"But *why* are they different? Why aren't they always exactly the same?"

Grandpa Bob patiently explained. "Well, when a plant lives for a year or so, the conditions where it lives might change some. It may get hotter or colder. Maybe the old seeds blew a long way from where the original plant lived, and the weather there is very different. Sometimes a plant can get a disease, say a virus. There are many reasons why the conditions where the new plant grows could be different from those where the previous plant lived. When the new plant makes seeds, those new seeds will be slightly different because the plant became slightly different due to these changes."

"But why do the conditions change? Why does it get hotter or colder?"

"Good question!" exclaimed Grandpa Bob. "Well, you know that we live on the Earth, which is a big ball of rocks and dirt and water. Now, the Earth is very complicated, with clouds, and earthquakes and storms and summers and winters. The Earth is always changing, and sometimes it changes in ways that affect the plants. For instance, the air might be dry this year because it's hotter than last year. That means that the plants may not have as much water and they might not grow as tall as before. That means they might not get as much sunshine, and because of that they might not grow as strong, and that might mean that the insects might be able to damage them more. And that might mean that when they make seeds, not as many of those seeds would grow into new plants." Grandpa Bob was having difficulty knowing when to stop.

"But Grandpa, maybe if the plants didn't grow as high, the bad insects might not be able to find them and they would grow stronger and make *better* seeds."

"Good point, Daniel," he said. "We just don't know exactly what happens, and even if we did, we might not know how the plant changed."

"But don't people know everything?" Daniel asked, surprised.

"Oh my goodness, no!" exclaimed Grandpa Bob. "We only know a *little* about the world!"

Daniel asked more and more questions. Grandpa Bob could answer most of these questions, but some just left him stumped—he simply didn't know the answers. When this happened, he would say something like "Daniel, I do not know. Perhaps we can find out together, or perhaps you will learn enough in school that you will be able to discover the answers for yourself."

Finally, Grandpa said "Almost everything people know is written in books in the library. If you want to know something, you can go to the library and see if you can find it in a book. But there are many things *no one knows*. Those aren't written in any book. Maybe you will grow up to be a scientist, and you will learn things that no one knows. If you do that, you can write your own books!"

"I already know lots of things," bragged Daniel. They agreed that each of them knew a lot of things, and that made Daniel feel very important.



The next day Daniel found Grandpa Bob writing in the notebook.

"Daniel," he asked. "Can you remember all the steps that we went through? We started with a seed, grew a tiny plant, then the plant got bigger and made flowers, and the flowers turned into seed pods, and in the pods grew new seeds."

Daniel nodded in agreement, but he had nothing to add to Grandpa's list of what they had done.

Grandpa Bob showed Daniel a group of pictures he had put together to show how the seeds made plants which made flowers which made pods which made new seeds. "The plant goes around and around this circle: seeds, plants, flowers, pods, seeds, plants, flowers, pods, seeds,..."

Daniel thought Grandpa should include pictures of the caterpillars and butterflies, and so he did.

Grandpa Bob continued to make notes in the notebook. He glued some of the old seeds from the old plant and some of the new seeds from the new plant into the pages of the notebook, and suddenly thought of a question for Daniel.



"Daniel! What if you cut a seed in two pieces and plant both pieces, the same way we planted a whole seed. Do you think each piece would grow into a new plant?"

"I don't know," said Daniel. "Would it?"

"I don't know either, but we could find out, couldn't we? Just take some seeds, cut them into halves, and plant both halves! Pretty soon we would know whether they could make plants or not."



Daniel liked this idea, and so they did it. They cut 5 seeds in half, and planted all 10 pieces in 5 new pots, wetting the soil to start the process of making new plants. But even after 3 months, the seed halves had not made new plants. They decided that you need to have the whole seed to make a new plant.

Daniel had another question for Grandpa Bob. "What would happen if we planted a little rock and kept it watered? Would it grow a new rock?"

"Hmmm..." Grandpa Bob had to think for a moment about how to answer that question. "No, it wouldn't. Rocks are not *alive*, so they don't *grow*. Rocks aren't made of the same stuff that plants are made of."

"What are plants made of?" Daniel asked?



"All living things, whether they are plants or animals, are made up of millions and millions of tiny pieces that do the things that plants and animals do—they grow, make more like themselves, and eventually die. Those pieces are *alive*, and that's what makes the whole plant or animal alive. But rocks and bricks and marbles and pieces of plastic don't have those pieces, so they are not alive. If you planted a rock, it would just sit there, perhaps for millions of years."

"But a seed *looks* like a rock. Is the seed alive?"

"Yes, we say it is alive, because it can make a new plant. The plant can make new seeds which make new plants which make new seeds, and so on, so we say that it is alive. But *not rocks*."

Daniel understood that, but already he was thinking of something else; he was thinking of *planting* his new seeds. He had *hundreds* of new seeds, and he wanted to see if he could grow *hundreds* of new plants...

All during the winter, Daniel kept his new seeds in a jar in the garage. It was cold, but Grandpa Bob said that it would be good for the seeds to get cold, because it helped them to start growing in the spring. So when spring finally came, Daniel got a little shovel and took his new seeds out into the meadow. He found a clear area, and carefully scraped away a little bit of dirt, put a seed on the bare spot, and scraped some dirt over it. He did this for each one of the hundreds of seeds in his jar. He didn't have his watering can with him, but he hoped the rain would provide enough water for all those seeds to grow into plants.

Sure enough, in about a week it rained, and the dirt got moist. Luckily, it rained several more times over the next few weeks, so the dirt never dried out. Daniel checked the field every few days, and after about a month he began to see tiny new plants poking through the surface of the dirt! There were *hundreds* of new plants!



They were everywhere! Daniel couldn't believe how many there were! In a couple of months, the entire meadow was covered with *hundreds* of new milkweed plants!

Daniel remembered all of the little animals that came to the milkweed plants: the butterflies, the beetles, the bugs, and the weevils. He realized that since he now had hundreds of milkweed plants, there would soon be hundreds and hundreds of those little insects. That summer Daniel tried to collect all of the seeds from the hundreds of new plants. Pretty soon he had a whole bucket full of them, *thousands and thousands of seeds*.

Gradually he realized that each plant would make hundreds more *seeds*, and each seed could make a new *plant* that would make *hundreds more seeds*. "I'm going to plant all of these," he thought. "And grow new plants and new seeds and more new plants! I'm going to have *millions and millions of milkweed plants*!





And so he began to think about how he was going to do that.

But that's another story...

Who is "Grandpa Bob?"



I am extraordinarily lucky—I have six grandchildren. Sadly, most of us live too far apart, scattered around the world really, to have as much time together as I would like. But that doesn't prevent me from enjoying many adventures that we could have together if only we lived next door. This book captures, ever so briefly, one such adventure, the one in which Daniel discovered a mysterious flower—or was it a seed?--and launched himself into an intense search for what it was, and what it could do. I hope this story will give you an idea of how exciting this was for us, and how important.

When I was not having adventures with Daniel, I

earned a living as a physicist. I studied the structure of atoms, how light bounces around collections of mirrors, how to make new elements in an accelerator, how atoms can be torn into pieces, what happens when a laser beam passes through a crystal, how a laser can make a spark, how a radioactive atom can tear a molecule apart and make it give off light, how a flame makes soot, how a bunch of simple objects can get together to do really complicated things, how to make a flat screen color TV, and how to use nanotechnology to make a computer that would be better than any computer that has ever been built.

When I wasn't busy with these activities, I did a lot of traveling, on all seven continents. I have been to Australia, Canada, Chile, China, Egypt, Ecuador, the Galapagos Islands, Indonesia, Israel, Mexico, all 50 States, and nearly every country in Europe. For many years, I organized and led expeditions to very remote places in the ocean, especially exploring underwater islands. One of these, Cordell Bank, became a national marine sanctuary, and another was eventually named Schmieder Bank. I took expeditions to some famous places, including Peter I Island and Heard Island in Antarctica, Easter Island, and Kure Atoll (at the end of the Hawaiian Island chain). On these expeditions we discovered many new species of organisms; three animals and one plant that we discovered were named after me.

I like to write, and so far I have published about 100 technical papers and fourteen books, including one for each of my grandchildren. All this is well and good, but perhaps you'll discover, as I did, that life is mostly about family and friends, and that's what this book is about.

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The CD

The CD included with this book contains the electronic version of the book itself, and also various documents, pictures, and other material about milkweed plants, the seeds, and the little animals that are found on the plants.

Publication information

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