Three weeks ago I underwent quintuple heart bypass surgery. This morning I took the daily two-mile 40 minute walk I’ve been building up to over the past week. Though my sliced breastbone will need three more weeks before I’m allowed any heavy lifting, I do seem to be nicely on the mend.

While an editor can easily order up a heart story, it’s tough on the reporter when it has to be first hand. So let me tell my story, after all, it’s easier for me to pretend to be a reporter than for a reporter to pretend he’s just had open heart surgery.

1 The Heart

If you want the full picture of what happened to me it will help to know how hearts work. If you’re the action type and prefer to cut to the chase, just bypass this section.

The heart does two things with blood: it pumps it around the body, and as the hardest-working muscle in the body it also runs on blood, or more precisely on the oxygen in the blood.

In mechanical operation the heart is a muscle the size of a tennis ball that pumps by squeezing once a second. The interior of the heart is divided by a membrane called the septum into two chambers or ventricles. The right ventricle pumps used blood from the returning veins to the lungs while the left ventricle pumps the freshly reoxygenated blood from the lungs to the arteries, which then carry it all over the body. The squeezing action by itself only makes the blood swoosh in and out of the heart, to make it flow in the proper direction the heart has four valves, one at the inlet and another at the outlet of each of the two ventricles.

While that’s all you need to know about the heart as a vendor of blood, no conscientious biology teacher would let me leave out the heart’s neat little turbochargers. Attached to the inlet of each ventricle is a chamber called the atrium, like the ventricle but smaller. The atria also pump, but before the ventricles. This pre-pressurizes the inlet to each ventricle to improve its aspiration, just like an automobile turbocharger but pumping blood to the ventricle instead of pumping air to the carburetor. This nifty add-on calls for elaborate wiring.
throughout the heart to regulate its delicate timing, yet another thing that can go wrong with the heart.

As I mentioned, the heart is not just a vendor of blood, it is also its own best customer. Several coronary arteries deliver blood from the aorta (the main artery exiting the left ventricle) to the entire outer surface of the heart. People like me with high cholesterol and high blood pressure tend to develop blockages or occlusions of the arteries (coronary or not) in the form of cholesterol laid down inside the artery as so-called plaque, a condition called atherosclerosis. Though hardworking, the coronary arteries are thin compared to the major arteries of the body, and such occlusions can therefore become complete in a relatively short time. This prevents blood from reaching the portion of the heart served by the occluded artery, which then starves of oxygen. This may result in chest pain, angina pectoris, felt as a force ranging from uncomfortable to crushing, along with a tingling in the arms. Within a few minutes the heart muscle tissue starts to die. One should always die with dignity, and medicine dignifies the death of your heart tissue with the mellifluous term myocardial infarction, properly pronounced with a long face in a quiet room. If enough of the heart dies, it loses strength and may also lose coordination (go into fibrillation). Once it stops pumping blood the rest of the body starves of oxygen and dies within a matter of minutes.

The term “heart attack” is strictly speaking reserved for myocardial infarction, with a minor attack killing a small part of the heart and a major one killing enough heart tissue to jeopardize most or all of its function. Other heart conditions such as (congestive) heart failure and heart block do not involve heart death but rather have to do with mishaps to respectively the heart’s pumping ability and synchronisation of the atria with the ventricles.

2 My Symptoms

On Monday April 27, two weeks after my 48th birthday, I experienced what I took to be a mild twenty-minute indigestion after lunch. On Wednesday the apparent indigestion returned for an hour during the afternoon. I was sure nothing serious was up, but on the principle of better safe than sorry I headed for the clinic. To my relief my doctor found no clear symptoms of heart trouble, but nevertheless scheduled me for a stress or treadmill electrocardiogram, EKG, late Friday afternoon. He also gave me nitroglycerine to take if the pain returned. In the meantime, still convinced I was fine, I continued to bicycle to and from work.

On Friday the “indigestion” set in again as I began my shower, but this time it continued all day. I tried the nitroglycerine but it didn’t relieve the pain, which was good inasmuch as it suggested my problem was not heart related. I had scheduled that day to work at home, but was too uncomfortable to concentrate. When at last I stepped onto the treadmill that afternoon and started walking, to my great relief the discomfort went away, and I completed the test with what I presumed would be flying colors.
The question now arose, what was causing the pain if not my heart? The test was not scheduled to be looked at until the next day, but I consulted a physician immediately after my test with the information that the test seemed on the surface to have gone well, and meanwhile what was I to do about the pain? He suggested that it might be a gastro-intestinal spasm, whose symptoms would be essentially what I was experiencing. At last I had a plausible match of symptoms and diagnosis, and greatly relieved I went home bearing suitable medication for this condition.

On Saturday morning I went in to see the cardiologist responsible for interpreting my stress EKG. He startled me with the news of his suspicion of an occlusion low down in my right coronary artery affecting the lower right of my heart. First he showed me some normal and abnormal EKG’s of other patients, then he showed me mine, so I could judge for myself whether I’d been naughty or nice. Tea-leaves would have been more convincing. My EKG was clearly neither normal nor abnormal, and it occurred to me that my secret identity as a visitor from Krypton was about to be revealed to armed militia poised in the next room.

But he just packed me off to Stanford Hospital and scheduled me for angiography on Monday. Although I was annoyed at having my weekend interrupted on so little notice, an angiogram was an opportunity to settle the matter decisively, so it seemed to me a very good idea to play along with the little plan of this demented reader of tea-leaves, however unlikely it was to reveal any coronary treason by my faithful heart.

An angiogram is a live X-ray of the coronary arteries in motion, but with far more clarity and detail than obtainable with an ordinary chest X-ray. This is achieved with a contrast agent squirted into the coronary artery under examination, or into a ventricle, making the blood in the artery or ventricle stand out as a dark region against the lighter surrounding tissue. The agent is delivered via a catheter, a long tube inserted into the groin and up a large artery into the heart. The patient gets to watch the movie along with the cardiologist. While it is an eerie sensation to watch your own heart in action on the screen, it is also like being able to see after being blind from birth—suddenly you see in sharp and pulsating detail what had all your life been just a vague ka-thumping in a stethoscope.

What my angiogram revealed was a far more life-threatening situation than anyone had expected: a total of 8 coronary occlusions, including the 100% occlusion of the right coronary artery predicted by the cardiologist right where he said (how does he do that?), along with five 70%-90% occlusions that would presumably soon start giving my heart a very hard time.

Apparently I picked a good artery to shut down first. Had my left anterior (front) coronary artery gone first, which it wasn’t too far from doing, I could have had an immediately fatal heart attack, perhaps on one of my bike rides. As it was, the occlusion responsible for my angina was starving a relatively unimportant part of my heart on the lower right. The pain was not the crushing angina one reads about, and the small heart damage I suffered was to the right ventricle, which has the easier job and hence is less bothered by a little infarction.
In addition I had apparently over time developed collaterals, small new coronary arteries that were growing and crossing over into other coronary arteries’ turf to duplicate their flow.

So on a scale of one to ten this was not worth much more than a two as heart attacks go. But the angiogram was saying eight, so the cardiologist had no trouble persuading me that a far more serious heart attack was in my crystal ball. He booked me for heart surgery the following Monday, a week away.

I spent the next two days in the hospital under close observation. While angiography does no great violence to the heart, the agent does irritate it enough to risk arrhythmia, irregular heartbeat, and the practice is to give the heart time to get over its outrage at this little Exxon Valdez from Mars. The rest of the week was spent, as they say, putting my affairs in order, which seemed the most appropriate response to the news that my heart was about to be temporarily disconnected from my circulation.

3 My Operation

The operation to fix coronary atherosclerosis is called in full a Coronary Artery Bypass Graft, CABG, or bypass for short. The cardiac surgeon takes veins or occasionally arteries from elsewhere in your body (so as not to trigger a rejection by your immune system) and, after relieving your heart from its usual grind with an external artificial one, connects them from the now motionless aorta to whichever portions of the heart have been partially or completely disconnected from the blood supply by the occlusions, which are thereby bypassed. A number of such bypasses may be put in, typically two to five depending on what areas are in danger of being isolated and what proportion of the heart any given bypass might usefully serve.

When only one or two bypasses are indicated, an alternative recently developed and simpler operation called balloon angioplasty may be used instead to expand the occlusions from inside, using a balloon that is inflated after being maneuvered into position using a catheter from the groin via an artery to the heart, as with the angiogram. I had hoped I might be eligible for this simpler operation, but my cardiologist assured me that with my number of occlusions angioplasty would be neither easy nor long-lasting.

I received five bypasses. (If you’ve been counting, that’s fewer than my eight occlusions, but if two occlusions are in the same artery and near each other you just jump over both without bothering about the short bit in between.) One bypass consisted of a mammary or breast artery, only one end of which needed to be rerouted, the other remaining attached to the aorta. The other four were saphenous veins taken from my legs, the ones they take out when you have varicose veins. That meant a total of nine ends to be sewn, each taking about 10 minutes to sew. The veins are the traditional source of bypass material, the mammary artery is a relatively recent source that has proved to be more effective than veins, but unfortunately there are only two and current practice is to preserve one as a spare.
The whole operation lasted some four and a half hours, requiring my chest cavity to be sawn open, the heart disabled, my legs to be robbed of their veins, the bypasses to be sewn in place, the heart to be connected back up and restarted, and everything to be sewn back together, or wired together with stainless steel wire in the case of my sternum (breastbone). I get to keep the wire; for airport metal detectors it’s no big deal, being less metal than one key on my keyring.

I remained under anesthesia for nearly a day. I came slowly out of it during the second day, feeling very groggy. After one more day in intensive care I was transferred to an intermediate care unit where I convalesced for four more days before returning home.

4 What This Meant to Me

This operation, which I am sure spared me from a far more serious heart attack in the not too distant future, had a yet deeper significance for me. My doctor father had his first serious heart attack at 49 while standing in front of a defibrillator on exhibit at a medical conference. He would have died on the spot had his choice of spot been less foresighted. After a couple more relatively minor attacks he died of a massive heart attack at 54.

I had inherited my father’s high cholesterol and blood pressure and was of the opinion that I would be very lucky to outlive him by ten years. I was therefore resigned to not seeing 65. Now that I have had this operation, and now that the doctors have looked so closely at my heart while operating on it, thus giving me much more insight into the state of my heart, I feel that my chances of living to 80 have gone up dramatically. Thus the meaning of the operation for me was not only a life saver but a reprieve from the prospect of an early death. Both mean a lot to me.

This is not to say that I expect my bypasses to last thirty years. They may last ten to fifteen years before clogging up again, perhaps more if I’m very good to them, but now I and my doctors understand my situation much better than before and will be watching it a lot more closely. And I am optimistic that if and when the time comes for me to go through this again, the state of the art will be sufficiently further along that both the diagnosis and the treatment will be easier.

5 What It Could Mean to You

Your 50th birthday marks your two billionth heartbeat. That and stories like mine do create a little apprehension, and a number of my friends have asked my advice, as though my experience had somehow made an expert of me. In a way it has, thanks to my greatly increased interest in the topic together with my ready access while in Stanford Hospital to some of the world’s top heart experts. Who last saw the devil gives the most urgent sermon, but if you were
expecting a little visit from the devil yourself you may not mind my taking the liberty of holding forth on the subject.

The four points you can do something about yourself are weight, diet, exercise, and stress. Smokers of course have a very critical fifth point: quit while you’re ahead.

Weight. The more of you there is, the more work your poor heart has to do to pump blood to every oxygen-consuming cell of your body. And the more work your heart does, the sooner it wears out. When you reduce you do your figure a small favor but your heart a big favor.

You’ve probably heard of the body’s setpoint, which is set at your present weight, drives your hunger pangs, and cannot be changed. During the past two years I’ve tried changing my setpoint, with some success. My setpoint feels to me like a five ton truck. You push hard on it, nothing happens for a while, then it slowly starts moving. During this period you feel withdrawal symptoms. Once your setpoint has moved down say ten pounds, it seems happy to stay there, the withdrawal symptoms go away, and you find yourself eating normally again. But then along come a slew of social whirls, in the form of dinners, retreats, conferences, and so on, which exert an upward force on the setpoint. Enough of them can move that five-ton setpoint right back up to where it was, and you have to start over. All this happened to me.

My message: bear down on your setpoint, bear with the withdrawal symptoms while they last, and watch those social whirls like a hawk.

Diet. Didn’t we just cover this? While it’s true that “go on a diet” normally means eating less in order to reduce, what I mean here is not quantity but quality. Certainly stay away from Diet City’s notorious gangsters, arsenic, cyanide, and the others in that food group. But be aware that you are also at risk from diet’s two white collar criminals, fat and cholesterol. The presence of either of these substances in your diet is strongly implicated today in elevated blood cholesterol levels, making them con-men to watch out for.

Your best bet is to look for some recent cookbooks bearing the key word “light”. “Light” means little on 1992 food packaging but everything on 1992 cookbooks. “Heart-healthy” is another key word. They should tell you not only which ingredients are in or out but how to make great-tasting meals that meet all the rules. In particular they should be telling you to forget ice cream (try frozen nonfat yogurt, which has gotten creamier-tasting lately), cheese (pizza is out), red meat (stick to turkey and seafood), and nuts. Switch to nonfat milk and go easy on the margarine and mayonnaise. Many of the other things you’ve been eating should be ok. For bread condiments, honey and jam are lower in fat and cholesterol than peanut butter and cheese spread. (But if your doctor says you have high triglycerides you may have to watch your sugar intake.) And a glass or two of red wine each day is very in these days, though this is a new enough addition to nutrition science that for all we know grape juice may work as well.

When eating out, try to correlate what your favorite restaurants are serving with what your cookbooks say and stick to those restaurants where you can obtain good-tasting food with a minimum of grease and cholesterol.
A note on changing diet. It may seem like the worst kind of masochism to abandon all those foods whose aromas made your mouth water from a hundred yards away. You may even feel like you are going through withdrawal. However it takes only a few months to grow accustomed to any reasonable diet. Once you have settled in with your new diet, don’t backslide or you’ll get hooked again on the bad old diet and have to go through withdrawal again. Just say no. If the weak flesh isn’t equal to the willing spirit, get help. This is your heart on cholesterol.

One caveat: what we presently know about the impact of diet on cholesterol level and more generally on health is still in a great state of flux. The above is essentially the overall 1992 middle-of-the-road recommendation from health professionals. Don’t be surprised to find the middle of the road shifting around a little during the 1990’s. At the same time however don’t expect any sudden dramatic changes in where that middle is from year to year. Every new study you will read about in the newspaper may sound like the rug being pulled out from under your diet. That’s journalism for you. In reality no more than a thread of the rug is being gently tugged by any one study among the hundreds of studies completed and ongoing.

Exercise. I bike four miles to work three or four times a week on average, and have done so the past twelve years. I also used to swim, up to five miles a day when I was a teenager, but regrettably it has become more boring for me than I can stand, no more fun than a stationary bicycle, though both are very safe. Consider also walking, jogging, or roller-blading, though these last two are a bit risky: jogging pounds your joints, and the spills in roller-blading can be rougher still.

Whatever your exercise, aim to get your pulse rate well up. Your doctor can suggest a target pulse rate for your situation, typically 130 to 160 beats a minute. Sustain your target rate for half an hour or so, several times a week.

Stress. I deal with stress by enjoying it. If you don’t enjoy it, don’t do it. If you’re in what seems to be an unavoidable rut you don’t enjoy, consider retiring, joining a commune, living on a farm, marrying into money, or just switching into a more satisfying job (this will require some patience this year).

I also take an hour-long shower every second day, with the showerhead set on a fine slow spray, about a gallon a minute, and I brush my teeth and think about things in general. No agenda, I just let questions and ideas pop into my head and I mull them over. I’ve been doing this for twenty years, and while it obviously hasn’t completely protected me from my heart condition I nevertheless find it a very calming time. And my teeth love it, though I do go through a lot of toothbrushes.

6 When to Worry

If you have low blood pressure and low cholesterol you are at low risk of heart disease. Your doctor can tell you whether your blood pressure is putting you at risk. However the meaning of your cholesterol is in a state of flux just now.
The old scale was 150-300, with the upper half of the scale being considered putting you at risk. Now cholesterol is being classified according to the kind of lipoprotein it rides on as it flows through your body. HDL is the high density lipoprotein and LDL the low. Your total cholesterol is defined as the sum of these two plus one fifth of your triglyceride count. There are now respectable sources who say that the ratio of HDL to LDL is a more reliable risk indicator than total cholesterol. 1:1 is very safe while 1:3 is into the risky region. However it still seems to be very much up for grabs where to draw the line, and even whether it is the ratio that matters or whether one has to interpret the HDL and LDL figures separately. Keep your eyes peeled for developments in this area.

So check with your cardiologist or dietician for the latest figures and guidelines, and don’t settle for a total cholesterol figure, ask for your HDL and LDL numbers separately. They are harder to measure than total cholesterol since the lab has to centrifuge your cholesterol to separate out the different densities, but if you don’t go that extra mile you’re that much more in the dark.

Incidentally exercise appears to raise HDL levels.

Let me conclude with a disclaimer. I teach computer science at Stanford and I’m only as much of an expert in heart medicine as my very recent first hand experience has been able to make of me in a month. Your doctor and the reputable experts are the authorities in this business. My advice is free but my experience is first-hand, treat both accordingly. And may you never need bypass surgery.