From the Society for Vascular Surgery

Presidential address: Charles Darwin and vascular surgery

Frank J. Veith, MD, *New York, N.Y.*

Selection as President of The Society for Vascular Surgery is for me a singular honor, especially because it comes on the 50th Anniversary of this esteemed Society. However, this is a time of enormous upheaval in American medicine, and holding this office has also forced me to focus on the future of Vascular Surgery and how well it will survive these turbulent times. The resulting concern I have for the future of our specialty has prompted me to select Charles Darwin as the topic of my Presidential Address. It is certainly reasonable to wonder what possible relevance Darwin, the famous English naturalist and the father of the theory of evolution, could have to Vascular Surgery. In fact, the theory and principles of Darwin are important to our specialty, and I will explain why.

The life and accomplishments of Charles Darwin

Charles Darwin was born in 1808 to a wealthy medical family in Shrewsbury, England. His father, a fashionable physician, entered his young son in Edinburgh Medical School. However, young Charles fled in horror at the sight of his first operation. Because the choice of alternative careers was limited and his aptitude for the classics minimal, his father enrolled Charles in Christs' College at Cambridge University with the intent that he become a clergyman. At Cambridge, Darwin obtained the rudiments of a scientific education and was able to pursue his boyhood interest in the natural history of plants, birds, and insects. Indeed, until the defining event in Darwin's life, it appeared that he was destined to become yet another botanizing Victorian clergyman. That seminal event was his appointment as Naturalist on the naval ship, *H.M.S. Beagle,* which had been commissioned to make a surveying voyage of the unexplored nether regions of South America, including Patagonia and Tierra del Fuego (Fig. 1). This 40,000 mile, 5-year voyage included many adventure-filled inland expeditions that gave Darwin a view of the natural world from the Brazilian jungle to the peaks of the Andes. His observations led him to speculate about the relationship between extinct and contemporary species and to question the then-current view that animal and plant species, having been created by God in His infinite wisdom, are permanently fixed and immutable. Concepts born in Darwin's mind on the voyage of the *Beagle,* together with supporting evidence gathered on that trip, ultimately led to his definitive formulation of the theory of evolution in *The Origin of Species By Means of Natural Selection,* published 23 years after the voyage.[1] Darwin was not one to rush prematurely into print and had spent the two decades between the formulation of his theory and its announcement in wrestling with potential objections and collecting supportive facts. This caution was based on Darwin's recognition that his theory would contradict religious thinking and would therefore elicit a storm of hostility and opposition. As Mark Twain would subsequently say: "Let a man proclaim a new principle and public sentiment will surely be on the other side." This statement certainly applied to Darwin's theory in his era. It is often applicable today, and it may apply to parts of this Presidential Address.

The theory of biologic evolution was not new. By Darwin's own count, evolutionary ideas had been put forth by more than 30 predecessors going back to the ancient Greeks. Others, including Diderot, Lamarck, and Darwin's own grandfather, had previ-

From the Division of Vascular Surgery, Department of Surgery, Montefiore Medical Center & Albert Einstein College of Medicine.

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Reprint requests: Frank J. Veith, MD, Montefiore Medical Center/Albert Einstein College of Medicine, 111 East 210th St., New York, NY 10467.

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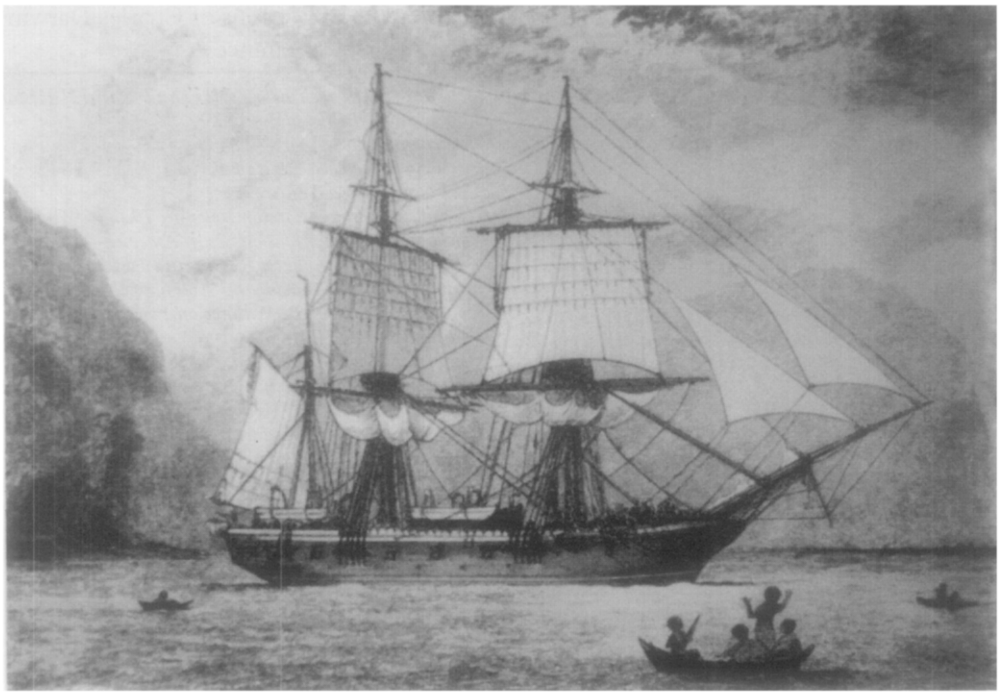

Fig. 1. The *Beagle* in the Straits of Magellan.

ously expressed evolutionary concepts only to have them greeted by theologic indignation and discredited in favor of divine creation of fixed species. Darwin's unique accomplishment was to accumulate a massive body of exemplary evidence, bolstered by the newly emerging scientific disciplines of geology and paleontology, to support his theory. He was also the first to have the crucial insight that the cause of evolutionary change must lie within the reproductive process, which produced random unlimited variations. These random heritable variations placed certain offspring in a favored position to cope with the Earth's constantly changing environment. Darwin postulated that these favored forms were better able to survive and would go on to form species, all members of which would have the new favorable trait. These new species would hold a competitive advantage and would win out over less-favored forms or species in the constant struggle for survival that exists throughout the animal and plant kingdoms. The less-favored forms or species would then diminish in numbers and become extinct. This process was Darwin's "Natural Selection." Species that were most fit by virtue of a particular trait to cope with an ever-changing environment would displace other less fit or less capable related species. In the universal struggle for existence, the former would survive while the latter would not. To describe this process, Darwin adopted a phrase used in 1852 by Herbert Spencer: "survival of the fittest." However, Darwin's use of the word "fittest" was in relation to a given environment and not on an absolute scale of perfection.[2]

Other aspects of Charles Darwin's life are inheritantly fascinating. On March 26, 1835, Darwin was heavily bitten by the Benchuca or great black bug of the Pampas.[3] This "kissing bug" carries *Trypanosoma cruzi,* the causative agent of Chagas' disease. Although the disease was not known until long after Darwin's death, it is likely that this infestation produced the lassitude and the heart and gastrointestinal disorders that troubled Charles Darwin throughout his life after the Beagle. These symptoms and the resulting semi-invalidism caused Darwin to shun society and other amusements and distractions, thereby giving him the opportunity to concentrate more fully on his work.

Darwin's scientific accomplishments were prodigious and not restricted to *The Origin of Species.* As shown in Table 1, his scientific interests spanned an enormous breadth within botany and zoology. Although some of his secondary works were related to his primary interest in evolutionary theory, others described innovative concepts regarding the formation of volcanic islands and coral reefs, the mechanisms of plant fertilization and reproduction, the

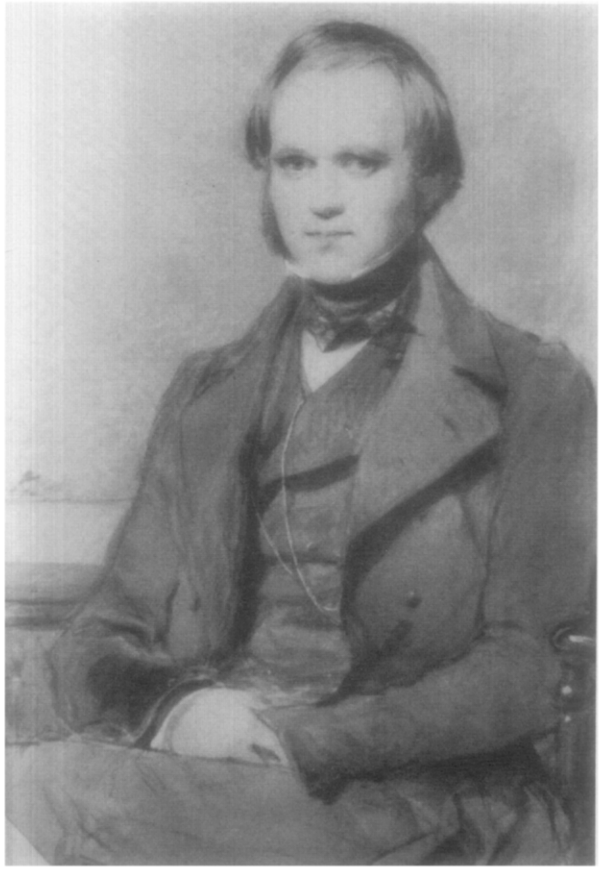

Fig. 2. Charles Darwin, 1840. From a portrait by George Richmond.

Table I. Publications of Charles Darwin and date of first appearance

Journal of Research Into Zoology and Natural History (during the Voyage of the Beagle)—1839
Sketch of Species Theory—1842
Structure and Distribution of Coral Reefs—1842
Essay on Species—1844
Geological Observations on Volcanic Islands—1844
Geological Observations on South America—1846
Multiple Monographs on Recent and Fossil Lepadidae and Balanidae (Barnacles and Acorn Shells)—1851–1854
Joint Paper with A.R. Wallace on Evolution and Natural Selection—1858
Origin of Species—1859
Paper on Dimorphism in Primula (Primroses)—1862
On the Various Contrivances by Which British and Foreign Orchids are Fertilized by Insects—1862
Descent of Man—1871
Expression of the Emotions in Man and Animals—1872
Insectivorous Plants—1875
Climbing Plants—1875
Effects of Cross and Self-Fertilization in the Vegetable Kingdom—1876
Different Form of Flowers on Plants of the Same Species—1877
Role of Erasmus Darwin—1879
Power of Movement of Plants—1880
Formation of Vegetable Mold Through the Actions of Worms—1881
Autobiography—1887 *(Published after his death as part of Life and Letters of Charles Darwin) (Charles Darwin died April 19, 1882)*

power of movement in climbing and insectivorous plants, and landmark studies of the natural history of earthworms and barnacles. In time many of these concepts would become classics.

After seriously debating with himself the pros and cons of marriage and its impact on his scientific career, Charles Darwin on January 28, 1939, at age 30, married his cousin, Emma Wedgewood, the daughter of the famous pottery maker Josiah Wedgewood (Figs. 2 and 3). He rationalized his marriage with the following: "My God, it is intolerable to think of spending one's whole life, like a neuter bee, working, working, and nothing after all. No, no, won't do . . . Marry, Marry, Marry Q.E.D."[2] After marriage, Charles and Emma Darwin, who had 11 children, lived in London for 4 years. They then moved to a country home, Down House in Kent, where he wrote most of his books and articles (Fig. 4). Although Darwin's poor health was ascribed to hysteria, anxiety, and hypochondriasis, it is unlikely that a man with the physical stamina, fortitude, and bold spirit he showed during the arduous and adventure-filled voyage of the Beagle could be afflicted with these neuroses. The Benchuca and Chagas disease are far more likely explanations for the ill health that formed a backdrop for Darwin's work from the end of 1839 until his death at age 73 on April 19, 1882.

What human qualities best define Charles Darwin? The keynote of his character was simplicity. His wife described him as "the most open, transparent man I ever saw. . . ." Darwin characterized himself as "a great overgrown child" committed to happy endings. He despised cruelty to man and animals, but he recognized that animal experimentation was important for scientific progress, which, in turn, he believed was essential to the betterment of mankind. In the latter part of his life, his religious beliefs centered around natural scientific laws rather than a Creator with unlimited power and compassion. Darwin's self-appraisal of his mental qualities indicated that he "had become skillful in guessing right explanations and devising experimental tests. . . ." He believed he had "no quickness of apprehension or wit . . ." but that he was "superior to the common run of men in noticing things which easily escape attention, and in observing them carefully." He attributed his success in science to "methodical habits, ample leisure from

Fig. 3. Emma Darwin, 1840. From a portrait by George Richmond.

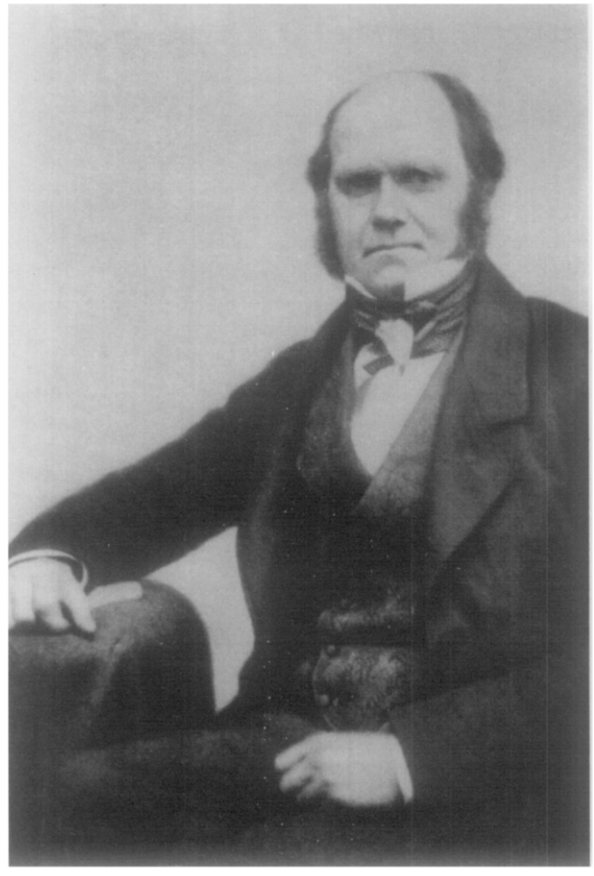

Fig. 4. Charles Darwin, 1854. From a photograph by Maull and Fox.

not having to earn my bread . . . and ill health, . . . love of science, unbounded patience, industry in observing and collecting facts, and a fair share of invention [and] . . . common sense."[2] Apart from the ill health, all these qualities would serve an aspiring young vascular surgeon well today.

Despite the turmoil and controversy his theories had created, on his death the greatness of Charles Darwin and the revolutionary importance of his theory to the biologic sciences were recognized (Fig. 5). He was likened to Copernicus, Newton, and Faraday and was buried with appropriate honors in Westminister Abbey.

The changing medical environment

Before considering the uncanny relevance of Darwinian principles to Vascular Surgery, it is important to examine some of the forces of change ongoing in its medical environment. All of these threaten the status quo, and some are threatening to the very existence of Vascular Surgery as a specialty. These forces have been fully discussed elsewhere,[4,5] but some bear reemphasis.

The financial support structure for medical care is changing. To restrain escalating health costs, government funding is being curtailed and managed care systems are being introduced widely. These systems provide financial disincentives to use invasive treatments, such as those required by some vascular disease patients. They also tend to place control of the use of these procedures in the hands of generalists rather than the specialists who perform them. All of these changes will make it difficult for the vascular surgeon specialist to function and will increase competition for the reduced dollars that are available to provide care for vascular disease patients.

A second major environmental change is the introduction of technologic improvements that permit less-invasive, more cost-effective treatments. In the vascular disease area this involves a host of endovascular treatments with catheters, balloons, atherectomy devices, stents, stented grafts, and various de-

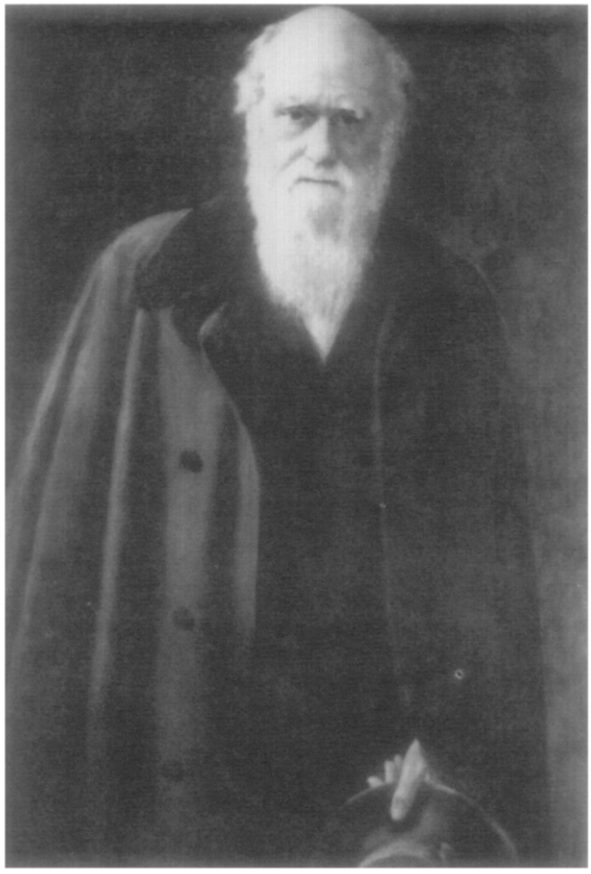

Fig. 5. Charles Darwin, 1881. From a portrait by John Collier.

rivative devices. All of these endovascular treatments involve catheter-guidewire-imaging techniques. All are potentially threatening to vascular surgeons because they may prove equal to or better than open surgical treatments and because they may be administered by nonsurgical interventional specialists with background training in Radiology or Cardiology. Competition of these other specialists with vascular surgeons for patients and limited health care dollars is inevitable. Moreover, interventional radiologists and cardiologists sincerely believe their access to new catheter-based treatments justifies their expanding role in the management of patients who were previously cared for by vascular surgeons.[6-10] Ever-increasing expansion of the workforce in these nonsurgical specialties and decreasing workloads provide further impetus for them to increase their activities in the realm of vascular disease treatment.

A third change in the challenging environment that vascular surgeons face is the re-entrance of general surgeons into the vascular disease treatment field. Decreasing workloads in traditional general surgical procedures, the emphasis on generalist care, and the current antispecialty aura has prompted some leaders in general surgery to advocate broadening the training and role of general surgeons so that they can provide "expertise that at the present time is attributed to various subspecialties, both within and without the realm of traditional general surgery" and can "practice to the fullest extent of the specialty."[11] This is a call to reverse the recent trend for younger general surgeons without special training and certification in Vascular Surgery to *not* perform vascular procedures.[12,13] If this call were heeded, it would negate the purpose of specialized training in Vascular Surgery, namely the provision of better care to vascular disease patients.[14-16] Vascular Surgery came into being as a specialty when it became obvious that general surgeons and cardiothoracic surgeons were not achieving optimal results with vascular operations.[14-16] The improved results of vascular operations, when performed by well-trained surgeons who focus their attention on them and perform them in adequate numbers, has been amply documented by a plethora of studies that are well summarized by Hertzer.[17]

Darwinism and vascular surgery

To apply the theory and principles of Darwin to Vascular Surgery in its present changing environment demands that we equate a "medical specialty" to a "species." The validity of this equivalence becomes apparent if we recognize that *species* may be defined as a group of individual plants or animals that all have a high degree of similarity, can generally interbreed or reproduce only among themselves, and that show persistent differences from allied species.[1,18] A *medical specialty* may be defined as a group of individual doctors of medicine who, as a result of specialized effort and training in a defined field, have a high degree of similarity in their possession of a special, distinct body of scientific medical knowledge and technical ability that is not possessed in full by other specialists.[19] They concentrate their practice in the well-defined and distinct area of their special knowledge and technical ability, and they have the capacity to reproduce themselves via recognized residency training programs with a defined curriculum and specified case and procedural experiences.[19] Among the objectives of recognized medical specialties and their governing bodies or boards is that they act in the public interest by contributing to the improvement of medical care by establishing qualifications and by evaluating individuals who apply for certification.[20] Establishment of new medical spe-

cialty boards "must be based on major new concepts . . . or substantial advancement in medical science. [They] must represent a distinct and well-defined field of medical practice."[21] Vascular Surgery incorporates a discrete body of knowledge and distinct skills. Many are major new advances. It differs from other specialties, and its members reproduce themselves by recognized residency programs in vascular Surgery. It, therefore, qualifies as a separate *species* or *medical specialty.*

Darwin's theory and principles of evolution and natural selection are particularly relevant to Vascular Surgery if we realize that medical specialties, like species, are engaged in a constant struggle for existence and survival. Our specialty, Vascular Surgery, is in competition with other specialties, Interventional Radiology and Cardiology, for the patients that are the wherewithall to survive and flourish. This competition is rendered more fierce by some of the previously noted forces of change that exist in our environment. These forces will also place us in competition with our more closely related progenitor specialty, General Surgery. The outcome of this competition and struggle for existence will be survival and flourishing with increased numbers for some specialties; for others it will be weakening and diminished numbers; for still others it will mean extinction.

Although the pollyannas may say there will be work for all, medical specialties, like species and individuals, have an irresistible urge to procreate and generally exercise minimal restraint of their excessive reproductive capacity. This leads to unchecked increases in the numbers of individuals within a well-adapted species/specialty, which, as Darwin noted, assures the extinction of less-well-adapted forms that are competing for the same niche in the environment.[1] This niche is defined by food supply and habitat in the case of an animal species and by patients in the case of a medical specialty. Thus the universal struggle for existence inevitably follows from the high rate at which all organic beings and medical specialists tend to increase. Although some suggestions have been made to limit the numbers of medical specialty trainees, these efforts have been limited by antitrust laws and by the obvious incentives, such as prestige and low-cost assistance, that accrue to individuals who direct training programs.

Because a changing environment can and has in the past produced the extinction of innumerable species and some medical specialties and because such extinction is a consequence of poor adaptation to a changing environment, what can Vascular Surgery and vascular surgeons do to assure the survival of their specialty in the present circumstances? They must recognize that their species or specialty is not immutable or fixed by some Creative Power, but must constantly evolve to survive. Moreover, they must realize, as Darwin showed, that transmutation of species is the rule and that several current species or specialties may descend from a common ancestor or progenitor. In the case of surgical specialties, they have all descended from a common progenitor specialty, General Surgery, to become clearly defined and separate specialties. This has been the case for Neurosurgery, Orthopedics, Urology, Plastic Surgery and Cardiothoracic Surgery. It must also be so for Vascular Surgery, if it is to survive. Vascular surgeons must also recognize the applicability of the Darwinian principle that forms that most resemble the common ancestors of several current species or specialties often become extinct as their superior and better-adapted progeny with favorable variations displace them in the endless struggle for existence.[1] Darwin's principle of divergence also applies to medical specialties as well as species. According to this principle, differences between species or specialties that are at first barely perceptible tend to increase steadily, causing the different species or specialties to diverge increasingly in character both from each other and from their common progenitor.[1]

After vascular surgeons recognize that Darwinian theory applies to medical specialties as well as species throughout nature, they must then address three specific issues to minimize the risk of extinction.

Vascular surgeons must acquire endovascular skills

There are two clear reasons why vascular surgeons must become competent with the catheter-guidewire-imaging techniques that will enable them to perform endovascular treatments. The first is that some of these treatments will prove to be safe and effective and will replace standard open surgical techniques. This is already true for percutaneous balloon angioplasty (PTA) and caval filters. As stents, endovascular grafts, and other newer treatments become perfected, it is possible that 40% to 70% of current operations will be replaced with less-invasive endovascular treatments.[22,23] The survival of Vascular Surgery will depend on the ability of vascular surgeons to adapt and acquire the catheter-guidewire-imaging skills to perform some of the new endovascular procedures that replace vascular operations. If we do not, the need for our services will decrease, we will gradually be replaced, and our numbers will diminish

heading toward eventual extinction. As Darwin noted, the "death of a species [specialty] is a consequence of non-adaptation to [changing] circumstances."[1]

It is true that some endovascular procedures are done efficiently by other interventional specialists. Accordingly, it should not be our goal to "take back" diagnostic angiography or the simple catheter-directed treatments that are currently performed mostly by interventional radiologists. To do so is unnecessary and will lead to destructive turf battles.[22,23] However, it is the newer endovascular procedures, many that require surgical as well as endovascular skills, that will replace a large proportion of vascular operations. It is these that vascular surgeons must be able to perform to survive and flourish. Most endovascular grafting and some complex stenting procedures that are performed with an open vascular component are typical examples.

A second reason to acquire endovascular skills is that they can be effectively used to simplify and improve a variety of standard vascular operations. Fluoroscopically assisted thromboembolectomy is an example.[24] Using intraoperative digital C-arm fluoroscopy, a variety of guidewires and double-lumen balloon catheters, it is now possible to perform safer, better thromboembolectomy of even heavily diseased arteries. This technique facilitates over-the-wire passage of the balloon catheter through tortuous, stenotic, clot-filled arteries. It permits visual control of the contrast-filled balloon as it is drawn through diseased arteries to remove the clot, thereby avoiding damage to diseased and normal arteries. It also facilitates complete clot removal and localization and minimally invasive endovascular treatment of significant inflow and outflow lesions.[24]

Intraoperative digital fluoroscopy and catheter-guidewire techniques also facilitate other vascular operations. These techniques enable over-the-wire balloon control of inflow or outflow arteries when infection, scarring, or location renders traditional surgical access difficult. A good example is a case with subclavian artery injury. These techniques allow precise localization of pressure gradients and they facilitate simple endovascular treatment of unexpected lesions. They can also provide more accurate, more complete intraoperative angiograms of arterial reconstructions along with their entire inflow and outflow tracts. With cinefluoroscopy, these improved arteriograms also provide a dynamic index of flow. Vascular surgeons from now on must use these endovascular techniques as an essential survival adaptation in a changing environment. Because the instrumentation is available, we must be able to use it. To do so will render us "fit" to survive. Not to use these techniques is analogous to flying blindly through clouds when good navigational instruments are available. It is a clear path to extinction.

How will current vascular surgeons acquire these endovascular skills? Three steps are involved. One consists of gaining familiarity with endovascular tools, devices, and instrumentation and learning some basic principles regarding their usage, their indications, and their limitations. This information, together with the principles of radiation safety, can be acquired in a Basic Endovascular Techniques Course, which combines didactic teaching with hands-on experience in mock circulatory models. The Society for Vascular Surgery (SVS) and the North American Chapter of the International Society for Cardiovascular Surgery (ISCVS) have made a commitment to conduct such a course to familiarize vascular surgeons with current catheters, guidewires, sheaths, balloons, stents, and intravascular imaging techniques. The first offering of this course preceded this year's Annual SVS/ISCVS Meeting. It was a success and will be repeated if there is a demand for it.

The second step in acquiring endovascular skills is for vascular surgeons to obtain supervised clinical experience. This will be required for the third step, credentialing, which is a local hospital function that will not be discussed further. With regard to clinical experience, some vascular surgeons already have enough to be considered competent. Those that do not can take several pathways to obtain this endovascular patient experience. All involve supervision by a skilled endovascular therapist.

The easiest pathway is for the vascular surgeon to work collaboratively on his or her own patients in his or her own operating room or angiography suite by assisting at or performing the various endovascular manipulations under the tutelage of an experienced colleague, who can be a vascular surgeon, an interventional radiologist, or cardiologist. In such a collaborative setting the interventionalist can serve as a teacher and a consultant if a problem or difficulty is encountered. This training and clinical experience may be provided as part of a healthy and mutually beneficial collaborative relationship, such as an interdisciplinary partnership or a Vascular Disease Center. This is consistent with the observations of Darwin who recognized that one species may be dependent on another. Such species interdependence generally occurs between beings remote in the scale of nature, whereas the struggle for existence will generally be

more severe between closely related species.[1] To some extent such specialty interdependence already exists in the current collaborative relationships in which interventional radiologists provide vascular surgeons with high-quality angiograms and vascular surgeons provide surgical resources to interventional specialists for their complications or failures.

When such mutually beneficial relationships are not present within an institution, vascular surgeons must obtain their clinical experience in endovascular techniques at another institution as a trainee for at least 1 to 3 months, depending on the vascular surgeon's level of proficiency and talent, or by performing endovascular procedures with a visiting preceptor who is a skilled endovascular therapist. When either extramural arrangement is required, the SVS/ISCVS should play a major facilitating role by helping to establish a system whereby the necessary experience can be obtained with adequate supervision. The guiding principle in all these arrangements for gaining endovascular experience must be the absolute well-being of the patient. If appropriate skills are not available to one or another member of the team caring for the patient, the procedure should *not* be performed. Whatever pathway is chosen, the degree of endovascular proficiency that the vascular surgeon trainee must attain will depend on the setting in which he will use his new skills. Greater proficiency will be required if the vascular surgeon will not have available immediate interventional consultation and support. Again, the advantages of healthy collaboration between vascular surgeons and other interventional specialists (radiologists, cardiologists, or both) are obvious.

If we accept in the Darwinian sense that current vascular surgeons will have to develop some level of catheter-guidewire-imaging skills to be "fit" enough to survive, it is apparent that we must also assure the endovascular competence of our progeny. To this end, the Association of Program Directors in Vascular Surgery (APDVS) and the Residency Review Committee in Surgery (RRC-S), which oversees training requirements in our specialty, must mandate that Vascular Surgical residency programs provide adequate endovascular training and experience.

Multidisciplinary Vascular Disease Centers

The need for vascular surgeons to possess and use endovascular skills has led to the suggestion that vascular therapists of the future be hybrids between vascular surgeons and interventional radiologists. Darwin has pointed out that hybrids between species are generally infertile and weaker than their forbearers and rarely displace them.[1] It is unlikely that the hybrid vascular specialist of the future will be the exception to this rule. There will always be a niche in the medical world for a specialty/species with dominant operative skills to perform complex open operations, despite the need for these individuals to have some degree of endovascular skills. Similarly, there will always be a niche for those with dominant interventional or endovascular skills, despite the advantages of these individuals having some degree of basic open operative skills. The beneficial effects of having both kinds of specialists, each with some degree of these overlapping skills, working together in a true partnership are immediately apparent.[22,23,25] Management of vascular disease patients would be based on what treatment mode was best and most cost-effective rather than on what procedure an individual physician could perform, who saw the patient first, or the resources (operating room or angiography suite) a given physician controlled. Optimal training and patient care would be greatly facilitated and turf issues would be minimized.

The formation of multidisciplinary Vascular Disease Centers in hospitals and medical schools would certainly facilitate true collaborative partnerships between vascular surgeons and other specialists interested in vascular disease diagnosis and management. These other specialists include primarily interventional radiologists but also some interventional cardiologists and those committed to vascular medicine. Some efforts at creating such Centers have already been made in a number of institutions. However, few if any have functioned well.

Because the advantages of such Vascular Centers and other forms of collaborative partnership are so obvious, one wonders why they have functioned poorly and are not already widespread. One reason is the traditional administrative structure in most hospitals and medical schools in which Vascular Surgery is a component of General Surgery and Interventional Radiology is a component of Radiology. Because both of these components are large income producers for their parent departments, there is a natural reluctance to give them the financial or administrative independence to combine and form a new entity linked by their interest in vascular disease rather than their historical derivation from a progenitor specialty. Other reasons are inability to achieve financial integration between specialists, dominance of one or another specialty, and excessive control by the parent Departments of Surgery, Radiology, or Medicine. Underlying all these reasons are the major human motivators, jealousy and greed. Hopefully

the enormous benefits of fully integrated Vascular Disease Centers will eventually overcome these negative forces.

To this end, the clear advantages offered by Vascular Disease Centers prompted the Joint Council of the SVS/ISCVS and the Executive Council of the Society for Cardiovascular and Interventional Radiology (SCVIR) to approve a joint statement of support for Vascular Disease Centers. The SVS/ISCVS/SCVIR document recognizes that these Centers, if appropriately structured, will deliver the highest-quality diagnosis, treatment, research, and teaching in vascular diseases. The document mandates that such Centers be comprised of professionals whose primary interest and commitment is to vascular disease patients and that the Centers be administratively independent and co-directed by an interventional radiologist and a vascular surgeon. The document also specifies that all Center patients be cared for on a single integrated service, with management decisions being reached only after joint discussions between members of the two or more involved disciplines. All professional fees accruing to individuals in such a Center would be pooled and distributed on the basis of each individual's overall responsibilities and contributions to the Center. Interdisciplinary training and research would be fostered.

Although resistance to real Vascular Disease Centers based on this document will come from a number of quarters, they will come into being and they will succeed for several reasons. Such Centers will reduce costs. They will provide optimal patient care. They will facilitate the rapid evaluation of new and better treatments. They will minimize the turf battles that might otherwise occur as the result of the shrinking financial support for health care and the introduction of new technologies which cross specialty boundaries. And most importantly, they are intrinsically right because they combine the assets and minimize the liabilities of the many specialties interested in vascular disease management.

Relationships between Vascular Surgery, the American Board of Surgery, and the RRC-S

The American Board of Surgery (ABS) and the RRC-S are the governing bodies of General Surgery and Vascular Surgery. The ABS defines the boundaries of General Surgery and administers the examination that certifies general surgeons. The ABS also defines Vascular Surgery and administers the examination for Added Qualifications in that specialty. The RRC-S determines requirements for training and accredits residency programs in both General Surgery and Vascular Surgery. Both the ABS and the RRC-S presently consider Vascular Surgery a component of General Surgery and hold the view that General Surgeons should be trained and qualified to practice Vascular Surgery.

This creates a potential problem or conflict. This stems from the fact that we are training two classes of "vascular surgeons," one which is considered competent by all and holds a certificate to that effect, and a second class that is less well-trained but deemed by some qualified to perform Vascular Surgery—or at least "simple vascular operations." This problem is exacerbated by the fact that the governing bodies for *both* related specialties are the same ABS and RRC-S. This arrangement may be beneficial when the interests of both specialties coincide, e.g., with reimbursement issues or conflicts with other less closely related specialties. However, when the interests of General Surgery and Vascular Surgery diverge, the governing bodies must favor one of two conflicting interests.

One specific example is the recent mandate from the RRC-S that all general surgical residents perform at least 10 aortic cases.[26] Many Vascular Surgery program directors were concerned about this new requirement since aortic surgery is diminishing because of PTA and stenting techniques. This concern was verified by an APDVS survey, which showed that this mandate threatens the viability of at least 28% of Vascular Surgery training programs.[27] The result could be maintenance of the numbers of less well-trained "vascular surgeons," i.e., General Surgeons, at the expense of decreased numbers of well-trained "real" vascular surgeons. How can this be reconciled with the objectives of medical specialization and Specialty Boards "to act in the public interest by contributing to the improvement of medical care . . ." and to ". . . promote and enhance recognition of a single standard in preparation for practice in each specialty"?[20,21] Clearly it cannot on a long-term basis.

The only short-term justification for doing so is the fact that enough well-trained, certified vascular surgeons do not presently exist to perform all the Vascular Surgery procedures required in the United States.[13] It seems reasonable, therefore, to continue to train General Surgeons to fill this gap until adequate numbers of well-trained "real" vascular surgeons can be produced. Consensus was reached on this issue at a recent meeting between leaders of the SVS/ISCVS, the APDVS, and the ABS held on April 29, 1996. At that meeting it was also agreed that the role of the RRC-S, which was not represented, was also important in resolving this problem and related conflicts. It was, however, agreed that better repre-

sentation of Vascular Surgery, i.e., the APDVS and the SVS/ISCVS leadership, on the RRC-S was urgently required. The meeting ended on a note of optimism that compromise within the present ABS/RRC-S system could lead to resolution of the conflicting needs of Vascular Surgery and of General Surgery. Hopefully this optimism will be justified by the future actions of our governing bodies.

However, there is little in the history of the relationship between Vascular Surgery and these governing bodies to justify such optimism. Although all vascular surgeons recognize the importance of including a rich Vascular Surgery experience in General Surgery training, issues similar to those present today have received the attention of SVS/ISCVS leaders for more than 26 years.[14-16,28-30] In 1970, when discussing the value of training General Surgery residents in simple vascular procedures, Wylie wondered how many of these programs "would qualify a surgeon for appendectomy who could not remove the right colon. . . ."[14] More recently, approval of Vascular Surgery training programs has depended more on the quality of Vascular Surgery training afforded General Surgery trainees than the Vascular trainees themselves.[30] In addition, graduates of adequate independent or freestanding Vascular Surgery training programs have been denied access to the certification process simply because their training was not in an institution with a General Surgery residency.[31] These actions are not consistent with a policy of quickly producing adequate numbers of well-trained Vascular Surgeons, and will tend to maintain the status quo of the two or three class system.

This problem must be resolved soon. The overriding reason is so that *Surgery at large can serve the public better.* Our governing bodies must answer to this call rather than to the parochial interest of any surgeon group or other power base. To reach this goal your leaders in Vascular Surgery can continue our dialogue with the ABS and the RRC-S to obtain better representation for the SVS/ISCVS and the APDVS on these governing bodies. We can maintain steady pressure to see that the needs of Vascular Surgery, our training programs, and, most importantly, the patients we serve are met, so that we can train enough real Vascular Surgeons and provide optimal care to all vascular disease patients—as has already occurred in many other industrialized countries. To maintain a consistent even-handed approach to this problem, the SVS/ISCVS last year formed a Strategic Planning Group that will address this and other issues critical to Vascular Surgery on a long-term basis. Some of these other issues include training in new techniques, workforce analysis, relationships with other specialties and other vascular societies, and vascular research funding.

On all these issues, your leaders can provide analysis and point the way toward resolution. However, problems facing Vascular Surgery may require action and sacrifice and will only be solved if there is consensus and commitment from *all* "real" Vascular Surgeons. In this regard, I define a "real" Vascular Surgeon as a *Specialist in Vascular Surgery or one who has completed at least 1 year of senior level training in Vascular Surgery and vascular disease management, who devotes more than 50% of his or her practice to vascular disease patients, and who performs more than 50 major vascular operations per year.* Although this definition extends beyond the membership of the SVS and ISCVS and it certainly extends beyond the Certificate of Added Qualifications in Vascular Surgery, actions begun in the last year will hopefully lead to ISCVS membership for all such individuals. Clearly the well-being of vascular disease patients will be best served if they are cared for by such specialists.

Charles Darwin has some concluding comments. Vascular Surgery is differentiating from its ancestor, General Surgery. Even though there is a continuing struggle for existence between the two, this will be resolved by the "constant tendency [of] the improved descendants of any one species . . . to supplant . . . the predecessors and original parent" species.[1] Vascular Surgery's descent and separation are inevitable because its members are better adapted, more "fit" by virtue of training and experience to care for vascular disease patients. The divergence of Vascular Surgeons from their ancestral forms will increase with time and be enhanced by increasing special knowledge involving improved operative techniques, vascular biology, noninvasive vascular laboratory techniques, and especially endovascular techniques. Indeed it is likely that endovascular treatments and proficiency in their use will be analogous to the cystoscope in separating Urology from General Surgery, and the pump-oxygenator in separating Cardiothoracic Surgery from General Surgery.

And finally, Darwin would predict that forces of evolution will result in the distinct separation of our specialty, with our own recognized Specialty Board and related Residency Review Committee. That certainly would eliminate much conflict of interest and would probably be best for all concerned, especially for vascular patients.

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