THE ENDLESS VOYAGE

"First Steps" Episode 102

One of the most remarkable characters in all of the history of oceanography is Captain James Cook of the British Royal Navy. Interestingly, he was not well schooled. He wasn't the kind of person that you would, looking at him as a young man, believe would change the world peacefully more than any other person in history did, but, he did.

The United States Exploring Expedition probably was the nucleus for much of marine science that occurred following this expedition. For instance, in the 1870s, the British mounted what was known as the Challenger Expedition. And it was a very, very successful expedition.

The outcome of that expedition was very uncertain. And, yet, the people who did it made the commitment to do it, and I think, were quite heroic.

NARRATOR:
AN OCEANOGRAPHIC VESSEL TODAY IS ESSENTIALLY A FLOATING LAB, EQUIPPED WITH THE LATEST COMPUTERIZED TECHNOLOGY. IT IS CAPABLE OF GATHERING DATA FROM THE DEPTHS OF THE WORLD OCEAN, THEN COMMUNICATING WITH VIRTUALLY ANY POINT, EITHER ON LAND OR IN THE AIR. IN STARK CONTRAST, THE EARLIEST ATTEMPTS TO EXPLORE THE OCEAN WERE DANGEROUS FORAYS INTO A VAST AND UNFAMILIAR WORLD, LED BY HEROIC INDIVIDUALS WITH LITTLE MORE TO GUIDE THEM THAN INSATIABLE CURIOSITY AND A SENSE OF ADVENTURE.

THE EARLIEST MARINE STUDIES WERE DRIVEN BY PRACTICAL CONSIDERATIONS—TRAVEL, TRADE, WARFARE AND THE SEARCH FOR FOOD. THE GREEKS WERE THE FIRST EUROPEANS TO VENTURE BEYOND THE SIGHT OF LAND, EXPLORING THE ATLANTIC OCEAN BETWEEN ABOUT 900 AND 700 B.C. MARINE SCIENCE, THE SYSTEMATIC STUDY OF THE OCEAN, BEGAN AT THE LIBRARY OF ALEXANDRIA IN EGYPT, FOUNDED BY ALEXANDER THE GREAT IN THE THIRD CENTURY B.C. MEANWHILE, THE POLYNESIANS CONTINUED THEIR LONG HELD TRADITION OF OCEANIC VOYAGES, EVENTUALLY COLONIZING THE HAWAIIAN ISLANDS SOMETIME BETWEEN 450 AND 600 A.D. AND IN THE CENTURIES THAT FOLLOWED, THE VIKINGS OF SCANDINAVIA AND THE CHINESE ALSO MADE SIGNIFICANT CONTRIBUTIONS TO MARINE EXPLORATION. FINALLY, WITH THE AGE OF DISCOVERY, RENAISSANCE EUROPEANS SET OUT TO EXPLORE THE WORLD BY SEA. FROM PRINCE HENRY THE NAVIGATOR TO FERDINAND MAGELLAN, THIS WAS A TIME OF PROFOUND CHANGE AND ENORMOUS PROGRESS. BUT IT WAS JUST THE BEGINNING. IN 1768, A BRITISH SCIENTIFIC ORGANIZATION KNOWN AS THE ROYAL SOCIETY SENT NAVAL CAPTAIN JAMES COOK TO TAHITI. COOK'S MISSION WAS TO MEASURE

THE TRANSIT OF VENUS ACROSS THE FACE OF THE SUN AND, IN DOING SO, VERIFY THE GRAVITATIONAL LAWS OF SIR ISAAC NEWTON. ONCE HE COMPLETED THAT ASSIGNMENT, COOK WAS TOLD TO RETURN HOME, BUT IT WAS SUGGESTED THAT HE DO A BIT MORE EXPLORING ALONG THE WAY.

TOM GARRISON, Ph.D., Orange Coast College:
So Cook takes off and goes over into the areas of the Great Barrier Reef. He discovers New Zealand. He goes around the world and, eventually, in 1771, ends up back home. But by the way, on the way, in the process of doing this, he can chart the positions of the objects he finds, can get back to the areas or tell other people how to get back to the areas that he discovered, and gets back home in 1771 a hero.

NARRATOR:
IN FACT, THE BRITISH GOVERNMENT WAS SO PLEASED WITH COOK'S WORK THAT IN 1772 IT SENT HIM BACK TO THE PACIFIC. HIS MISSION: TO HEAD TOWARDS THE SOUTH POLE IN SEARCH OF AN AS YET UNDISCOVERED CONTINENT THAT IT WAS THOUGHT COULD POSSIBLY BE IN THAT REGION. WHEN COOK RETURNED TO ENGLAND IN 1775, HE HAD FOUND EVIDENCE OF SUCH A CONTINENT, BUT HADN'T ACTUALLY REACHED WHAT TURNED OUT TO BE ANTARCTICA. HE HAD HOWEVER, CHARTED TONGA AND EASTER ISLANDS AND DISCOVERED NEW CALEDONIA IN THE PACIFIC AND SOUTH GEORGIA IN THE ATLANTIC. HE HAD ALSO MANAGED TO CIRCUMNAVIGATE THE GLOBE AT THE HIGHEST LATITUDE EVER. A SCANT YEAR LATER, COOK WAS SENT OUT A THIRD TIME WITH HIS SHIPS, RESOLUTION AND DISCOVERY.

And his goal on this trip is to find a passage across the north of North America, from the Pacific to the Atlantic, the fabled Northwest Passage. So, he goes into the Pacific. He goes around the bottom of South America from the Atlantic, goes into the Pacific, goes to some of his old haunts, goes straight up the center of the Pacific and discovers—western discovery, of Hawaii. The Spanish had gone back and forth across the Pacific to Manila and back and they'd never seen Hawaii. Cook goes up the middle, finds Hawaii, makes friends with the locals, uses this as a staging area, goes up to the north and discovers a lot of places that we know of today. For example, Vancouver Island and Vancouver, B.C. are named after George Vancouver who was a sailing master in one of the two ships. And he punches his way up into the Bering and Chukchi Seas, unable to find his way across the top. Understandably, since that's always ice choked. Well, he gives up, decides he has to get back home, goes back to Hawaii to provision and restage, and a little bit of a fracas dusts up between Cook and the locals. And on the 14th of February in 1779, Cook is killed.

NARRATOR:
CAPTAIN JAMES COOK IS WELL KNOWN FOR HIS OCEANIC EXPLORATION AND SCIENTIFIC DISCOVERIES. WHAT IS NOT SO WELL KNOWN ABOUT

COOK IS THE KIND OF MAN HE WAS. PERHAPS MOST TELLING WAS THE WAY HE TREATED HIS CREW.

GARRISON:
He didn't beat 'em up, he didn't whip them. He was a good disciplinarian, but they respected him greatly, and he looked after them and included them in scientific work—in the collection of specimens, in understanding of how things work. He was an excellent diplomat. He made friends with people wherever he went. He was a person who, no matter what the language barrier, people instinctively liked. His leadership abilities were legendary. His commanders and lieutenants worshipped the ground he walked on. He was a singularly remarkable man.

NARRATOR:
AS GREAT AS CAPTAIN COOK'S CONTRIBUTIONS WERE, HIS THREE HISTORIC VOYAGES WERE NOT PURELY SCIENTIFIC EXPEDITIONS. HE DID HIS WORK AS A REPRESENTATIVE OF THE BRITISH CROWN AND PART OF WHAT HE DID CONCERNED FOREIGN RELATIONS AND OTHER MATTERS THAT PERTAINED TO THE ROYAL NAVY. IT WOULD BE ALMOST 100 YEARS BEFORE THE BRITISH WOULD EMBARK UPON THE FIRST COMPLETELY SCIENCE-BASED MARINE EXPEDITION IN 1872. BUT PRIOR TO THAT, THE UNITED STATES SET THE STAGE FOR WHAT WAS TO COME, WITH AN EXPLORING EXPEDITION LAUNCHED IN THE LATE 1830'S UNDER THE COMMAND OF LIEUTENANT CHARLES WILKES.

DENNIS KELLY, Orange Coast College:
The United States exploring expedition originated under probably the most unusual circumstances of all time. In the early 1820s, a fellow by the name of John Cleves Symmes, a former military officer and artilleryman, published a pamphlet saying that the United States needed a great philosopher like England had. And, lacking somebody else, he named himself that person. In fact, he called himself the Newton of the West. And if you're going to be the Isaac Newton of the Western Hemisphere, you got to come up with something miraculous. What he came up with a description of the world that he maintained was correct, that at each of the poles, the North and South Pole, there were holes, and if you sailed to the poles, you could actually sail inside the Earth through the holes. And because of the spinning of the Earth, you could sail around the inside of the Earth, and that when you got in there, you would find continents that were mirror images of the continents on the outside, peopled by races of people we didn't know about.

NARRATOR:
BY 1838, NOBODY REALLY BELIEVED THERE WERE HOLES IN EITHER THE NORTH OR SOUTH POLE. BUT THOSE IN FAVOR OF AN EXPEDITION THAT WOULD INCLUDE A POLAR COMPONENT BELIEVED THERE WERE MANY OTHER REASONS TO LAUNCH SUCH A VOYAGE. NOT EVERYONE AGREED, HOWEVER.

KEITH BENSON, Ph.D., University of Washington:
There was no tradition in the United States federal government for funding science. The only other scientific expedition was Lewis and Clark Expedition of Thomas Jefferson. So this was something that was difficult to get through Congress, and it took until 1838 to have it funded.

The United States Exploring Expedition, 1838 to 1842, was our very first ever large scientific ocean research expedition. And at the time, it was the largest, most ambitious expedition that had ever been attempted in human history by anybody. It involved six ships, almost three hundred men. It was the first expedition to take along scientists who were paid to work on behalf of a government to study the ocean. It had many, many different objectives. Part of the expedition's objective was to sign treaties with nations that at the time we had no treaties with. Part of the purpose was to explore places that had never been explored before. Also, to investigate the possibility that there was one last continent at the very southern end of the globe, what we know now is the continent of Antarctica. And nobody had ever been there and mapped the continent before. They were also to collect marine specimens all over the world, they were take soundings, they were to measure water temperatures, they were to measure currents—everything and anything about the ocean that would of benefit to the United States.

And the voyage went south along the Atlantic coast, around South America, up the western coast of South America to the Pacific, explored thoroughly the northwestern part of the United States. Then the ship went off into the Pacific, through Hawaii, the South Sea Islands and then back to the East Coast. But the work that was done on this…expedition was really quite monumental.

The United States Exploring Expedition was phenomenally successful, far beyond their wildest dreams. They found whole new stocks of whales that nobody knew about. They recovered many, many species of animal, plant, fish that had never been seen before. They named hundreds and hundreds of species for the first time ever. It let to an era of discovery and understanding about the ocean that had not proceeded that in all of history for any country, let alone the United States. It resulted in the basis for our educational system concerning the ocean. And it led to further expeditions to different places on the earth that the exploring expedition didn't happen to visit. So, it's really the beginning of marine science in the United States.

NARRATOR:
SHORTLY AFTER THE U.S. EXPLORING EXPEDITION CONCLUDED, MATTHEW FONTAINE MAURY, PERHAPS THE FIRST PERSON FOR WHOM OCEANOGRAPHY WAS A FULL-TIME OCCUPATION, BEGAN CHARTING WINDS AND OCEAN CURRENTS FOR THE UNITED STATES NAVY.

And this basically was a pioneering effort in understanding the different currents that make up each ocean. That is, an ocean is not just one mass of water, but is the combination of many different flowing rivers, if you will, of water.

NARRATOR:
MAURY PRODUCED A SET OF DIRECTIONS FOR SAILING GREAT DISTANCES MORE EFFICIENTLY. HIS WORK QUICKLY ATTRACTED WORLDWIDE NOTICE. TODAY, MATTHEW MAURY IS CONSIDERED BY MANY TO BE THE FATHER OF PHYSICAL OCEANOGRAPHY. ALSO NOTABLE FOR HIS OCEANOGRAPHIC WORK IN THE MID-19TH CENTURY WAS CHARLES DARWIN. ALTHOUGH DARWIN WOULD LATER BE PRIMARILY RECOGNIZED FOR HIS REVOLUTIONARY EXPLANATION OF BIOLOGICAL EVOLUTION, HIS VOYAGE TO SOUTH AMERICA AND THE PACIFIC ON THE H.M.S. BEAGLE PRODUCED SIGNIFICANT OCEANOGRAPHIC RESULTS, INCLUDING HIS WORK PERTAINING TO CORAL ATOLLS AND REEFS BARNACLE BIOLOGY, VOLCANIC ISLANDS AND FOSSILS. BUT IT WAS THE BRITISH CHALLENGER EXPEDITION, A FOUR-YEAR VOYAGE BEGUN IN 1872, THAT WOULD COME TO BE KNOWN AS THE MOST IMPRESSIVE AND IMPORTANT MARINE EXPEDITION EVER UNDERTAKEN. IN LARGE PART, THIS RECOGNITION STEMMED FROM THE FACT THAT IT WAS THE FIRST SAILING EXPEDITION DEVOTED EXCLUSIVELY TO MARINE SCIENCE.

And the goal of this was to basically survey the oceans. By the second half of the 19th century, the oceans had of course been explored, but never in a systematic way.

DEBORAH DAY, Scripps Institution of Oceanography, UCSD:
The British Navy and the navies of a number of other nations had always taken measurements of tides from ships in the ocean. The most famous one, of course, is Captain Cook, who's known for a number of amazing voyages. However, they normally didn't carry scientists. Sometimes they carried naturalists like Charles Darwin on the Beagle. But there was no cruise devoted to oceanography until the Challenger.

In particular, they wanted to look at the plants and animals of the sea, where they live, relative abundance, how deep they lived and so forth.

DAY:
There was a scientist in Britain named Edward Forbes who postulated that the sea below a certain level could not sustain any life at all. This was a theory. And one of the reasons the Challenger was put together is that they wanted to test that theory and find out if there were any living things below the—what was called the Azoic Zone of the ocean. However, the Challenger Expedition was really an exploratory expedition. It was a four-year circumnavigating expedition, which wanted to take basic scientific measurements of the oceans, the currents, temperature, and dredge the bottom of the ocean.

NARRATOR:
FOR THE 240 MEN WHO COMPRISED THE CREW, THE CHALLENGER EXPEDITION WAS ABOUT MORE THAN JUST SCIENCE. IT WAS ABOUT SURVIVAL.

DAY:
There were about a dozen people killed on the expedition. It was a cruise that was very, very rough. They went to Kerguelen, which is one of the islands off the Antarctic. They encountered ice, dangerous conditions. They found two shipwrecked men on an island down there. It was a tremendously romantic, but hardworking cruise.

NARRATOR:
THE RIGORS OF THE VOYAGE NOTWITHSTANDING, THE IMPACT OF THE CHALLENGER EXPEDITION CAN STILL BE FELT.

Much good science had been done by previous expeditions around the world, but Challenger actually took their collections off the ship. These collections were disbursed to scientists who then wrote specific reports on this type of specimen and this type of specimen. All of those reports were published in fifty huge folio volumes. The volumes then were put in libraries around the world, including this one, where it continues to be used by scientists today.

NARRATOR:
IF THE CHALLENGER REVOLUTIONIZED WHAT WAS KNOWN ABOUT THE MARINE ENVIRONMENT, IT ALSO CHANGED FOREVER THE WAY MARINE SCIENCE WOULD BE STUDIED.

KEITH BENSON, Ph.D., University of Washington:
The Challenger really focuses, for the first time, the oceans as a systematic area of investigation. And then the need, in doing that, of a huge coterie of individuals who can evaluate the results of that type of investigation.

NARRATOR:
UNFORTUNATELY, ONCE THE CHALLENGER EXPEDITION ENDED IN 1876, THERE WAS NO FOLLOW-UP MISSION IN PLACE TO CARRY ON ITS LEGACY.

It was a one-time effort. The money was raised for the expedition, and a group of people was brought together, and then went out and made the discoveries and so forth. There wasn't a plan for continuous oceanography. And oceanographers suffered for a number of years after that for the lack of ships. One of the reasons that short stations such as this institution were built were to provide a place for scientist to gather together, and make it possible to bring fresh specimens to them to study, and ultimately to build fleets so that scientists could go around the world continually.

NARRATOR:
AS IT TURNED OUT, THE WORLD'S FIRST OCEANOGRAPHIC LABORATORIES WERE NOT BUILT IN THE U.S. OR ENGLAND. ONE OF THE EARLIEST LABS WAS ACTUALLY ESTABLISHED IN NAPLES, ITALY, AT THE STAZIONE ZOOLOGICA, IN THE LATTER HALF OF THE 19th CENTURY.

DAY:
Many people from around the world came to Naples to work in that laboratory, including a young man named William Ritter. And a number of these people took a look around Naples and said, "This is fabulous. We must do this in our own countries." William Ritter returned to his native California and started an effort to establish a marine biological laboratory in California.

NARRATOR:
RITTER TRAVELED TO SAN DIEGO, GIVING A SERIES OF LECTURES AND TALKING TO ANYONE WHO WOULD LISTEN ABOUT HIS DREAMS FOR AN OCEANOGRAPHIC INSTITUTION.

The fathers of the city are interested in this. One of the fathers of the city is a guy named Fred Baker, who is a shell collector, as well as being an eminent local physician. He plays poker with E.W. Scripps, and so he suggests that William Ritter meet E.W. Scripps. His brother George had recently died, died around 1900, and George had always been interested in science. And George left his fortune, which was about $700,000, to Ellen Browning Scripps, the sister of E.W. Scripps. So she was very interested in finding an institution that might memorialize her brother George. She herself was very interested in biology, so these three people, E.W. Scripps, Ellen Browning Scripps and William Ritter, met in San Diego in 1903, and at that meeting, a check is given and they decide to start a private organization called the Marine Biological Association of San Diego. Now, Ritter, at that point, was a Professor of Zoology from Berkeley. He wanted the university to be involved. But the university didn't have a lot of funds, and they were hesitant about having a marine biological station that they couldn't support. And so what happened is, Ellen Browning Scripps decided to give a large endowment for the Marine Biological Association in 1912 on the provisional, on the understanding that the Marine Biological Association would become part of the University of California. So, in 1912, they exchanged $10, and all of the property that belonged to the Marine Biological Association of San Diego was turned over to the University of California, and it became The Scripps Institution at that point.

NARRATOR:
SOME YEARS LATER, A SIMILAR EFFORT WAS UNDERTAKEN ON THE EAST COAST OF THE U.S. AT A SMALL RESEARCH LAB ON CAPE COD IN MASSACHUSETTS.

DAVID GALLO, Ph.D., Woods Hole Oceanographic Institution:
Woods Hole Oceanographic Institution really was born because of a study conducted by the National Academy of Sciences. And they were concerned that the U.S. was starting to slip after World War I in oceanography. So they wanted to build a place that would really be a leader in the world of ocean sciences and ocean technologies.

NARRATOR:
WHILE SCRIPPS CHOSE TO ALIGN ITSELF WITH AN ESTABLISHED UNIVERSITY, WOODS HOLE DECIDED TO GO A DIFFERENT ROUTE.

DAVE GALLO:
Woods Hole's different from the rest, most of them, because we're independent—we're not affiliated with a university or a college. Started with a sailing vessel called the Atlantis. And then, through the years, started to grow slowly. We got a big boost in growth during World War II because we got involved with the Navy, with submarine warfare. We did things like antifouling paint. We understood how you could hide submarines. We understood how you could find submarines. So during the war years, we had a big boost in growth. And then it wasn't too long after World War II that the National Science Foundation and the Office of Naval Research came around, and we really started to understand more about Planet Earth and about all the wonderful things that are going on in the ocean that we had no knowledge about. And so then the science really kicked in.

DEBORAH DAY, Scripps Institution of Oceanography, UCSD:
During the war, a lot of the scientists here began to study sonar, sound in the sea. And physical oceanography became more and more important for the institution. A number of the scientists here were also reserve naval officers. As soon as the war happened, they all became active naval officers. They began to go out to sea in naval ships. Suddenly, you had scientists who had a lot of experience on the ocean—some of it military and some of it not military. So after the war, the other thing that occurred is that there were a lot of naval vessels that need to go into mothballs. The Director of the institution at that time was a reserve naval officer named Roger Revelle. He was able to acquire three large vessels from the government and suddenly, the institution had a fleet. So in 1949, 1950, it undertook a whole series of expeditions to the deep Pacific, which really made the institution famous.

ANTHONY MICHAELS, Ph.D., Wrigley Institute of Environmental Studies, University of Southern California:
I think the real push in oceanography was right after World War II. And there were a number of cases in World War II where the Marines would land on a beach and didn't even know—because they didn't even know the tides, there would be these incredible losses, and those were unacceptable. And so the Navy said, "We have to understand how this ocean works in any possible way that can affect our current activities or our future." And that required that a huge amount of money go into oceanography in a very formal way. And that was really the boom in the 1950s of oceanography throughout the United States, and many of the existing institutions grew dramatically at that time.

GALLO:
And so you can go back 30 years or so and look at our history in deep submergence and it's a wonderful legacy that we're leaving behind there, so we were leaders in that. Also I think some of our work in understanding marine mammals and how they communicate, recording mammal sounds—that's another place where we had a real big impact. Understanding the north Atlantic, which we're finding out now is critically important to things like abrupt climate change.

NARRATOR:
THE LAST 100 YEARS HAVE BEEN A TIME OF EXPLOSIVE GROWTH WITHIN MARINE SCIENCE—THE RISE OF OCEANOGRAPHIC INSTITUTIONS LIKE SCRIPPS AND WOODS HOLE, REMARKABLE SCIENTIFIC VOYAGES, LIKE THAT OF THE GLOMAR CHALLENGER IN THE LATE 1960s, UNPRECEDENTED ADVANCES IN TECHNOLOGY, INCLUDING REMOTELY OPERATED SUBMERSIBLES THAT PROBE THE DEEP SEA, AND HIGHLY SOPHISTICATED SATELLITES THAT CAN SEE VIRTUALLY ANYWHERE ON THE SURFACE OF THE OCEAN. BUT PERHAPS THE GREATEST CHANGE OVER THE PAST CENTURY HAS BEEN THE RECOGNITION THAT IF IT IS TO FLOURISH, OCEANOGRAPHY MUST BE PRACTICED IN A COLLABORATIVE AND INTERDISCIPLINARY MANNER.

GALLO:
We do collaborate—oceanography's much bigger than one laboratory. We're talking about three-quarters of the planet to cover with a very few institutions and even just a handful of ships and just one or two submarines. So it's—there's more than enough to go around, and we collaborate nationally and we collaborate internationally as well.

MICHAELS:
There's a side effect of the way we get to the systems we work on. We've got to go to sea, we've got to go to the ocean and do the work. And that means either that we go out on ships or that we go to marine labs. In either of these situations, you end up getting thrown together with people that need to be there, need to be at that place, but might be there for a very different reason. They might study a completely different part of it. But when we do that, either long trips at sea or these periods in the summers at marine labs, we live together, we eat together, we play together, and out of that togetherness grows a whole network of friendships that are independent of the actual disciplines we work in, but are still linked to the kinds of places and reasons we chose to go somewhere. And out of these friendships then grow collaborations across the disciplines.

PETER RHINES, Ph.D., University of Washington:
We look at the sea as a single entity with these many, many subdisciplines. And they again make it the most interdisciplinary of sciences without question. And I think it also gives us a little extra advantage in the sense that, as the world is changing in rapid and frightening ways, in this subject we have all of the tools to study a multidisciplinary system.